PANORAMA BESS

Updated Noise Impact Assessment

Prepared for:

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Recurrent Energy (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
660.30234-R04-v3.1	14 January 2026	John Sleeman	Aaron McKenzie	John Sleeman
660.30234-R04-v3.0	24 December 2025	John Sleeman	Aaron McKenzie	John Sleeman
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Recurrent Energy to undertake an updated noise impact assessment for the proposed installation and operation of a Battery Energy Storage System (BESS) adjacent to the existing Transgrid electricity substation near Bathurst NSW. This assessment has been prepared to accompany the Amendment Report for the proposal.

This report assesses the potential construction and operational noise and vibration impacts associated with a design upgrade of the original proposal, with the associated assessment contained in SLR report 660.30234-R04-v1.2 '*Panorama BESS Noise Impact Assessment',* 9 June 2023. The design upgrade consists of replacement of the Solbank 2.0 battery storage units with Solbank 3.0 battery units, and the replacement of Twin Skid compact units with Single type compact units. In addition there are minor changes in the alignment of the components, and the slope of the hardstand area on which they are proposed to be located. Construction activities have also been modified with a revised underground cable route to the Transgrid site, with earthworks and construction of a retaining wall on the north-east side of the Transgrid site, and additional switch gear on the Transgrid site.

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

1.1 Amendments to the Proposal

Recurrent Energy has now determined to make specific changes to the proposal as exhibited in the EIS (SLR, 2024). The proposed amendments to the proposal involve a change in technology of the battery energy storage from the Solbank 2.0 system to the Solbank 3.0 system, and an increase in the development Footprint to address the following issues:

BESS System

- Improvements in battery energy storage technology since the submission of the EIS mean that the Solbank 3.0 system offers an increased capacity and enhanced energy density per battery container compared to the Solbank 2.0 system while reducing the BESS layout footprint by approximately 20% or 0.35 ha.

Site Layout

- The total area of the Development Footprint identified during the EIS process was 3.47 ha.
- Since the submission of the EIS, detailed civil engineering optimisation has taken place recommending that the location and orientation of the development footprint should move to the west by approximately 40 m. To accommodate this change, benching of the BESS would require additional civil battering to improve the safety and landform stability of the Project.
- As a result, the amended Development Footprint would be approximately 5.18 ha.
- Finally, and in response to submissions received, the Recurrent Energy has also undertaken an additional visual impact assessment and is proposing to install a visual screen to be added to the perimeter of the BESS Facility. The following screening has been proposed:
  - 3.0 m high perforated metal screen panels along the part northern, western and southern perimeter of the BESS Facility;
  - 0.1 m stainless steel square posts and stainless steel base plates; and

- The panels and posts coloured “Evergreen” or similar.

Table 1 below is included for a comparison of amendments to the proposal.

Table 1 Comparison of Amendments to the Proposal in Terms of Key Parameters

Element	Approved EIS Proposal	Amended Proposal	Sensitivity
Change in technology of the BESS	Solbank 2.0 system	Solbank 3.0 system	Change in technology from the Solbank 2.0 to Solbank 3.0 BESS. Reduction in BESS layout footprint by 0.35 ha.
Development footprint	3.47ha	5.18ha	+1.71ha
Total change in development footprint			+1.71ha
Battery storage container equipment sound power level	104 battery storage containers 79 dBA per container sound power level	48 battery storage containers 86 dBA per container sound power level fan speed 100% 81 dBA per container sound power level fan speed 80%	Total sound power 104 battery storage containers 99 dBA (2.0 system) Total sound power 48 battery storage containers 100% fan 103 dBA (3.0 system) Total sound power 48 battery storage containers 80 % fan 98 dBA (3.0 system)
Total change in battery storage equipment sound power level			Total sound power +4 dBA 100% fan speed Total sound power -1 dBA 80% fan speed

1.2 Bathurst City Council Comments

Bathurst Council recommended that the land directly to the north of the lot boundary zoned R5-Large Lot Residential may see residential development and this needs to be acknowledged. Accordingly noise contours have been provided in this updated assessment for comparison with the R5 zoning.

1.3 Proposal Description

The application proposes a 100 Megawatts (MW), 200 Megawatt Hours (MWh) BESS to be constructed at Lot 2 DP 864272 at 800 Mid-Western Highway, Evans Plains, NSW, located at approximately 5.8 kilometres (km) south-west of Bathurst and 2.5 km west of Robin Hill.

The proposed development will comprise of SolBank BESS which consist of battery enclosures, inverters and transformers. The development requires the installation of approximately 100m of 33kV underground cable to connect the BESS infrastructure to an existing TransGrid substation (Lot 521 DP 603541) located immediately north of the site. The development also involves the construction of ancillary facilities including an operation and maintenance building, stormwater management infrastructure, lighting, fencing and temporary construction laydown areas.

The site location is shown in **Figure 1** and the proposed site layout is shown in **Figure 2**

The BESS will primarily be on automatic control 24 hours per day 7 days per week with very little human intervention. The BESS will typically be controlled by the BESS control system. This control system will automatically determine the state of charge or dis-charge as required.

The identified sources of noise from the operation of the proposed development include:

- Battery Storage Containers – 48 units,
- MV Single Skid Compact Units comprising one invertor and one low voltage to high voltage transformer – 32 units,
- 33 kV to 132 kV transformer,
- Control Room Heating, Ventilation, and Air Conditioning (HVAC)

Construction activities associated with the proposal would include:

- Site Establishment;
- Enabling and earthworks to provide roadway access from the existing substation, a level area for the location of equipment, and trench(s) for underground cabling to the Transgrid substation;
- Construction of new access roads within the Transgrid perimeter fence (all sides) as well as from the existing access road to the north west corner of the substation to assist with construction access, and upgrading of existing access roads on the eastern, southern and western sides;
- Expansion of the existing Transgrid substation to the north-west to accomodate additional switching equipment, with associated earthworks to level the area including the construction of a retaining wall;
- Civil works and construction of the operations and maintenance building;
- Location of equipment on site; and
- Commissioning.

Figure 1 Site Location and Surrounding Receivers

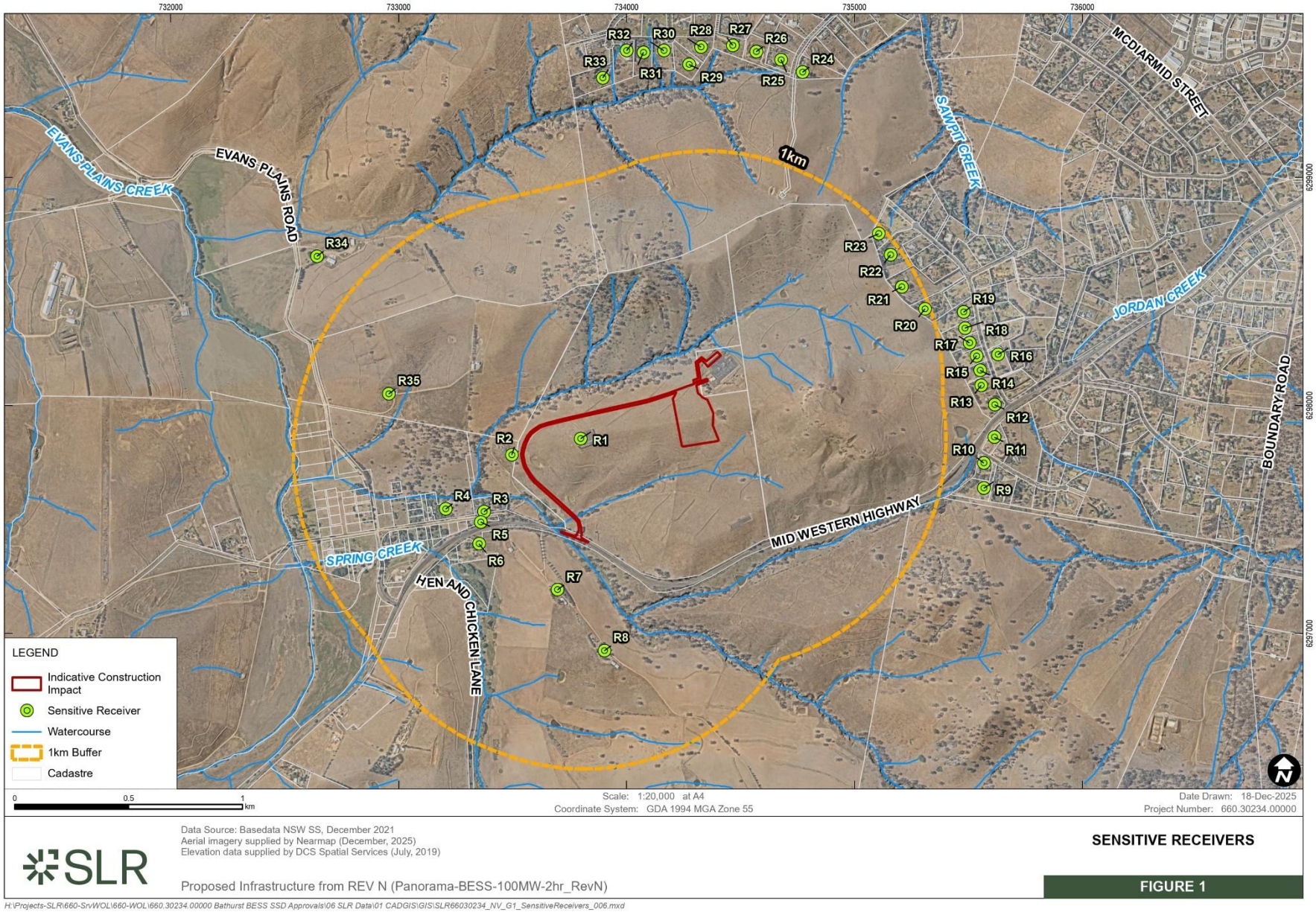
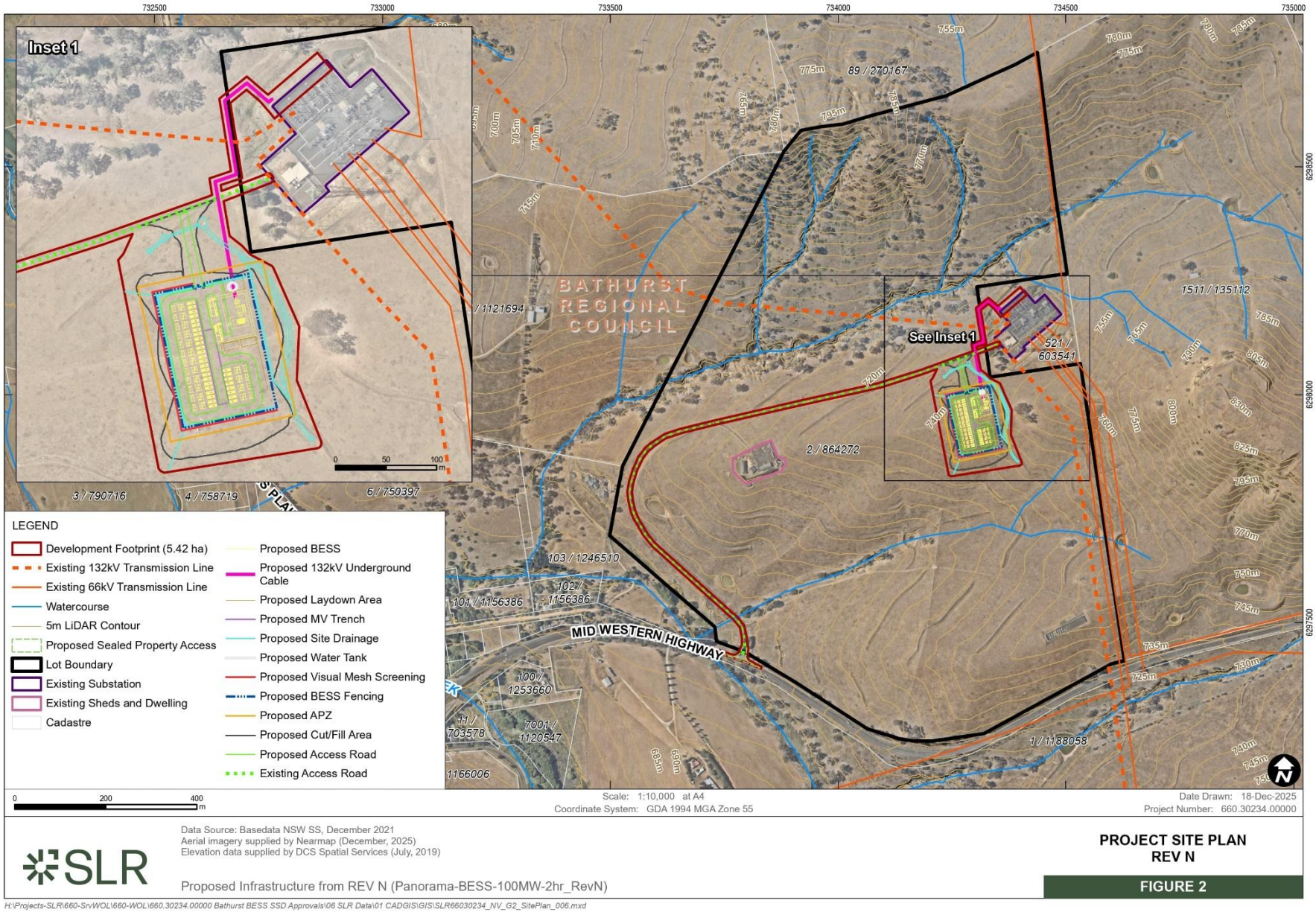


Figure 2 Proposed Development



1.4 Nearest Receivers

The nearest sensitive receivers are the residential property located at 800 Mid Western Highway, Evans Plains (DP 86427), several rural residences located to the south west, residences to the east on Windemere Road and residences to the north on Hartwood Avenue. The residence at 800 Mid Western Highway also shares the access road to the facility. The Transgrid electricity substation located adjacent to the Facility has been identified as an industrial receiver. The nearest receivers are presented in **Figure 1** and summarised in **Table 2**, with a detailed listing in **Appendix B**.

Table 2 Nearest Surrounding Sensitive Receivers

ID	Address	Receiver Type	Distance (m)	Direction
R1	800 Mid Western Highway, Evans Plains	Residential	490	West
R2	16 Stewart Street, Evans Plains	Residential	790	West
R3	24 Stewart Street, Evans Plains	Residential	950	West South West
R7	831 Mid Western Highway, Evans Plains	Residential	870	South West
R35	403 Evans Plains Road, Evans Plains	Residential	1,340	West
R9-R11	McLennan Close, Robin Hill	Residential	1,210	East-South-East
R12-R23	Windemere Road, Robin Hill	Residential	990	North-East
R24-R33	Hartwood Avenue, Robin Hill	Residential	1,480	North
	Transgrid Substation	Industrial	100	North-North-East

Notes 1. The typical closest distance to receivers is shown

1.5 Secretary's Environmental Assessment Requirements (SEARS)

The proposal is a State Significant Development, and the Department of Planning and Environment (DPE) has issued Secretary's Environmental Assessment Requirements (SEARs). SEARs relevant to this study and where they are addressed are listed in **Table 3** below.

Table 3 SEARs requirements and where addressed

Relevant SEARs Requirements	Report Section where addressed
'*NOISE - including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry (2017), cumulative noise impacts (considering other developments in the area), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria*'	Section 4 and Section 5

2 Existing Noise Environment

2.1 Background and Ambient Noise Levels

2.1.1 Unattended Noise Monitoring

In order to characterise the existing noise environment at the nearest residences, unattended ambient noise monitoring was conducted at the residence on DP 864272 (800 Mid-Western Hwy, Evans Plains), at 44 Windemere Road, Robin Hill and at 270 Hartwood Avenue, Robin Hill. The locations of which are indicated in **Figure 1** The ambient noise monitoring was conducted from Friday 28 October 2022 to Thursday 22 November 2022.

The measured noise levels were used to determine the ambient and to establish existing background noise levels at the nearest noise-sensitive receivers, for the development of the construction and operational criteria.

The noise monitoring devices continuously measured noise levels in 15 minute sampling periods to determine the existing L_{Aeq}, L_{A90} and other relevant statistical noise levels during the daytime, evening and night-time periods. The noise monitoring equipment is outlined in **Table 4**.

Table 4 Noise Monitoring Locations and Equipment

ID	Location	Model	Serial Number
L01	DP 864272 (800 Mid-Western Hwy, Evans Plains)	Svantek 957	20665
L02	44 Windemere Road, Robin Hill	Svantek 957	21884
L03	270 Hartwood Avenue, Robin Hill	Svantek 957	20664

The equipment was set up with microphones at 1.5 m above the local ground level. All microphones were fitted with wind shields.

All noise monitoring instrumentation used were compliant with the requirements of *AS IEC 61672.1-2004: Electroacoustics - Sound level meters - Specifications* and carried appropriate and current National Association of Testing Authorities (NATA) (or manufacturer) calibration certificates. The calibration of the equipment was checked both before and after the survey and no significant drift in calibration (±0.5 dBA) was noted at any location.

The noise monitoring results were processed to exclude weather-affected data following consultation of weather reports recorded at the Bureau of Meteorology (BOM) Bathurst weather station to establish representative noise levels at each measurement location.

Information of the logger locations and graphs of each day's noise logging are presented in **Appendix C**. A summary of the unattended and attended results are presented in **Table 5** and **Table 6**.

Table 5 Summary of Ambient and Background Noise Levels

Location ID	Address	Measured Noise Level (dBA)[1]					
		Rating Background Levels (L_{A90})[2]			Ambient Noise Levels (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	800 Mid-Western Hwy, Evans Plains	35 (26)[3]	30 (28)[3]	30 (30)[3]	53	45	51
L02	44 Windemere Road, Robin Hill	35 (31)[3]	30 (28)[3]	30 (22)[3]	54	50	47
L03	270 Hartwood Avenue, Robin Hill	35 (30)[3]	30 (30)[3]	30 (27)[3]	60	58	51

Note 1: NPfI assessment periods – Daytime: 7:00 am to 6:00 pm Monday to Saturday, 8:00 am to 6:00 pm Sundays and Public Holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 8:00 am Monday to Saturday, 10:00 pm to 8:00 am Sundays and Public Holidays

Note 2: The RBL noise level is representative of the "average minimum background sound level", or simply the background level.

Note 3: The NPfI minimum RBL value has been used due to the measured RBL (as shown in brackets) being below the NPfI minimum value.

2.2.2 Attended Noise Monitoring Results

Attended monitoring was also conducted at the three unattended locations to observe the existing ambient noise environment in the area, as presented in **Table 6**.

Table 6 Summary of Attended Noise Monitoring Results

Noise Monitoring Location	Date/time	Sound pressure level (dB re 20 µPa), 15 minute measurement period			Typical ambient noise levels (noise level in dBA)
		LA90	LAeq	LAmax	
800 Mid Western Highway, Evans Plains	22/11/22 14:33	35	43	53	Cows: 37-48 dBA Wind: 37-41dBA Workers: 48-53dBA
44 Windemere Road, Robin Hill	22/11/22 14:02	40	46	53	Wind: 34-50dBA Birds: 45-53dBA
270 Hartwood Avenue, Robin Hill	22/11/22 15:40	39	46	52	Wind: 45-52dBA Birds: 43dBA

The unattended and attended ambient noise monitoring results are consistent with those of a semi-rural area as defined in the NPfI.

3 Assessment Criteria

3.1 Construction Noise Assessment Criteria

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise at residences and 'other sensitive' land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) based on the existing background noise in the area. Representative 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.1.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 7**.

Table 7 Determination of NMLs for Residential Receivers

Time of Day	NML (dBA) $L_{Aeq(15minute)}$	How to Apply
Standard Construction 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[1] + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15minute)}$ 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 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 dBA
		The Highly Noise Affected (HNA) 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 restructuring the hours that the very noisy activities can occur, taking into account:
		  • 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
		  • If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Outside Standard Construction 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 practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

Sleep Disturbance

The ICNG recommends that an assessment of sleep disturbance impacts should be completed where construction works are planned to extend over more than two consecutive nights. The ICNG refers to the NSW *Environmental Criteria for Road Traffic Noise* for assessing the potential impacts, which notes that to limit the level of sleep disturbance the L_1 level (or L_{Amax}) should not exceed the existing L_{90} (or RBL) by more than 15 dB.

3.1.2 Other Sensitive Land Uses

The ICNG NMLs for 'other sensitive' non-residential land uses are shown in **Table 8**.

Table 8 NMLs for 'Other Sensitive' Receivers

Land Use	Noise Management Level $L_{Aeq(15minute)}$ (dBA) (Applied when the property is in use)	
	Internal	External
ICNG 'Other Sensitive' Receivers		
Classrooms at schools and other educational institutions	45	55[1]
Hospital wards and operating theatres	45	65[2]
Places of worship	45	55[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70
Industrial	-	75

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Note 2: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.

3.1.3 Summary of NMLs

The NMLs for the proposal are determined using the RBLs and are shown in **Table 9**. The works are proposed to occur during Standard Construction Hours so only the daytime NMLs have been adopted for this assessment.

Table 9 Construction Noise Management Levels

Receiver Type	Representative Background Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Criteria (RBL +15 dB)
		Standard Construction (RBL +10 dB)	Out of Hours (RBL +5 dB)			
		Daytime	Daytime[1]	Evening	Night-time	
Residential	L01	45	40	37	35	45

Receiver Type	Representative Background Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Criteria (RBL +15 dB)
		Standard Construction (RBL +10 dB)	Out of Hours (RBL +5 dB)			
		Daytime	Daytime[1]	Evening	Night-time	
Industrial	n/a	75	75 (when in use)			-

Note 1: This refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

3.2 Construction Vibration

3.2.2 Categories of Vibration in Structures

The effects of vibration in buildings can be divided into three main categories; those in which the occupants or users of the building are inconvenienced or possibly disturbed, those where the building contents may be affected and those in which the integrity of the building or the structure itself may be compromised.

For the Facility construction works, the nearest structure is the Transgrid buildings adjacent to the north, and adjacent to the south. The nearest residential dwellings are 800 Mid-Western Hwy, Evans Plains located 95 m south of the site access road and approximately 490 m to the east of the BESS, and 16 Stewart Street, Evans Plains located 55 m west of the access road, and approximately 800 m east of the BESS.

3.2.2 Assessment Criteria

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of cosmetic damage such as surface cracks, and are set well below the levels that have potential to cause structural damage. The British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2,* provides frequency-dependent vibration limits related to the cosmetic damage risk.

The German Standard DIN 4150-3:1999 "*Structural Vibration Part 3: Effects of vibration in structures*" provides guideline values for evaluating the effect of vibration on sensitive structures, such as buried pipework. In addition, SLR has identified appropriate vibration criteria for the operating of a mechanical plant where applicable.

The EPA's "*Assessing Vibration: A Technical Guideline"* (DEC 2006) provides guideline building vibration levels associated with a low probability of annoyance from occupants. The applicable damage risk and annoyance risk vibration velocity criteria are further discussed in **Appendix D** and summarised in **Table 10**.

Table 10 Vibration Velocity Damage Risk and Annoyance Risk Criteria (mm/s)

Receiver Area	Damage Risk (mm/s)		Annoyance Risk (mm/s)	
	Horizontal	Vertical	Horizontal	Vertical
Residential/Dwellings	7.5	7.5	1.2	0.45
Commercial/Offices	25	25	1.6	0.6
Industrial/Workshops			3.2	1.2
Reinforced structures (ie concrete buildings)			-	-
Mechanical (On/Off)[1]	20/5	20/5	-	-
Subsurface structures	50-100	50-100	-	-

Note 1: 'On' refers to when machinery is turned on, and 'Off' is when machinery is off. Criteria are stricter for 'Off' as machinery is more likely to be damaged by vibration when it is not operating due to potential for brinelling.

3.3 Operational Noise Assessment Criteria

The NSW *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the requirements for the assessment and management of operational noise from industry in NSW.

3.3.1 Project Intrusiveness and Project Amenity Noise Levels

The NPfI defines how to determine 'trigger levels' for noise emissions from industrial developments. Where a development is likely to exceed the trigger levels at existing noise sensitive receivers, feasible and reasonable noise management measures are required to be considered to reduce the impacts.

There are two types of trigger levels – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses:

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15-minutes, does not exceed the representative background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

For this assessment, the area surrounding the proposal is considered to be 'Rural' as per the NPfI definitions.

3.3.2 Project Noise Trigger Levels

As presented in **Table 5** similar ambient noise levels were recorded at all three noise logger locations, and to simplify the assessment the determination of trigger levels were based on the results at 800 Mid-Western Hwy, Evans Plains. The trigger levels for industrial noise from the proposal are summarised in **Table 11**. The Project Noise Trigger Levels (PNTL) are the most stringent of the intrusiveness and amenity trigger level for each period and are highlighted below.

Table 11 Project Noise Trigger Levels

Receiver Type	Period	Amenity Noise Level $L_{Aeq(period)}$ (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
			RBL[1]	$L_{Aeq(period)}$	Intrusiveness	Amenity[2,3]
Residential	Daytime	50	35	67	40	48
	Evening	45	30	43	35	43
	Night-time	40	30	39	35	38
Industrial	When in use	75	-	-	-	75

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to other sources of industrial noise being present in the area.

Note 3: The project amenity noise levels for residences have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

3.3.3 Modifying Factors

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factors, shown in **Table 12**, which are to be applied where annoying characteristics are present.

Table 12 NPfI Modifying Factors

Factor	Assessment/Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.	5 dB[3]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

Note 1: Corrections to be added to the measured or predicted levels.

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Note 3: Adjustment to be applied to night-time only.

3.3.4 Sleep Disturbance

The NPfI defines the sleep disturbance screening level as:

- 40 dB $L_{Aeq,\ 15\ min}$ or the prevailing RBL plus 5 dB, whichever is greater, and/or
- 52 dB L_{AFmax} or the prevailing RBL plus 15 dB, whichever is greater.

Where the predicted L_{AFmax} noise is above the sleep disturbance screening level then a detailed maximum noise level event assessment should be undertaken, including consideration of the existing maximum noise levels and guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*.

Due to the type of noise emission sources associated with the proposal (i.e. constant noise emission), the 40 dB $L_{Aeq,\ 15\ min}$ screening level has been adopted for this assessment.

3.4 Road Traffic Noise

The potential for impacts from project related traffic (construction and operation) on the surrounding public road network is assessed using the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB. Where this is considered likely, further assessment is required using the RNP criteria shown in **Table 13**.

Table 13 RNP Criteria for Assessing Project Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	**Night-time (10 pm – 7 am)**
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4 Construction Noise Assessment

A computer model was developed in order to predict noise emissions from the construction of the proposed Panorama BESS. The noise modelling was undertaken using SoundPlan v8.2 software developed by Braunstein and Berndt Gmbh in Germany, using the Concawe algorithm for predicting noise. The noise modelling takes into account source sound level emissions and locations, screening effects, receiver locations, ground topography and noise attenuation due to spherical spreading and atmospheric absorption.

The model used 1 m terrain data provided by GIS. The noise model also included the details of surrounding buildings with the potential to provide acoustic shielding of construction noise to surrounding receivers.

The potential impacts have been determined by comparing the predicted noise levels to the NMLs in a 15-minute assessment period.

4.1 Modelling Scenarios and Sound Power Levels

The Panorama BESS is expected to have a design and construction duration of 14 months. This would include a three month design period and a nine month construction, testing and commissioning.

4.2 Modelling Scenarios and Sound Power Levels

As outlined in **Section 1.3** construction works would involve civil works for site preparation followed by the installation of plant. The significant noise generating stages or scenarios are summarised as follows:

- Scenario 1 - Site Establishment;
- Scenario 2 - Enabling and earthworks; and
- Scenario 3 - Civil works and build construction.

Construction equipment for these scenarios have been determined and these are presented in **Appendix E** with the associated equipment sound power levels (SWL) used in the modelling. The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that is likely to occur for each work scenario, as required by the ICNG.

The on-site vehicle speed limit is 40 km/hr, however due to heavy vehicles likely to make the most noise using the access road to make deliveries (ingress movement is uphill and vehicles loaded) a speed of 10 km/hr was assumed for noise modelling of the heavy vehicles. This corresponds to the worst case traffic noise impact with the time to travel on the access road from the Mid Western Highway to the site being more than 8 minutes. A maximum of one movement for the 15 minute assessment period was assumed.

4.2.1 Working Hours

The works would be undertaken during Standard Construction Hours, as outlined in the ICNG. These are:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays
- No work on Public Holidays or Sundays.

It is not expected that there would be any requirement for works during evening or night-time periods.

4.3 Construction Noise Impact

Construction noise from each of the construction scenarios presented in **Appendix E** was predicted at the nearest residential receivers as presented in **Table 14.**

Table 14 Predicted Daytime Construction Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)

Reference [1]	Receiver [2]	L_{Aeq} Noise Level			
		Daytime Project Specific NML	Scenario 1 - Site establishment	Scenario 2 - Enabling and earthworks	Scenario 3 - Civil works and construction
R1	800 Mid Western Highway, Evans Plains	45	44	**46**	**46**
R2	16 Stewart Street, Evans Plains	45	**48**	**48**	**48**
R3	24 Stewart Street, Evans Plains	45	37	38	38
R7	831a Mid Western Highway, Evans Plains	45	35	37	38
R35	403 Evans Plains Road, Evans Plains	45	30	32	32
R9 to R11	McLennan Close, Robin Hill	45	< 10	< 10	< 10
R12 to R23	Windemere Road, Robin Hill	45	31	34	35
R24 to R33	Hartwood Avenue, Robin Hill	45	24	26	27
	Transgrid Substation	75	68	**80**	71

Notes 1. The Receiver Reference is shown in Figure 1.
2. At receivers in Mc Lennan Close, Windemere Road and Hartwood Avenue the highest noise level for receivers in the area is presented.

Discussion

The results represent the worst-case noise levels where all equipment in each scenario is working concurrently. Accordingly for most construction activities, it is expected that the construction noise levels would frequently be lower than predicted. The predicted noise levels in **Table 14** above show the following.

- There is a minor exceedance of 3 dBA predicted at 16 Stewart Street (R2 in **Figure 1**) during the Scenarios, with the noise levels dominated by a truck movement on the access road. At 800 Mid Western Highway, Evans Plains (R1 in **Figure 1**) a noise level of up to 46 dBA is predicted, also dominated by a truck movement. At all other residential receivers noise levels are below 40 dBA, due to the large distances to the access road and site.
- There is a minor exceedance of up to 5 dB of the NML at the Transgrid substation building.

It is noted that works would only occur during Standard Daytime Construction Hours, therefore comparison to other NMLs does not form part of this assessment.

Recommended construction noise mitigation and management measures are discussed in **Section 4.6**.

4.4 Construction Vibration

Minimum working distances for typical vibration intensive construction equipment are provided in the NSW Roads and Maritime *Construction Noise and Vibration Guideline* (CNVG) and are shown in **Table 15**.

The minimum working distances are for both cosmetic damage (from *BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2*, BSI, 1993) and human comfort (from the NSW DEC *Assessing Vibration: A Technical Guideline*, 2006 (AVTG)). Works that occur further from receivers than the minimum distances are unlikely to result in vibration impacts.

Table 15 CNVG Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (AVTG)
Vibratory Roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	>18 tonne	25 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	73 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Note 1: More stringent conditions may apply to heritage or other sensitive structures.

Based on the equipment and activities identified for the proposed construction, potential sources of vibration are limited and would only occur during site preparation, establishment and earthworks. Given the large distance offset (> 100 m) to the closest sensitive receivers (Transgrid building), vibration is unlikely to be perceptible and impacts are unlikely to occur.

It is therefore anticipated that vibration generated by the construction works will comply with the requirements of the AVTG (human comfort) and BS 7385 (cosmetic and structural damage). No further recommendations for vibration mitigation and management measures are provided in this assessment.

4.5 Construction Traffic

The proposed construction is expected to generate of the order 20 return light vehicle trips and one return heavy vehicle trip per day. That would be approximately 42 vehicle movements (in and out) per day.

Construction traffic would generally access the site from the Mid Western Highway. Existing daily traffic volumes on the Mitchell Highway in the vicinity of the proposal from recent traffic counts are 1561 vehicles during the daytime. Therefore, the proposal is not anticipated to increase road traffic noise during construction by more than 2 dBA. Differences in noise levels of less than approximately 2 dBA are generally imperceptible in practice and an increase of 2 dBA is hardly perceivable, if at all.

The requirements for construction traffic movements would be minimal and would not be expected to result in any additional noise impacts at the nearest receivers due to the existing volumes of traffic on the access roads, noting that a vehicle increase of approximately 60% would be required to increase the noise levels by 2 dBA. As such, no recommendations for road traffic noise mitigation and management measures are warranted or provided in this assessment.

4.6 Construction Recommendations

Noise impacts may be apparent at the nearest receivers at certain times during construction of the proposal. The project should apply all feasible and reasonable mitigation measures to minimise the impacts, particularly during noise intensive works, such as site preparation and earth works.

The following best-practice measures shown in **Table 16** should be implemented to minimise the potential impacts from the works.

Table 16 Standard Construction Recommended Mitigation and Management Measures

Project stage	Measure
Scheduling	Highly noisy intensive works should only be undertaken during the following Standard Construction Hours, unless otherwise assessed and justified: - 7 am to 6 pm Mondays to Fridays, inclusive; and - 8 am to 1 pm Saturdays; and - at no time on Sundays or public holidays.
	Schedule heavy vehicle movements on the site access road to be limited to one every fifteen minute period, where practicable.
	Avoid loading and unloading of materials / deliveries outside of daytime hours.
Site Layout	Site entry and exit points should be located as far as possible from sensitive receivers, noting the current site entry and exit point meets this mitigation measure.
	Compounds and work areas should be one-way to minimise the need for vehicles to reverse.
	Work compounds, parking areas, equipment and stockpiles should be positioned away from noise-sensitive locations and/or in shielded locations.
	Trucks should not idle near to residential receivers.
	Stationary sources of noise, such as generators, should be located away from sensitive receivers.
Contractor management	Training should be provided to project personnel, including relevant sub-contractors, on noise and vibration requirements and the location of sensitive receivers during inductions and toolbox talks.
	Delivery vehicles should be fitted with straps rather than chains for unloading, wherever possible.
	Truck drivers should avoid compression braking as far as practicable.
	Where night-time works are required, trucks should use broadband reversing alarms.
Noise source mitigation	Use the minimum sized equipment necessary to complete the work and where possible, use alternative, low-impact construction techniques.
	Power tools should use mains power where possible rather than generators.
	Shut down machinery, including generators, when not in operation.
	Avoid dropping materials from a height and dampen or line metal trays, as necessary.
	Ensure equipment is operated in the correct manner.
	All equipment should be appropriately maintained and fitted with noise control devices, where practicable, including acoustic lining of engine bays and air intake / discharge silencers, etc.
Community consultation	Provide appropriate notice to the affected sensitive receivers prior to starting works and before any noisy periods of works.
	Provide signage with a 24 hour contact number.
	Where there are complaints regarding noise, review and implement additional control measures, where feasible and reasonable.
Transgrid consultation	During construction the proponent should update Transgrid regarding noise and hours of work.
Monitoring	Conduct noise and/or vibration monitoring in response to any formal complaints received.
	Conduct vibration monitoring whenever vibration intensive works are undertaken within the minimum working distances of sensitive receivers or structures.

5 Operational Noise Assessment

The SoundPlan v8.2 computer model developed for construction activities has been used to predict operational noise. Predictions were based on the CONCAWE method.

The potential impacts have been determined by comparing the predicted noise levels to the PNTLs in a 15-minute assessment period.

5.1 Modelling and Sound Power Levels

Sound power levels of noise producing equipment shown in **Table 17** are typical of currently available equipment. All equipment are assumed to be in operation for the entire period, with 15-minute and period noise data identical.

The battery enclosures and medium voltage power station inverters are also assumed to operate at 100% capacity (i.e. maximum fan speed) 24 hours each day. The transformers and associated fan cooling (where fitted) are assumed to operate at 100% capacity (i.e. maximum fan speed) 24 hours each day.

Sound power levels and spectrum information were provided for the Solbank 3.0 Battery Storage Containers. Overall sound pressure levels (SPLs) were provided for the inverters and from this information the overall sound power level was estimated (as based on the provided SPL, distance, location, and number of fan outlets and inlets on the equipment). The sound power levels for the transformers, and the spectrum for the transformers, transformer fans and inverters (fans) were adopted from previous measurements conducted by SLR on similar equipment. The effect of the perforated screens proposed to provide visual screening was also considered, and they would not provide attenuation of noise emissions.

Table 17 Equipment sound power levels

Qty	Item	Sound Pressure Level (SPL), Leq 15 min, dBA	Overall Sound Power Level (SWL), Leq 15 min, dBA
48	Battery Storage Containers – Solbank 3.0	n/a	86 dBA per container fan speed 100% [1] 81 dBA per container fan speed 80% [1]
32	Inverter (one per single skid)	57 dBA at 15 m 63 dBA at 15 m	88 dBA per unit for unit side; 94 dBA per unit for unit end [2].
32	Medium Voltage Transformer	n/a	70 dBA per unit [3]
1	High Voltage Transformer	n/a	80 dBA per unit [3]
2	High Voltage Transformer (transgrid)	n/a	80 dBA per unit [3]
2	High Voltage Transformer cooling fan (transgrid)	n/a	75 dBA
1	Control Room HVAC Unit	n/a	80 dBA

Notes
1. The Solbank 3.0 sound power levels are specified in report CSI–Solbank–S-5016-2h
2. Manufacturers specifications (Sound pressure level at distances from 1m to 15 m) were used to derive the unit sound power levels used in the modelling.
3. The transformer sound power levels are based on SLR measurements of similar equipment and include a 5 dB tonal penalty.

The battery storage containers were modelled as small industrial buildings, with a noise source located on the end corresponding to the chiller, with the chiller end advised by Recurrent Energy. The Solbank 3.0 noise report provides sound power levels for 100%, 80%, and 60% fan operation. Recurrent Energy have advised that at 25° C the fans will operate at 70% and that the 80% sound power level would be appropriate for night-time operations. Accordingly for daytime the battery storage containers are modelled at 100%, and for night-time 80% fan operations.

The 'single skid compact' contains one inverter which was modelled as an industrial building with a fan inlet noise source on each side and one fan exhaust noise source located on the end opposite the associated transformer. The 'single skid compact' medium voltage transformer was modelled as an omnidirectional point noise source. The high voltage transformers and associated cooling fans were modelled as omnidirectional point noise sources. During daytime one light vehicle was modelled on the access road.

5.2 Cumulative Operations

To assess cumulative noise emissions from the Panorama BESS and the adjacent Transgrid Substation the two high voltage power transformers and associated cooling fans were included in the noise model. The sound power levels for the transformers and cooling fans are presented in **Table 17**.

5.3 Weather Conditions

General meteorological conditions for the project-specific noise models included a temperature of 20°C, and humidity of 49% daytime and 7°C and humidity of 78% night-time,as representative of average conditions for the area. These values were determined based on publically available climate statistics from the Bureau of Meteorology (BOM) Weather Station situated at Bathurst Research Station (063291).

Certain weather conditions can increase noise levels by focusing noise towards receivers. Noise-enhancing weather conditions can occur where wind blows from the source to the receiver, or where temperature inversions occur.

The NPfI defines 'standard' and 'noise-enhancing' weather conditions as shown in **Table 18**. Noise-enhancing weather should be included in the assessment where they occur for more than 30% of the daytime, evening or night-time period in any season.

Table 18 Standard and Noise-Enhancing Weather Conditions

Weather Conditions	Meteorological Parameters
Standard	Daytime/evening/night-time: stability categories A–D with wind speed up to 0.5 m/s
Noise-enhancing	Daytime/evening: stability categories A–D with light winds up to 3 m/s Night-time: stability categories A–D with light winds up to 3 m/s and/or stability category F with winds up to 2 m/s

The NPfI contains guidance for determining prevailing weather conditions. Based on previous analysis of weather conditions conducted in central NSW noise-enhancing weather conditions are expected to be a feature of the proposal site.

Accordingly to provide a conservative assessment, a source to receiver wind has been adopted for all receivers and it is assumed that a temperature inversion (Stability Class F) condition can also occur during the night-time period. Standard and noise enhancing weather conditions have been adopted for the assessment as shown in **Table 18**.

5.4 Predicted Operational Noise Levels

A summary of the predicted operational noise assessment at the receivers surrounding the proposal is shown in **Table 19** with the inclusion of the noise mitigation measures. The mitigation measures include the specified sound power levels in **Table 17** for the Solbank 3.0 Battery Storage Containers and the Inverters, and the limiting of fan operation to 80% or less during night-time. The predicted noise levels are compared to the PNTLs to determine the potential for noise impacts. Predicted noise levels for all receivers as identified in **Figure 1** are presented in **Appendix B**.

Appendix F and **Appendix G** present noise contours for noise enhancing day and night respectively to assist in future land planning.

Table 19 Industrial Noise Assessment

Reference [1,2]	Receiver	Project Noise Trigger Level LAeq(15minute) (dBA)			Predicted Noise Level[1,2] LAeq(15minute) (dBA)		Compliant ?
		Day (D)	Evening (E)	Night (N)	Standard (D/N)	Noise Enhancing (D/N)	
R1	800 Mid Western Highway, Evans Plains	40	35	35	34 / 31	36 / 34	Y
R2	16 Stewart Street, Evans Plains	40	35	35	31 / 17	32 / 20	Y
R3	24 Stewart Street, Evans Plains	40	35	35	24 / 20	27 / 24	Y
R7	831a Mid Western Highway, Evans Plains	40	35	35	23 / 21	26 /24	Y
R8	831b Mid Western Highway, Evans Plains	40	35	35	21 / 21	25 / 24	Y
R35	403 Evans Plains Road, Evans Plains	40	35	35	18/ 15	21 / 19	Y
R9 to R11	McLennan Close, Robin Hill	40	35	35	<10	<10	Y
R12 to R23	Windemere Road, Robin Hill	40	35	35	23 / 23	26 / 26	Y
R24 to R33	Hartwood Avenue, Robin Hill	40	35	35	<10 / 11	< 10 / 11	Y
	Transgrid Substation	75	75	75	49 / 50	52 / 51	Y

Notes
1. The Receiver Reference is shown in Figure 1.
2. For a range of receivers, the highest predicted noise level for the group is presented
3. The same noise levels are predicted for the evening and night-time period.

Discussion.

The predicted noise levels above show the following:

- The highest noise levels at a sensitive receiver (i.e. 36 dBA) is predicted at 800 Mid Western Highway, Evans Plains (R1 in **Figure 1**) during noise enhancing weather conditions at day time. 800 Mid Western Highway is the closest receiver (approximately 490m) from the proposed development.
- Noise levels are predicted to be approximately 3 dBA higher during noise enhancing conditions.
- The predicted noise from the proposal complies with the Project Noise Trigger Levels at all receivers during all periods and weather conditions
- Predicted $L_{Aeq,\ 15\ minute}$ noise levels are also compliant with the sleep disturbance screening level of 40 dBA.

Based on the results and findings discussed above, recommended safeguards and provisions for monitoring are provided in **Section 5.6**. They are designed to assist in maintaining compliance and minimise any residual impacts as far is commonly feasible, reasonable, and safe to do so.

5.4.1 Cumulative Operations

The two Transgrid transformers and associated cooling fans were included in the noise model, and accordingly the predicted noise levels presented in **Table 19** assess cumulative operations.

Operational emissions of the Panorama BESS the with the additional of the Transgrid substation is therefore compliant with the NPfI requirements.

5.4.2 Zone 5 – Large Lot Residential Impacts.

Bathurst Regional Council raised the potential for rural residential expansion of the Zone R5 – Large Lot Residential, located north of the Project Site. Accordingly the noise assessment should consider the noise impact of the proposal on potential future residential in Zone R5. **Appendix F** presents noise contours for daytime operations with a wind. The limiting 40 dBA noise contour is outside the Lot, and therefore the Lot complies with the 40 dBA daytime criterion.

Appendix G presents noise contours for night-time operations with a category F (temperature inversion) and wind. The limiting 35 dBA noise contour is at the Lot boundary at the western end of the southern boundary, and outside the lot for the remainder of the southern boundary. Accordingly the Lot complies with the 35 dBA evening and night-time criterion.

Figure 3 presents the site in question from the NSW Planning Portal Spatial Viewer, known as Lot 89/-/DP270167 Hartwood Avenue Robin Hill, with the Lot shown as the pink area to the north of the dotted line.

Zone R5 – Large Lot Residential aims to provide residential housing in rural settings while balancing the preservation of the environment, scenic quality, and the promotion of rural lifestyles. LEP 2014 states the following relevant objectives:

- *To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.*

Appendix F presents noise contours for daytime operations with a wind. The limiting 40 dBA noise contour is outside the Lot, and therefore the Lot complies with the 40 dBA daytime criterion.

Appendix G presents noise contours for night-time operations with a category F (temperature inversion) and wind. The limiting 35 dBA noise contour is at the Lot boundary at the western end of the southern boundary, and outside the lot for the remainder of the southern boundary. Accordingly the Lot complies with the 35 dBA evening and night-time criterion.

Figure 3 Lot 89/-/DP270167 Hartwood Avenue Robin Hill

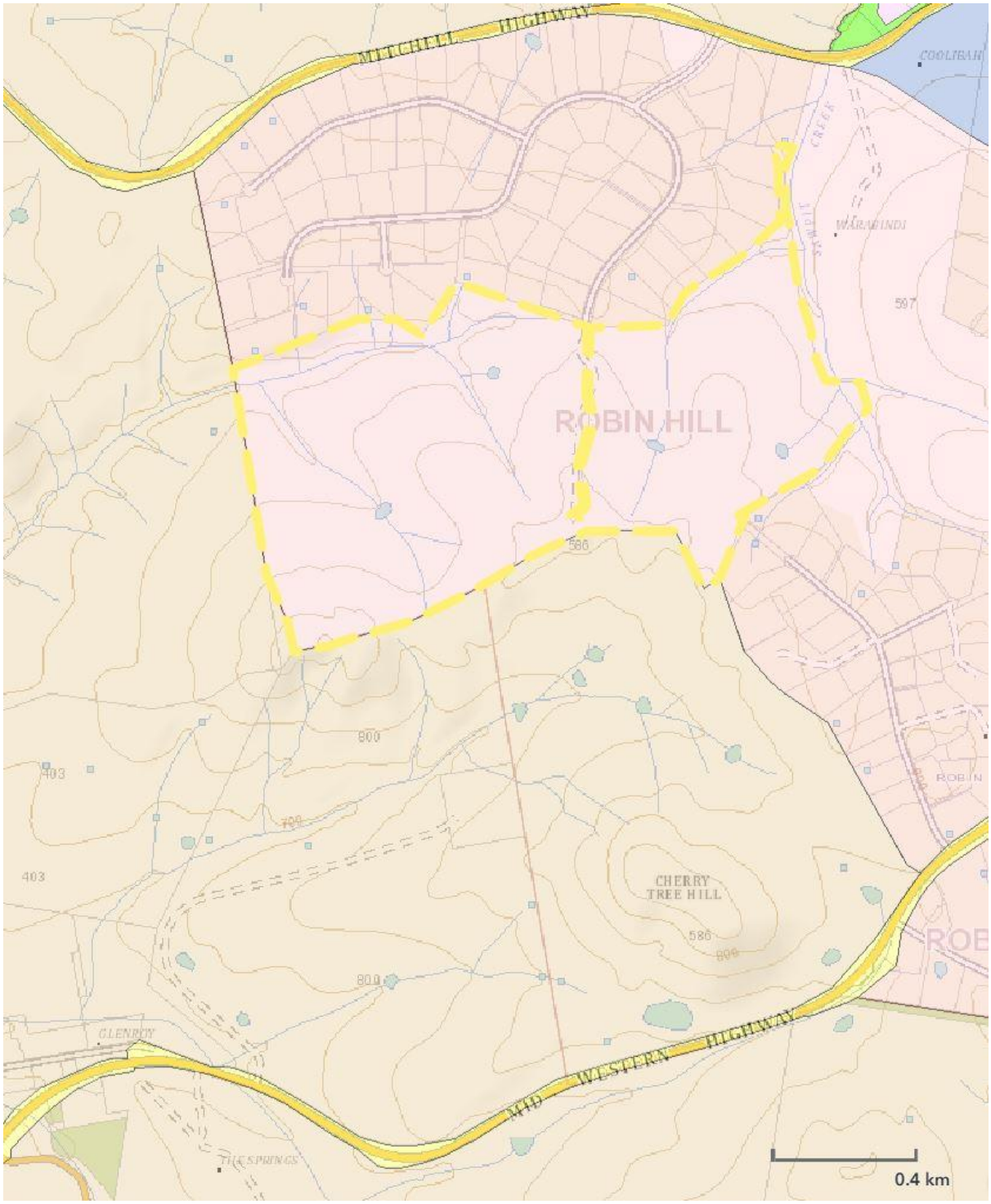


Image from the NSW Planning Portal Spatial Viewer

5.5 Operational Traffic

Operational road traffic noise impacts from the proposal are not anticipated (i.e. from additional vehicles on the public road network). The BESS facility will be on automatic control, and any periodic maintenance would be undertaken by staff from the Panorama BESS. Additional traffic from the proposal will therefore be minimal.

For arterial and sub-arterial roads (e.g. Mid Western Highway) the proposal will not generate a significant increase in vehicles when compared to that of the existing vehicle flows and mixes on the surrounding road network. The introduction of the proposal's operational traffic is unlikely to be perceptible.

5.6 Operational Recommendations

Based on the findings presented above, all predicted operational $L_{Aeq,\ 15\ minute}$ noise levels for worst-case proposed operations are below the PNTL at all identified receivers. The BESS is deemed compliant with the NPfI for the daytime, evening and night-time periods. As such no further recommendations for noise reducing mitigation or management measures are provided in this report. Suitable safeguards and provisions for monitoring have been recommended below, to assist operational noise levels being maintained below the applicable PNTL.

5.6.1 Safeguards and Provisions for Monitoring

Operational compliance has been achieved with the assumption that noise emission sources include:

- 48 x Battery Storage Containers with sound power level (L_W) of 86 dBA and 100% fan operation during the day and 81 dBA at 80% fan operation during the night.
- 32 x Single Skid Compact Units comprising one invertor and one low voltage to high voltage transformer. L_W of 88 dBA to each side; and 94 dBA to one end for the inverter plus 80 dBA for the transformer at all times.
- 1 x Control Room HVAC with L_W of 80 dBA at all times.

On this basis the following safeguards and provisions are provided:

- During detailed design / equipment procurement, ensure that the BESS noise emission sources achieve quantities and sound power levels equal to or lower than presented in this report. If overall BESS noise emissions are expected to be higher, additional assessment should be considered. The potential for tonal noise from the inverter units will need to be carefully considered during the detailed design / equipment procurement, such that the specified inverter sound power levels are met if a 5 dB tonal penalty is applicable.
- Where new and improved BESS technology becomes available within the life of the project, replacement of BESS equipment should aim to achieve sound power levels equal to or lower than presented in this report. If overall BESS noise emissions are expected to be higher, additional assessment should be considered.

6 Conclusion

SLR has been engaged to assess the potential construction and operational noise emissions from the proposed upgrade of the Battery Energy Storage System (BESS) at the existing Transgrid substation located off the Mid Western Hwy in Bathurst NSW.

The upgraded BESS as assessed in this report, results from amendments to the proposal which includes a change in technology of the battery energy storage from the Solbank 2.0 system to the Solbank 3.0 system, and an increase in the development footprint to improve the safety and landform stability of the proposal.

The BESS will include battery storage containers, inverters, low voltage-high voltage (LV-HV) step-up transformers, high voltage underground feeders, connection to the Transgrid substation and associated roads, tracks, fences, and control building.

The BESS will primarily be on automatic control 24 hours per day 7 days per week with very little human intervention. The functioning of the BESS will typically be controlled by the BESS control system. This control system will automatically determine the state of charge or dis-charge as required.

The construction noise assessment identified that predicted $L_{Aeq,\ 15\ minute}$ noise levels have the potential to exceed the Noise Management Levels (NMLs) at certain times when the noisiest works are occurring. These minor exceedances occur at 800 Mid Western Highway, Evans Plains (R1), and 16 Stewart Street, Evans Plains (R2). There is also a minor exceedance of the NML at the Transgrid substation building. The worst-case impacts are, however, only likely to occur for relatively short times of the total project duration and the works would be limited to Standard Daytime Construction Hours, with no evening or night-time works required. A number of best-practice mitigation and management measures have been recommended to be applied, where feasible and reasonable, to control and minimise the impacts during construction as far as practicable.

The operational noise assessment identified that all predicted $L_{Aeq,\ 15\ minute}$ noise levels for the proposed operations of the BESS are below the project noise trigger levels (PNTL) at all the identified receivers

Cumulative noise emissions from the Panorama BESS (including substation) and the Transgrid substation were also considered. Cumulative $L_{Aeq,\ 15\ minute}$ noise levels during noise enhancing weather conditions (i.e. worst-case) are expected to remain below the most stringent night-time criteria of 35 dBA.

Operational emissions of the Panorama BESS are therefore predicted to be compliant with the NPfI requirements for all assessment periods. As such no further recommendations for noise reducing mitigation or management measures are provided in this report. Suitable safeguards and provisions for monitoring have been recommended to assist operational noise levels being maintained below the applicable PNTL.

Noise contours for daytime and night-time operations are provided to compare with Zone R5 – Large Lot Residential, located to the north of the site. The contours show the daytime an night-time criterion is complied with within the Lot boundary.

Based on the findings of this report and assuming the recommendations and/or safeguards are applied, the proposal is considered appropriate from an acoustic standpoint.

7 References

CONCAWE – Report no. 4/18; **The propagation of noise from petroleum and petrochemical complexes to neighbouring communities**, Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981.

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NSW Department of Environment and Conservation – **NSW Environmental Noise Management – Assessing Vibration: A Technical Guideline** (AVTG), February 2006

NSW Department of Environment and Climate Change (DECC) – **NSW Interim Construction Noise Guideline** (ICNG), July 2009.

Standards Australia AS 2436–2010 (AS 2436, 2010) – **Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.**

Roads and Maritime Services (RMS) - **Construction Noise and Vibration Guideline (CNVG)**, dated August 2016

Transport for NSW (TfNSW) - **Construction Noise and Vibration Strategy (CNVS)**, ST-157/4.1, April 2019

NSW Environment Protection Authority – **Noise Policy for Industry** (NPfI), October 2017.

APPENDIX A

Acoustic Glossary

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

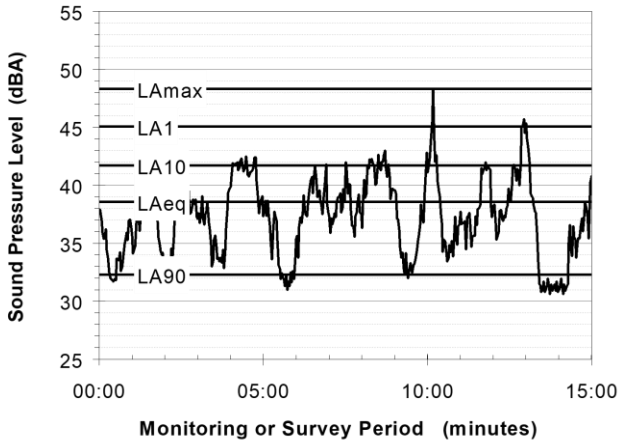
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

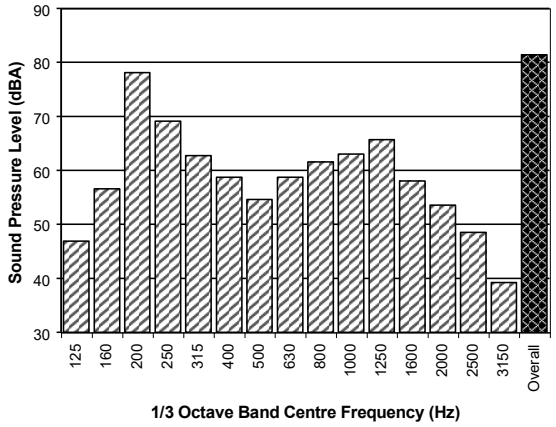
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

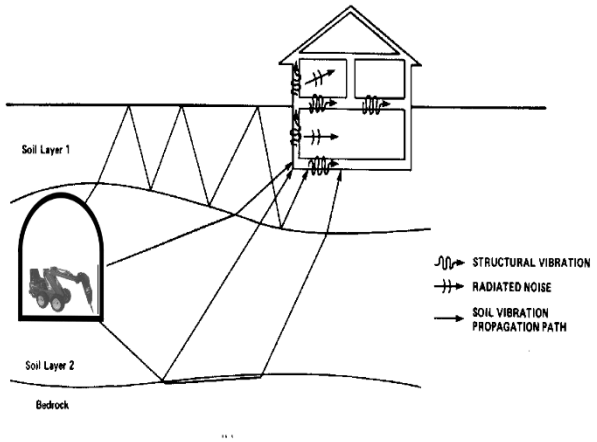
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

APPENDIX B

Surrounding Sensitive Receivers and Predicted Noise Levels

ID	Address	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			
		Day	Day Enhanced	Night	Night Enhanced
R1	800 Mid Western Highway	34	36	31	34
R2	16 Stewart St DP1246510	31	32	17	20
R3	24 Stewart St	24	27	20	24
R4	30 Stewart St	21	24	18	21
R5	27 Stewart St	24	27	21	25
R6	849 Mid Western Highway	20	23	18	21
R7	831a Mid Western Highway DP1188058	23	26	21	24
R8	831b Mid Western Highway DP1188058	21	25	21	24
R9	9 McLennan Close	< 10	< 10	< 10	< 10
R10	7 McLennan Close	< 10	< 10	< 10	< 10
R11	6 McLennan Close	< 10	< 10	< 10	< 10
R12	3a Windemere Rd	< 10	< 10	< 10	< 10
R13	3b Windemere Rd	< 10	< 10	< 10	< 10
R14	16 Windemere Rd	< 10	< 10	< 10	< 10
R15	24 Windemere Rd	< 10	< 10	< 10	< 10
R16	34 Windemere Rd	< 10	< 10	< 10	< 10
R17	38 Windemere Rd	< 10	12	< 10	11
R18	44 Windemere Rd	< 10	12	< 10	11
R19	58 Windemere Rd	< 10	10	< 10	10
R20	60 Windemere Rd	23	26	23	26
R21	80 Windemere Rd	10	13	10	13
R22	92 Windemere Rd	< 10	12	< 10	12
R23	23 Windemere Road	< 10	< 10	< 10	< 10
R24	331 Hartwood Av	< 10	< 10	< 10	< 10
R25	260 Hartwood Av	< 10	11	< 10	< 10
R26	290 Hartwood Av	< 10	< 10	< 10	< 10
R27	120 Hartwood Av	< 10	< 10	< 10	< 10
R28	11 Hartwood Av	< 10	11	< 10	10
R29	21 Hartwood Av	< 10	< 10	< 10	< 10
R30	20 Hartwood Av	< 10	11	< 10	11
R31	70 Hartwood Av	< 10	< 10	< 10	< 10
R32	60 Hartwood Av	< 10	< 10	< 10	< 10
R33	50 Hartwood Av	< 10	< 10	< 10	< 10
R34	DP 1002050	12	16	11	14
R35	403 Evans Plains Road DP 1121694	18	21	15	19

APPENDIX C

Ambient Noise Graphical Results

Noise Monitoring Location	L01	Map of Noise Monitoring Location
Noise Monitoring Address	**800 Mid Western Highway, Evans Plains**	

Logger Device Type: Svantek 957: Logger Serial No:20665

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 3008204

Ambient noise logger deployed at Evans Plains located at the residence front door pavement surrounded by open terrain.

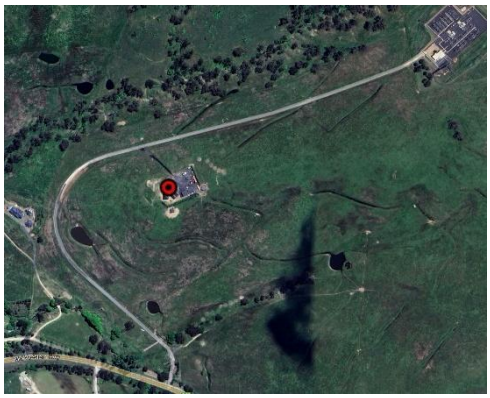
Attended noise measurements indicate the ambient noise environment at this location is influence by wildlife noise.

Recorded Noise Levels (LAmax) 22/11/2023:

Cows: 37-48 dBA

Wind: 37-41dBA

Workers: 48-54dBA



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	26	53	41	52
Evening	28	45	42	47
Night-time	30	51	40	44

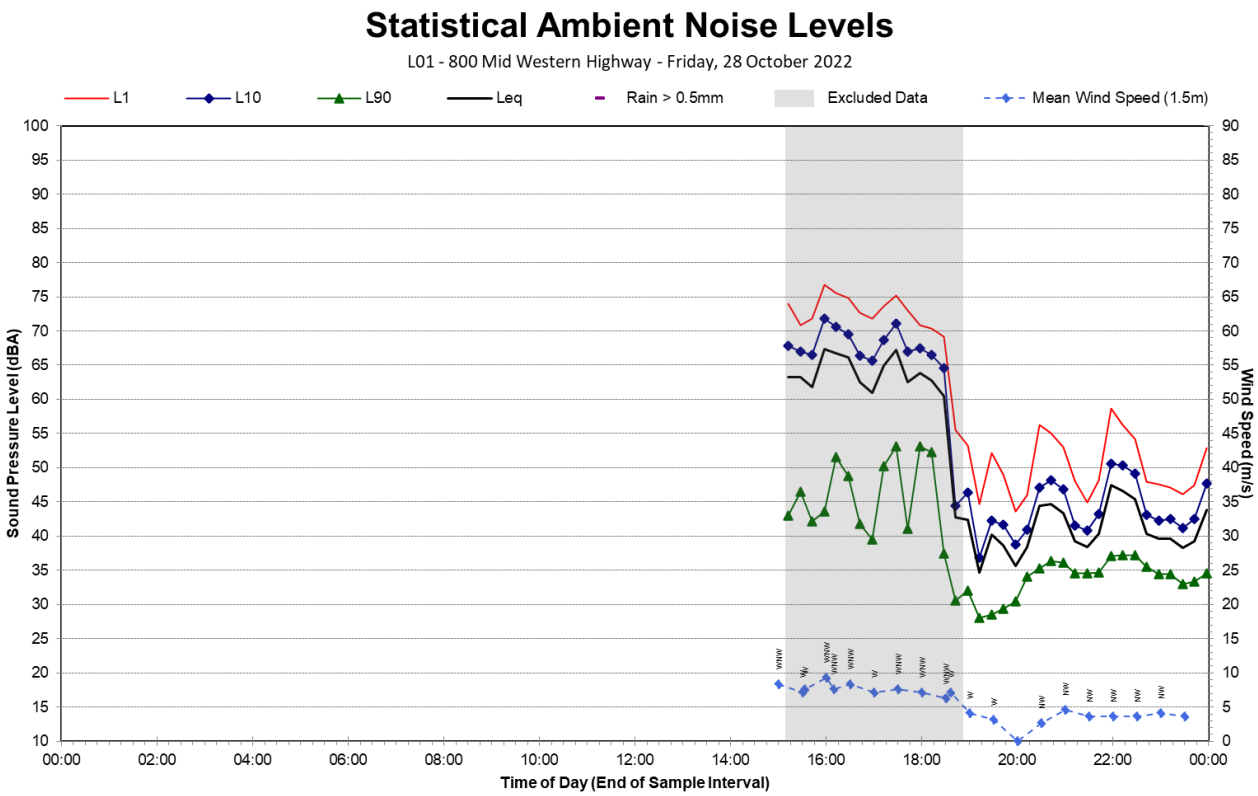
Ambient Noise Logging Results – RNP Defined Time Periods

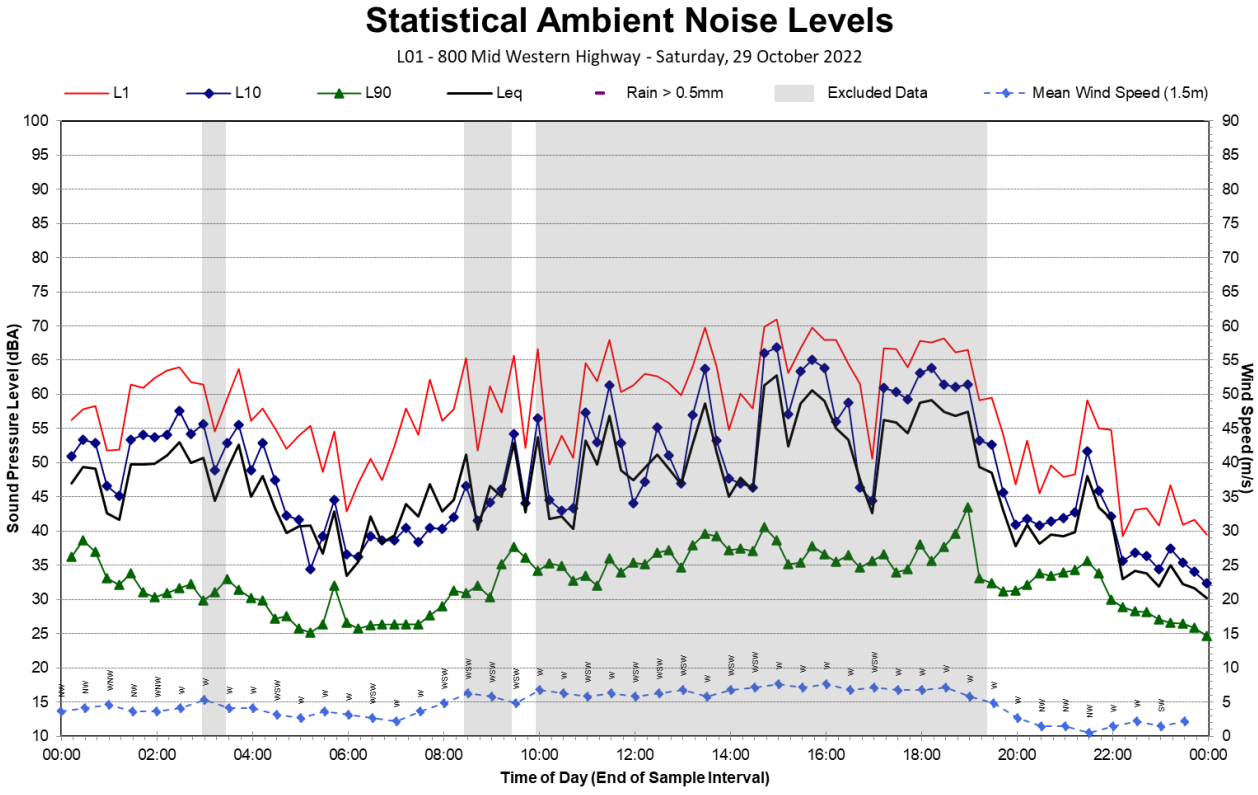
Monitoring Period	Noise Level (dBA)	
	LAeq (period)	LAeq (1 hour)
Daytime (7am - 10pm)	58	49
Night-time (10pm - 7am)	52	45

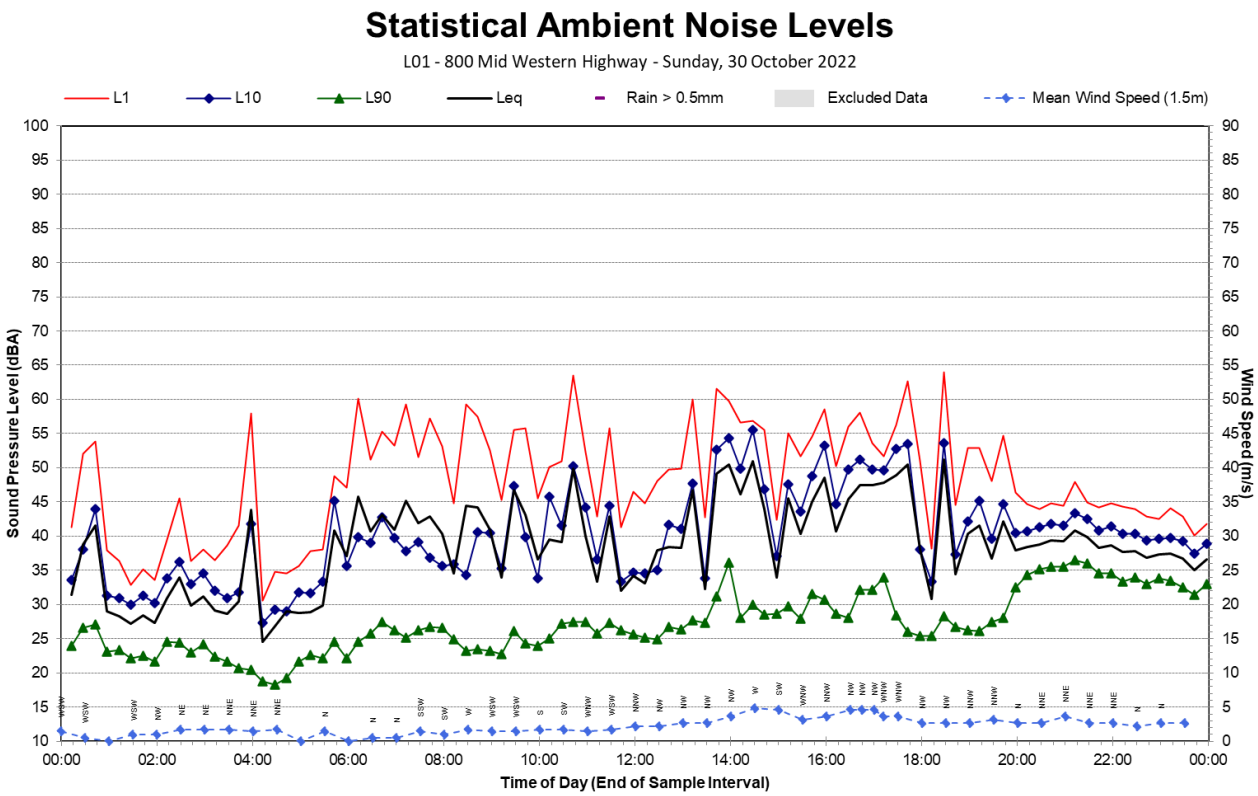
Attended Noise Measurement Results

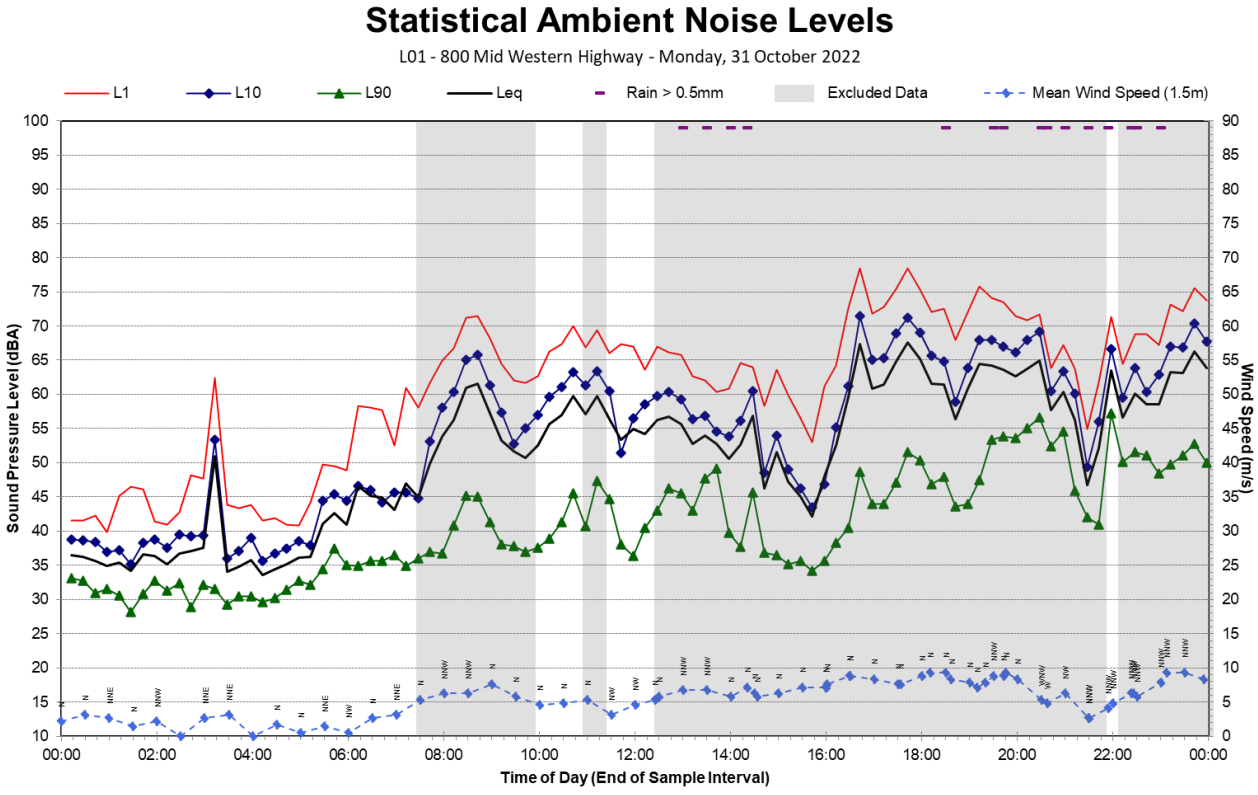
Date	Start Time	Noise Level (dBA)		
		LA90	LAeq	LAmax
22/11/2023	2:33pm	35	43	53

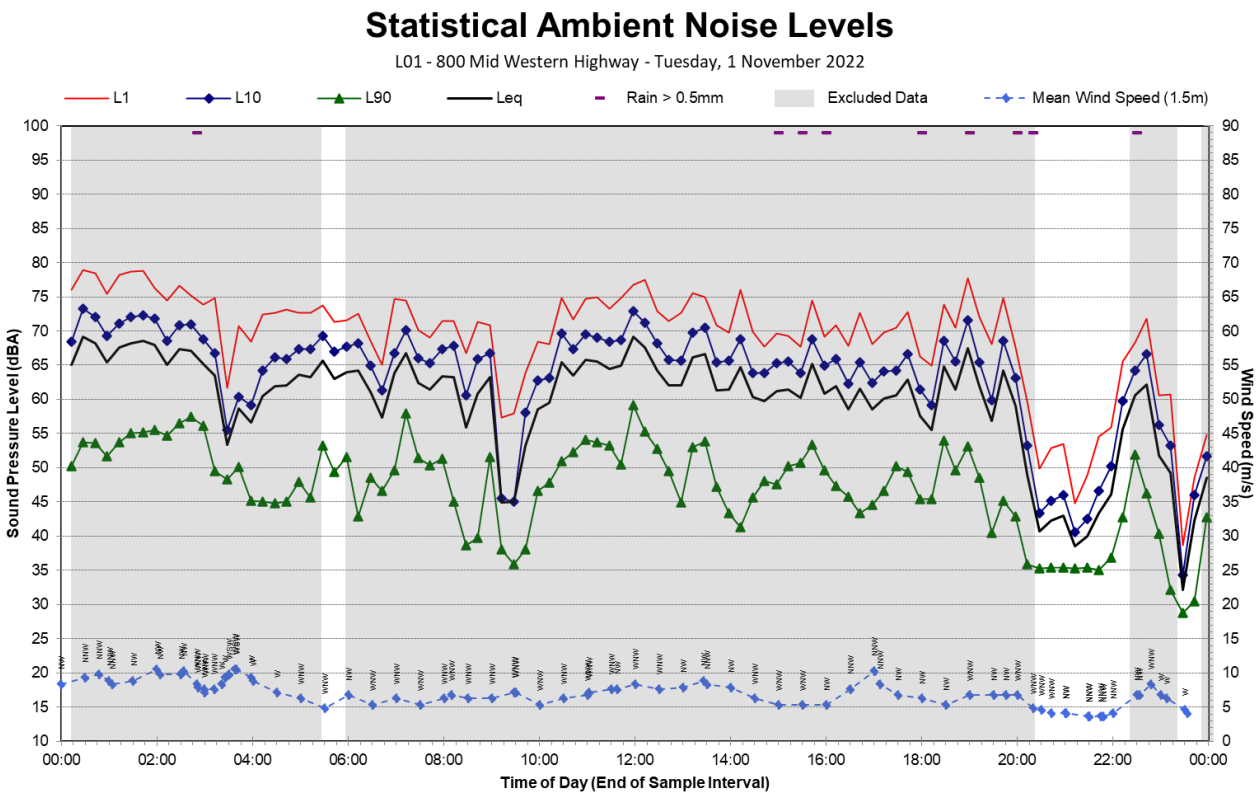
Photo of Noise Monitoring Location

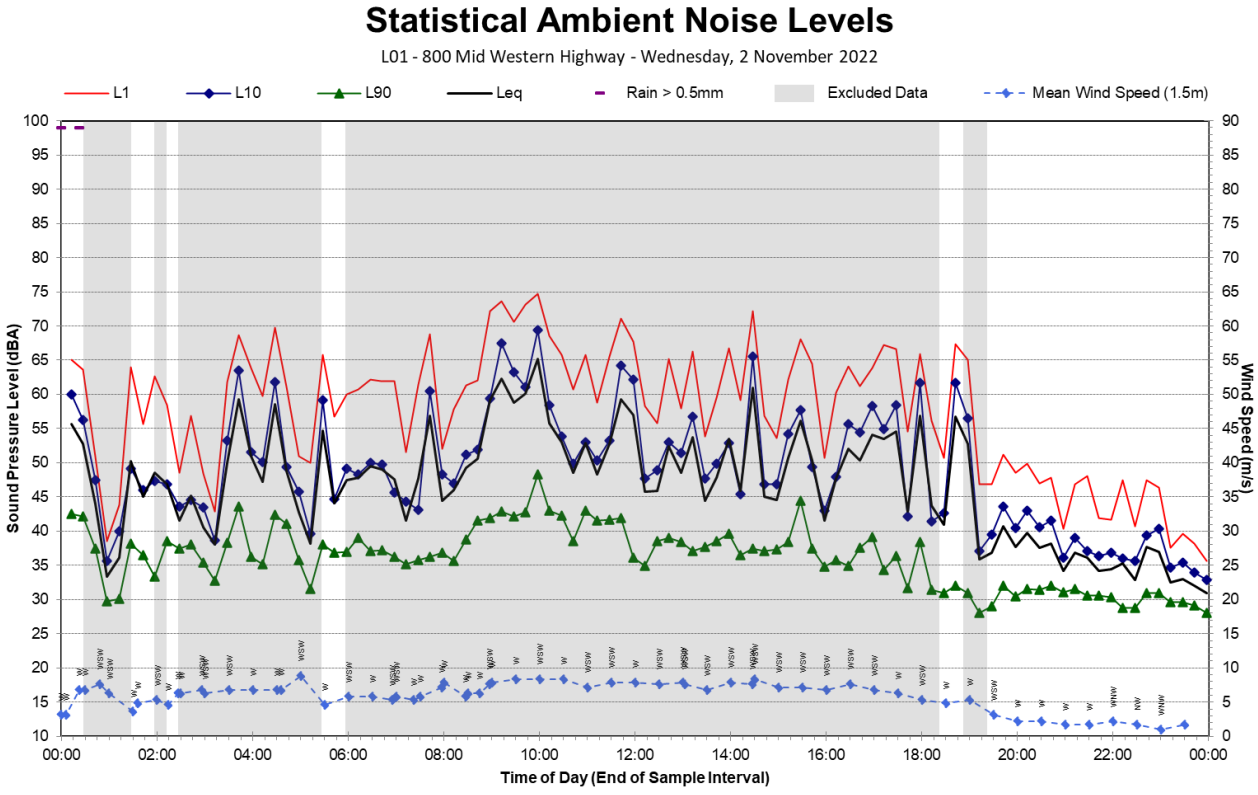

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Friday, 28 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

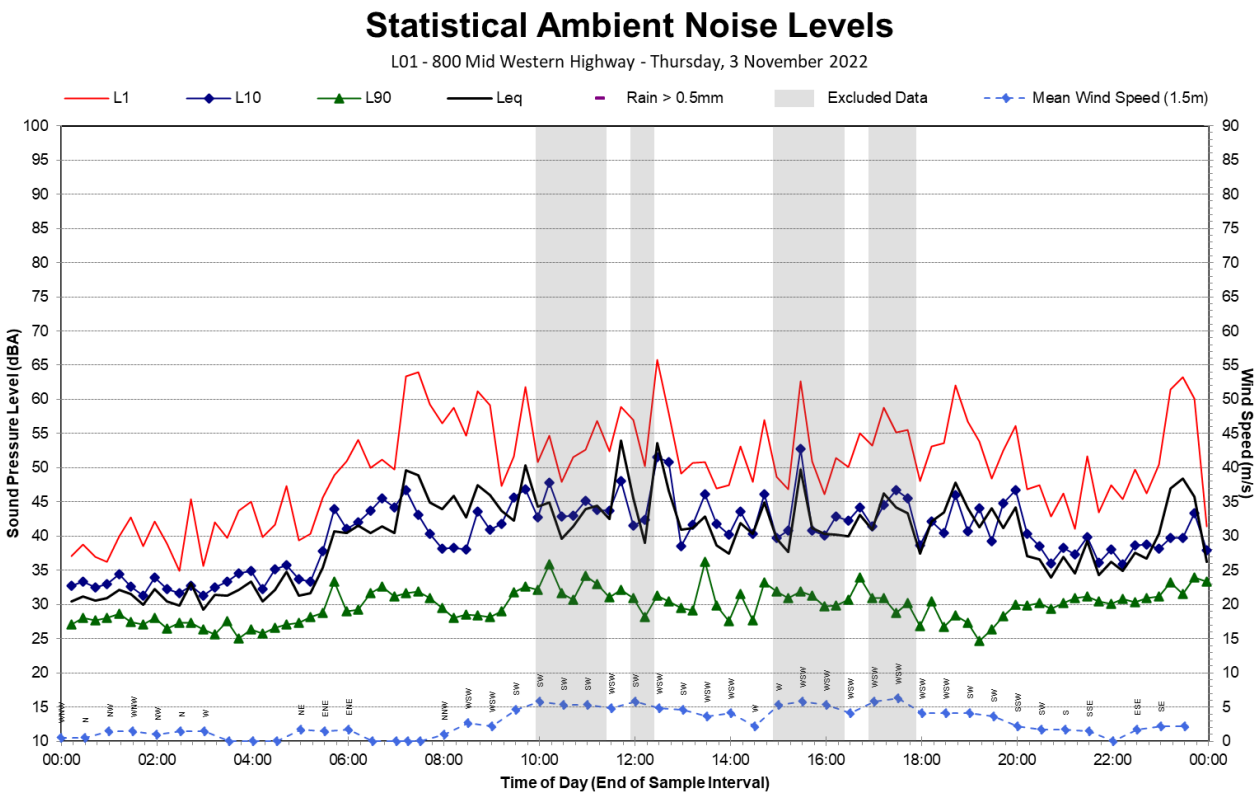

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Saturday, 29 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

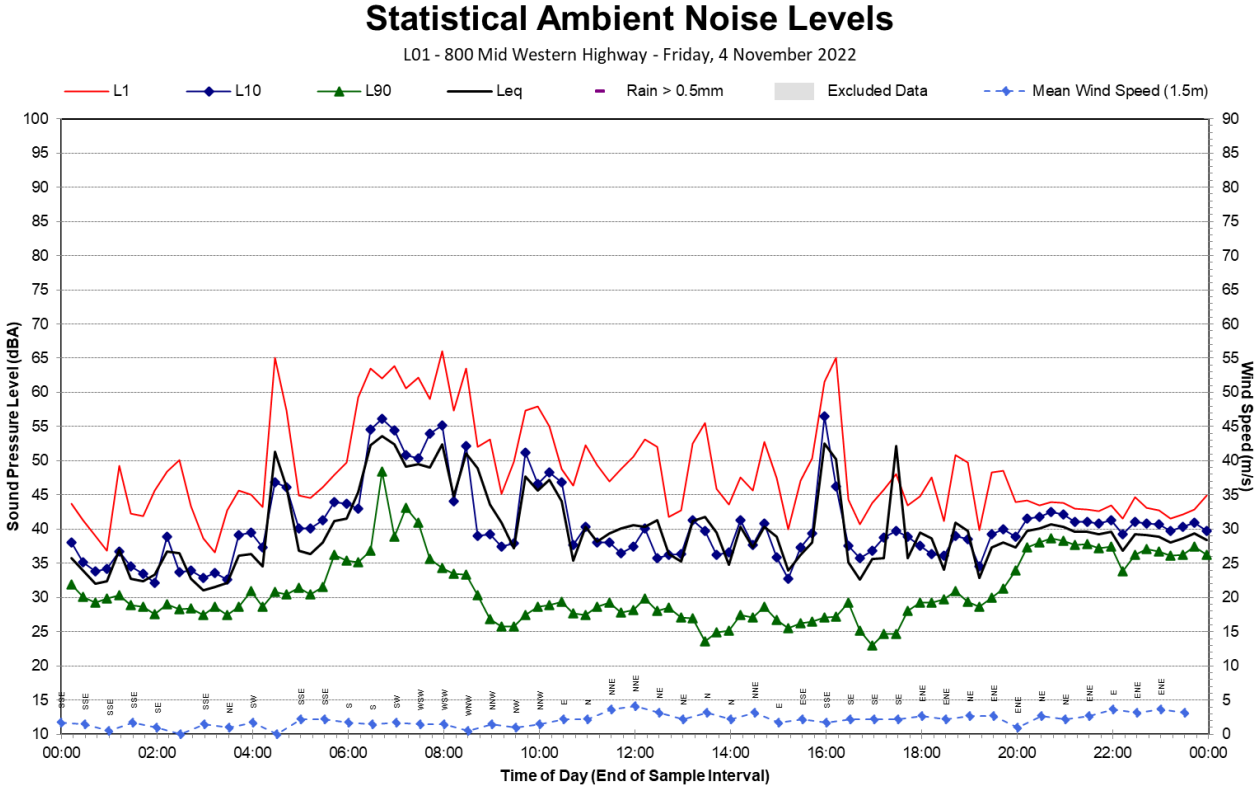

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Sunday, 30 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

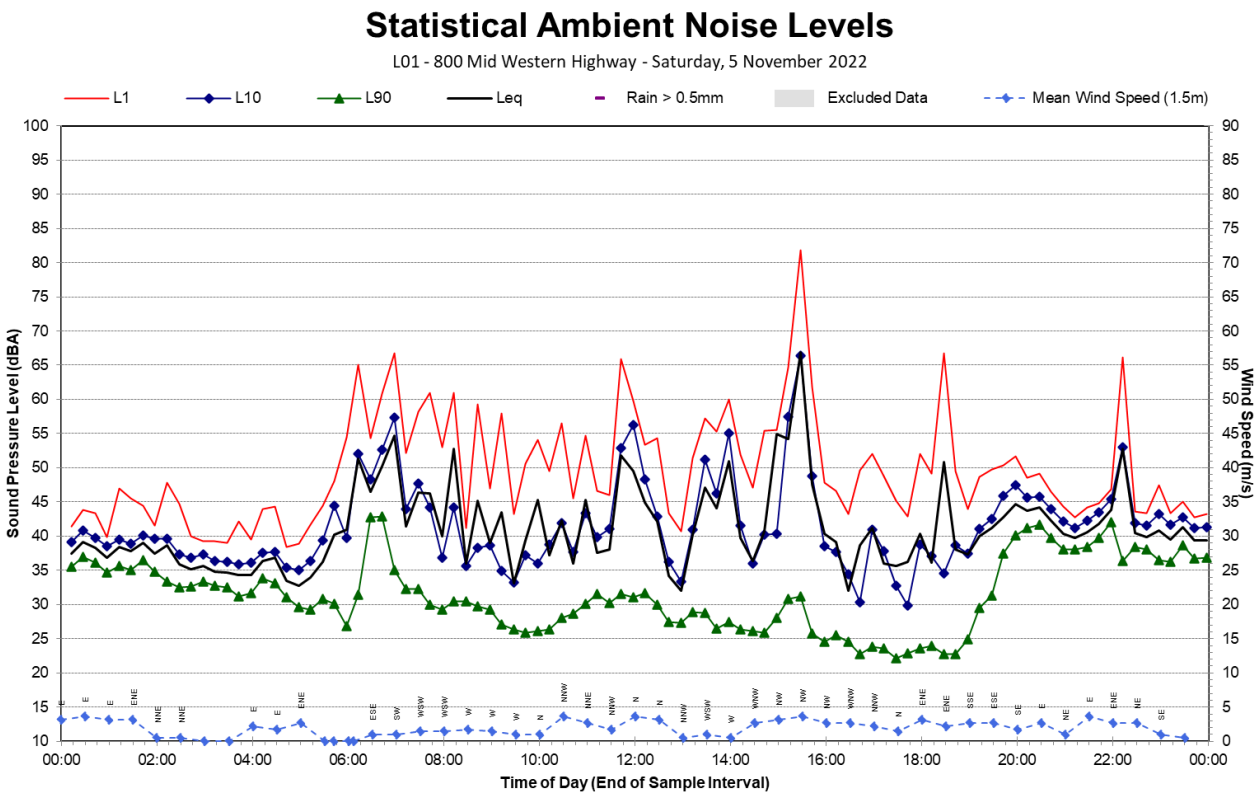

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Monday, 31 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

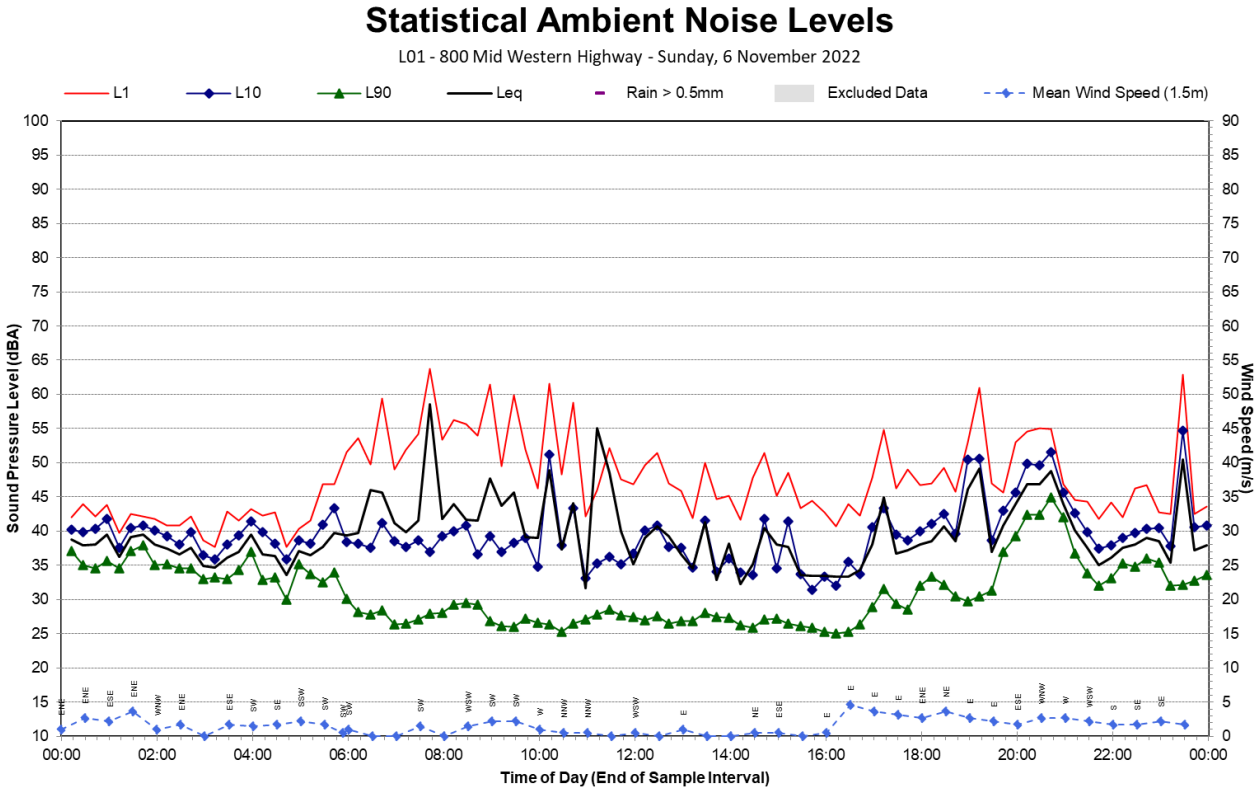

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Tuesday, 1 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

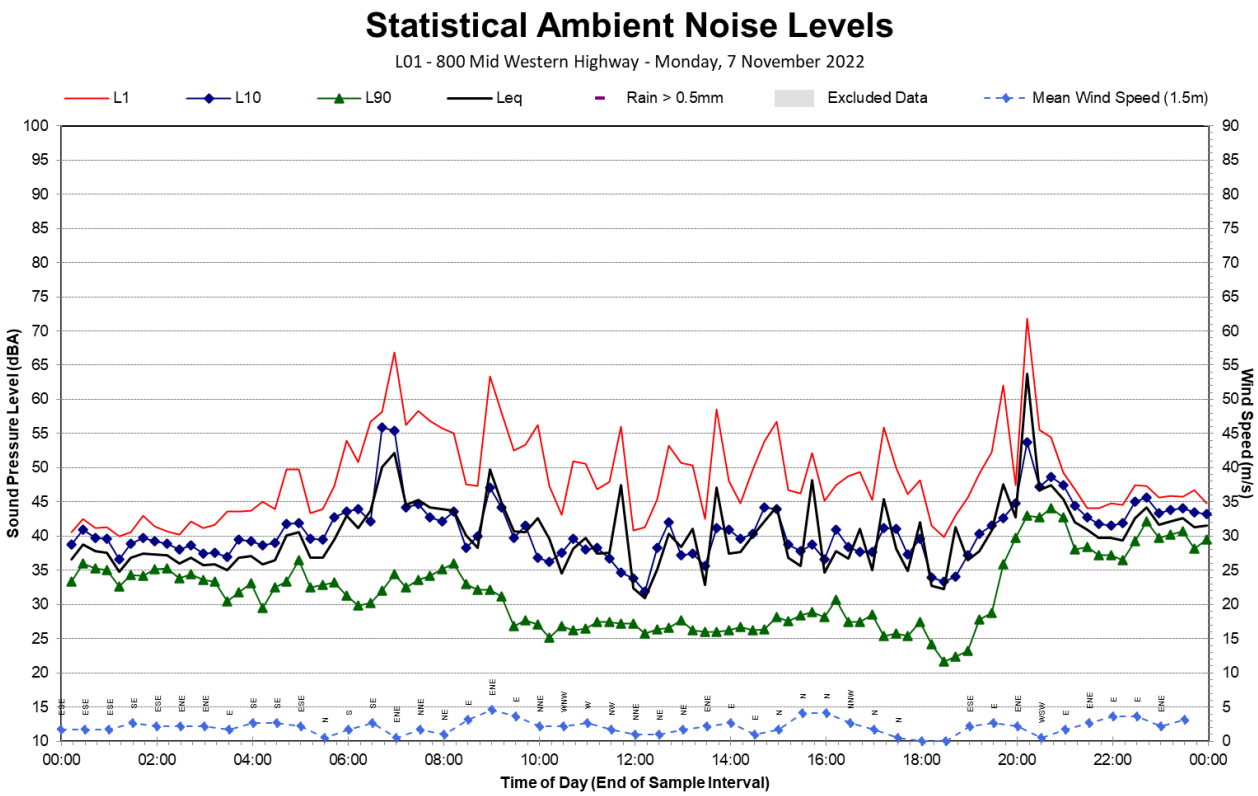

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Wednesday, 2 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

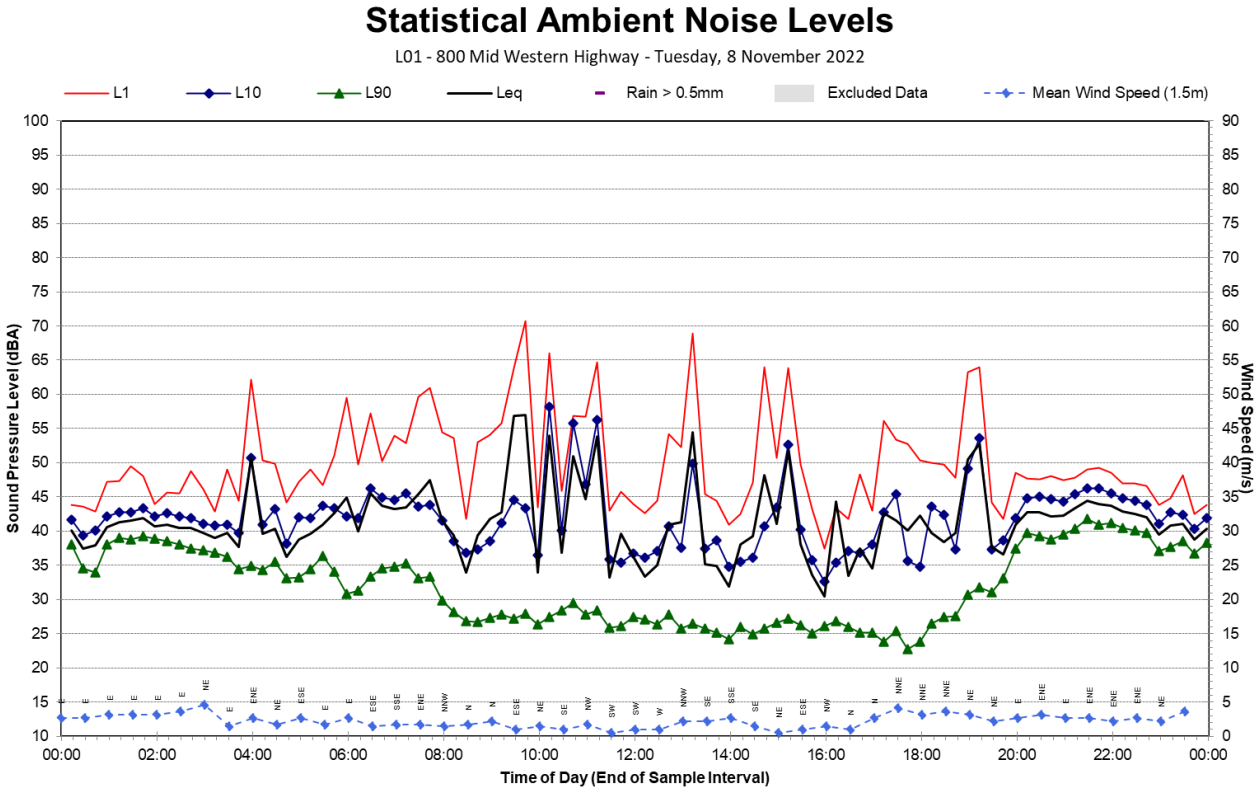

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Thursday, 3 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Friday, 4 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Saturday, 5 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

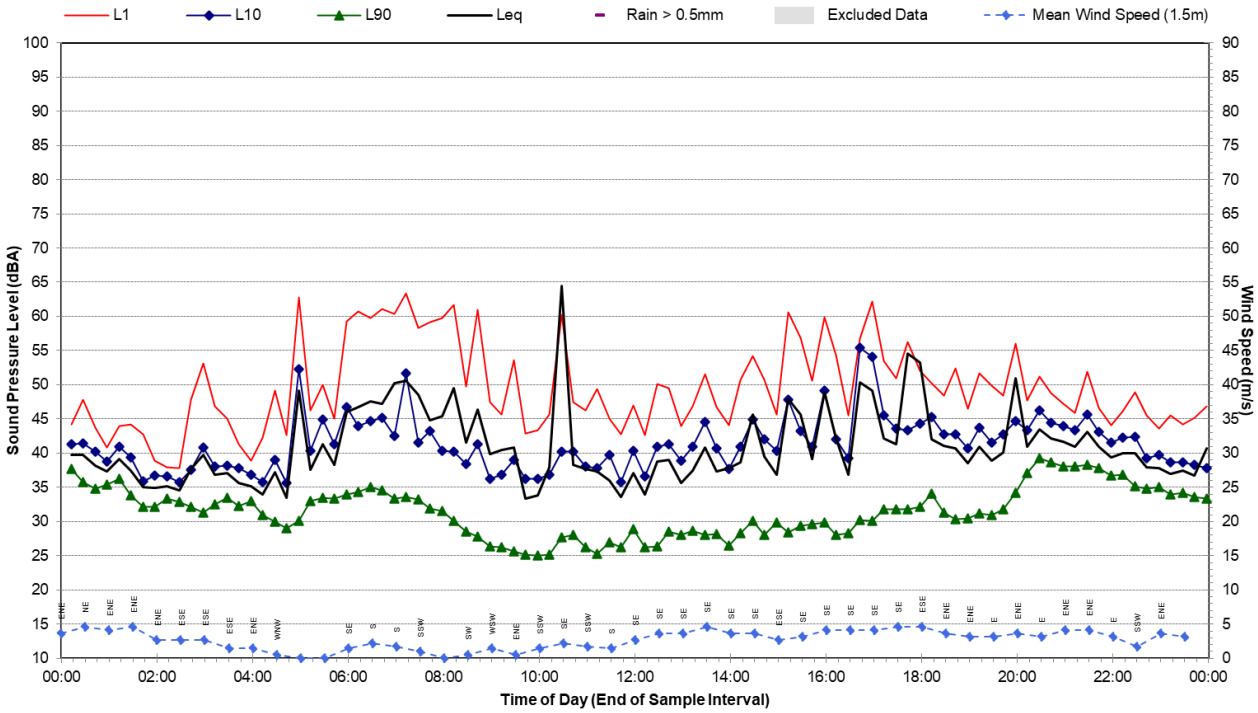

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Sunday, 6 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Monday, 7 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Tuesday, 8 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

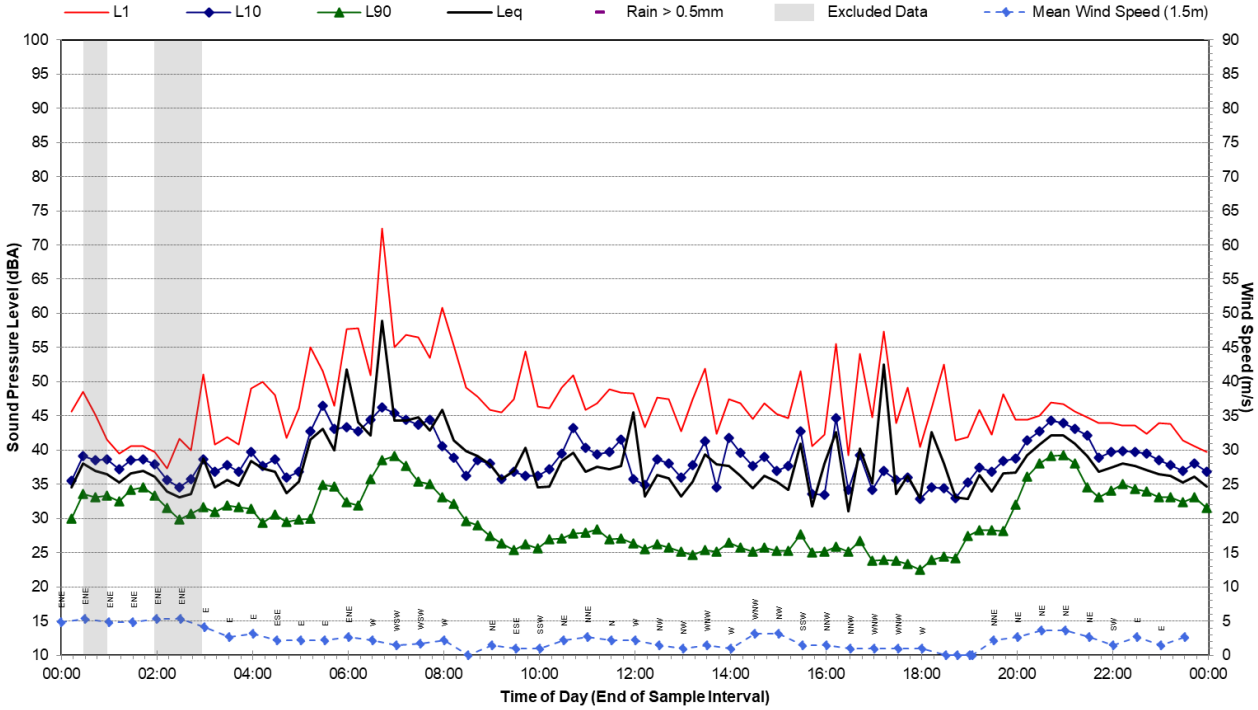
Statistical Ambient Noise Levels

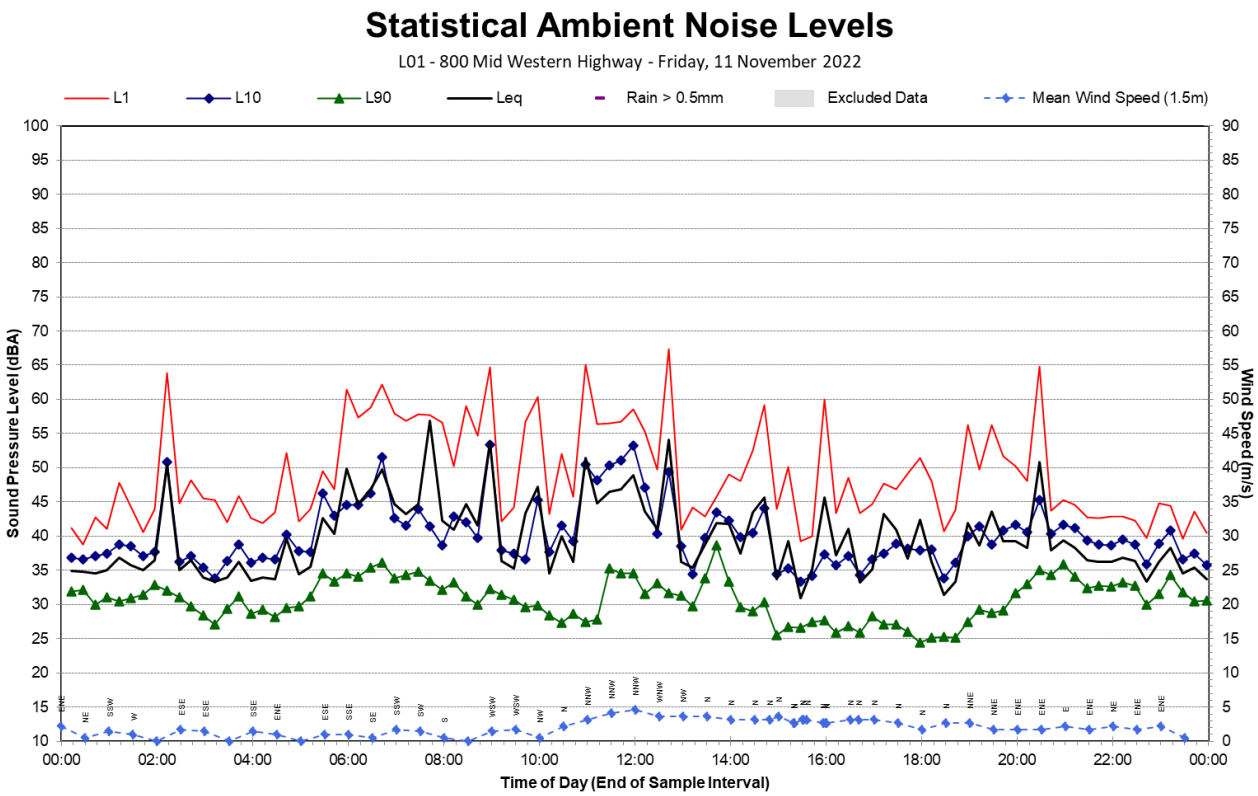
L01 - 800 Mid Western Highway - Wednesday, 9 November 2022

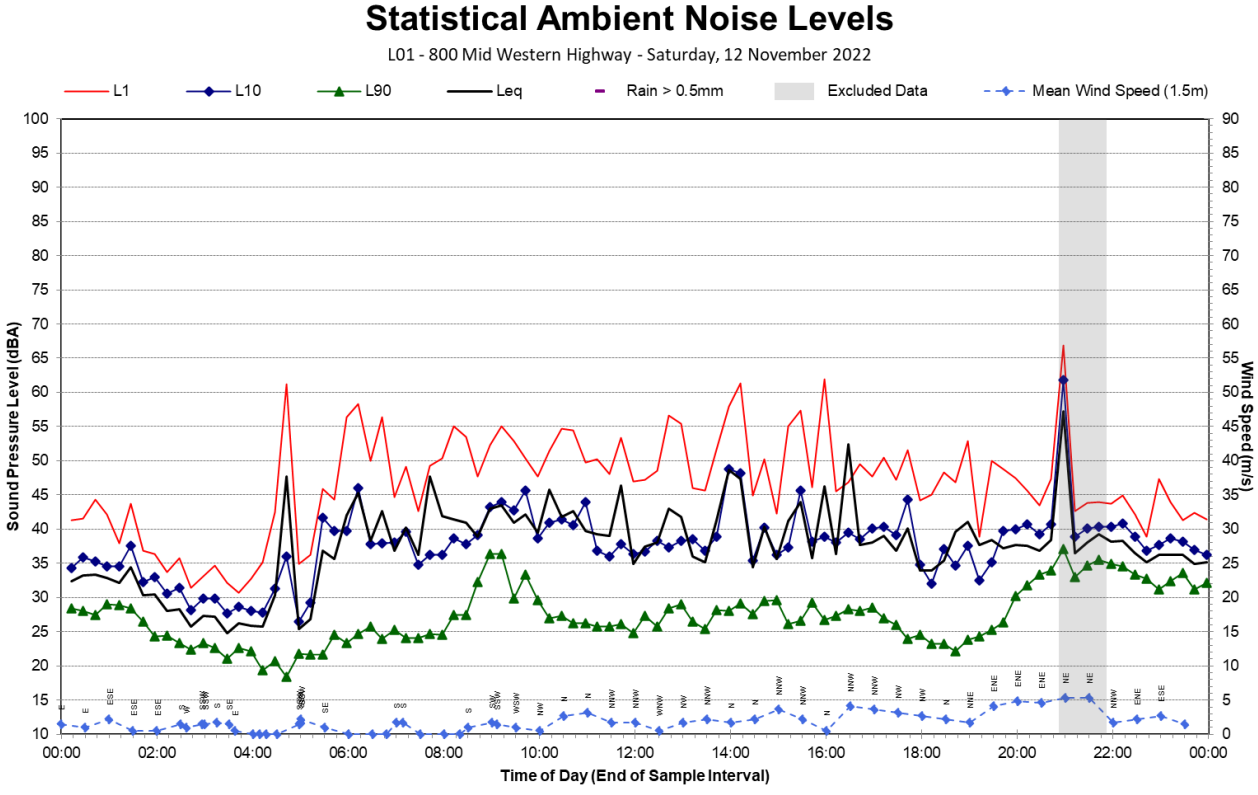


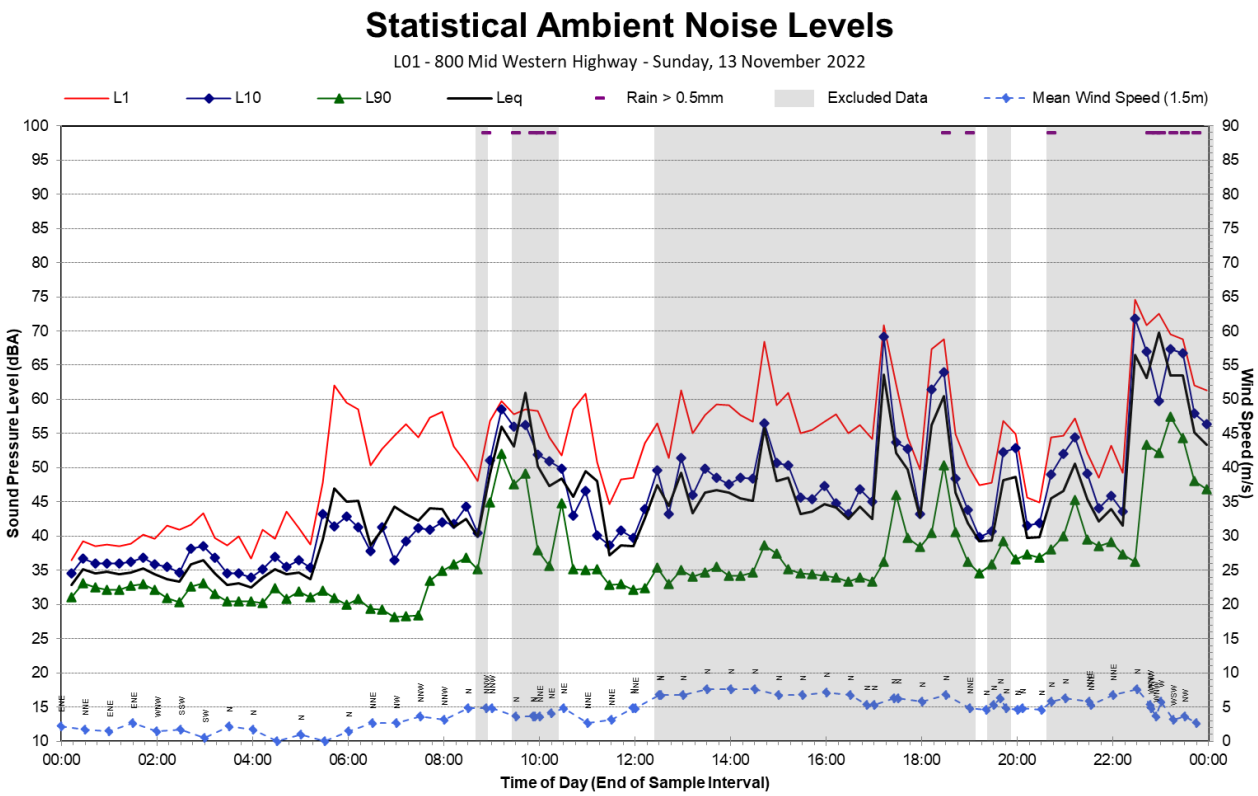
Statistical Ambient Noise Levels

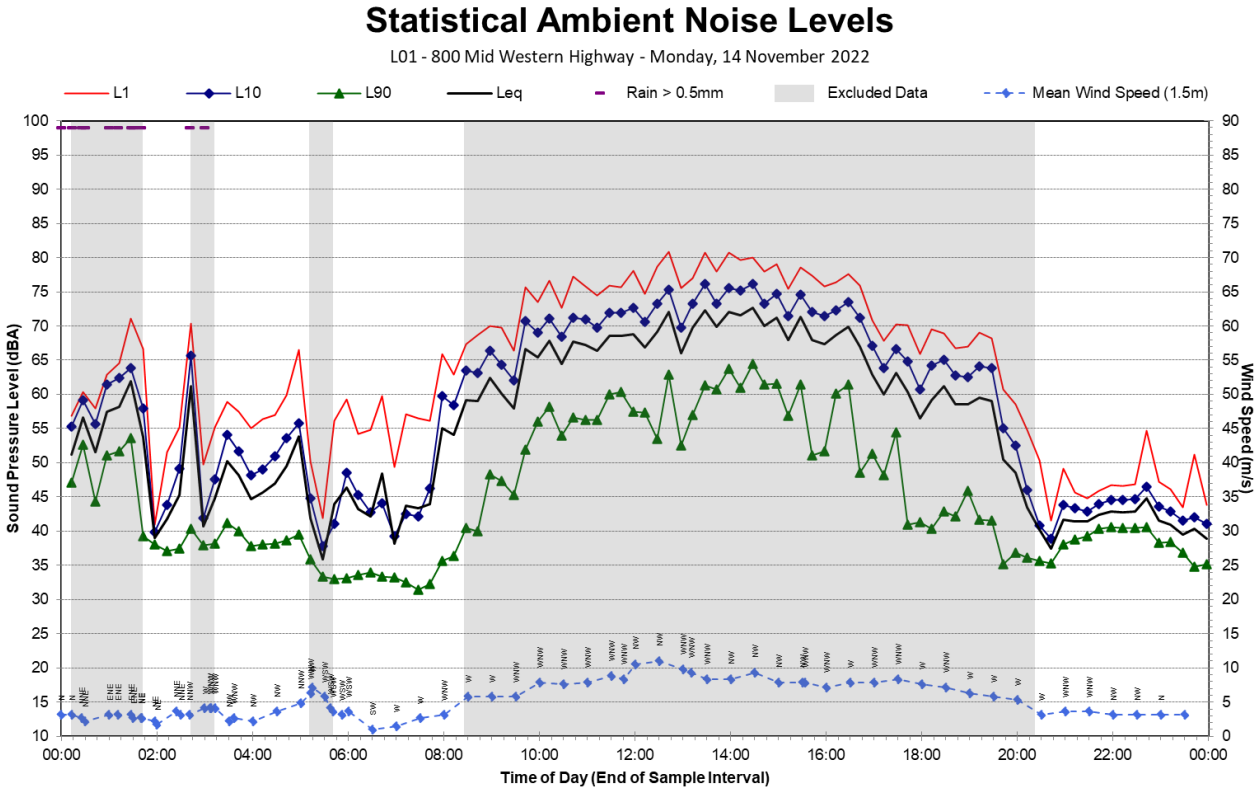
L01 - 800 Mid Western Highway - Thursday, 10 November 2022

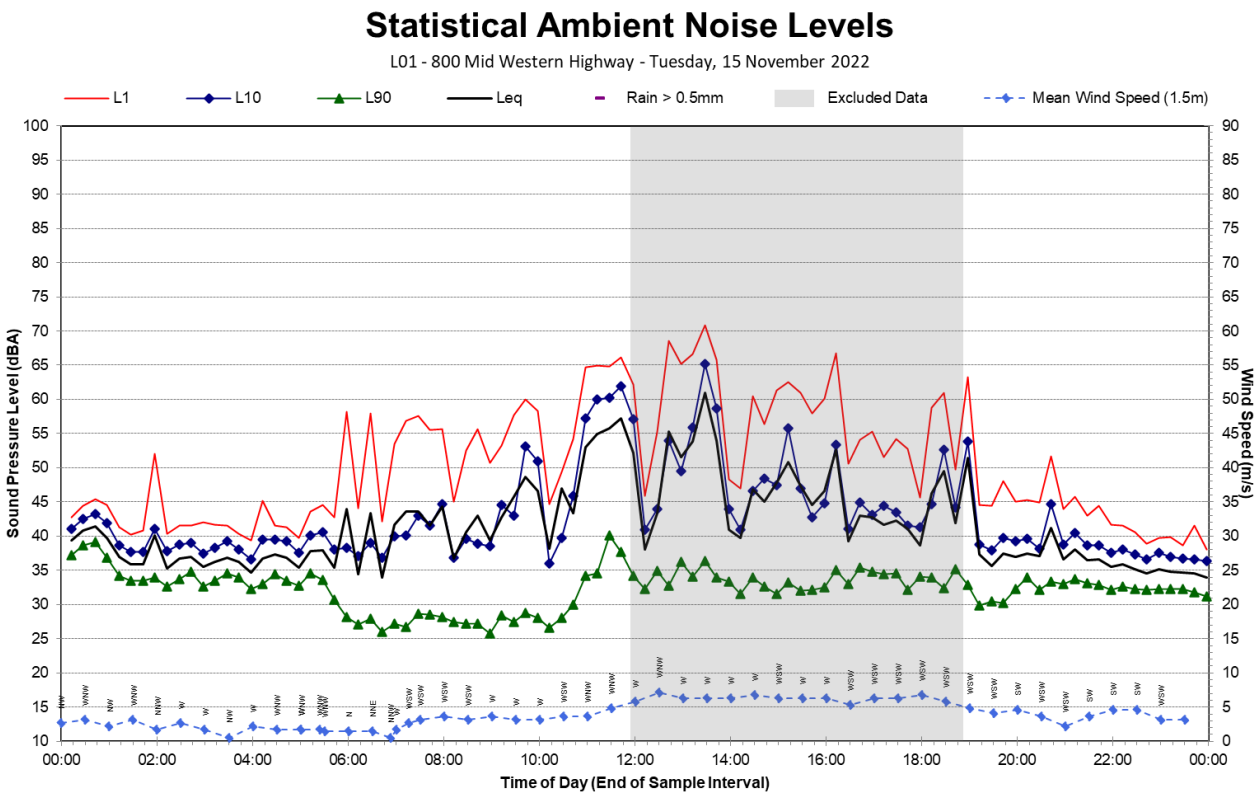


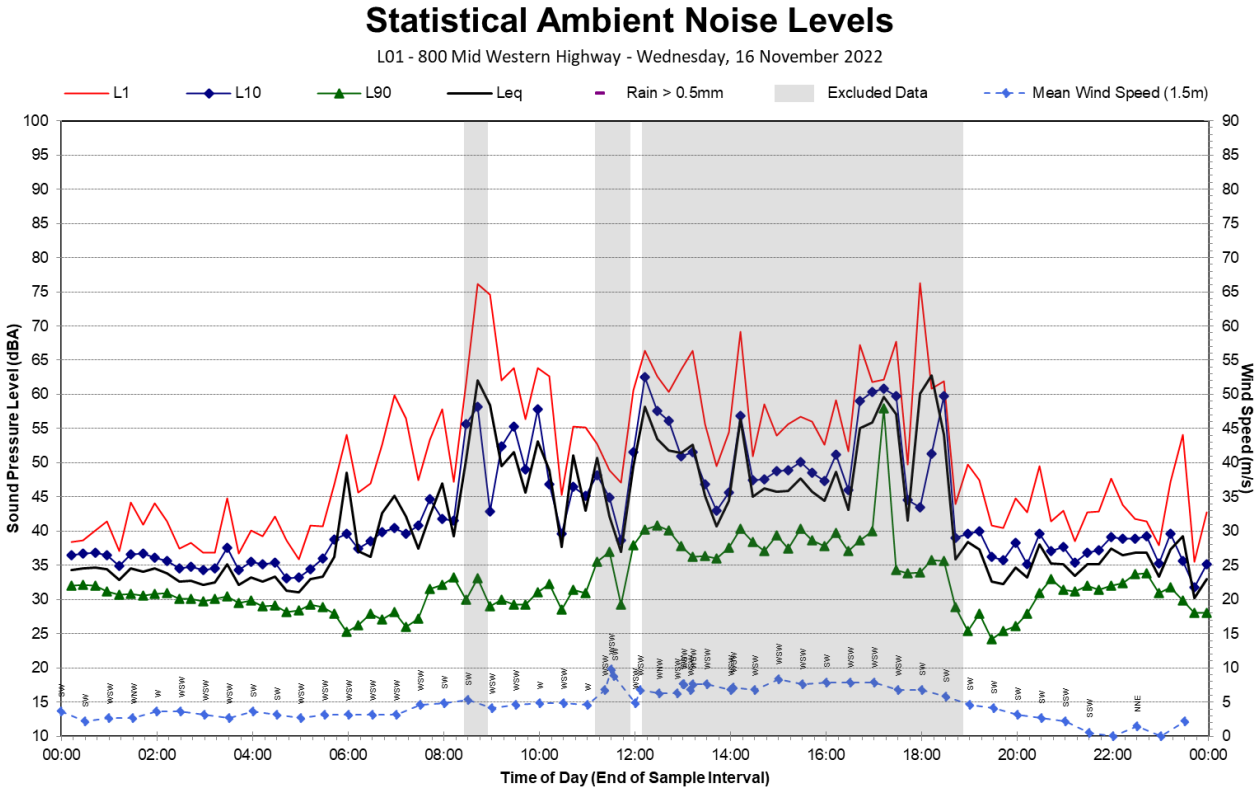

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Friday, 11 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

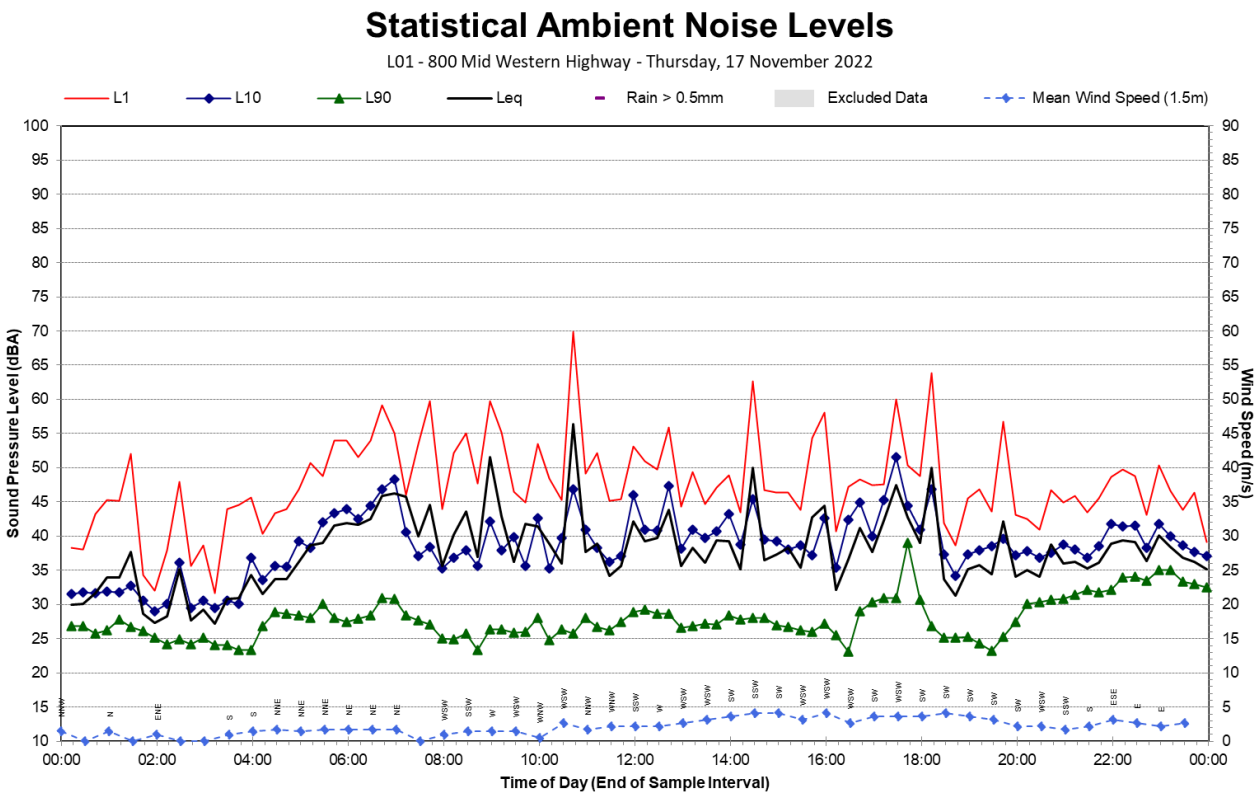

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Saturday, 12 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

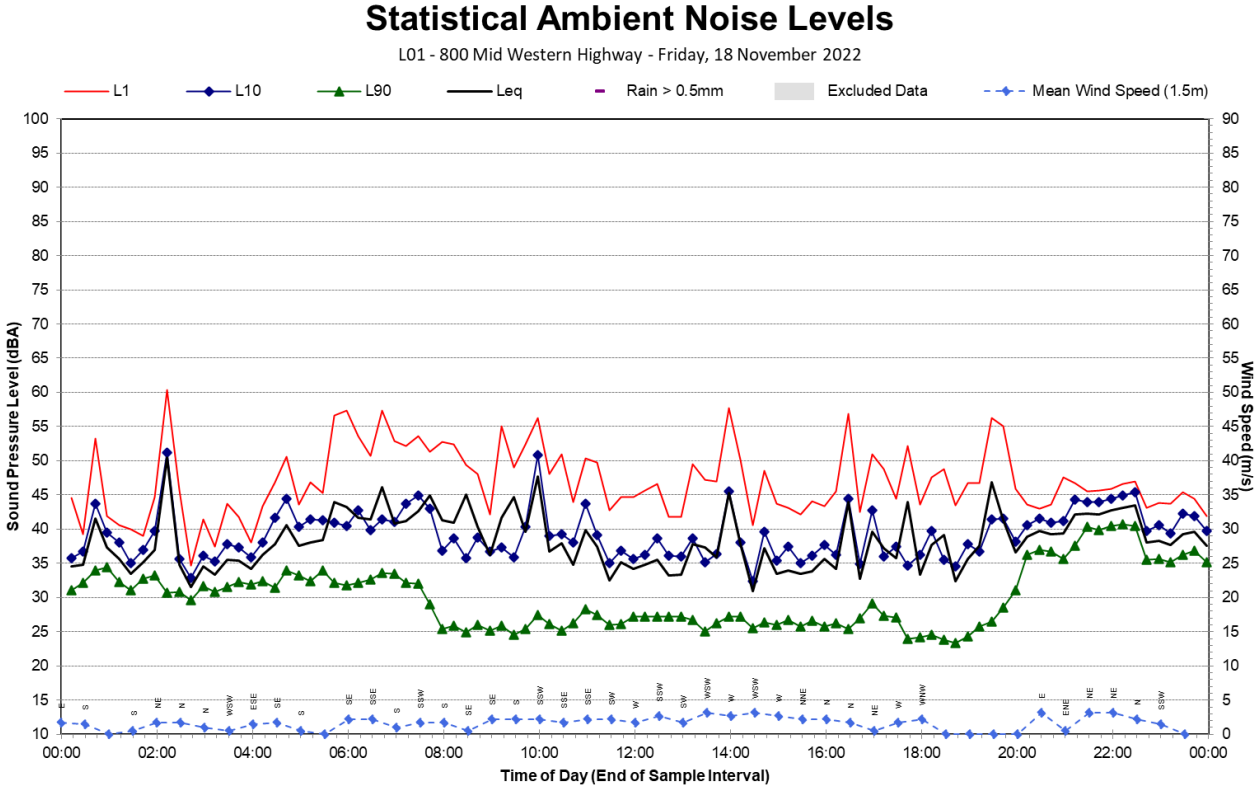

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Sunday, 13 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

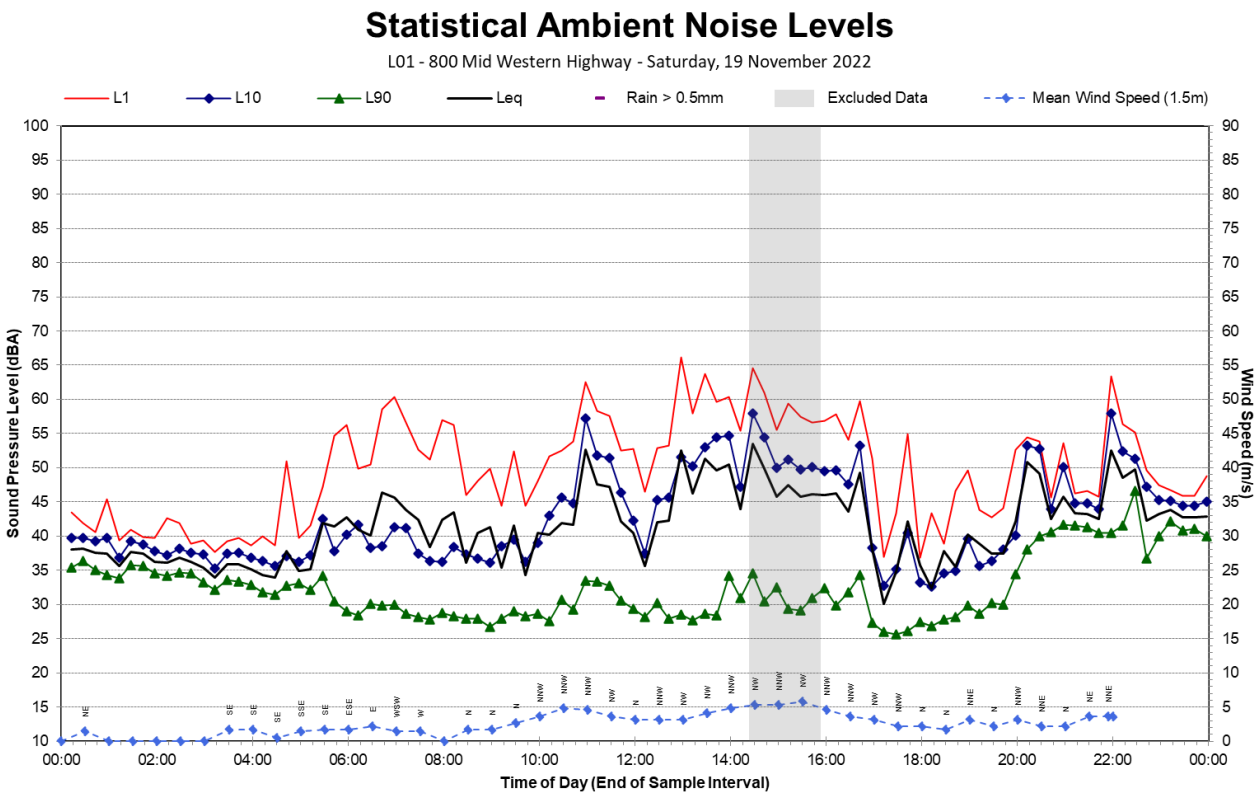

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Monday, 14 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

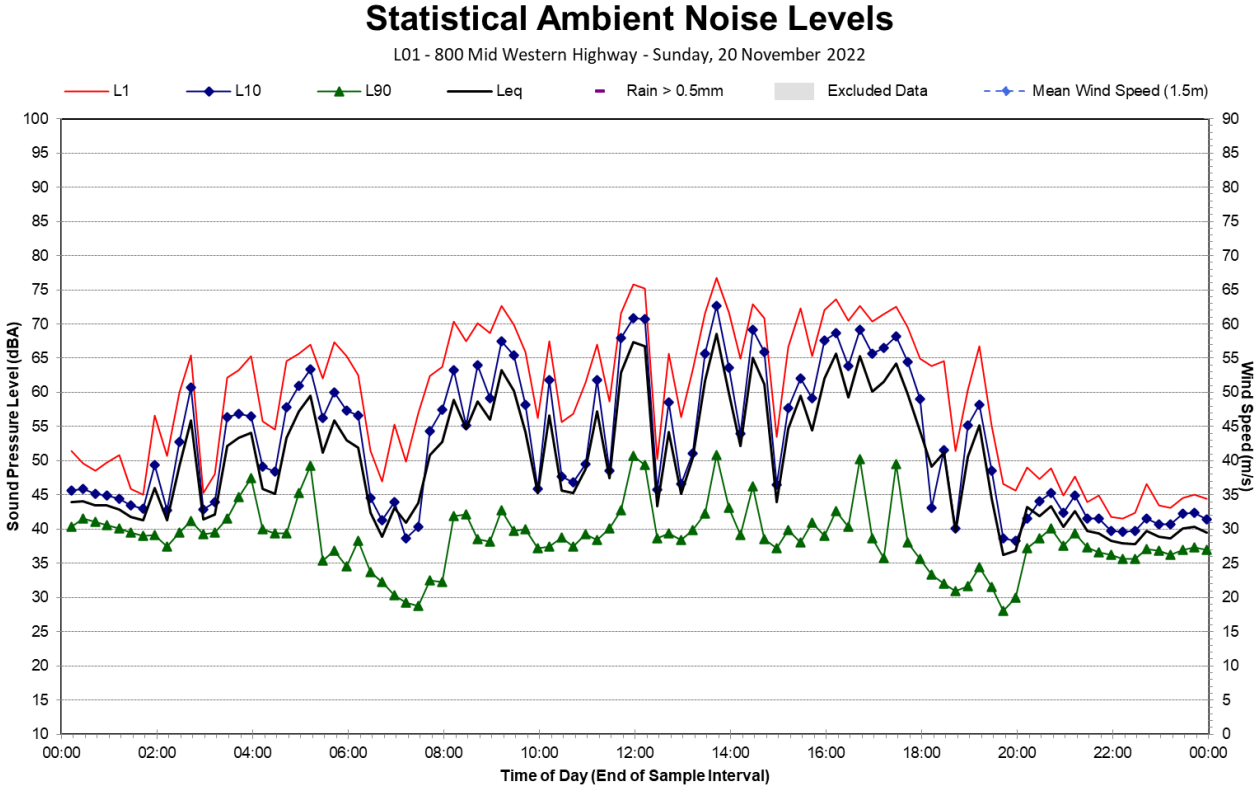

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Tuesday, 15 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

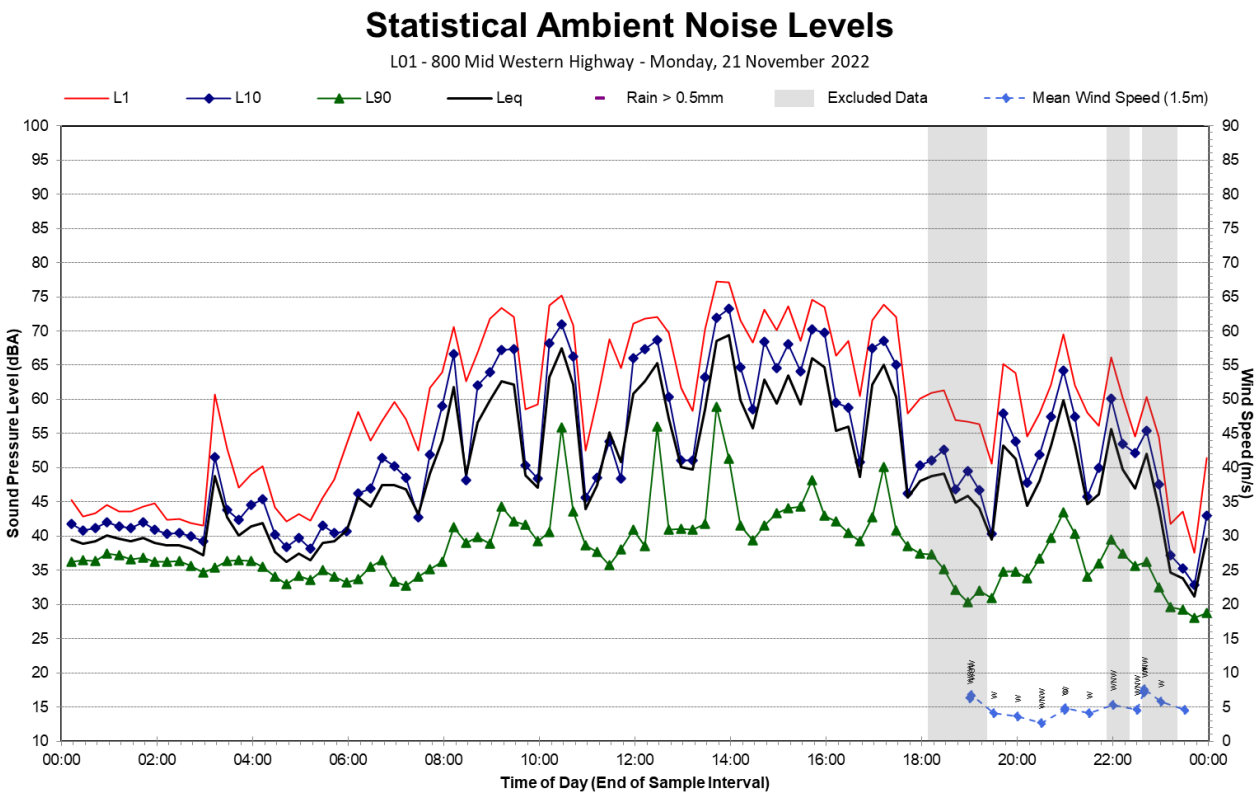

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Wednesday, 16 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

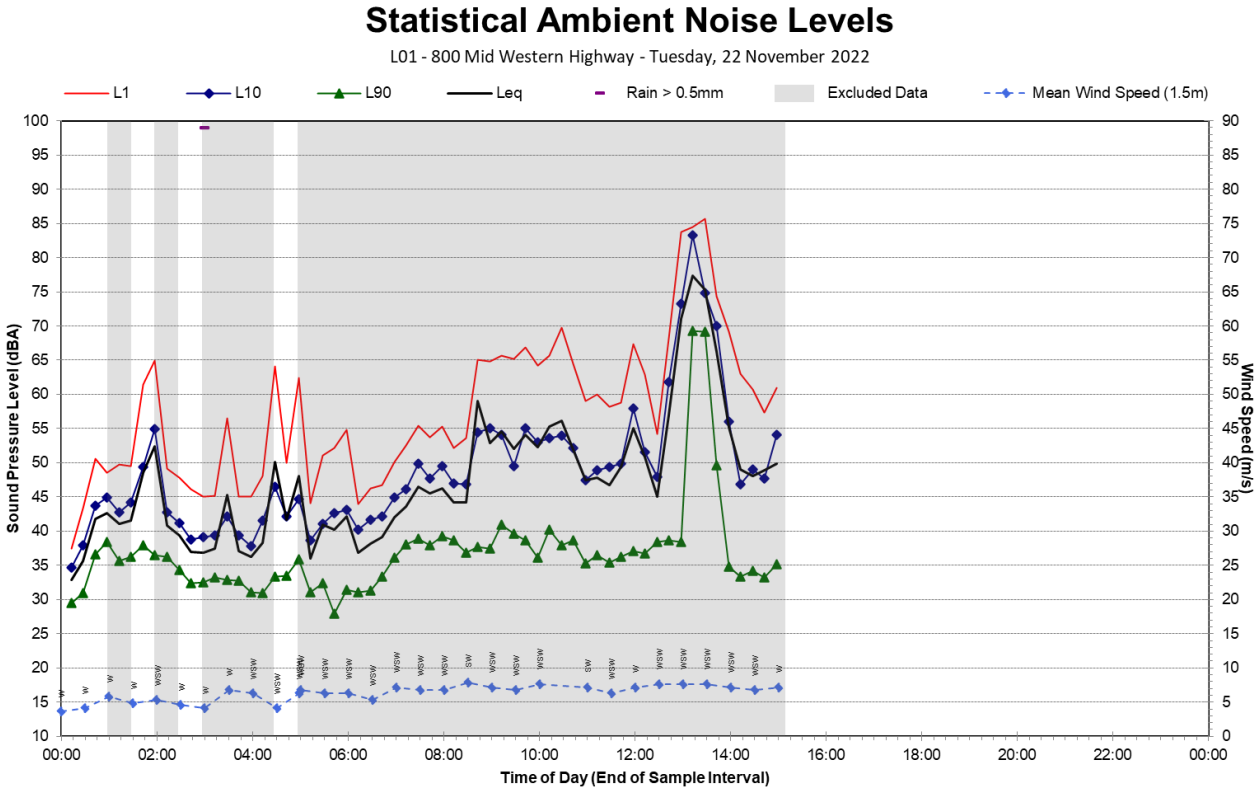

Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Thursday, 17 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Friday, 18 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Saturday, 19 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Sunday, 20 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Monday, 21 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L01 - 800 Mid Western Highway - Tuesday, 22 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

Noise Monitoring Location	L02	Map of Noise Monitoring Location
Noise Monitoring Address	44 Windamere Road, Robin Hill	

Logger Device Type: Svantek 957: Logger Serial No:20665

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 3008204

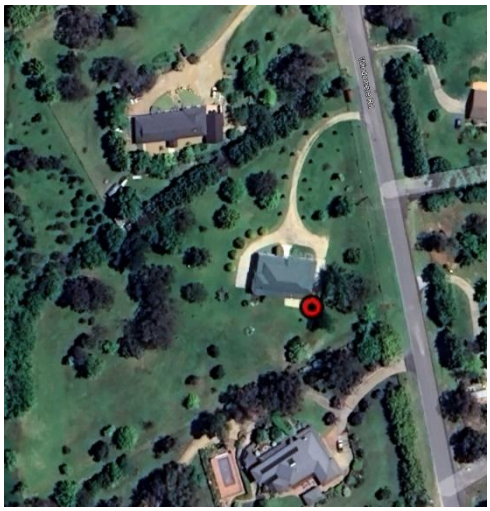
Ambient noise logger deployed at 44 Windamere Road located at the residence back garden surrounded by open terrain.

Attended noise measurements indicate the ambient noise environment at this location is influence by wildlife noise.

Recorded Noise Levels (LAmax) 22/11/2023:

Wind: 34-50dBA

Birds: 45-50dBA



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	31	54	48	58
Evening	28	50	43	51
Night-time	22	47	33	39

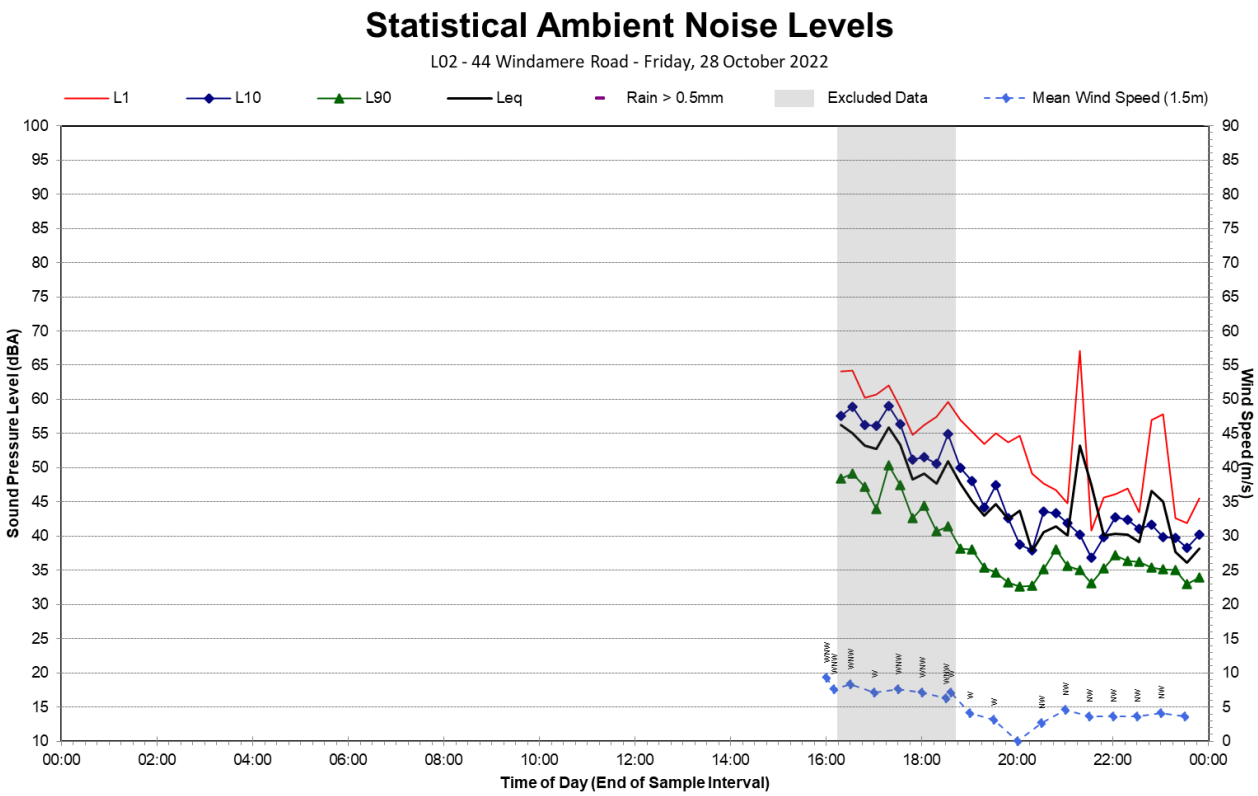
Ambient Noise Logging Results – RNP Defined Time Periods

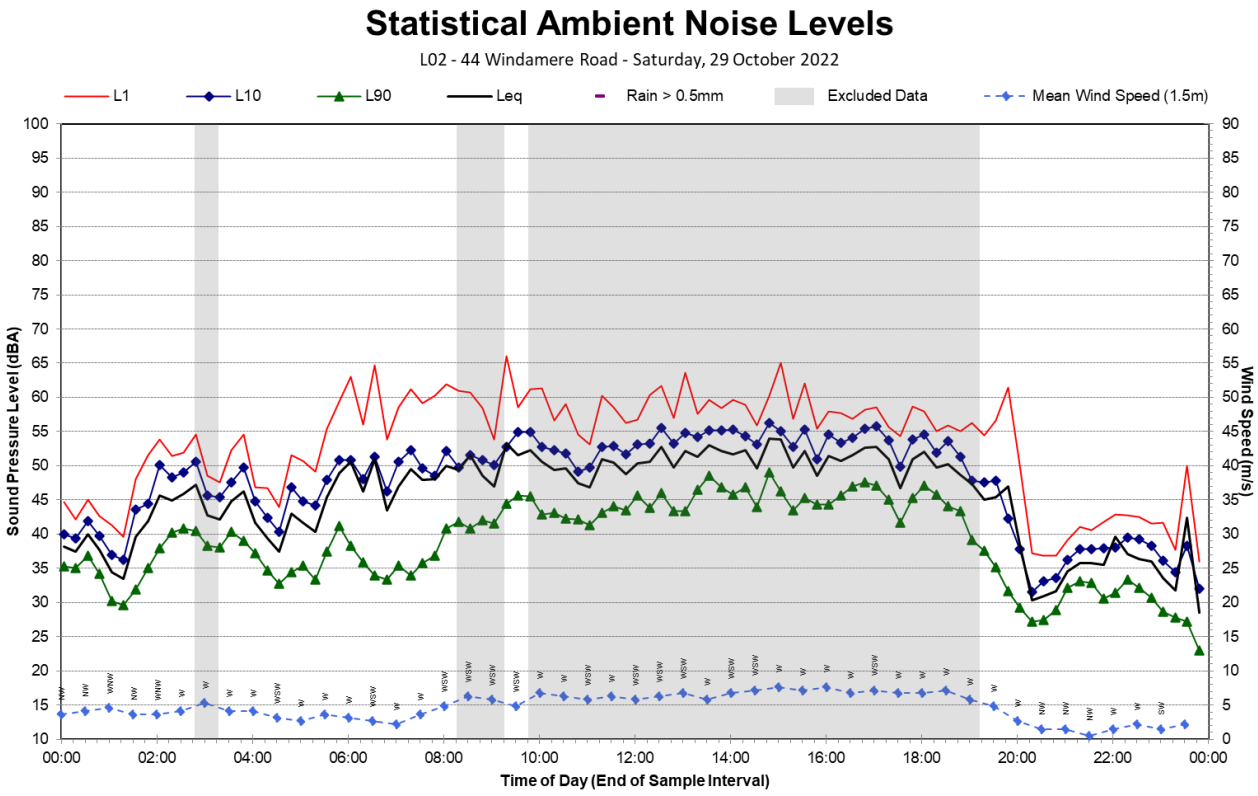
Monitoring Period	Noise Level (dBA)	
	LAeq (period)	LAeq (1 hour)
Daytime (7am - 10pm)	53	54
Night-time (10pm - 7am)	49	46

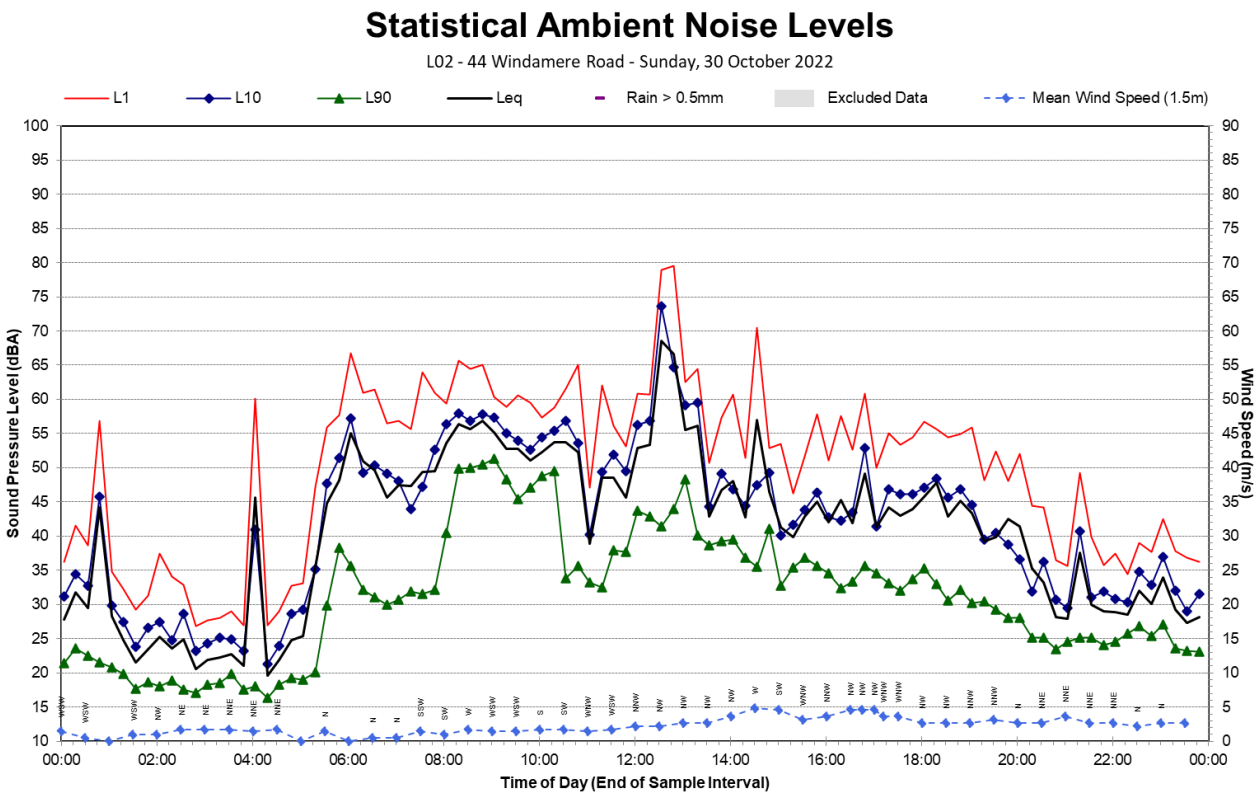
Attended Noise Measurement Results

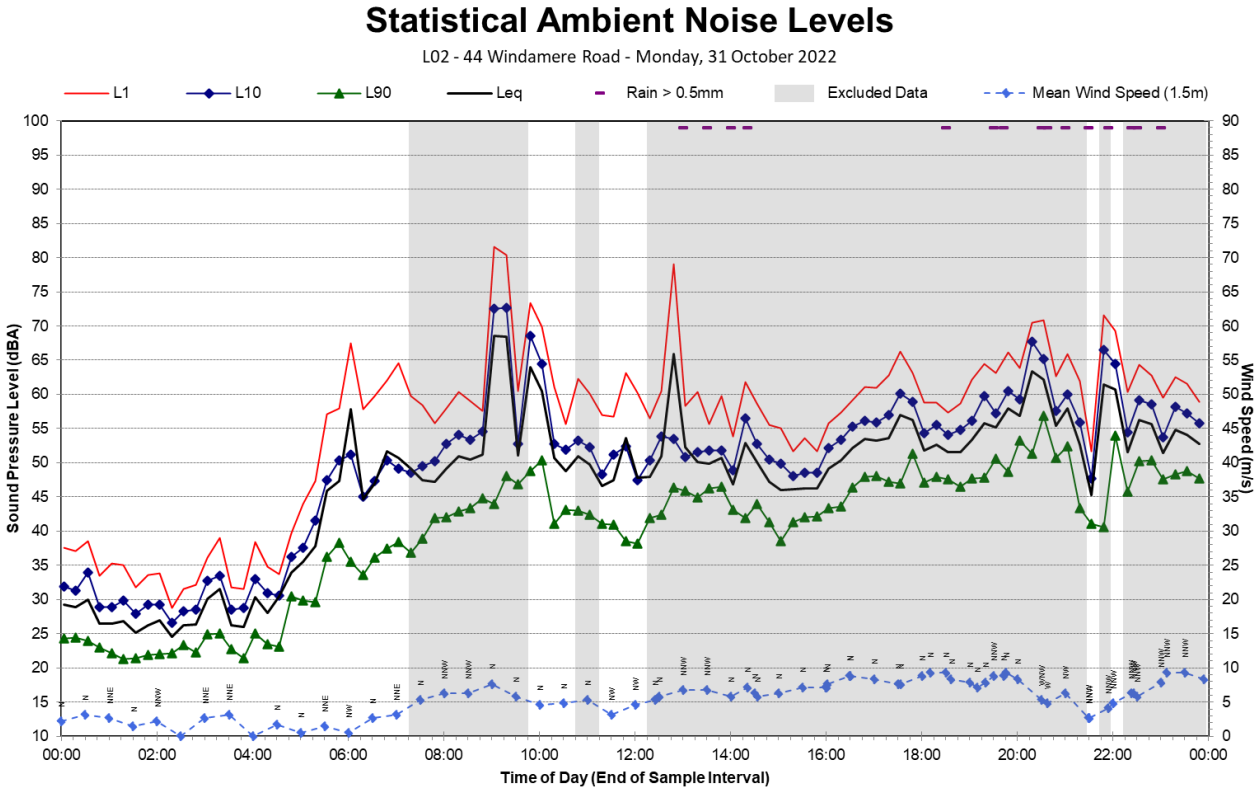
Date	Start Time	Noise Level (dBA)		
		LA90	LAeq	LAmax
22/11/2023	2:02pm	40	46	53

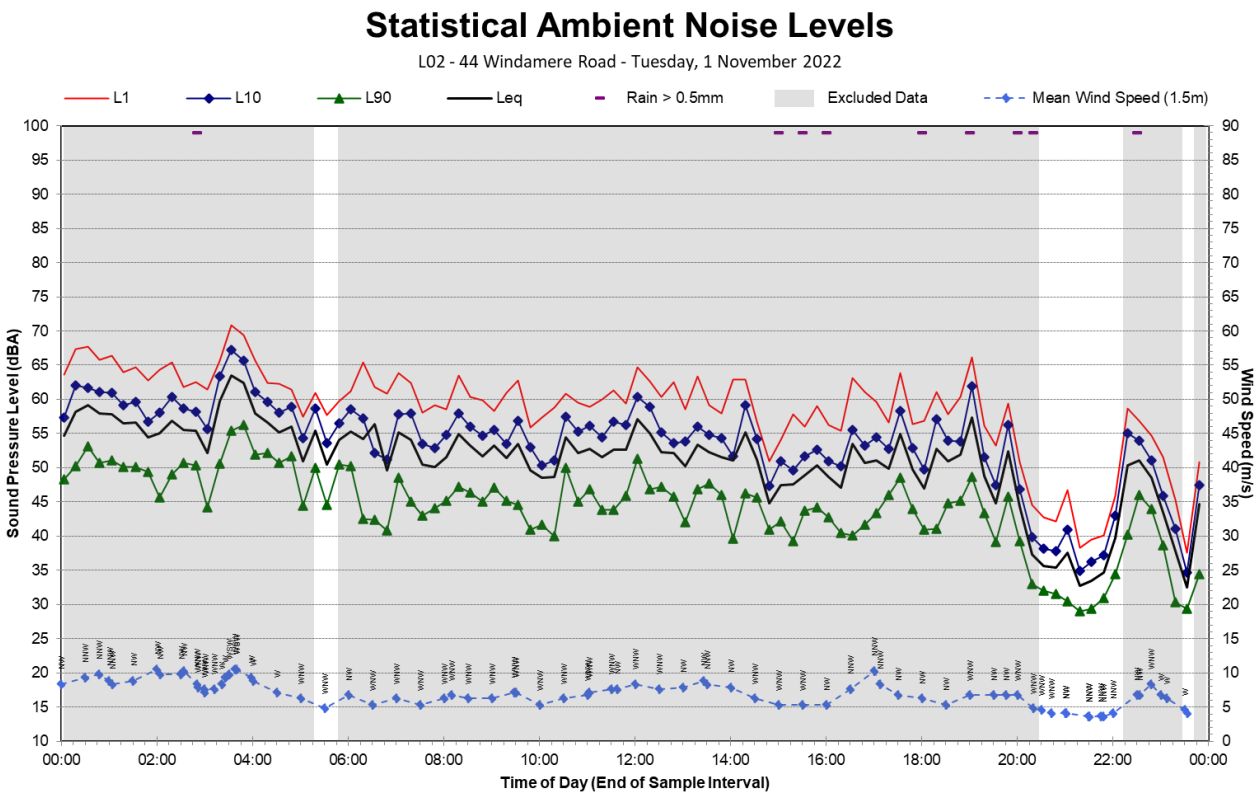
Photo of Noise Monitoring Location

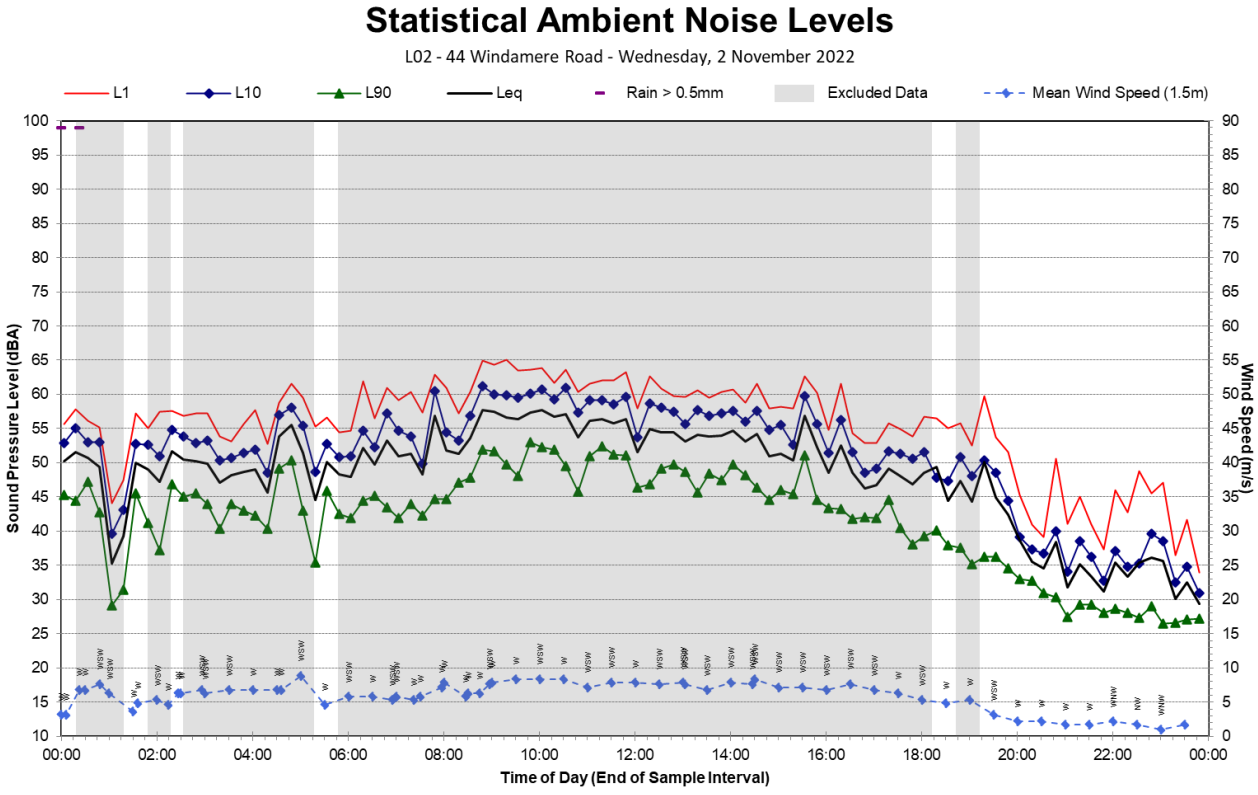

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Friday, 28 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

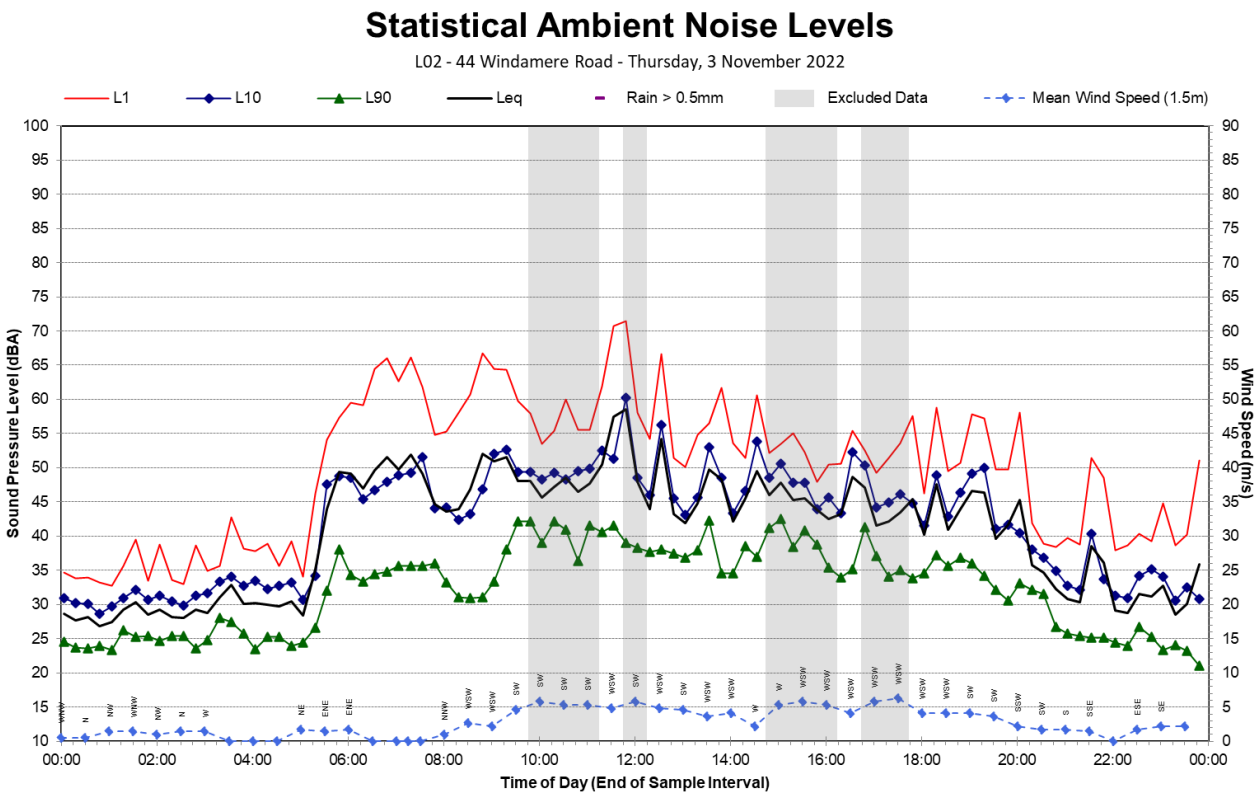

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Saturday, 29 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

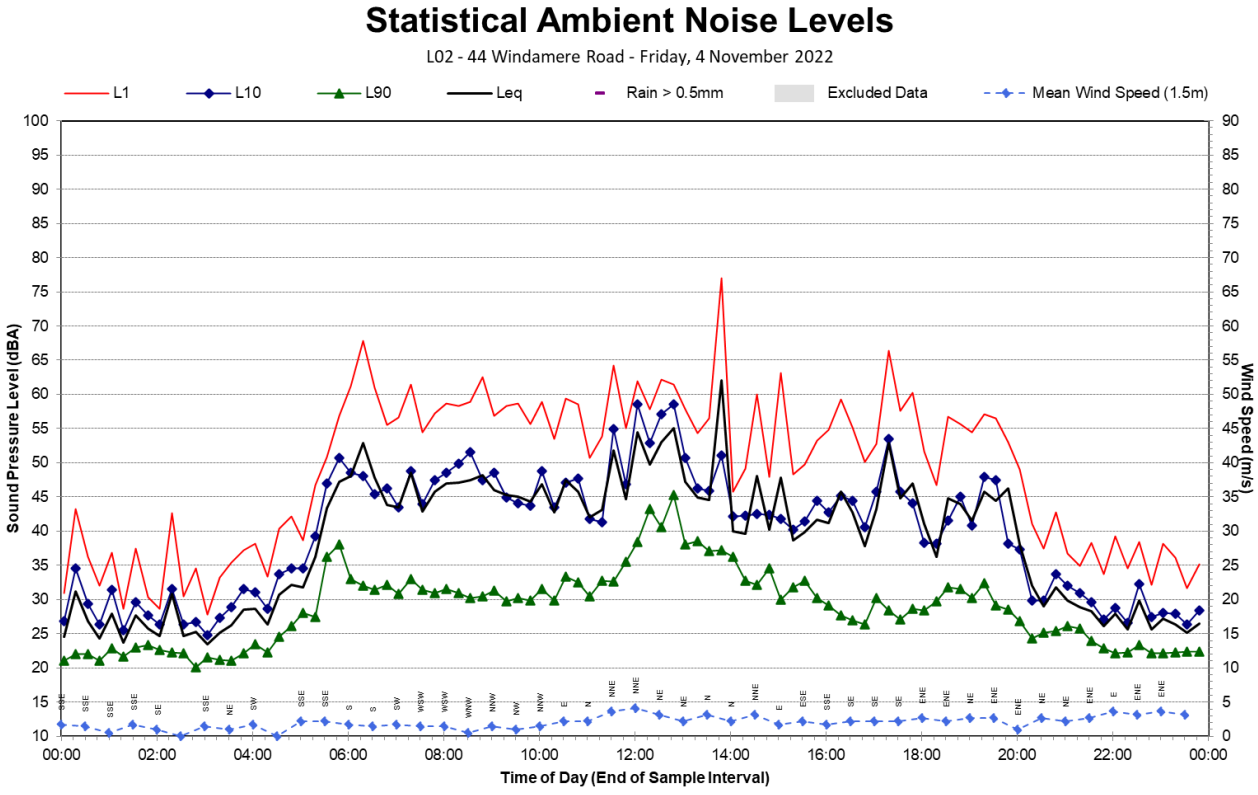

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Sunday, 30 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

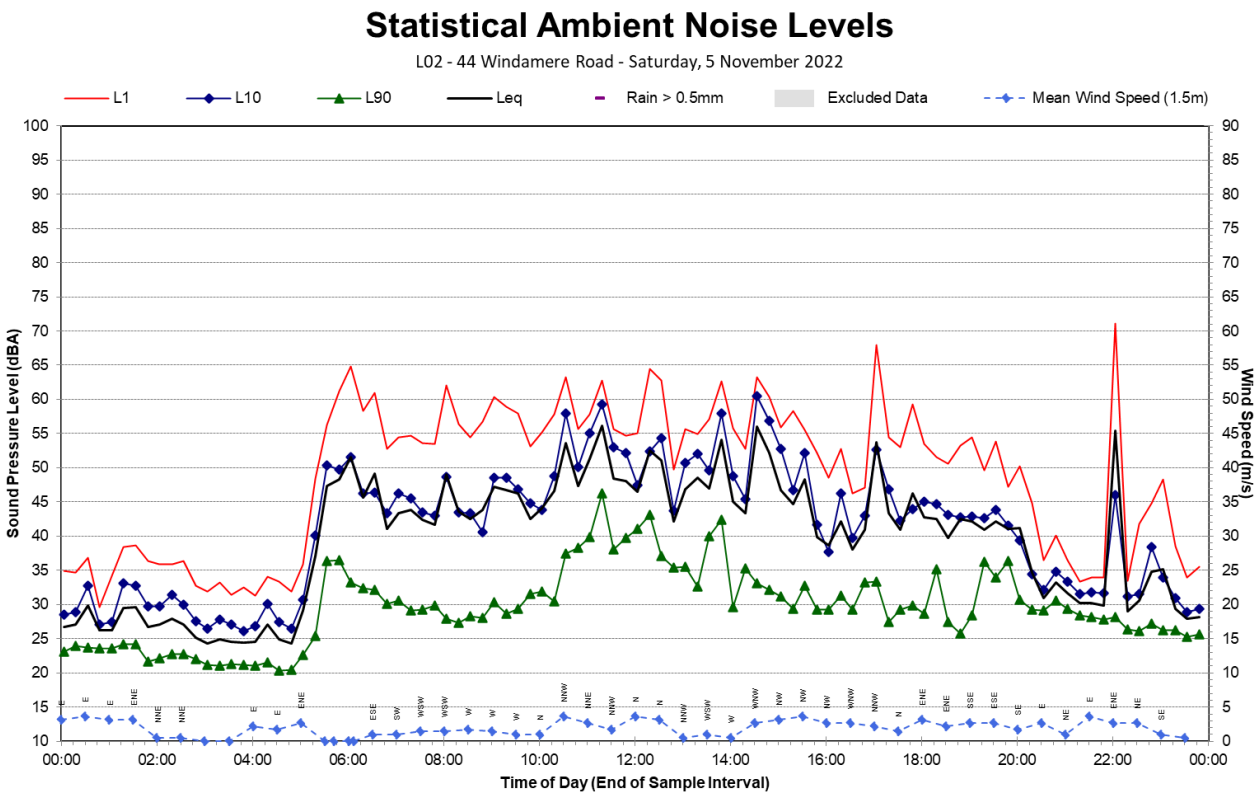

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Monday, 31 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

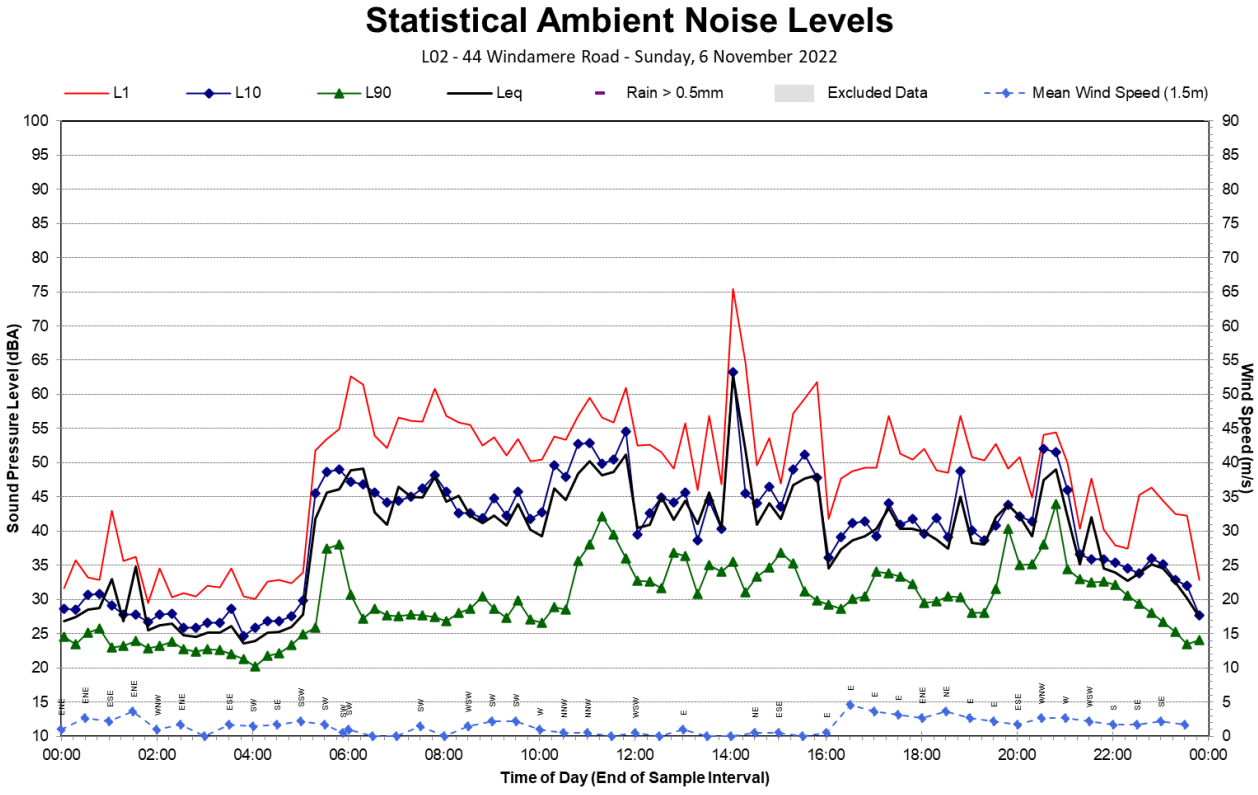

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Tuesday, 1 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

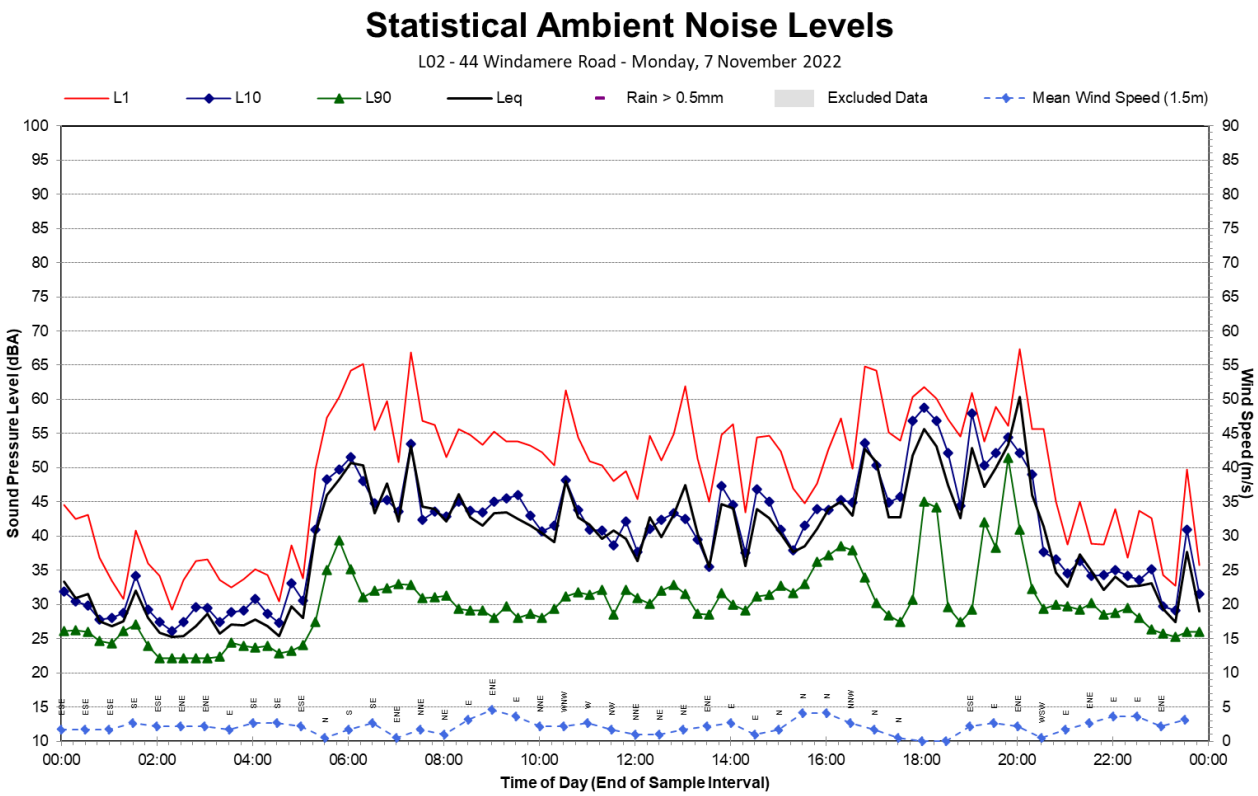

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Wednesday, 2 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

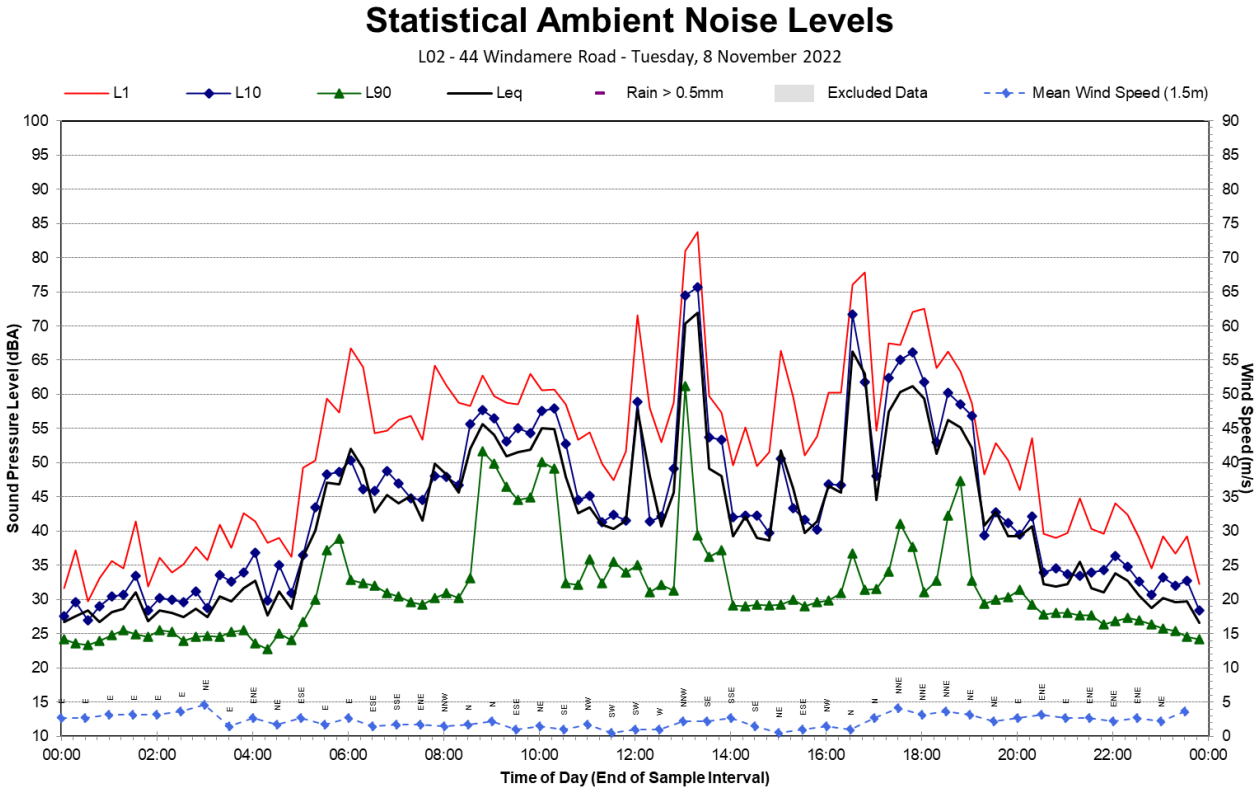

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Thursday, 3 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

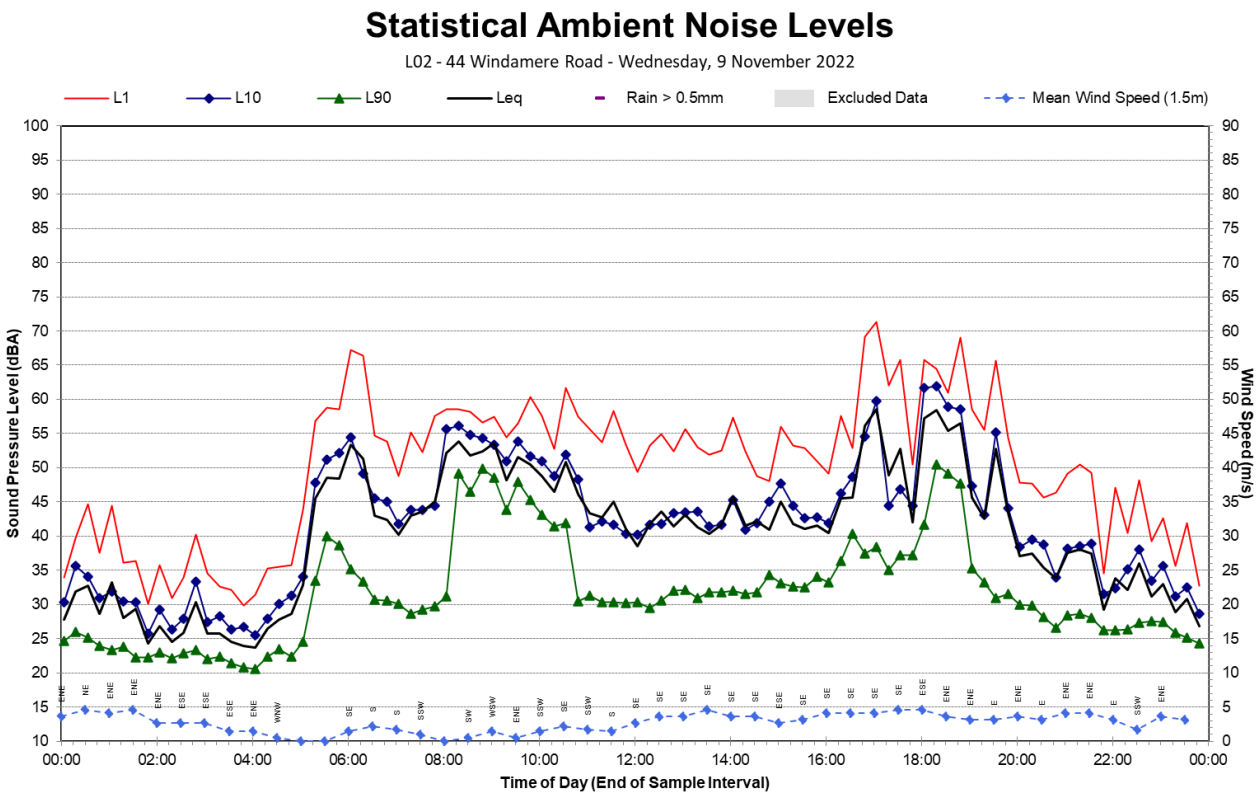

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Friday, 4 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

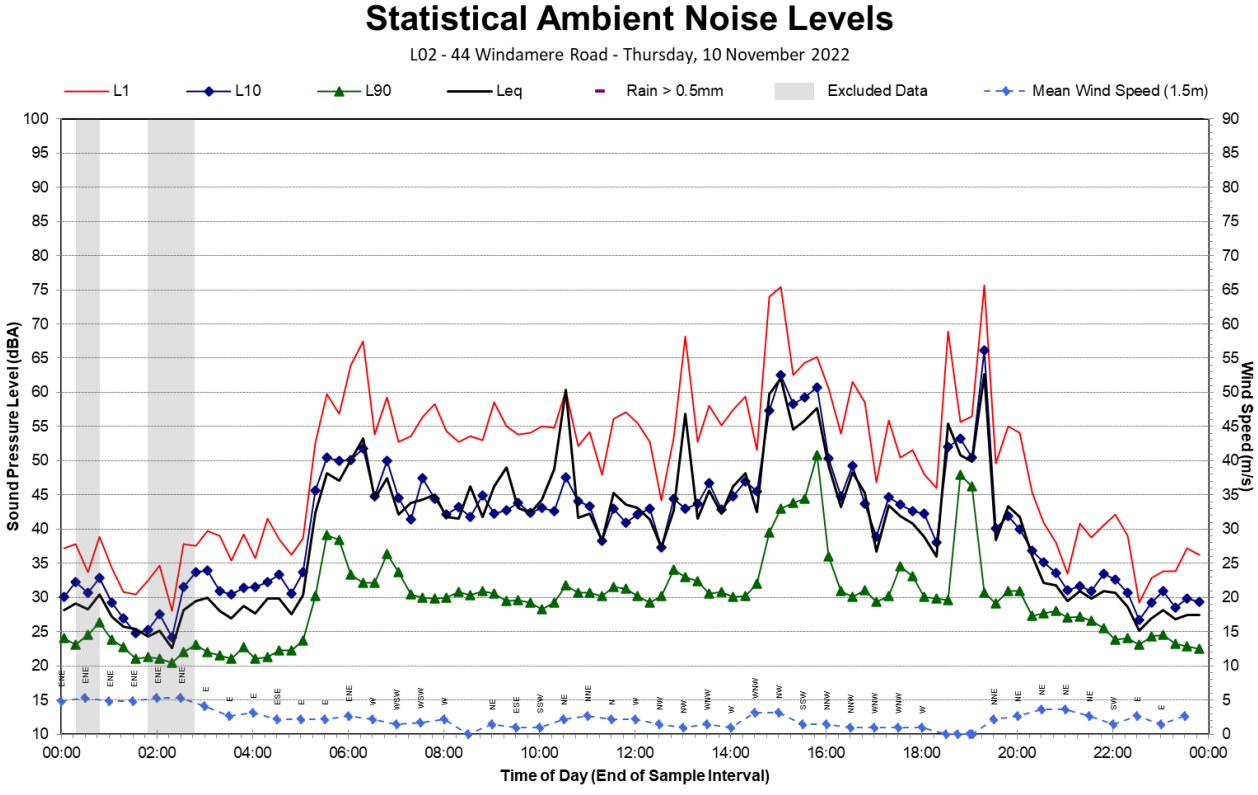

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Saturday, 5 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

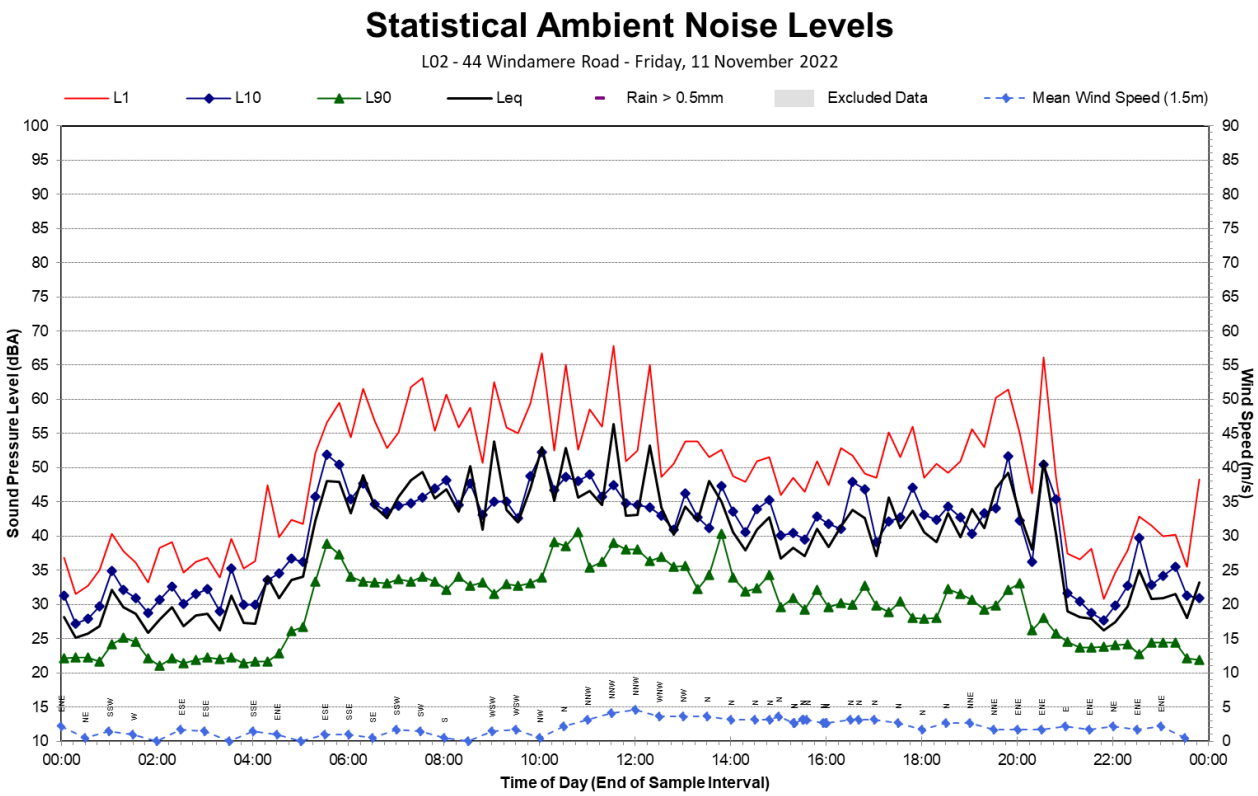

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Sunday, 6 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

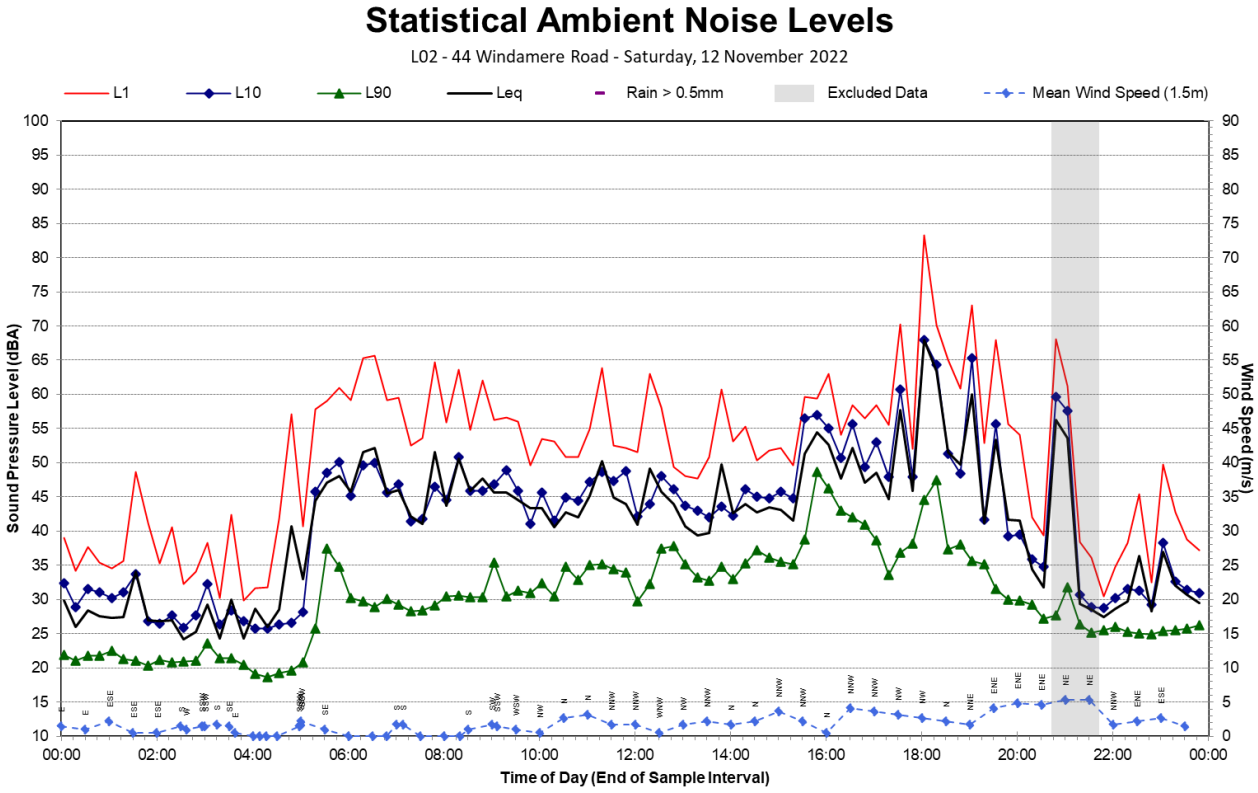

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Monday, 7 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

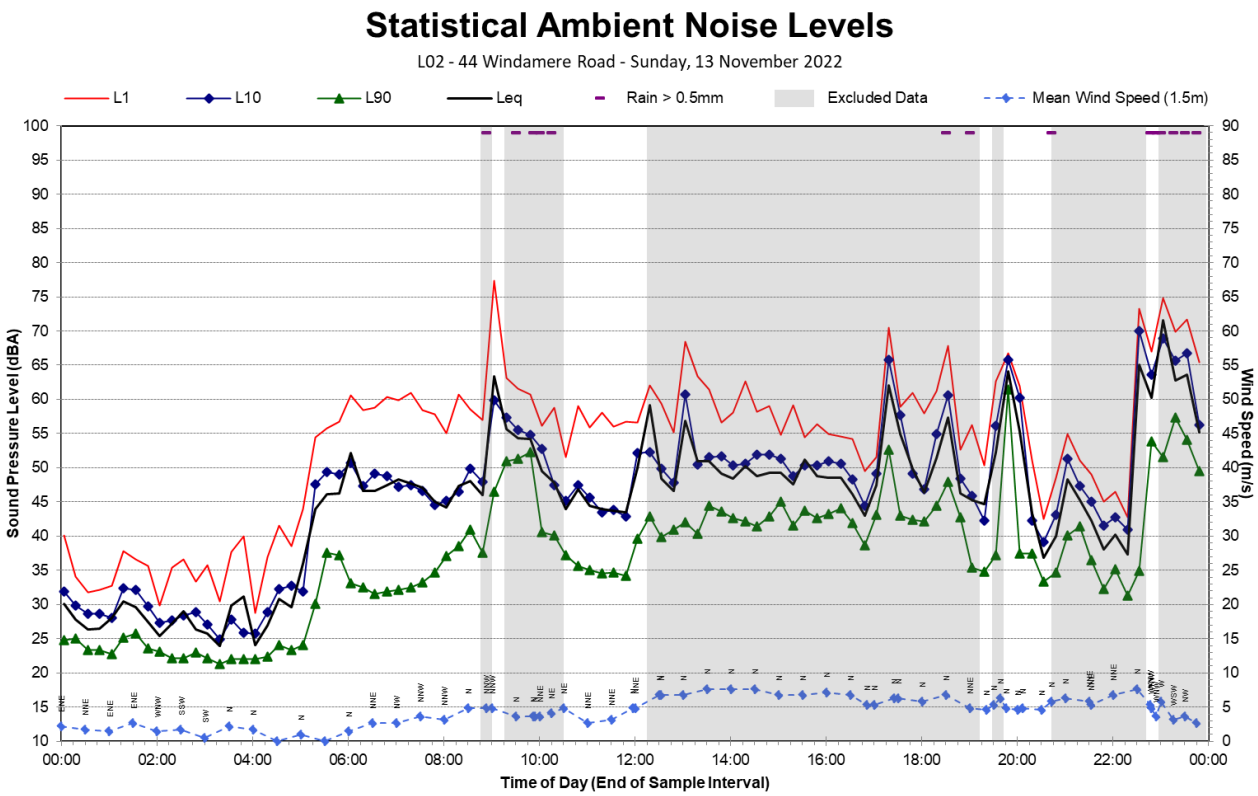

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Tuesday, 8 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

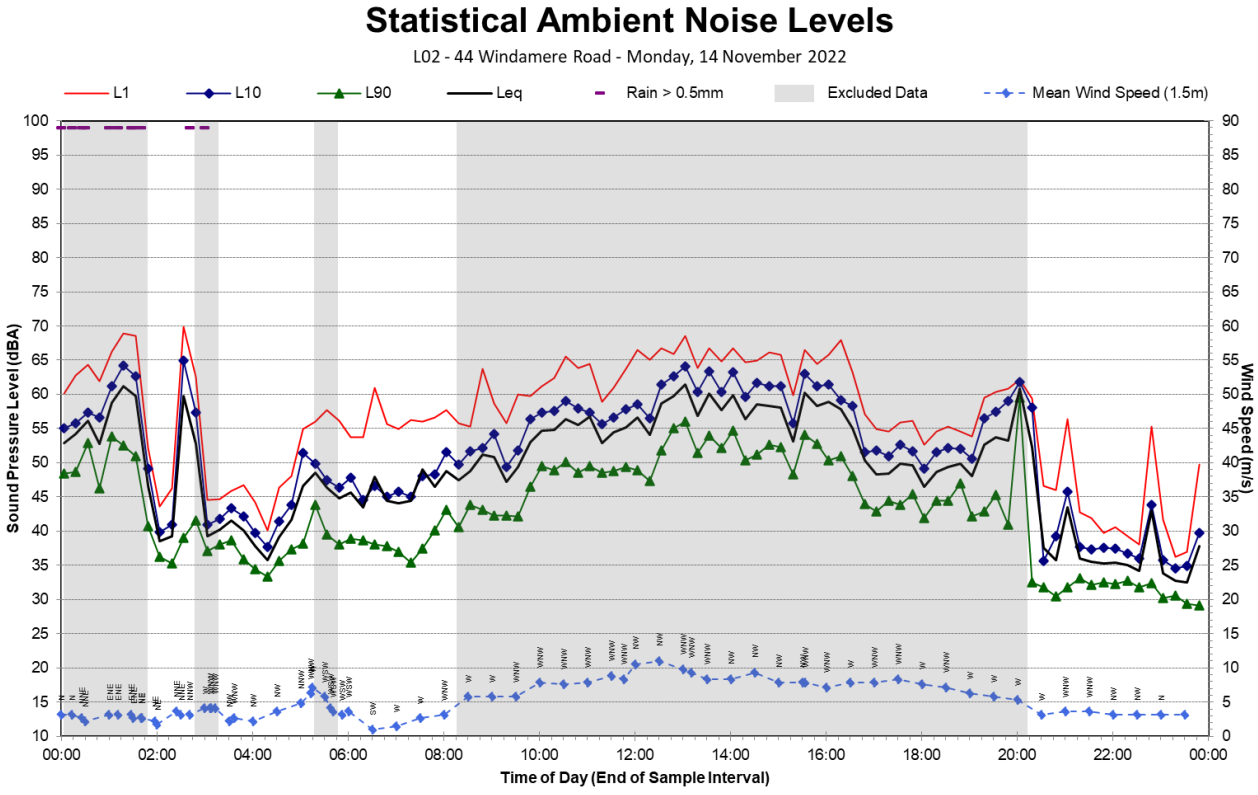

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Wednesday, 9 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

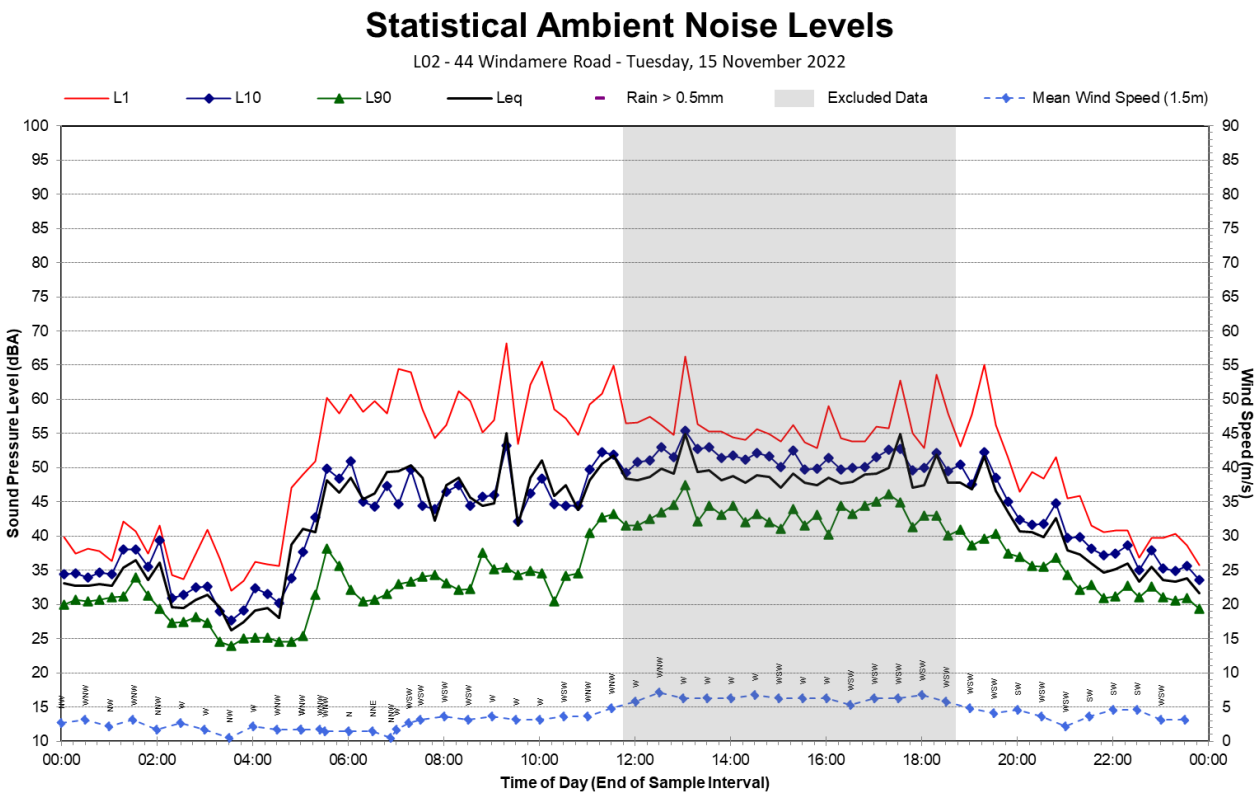

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Thursday, 10 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

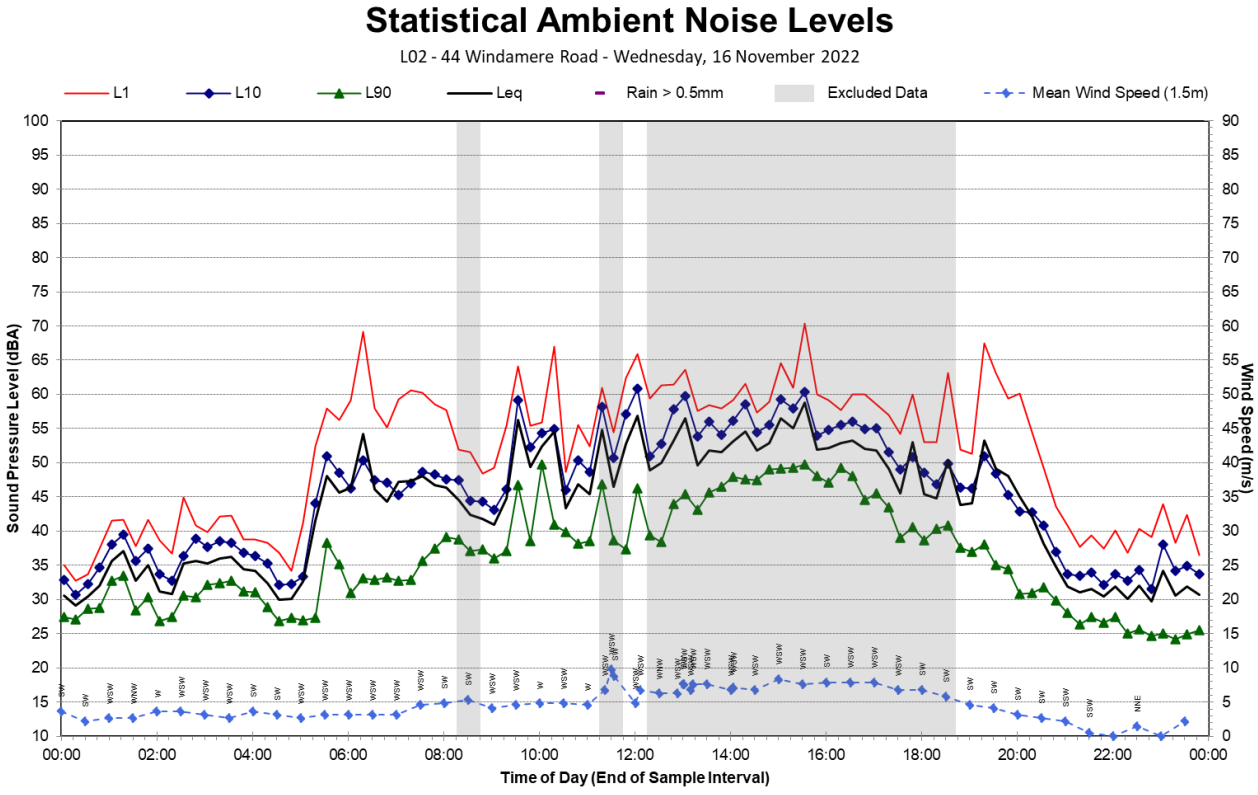

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Friday, 11 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

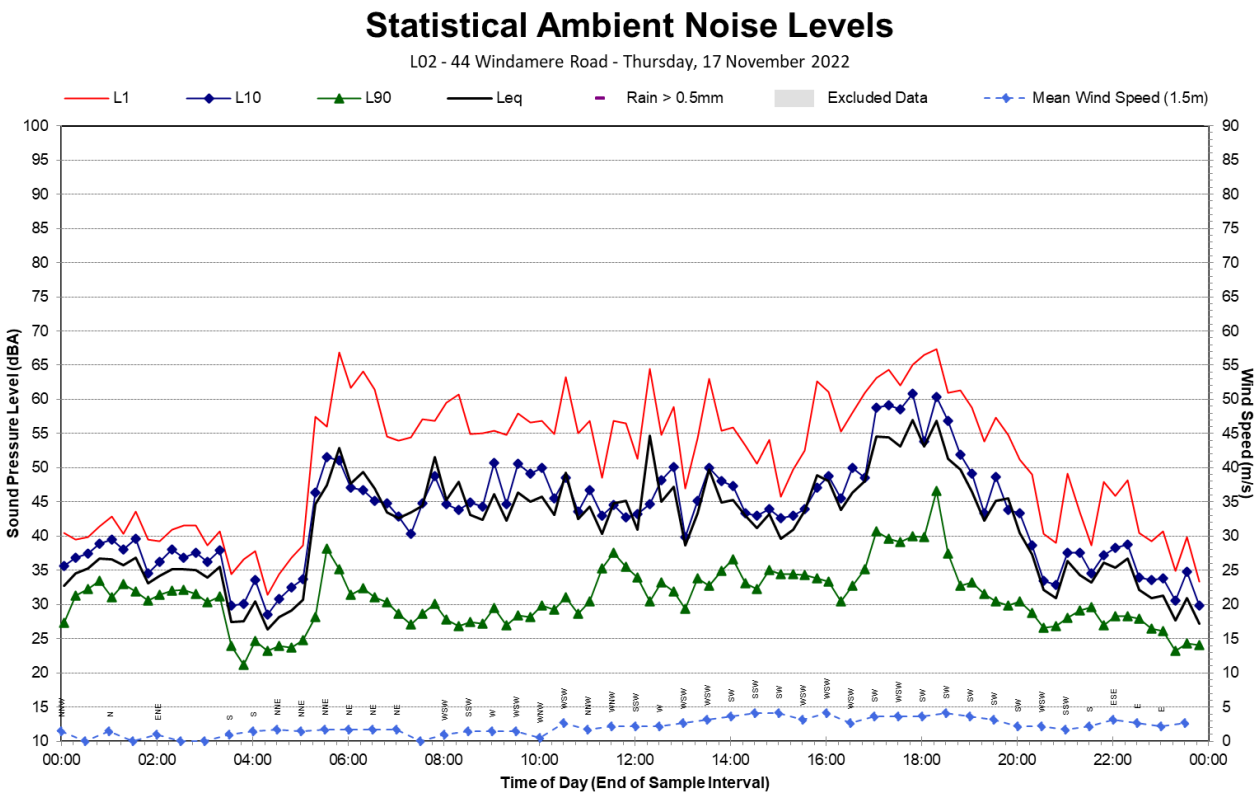

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Saturday, 12 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

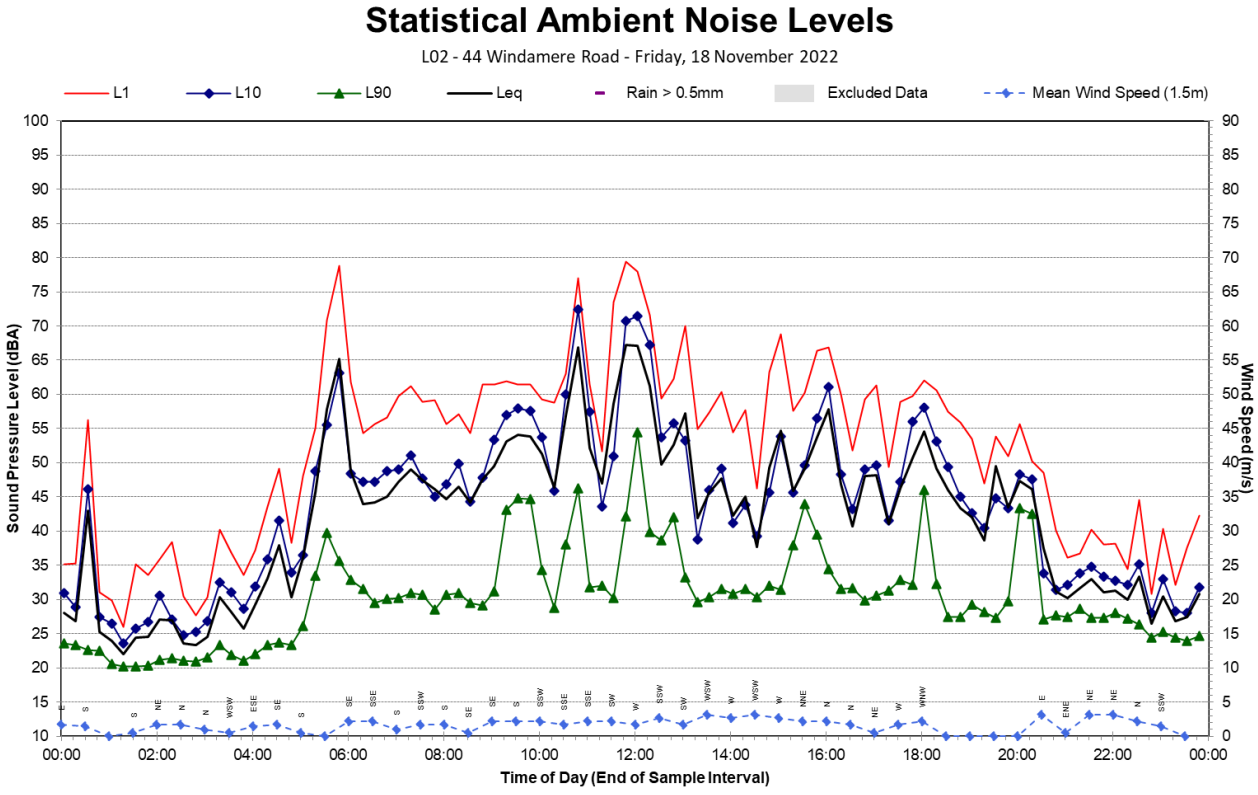

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Sunday, 13 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

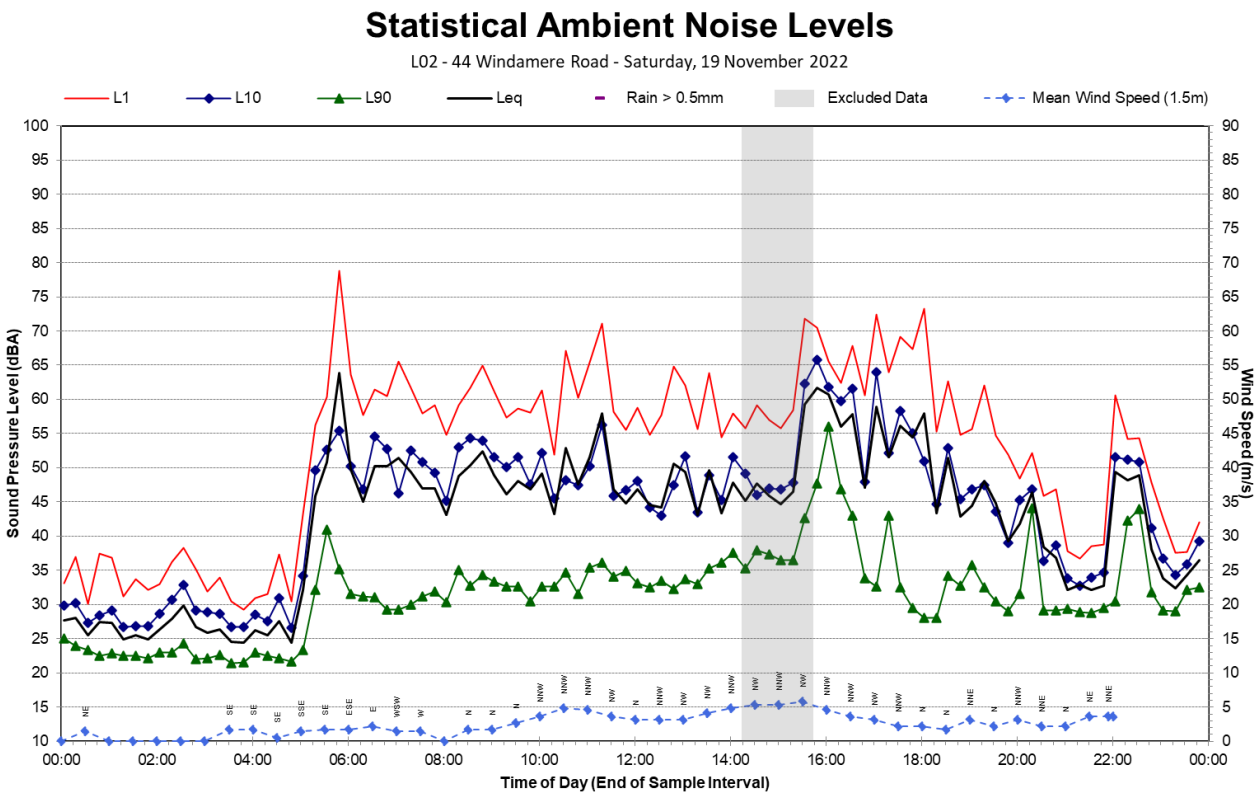

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Monday, 14 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

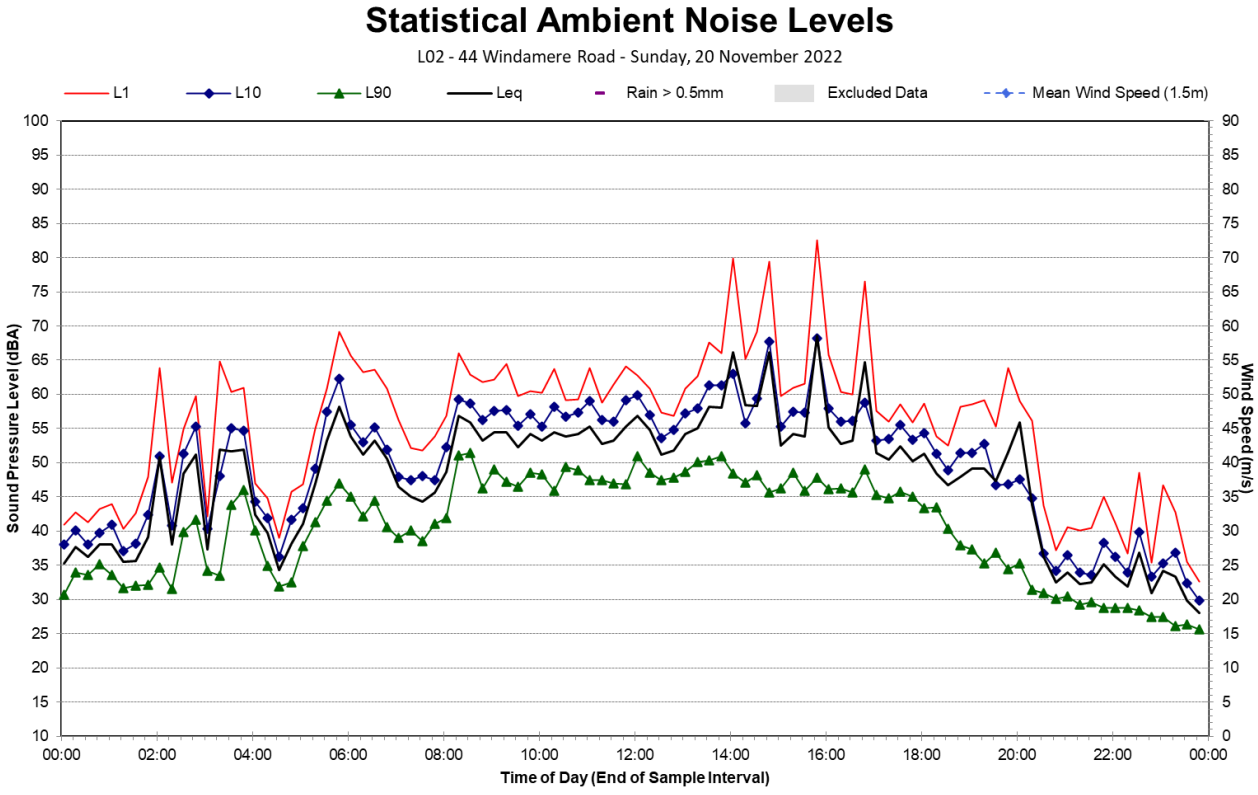

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Tuesday, 15 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

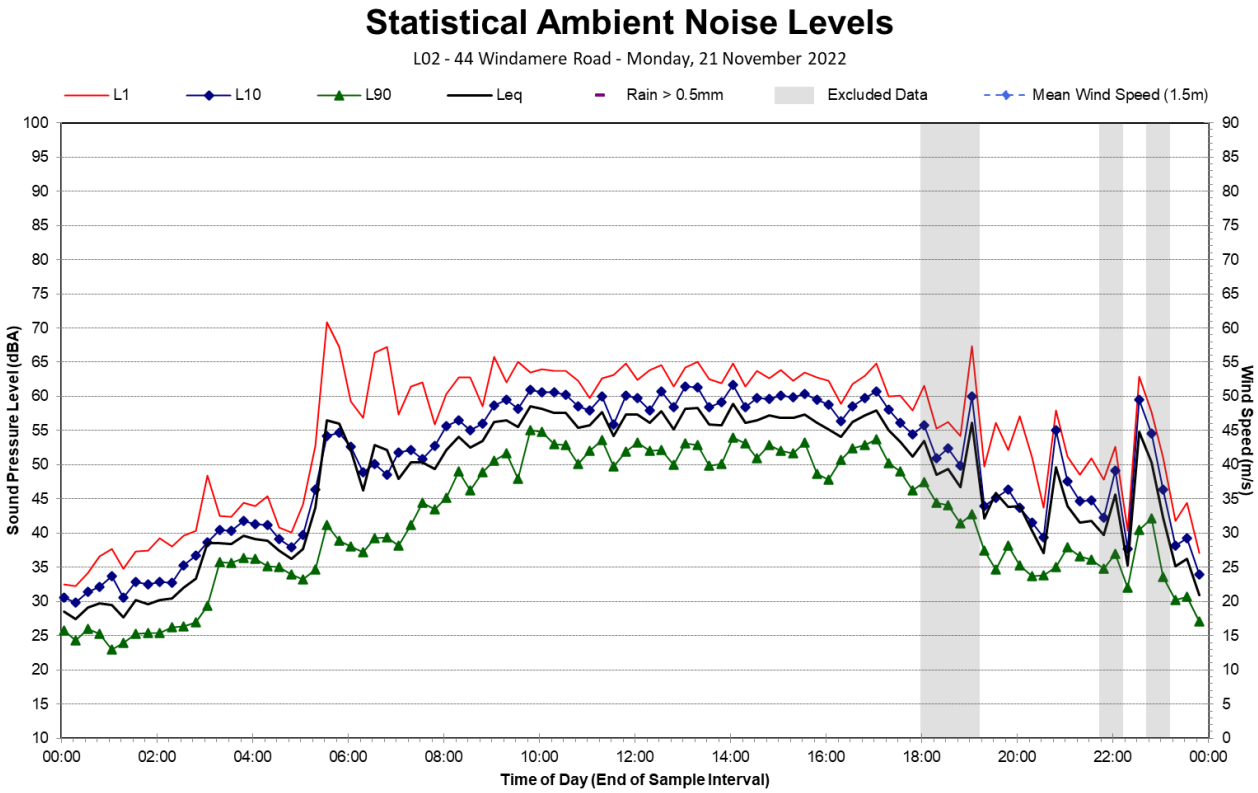

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Wednesday, 16 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

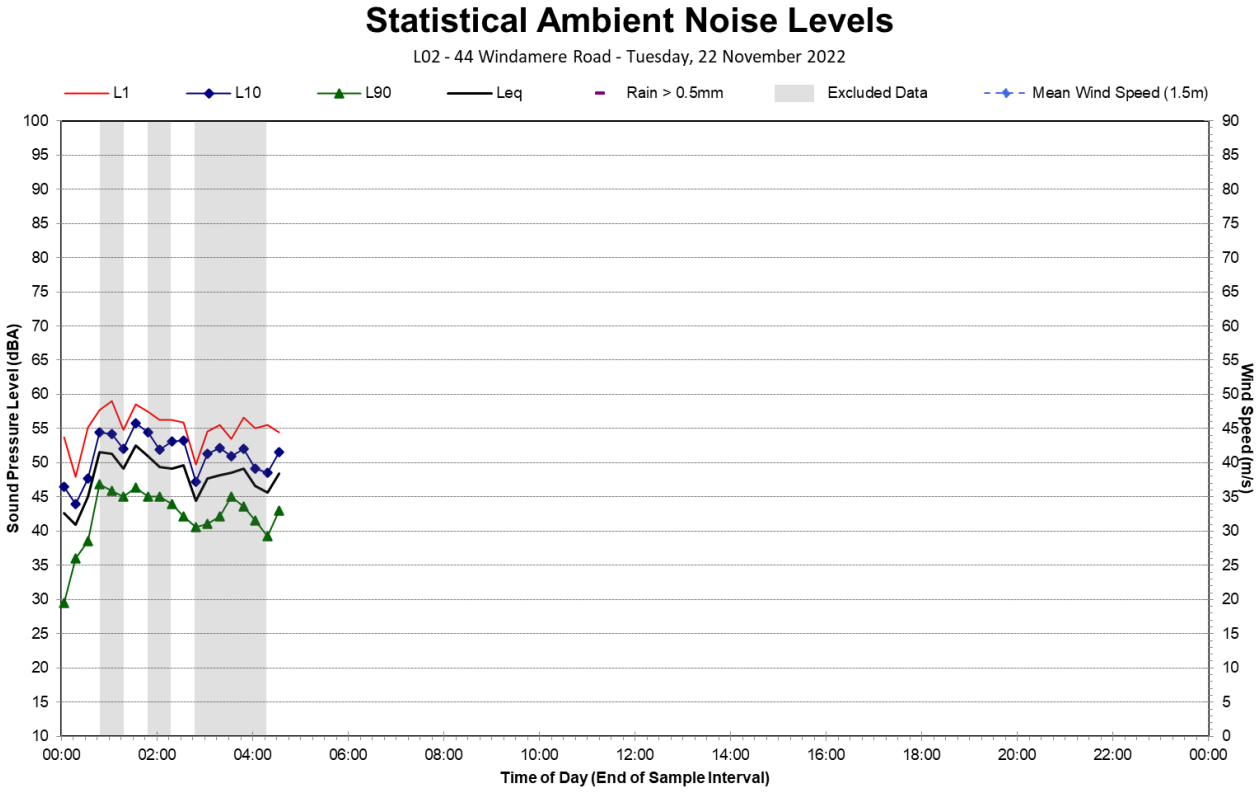

Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Thursday, 17 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Friday, 18 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Saturday, 19 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Sunday, 20 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Monday, 21 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 44 Windamere Road - Tuesday, 22 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

Noise Monitoring Location	L03	Map of Noise Monitoring Location
Noise Monitoring Address	270 Hartwood Avenue, Robin Hill	

Logger Device Type: Svantek 957: Logger Serial No:20665

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 3008204

Ambient noise logger deployed at 270 Hartwood located at the residence back garden surrounded by open terrain.

Attended noise measurements indicate the ambient noise environment at this location is influence by wildlife noise.

Recorded Noise Levels (LAmax) 22/11/2023:

Wind: 45-50dBA

Birds: 43dBA

Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	30	60	44	52
Evening	30	58	43	49
Night-time	30	51	40	45

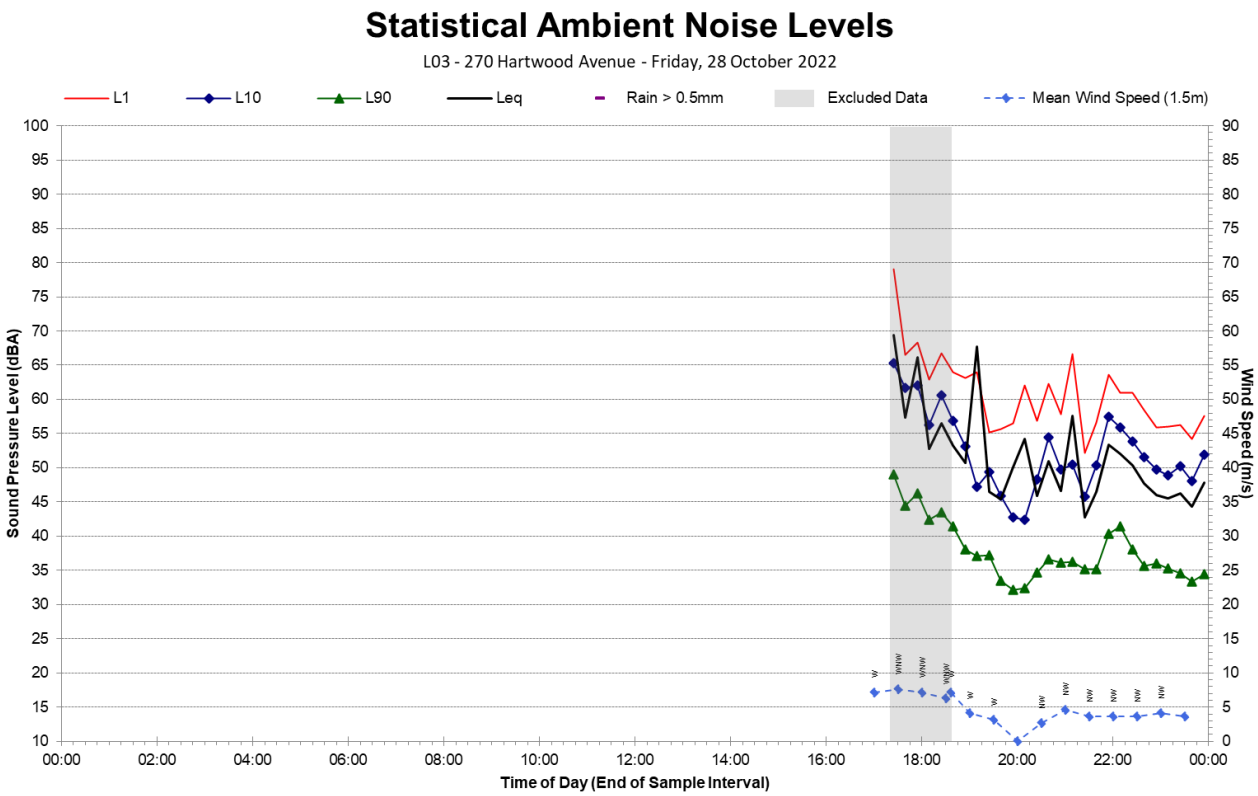
Ambient Noise Logging Results – RNP Defined Time Periods

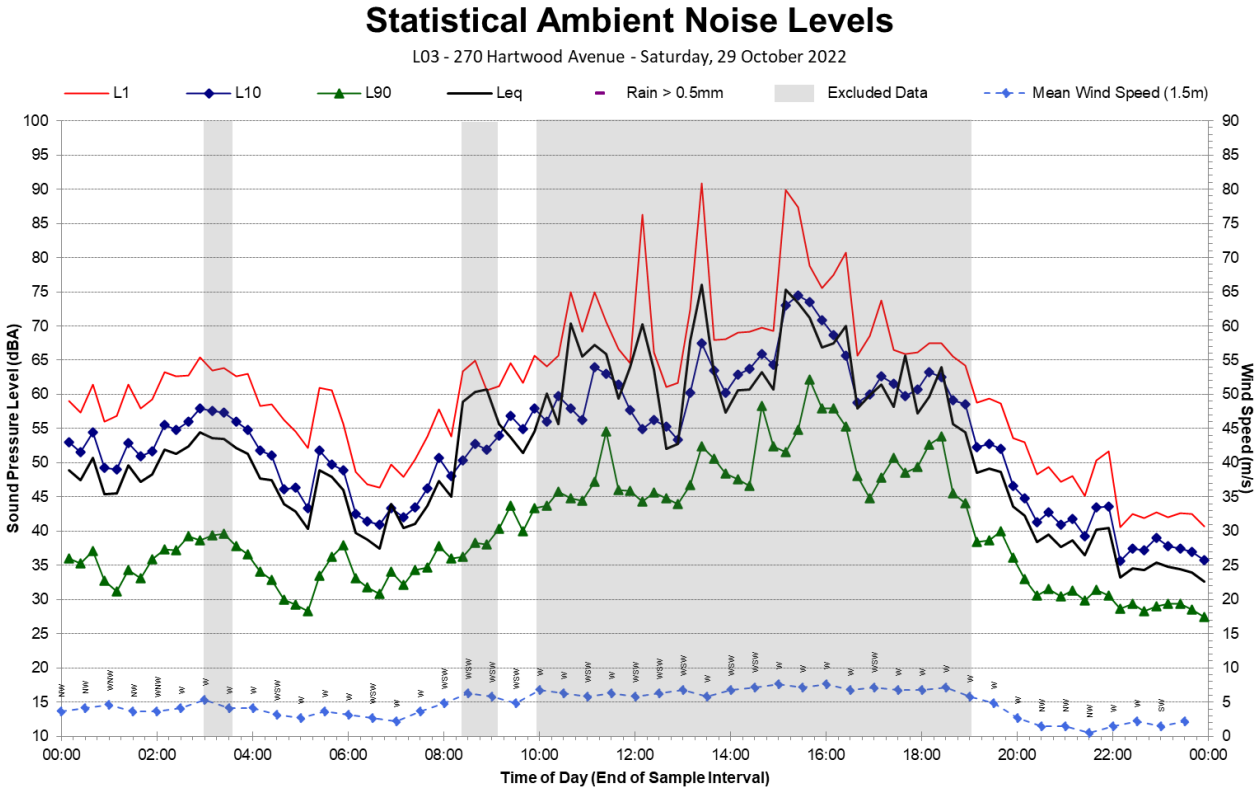
Monitoring Period	Noise Level (dBA)	
	LAeq (period)	LAeq (1 hour)
Daytime (7am - 10pm)	61	63
Night-time (10pm - 7am)	53	44

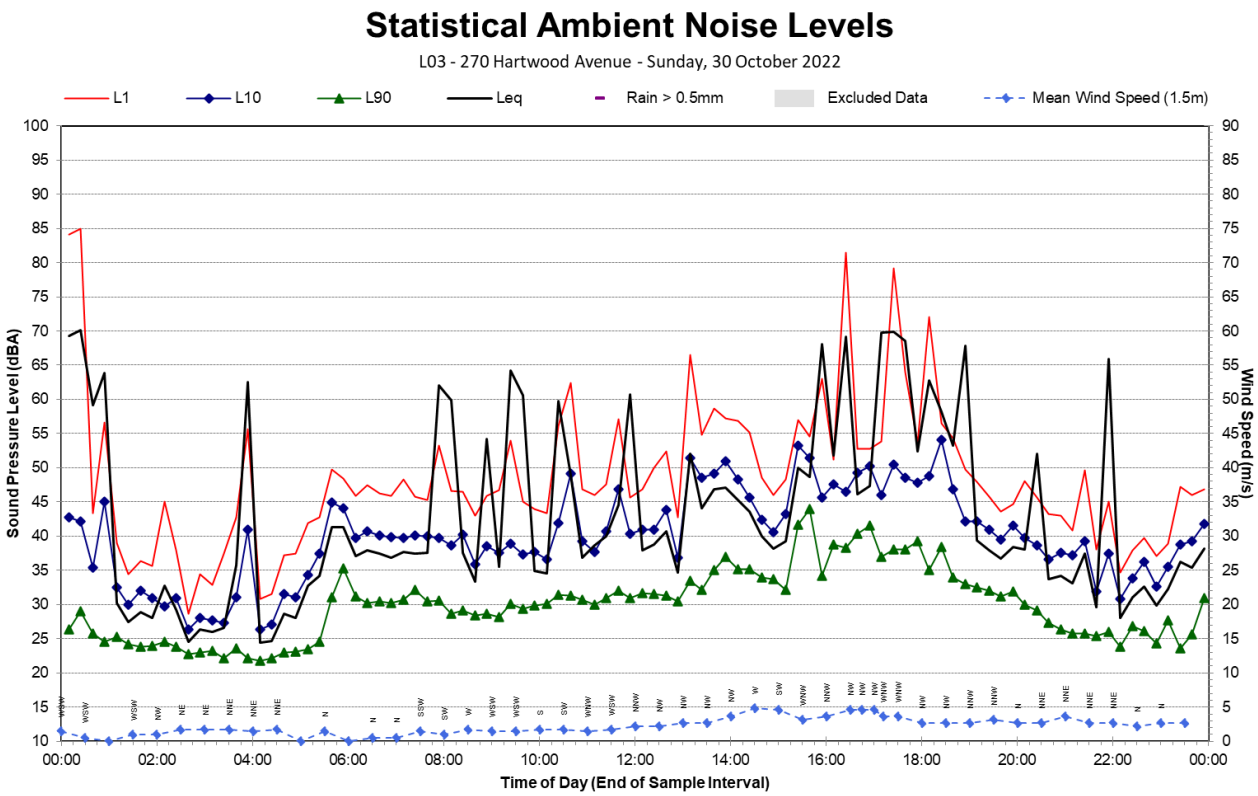
Attended Noise Measurement Results

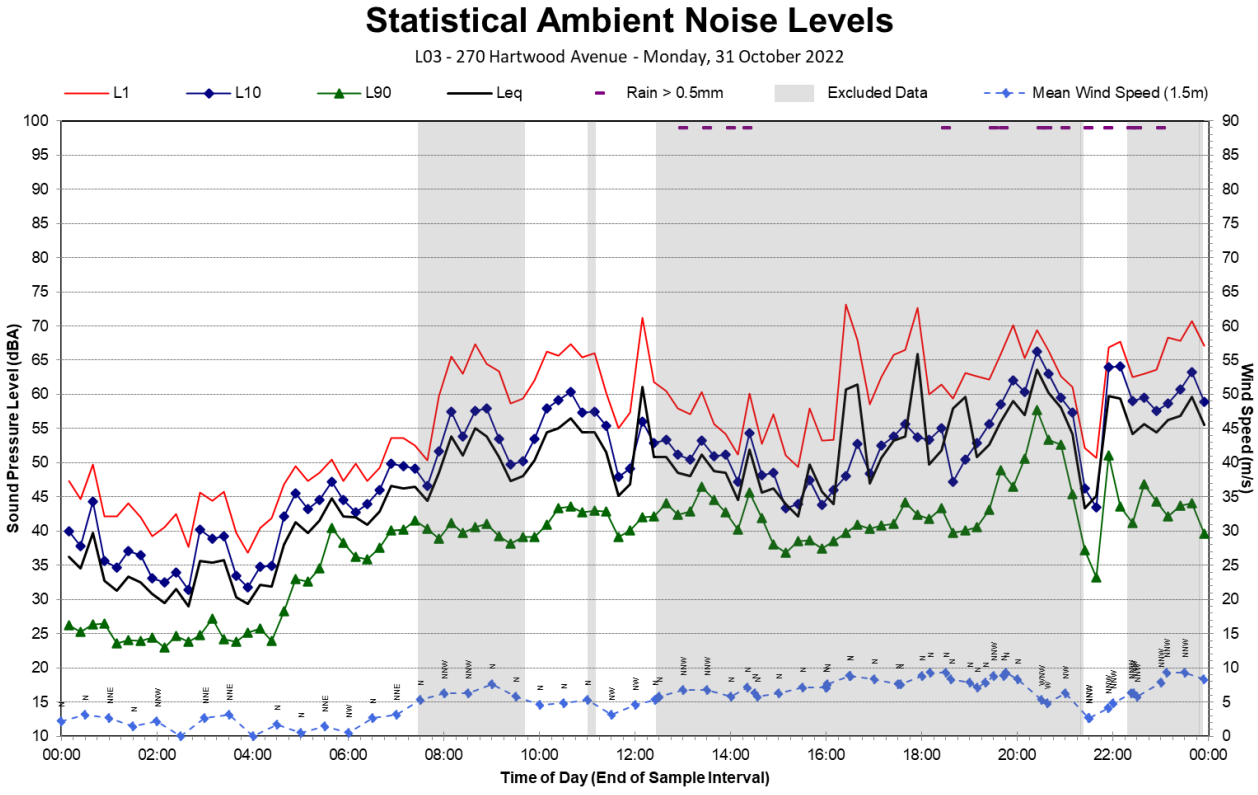
Date	Start Time	Noise Level (dBA)		
		LA90	LAeq	LAmax
22/11/2023	3:40pm	39	46	52

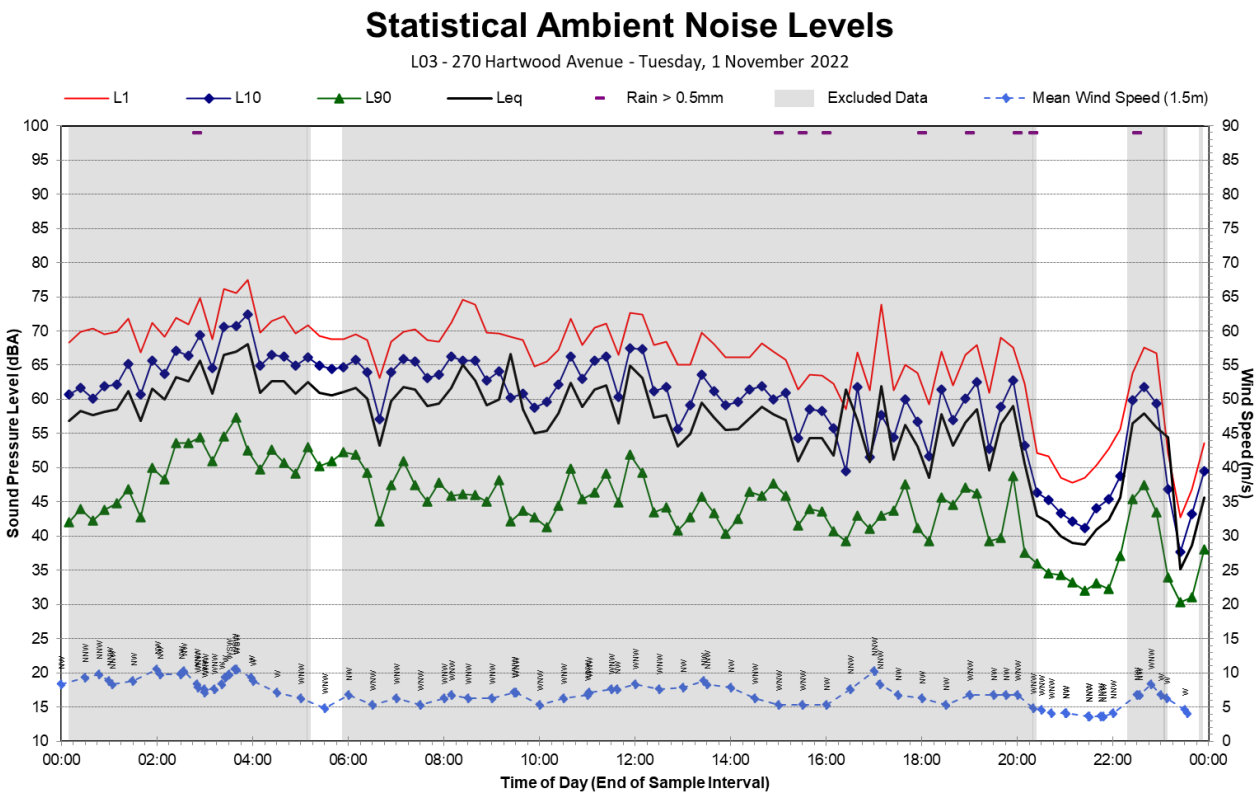
Photo of Noise Monitoring Location

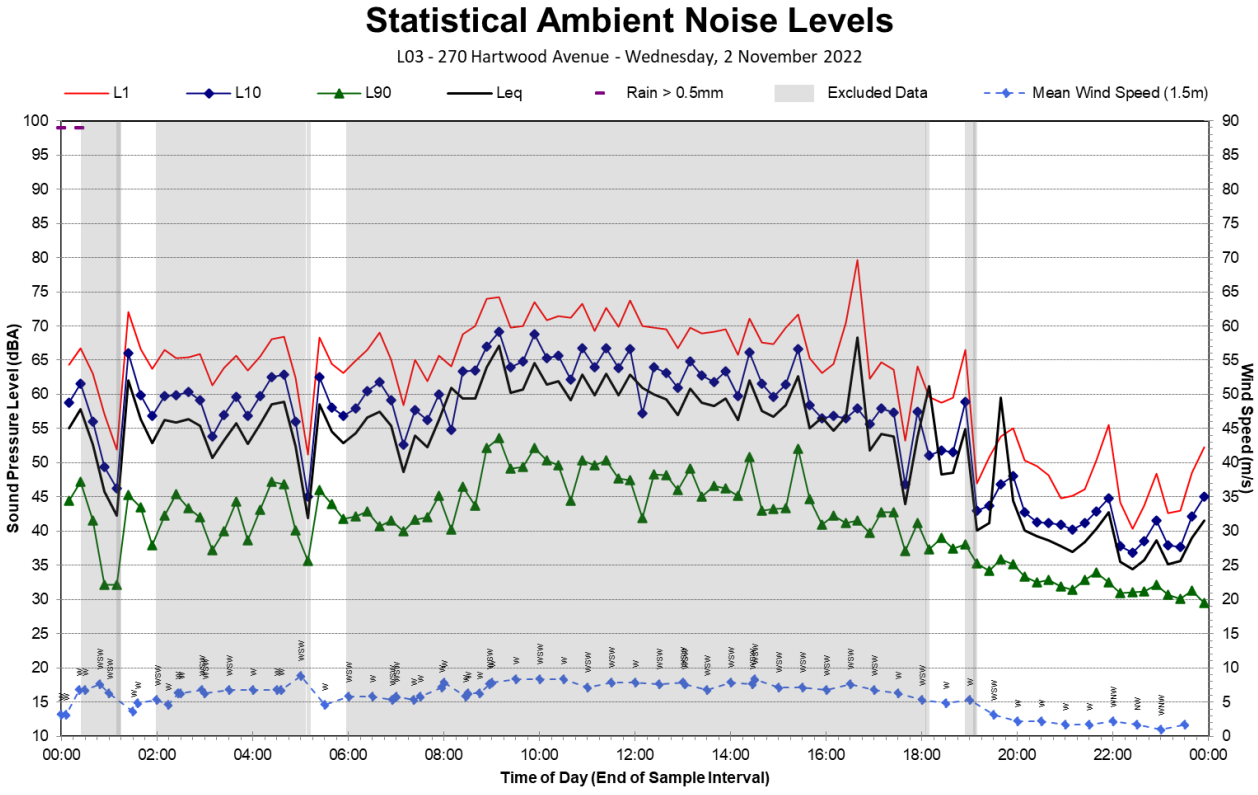

Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Friday, 28 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

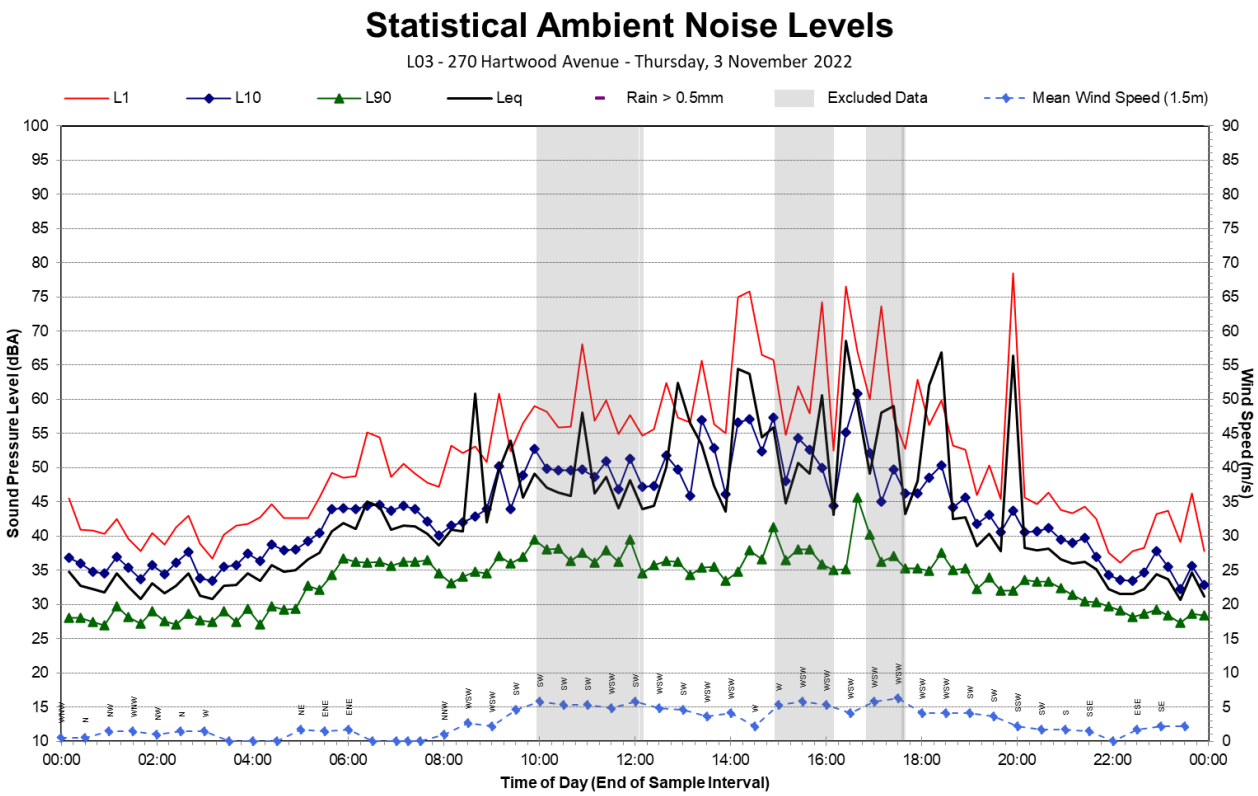

Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Saturday, 29 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

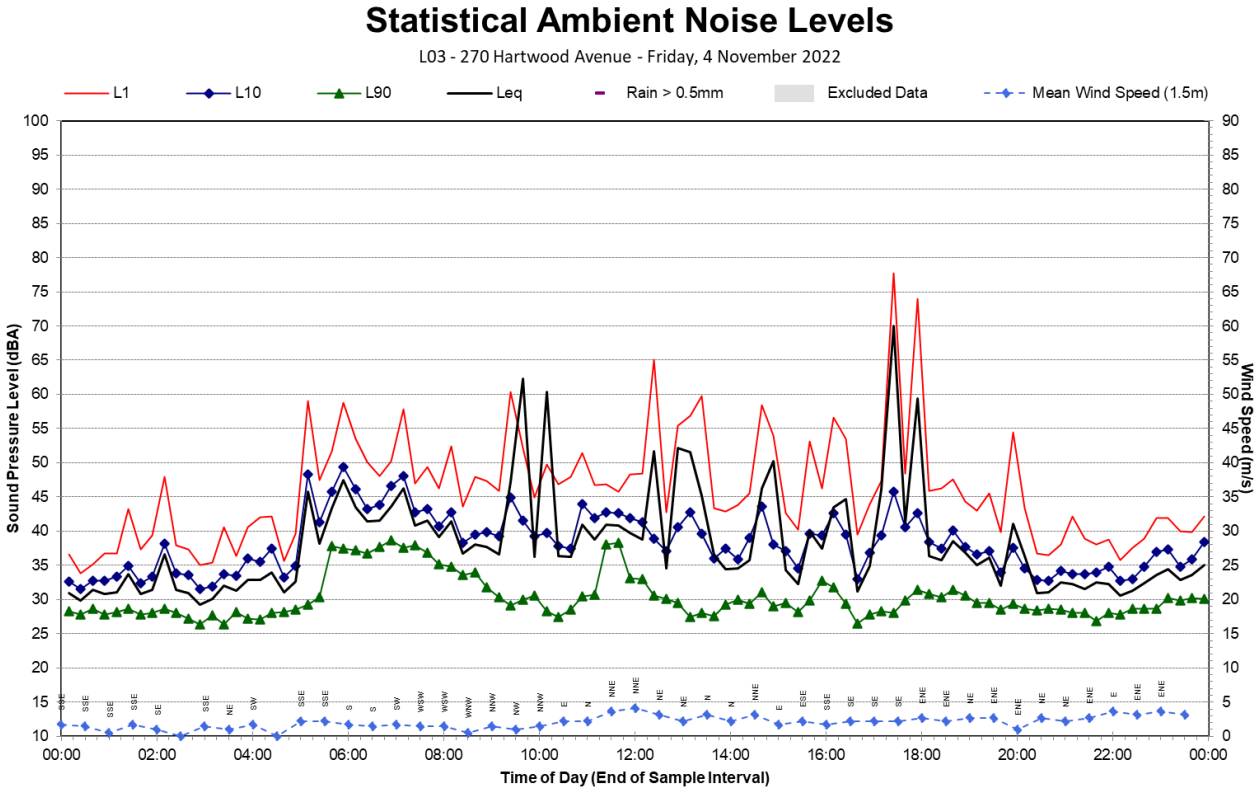

Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Sunday, 30 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

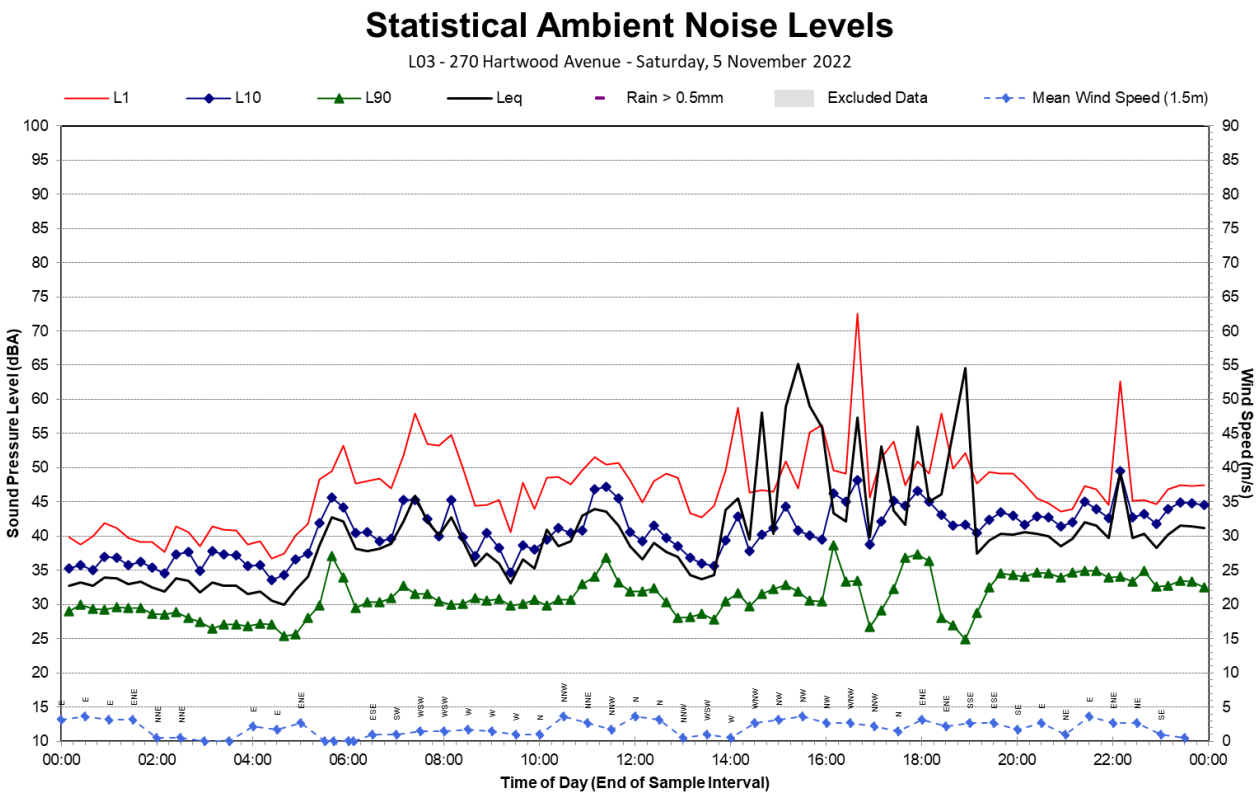

Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Monday, 31 October 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Tuesday, 1 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Wednesday, 2 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Thursday, 3 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Friday, 4 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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L1
L10
L90
Leq
Rain > 0.5mm
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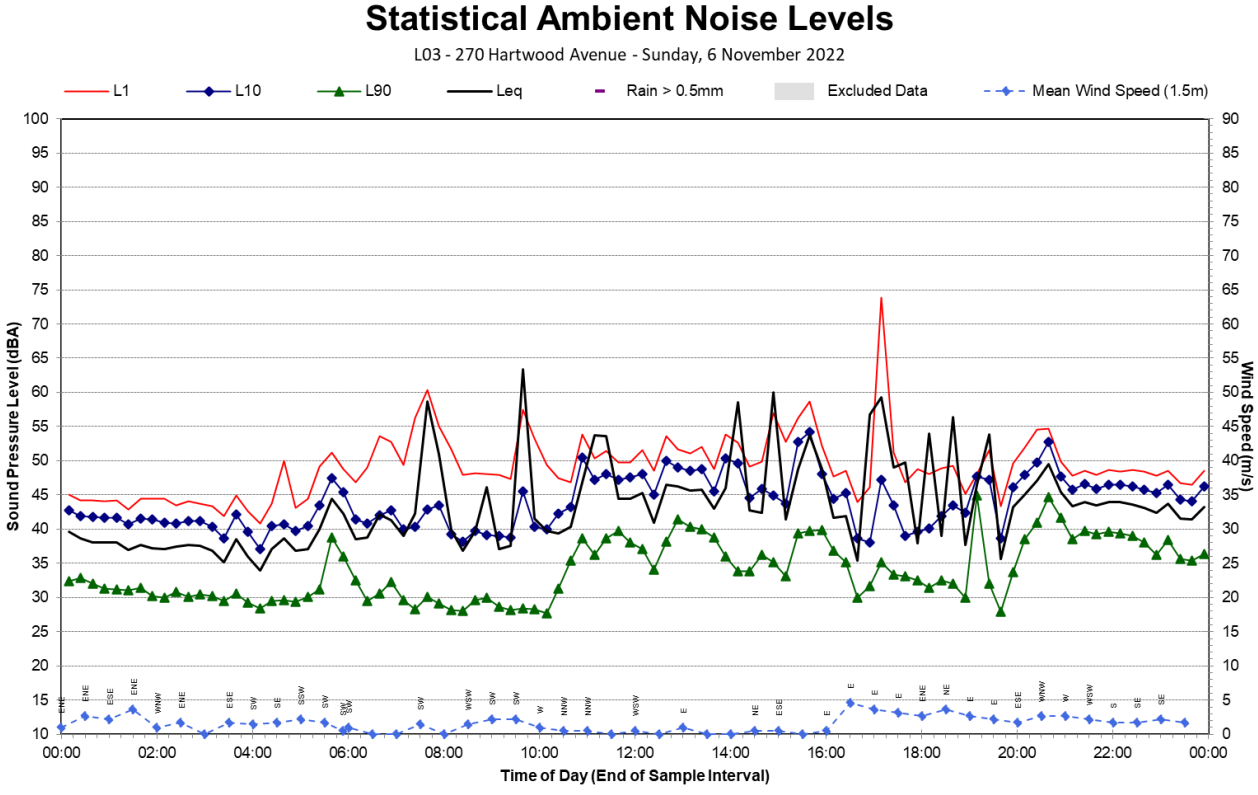
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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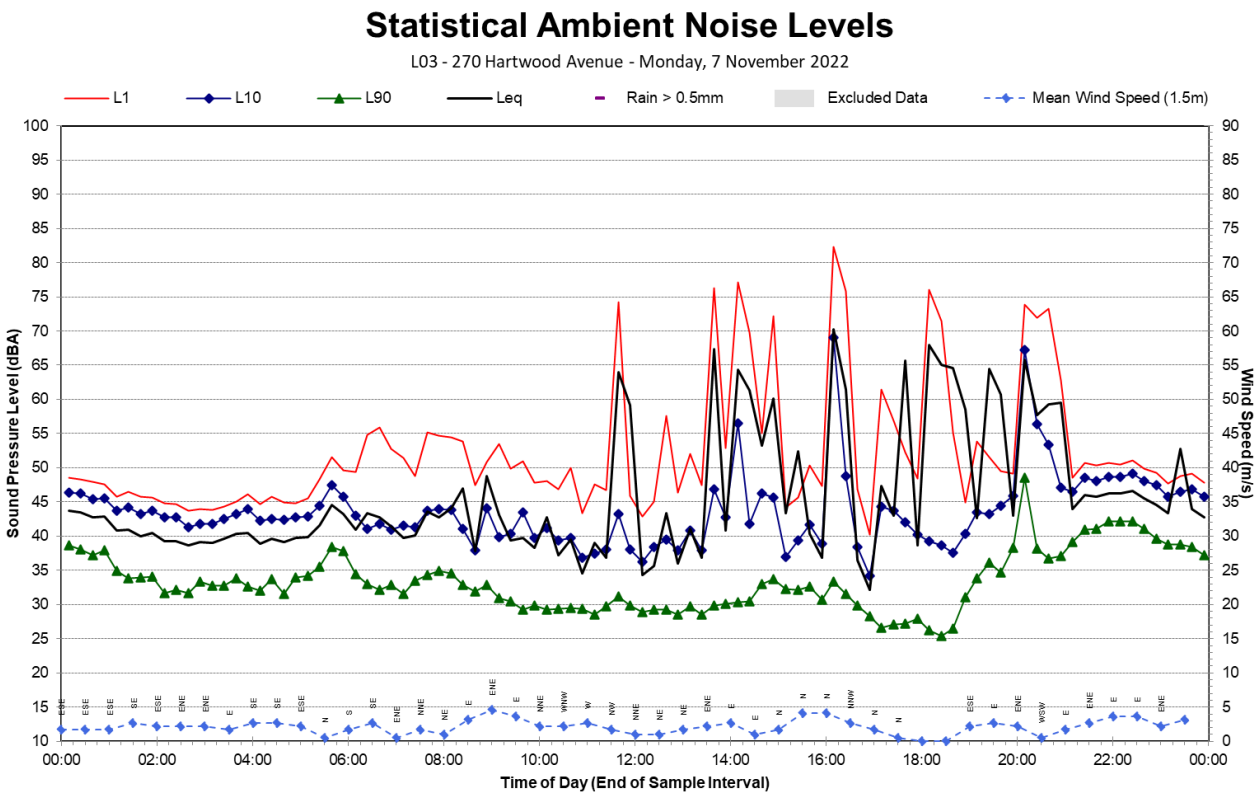
L03 - 270 Hartwood Avenue - Sunday, 6 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
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L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
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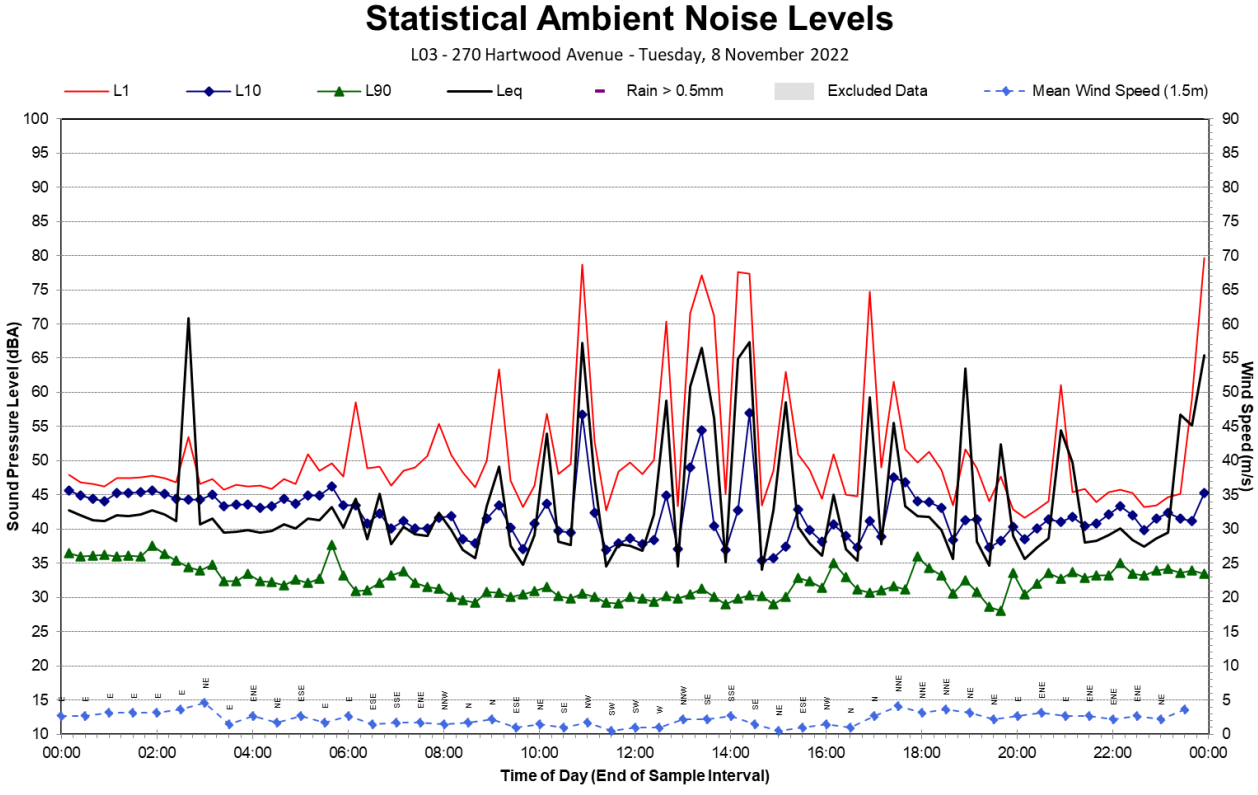
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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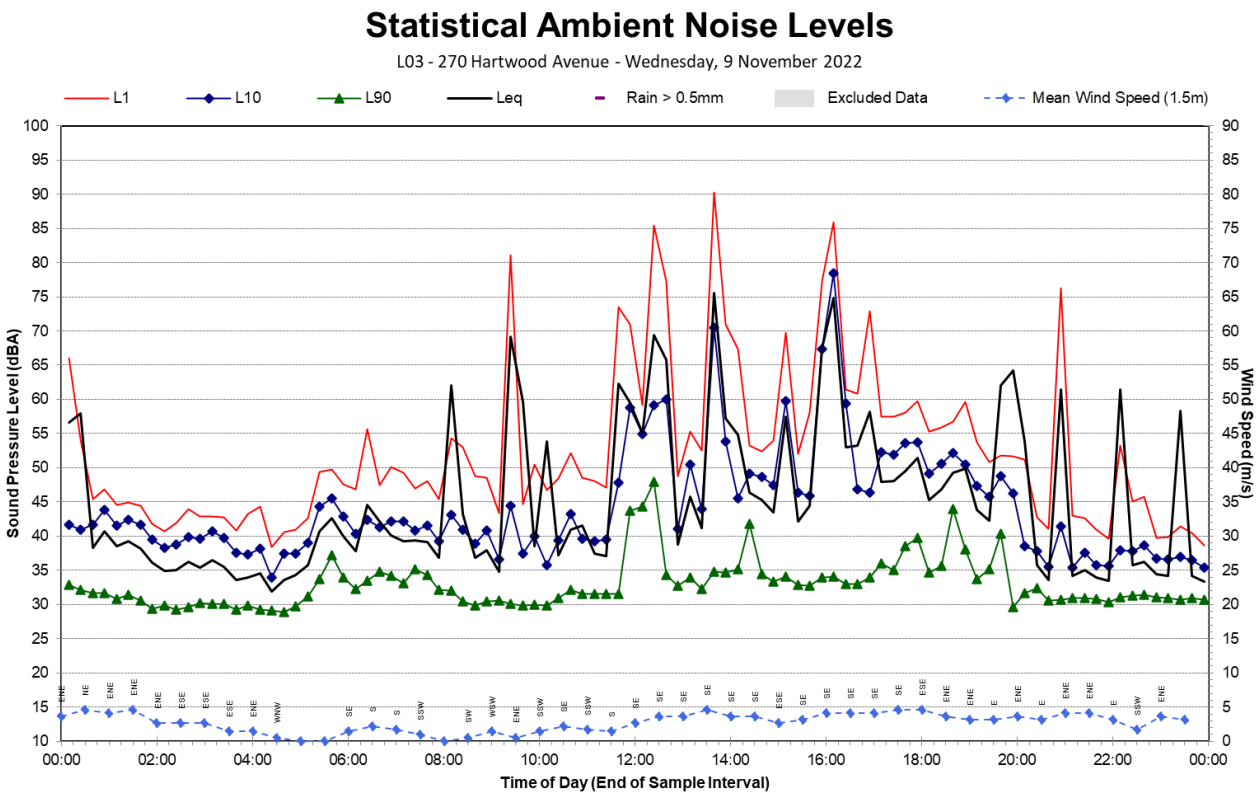
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Wednesday, 9 November 2022
L1
L10
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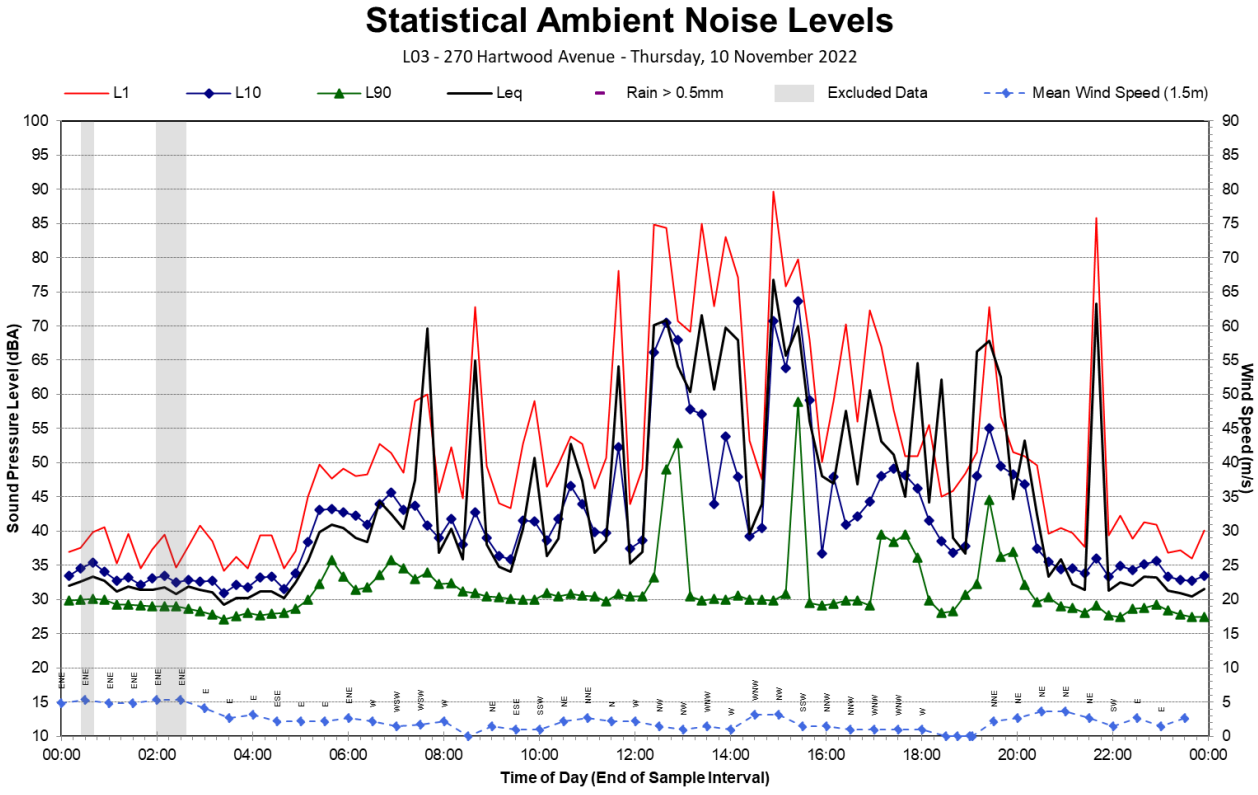
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
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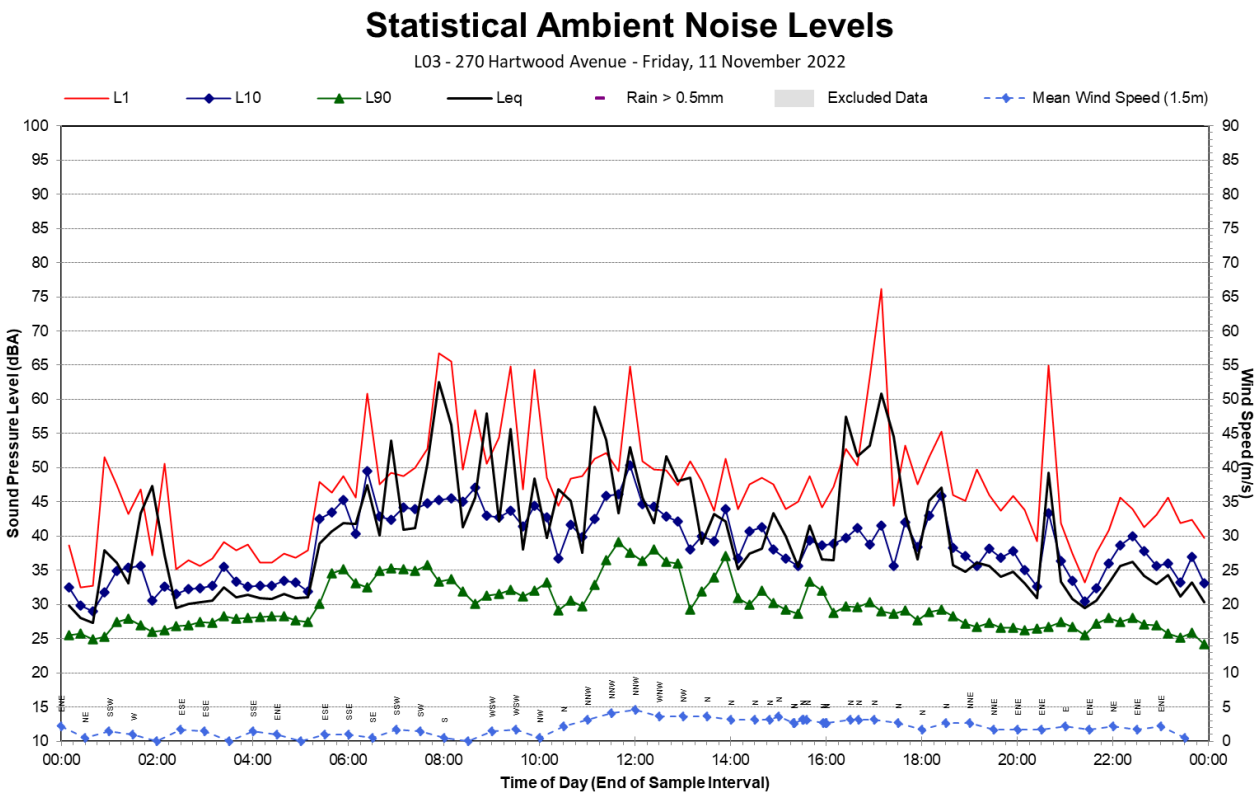
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Friday, 11 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
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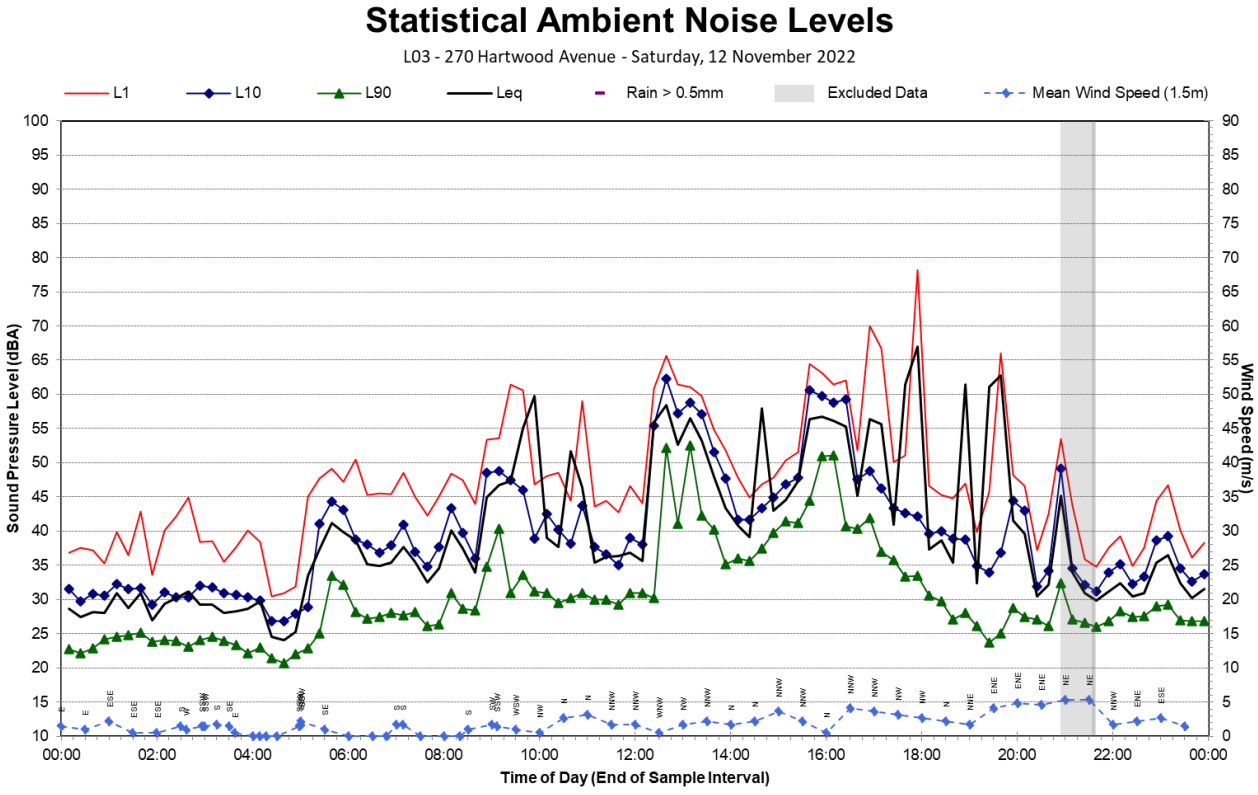
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Saturday, 12 November 2022
L1
L10
L90
Leq
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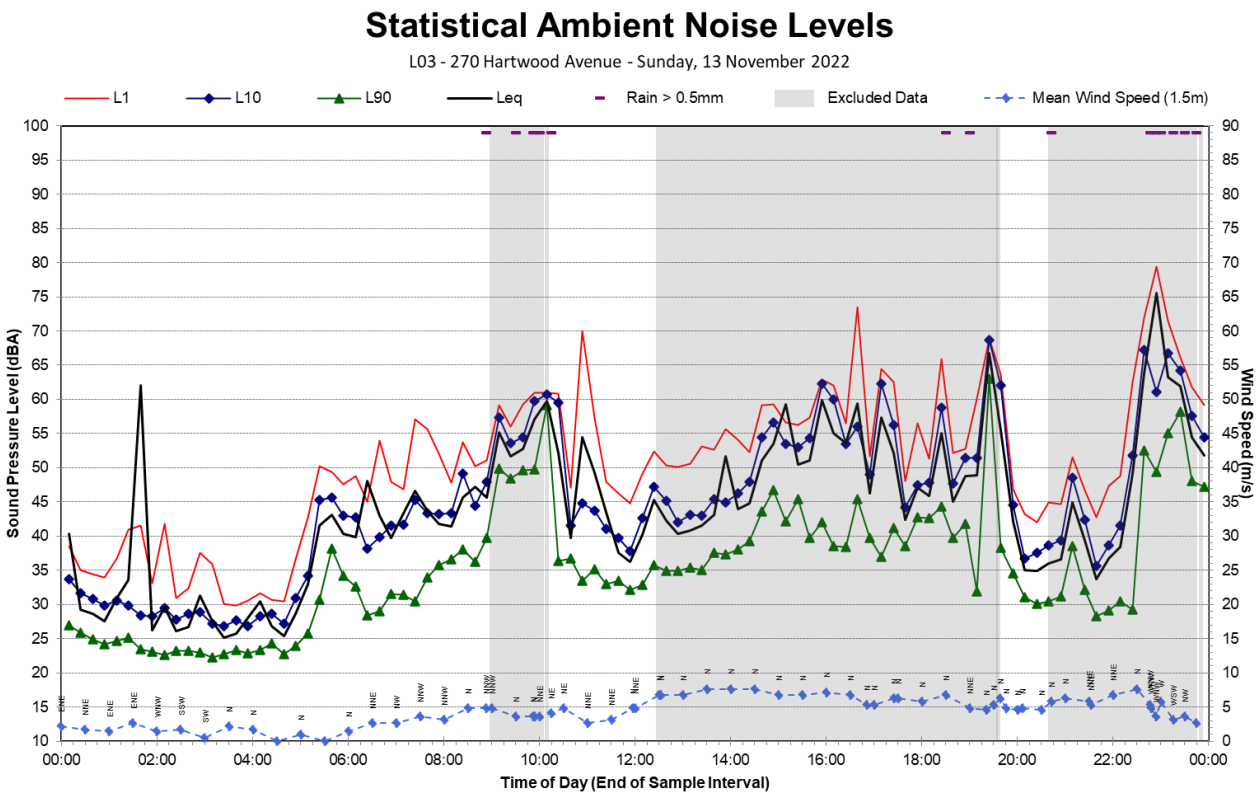
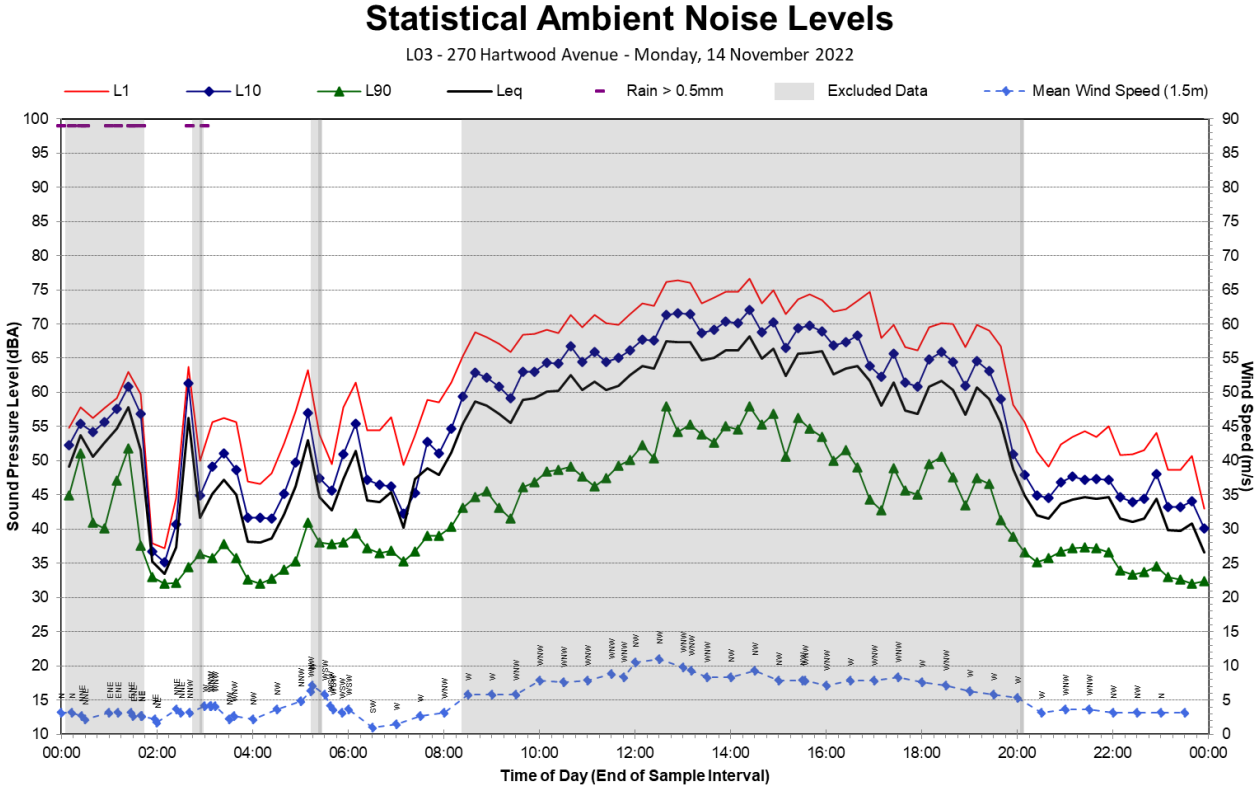
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Sunday, 13 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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L10
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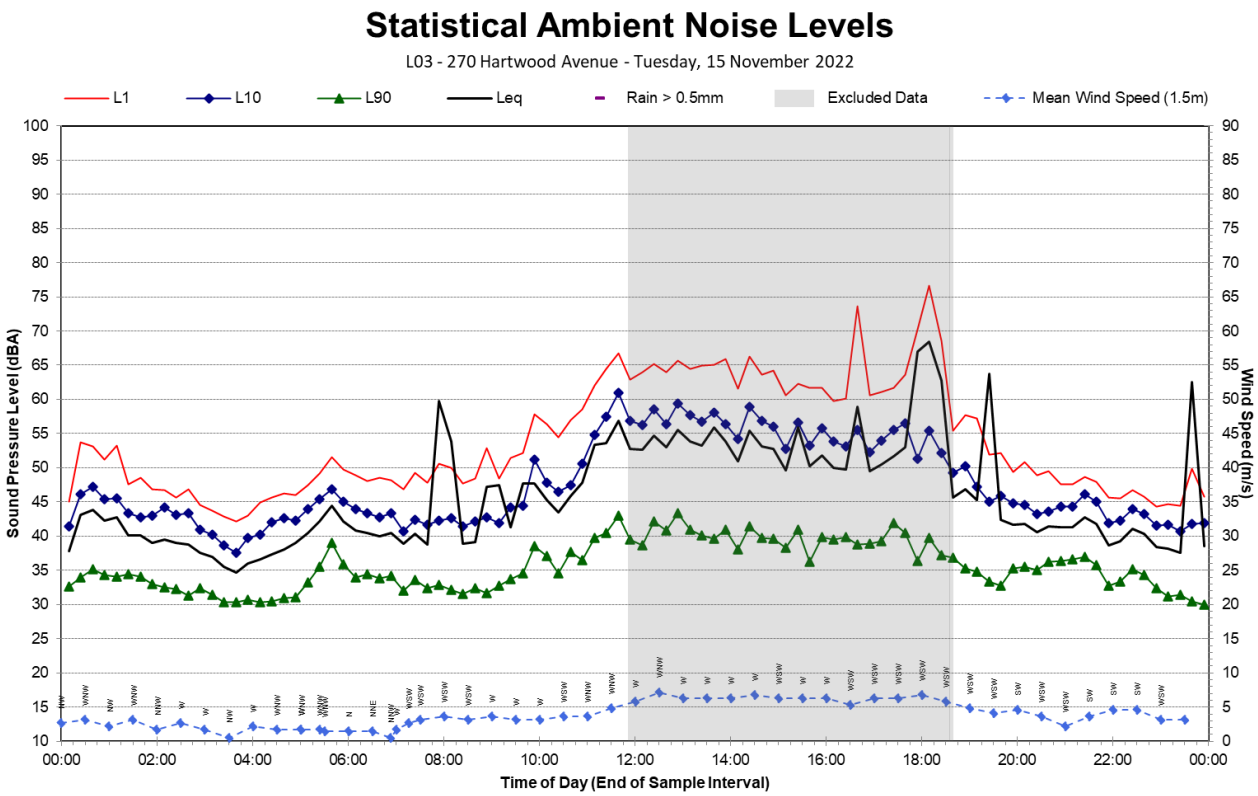
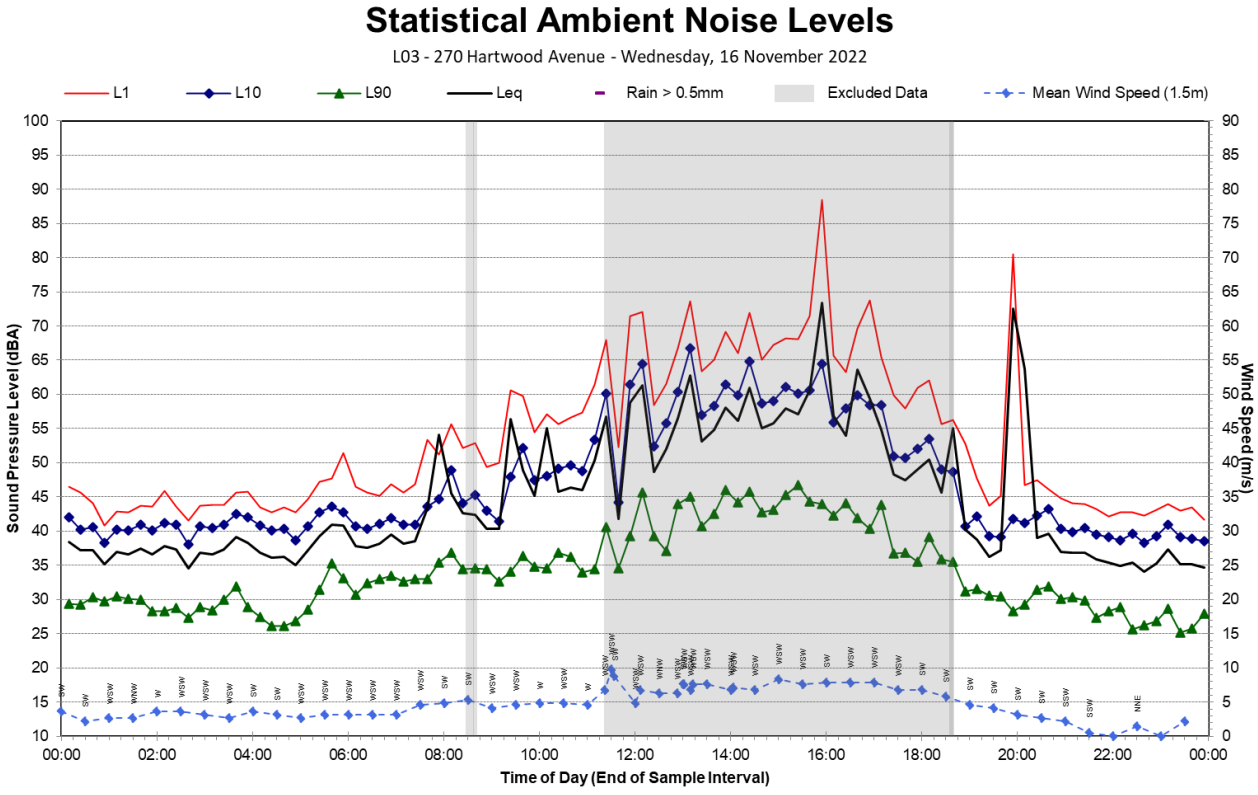
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Tuesday, 15 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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Excluded Data
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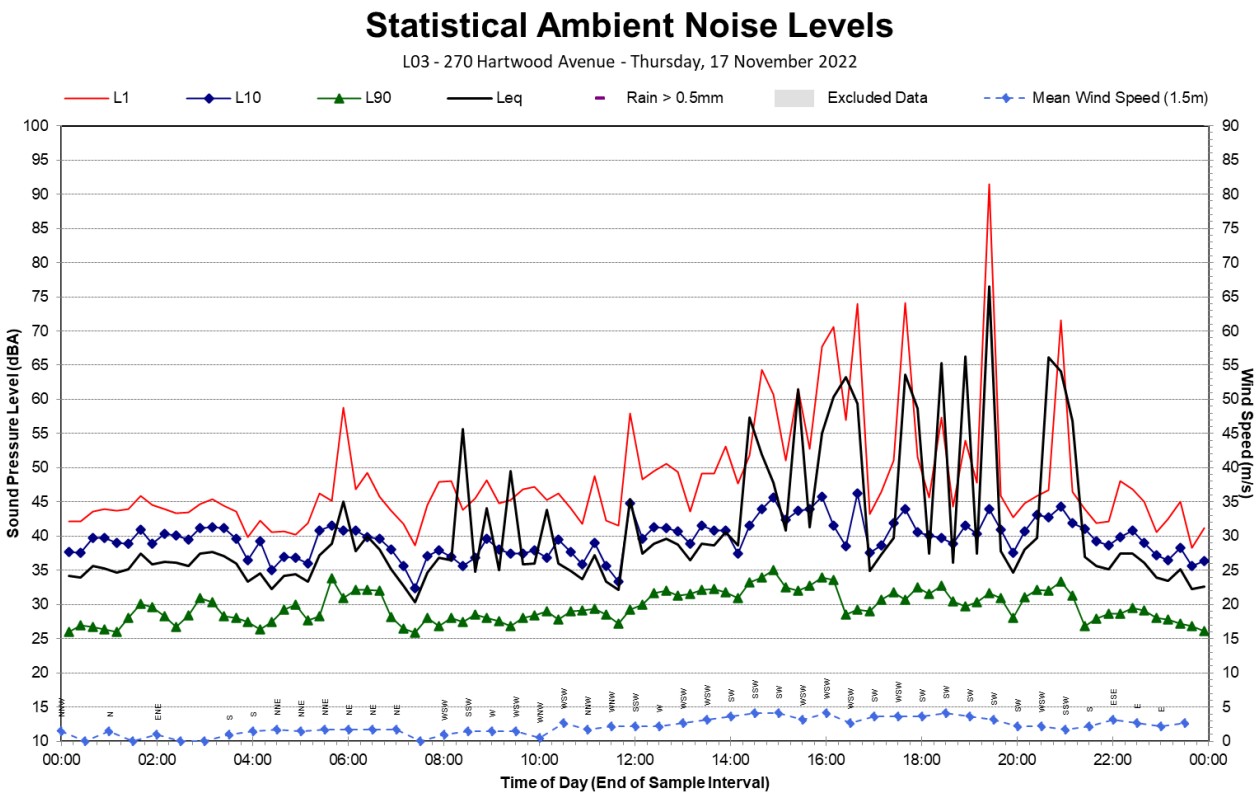
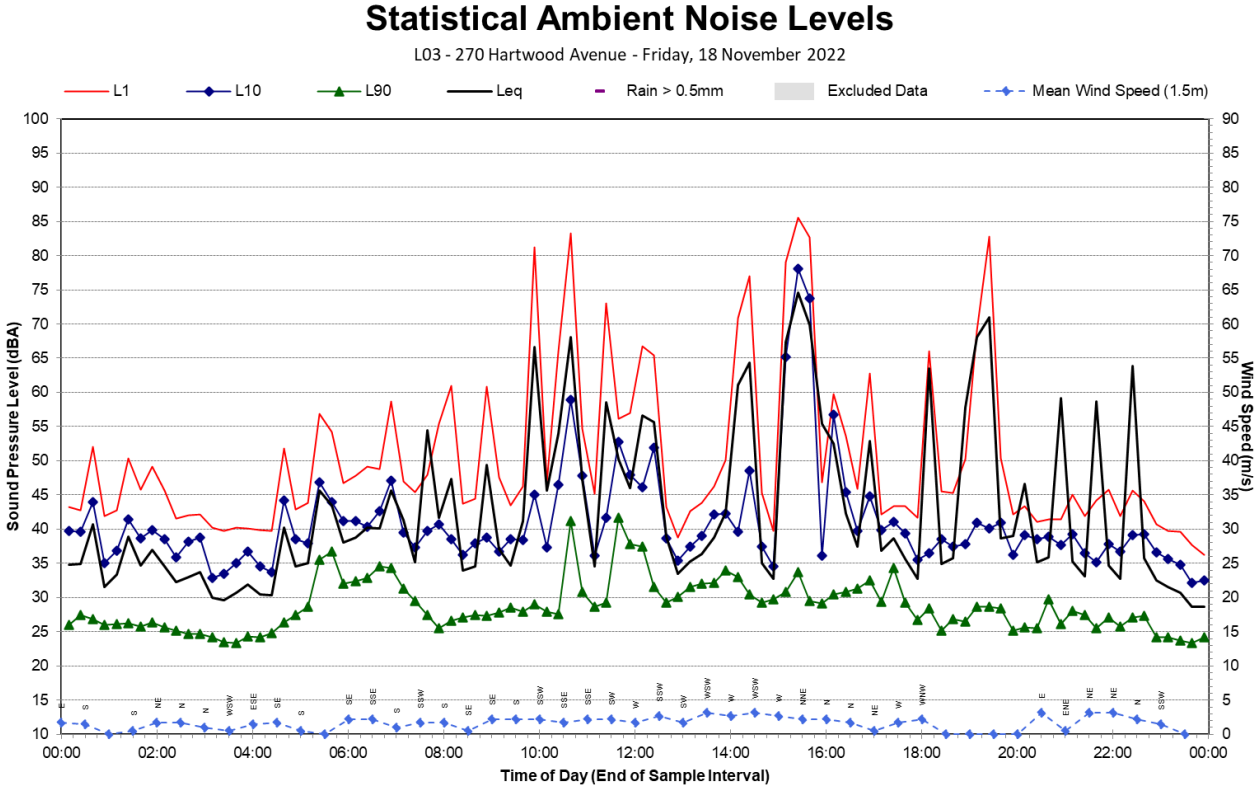
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Thursday, 17 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)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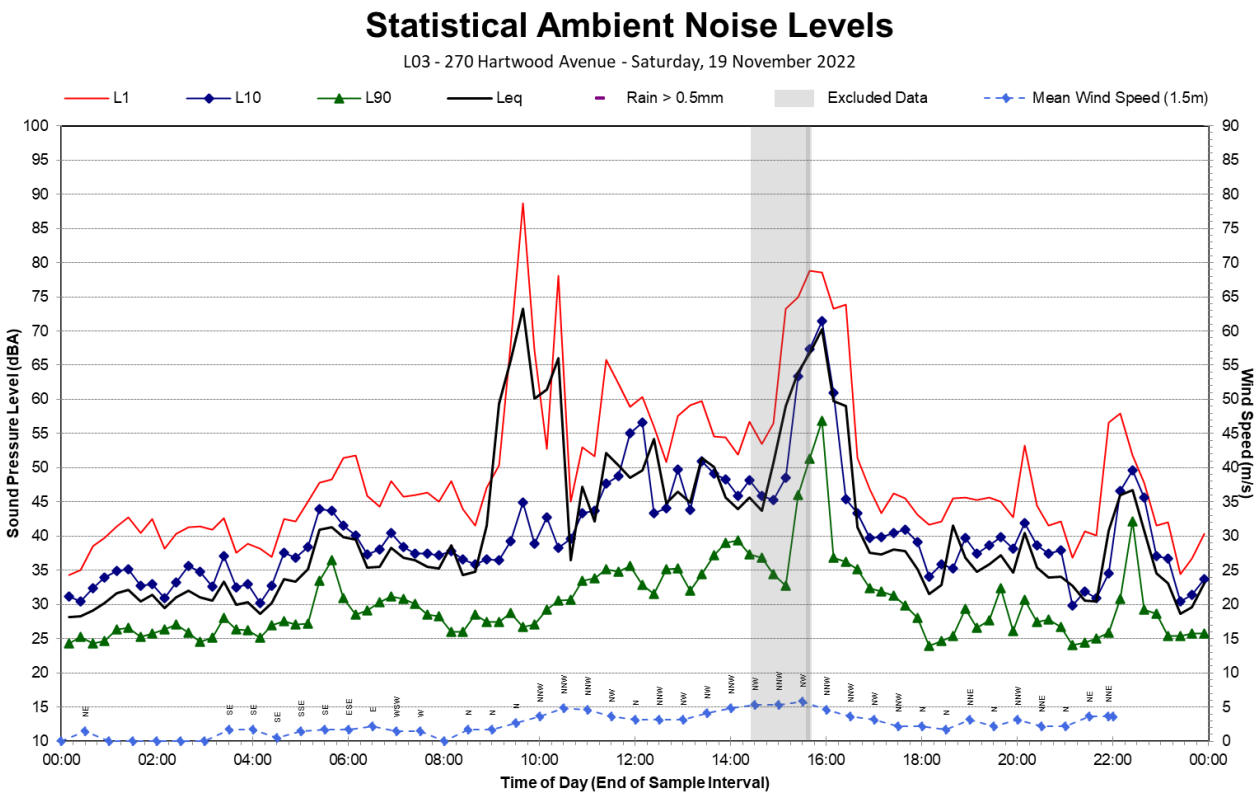
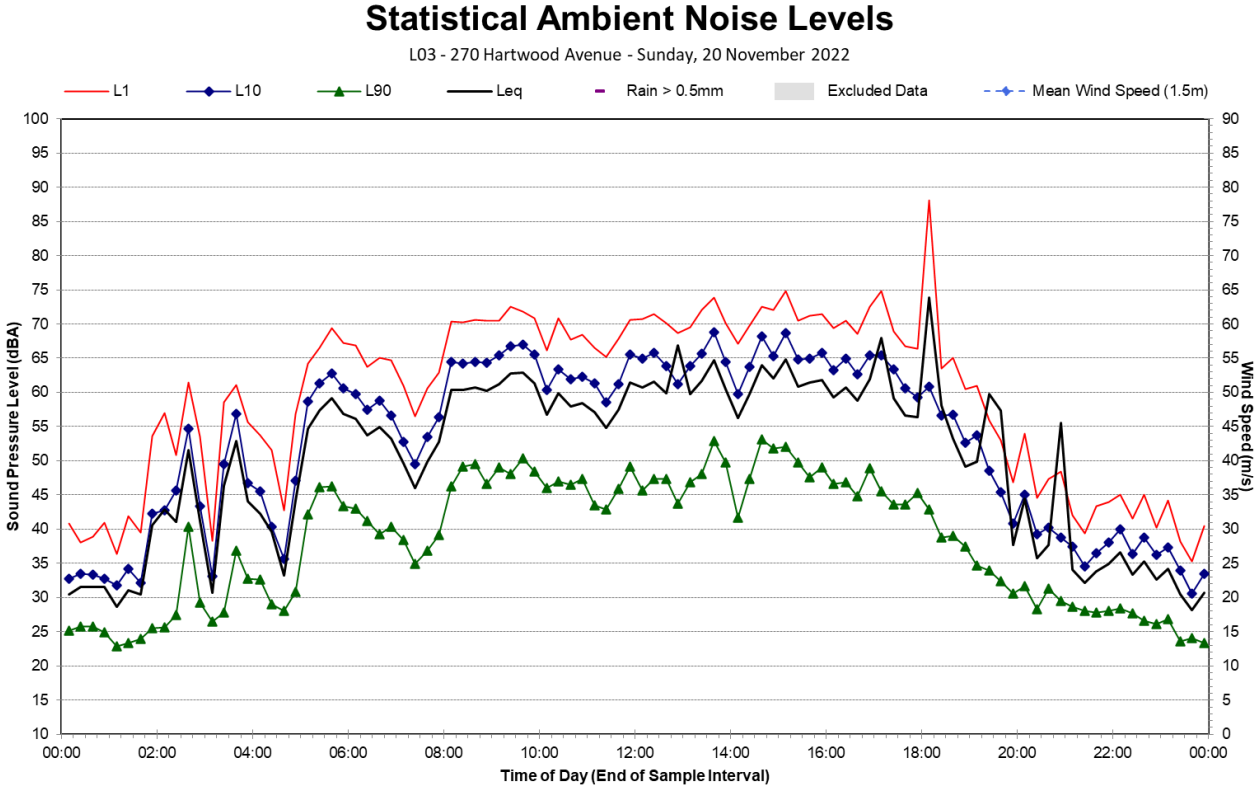
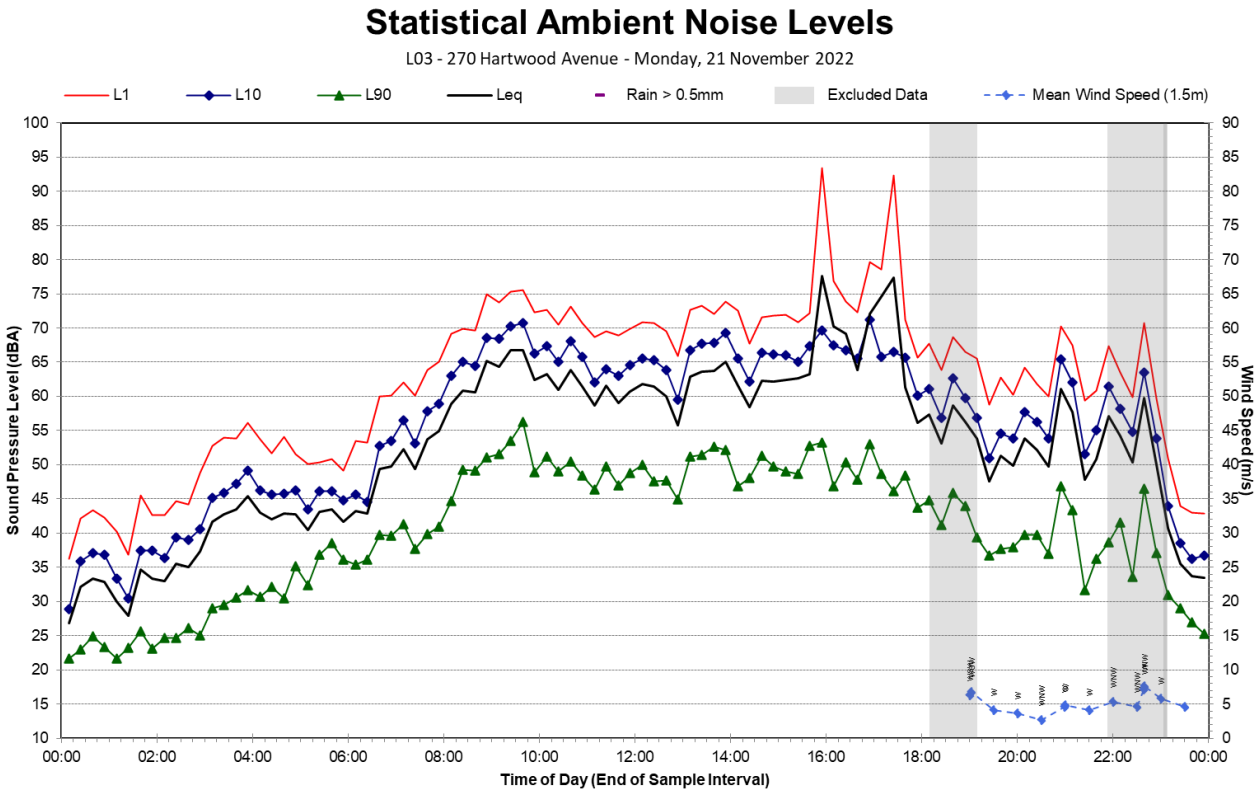
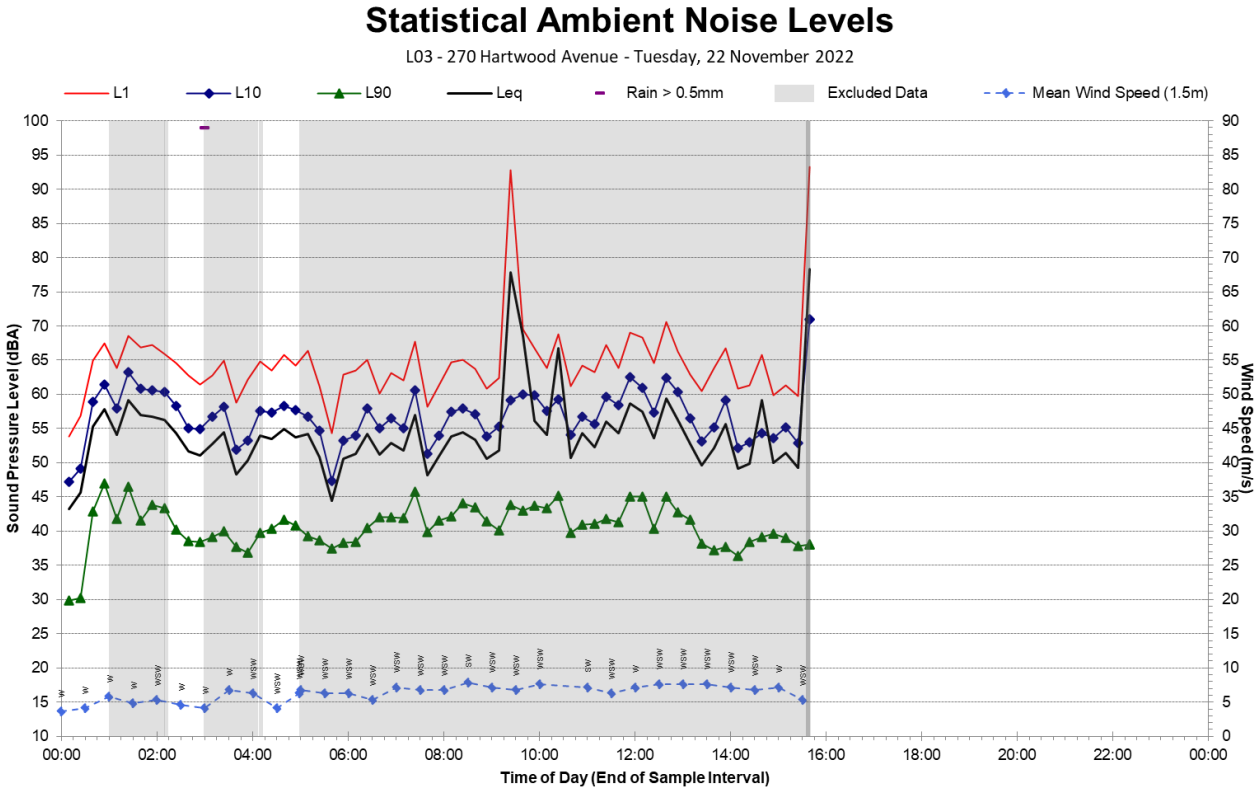
L03 - 270 Hartwood Avenue - Friday, 18 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Saturday, 19 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Sunday, 20 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Monday, 21 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L03 - 270 Hartwood Avenue - Tuesday, 22 November 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

APPENDIX D

Construction Vibration Assessment Criteria

Vibration - Building Structures Cosmetic Damage Risk

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of cosmetic damage such as surface cracks, and are set well below the levels that have potential to cause structural damage. British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2,* provides frequency-dependent vibration limits related to the cosmetic damage risk. Noting, cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

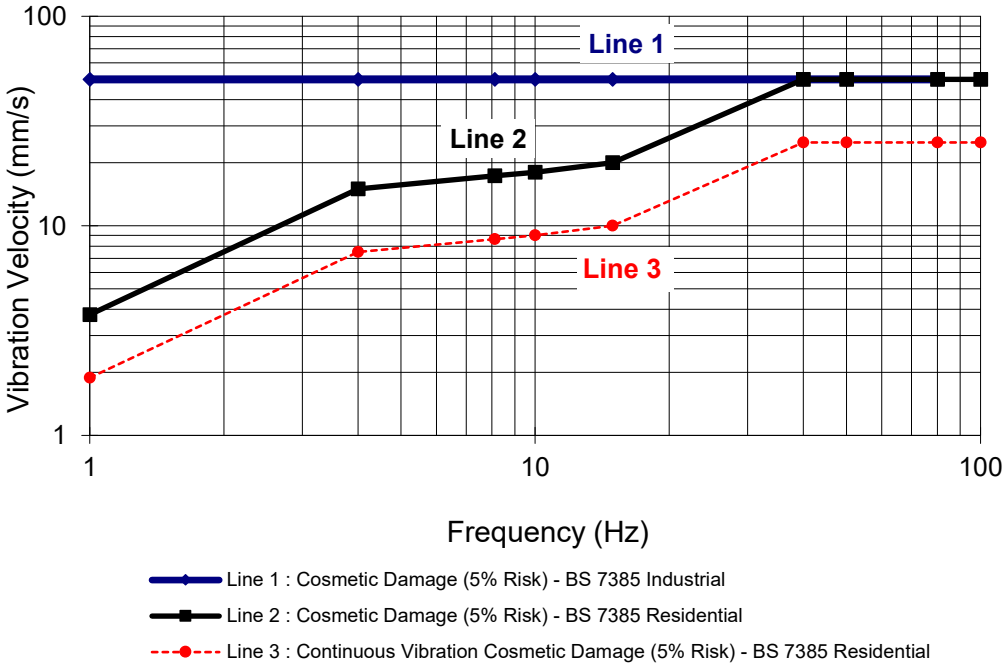
The BS 7385 Part 2-1993 sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect. Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table D1** and graphically in **Figure D1**.

Table D1 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

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 structures 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

Figure D1 Graph of Transient Vibration Guide Values for Cosmetic Damage



BS 7385 Part 2-1993 goes on to state that cosmetic damage is possible at vibration magnitudes which are greater than twice those given in **Table D1**, and damage to a building structure may occur at values greater than four times the tabulated values. It is also noteworthy that extra to the guide values nominated in **Table D1**, the BS 7385 Part 2-1993 states that:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

Also that:

> *"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."*

BS 7385 Part 2-1993 states that the guide values in **Table D1** relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where the dynamic loading caused by continuous vibration (ie rock breaking or sheet piling) may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in **Table D1** may need to be reduced by up to 50%.

For construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- Unreinforced or light framed structures: **7.5 mm/s**.
- Reinforced or framed structures: **25.0 mm/s**

Vibration - Buried Pipework

The German Standard DIN 4150-3:1999 "*Structural Vibration Part 3: Effects of vibration in structures*" provides guideline values for evaluating the effect of vibration on buried pipework. The values are based on the assumption that pipes have been manufactured and laid using current technology. Additional considerations may be required at junctions. The recommended limits for short term vibration to ensure minimal risk of damage are presented numerically in **Table D2**.

Table D2 Guideline Values for Vibration - Effects of Short Term Vibration on Buried Pipework

Pipe Material	Vibration Measured on the Pipe[1] (ppv mm/s)
Steel (including welded pipes)	100
Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
Masonry, plastic	50

Note 1: Mounting equipment directly onto pipes may not be possible. If the vibration source is not immediately next to the pipework, measurements can be made on the ground surface to obtain an estimate. Generally, this vibration level will be greater than the level measured directly on the pipework.

Vibration - Human Comfort

EPA's "*Assessing Vibration: A Technical Guideline*" (DEC 2006) is based on the information set out in British Standard 6472-1992 "*Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*". This standard defines levels of building vibration associated with a "low probability of adverse comment" from occupants. The applicable levels for continuous daytime activities are shown in **Table D3**.

Table D3 Vibration Levels with "Low Probability of Adverse Comment" (1 Hz to 80 Hz)

Building Type	Peak Floor Vibration	Peak Floor Vibration (Z Vertical)
Residential	0.8 mm/s to 1.6 mm/s	0.3 mm/s to 0.6 mm/s
Commercial/Offices	1.6 mm/s	0.6 mm/s
Industrial/Workshops	3.2 mm/s	1.2 mm/s

APPENDIX E

Construction Scenarios and Equipment Sound Power Levels

Table C1 CONSTRUCTION NOISE MODELLING SCENARIOS

Construction Component	Construction Period	Equipment Involved at the Work Site	
		Equipment Type	Number of Items
Project	**TBA**		
Site Establishment	Daytime	Bobcat/Skid Steer	1
		15t excavator	1
		12-15t Trucks	1
		Hand tools Enabling	1
		Mobile Crane 80-100 tonne	1
		Grass Slasher/Lawn Mower	1
		Generator 100KVA	1
Enabling	Daytime	30t excavator	1
		Grader	1
		Water cart	1
		Vibrating Smooth Drum Roller	1
		12-15t Trucks	1
		Hand tools Enabling	2
		Telehandler	1
		Generator 100KVA	1
Construction	Daytime	Concrete Trucks / Agitator	1
		12-15t Trucks	2
		Roller (for Asphalt)	1
		Pad foot	1
		Hand tools	2
		Grader 14H	1
		Water Truck	1
		Generator 100KVA	1
		Telehandler	1
		Excavator 30 tonne	1
		Skidsteer	1
		Hydrovac	1
		Flatbed Truck	1
		Mobile Crane 80 tonne	1

Notes 1. The equipment numbers represent the maximum operational in a typical 15 minute period.

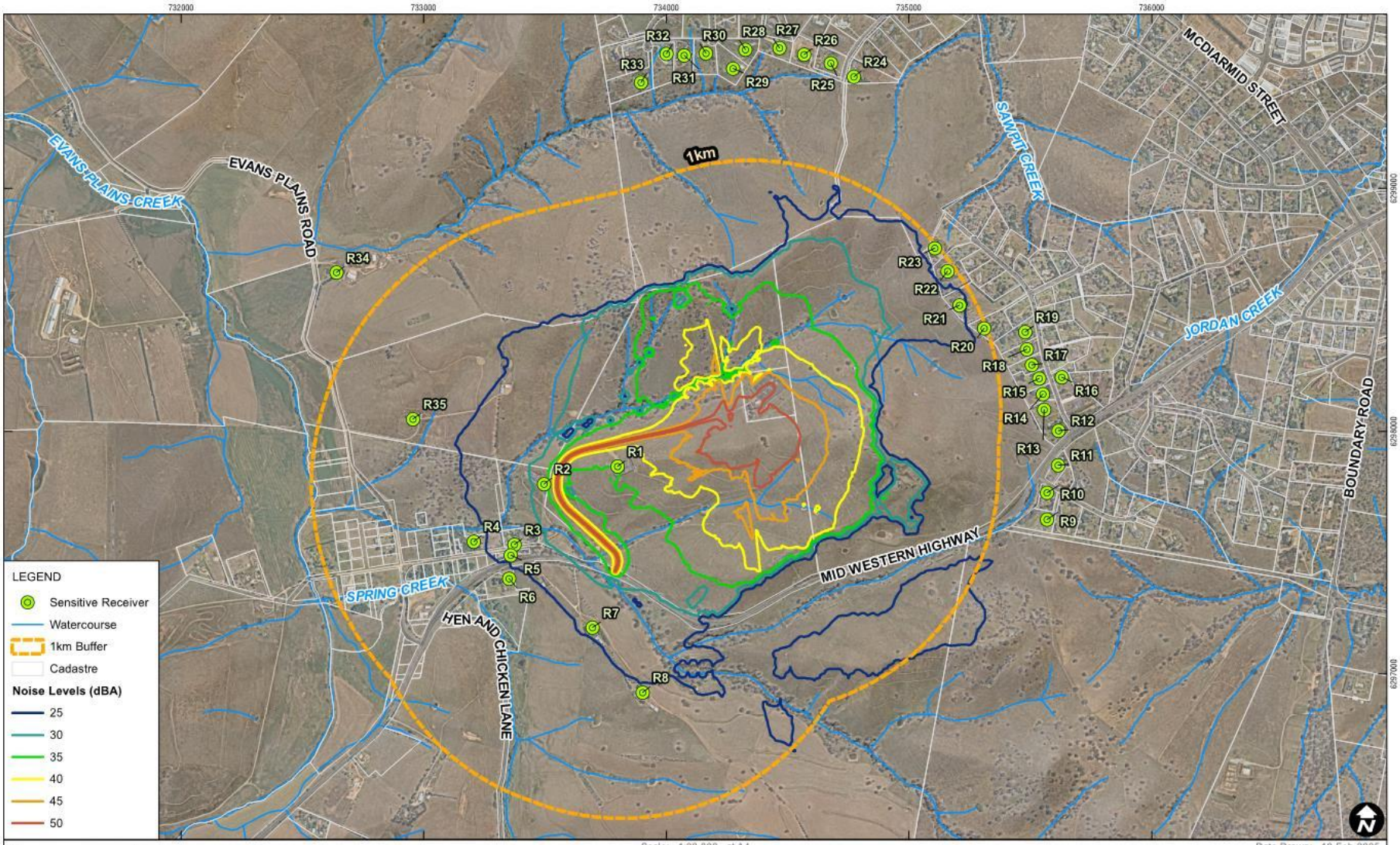
Table C2 EQUIPMENT SOUND POWER LEVELS

Facility Construction Equipment	Overall SWL $L_{Aeq(15minute)}$ (dBA re 1ρW)
Excavator (30 tonne)	110
10 to 15t Trucks	108
Concrete Truck / Agitator	109
Mobile Crane (100 tonne)	104
Generator	103
Vibratory Roller	109 *
Grader 14G	108
Bobcat	104
Forklift	101
Hand tools	94
Elevated Work Platform	97

Notes The overall SWLs are based on SLRs database and the NSW Roads and Maritime Construction Noise and Vibration Guideline.
A 5 dB penalty was added to the overall SWL in accordance with the ICNG.

APPENDIX F

Noise Contours – Daytime Operations + Wind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735000
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6298000
6297000
R32
R30
R28
R27
R26
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R31
R29
R25
R34
R23
R22
R21
R20
R19
R18
R17
R16
R15
R14
R12
R13
R11
R10
R9
R35
R1
R2
R4
R3
R5
R6
R7
R8
1km
EVANS PLAINS CREEK
EVANS PLAINS ROAD
SAWPIT CREEK
MCDIARMID STREET
JORDAN CREEK
BOUNDARY ROAD
MID WESTERN HIGHWAY
SPRING CREEK
HEN AND CHICKEN LANE
LEGEND
Sensitive Receiver
Watercourse
1km Buffer
Cadastre
Noise Levels (dBA)
25
30
35
40
45
50
0
0.5
1
km
Scale: 1:20,000 at A4
Coordinate System: GDA 1994 MGA Zone 55
Date Drawn: 19-Feb-2025
Project Number: 660.30234.00006
Data Source: Basedata NSW SS, December 2021
Aerial imagery supplied by Nearmap (May, 2023)
Elevation data supplied by DCS Spatial Services (July, 2019)
SLR
LAeq Noise Contours
Daytime + Wind
APPENDIX F
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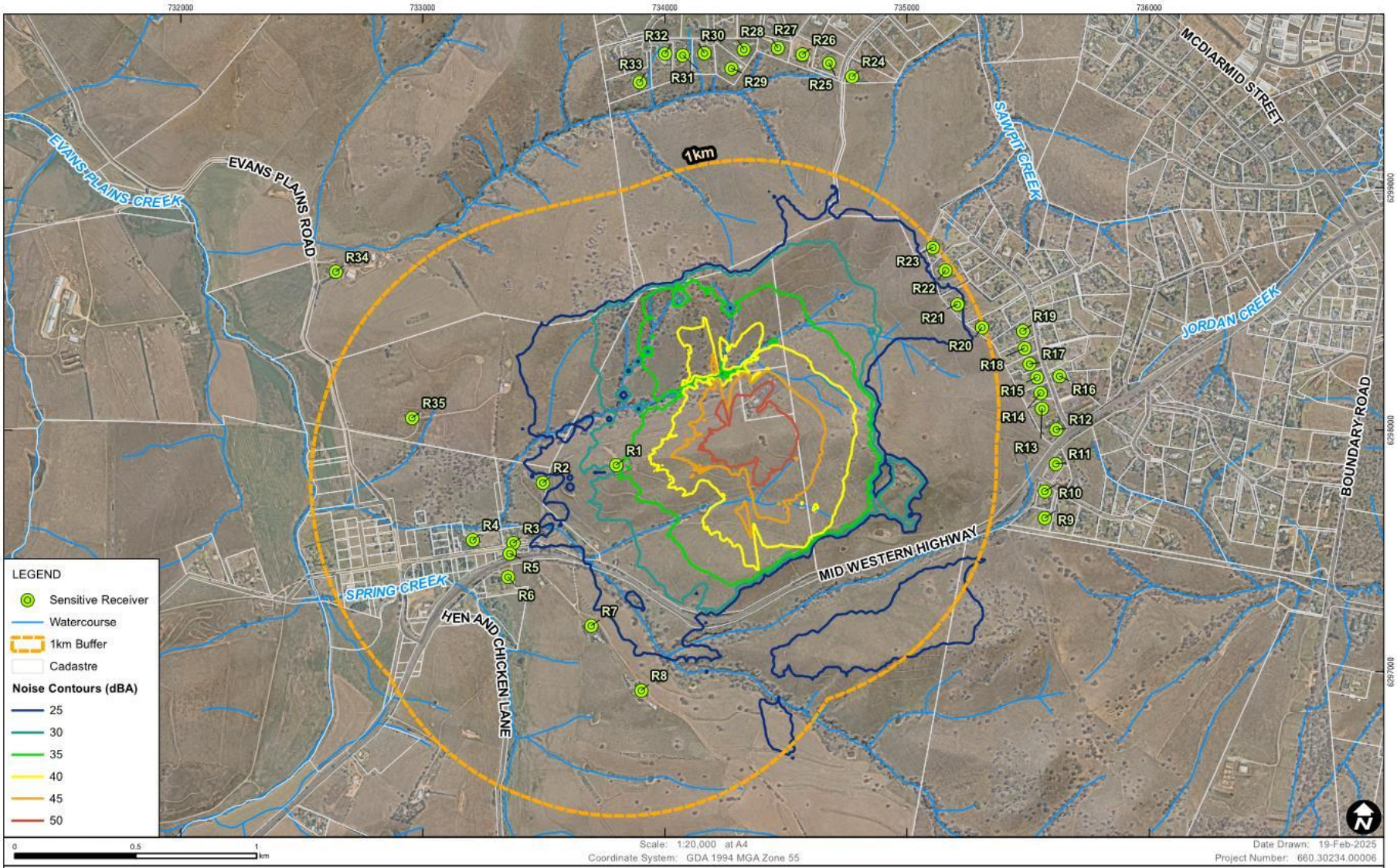
APPENDIX G

Noise Contours – Night-time Operations Category F + Wind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733000
734000
735000
736000
6299000
6298000
6297000
EVANS PLAINS CREEK
EVANS PLAINS ROAD
SAW PIT CREEK
MCDIARMID STREET
JORDAN CREEK
BOUNDARY ROAD
MID WESTERN HIGHWAY
SPRING CREEK
HEN AND CHICKEN LANE
1km
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
LEGEND
Sensitive Receiver
Watercourse
1km Buffer
Cadastre
Noise Contours (dBA)
25
30
35
40
45
50
0
0.5
1
km
Scale: 1:20,000 at A4
Coordinate System: GDA 1994 MGA Zone 55
Date Drawn: 19-Feb-2025
Project Number: 660.30234.00006
Data Source: Basedata NSW SS, December 2021
Aerial imagery supplied by Nearmap (May, 2023)
Elevation data supplied by DCS Spatial Services (July, 2019)
SLR
LAeq Noise Contours
Nighttime Category F + Wind
APPENDIX G
\\au.slr.local\Corporate\Projects-SLR\660-SrvWOL\660-WOL\660.30234.00000 Bathurst BESS SSD Approvals\06 SLR Data\01 CADGIS\GIS\SLR66030234_NV_AppG_LAeqNoiseContours_Night_CatF_Wind.mxd

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