245 GREAT WESTERN HIGHWAY, SOUTH WENTWORTHVILLE

Noise Impact Assessment

Prepared for:

Mecone
Level 2, 3 Horwood Place
Parramatta NSW 2150

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BASIS OF REPORT

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Mecone, on behalf of NRB Group Pty Ltd, to undertake a noise impact assessment for the proposed 5-storey hotel at 245 Great Western Highway, South Wentworthville. This assessment has been prepared to accompany the proposed rezoning application for the development.

This report predominantly addresses the following noise impacts for assessment:

- Development noise intrusion – impacts of external road traffic noise levels on the internal noise goals of the proposed development, with example façade constructions provided to demonstrate viability.
- Development operational noise emissions – impacts of noise levels from proposed development plant equipment on neighbouring receivers, with strategies provided to establish relevant criteria.

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

2 Proposal Overview

The proposed development includes a 5-storey hotel, consisting of 70-80 rooms and associated facilities, rooftop dining and a restaurant.

A summary of the outcomes, envisioned by the concept design of the planning proposal, is presented below:

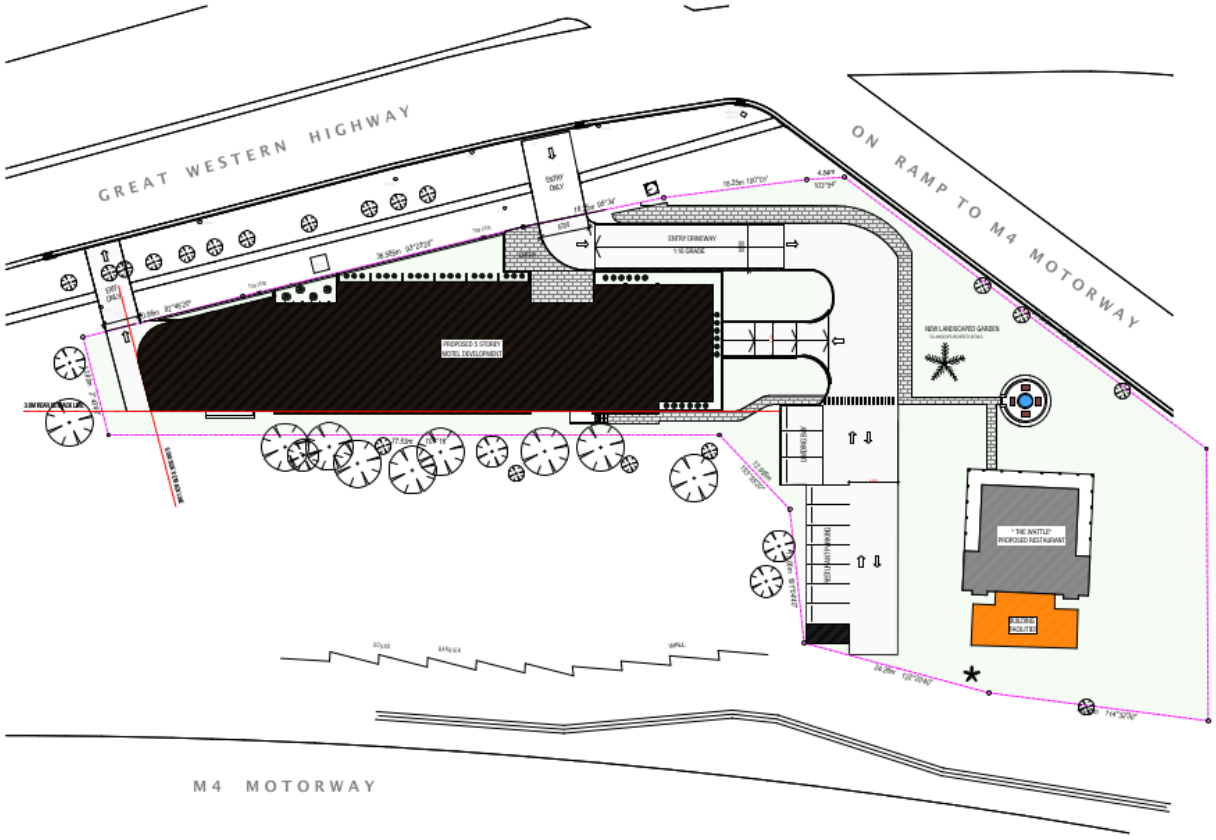
- 5-storey hotel with rooftop dining.
- Approximately 70-80 hotel rooms and hotel facilities.
- Restoration of The Wattles house for adaptive re-use as a restaurant.
- Single level restaurant facilities building linked to the rear of The Wattles.
- Reinstated heritage gardens around The Wattles and landscaping of the site.
- Basement and at-grade parking and loading.
- Potential for approximately 40 jobs in the hotel and restaurant.
- 45% of the site maintained for deep soil planting.
- Separation of over 40m between the hotel building and The Wattles building.

The site exhibits island-like qualities, being surrounded by road infrastructure on all sides. The Great Western Highway occupies north of the site and the M4 Motorway encompasses the south, west and on-ramp to the east.

The locations of the site, surrounding receivers and unattended noise monitoring equipment are shown in **Figure 1** and the concept layout plan is shown in **Figure 2.**

Figure 1 Site Location, Surrounding Receivers and Noise Monitoring Locations

Figure 2 Concept Layout Plan



2.1 Nearest Receivers

The nearest sensitive receivers are residential properties located to the north and south of the site. The nearest commercial receiver is located to the north and north-east of the site. Westmead Christian Grammar School is located to the north of the site. The nearest receivers are shown in **Figure 1** and detailed in **Table 1**.

Table 1 Surrounding Sensitive Receivers

ID/NCA	Address	Type	Distance (m)	Direction
R01	260 Great Western Highway, Wentworthville	Residential	55	North
R02	258 Great Western Highway, Wentworthville	Commercial	55	North
R03	256 Great Western Highway, Wentworthville	Residential	47	North
R04	254 Great Western Highway, Wentworthville	Residential	47	North
R05	252 Great Western Highway, Wentworthville	Residential	46	North
R06	250 Great Western Highway, Wentworthville	Residential	52	North
R07	248 Great Western Highway, Wentworthville	Residential	52	North
R08	246 Great Western Highway, Wentworthville	Residential	52	North
R09	244 Great Western Highway, Wentworthville	Residential	54	North

ID/NCA	Address	Type	Distance (m)	Direction
R10	242 Great Western Highway, Wentworthville	Residential	59	North
R11	2-8 Bridge Road, Westmead	Educational	70	North
R12	1 Bridge Road, Westmead	Residential	118	North-East
R13	240 Great Western Highway, Westmead	Commercial	112	North-East
R14	235 Great Western Highway, South Wentworthville	Residential	54	East
R15	13 Hayes Avenue, South Wentworthville	Residential	94	South
R16	14-15 Hayes Avenue, South Wentworthville	Residential	76	South
R17	17 Hayes Avenue, South Wentworthville	Residential	78	South
R18	18-19 Hayes Avenue, South Wentworthville	Residential	74	South
R19	23 Hayes Avenue, South Wentworthville	Residential	64	South
R20	12 Hayes Avenue, South Wentworthville	Residential	87	South
R21	63 Frances Street, South Wentworthville	Residential	134	South-West

3 Existing Noise Environment

Unattended noise monitoring was completed at the site from 26 April to 9 May 2022. The measured noise levels have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts to the development and receivers.

The monitoring equipment was positioned to measure existing noise levels that would be representative of the noise levels at the façade of the proposed development, within constraints such as accessibility, security and landowner permission.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time. All equipment carried current National Association of Testing Authorities (NATA) or manufacturer calibration certificates and equipment calibration was confirmed before and after each measurement.

The measured data has been processed to exclude noise from extraneous events and periods affected by adverse weather conditions, such as strong wind or rain (measured at the BOM weather station at Sydney Olympic Park AWS (Archery Centre)) to establish representative existing noise levels at the site.

The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 2**. Details of the unattended monitoring together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 2 Summary of Unattended Noise Monitoring Results

Logger ID	Address	Measured Noise Levels (dBA)[1]					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	245 Great Western Highway, South Wentworthville (facing Great Western Highway)	62	61	53	68	67	64
L02	245 Great Western Highway, South Wentworthville (facing M4 Motorway)	74	71	59	78	76	74

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA *Noise Policy for Industry*.

Short-term attended noise measurements were also completed at each monitoring location. The attended measurements allow the contributions of the various noise sources at each location to be determined. Detailed observations from the attended measurements are provided in **Appendix C**.

The attended measurements were generally found to be consistent with the results of the unattended noise monitoring and show that existing noise levels are typically dominated by road traffic from the surrounding road network. The nearest major roads are Great Western Highway, which is located 11 m to the north of the site boundary, and M4 Motorway, which is located 9 m to the south of the site boundary.

4 Noise Assessment Criteria

4.1 Internal Noise Criteria

4.1.1 Internal Noise Levels as per AS/NZS2107:2016

The criteria for internal acoustic design is presented below in **Table 3.** It is dependent on the intended use of the room, concerning its steady state noise level. Sources influencing this noise level, such as air-conditioning systems and road traffic, are taken into consideration for the recommended sound range. Such recommendations are presented in terms of an averaged A-weighted sound pressure level (L_{Aeq}) and reverberation time (RT60, s), which are derived from AS 2107-2016 Acoustics – Recommended design sound levels and reverberation times for building interiors.

The third column in **Table 3** displays the requirements for reverberation times within occupied spaces. The reverberation time defines the time taken for sound to decay within a space and, thus, affects the degree of speech intelligibility. Typically, speech clarity improves with lower reverberation times.

Table 3 Internal design acoustic criteria from AS 2107:2016

Occupancy	Design sound range LAeq dBA	Design Reverberation Time , RT60, s
Hotels and Motels		
Sleeping Areas	35 to 40	-

Note 1: Reverberation time should be minimised for noise control.

4.1.2 NSW Department of Planning 'Development near Rail Corridors and Busy Roads – Interim Guideline'

Major roads and rail operations generate noise and vibration, with the potential to adversely affect people living and working near major transport corridors. The Guideline assists in the planning, design and assessment of development in, or adjacent to, rail corridors and busy roads.

In circumstances where a development is adjacent to a road that contains an annual average daily traffic (AADT) volume of between 20,000-40,000 vehicles (based on the traffic volume data published on the website of the RMS), the Guidelines provide best practice advice.

The AADT of the surrounding streets have been determined from the RTA 'Traffic volume maps for noise assessment for building on land adjacent to busy roads. Great Western Highway and M4 Motorway have been identified as roads containing traffic levels of more than 20,000 meaning an assessment, as per the requirements of the DoP 'Development near Rail Corridors and Busy Roads – Interim Guideline', is required.

Based on the above assessment, it is noted that the most relevant criteria for this project will be AS/NZS 2107:2016 for the development as summarised in **Table 4**.

Table 4 Project Specific Internal Noise Levels for Hotel Accommodation as per AS2107:2016

Location	Requirement, LA_{eq}
Sleeping Areas	35-40 dBA between 10pm – 7am

4.2 Operational Noise 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.

4.2.1 Industrial Noise Trigger 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.

Intrusive and amenity noise levels are not used directly as regulatory limits. They are used to assess the potential impact of noise, assess feasible and reasonable mitigation options, and subsequently determine achievable noise requirements.

The NPfI provides guidance on assigning residential receiver amenity noise categories based on the site-specific features shown in **Table 5.**

Table 5 Residential Receiver Amenity

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Rural	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime <40 dBA Evening <35 dBA Night <30 dBA	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime <45 dBA Evening <40 dBA Night <35dBA	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime >45 dBA Evening >40 dBA Night >35 dBA	**Urban** – an area with an acoustical environment that: • Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • Has through-traffic with characteristically heavy and continuous traffic flows during peak periods • Is near commercial districts or industrial districts • Has any combination of the above.

Amenity noise categories have been determined for the surrounding receivers with reference to the NPFI. The assessment is shown in **Table 6**. The areas are zoned as R3 and R2 – medium and low density residential, however, residences have been classified as urban due to high existing background noise levels that are dominated by through-traffic, with characteristically heavy and continuous traffic flows during peak periods.

Table 6 Residential Receiver Amenity Category Assessment

Logger ID	Area	Land Use Zoning	Existing Background Noise Levels RBL (dBA)		
			Day	Evening	Night
L01	North (R01 and R03 to R10)	R3 – medium density residential	62	61	53
L01	North-East (R12)	R3 – medium density residential	62	61	53
L02	East (R14)	R2 – low density residential	74	71	59
L02	South (R15 to R20)	R3 – medium density residential	74	71	59
L02	South-West (R21)	R3 – medium density residential	74	71	59

4.2.2 Project Noise Trigger Levels

The trigger levels for industrial noise from the development are summarised in **Table 7**. 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 7 Project Noise Trigger Levels

Receiver Location/ Type	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
			RBL[1]	L_{Aeq}	Intrusiveness	Amenity[2,3]
Residential (North and North-East of the development) – L01	Day	60	62	68	67	**58**
	Evening	50	61	67	66	**48**
	Night	45	53	64	58	**43**
Residential (East, South and South-West) – L02	Day	60	74	78	79	**58**
	Evening	50	71	76	76	**48**
	Night	45	59	74	64	**43**
Commercial (North and North-East of development) – L01	When in use	65	-	-	-	**63**

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 likely to be built in the area in the future.

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

4.3 Sleep Disturbance

Guidance for assessing the potential for sleep disturbance impacts on nearby residences is provided in Section 2.5 of the NPfI, which states:

> *Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
> - L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,
>
> *a detailed maximum noise level event assessment should be undertaken*

Note that the $L_{Aeq(15minute)}$ criteria would be equal to or higher than the Project Noise Trigger Levels outlined in **Table 7**. As such, the assessment against Project Noise Trigger Levels is considered to address this part.

The night-time sleep disturbance L_{Amax} screening noise levels for the residential areas in the vicinity of the development are presented in **Table 8**.

Table 8 Sleep Disturbance Screening Levels

Location	Noise Level (dBA)	
	Measured Prevailing Night-time Background Level	**Sleep Disturbance Screening Level[1]**
R01, R03 to R10, R12 (Logger 1)	53	68
R14 to R21 (Logger 2)	59	74

Note 1: The sleep disturbance screening level is 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater

Where the sleep disturbance screening noise level is predicted to be exceeded then a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should discuss the predicted level of the events, the exceedance of the screening level, existing maximum noise levels, and consider guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*.

4.4 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 9**, which are to be applied where annoying characteristics are present. The corrections are to be added to the noise level at the receiver before comparison with the Project Noise Trigger Levels.

Table 9 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. The NPfI further defines intermittent noise as noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB, for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.	5 dB[3]

Factor	Assessment/Measurement	When to Apply	Correction[1]
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.

4.5 Off-site Traffic on Surrounding Roads

The potential impacts from project related traffic on the surrounding public roads are assessed using the NSW *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 10**.

Table 10 RNP/NCG Criteria for Assessing Traffic on Surrounding 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)

5 Noise Intrusion Assessment

5.1 Road Traffic Noise Intrusion

5.1.1 Existing Noise Levels

Unattended monitoring conducted on site was used to determine the existing noise impacts from road traffic on the Great Western Highway and M4 Motorway, concerning the proposed development. Data collected from logger L01 (location shown in **Figure 1**) depicts the noise environment at the façade to the north of the proposed development, with logger L02 (location shown in **Figure 1**) depicting the noise environment at the façade to the south of the proposed development.

The monitoring data was processed to establish the road traffic noise levels at the site as 15-hour and 9 hour L_{Aeq} levels, as defined in the Road Noise Policy (RNP), as is common and appropriate for the assessment of road traffic noise. The results are presented in **Table 11**.

Table 11 Road Traffic Noise Levels

Logger Location	Daytime dBA $L_{Aeq(15hour)}$	Night-time dBA $L_{Aeq(9hour)}$
L01 – North façade, facing Great Western Highway	68	64
L02 – South façade, facing M4 Motorway	78	74

5.1.2 Adjusted Noise Levels

A comparison of the Great Western Highway daily eastbound and westbound traffic volumes (all vehicles), between the periods of April 2019 (pre-COVID) and April 2022 (logging period), was performed to assess significant changes in traffic volumes that would influence the existing measured noise levels. A period prior to the COVID pandemic was selected for comparison, as this would be indicative of the typical traffic volume.

Data published on the RMS Traffic Volume Viewer, displayed totals for all vehicle types: 15,668 eastbound and 18,709 westbound during April 2019, compared to 15,144 eastbound and 17,148 westbound during April 2022. As a result, the recorded differences are not substantial and, thus, would not require adjustment of the existing measured noise levels.

For the M4 Motorway, data was derived from the Transurban Toll Road, indicating the following totals for all vehicle types: 142,231 during March 2019 and 154,330 during March 2022. Thus, an increase in traffic volume post-COVID suggests that a compensatory increase to the existing noise levels is not required.

Logger L01 (location shown in **Figure 1**) was positioned approximately 3 m from the north façade of the proposed 5-storey hotel development and approximately 13 m from the Great Western Highway. Logger L02 (location shown in **Figure 1**) was positioned approximately 41 m from the south façade of the proposed 5-storey hotel development and approximately 17 m from the M4 Motorway.

A distance correction has been applied, producing adjusted road traffic noise levels at the exposed northern and southern façades of the proposed 5-story hotel development and are presented below in **Table 12**.

Table 12 Adjusted Road Traffic Noise Levels

Logger Location	Daytime dBA $L_{Aeq(15hour)}$	Night-time dBA $L_{Aeq(9hour)}$
L01 – North façade, facing Great Western Highway	67	63
L02 – South façade, facing M4 Motorway	73	69

The adjusted road traffic levels have been used to determine the likely façade performance required to achieve the internal noise goals for residential properties outlined in the SEPP.

A summary of the assessment and required noise reduction for external facades is provided in **Table 13**.

Table 13 Required Noise Reduction

Area of Occupancy	Noise Level $L_{Aeq(1hour)}$ (dBA)		
	Measured Existing	**Internal Criteria**	**Required Noise Reduction**
Bedroom (10pm-7am), North Facade	67	35	32
Any other Habitable Room, at any other time, North Facade	73	40	33
Bedroom (10pm-7am), South Facade	63	35	28
Any other Habitable Room, at any other time, South Facade	69	40	29

Note 1: The typical worst-case $L_{Aeq(1hour)}$ noise level measured during the daytime.

Australian Standard AS 3671:1989 *Acoustics – Road traffic noise intrusion – Building siting and construction* provides guidance regarding façade constructions where buildings are affected by road traffic noise. The building construction categories outlined in the standard are shown in **Table 14**.

Table 14 Building Facade Construction Categories – AS 3671:1989

Category Type	Definition	Approximate Traffic Noise Reduction (TNR)
Category 1	Standard construction, openings including open windows and doors may comprise up to 10% of the exposed facade.	Up to 10 dBA
Category 2	Standard construction, except for light-weight elements such as fibrous cement or metal cladding or all-glass facades. Windows, doors and other openings must be closed.	> 10 dBA ≤ 25 dBA
Category 3	Special construction using components with increased sound attenuation. Windows, doors and other openings must be closed.	> 25 dBA ≤ 35 dBA
Category 4	Specialist acoustic advice should be sought.	> 35 dBA

Based on the above, Category 3 façade construction (ie standard construction) is required for the façade to both the north and south of the proposed development to achieve suitable internal noise levels. This includes the requirement to keep windows closed.

6 Operational Noise Assessment

6.1 Mechanical Plant Emissions

The mechanical plant located on the roof terrace level, as can be seen in **Figure 1**, is likely to be a source of noise emissions that will need to be considered for the surrounding sensitive receivers shown in **Table 1**.

Mechanical services design and plant selection have not been undertaken at this stage.

The mechanical plant will require review to determine potential noise impacts prior to the issue of a construction certificate. Upon final selection, noise emissions from the plant to be installed, with the potential to operate continuously, should be compared with the project noise trigger levels. Where exceedances of these levels occur, feasible and reasonable noise mitigation measures shall be determined.

The following strategies are recommended where exceedances are predicted:

- Selection of quieter equipment
- Altering equipment location
- Acoustic louvres
- Acoustic attenuators
- Acoustic barriers

With the implementation of noise management measures, such as low noise plant selection, judicious location and engineering controls such as barriers and silencers, operational noise impacts from mechanical services are unlikely.

6.2 Other Potential Noise Emissions

Noise impacts from new commercial noise sources within the development would be assessed individually in the DA stage of the project. Other potential sources of noise emissions, such as patron noise and vehicle movements, will likely be dominated by the existing road traffic noise on the Great Western Highway and M4 Motorway.

Where noise impacts from the development are predicted to exceed the relevant noise criteria, feasible and reasonable operational noise mitigation and management measures should be considered, with the aim of reducing noise emissions to the relevant criteria.

The typical hierarchy for mitigation and management of industrial noise sources is as follows:

- Reducing noise emissions at the source (ie noise source control)
- Reducing noise in transmission to the receiver (ie noise path control)
- Reducing noise at the receiver (ie at-receiver control)

7 Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Mecone, on behalf of NRB Group Pty Ltd, to undertake a noise impact assessment of the proposed 5-storey hotel at 245 Great Western Highway, South Wentworthville. This assessment has been prepared to accompany the proposed rezoning application for the development.

A noise intrusion assessment was conducted to determine the impacts of existing road traffic noise on the proposed development. Noise from the Great Western Highway was assessed, due to its proximity to the north façade of the proposed development. The assessment found that a Category 3 construction would be required for both the north and south façade – that is, special construction with increased attenuation to achieve internal noise levels, as recommended in the SEPP.

An operational noise assessment was conducted to determine the potential noise emissions of the proposed development that would likely impact the surrounding sensitive receivers. It was deemed that the mechanical plant on the roof terrace could be a potential source of noise emissions requiring mitigation, with other potential noise emissions to be likely dominated by existing road traffic noise on the Great Western Highway and M4 Motorway. At this stage, further assessment is required, concerning the operational noise emissions of the proposed development, with such consideration to be given during the future DA stage of the proposal.

The study has shown that, from an acoustic perspective, the site would be suitable for the intended uses. Specific constructions and mitigation measures would require further investigation during the future DA stage of the proposal.

APPENDIX A

Acoustic Terminology

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

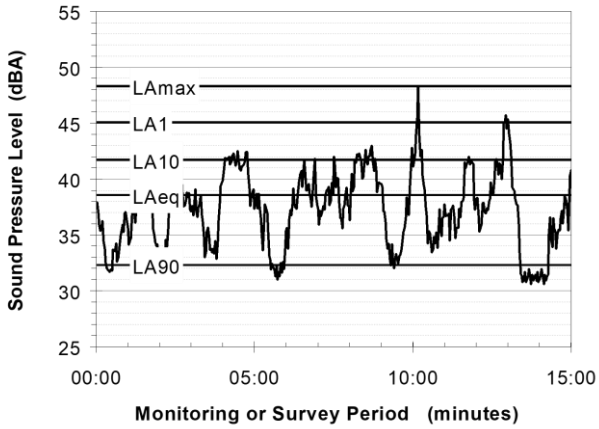
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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.

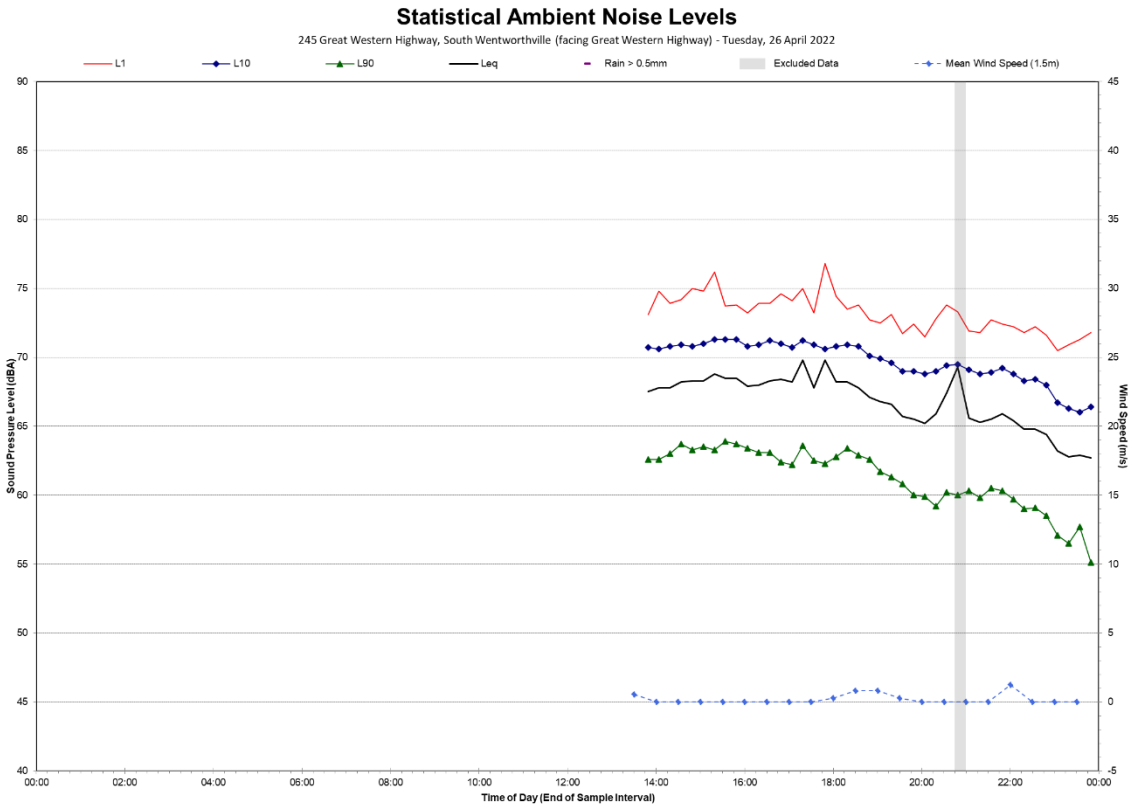
LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

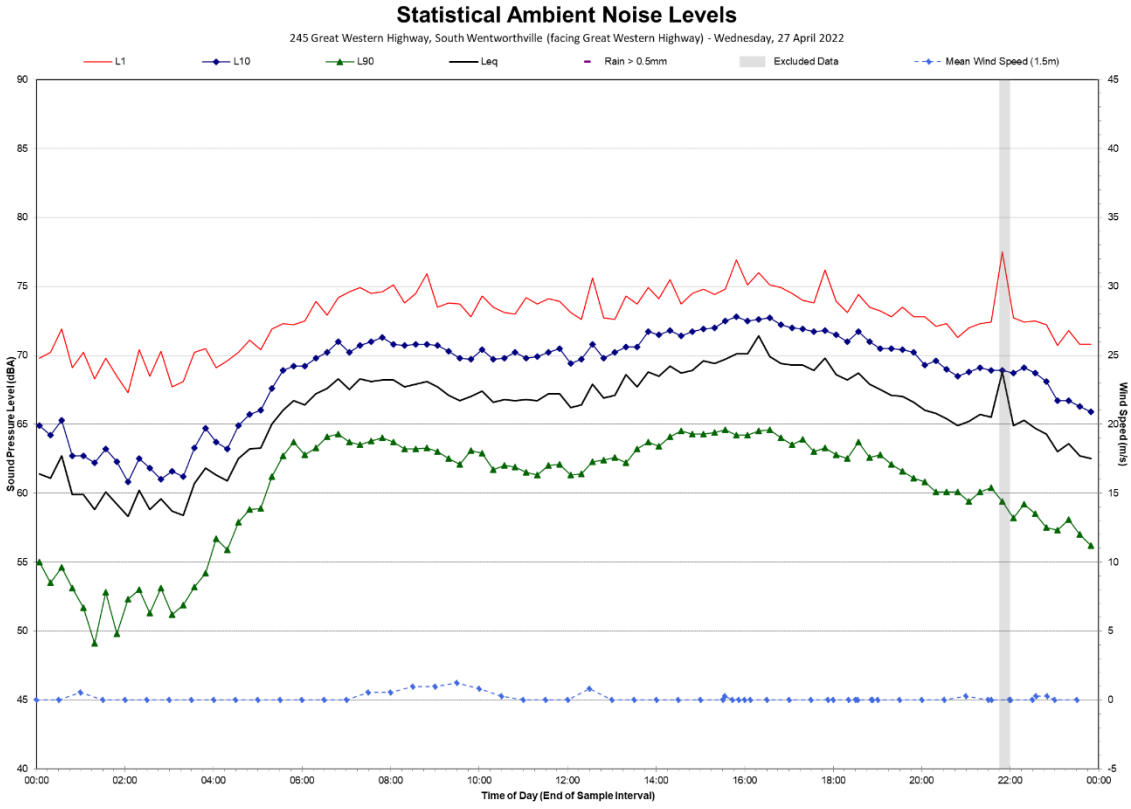
LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

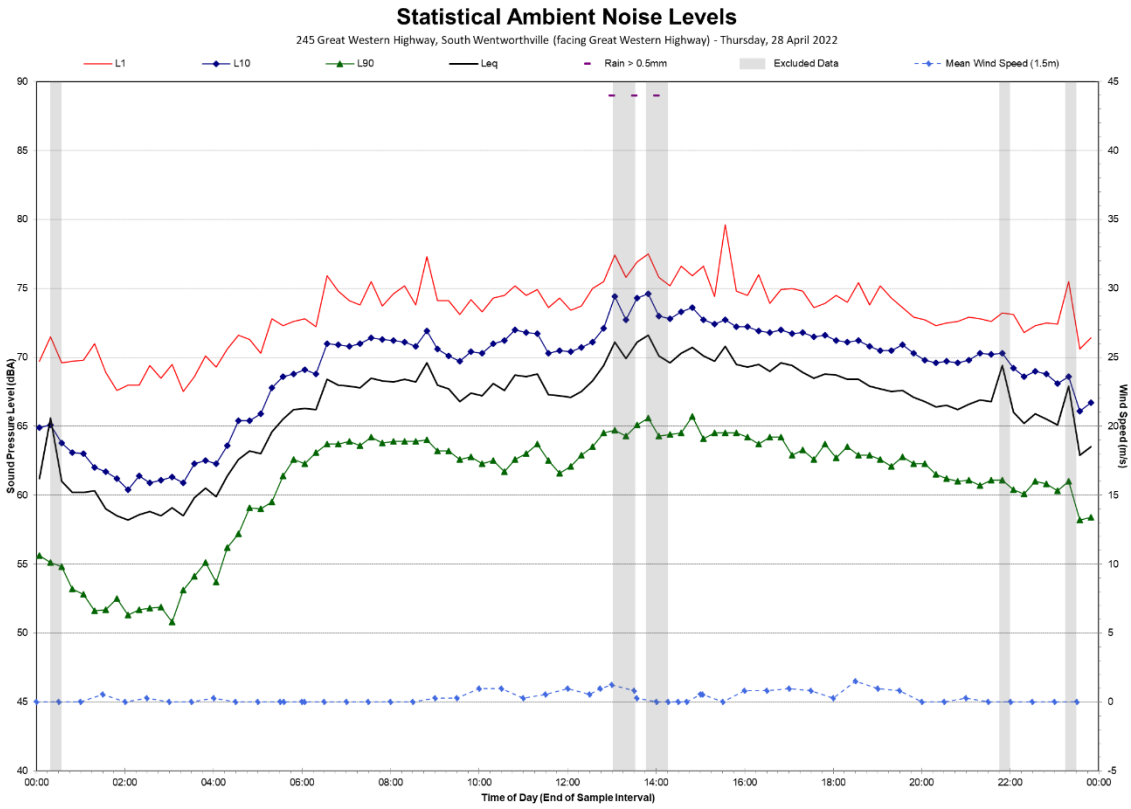
LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

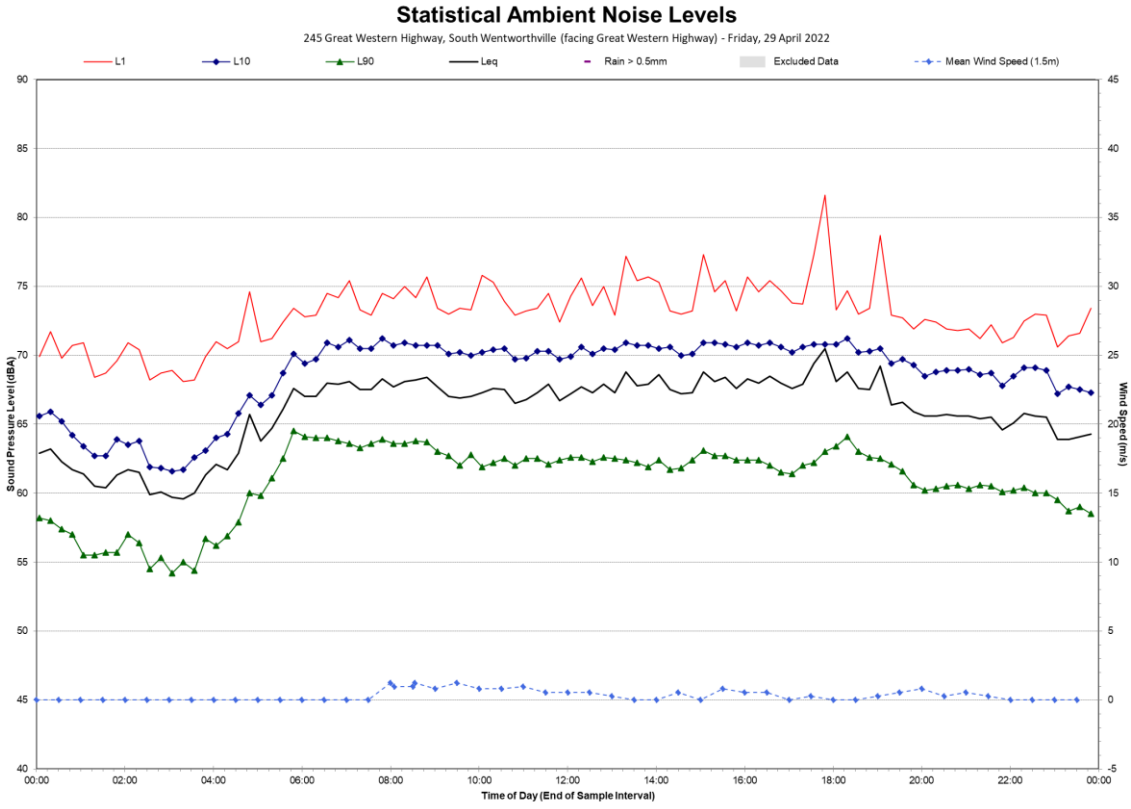
APPENDIX B

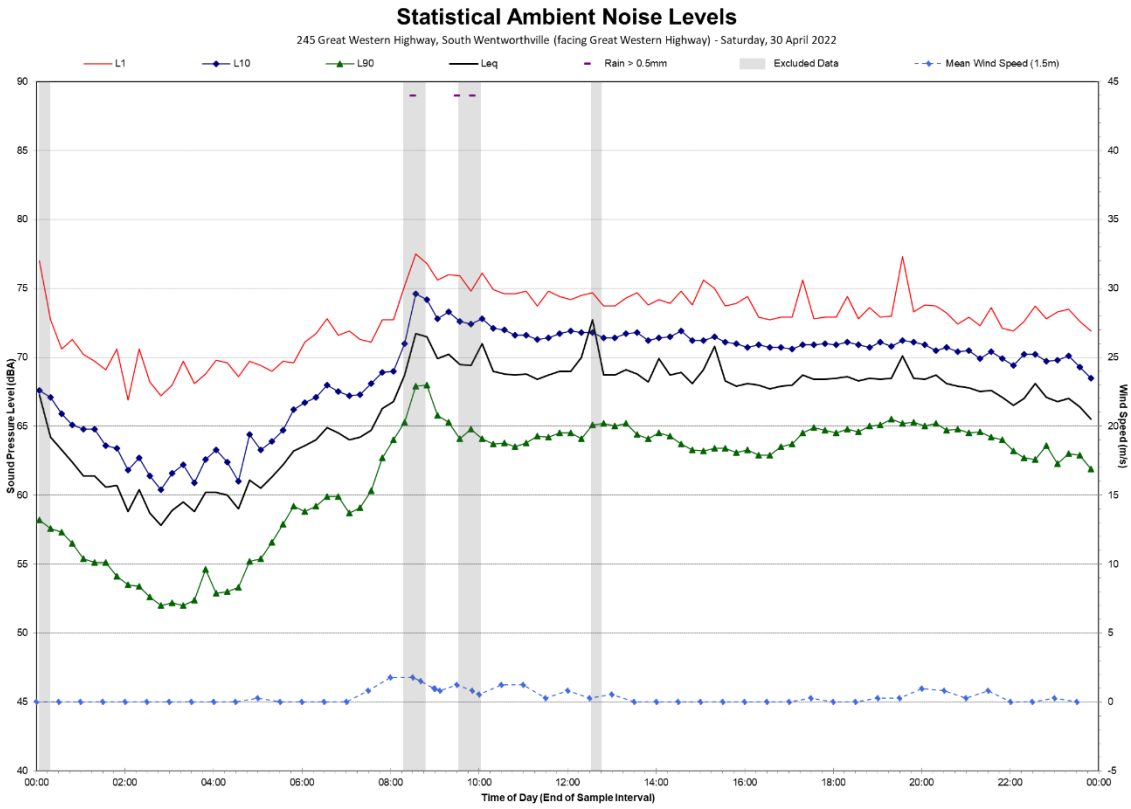
Noise Logger Graphs

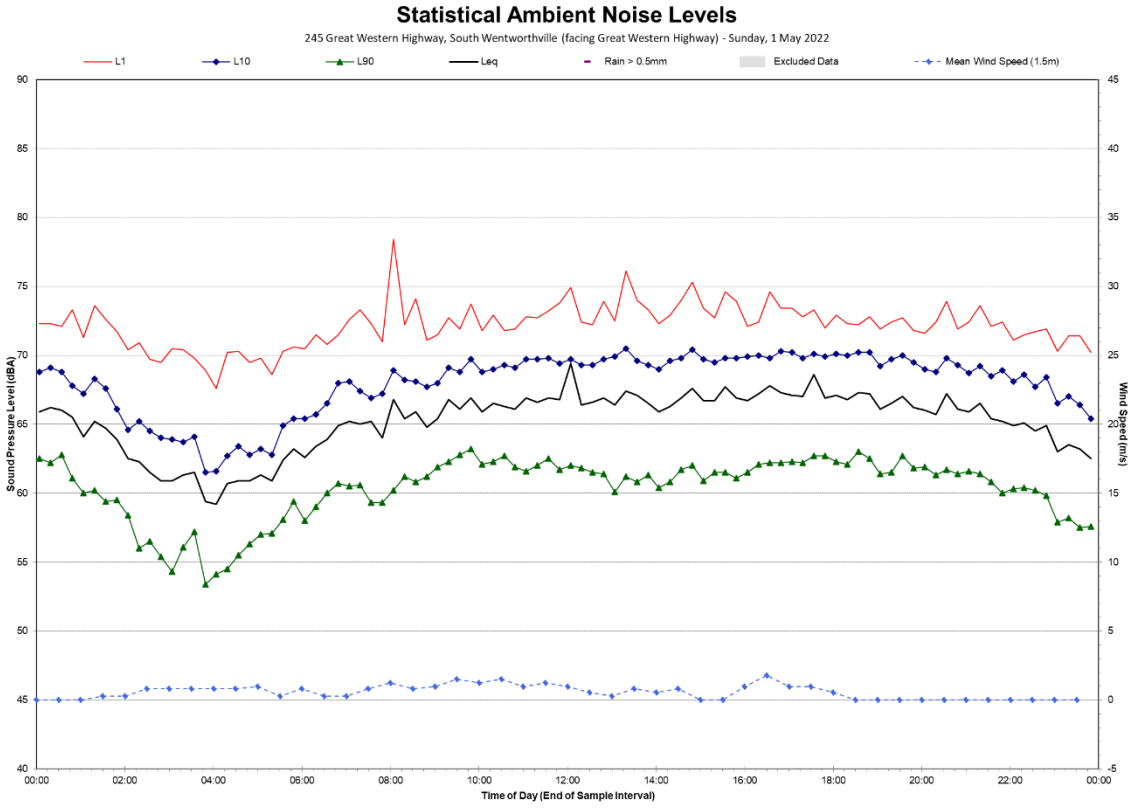

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Tuesday, 26 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

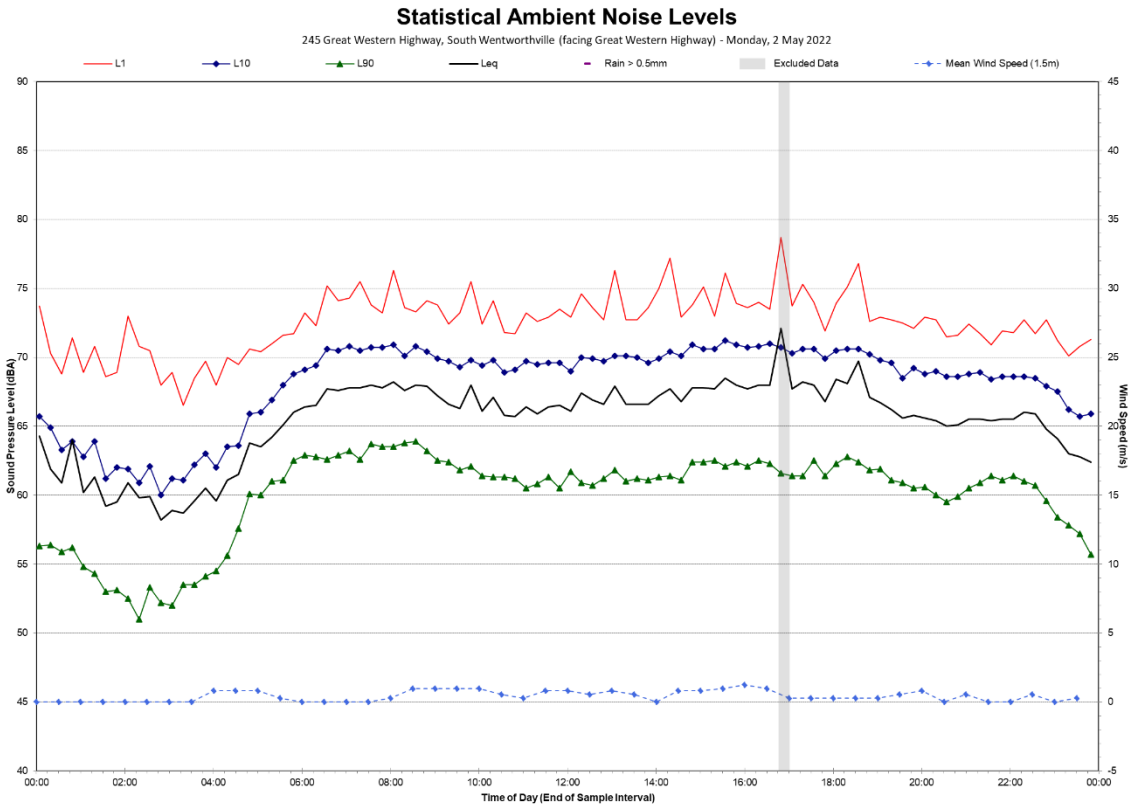

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Wednesday, 27 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

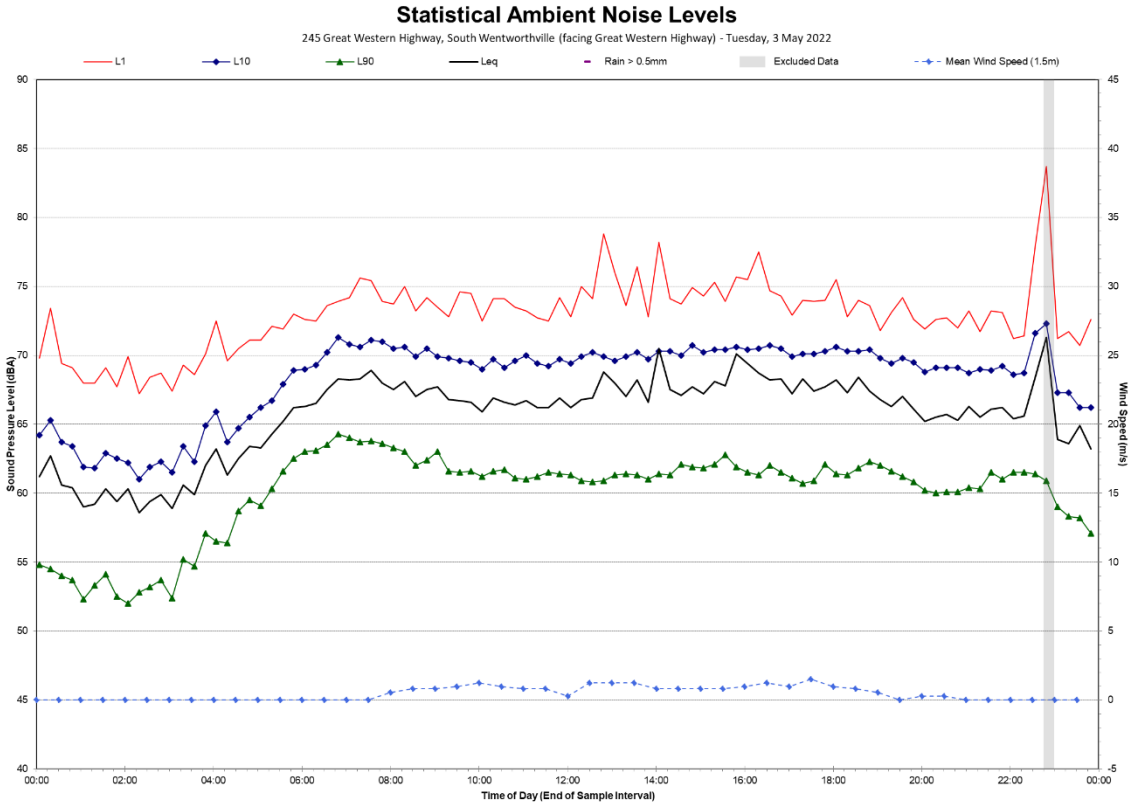

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Thursday, 28 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

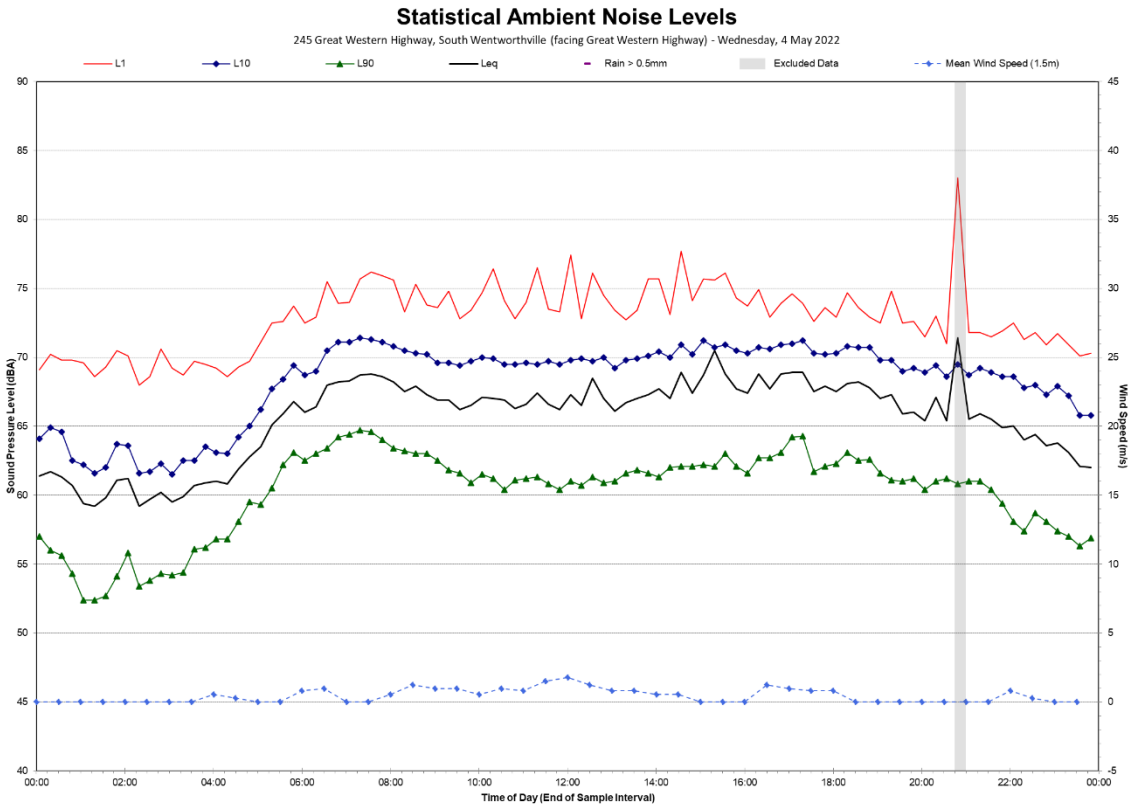

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Friday, 29 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

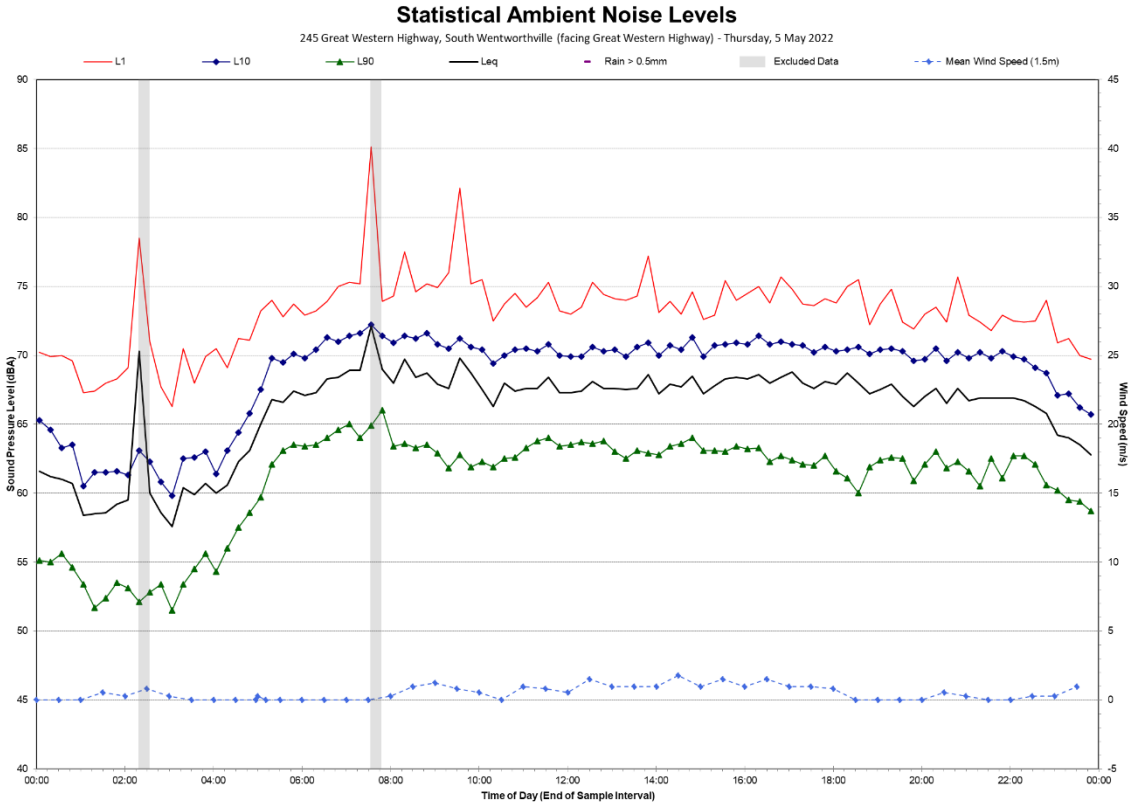

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Saturday, 30 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

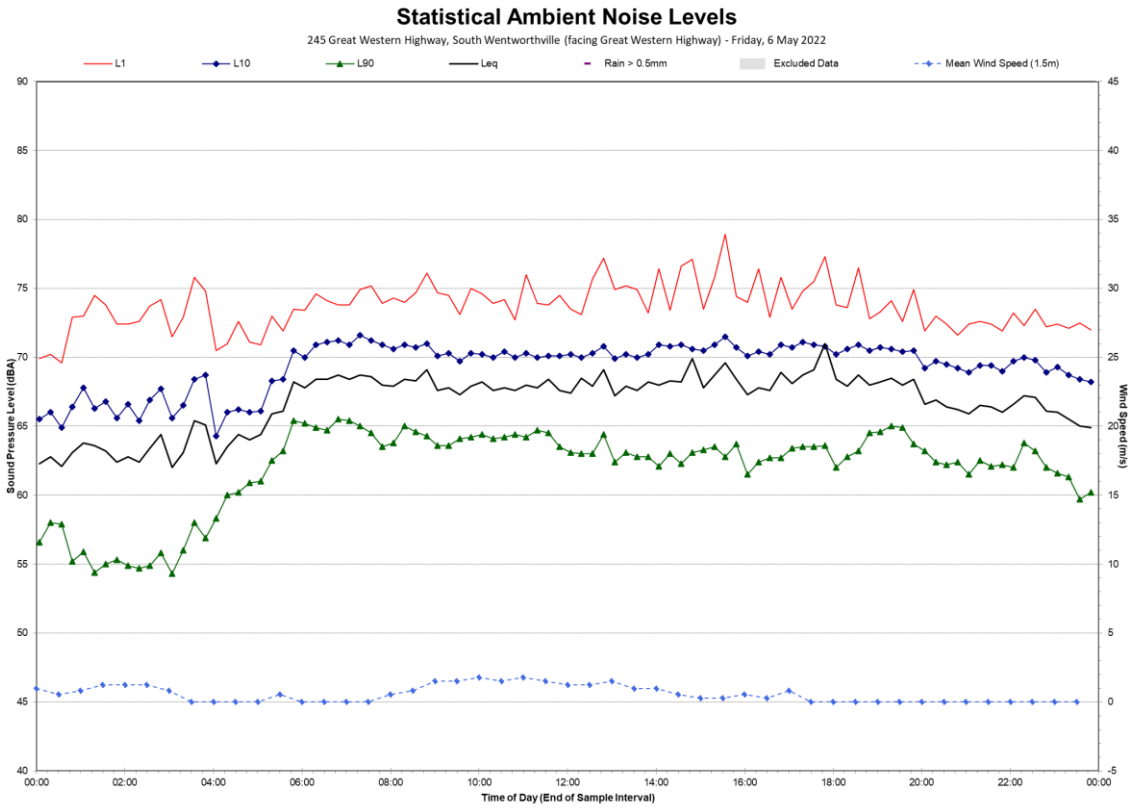

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Sunday, 1 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Monday, 2 May 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
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Tuesday, 3 May 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
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Wednesday, 4 May 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
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Thursday, 5 May 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
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Friday, 6 May 2022
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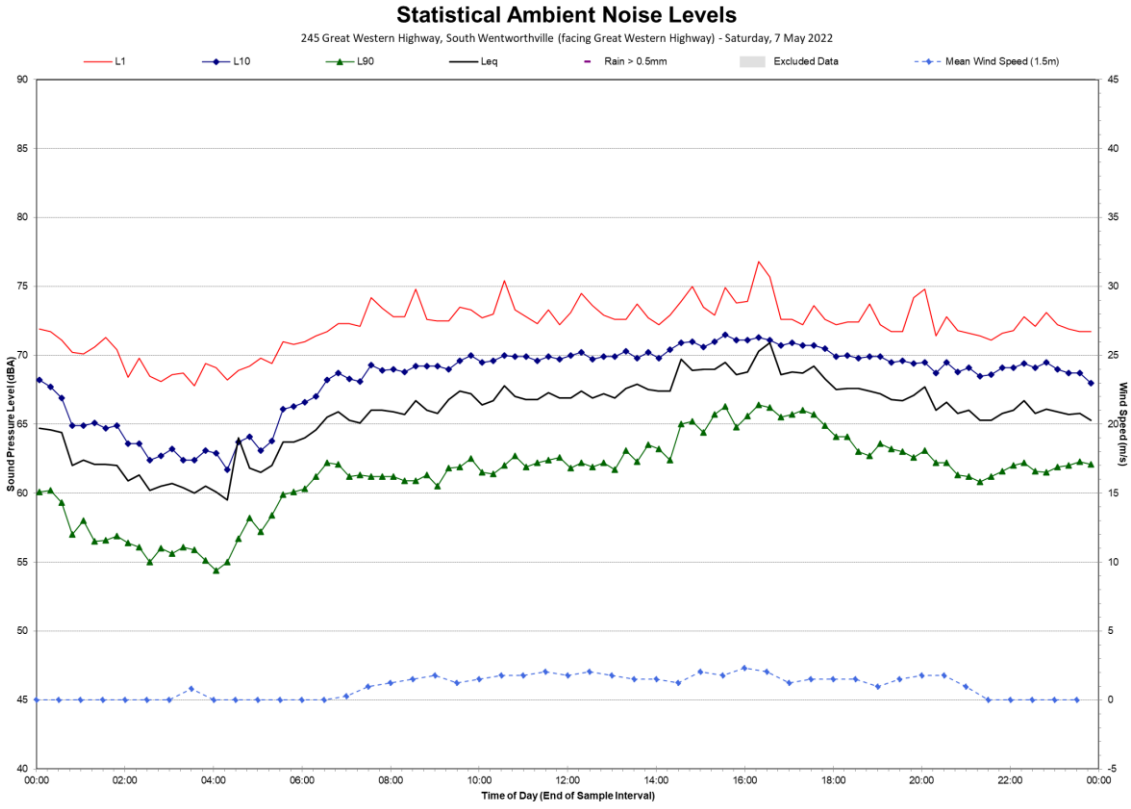
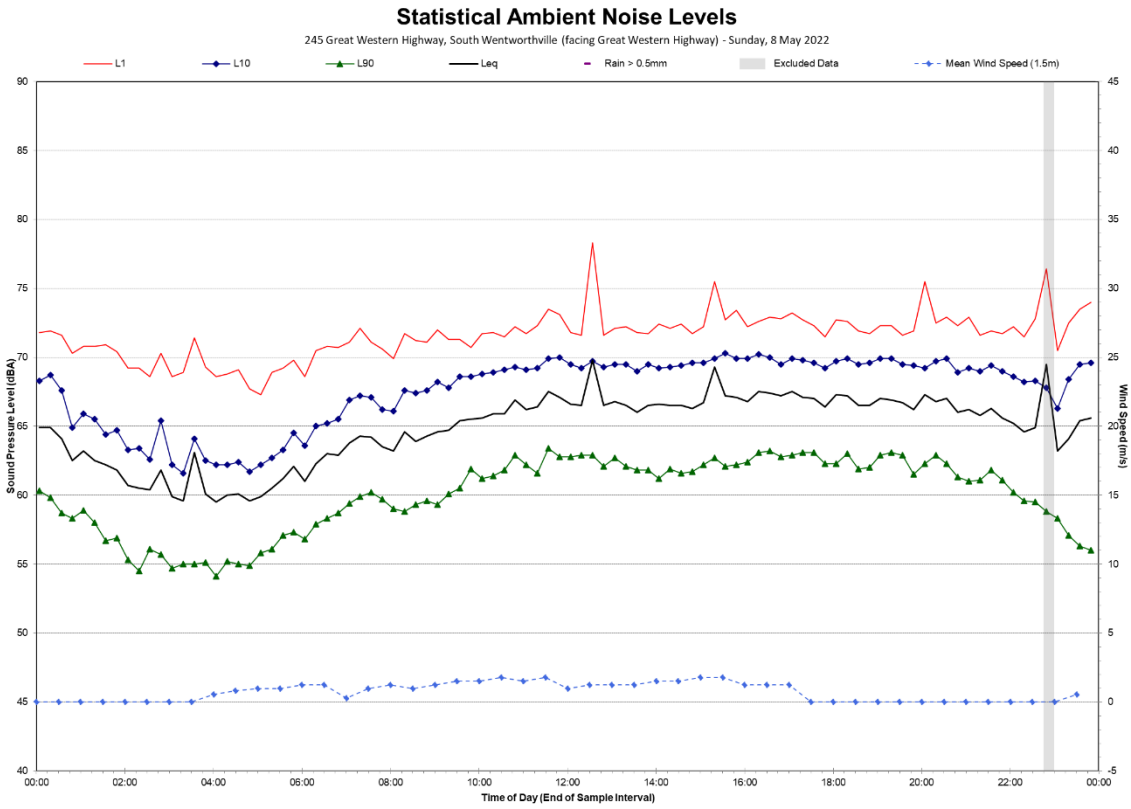
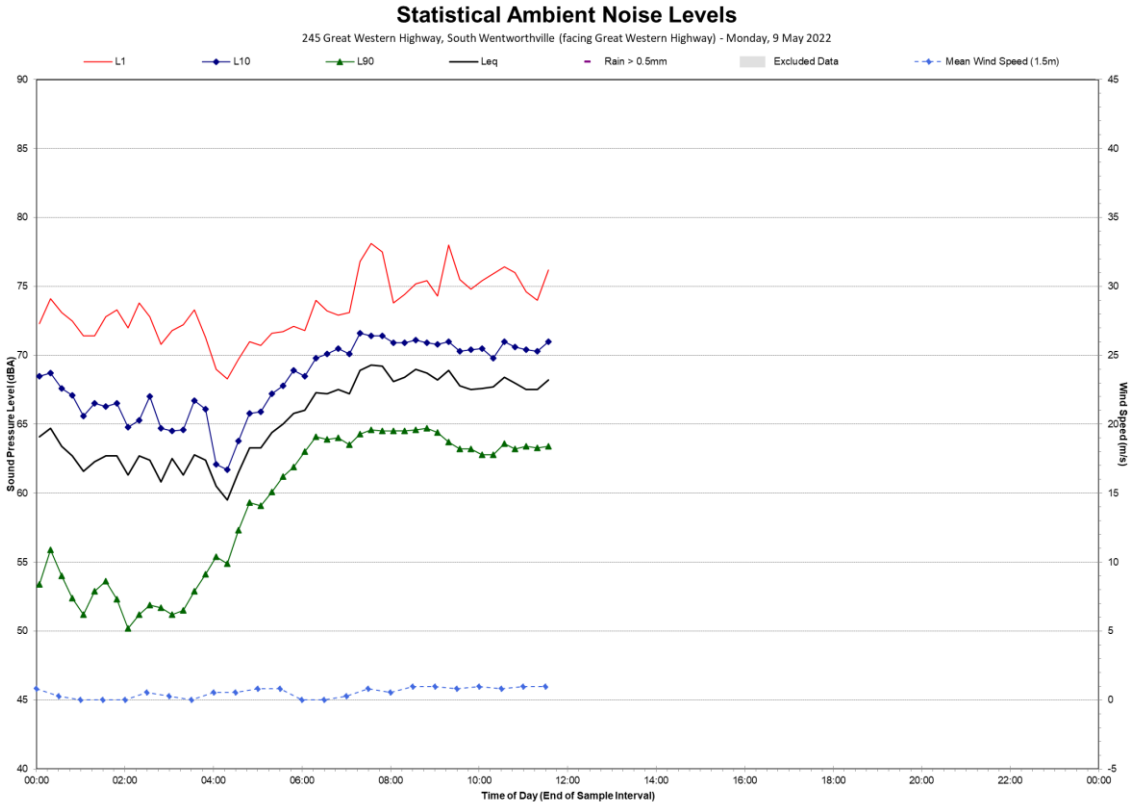
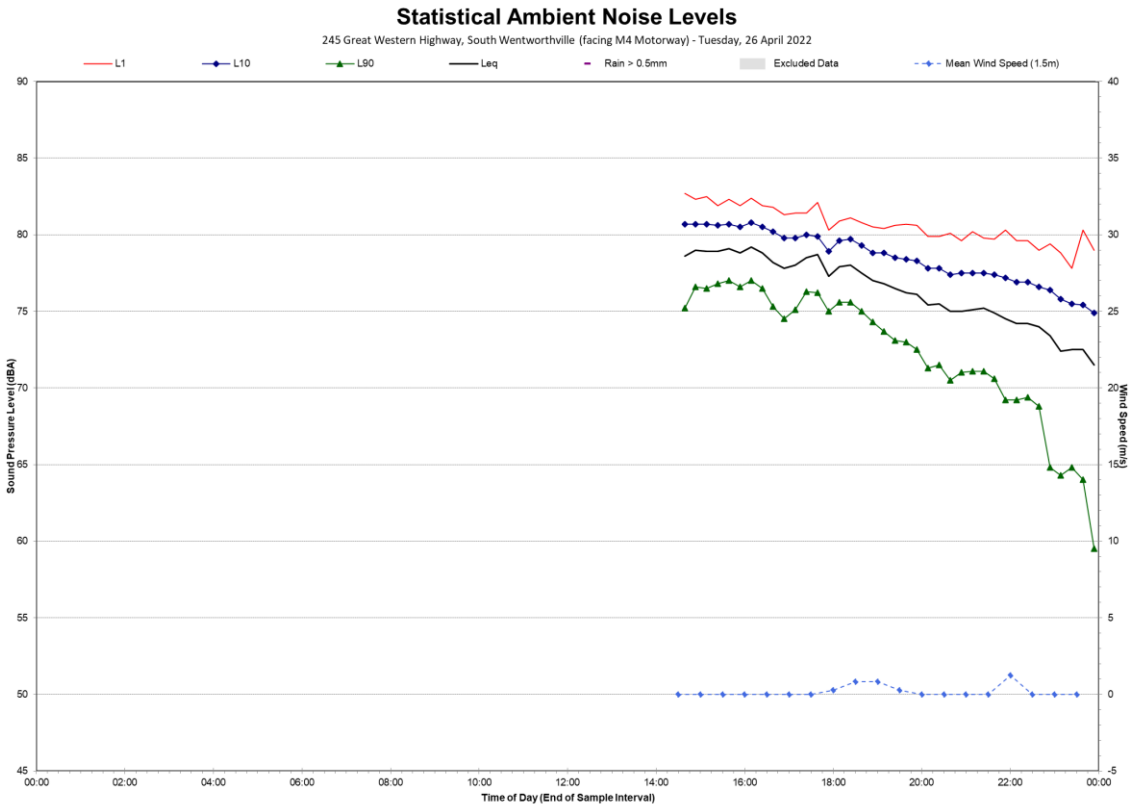
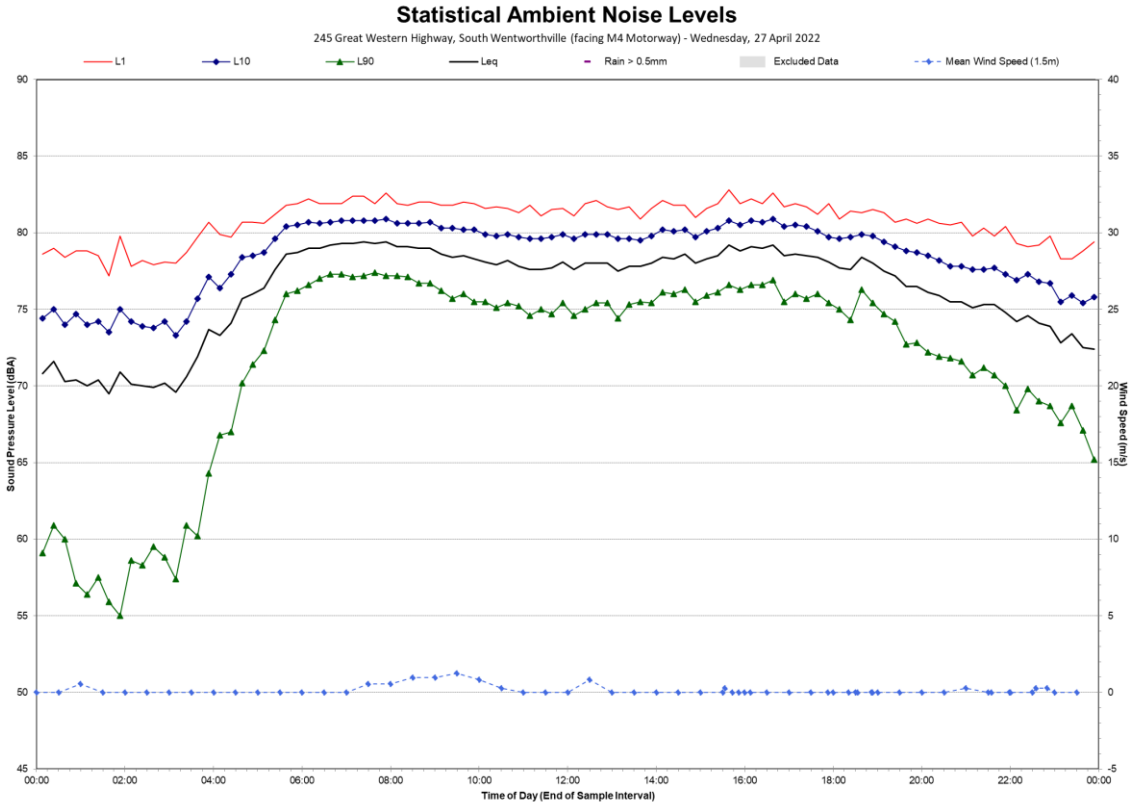
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

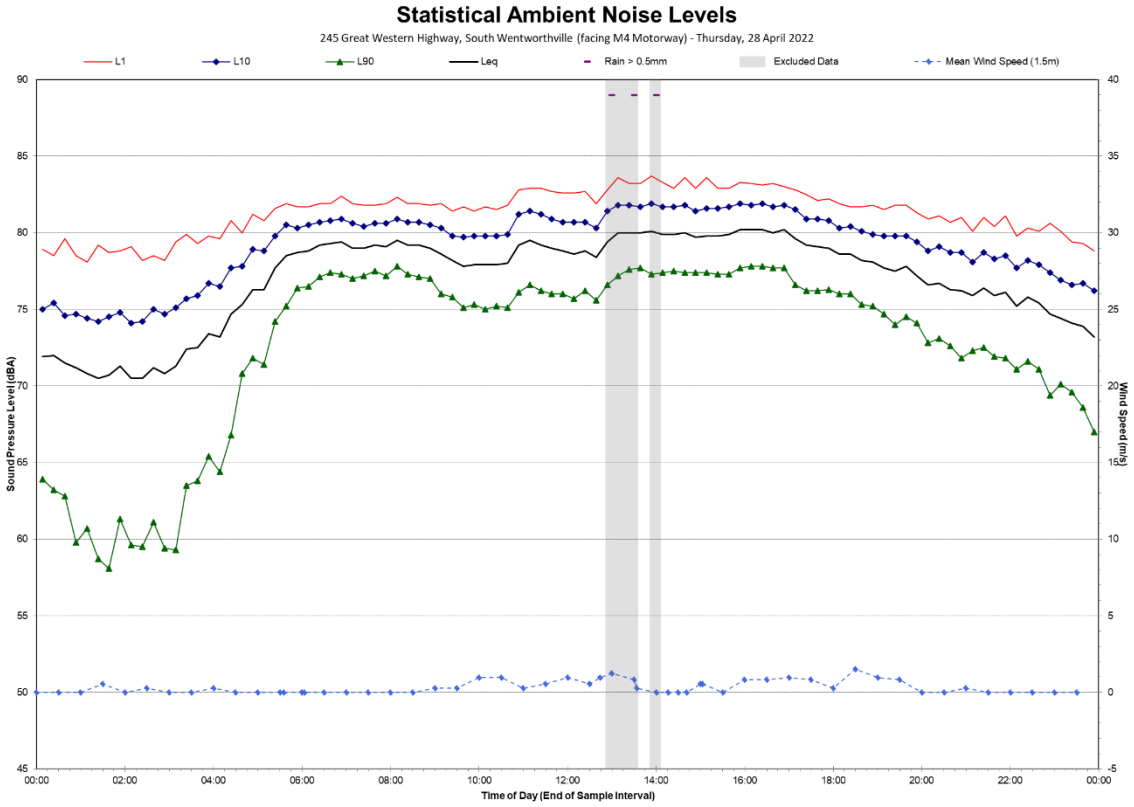

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Saturday, 7 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

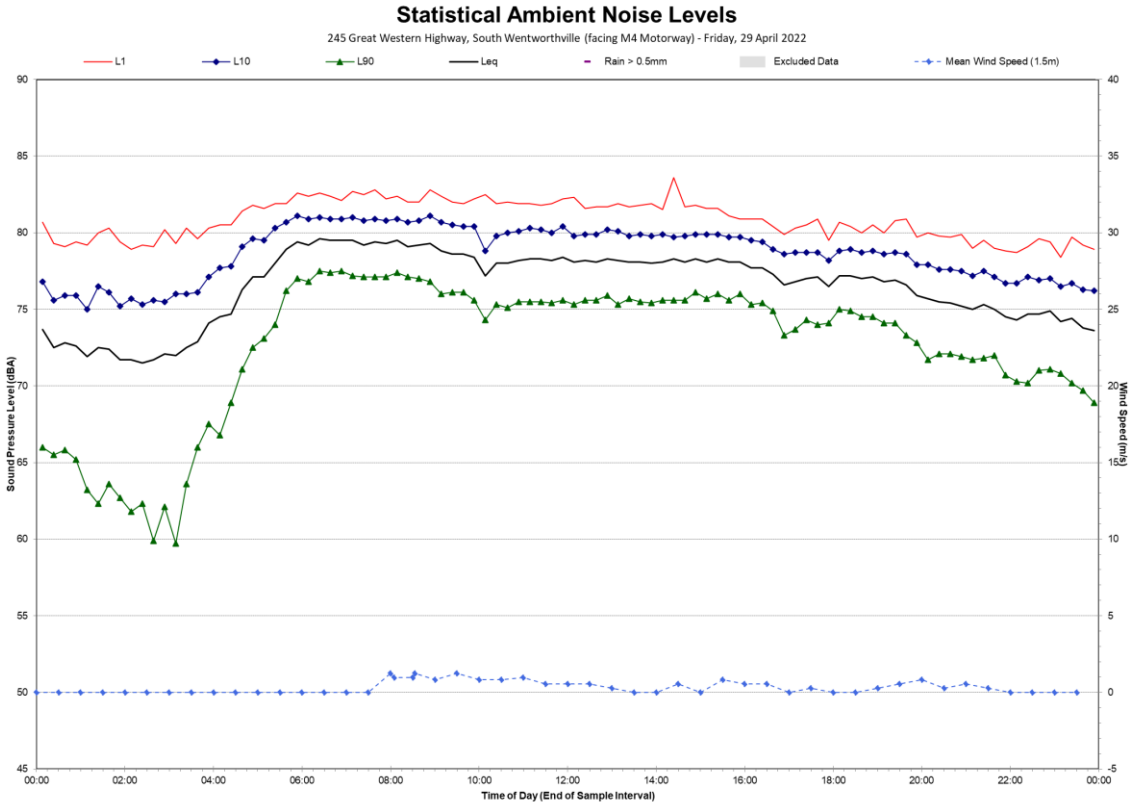

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Sunday, 8 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

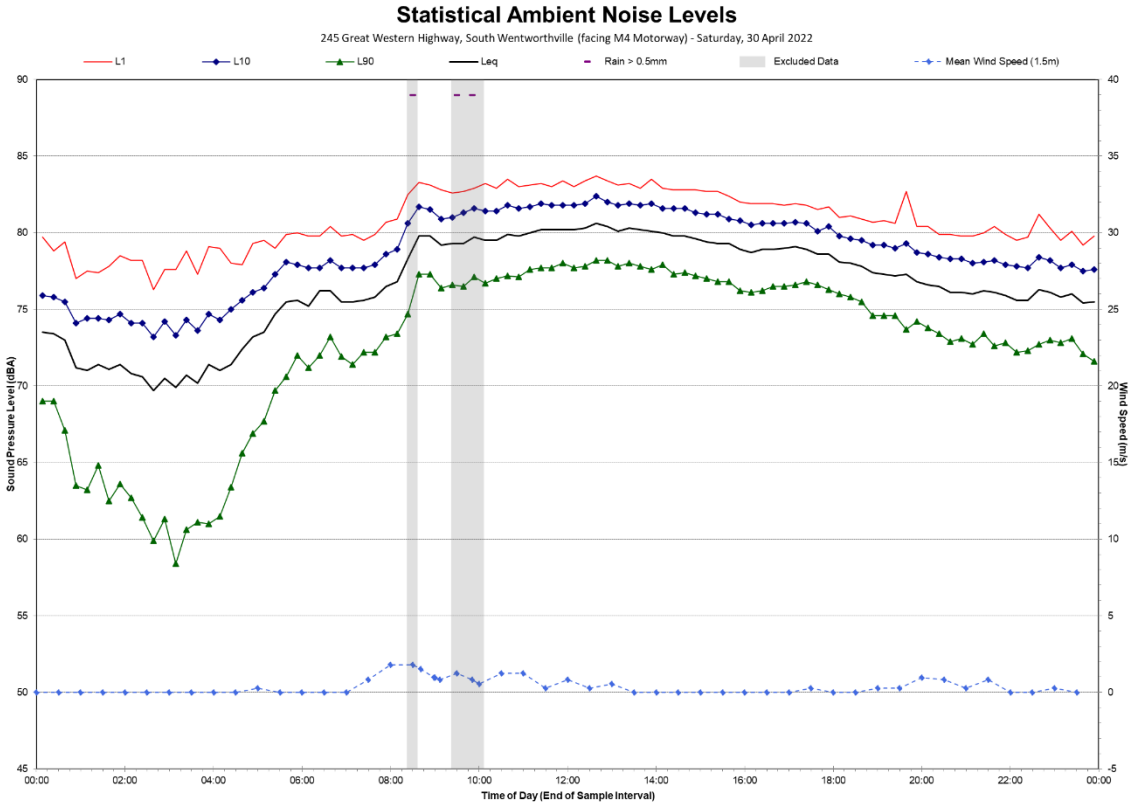

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing Great Western Highway) - Monday, 9 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

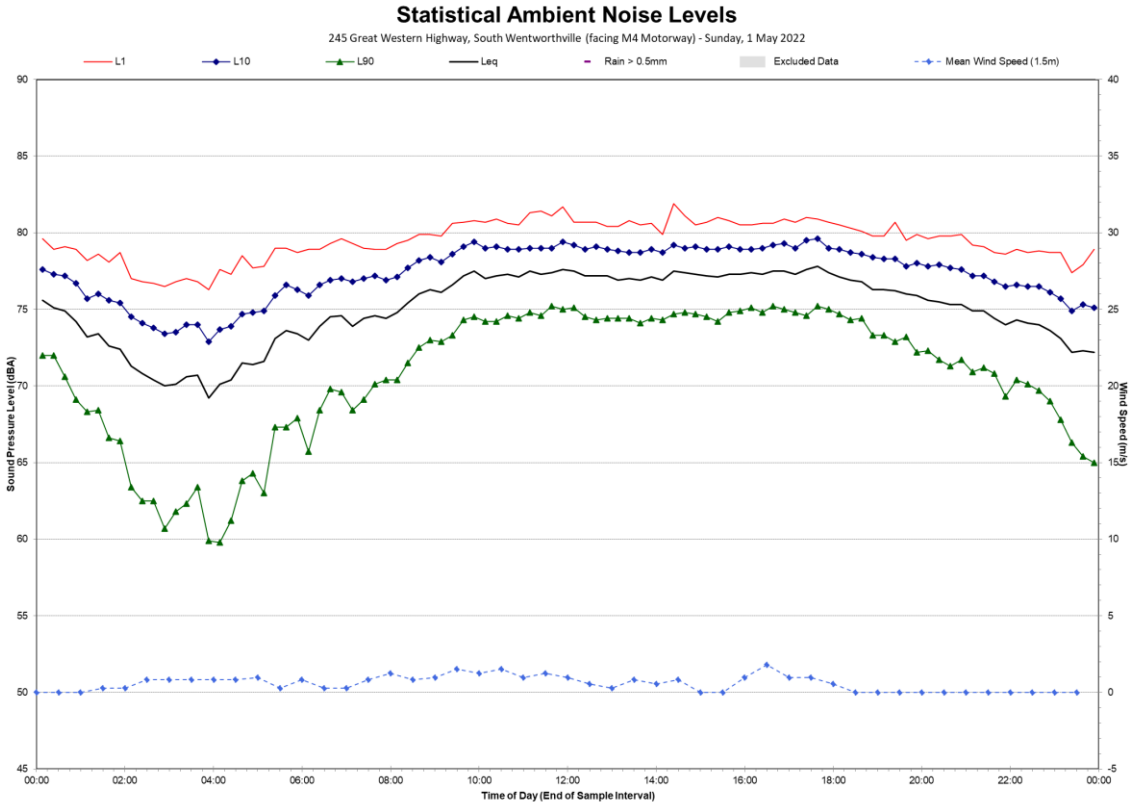

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Tuesday, 26 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

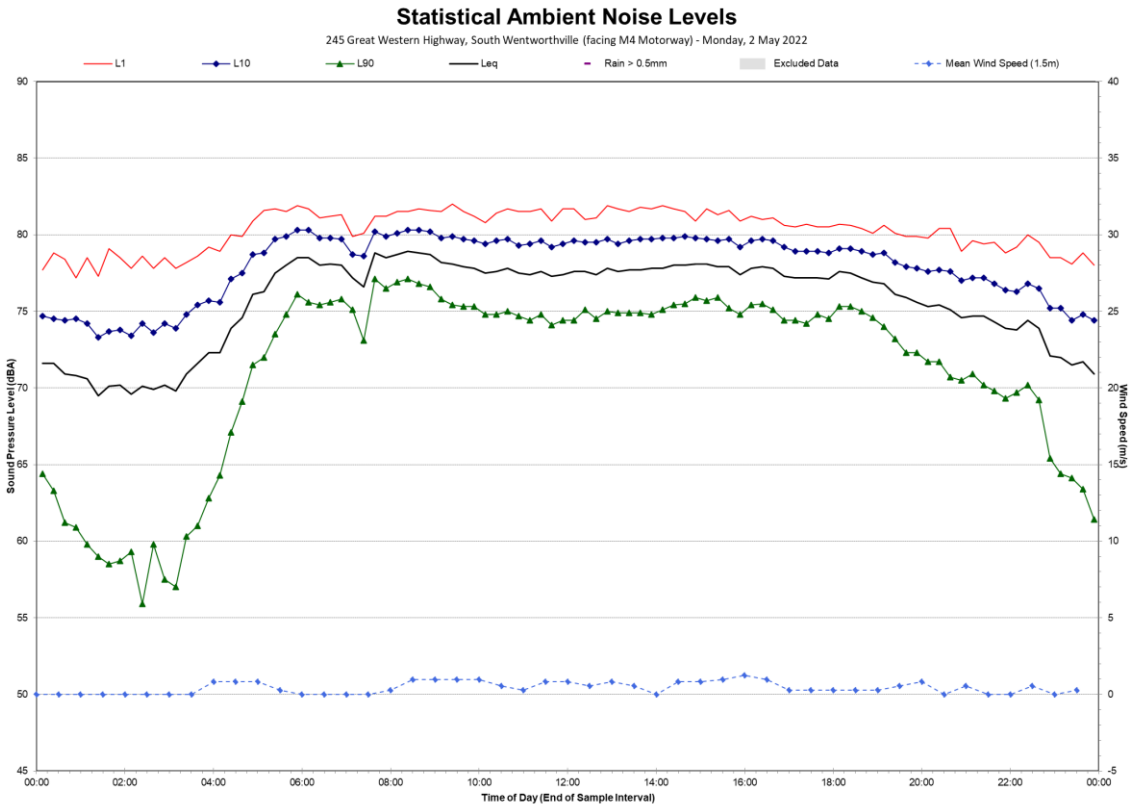

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Wednesday, 27 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

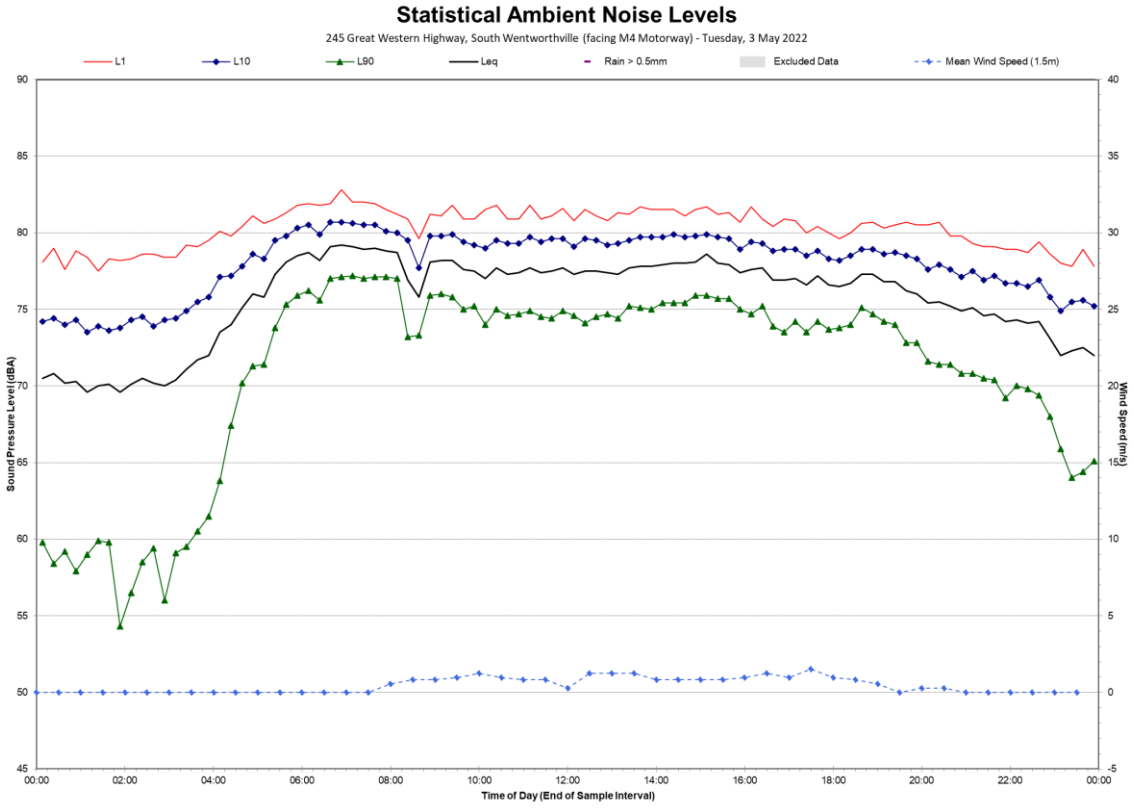

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Thursday, 28 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

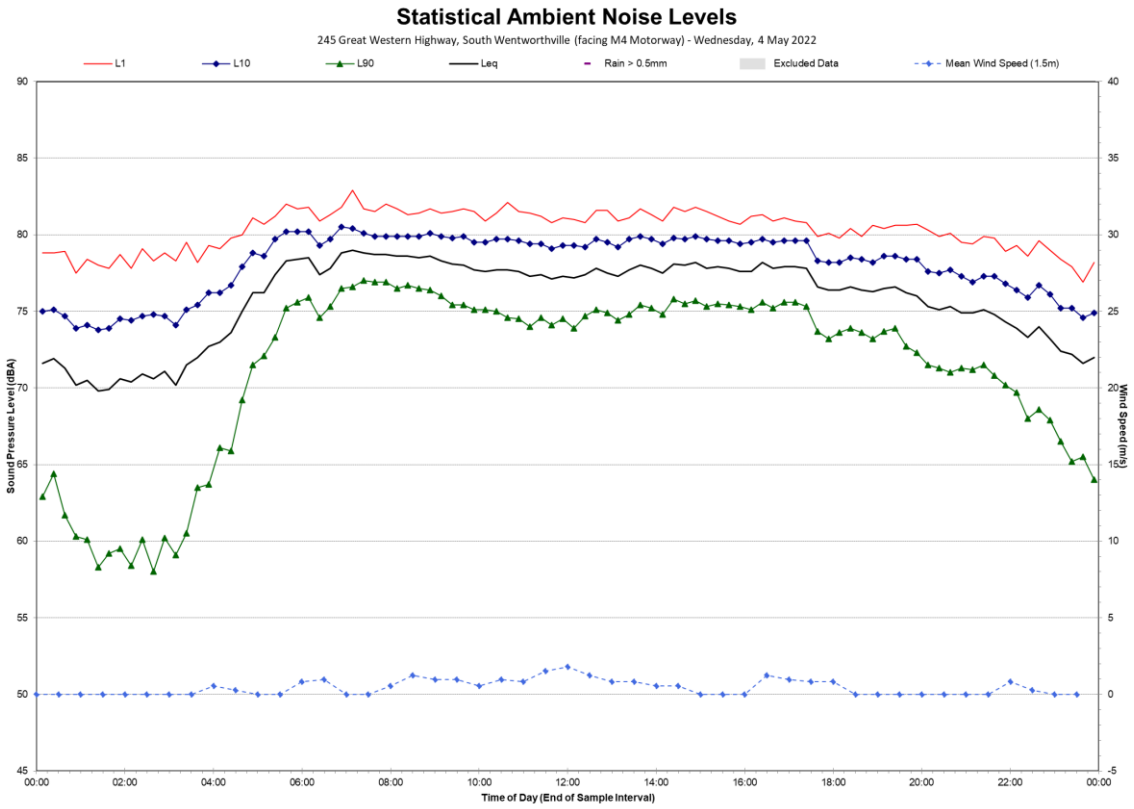

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Friday, 29 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

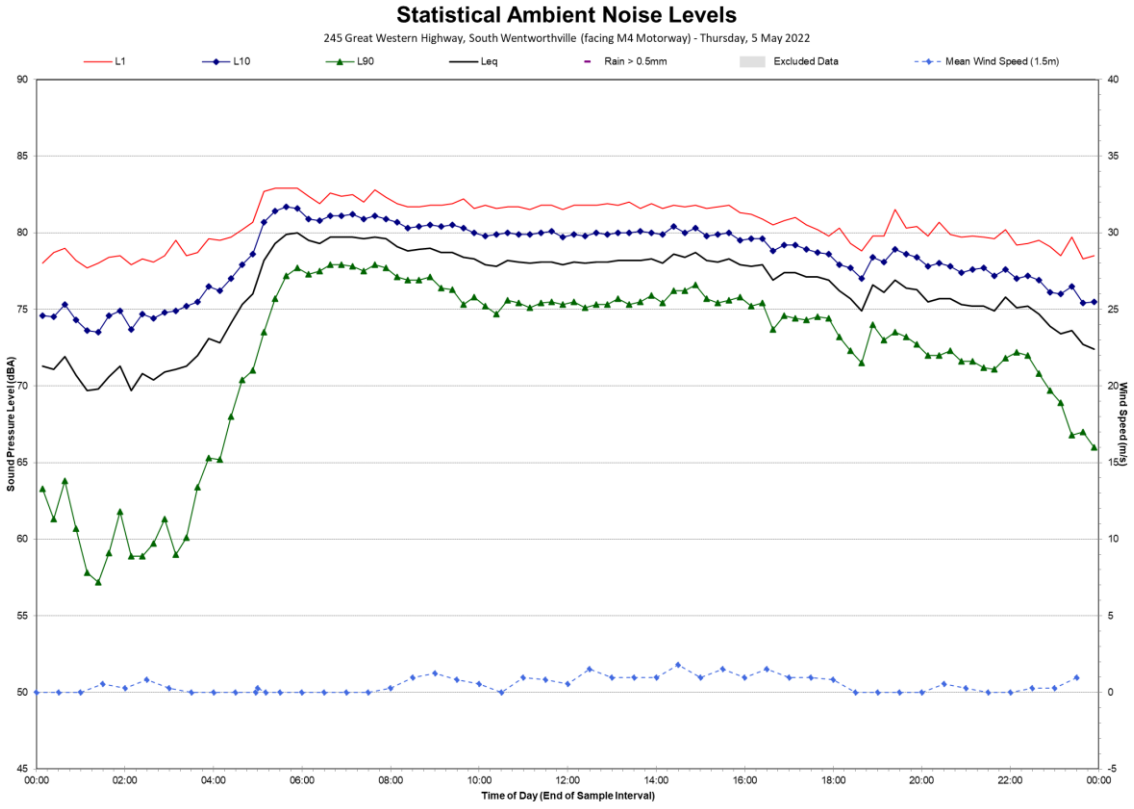

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Saturday, 30 April 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

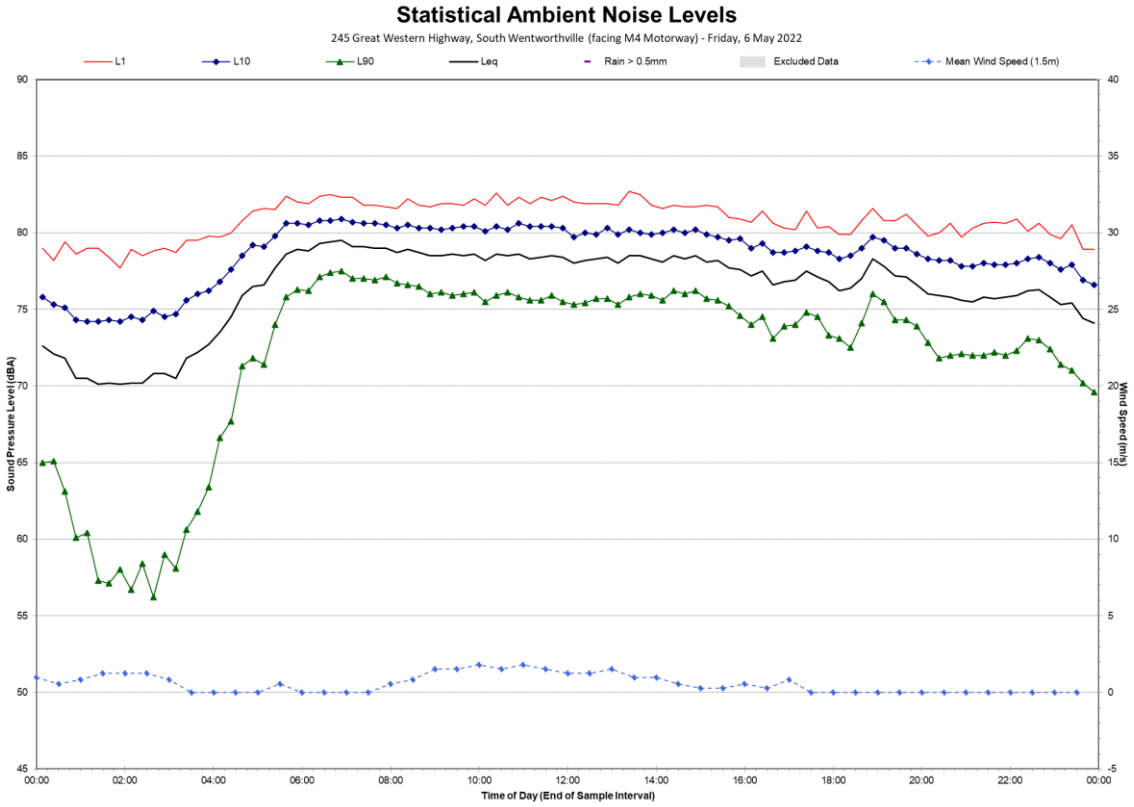

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Sunday, 1 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

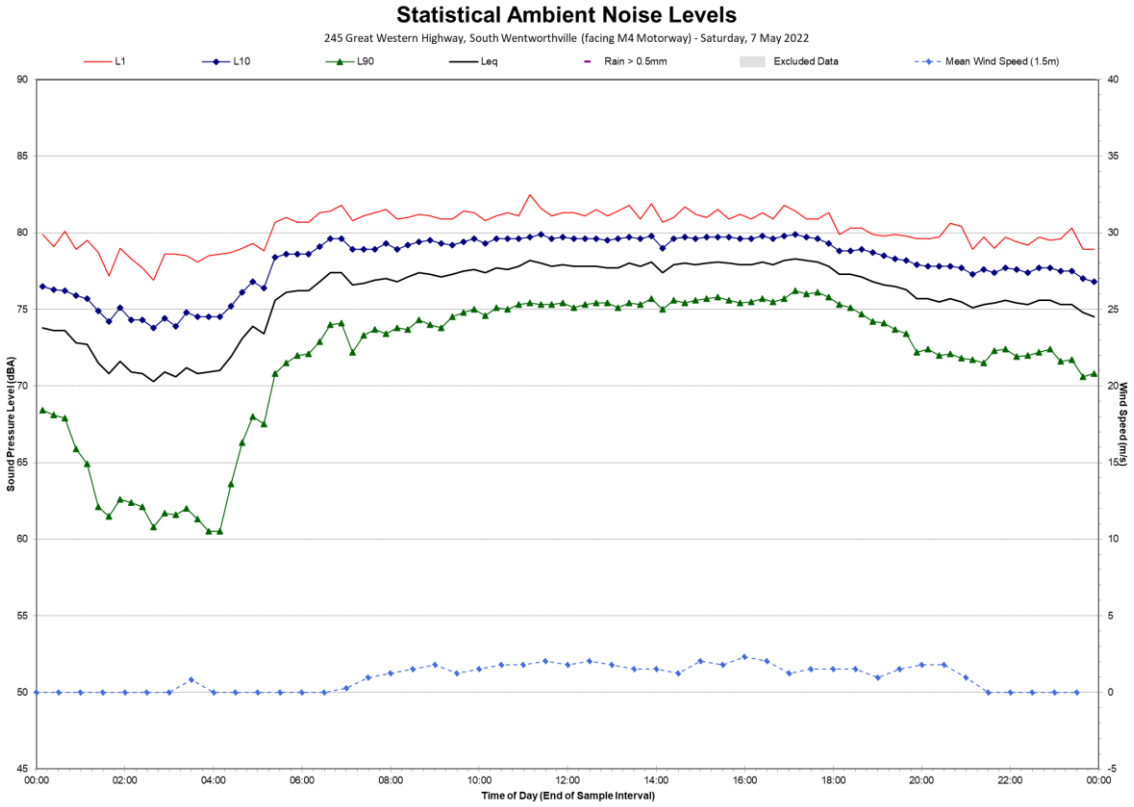

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Monday, 2 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

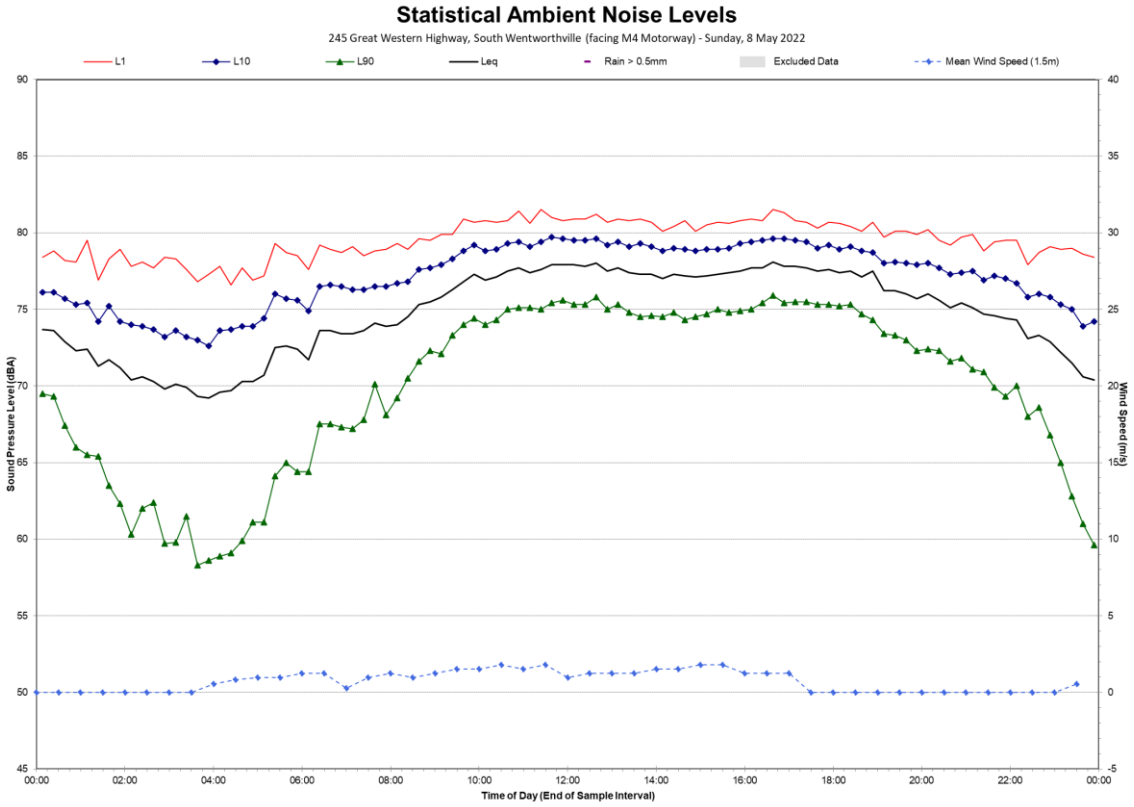

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Tuesday, 3 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

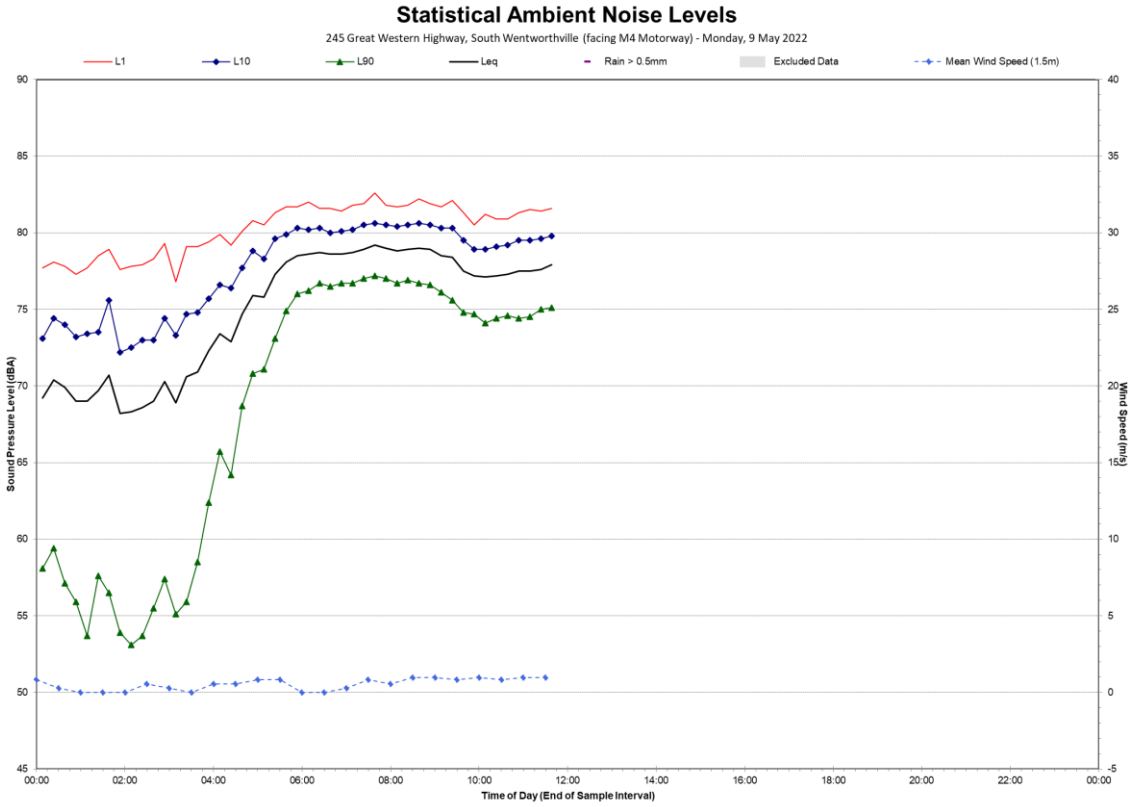

Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Wednesday, 4 May 2022
L1
L10
L90
Leq
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Thursday, 5 May 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
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Friday, 6 May 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
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Saturday, 7 May 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
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Sunday, 8 May 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
245 Great Western Highway, South Wentworthville (facing M4 Motorway) - Monday, 9 May 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 C

Attended Measurement Site Notes

Operator-Attended Noise Monitoring

SLR Global Environmental Solutions

Job Number: 610.30815	Site Diagram
Job Title:	
Measurement Description: 15min Attended	
Conducted by: PN	
Date: 26/04/22	
Time: Log 2 (14:37), Log 1 (14:5?)	
Location: 245 GW HWY	
GPS:	
Photo ref #:	

Weather Conditions			Instrumentation
Wind direction	Speed:	m/s	File No.
Temperature		°C	Instrumentation Type / Serial No.
Humidity:		%	Calibrator Serial No.
Cloud cover:		/8	Cal.Check: Pre - Post -
			Deployed Logger Serial No. N/A

Maximum Noise Levels

0-1min	Log 2 - Facing M4 (14:37)	Log 1 - Facing GW HWY (14:?)
1-2min	S/N 21884	S/N 27523
2-3min		
3-4min	Cars - 73-82 dB	Cars - 61-75 dB
4-5min	Trucks - 77-85 dB	Trucks - 70-80 dB
5-6min		Motorbike - 68-87 dB
6-7min	Dom. Source - Road Traffic	Bus - 65-75 dB
7-8min		Birds - 62-65 dB
8-9min	LAFmax: 85 dB	
9-10min	LAeq: 80 dB	Dom. Source - Road Traffic
10-11min	LAFmin: 73 dB	
11-12min	LAF90: 78 dB	LAFmax: 87 dB
12-13min	LAF10: 81 dB	LAeq: 69 dB
13-14min	LAF1: 83 dB	LAFmin: 61 dB
14-15min		LAF90: 64 dB
Special LAeq (20Hz – 1.25kHz)		LAF10: 72 dB LAF1: 77 dB

Measured Parameter (15 minute Period)

LAeq	LAmax	LAmin	LA1	LA10	LA90

Page ____ of ____

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F: +61 3 9249 9499

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New Lambton NSW 2305
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F: +61 2 4037 3201

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Grd Floor, 503 Murray Street
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T: +61 8 9422 5900
F: +61 8 9422 5901

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120 High Street
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T: +61 2 9427 8100
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12 Cannan Street
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F: +61 7 4722 8001

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