FUJITSU HYPERSCALE UPGRADE PROJECT

Western Sydney Data Centre
Noise Impact Assessment

Prepared for:

HDR Pty Ltd
Level 23, 12 Creek Street
Brisbane QLD 4000

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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 HDR Pty Ltd (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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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30599-R02-v0.1	8 April 2022	Lloyd Mears Mathew Bruck	Mark Irish	

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been appointed on behalf of Fujitsu Australia Limited (FAL) to undertake a Noise Impact Assessment (NIA) for the proposed development extension of the Western Sydney Data Centre (WSDC) site located at 6 Bellevue Circuit, Greystanes NSW 2145 (henceforth, the Project).

This NIA has been prepared by SLR on behalf of FAL C/O HDR Consulting.

This report summarises the results of ambient noise measurements undertaken at the site, assesses the potential operational noise impacts associated with the project and serves to support the original State Significant Development Application (SSDA) for the data centre and current planning submission being prepared by Genton Architects for the provision of infrastructure and construction of an external plant area at the WSDC.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

1.1 Proposal Description

The project site is described as Lot 308 DP 1035614 and Lot 140 DP 1061621, commonly known as 6 Bellevue Circuit, Pemulwuy Greystanes NSW 2145. The site has an area of approximately 38,500m2, with access achieved via Prospect Hwy through to Bellevue Circuit.

The site forms part of Greater Western Sydney and is located approximately 30 kilometres west of the Sydney central business district and is a strategic centre for small industry. The site is described through its commercial setting as an existing Data Centre, adjoining surrounding commercial premises along Bellevue Circuit, and forming part of the wider M4 corridor.

The site is situated approximately 30 km west of the Sydney CBD and 7km southwest of Parramatta. It is within close proximity to transport infrastructure routes (predominantly the M4 corridor and rail networks), as well as sharing direct links with the wider regional road network, including Great Western Hwy, Prospect Hwy and the M4 Western Motorway.

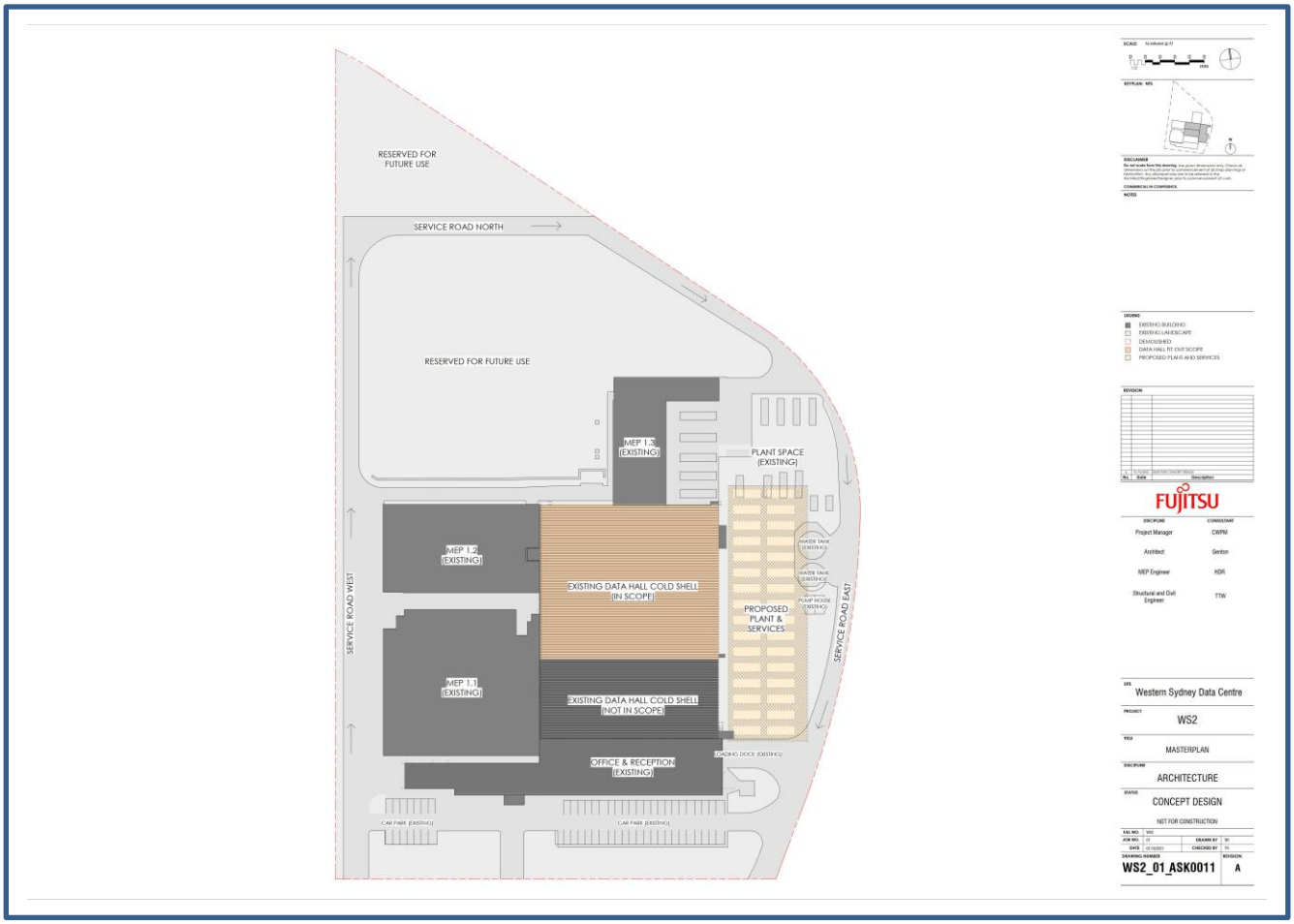
These road networks provide enhanced connectivity to the subject site and wider locality.

The project site is accessed via the site entry on Bellevue Circuit and is bound by parkland and commercial properties to the north, Bellevue Circuit to the south, parkland and residential properties to the east (along Daruga Avenue) and commercial properties to the west.

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

Figure 1 Site Location, Surrounding Receivers and Noise Monitoring Locations

Figure 2 Proposed Masterplan



Operating hours for the development would typically be 24 hours a day, 7 days a week. Deliveries to and from the development could occur at any time between 7am to 5pm, Monday to Friday.

The identified sources of noise from the proposed development include:

- Mechanical plant
- Truck and light vehicle movements on internal access roads, and in hardstands and parking areas.

The loading bays are situated on the south-eastern façade of the existing building.

A 58-space car park is situated on the southern side of the site adjacent to Bellevue Circuit and a truck entry/exit route runs along the eastern boundary and is accessed from the south-east of the site on Bellevue Circuit.

1.2 Nearest Receivers

The nearest sensitive receivers are residential properties located 138 m to east and a commercial property 12 m to the west. The nearest receivers are shown in **Figure 1** and detailed in **Table 1**.

Table 1 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
R01	10 Butu Wargun Dr, Pemulwuy (Asahi Beverages)	Commercial	135	North
R02	2 Litton Cl, Pemulwuy (Makita Australia)		32	West
R03	5WHC+6M, Pemulwuy (Jemena)		12	West
R04	5 Bellevue Circuit, Greystanes (Symbion)		35	South
R05	36 Daruga Avenue, Pemulway	Residential	238	East
R06	38 Daruga Avenue, Pemulway		233	
R07	40 Daruga Avenue, Pemulway		222	
R08	42 Daruga Avenue, Pemulway		219	
R09	44 Daruga Avenue, Pemulway		219	
R10	46 Daruga Avenue, Pemulway		205	
R11	48 Daruga Avenue, Pemulway		202	
R12	50 Daruga Avenue, Pemulway		198	
R13	52 Daruga Avenue, Pemulway		195	
R14	54 Daruga Avenue, Pemulway		192	
R15	56 Daruga Avenue, Pemulway		183	
R16	58 Daruga Avenue, Pemulway		180	
R17	60 Daruga Avenue, Pemulway		178	
R18	62 Daruga Avenue, Pemulway		175	
R19	64 Daruga Avenue, Pemulway		171	
R20	66 Daruga Avenue, Pemulway		168	
R21	68 Daruga Avenue, Pemulway		163	
R22	70 Daruga Avenue, Pemulway		145	
R23	72 Daruga Avenue, Pemulway		138	
R24	74 Daruga Avenue, Pemulway		138	
R25	76 Daruga Avenue, Pemulway		133	
R26	78 Daruga Avenue, Pemulway		133	
R27	80 Daruga Avenue, Pemulway		135	
R28	82 Daruga Avenue, Pemulway		135	
R29	84 Daruga Avenue, Pemulway		135	
R30	86 Daruga Avenue, Pemulway		133	

ID	Address	Type	Distance (m)	Direction
R31	88 Daruga Avenue, Pemulway		132	
R32	90 Daruga Avenue, Pemulway		132	
R33	92 Daruga Avenue, Pemulway		131	
R34	94 Daruga Avenue, Pemulway		137	
R35	96 Daruga Avenue, Pemulway		141	
R36	98 Daruga Avenue, Pemulway		144	
R37	100 Daruga Avenue, Pemulway		150	
R38	102 Daruga Avenue, Pemulway		150	
R39	104 Daruga Avenue, Pemulway		160	
R40	106 Daruga Avenue, Pemulway		167	
R41	108 Daruga Avenue, Pemulway		173	
R42	110 Daruga Avenue, Pemulway		181	

2 Existing Noise Environment

The existing noise environment at the site is generally controlled by operational noise generated by the site itself, including mechanical plant, carpark and loading dock operations. Noise generated by road traffic on the surrounding network is a contributing source with the nearest major road being Greystanes Road, located 500 m to the east of the site. Other existing noise sources include mechanical plant and road traffic associated with surrounding commercial properties.

2.1 Existing Noise Survey and Monitoring Locations

Unattended noise monitoring was conducted in the study area during November 2021. The measured noise levels have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts from the project.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the project, 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 Horsley Park), to establish representative existing noise levels in the study area. The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 2**. Details of each monitoring location together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 2 Summary of Unattended Noise Logging Results

ID	Address	Measured Noise Levels (dBA)					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	88 Daruga Avenue, Pemulway	38	38	33	51	50	45

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*.

2.2 Attended Noise Measurements

Short-term attended noise monitoring was also completed at the monitoring location. The attended measurements allow the contributions of the various noise sources at the monitoring location to be determined. 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:

- Environmental noise and road traffic noise at the nearest residential receivers.
- Mechanical plant and road traffic noise emissions at the subject site.

3 Assessment Criteria

3.1 Noise Policy for Industry

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.

3.1.1 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.

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

3.1.2 Project Noise Trigger Levels

The trigger levels for industrial noise from the project are summarised in **Table 3**. 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 3 Project Noise Trigger Levels

NCA	Receiver Type	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				RBL[1]	$L_{Aeq(period)}$	Intrusiveness	Amenity[2,3]
NCA01 (L01)	Residential	Daytime	55	38	51	**43**	53
		Evening	45	38	50	**43**	43
		Night-time	40	33	45	**38**	38
NCA02	Commercial	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 being present in the area.

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

3.1.3 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 4**, which are to be applied where annoying characteristics are present.

Table 4 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.

3.2 Sleep Disturbance

The NPfI defines the sleep disturbance screening level as 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater. The 52 dBA L_{AFmax} screening level has been used for this proposal.

3.3 Traffic on Surrounding Roads

The potential impacts from project related traffic on the surrounding public roads are 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 5**.

Table 5 RNP/NCG Criteria for Assessing 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 Methodology

The potential operational noise levels from the project have been predicted to the surrounding receivers using ISO 9613-2 industrial noise algorithm in iNoise Version 2021.1. The model includes ground topography, buildings and representative noise sources from the project.

The IS0 9613-2 noise algorithm assumes light, downwind weather typical of conditions that enhance noise propagation.

The potential impacts have been determined by comparing the predicted noise levels to the NPfI Project Noise Trigger Levels in a 15-minute assessment period.

4.1 Operational Noise Sources

A summary of the noise sources associated with the operation of the development is provided below.

4.1.1 On-Site Traffic

On-site vehicles have been modelled using the data shown in **Table 6**. The volumes are representative of the worst-case 15-minute period for the daytime, evening and night-time. Assumptions regarding the volume of on-site traffic have been based on data from similar assessments.

Table 6 Vehicle Traffic Data – Worst-case 15-Minute Period

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)	Number of Vehicles in Worst-case 15-minute Period		
				Daytime	Evening	Night-time
Large Trucks	Access route	103[1,2]	20	2	2	1
Medium Trucks	Access route	100[2]	20	2	2	1
Delivery Vans	Access route	96[2]	20	2	2	1
Light Vehicles	Car park	95[2]	20	15	15	5

Note 1: Taken from *Sound Power Levels of Trucks at Low Speeds*, Jan H. Grannerman et al, Internoise 2009.

Note 2: Taken from *Road Traffic Noise Prediction Model "ASJ RTN-Model 2013" Proposed by the Acoustical Society of Japan – Part 2: Study on Sound Emission of Road Vehicles*, OKADA et al, Internoise 2014, and accounts for vehicles accelerating.

4.1.2 Loading Docks

Details of the loading dock noise sources are shown in **Table 7**. Loading and unloading has been modelled in the south-eastern loading dock which represents a worst-case scenario for the nearest residential noise sensitive receivers to the east.

Table 7 Typical Loading Dock Noise Sources

Noise Source	Sound Power Level (dBA)	Typical Duration of Use in Worst-case 15-minute Period	Source Height (m)
Reversing Alarm[1]	110	10 seconds	1.0
Air brakes	120	1 second	1.0

Noise Source	Sound Power Level (dBA)	Typical Duration of Use in Worst-case 15-minute Period	Source Height (m)
Roller door	94	60 seconds	4.0
Gas Forklift	93	900 seconds	1.0

Note 1: It is noted that the operation of this equipment is typically intermittent and a +5 dB modifying correction factor has been added to the noise level in accordance with the NPfI.

4.1.3 Internal Activities

The internal noise generating activities are expected to be minimal and would not significantly contribute to external noise emissions.

4.1.4 Mechanical Plant

Noise emission data regarding the existing and proposed mechanical plant has either been supplied via HDR or based on assumptions detailed below

A worst case, 15-minute operational scenario has been modelled to conservatively determine the potential impacts of the proposal. This scenario assumes that all existing and proposed generators are running 100% of the time, inclusive of mechanical plant equipment proposed to be located on the gantry.

The noise emission details for modelled mechanical plant are shown in **Table 8**.

Table 8 Mechanical Plant Details

Noise Source	Data Source	Location/Comment	Sound Power Level (dBA) Per Unit	Typical Duration of Operation	Source Height (m)
Existing Chiller	Supplied by HDR	Location: MEP1.1 MEP1.2	86	100%	2[1]
Existing Chiller	Supplied by HDR	Location: MEP1.3 (Stage 1 - High Temperature Conditions)	100	100%	2[1]
Proposed Chiller	Supplied by HDR	Assumption: 24 out of 32 chillers operating. Each operational chiller working at 100% capacity.	98	100%	23
Existing Generator	Supplied by HDR Kohler KX25000 (Sound proofed version)	Both generators operating.	103	100%	2

Noise Source	Data Source	Location/Comment	Sound Power Level (dBA) Per Unit	Typical Duration of Operation	Source Height (m)
Proposed Generators	Assumed	All generators operating	87	100%	8x units at 4m 8x units at 12m
Proposed Generator Stacktip and Exhaust Stack	Calculated by SLR	-	Total: 82	100%	Stack tip at 23
Proposed UPS	Assumed based on previous measurements by SLR	-	93	100%	17

Note 1: Height above roof.

4.1.5 Noise Sources with Potential for Sleep Disturbance

As the development is proposed to operate 24-hours a day, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. The details of typical activities with the potential to cause sleep disturbance are shown in **Table 9**.

Table 9 Sleep Disturbance Noise Events – L_{Amax} Sound Power Levels

Noise Source	Sound Power Level L_{Amax} (dBA)	Source Height
Truck Movement in Truck Parking Area	108	1 m
Airbrake in Truck Parking Area	120	1 m
Reversing Alarm	110	1 m
Roller Door	94	4 m

These sources have been assumed to operate in thesouth-eastern most loading dock, which is the location which would most affect the nearest residential receivers to the east.

5 Noise Assessment

5.1 Predicted Noise Levels

A summary of the noise assessment at the receivers surrounding the project is shown in **Table 10**. The predicted levels are compared to the PNTLs to determine the potential impact from the project.

Noise emission contours for the worst-case 15-minute period during the night-time scenario are shown in **Figure 3**.

Figure 3 Operational Noise Emissions – Worst Case 15-minute period (Night-time)

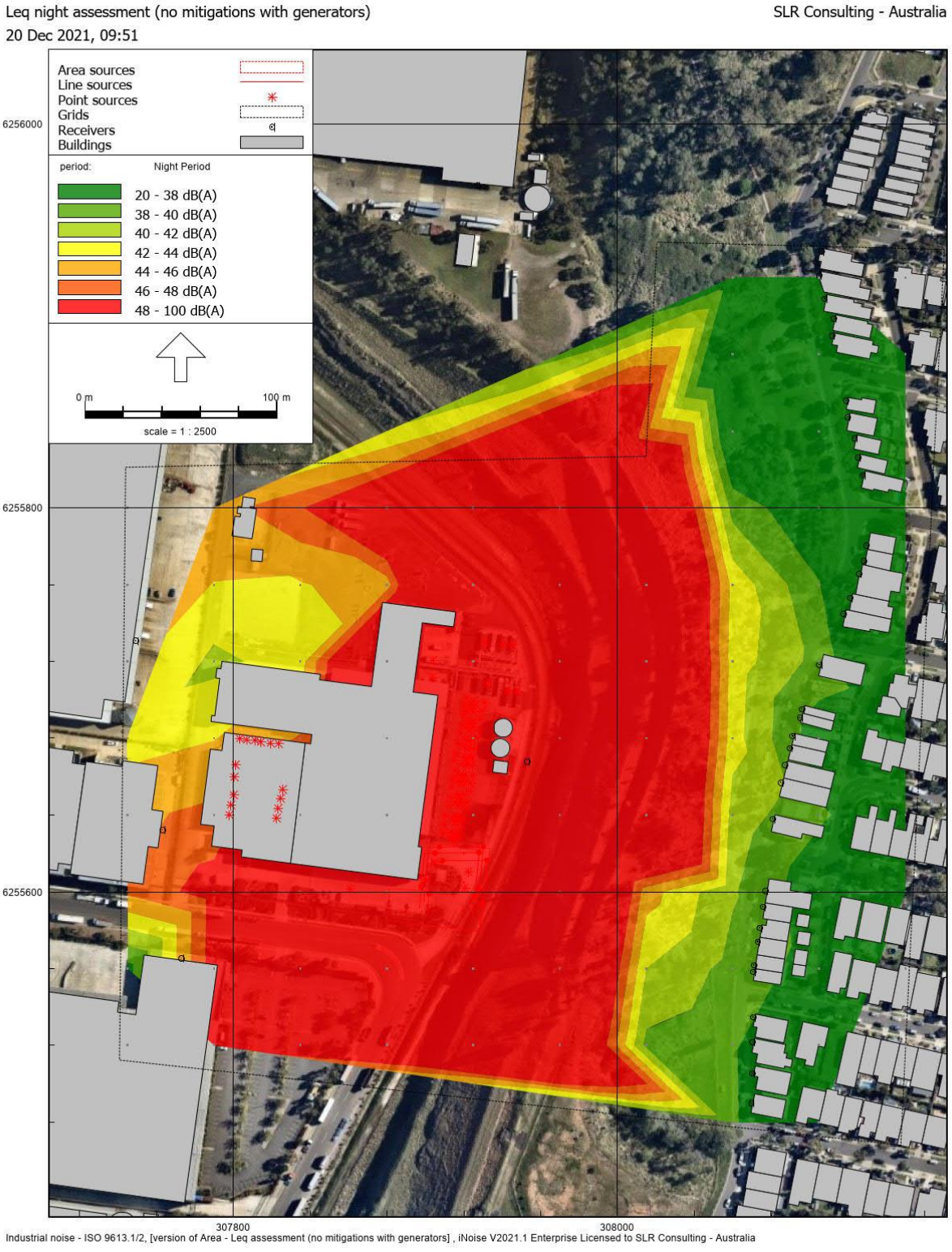


Table 10 Industrial Noise Assessment

Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
		Project Noise Trigger Level	**Predicted**	**Exceedance**	
R01	When in Use	65	52	-13	Yes
			52	-13	Yes
			52	-13	Yes
R02			46	-19	Yes
			46	-19	Yes
			46	-19	Yes
R03			48	-17	Yes
			48	-17	Yes
			48	-17	Yes
R04			50	-15	Yes
			50	-15	Yes
			50	-15	Yes
R05	Daytime	43	31	-12	Yes
	Evening	43	31	-12	Yes
	Night-time	38	31	-7	Yes
R06	Daytime	43	33	-11	Yes
	Evening	43	33	-11	Yes
	Night-time	38	33	-6	Yes
R07	Daytime	43	33	-10	Yes
	Evening	43	33	-10	Yes
	Night-time	38	33	-5	Yes
R08	Daytime	43	34	-9	Yes
	Evening	43	34	-9	Yes
	Night-time	38	34	-4	Yes
R09	Daytime	43	34	-10	Yes
	Evening	43	34	-10	Yes
	Night-time	38	34	-5	Yes
R10	Daytime	43	32	-11	Yes
	Evening	43	32	-11	Yes
	Night-time	38	32	-6	Yes
R11	Daytime	43	33	-10	Yes

	Evening	43	33	-10	Yes
	Night-time	38	33	-5	Yes
R12	Daytime	43	35	-8	Yes
	Evening	43	35	-8	Yes
	Night-time	38	35	-3	Yes
R13	Daytime	43	35	-8	Yes
	Evening	43	35	-8	Yes
	Night-time	38	35	-3	Yes
R14	Daytime	43	35	-8	Yes
	Evening	43	35	-8	Yes
	Night-time	38	35	-3	Yes
R15	Daytime	43	35	-8	Yes
	Evening	43	35	-8	Yes
	Night-time	38	35	-3	Yes
R16	Daytime	43	36	-8	Yes
	Evening	43	36	-8	Yes
	Night-time	38	36	-3	Yes
R17	Daytime	43	36	-7	Yes
	Evening	43	36	-7	Yes
	Night-time	38	36	-2	Yes
R18	Daytime	43	36	-7	Yes
	Evening	43	36	-7	Yes
	Night-time	38	36	-2	Yes
R19	Daytime	43	36	-7	Yes
	Evening	43	36	-7	Yes
	Night-time	38	36	-2	Yes
R20	Daytime	43	36	-7	Yes
	Evening	43	36	-7	Yes
	Night-time	38	36	-2	Yes
R21	Daytime	43	36	-7	Yes
	Evening	43	36	-7	Yes
	Night-time	38	36	-2	Yes
R22	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes
R23	Daytime	43	38	-5	Yes

	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R24	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R25	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R26	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R27	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R28	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R29	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R30	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes
R31	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R32	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R33	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R34	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R35	Daytime	43	38	-5	Yes

	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R36	Daytime	43	39	-4	Yes
	Evening	43	39	-4	Yes
	Night-time	38	39	+1	**No**
R37	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R38	Daytime	43	38	-5	Yes
	Evening	43	38	-5	Yes
	Night-time	38	38	0	Yes
R39	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes
R40	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes
R41	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes
R42	Daytime	43	37	-6	Yes
	Evening	43	37	-6	Yes
	Night-time	38	37	-1	Yes

The above assessment indicates that noise from the proposal is predicted to comply with the Project Noise Trigger Levels during the daytime, evening and night-time periods with the exception of a negligible 1dB exceedance at R36 (98 Daruga Avenue, Pemulway) during the night-time. The predicted exceedance is due to operations of the chillers on the east of the project site.

The operational scenarios modelled for the night-time period (with the most stringent criteria) assume a worst-case operational scenario. This means the 1dB exceedance is only likely to occur when there is a power outage and all generators including existing and proposed are operable. Given this exceedance will only occur in extreme situations, and will not occur during typical operations, it is considered negligible.

5.2 Sleep Disturbance

The predicted night-time L_{Amax} noise levels at the nearest residential receivers are shown in **Table 11**.

Table 11 Sleep Disturbance Assessment

Receiver Location	Noise Level L_{Amax} (dBA)			Below Screening Level
	Sleep Dist. Screening Level	**Predicted**	**Exceedance**	
R05	52	40	<0	Yes
R06	52	41	<0	Yes
R07	52	40	<0	Yes
R08	52	42	<0	Yes
R09	52	42	<0	Yes
R10	52	42	<0	Yes
R11	52	42	<0	Yes
R12	52	44	<0	Yes
R13	52	45	<0	Yes
R14	52	45	<0	Yes
R15	52	43	<0	Yes
R16	52	43	<0	Yes
R17	52	44	<0	Yes
R18	52	44	<0	Yes
R19	52	44	<0	Yes
R20	52	44	<0	Yes
R21	52	44	<0	Yes
R22	52	45	<0	Yes
R23	52	46	<0	Yes
R24	52	46	<0	Yes
R25	52	46	<0	Yes
R26	52	46	<0	Yes
R27	52	46	<0	Yes
R28	52	46	<0	Yes
R29	52	47	<0	Yes
R30	52	47	<0	Yes
R31	52	47	<0	Yes
R32	52	46	<0	Yes
R33	52	46	<0	Yes
R34	52	48	<0	Yes
R35	52	49	<0	Yes
R36	52	47	<0	Yes
R37	52	48	<0	Yes
R38	52	48	<0	Yes
R39	52	46	<0	Yes
R40	52	47	<0	Yes
R41	52	45	<0	Yes
R42	52	46	<0	Yes

The above assessment indicates that maximum noise events from the proposal are predicted to be below the sleep disturbance screening level at all surrounding residential receivers.

5.3 Traffic Increases on Surrounding Roads

Light and heavy vehicles would access the development directly from Bellevue Circuit. Given the data centre upgrade will not result in an increase in vehicles accessing the development, the potential noise impacts from traffic are expected to remain the same and will therefore not result in an increase in noise.

Increases of less than 2.0 dB represent a minor impact that is considered barely perceptible to the average person.

5.4 Noise Mitigation

Operational noise emissions from the proposal are generally predicted to comply with the PNTLs at the surrounding receivers and no specific mitigation measures are required.

6 Conclusion

SLR has been engaged to assess the potential operational noise emissions from the development extension of the Western Sydney Data Centre (WSDC) site located at 6 Bellevue Circuit, Greystanes NSW 2145. The project planning proposal addresses a change to the approved data centre (Lot 308 DP 1035614 and Lot 140 DP 1061621) to allow for planned data hall capacity, improving the overall operational efficiencies and provision of technology services to customers and the wider locality.

The assessment generally indicates compliance with the trigger levels at the nearby noise sensitive receivers with the exception of a 1dB exceedance during the night-time period at the residential property located at 98 Daruga Avenue, east of the project site. Given the negligible nature of this exceedance, no mitigation is deemed necessary for the proposal.

Based on the predicted levels, the proposal is considered appropriate from an acoustic standpoint.

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

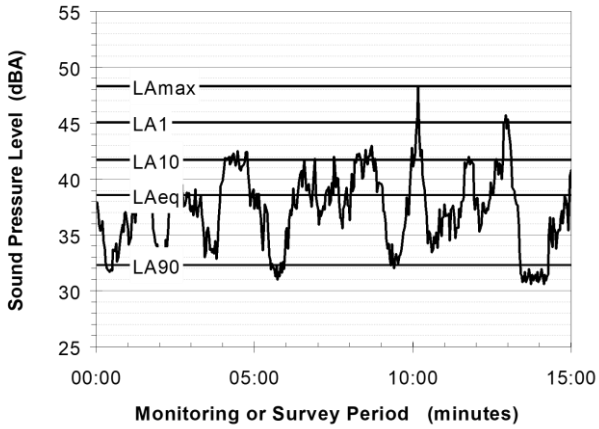
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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.

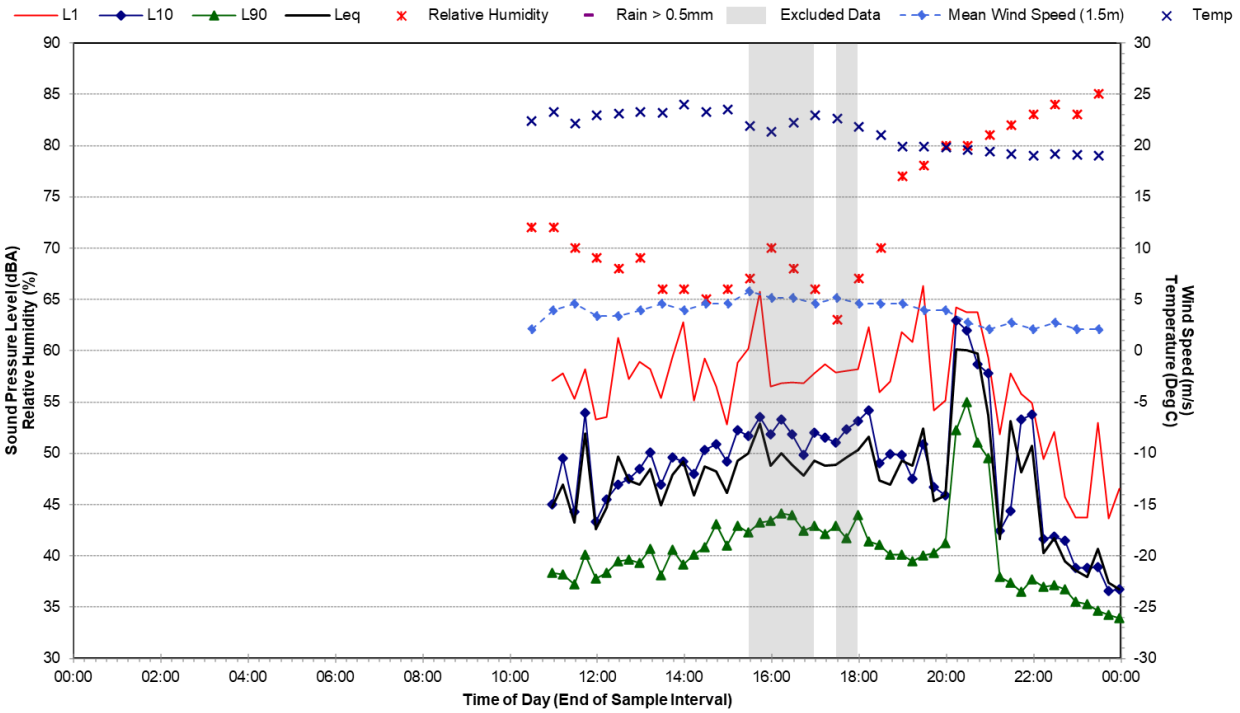
LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

APPENDIX B

Noise Monitoring Results

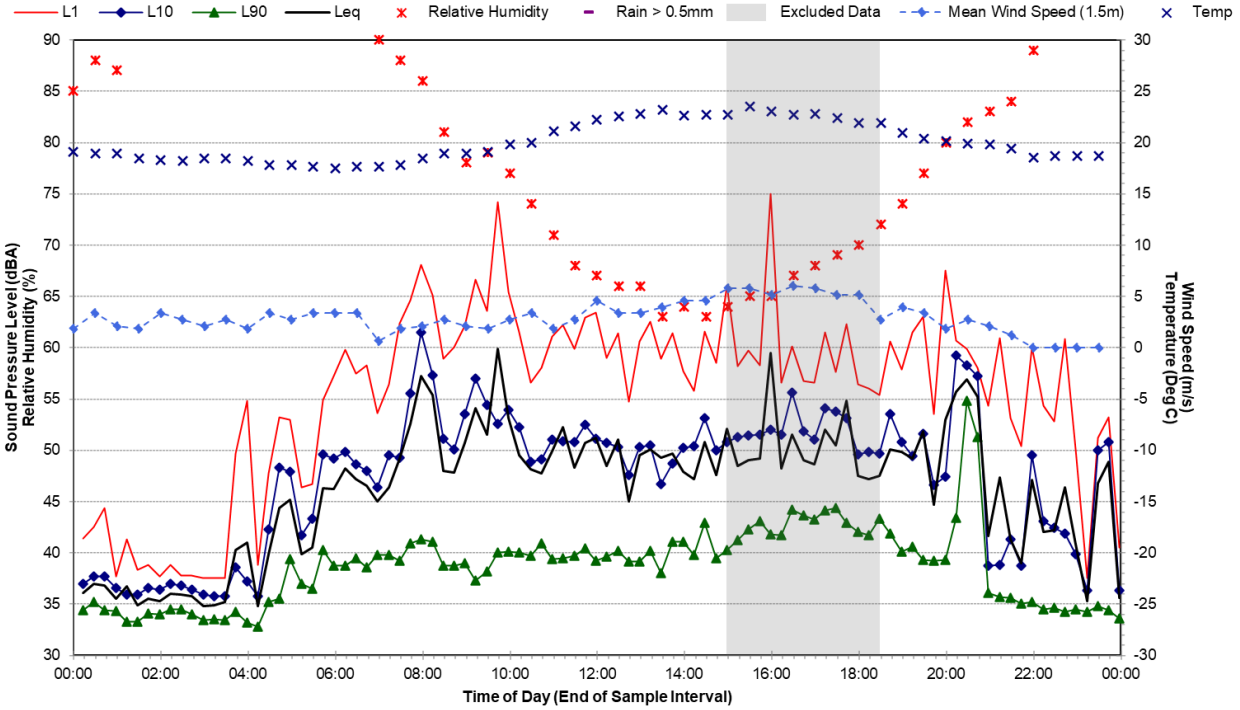
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Monday, 8 November 2021



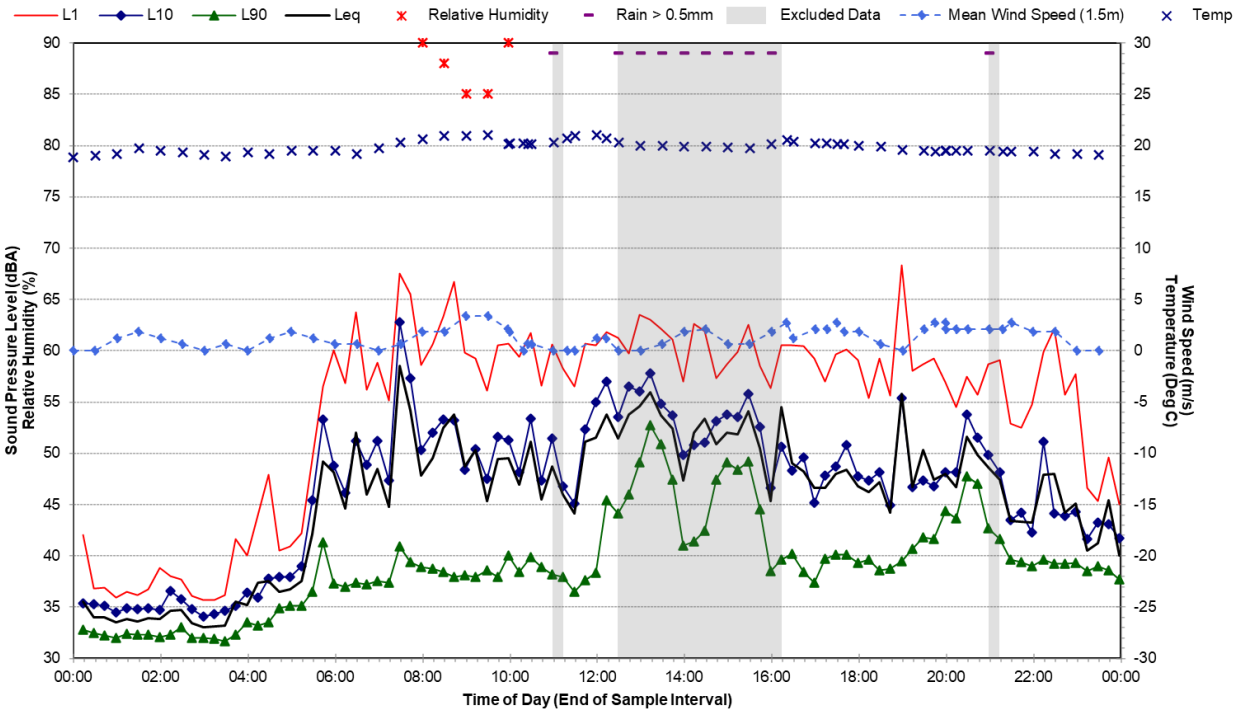
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Tuesday, 9 November 2021



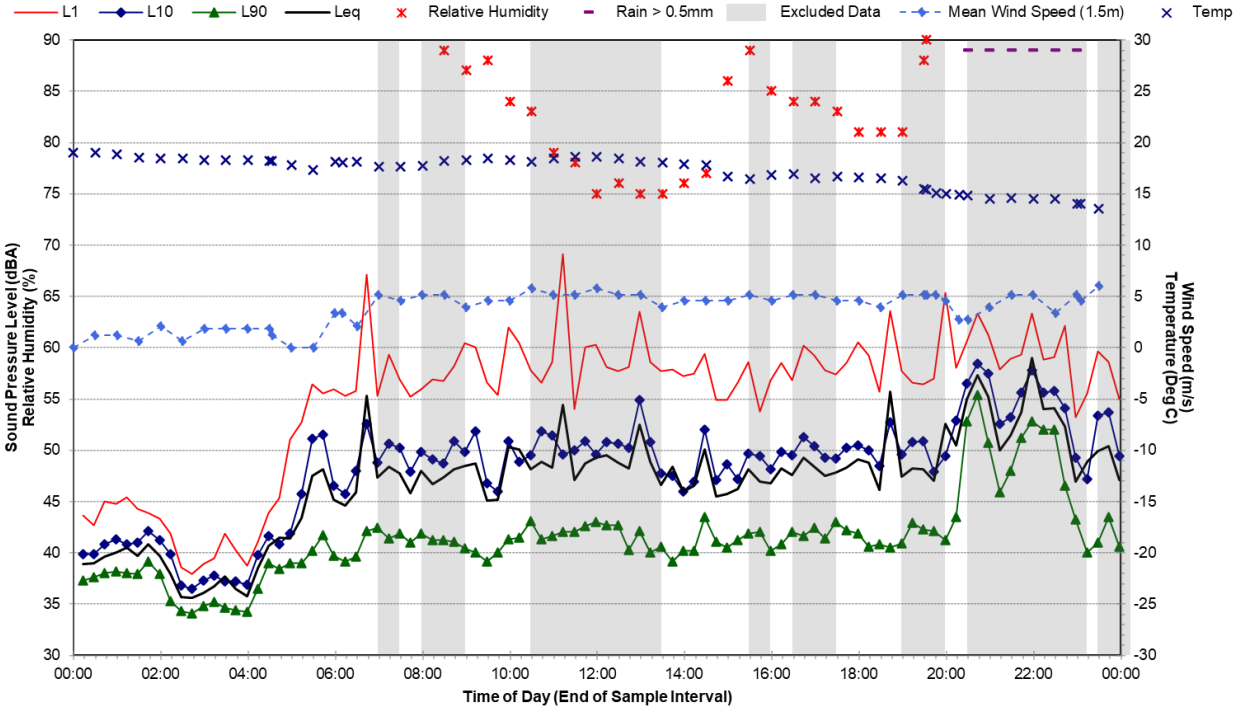
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Wednesday, 10 November 2021



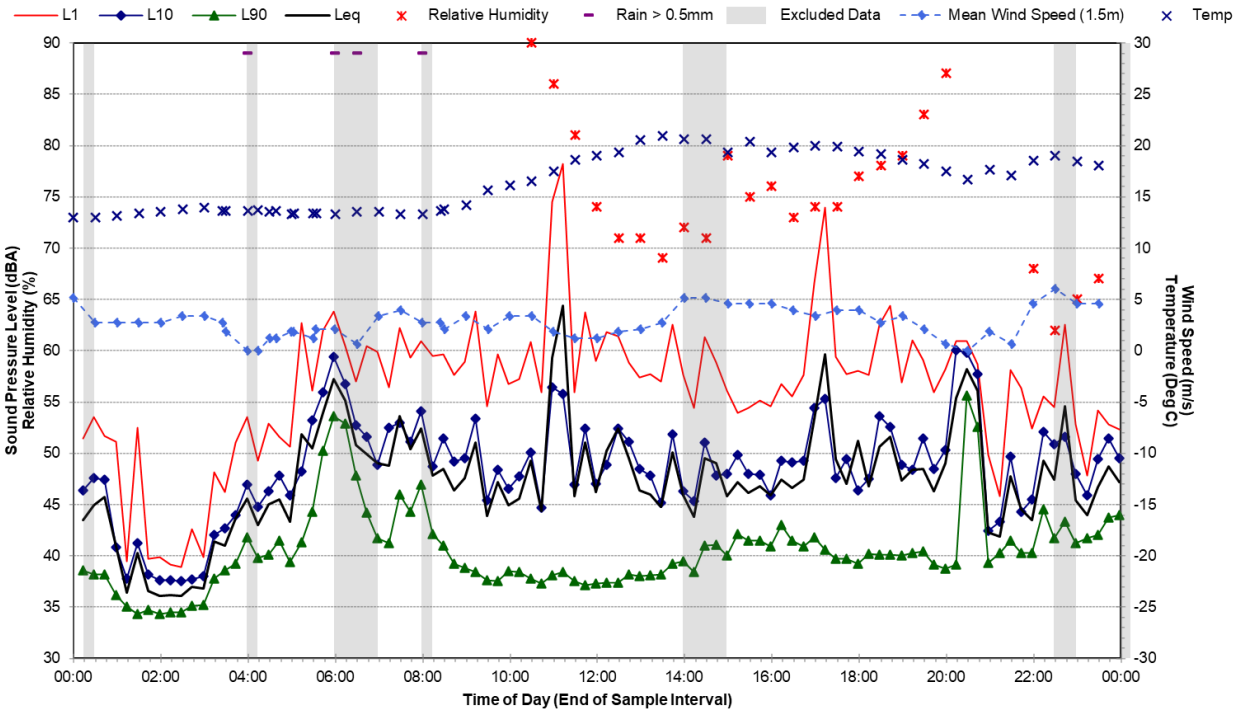
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Thursday, 11 November 2021



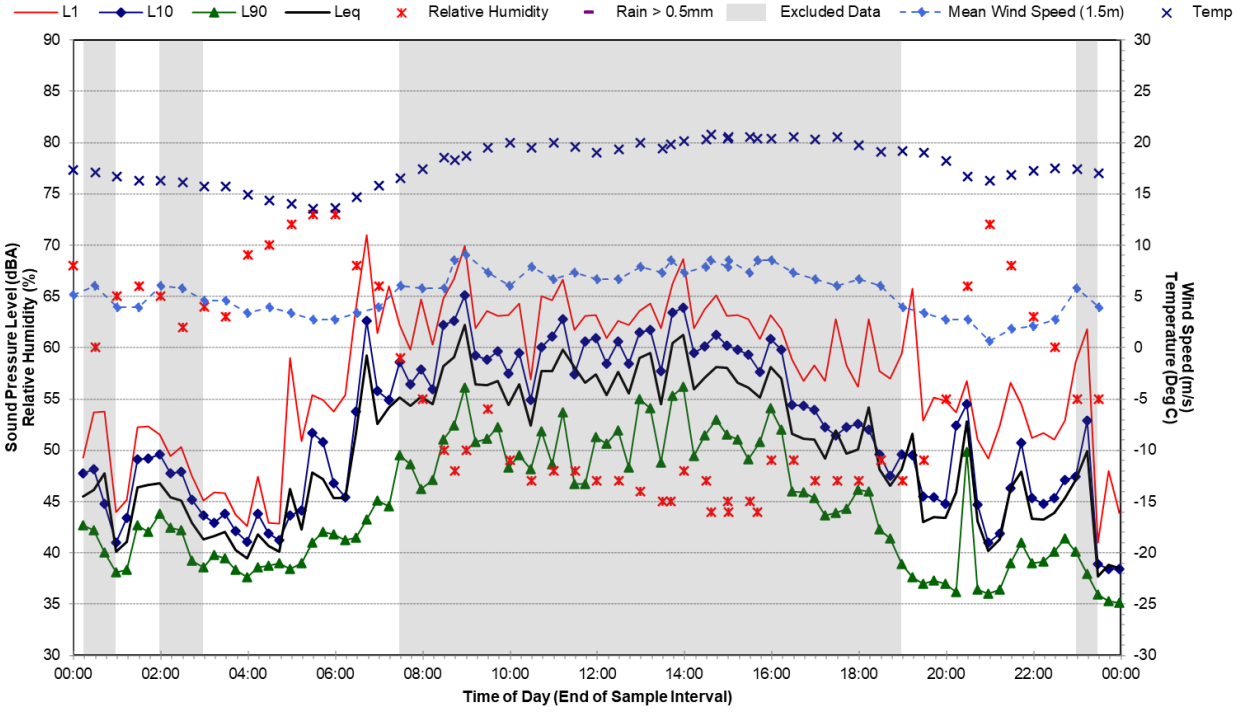
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Friday, 12 November 2021



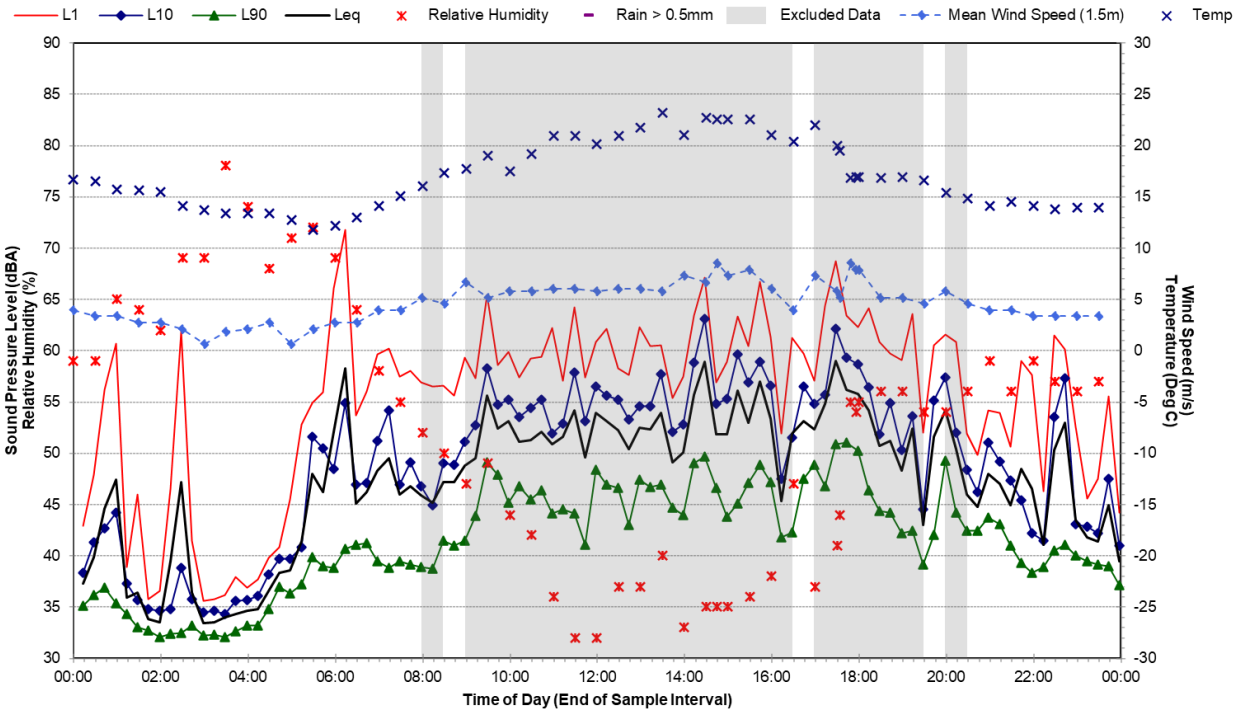
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Saturday, 13 November 2021



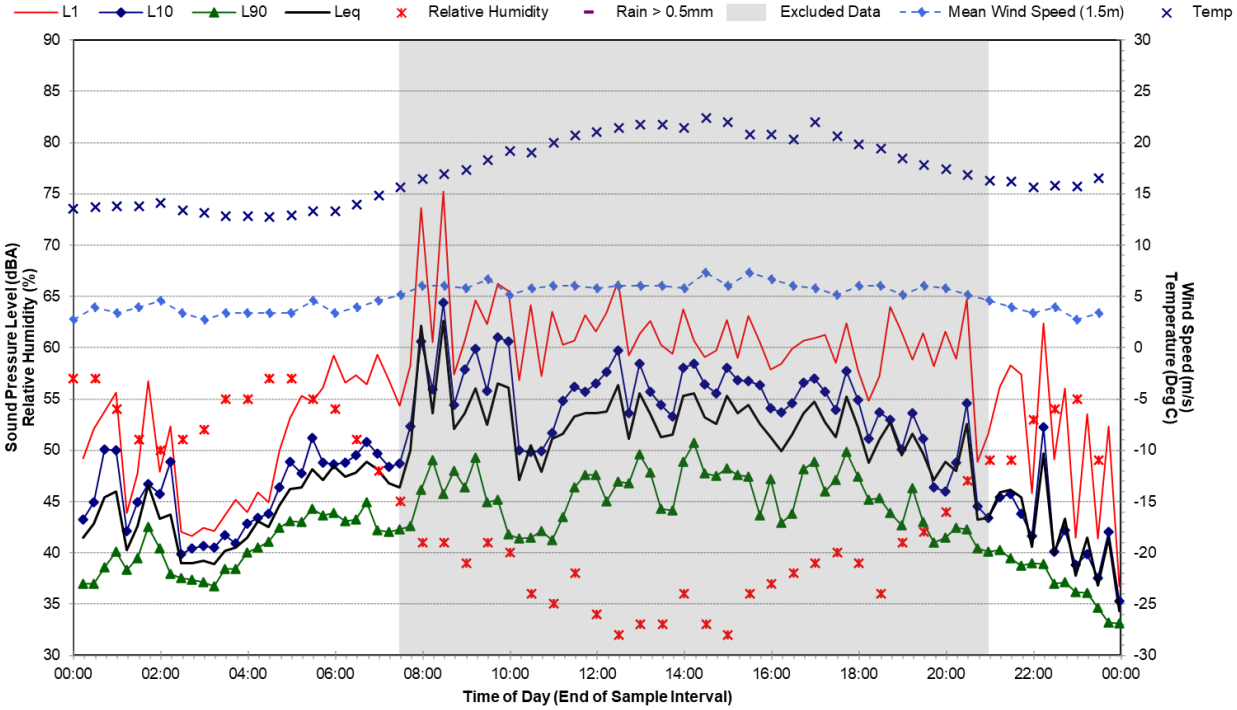
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Sunday, 14 November 2021



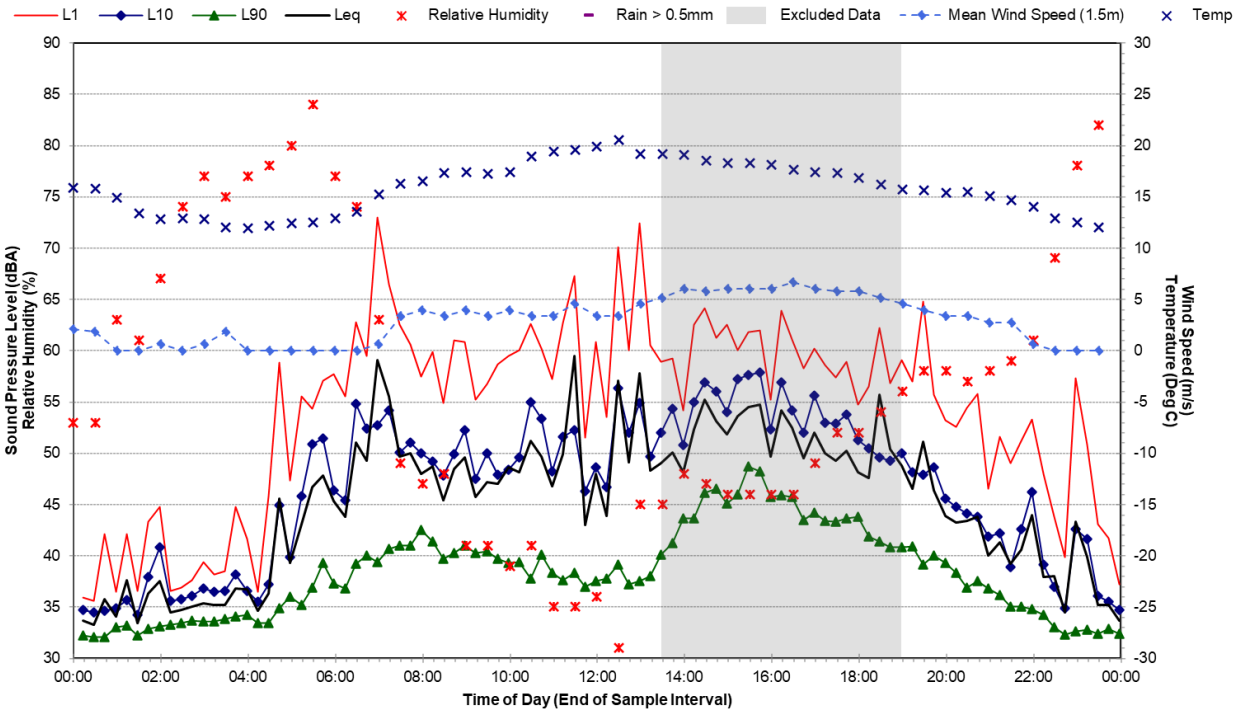
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Monday, 15 November 2021



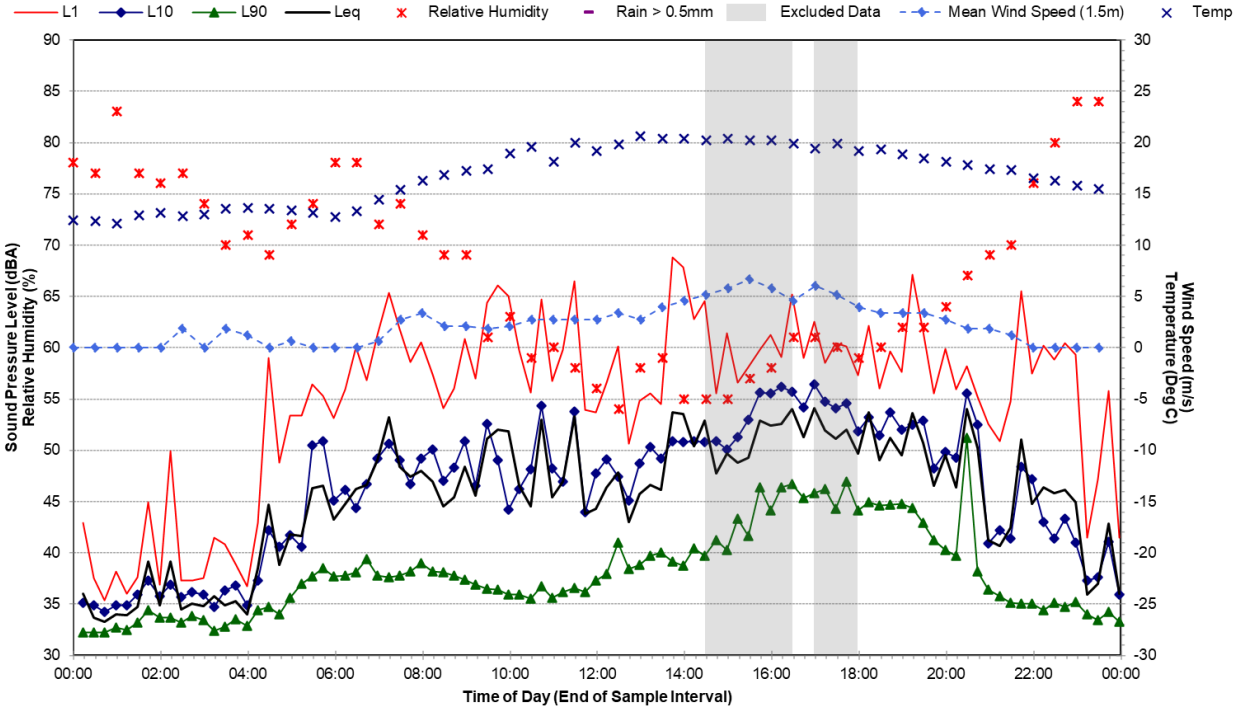
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Tuesday, 16 November 2021



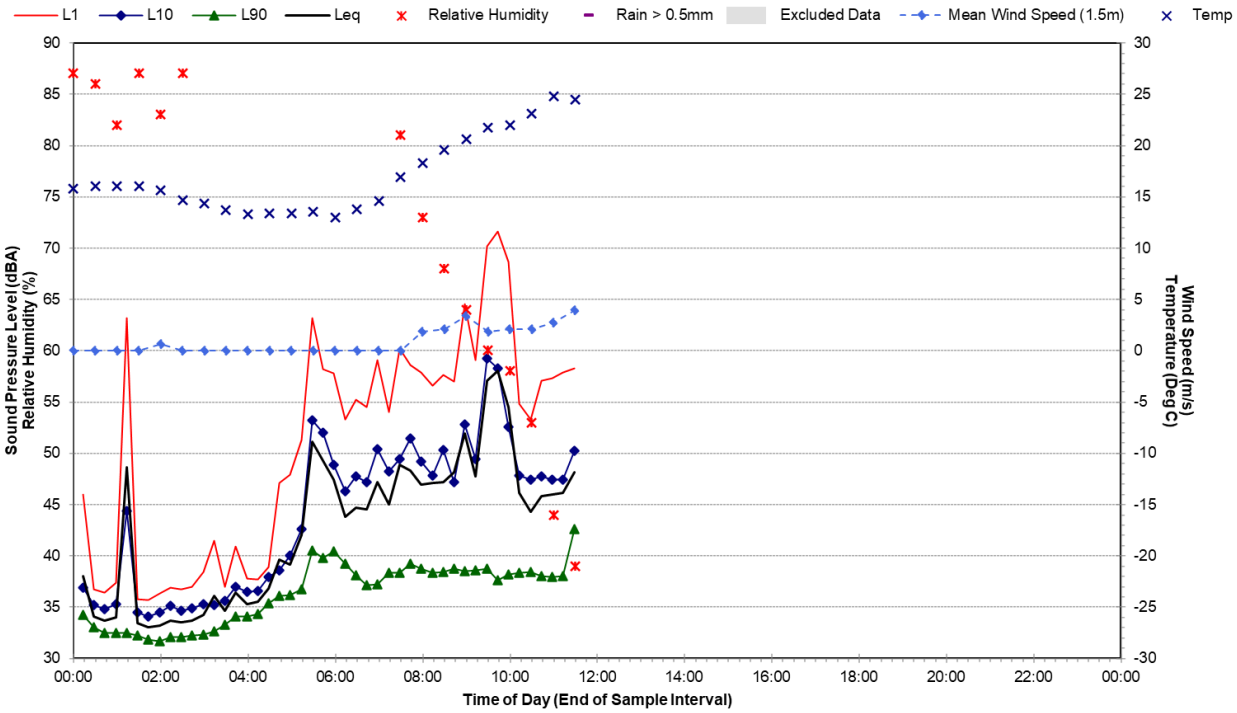
Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Wednesday, 17 November 2021



Statistical Ambient Noise Levels

88 Daruga Avenue, Pemulwuy - Thursday, 18 November 2021



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