

Noise and Vibration Assessment

Rosehill Recycled Water Scheme Extension

Smithfield to Horsley Park, NSW

Prepared For: Element Environment Pty Ltd

May 2026

MAC252543-01RP1V4



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Document Information

Noise and Vibration Assessment

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Smithfield to Horsley Park, NSW

Prepared for: Element Environment Pty Ltd

PO Box 1563

Warriewood NSW 2101

Prepared by: Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

www.mulleracoustic.com

PROJECT MANAGER	PREPARED BY	REVIEWED BY	DATE	REPORT NO
			21 May 2026	MAC252543-01RP1V4

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Element Environment Pty Ltd (Element), on behalf of coNEXA SYD Pty Ltd (coNEXA) to prepare a Noise and Vibration Assessment (NVA) to quantify potential noise emissions associated with the extension of the Rosehill recycled water scheme between Smithfield and Horsley Park, NSW (the 'project').

This assessment has been undertaken in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- NSW Department of Environment and Climate Change (DECCW) – NSW Interim Construction Noise Guideline (ICNG), July 2009;
- NSW Government – Transport for NSW (TfNSW), Construction Noise and Vibration Guideline (Roads), December 2024;
- NSW Department of Environment and Conservation (DEC) – NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline (the NSW vibration guideline), February 2006;
- NSW Environment Protection Authority (EPA), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures; and
- Australian Standard AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Project Description

2.1 Project Overview

The coNEXA group owns and operates the Rosehill Recycled Water Scheme (also referred to within the group as the AquaNet Recycled Water Scheme), comprising a recycled water plant at Fairfield (owned by AquaNet Sydney Pty Ltd (AquaNet)) and a recycled water reticulation network (owned by Rosehill Network Pty Ltd (Rosehill)).

The scheme was initially approved as a major project (MP07_0121) under the now-repealed Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)

The scheme receives treated effluent from Sydney Water and includes a recycled water treatment plant and an extensive pipeline network, producing high-quality non-potable water suitable for industrial use, supplying the Smithfield, Rosehill and Camellia precincts of Western Sydney.

NEXTDC Ltd (NEXTDC) is an established national developer and operator of data centres and is currently developing a network of facilities to achieve more than 3 gigawatts (GW) of data storage capacity. As part of its strategy, NEXTDC are currently seeking State significant development (SSD) consent to construct and operate the 'Western Sydney S4 facility' at Horsley Park, which will be capable of delivering up to 300 megawatts (MW) of data storage capacity.

While modern data centres implement advanced efficiency measures, they still require substantial cooling, with evaporative towers being the most effective. However, their reliance on large volumes of make-up water risks overdependence on Sydney's potable water supply, which could strain the water network and create vulnerabilities during drought or restrictions.

coNEXA, in partnership with NEXTDC, are developing an extension to the scheme to provide recycled water supply to cater for the demand of NEXTDC's facility.

coNEXA has identified the opportunity to extend the scheme to supply the NEXTDC S4 data centre with 16.6 megalitres per day (MLD) of recycled water. Technical assessments have confirmed the viability of this supply, which will be engineered to meet the data centre sector's stringent reliability requirements, targeting 99.999% supply resilience compared to the 98% standard for traditional potable water systems. The network will incorporate redundancy and adaptive capacity to ensure continuity in the face of climate variability, peak demand, and emergency conditions.

The existing scheme terminates at VISY Recycling (VISY) at 2 Herbert Street, Smithfield. A concept design alignment has been developed for the proposal, extending the network from the existing termination at Smithfield to the Western Sydney S4 facility in Horsley Park and includes:

- A 800mm diameter high-density polyethylene (HDPE) pipeline to transfer treated effluent from the Fairfield recycled water plant from the existing VISY connection at 2 Herbert Place, Smithfield to a proposed booster pump station at 46 Victoria Street, Smithfield.
- A 800mm diameter HDPE pipeline to transfer treated effluent from the pump station to a proposed reservoir site at 156-166 Walworth Road, Horsley Park.
- Dual HDPE pipelines (one 560mm and one 800mm diameter) supplying water from the reservoir to the NEXTDC facility via gravity.

An overview of the key elements of the project is provided in **Table 1**.

Table 1 Key Project Components	
Component	Details
Transfer pipeline – Section 1	Recycled water will be conveyed from the termination point of the existing network (2 Herbert Place, Smithfield) to the Smithfield booster pump station and then transferred to the Horsley Park reservoirs via a newly constructed 800mm diameter polyethylene (PE) rising main.
Smithfield booster pump station	A new booster pump station will transfer recycled water from the existing Rosehill recycled water scheme at Smithfield to the proposed reservoir at Horsley Park. The pumping system will operate in a duty/duty/standby configuration and be engineered to manage variable flow rates and seasonal demand fluctuations. This design will ensure reliable delivery of recycled water to the Western Sydney S4 facility while maintaining supply to existing AquaNet customers.
Reservoir storage	Three new reservoirs with a combined storage capacity of 30ML will be constructed to meet redundancy requirements, ensuring a continuous 24-hour recycled water supply during planned maintenance or unplanned outages. The primary inlet pipeline will deliver up to 16.6MLD of recycled water from the booster pump station into the reservoirs. Provision has been made for a secondary inlet connection to accommodate a future supplementary water source. Each reservoir will be connected to dual outlet pipelines that discharge via gravity into the distribution network. Isolation valves on each outlet will enable independent reservoir operation, flow balancing, and maintenance flexibility. To support safe and efficient operation, the reservoirs will be equipped with access hatches, roof vents and level instrumentation for structural protection and ongoing monitoring. Overflow and drain connections will manage high inflow events and facilitate routine cleaning.

Table 1 Key Project Components

Component	Details
	A dedicated sampling pump station will be installed at the reservoir site to enable water quality monitoring and dosing with sodium hypochlorite, maintaining consistent water quality within the reservoirs.
Dual pipeline – Section 2	A dual PE gravity main system, totalling 2.85km in length, will be constructed to deliver recycled water from the Horsley Park reservoirs to the Western Sydney S4 facility. The dual-pipe configuration is designed to ensure high reliability and built-in redundancy, meeting the stringent system resilience requirements necessary to maintain supply during both planned maintenance and unplanned outages.
Electrical connections	The existing network has the capacity to support the development without the need for upgrades. The proposed site architecture will include a new main switchboard/motor control centre (MCC) fed via an overhead to underground connection from the existing private pole. A new 500 kilovolt-ampere (kVA) distribution substation will be installed within the property boundary to enable a ring connection to the existing Endeavour Energy 11 kilovolt (kV) network. Both sites will be provided with new main switchboards/MCC's incorporating modern protection, control, and monitoring equipment, together with provisions for generator backup and automation hardware.

2.2 Project Location

The pipeline runs approximately 15.7km from the current connection point at VISY at 2 Herbert Place, Smithfield (Lot 2 DP 849480), heading westward to the NEXTDCS4 facility, located at 16 Johnston Crescent, Horsley Park (Lot 305 DP 1275011).

The pipeline begins in the Cumberland LGA and then crosses into the Fairfield LGA after passing beneath Prospect Creek. From there the pipeline:

- Follows Low Street, Robert Street, and Little Street before heading west to the booster pump station at 46 Victoria Street, Smithfield (Lot DP 230766).
- Continues along Victoria Street before turning north onto O'Connell Street.
- Travels west along Chifley Street until meeting Hassall Street, where it turns north and then heads west along Redfern Street to Walter Street.
- Travels north, before heading west along Frank Street.
- Diverts south down Elizabeth Street, briefly rerouting onto Victoria Street, before following Newton Road north and then west until it reaches Cowpasture Road.

- Runs south along Cowpasture Road before heading north at the roundabout along Trivet Street.
- Follows Chandos Road west, heads south along Ferrers Road, and west onto Redmayne Road.
- When reaching Walworth Road, it turns north-west to the reservoir storage site at 156-166 Walworth Road, Horsley Park (Lot 51 DP 1071120).
- After the reservoir storage site, the pipeline continues north-west along Walworth Road, then west down Burley Road.
- When it reaches Johnston Crescent, the pipeline travels south to connect to the proposed Western Sydney S4 facility at 16 Johnston Crescent, Horsley Park.

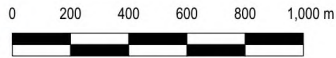
The proposed pipeline layout is illustrated in **Figure 1** for the eastern extent of the project site, and **Figure 2** for the western extent of the project site.



FIGURE 1
Locality Plan (East)
MAC252543-01
Aquanet Network Extension

KEY

- Pipeline Route
- Trenchless Installation
- Compound / Ancillary Sites



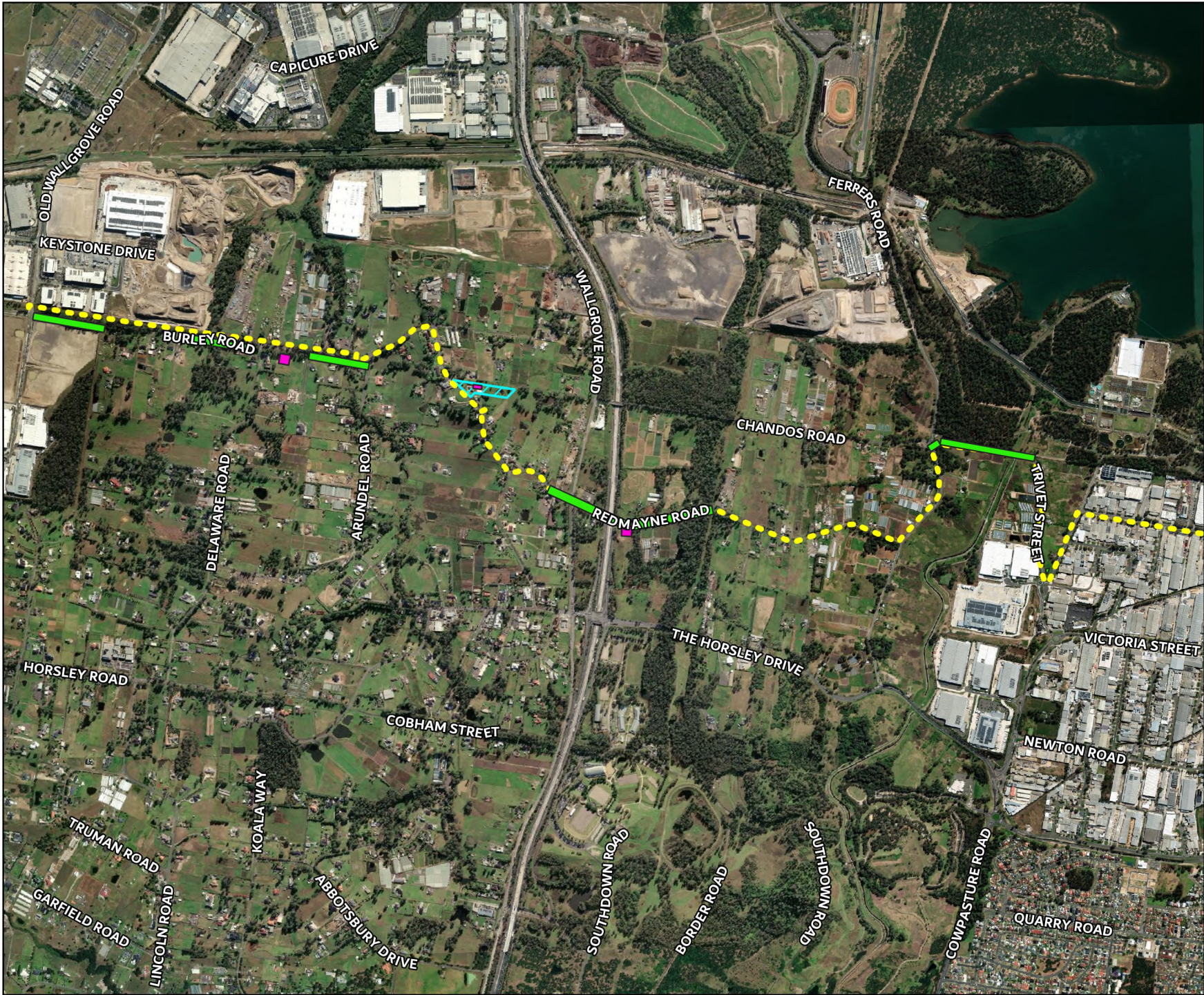


FIGURE 2
Locality Plan (West)
MAC252543-01
Aquanet Network Extension

KEY

- Pipeline Route**
- Primary Option
 - Alternate Option
 - Trenchless Installation
 - Compound / Ancillary Sites



2.3 Receiver Review - Noise Catchment Areas

A review of sensitive receivers in proximity to the project has been completed. Residential receivers are classified by their typical land use zoning in accordance with Table 2.3 of the NPI. Receivers that have a similar land use and ambient noise environment are collated into a representative Noise Catchment Area (NCA). A locality plan showing the position of these receivers in relation to the project is provided in **Figure 3**. The resulting NCA and classification of receivers are presented in **Table 2**.

Table 2 NCA and Receiver Type			
NCA	Receiver Type	Land Zoning / Description	Location
NCA 1	Residential	R2 Low Density Residential	Residential area east of Cumberland Hwy
		R3 Medium Density Residential	and south of Prospect Creek
	Passive Recreation	C2 Environmental Conservation	Kiola Street Reserve / Vineyard Reserve / Kenyons Bridge Reserve / Kaluna Reserve
	Active Recreation	RE1 Public Recreation	Smithfield Park
	Commercial	E4 General Industrial	Retail / Restaurants west of Cumberland Hwy
	Industrial		Smithfield Industrial Area
NCA 2	Residential	R2 Low Density Residential	Residential area north and south of Chifley St
	Education		Wetherill Park TAFE
	Active Recreation	RE1 Public Recreation	Market St Reserve / Shamrock Park / Victoria St Reserve
NCA 3	Commercial	E4 General Industrial	Wetherill Park Industrial Area
	Industrial		
NCA 4	Residential	SEPP (Precincts – Western Parkland City)	Large lot residential to west of Wetherill Park Industrial Area, off Redmayne Rd and Ferrers Rd
	Industrial	E4 General Industrial	Market Gardens off Redmayne Rd and Ferrers Rd
NCA 5	Residential	RU4 (Primary Production) SEPP (Precincts – Western Parkland City)	Large lot residential immediately to the east and west of M7 Motorway, off Wallgrove Rd and Redmayne Rd
	Worship	RU4 (Primary Production)	Spanish Community Bible Church
NCA 6	Residential	RU4 (Primary Production)	Large lot residential west of M7 Motorway, off Burley Rd and Walworth Rd
	Industrial	IN1 General Industrial	Hosley Park Industrial Area



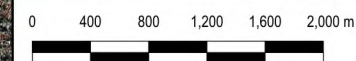
FIGURE 3
Noise Catchment Areas
MAC252543-01
Aquanet Network Extension

KEY

- Pipeline Route
- Logger Locations

Noise Catchment Areas

- NCA 1
- NCA 2
- NCA 3
- NCA 4
- NCA 5
- NCA 6



2.4 Operational Noise Sensitive Receivers

A review of sensitive receivers in proximity to the proposed pump station at 46 Victoria Street, Smithfield, and the reservoir pump station at 156–166 Walworth Road, Horsley Park has been completed, and summarised in **Table 3**. A locality plan showing the position of these receivers in relation to the project is provided in **Figure 4** for the Victoria Street pump station, and **Figure 5** for the reservoir pump station.

Table 3 Receiver Locations

Receiver	Description	Receiver Type	Coordinates (GDA94/MGA56)	
			Easting	Northing
Victoria Street Pump Station				
In1	42 Victoria St	Industrial Premise	309354	6252453
In2	39 Justin St	Industrial Premise	309342	6252473
Reservoir Pump Station				
R1	134-154 Walworth Rd	Residential Receiver	300954	6254422
R2	157-161 Walworth Rd	Residential Receiver	300854	6254416
R3	163-169 Walworth Rd	Residential Receiver	300830	6254476
R4	168 Walworth Rd	Residential Receiver	300941	6254508
R5	19-21 Burley Rd	Residential Receiver	301076	6254535
R6	126-132 Walworth Rd	Residential Receiver	301025	6254326
R7	129 Walworth Rd	Residential Receiver	300969	6254340



FIGURE 4
Receiver Map - Pump Station
MAC252543-01
Aquanet Network Extension

KEY

-  Pump Station
-  Receivers

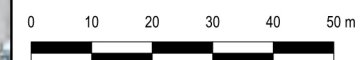




FIGURE 5
Receiver Map - Reservoir Site
MAC252543-01
Aquanet Network Extension

KEY

 Reservoir Site

 Receivers

0 20 40 60 80 100 m



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3 Noise Policy and Guidelines

3.1 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the NSW *Protection of the Environment Operations Act 1997*.

The objectives of the NPI are to provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals, promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified, and support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.
5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.
6. Monitor and report environmental noise levels from the development.

3.1.1 Project Noise Trigger Levels (PNTL)

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level (PINL)** and **Project Amenity Noise Level (PANL)** determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.1.2 Rating Background Level (RBL)

The Rating Background Level (RBL) is a parameter determined from noise monitoring and is used for assessment purposes. As per the NPI, the RBL is an overall single figure background level representing each assessment period (day, evening and night) over the noise monitoring period.

The measured RBLs relevant to the project are contained in **Section 4.1**.

3.1.3 Project Intrusiveness Noise Level (PINL)

The PINL ($L_{Aeq}(15min)$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

The NPI states that background noise levels to be measured are those that are representative of those present at the time of the noise assessment.

3.1.4 Project Amenity Noise Level (PANL)

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing on the project being assessed.

Additionally, Section 2.4 of the NPI states: “to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows”:

PANL for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level).

Furthermore, Section 2.4 of the NPI states “*where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required.*”

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 4**.

Table 4 Amenity Noise Levels

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq(period)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks.	See column 4	See column 4	5dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School Classroom	All	Noisiest 1-hour period when in use	35 (internal) 45 (external)
Hospital ward			
- internal	All	Noisiest 1-hour	35
- external	All	Noisiest 1-hour	50
Place of worship			
- internal	All	When in use	40
Passive Recreation	All	When in use	50
Active Recreation	All	When in use	55
Commercial premises	All	When in use	65
Industrial	All	When in use	70

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.

3.1.5 Maximum Noise Assessment Trigger Levels

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

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

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

3.2 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments.

The ICNG sets out procedures to identify and address the impacts of construction noise on residences and other sensitive land uses.

3.2.1 Standard Hours for Construction

Table 5 summarises the ICNG recommended standard hours for construction activities where the noise from construction is audible at residential premises.

Table 5 Recommended Standard Hours for Construction	
Period	Preferred Construction Hours
Day (Standard construction hours)	Monday to Friday - 7am to 6pm
	Saturdays - 8am to 1pm (only if required)
	Sundays or Public Holidays - No construction

The recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and / or to prevent environmental harm.

3.2.2 Construction Noise Management Levels

Table 6 reproduces the ICNG management levels for residential receivers. The construction noise management levels are the sum of the management level and relevant rating background level (RBL) for each specific assessment period.

Table 6 Noise Management Levels – Residential Receivers

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

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

Other sensitive land uses typically consider noise from construction to be disruptive when in use. **Table 7** reproduces the NMLs for other sensitive land uses based on the principle that the characteristic activities for each land use should not be unduly disturbed

To derive internal noise levels, a conservative reduction of 10dB across the façade is applied to the external noise level.

Table 7 Noise Management Levels – Other Land Uses

Land Use	Management Level, LAeq(15min)
Classrooms at Schools and other Educational Institutions	45dB (Internal)
Hospital Wards and Operating Theatres	45dB (Internal)
Places of Worship	45dB (Internal)
Active Recreation	65dB
Passive Recreation	60dB
Commercial Premises	70dB
Industrial Premises	75dB

3.3 Road Noise Policy

The road traffic noise criteria are provided in the Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in **Section 4.3.1**.

3.4 Vibration Standards and Guidelines

3.4.1 Structural Damage

British Standard BS7385:Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2”, gives guidance on the levels of vibration which building structures could be damaged. BS7385 also takes into consideration the frequency of the vibration which is critical when assessing the likelihood of building damage.

3.4.2 Human Comfort

Humans are far more sensitive to vibration than is commonly realised and may detect vibration levels which are well below levels that may cause damage to buildings or structures. Assessing vibration: a technical guideline was published in February of 2006 by the DECC and is based on guidelines contained in BS6472 – 1992, Evaluation of human exposure to vibration in buildings (1-80 Hz) and provides guidance on assessing vibration against human comfort.

The guideline defines three vibration types (continuous, impulsive and intermittent) and provides direction for assessing and evaluating the applicable criteria.

3.4.3 Heritage Items

German Standard DIN 4150 - 3: 1999 Structural Vibration – Part 3: Effects of vibration on Structures provides guideline values for vibration velocity to be used with evaluating the effects of short-term vibration on structures, including for sensitive structures such as heritage items.

It is noted that BS7385 does not specify recommended vibration limits for heritage items or other sensitive structures, however, BS7385 indicates that heritage buildings and structures should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is structurally unsound (following inspection) a more conservative cosmetic damage objective as per DIN 4150 - 3: 1999 would be applicable.

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4 Assessment Criteria

4.1 Existing Environment

To quantify the existing background noise environment(s) along the project alignment, unattended noise monitoring was conducted within the residential areas of each of the identified NCAs. The selected monitoring locations are shown in **Figure 3**, and are considered representative of the NCAs and residential receivers as per Fact Sheet B1.1 of the NPI.

The unattended noise survey was conducted in general accordance with the procedures described in Standards Australia AS 1055:2018, 'Acoustics – Description and Measurement of Environmental Noise'.

The measurements were carried out using Svantek 977 noise analysers. All acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dBA.

The results of long-term unattended noise monitoring are provided in **Table 8**. It is noted that the monitoring period for L1, L2 and L5 extended from Friday 7 November 2025 to Monday 17 November 2025. Background noise monitoring at locations L3 and L4 was previously completed during September 2023 and May 2024 respectively. It is noted that background monitoring was not undertaken within NCA 3 as the catchment comprises commercial and industrial receivers only.

The noise monitoring charts for the background monitoring assessment are provided in **Appendix B**. Data affected by adverse meteorological conditions have been excluded from the results in accordance with methodologies provided in Fact Sheet A4 of the NPI.

Table 8 Background Noise Monitoring Summary

NCA	ID	Measured background noise level, RBL, dBA			Measured dB LAeq(period)		
		Day	Evening	Night	Day	Evening	Night
NCA 1	L1	44	44	42	55	56	51
NCA 2	L2	42	41	35	52	50	49
NCA 4	L3	47	45	38	63	61	60
NCA 5	L4	56	51	44	71	68	68
NCA 6	L5	40	39	35	59	56	53

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology Horsley Park Equestrian Centre AWS (33.85°S 150.86°E).

Note 2: Background noise monitoring not undertaken in NCA 3 as receivers categorised as commercial and industrial premises only.

4.2 Operational Project Noise Trigger Levels (Criteria)

This section outlines the determination of PNTLs and Maximum Noise Assessment Trigger Levels in accordance with NPI methodology.

The operation of the project will include a booster pump station within an existing industrial building at 46 Victoria Street, Smithfield, and a dedicated sampling pump station adjacent to the reservoirs.

As per **Section 2.4**, the reservoir site is surrounded by large lot residential (rural residential) receivers, while the Victoria Street pump station is surrounded by industrial receivers.

4.2.1 Project Intrusiveness Noise Levels

The PINL for residential receivers adjacent to the reservoir site (NCA 6) are presented in **Table 9** and have been determined based on the RBL +5dBA and only apply to residential receivers.

Table 9 Project Intrusiveness Noise Levels

Location	Receiver Type	Period ¹	Measured RBL dB LA90	Adopted RBL dB LA90	PINL dB LAeq(15min)
Reservoir Site (NCA 6)	Residential	Day	40	40	45
		Evening	39	39	44
		Night	35	35	40

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Project Amenity Noise Levels

The relevant PANL for residential receivers and other receiver types (ie non-residential) potentially affected by the project are presented in **Table 10**.

Table 10 Amenity Noise Levels and Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period ¹	Recommended ANL dB LAeq(period)	ANL dB LAeq(period) ²	PANL dB LAeq(15min) ³
Residential (Reservoir)	Rural	Day	50	45	48
		Evening	45	40	43
		Night	40	35	38
Industrial (Pump Station)		When in use	70	65	68

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Project Amenity Noise Level equals the Amenity Noise Level -5dB as there is existing industry in the area.

Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.

4.2.3 Project Noise Trigger Levels

The PNTLs are the lower of either the PINLs or the PANLs. **Table 11** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

Table 11 Project Noise Trigger Levels				
Receiver Type	Assessment Period ¹	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential (Reservoir)	Day	45	48	45
	Evening	44	43	43
	Night	40	38	38
Industrial	When in use	--	68	68

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.4 Maximum Noise Trigger Levels

The maximum noise trigger levels shown in **Table 12** are based on night time RBLs and the maximum noise trigger levels as per Section 2.5 of the NPI. The maximum noise trigger levels are applied to transient noise events that have the potential to cause sleep disturbance.

Table 12 Maximum Noise Trigger Levels (Night)			
Residential Receivers			
LAeq(15min)		LAmax	
40dB LAeq(15min) or RBL + 5dB		52dB LAmax or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	40	RBL +15dB	50
Highest	40	Highest	52

Notes: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am. Morning Shoulder 5am to 7am; Evening Shoulder 10pm to 12am.

NPI identifies that maximum of the two values is to be adopted which is shown in bold font.

The NPI uses the maximum noise trigger levels as a screening tool to determine the potential for sleep disturbance. Essentially, exceeding the maximum noise trigger levels, does not result in sleep disturbance, but 'triggers' a further detailed assessment of maximum noise level (transient) events, considering additional factors such as the maximum noise level, the extent to which the maximum noise level exceeds the RBL, the number of times the event occurs, the distribution of events over the night time period and the time of night the event occurs.

To undertake a detailed maximum noise level assessment, the NPI provides additional guidance from the EPA NSW Road Noise Policy (RNP). Section 5.4 of the RNP outlines that a maximum internal noise level of 50-55dBA is unlikely to awaken people from sleep. Taking into account a 10dB loss for a partially open window an external level of 65dBA is unlikely to awaken internal occupants.

4.3 Construction Noise Management Levels

Noise Management Levels (NMLs) for construction activities are summarised in **Table 13**. Construction of the project would typically be undertaken during standard construction hours, however, works may be required during out of hours (OOH) work periods to minimise disruptions when constructing pipelines across state roads, busy local roads and for some horizontal directional drilling (HDD) operations.

Table 13 Construction Noise Management Levels

Receiver Type	NCA	Assessment Period ¹	RBL, dBA	NML dB LAeq(15min)
Residential Receivers	NCA 1	Standard Hours (Day)	44	54
		Out of Hours Evening	44	49
		Out of Hours Night	42	47
	NCA 2	Standard Hours (Day)	42	52
		Out of Hours Evening	41	46
		Out of Hours Night	35	40
	NCA 4	Standard Hours (Day)	47	57
		Out of Hours Evening	45	50
		Out of Hours Night	38	43
	NCA 5	Standard Hours (Day)	56	66
		Out of Hours Evening	51	56
		Out of Hours Night	44	49
	NCA 6	Standard Hours (Day)	40	50
		Out of Hours Evening	39	44
		Out of Hours Night	35	40
Education Institution	All	When in use	n/a	55 ²
Place of Worship	All	When in use	n/a	55 ²
Passive Recreation	All	When in use	n/a	60
Active Recreation	All	When in use	n/a	65
Commercial Premises	All	When in use	n/a	70
Industrial Premises	All	When in use	n/a	75

Note 1: Refer to **Section 3.2.1** for Standard Construction Hours.

Note 2: External noise level allowing for 10dB attenuation across the building façade.

4.3.1 Construction Sleep Disturbance

In accordance with the ICNG, where construction works are planned to extend over more than two consecutive nights, a quantitative assessment should be undertaken to analyse the maximum noise levels, and their potential for sleep disturbance impacts at residences.

The ICNG does not prescribe noise limits but states that guidance indicating the potential for sleep disturbance is in the *NSW Environmental Criteria for Road Traffic Noise* (EPA, 1999), which has been superseded by the NSW Road Noise Policy (EPA, 2011).

Section 5.4 of the RNP outlines that a maximum internal noise level of 50-55dBA is unlikely to awaken people from sleep. Taking into account a 10dB loss for a partially open window, an external level of 65dBA is unlikely to awaken internal occupants.

4.3.2 Construction Road Traffic Noise Criteria

Construction traffic generated by the project would typically comprise light vehicle movements associated with workforce travel to and from the site compounds / ancillary sites, and heavy vehicle movements associated with spoil removal, material delivery, pipe transport, trenchless support activities and waste transport. The travel routes would include both local and sub-arterial / arterial roads.

The road traffic noise assessment criteria for this assessment, as per the RNP, are presented in **Table 14**.

Table 14 Road Traffic Noise Assessment Criteria			
Road category	Type of project/development	Assessment Criteria – dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Local Roads	Existing residences affected by additional traffic on local roads generated by land use developments	55dB LAeq(1hr)	50dB LAeq(1hr)
	Existing residences affected by additional traffic on freeways/arterial/sub-arterial Roads generated by land use developments	60dB LAeq(15hr)	55dB LAeq(9hr)

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dBA, which is generally accepted as the threshold of perceptibility to a change in noise level.

4.3.3 Construction Vibration Criteria

Indicative safe working distances from sensitive receivers for typical items of vibration intensive plant are provided by the Transport for NSW (2024) Construction Noise and Vibration Guideline (CNVG). The safe working distances are quoted for “cosmetic” damage in accordance with BS7385.2-1993, heritage items in accordance with DIN4150 - 3: 1999, and human comfort in accordance with the Department of Environment and Conservation (2006) Assessing Vibration: a technical guideline. For detailed vibration criteria see **Appendix C**.

The items of equipment with the greatest potential for vibration during construction include pneumatic hammers and vibratory trench rollers during open trenching works, boring machines during micro tunnelling works, and vibratory rollers during reservoir construction works.

Table 15 provides the minimum working distances for the use of various vibration intensive sources to nearby receivers to meet cosmetic damage and human response criteria. It is important to note that the minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions.

Table 15 Minimum Working Distances for Vibratory Plant (m)

Plant item	Rating / Description	Minimum working distance		
		Cosmetic damage (BS7385)	Heritage Items DIN4150	Human response (OH&E)
Hydraulic Hammer	300kg (5-12t excavator)	2m	4m	7m
	900kg (12-18t excavator)	7m	14m	23m
	1600kg (18-34t excavator)	22m	44m	73m
Vibratory Roller	~50kN (Typically 1-2t)	5m	11m	15m to 20m
	~100 kN (Typically 2-4t)	6m	13m	20m
	~200 kN (Typically 4-6t)	12m	25m	40m
	~300 kN (Typically 7-13t)	15m	31m	100m
	>300 kN (Typically 13-18t)	20m	40m	100m
	>300 kN (>18t)	25m	50m	100m
Boring	≤800mm	2m (nominal)	4m	4m
Jackhammer / Plate Compactor	Hand held	1m (nominal)	2m	2m
Oscillating Roller	Hamm HD70 (Oscillating)	2m	2m	n/a
Static Roller	Hamm HD70 (Static)	1m	1m	n/a

Note: Source, CNVG (TfNSW, 2024).

5 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2026) noise modelling software. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613:1 and ISO 9613:2 including corrections for meteorological conditions using CONCAWE¹. The ISO 9613 standards are the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

¹ 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

5.1 Operational Noise Modelling Assessment

5.1.1 Operational Noise Modelling Scenarios

The operation of the project will include the following activities:

- A booster pump station will operate within an existing brownfield industrial building (portal frame, brick (bottom third) and Colorbond cladding (upper two thirds and roof)) at 46 Victoria Street, Smithfield. The booster pump station will comprise three Xylem E-XC125-300_25W centrifugal pumps (250kW rating); and
- A dedicated sampling pump station (concrete block construction) will be installed adjacent to the reservoirs, housing three Grundfos NBG 125-100-200/210 single-stage, centrifugal volute pumps (7.5kW rating).

Table 16 presents the sound power level for the proposed pumps, which were sourced from manufacturer's specifications. It is noted that only two pumps at the booster pump station (Victoria Street) and reticulation pump station (reservoir site) would run simultaneously, with one pump on standby.

Table 16 Acoustically Significant Sources - Sound Power Levels dBA (re 10^{-12} Watts)

Item	Number modelled per 15 minutes	Individual Sound Power Level	Total Sound Power Level	Source Height ¹
7.5kW Pump	2	70dB LAeq(15min)	75dB LAeq(15min)	1m
250kW Pump	2	93dB LAeq(15min)	98dB LAeq(15min)	1m
Pressure Relief Valve ²	1	98dB LAmax	98dB LAmax	1m

Note 1: Denotes height above ground level.

Note 2: LAmax noise level for MNLA.

The pump station noise emissions were modelled as emitting facades, applying the noise reduction levels presented in **Table 17**.

Table 17 Single Octave Façade Noise Reduction, dBA

Type	Octave Band Centre Frequency, Hz							
	63	125	250	500	1000	2000	4000	8000
Colorbond (Standard)	8	11	15	19	23	20	21	24
Concrete Block (nominally 150mm)	34	39	43	47	52	57	57	57

5.1.2 Meteorological Analysis

Noise emissions can be influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

Fact Sheet D of the NPI provides two options when considering meteorological effects:

- adopt the noise enhancing conditions for all assessment periods without an assessment of how often the conditions occur – a conservative approach that considers a source to receiver winds for all receivers and F class temperature inversions with wind speeds up to 2m/s at night; or
- determine the significance of noise enhancing conditions. This requires assessing the significance of temperature inversions (F and G Class stability categories) for the night time period and the significance of light winds up to 3m/s for all assessment periods during stability categories other than E, F or G.

Standard meteorological conditions and noise-enhancing meteorological conditions as defined in Table D1 of the NPI are reproduced in **Table 18**.

Table 18 Standard and Noise-Enhancing Meteorological Conditions	
Meteorological Conditions	Meteorological Parameters
Standard Meteorological Conditions	All periods: stability categories A–D with wind speed up to 0.5m/s at 10m AGL.
Noise Enhancing Meteorological Conditions	All periods: stability categories A–D with light winds (up to 3 m/s at 10m AGL). Night-time: stability categories A–D with light winds (up to 3m/s at 10m AGL) and/or stability category F with winds up to 2m/s at 10 m AGL.

A detailed analysis of the significance of noise enhancing conditions has not been undertaken and hence, the NPI noise enhancing meteorological conditions have been applied to the noise modelling assessment are presented in **Table 19**.

Table 19 Modelled Meteorological Parameters				
Assessment Condition1	Temperature	Wind Speed2/ Direction	Relative Humidity	Stability Class2
Day	20°C	3m/s all directions	50%	D
Evening	10°C	3m/s all directions	50%	D
Night	10°C	2m/s all directions	50%	F

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Implemented using CONCAWE meteorological corrections.

5.1.3 Annoying Characteristics

Fact Sheet C of the NPI provides guidelines for applying 'modifying factors' adjustments to account for annoying noise characteristics such as low-frequency, tonality, intermittent noise, irregular or noise of short duration. A detailed assessment of annoying characteristics has been undertaken for the project, is provided in full in **Appendix D** and summarised below. It is noted that due to the nature of the pump station operations, intermittent noise is unlikely to be a feature of the site and has not been considered further.

The analysis of low-frequency noise found that modelled noise levels from all sources exceeded the screening test of C-A weighted noise levels greater or equal to 15dB. Further analysis was undertaken to determine whether noise levels exceeded the threshold in any octave band. The results of the assessment indicated that Z weighted noise levels remained below the relevant thresholds for all octave bands for each receiver location. Hence, no correction for low-frequency noise is applied.

An assessment of tonality was undertaken to identify dominant tones associated with the operation of the pump station. The tonal noise correction applies when the level of an octave band exceeds the level of the adjacent band on either side by at least 5dB. The results of the tonality assessment demonstrates that the pump station operations do not result in dominant tones. Hence, no correction for tonality is applied.

5.2 Construction Overview

A summary of the main project elements is provided in the following sections.

5.2.1 Pipeline Installation

Section 1 – Pumping main – Smithfield to Horsley Park Reservoirs

A 800mm diameter HDPE pipeline will be installed from the existing connection at 2 Herbert Place, Smithfield, to the proposed booster station at 46 Victoria Street, Smithfield and onwards to the storage reservoirs. This section of the pipeline will be approximately 12.85km long.

The alignment includes HDD and microtunnel crossings at Prospect Creek, Cumberland Highway, M7 Motorway and Wallgrove Road. Additional trenchless installations are required at stormwater culverts, Sydney Water assets, the Ferrers Road roundabout, and at crossings of Jemena high-pressure gas pipelines at Eastern Creek.

Section 2 – Gravity main – Horsley Park Reservoirs to Western Sydney S4 facility (dual pipeline)

From the reservoir storage, the pipeline will comprise dual HDPE gravity mains totalling 2.85km and will extend to the NEXTDC facility. The alignment follows Walworth Road and Burley Road, running parallel to the Ausgrid easement.

Construction will primarily be open trench, with HDD crossings beneath Prospect Creek and key infrastructure.

5.2.2 Reservoir Installation

The reservoir site will be located at 156-166 Walworth Road, Horsley Park.

The facility will provide triple reservoir storage with a combined working capacity of 30ML, at an elevation of approximately 103m AHD Australian Height Datum (AHD). The site has been strategically selected to enable a gravity-fed recycled water supply to the NEXTDC facility.

The reservoir tanks will be fusion-bonded epoxy (FBE) or similar, bolted steel tanks or equivalent, fitted with access hatches, roof vents, and level instrumentation. Overflow and drain connections will be provided to manage extreme inflow events and facilitate periodic tank cleaning.

Each tank will hold 10ML, with a diameter of approximately 36m and a shell height of 11.5m.

5.2.3 Pump Station Installation

Booster pump station

A booster pump station will be installed in an existing brownfield industrial warehouse and office space at 46 Victoria Street, Smithfield. The site is approx. 1,170m² with the existing building structure comprising 800m² of the total site area. The new pump station is to be located within the existing industrial warehouse building.

Sampling pump station

A dedicated sampling pump station will be installed adjacent to the reservoirs to ensure that water quality within the storage is consistently maintained. The pump station is designed to draw water from the reservoirs and return it to the inlet structures of both reservoirs to achieve continuous turnover and mixing. It is noted that the final design has not been confirmed, and that the adopted design in this report represents a “worst-case” scenario for operational noise at the reservoir site.

5.3 Construction Duration

Subject to weather conditions, the pipeline installation is expected to take 14 to 18 months to construct, with the pump station and reservoirs to be constructed in a shorter time frame within the overall duration.

Work to install pipelines by open trenching will generally progress past individual properties within several days, although these activities may take longer to complete in areas with deeper trench sections or in conditions such as wet weather, difficult access, or hard rock.

Construction at the launch and receival pits for HDD and micro-tunnelling could take up to one month at each location, depending on ground conditions.

5.4 Construction Noise Modelling Scenarios

Construction activities considered to have the greatest potential for noise impacts on nearby receivers include:

- Scenario P1: Pipeline – open trench installation (standard processing work front);
- Scenario P2: Pipeline – open trench installation (hard rock variant);
- Scenario T1: Pipeline – horizontal directional drilling crossing (crossing launch and reception sites);
- Scenario T2: Pipeline – microtunnelling crossing (crossing launch and reception sites);
- Scenario R1: Reservoir Site – peak civil work / earthworks;
- Scenario R2: Reservoir Site – tank erection and structural works;

- Scenario S1: Victoria Street Pump Station – peak civil work / earthworks; and
- Scenario A1: Ancillary Facilities and Compounds – in operation throughout construction period.

Typical plant and equipment, along with the fleet Sound Power Level (SWL) for each of the construction activities are provided in **Table 20**, including maximum noise levels for potential sleep disturbance effects during trenchless installation (Scenarios T1 and T2). The fleet Sound Power Levels were sourced from the TfNSW Construction and Maintenance Noise Estimator Tool (CMNET), where available, or from in-field measurements at similar project sites.

It is noted that the precise locations and types of equipment used for construction are not known in detail at this stage of the project design. Hence, the construction fleet for each activity was modelled across the potential extent of each work area, with all plant and equipment operating simultaneously and at maximum capacity for the duration of the assessment period. It is noted that typical construction plant and equipment are unlikely to operate simultaneously but may be used sequentially across each part of the construction area. On that basis, this report provides a broad assessment of the likely worst-case impacts from each stage of the construction works.

It is also noted that Scenario A1 (Ancillary Facilities and Compounds) has been modelled / assessed as occurring simultaneously with other construction works, and not as stand-alone activities.

Table 20 Construction Scenarios and Fleet Sound Power Levels, dB LAeq(15min)

Item of Equipment	SWL dBA	Construction Scenario						
		P1	P2	T1	T2	R1	R2	S1
Light Vehicles	88	x6/hr	x6/hr	x6/hr	x6/hr	x6/hr	x6/hr	x6/hr
Generator	103	✓	✓	✓	✓	✓	✓	✓
Truck – Tipper	104	x2/hr	x2/hr	x2/hr	x2/hr			
Truck – Semi / Tanker	103	x1/hr	x1/hr	x1/hr	x1/hr			
Excavator (20t)	100							✓
Excavator (30t)	104	✓	✓	✓	✓	✓	✓	✓
Excavator / Hammer	113		✓					
Excavator (45t)	107					✓	✓	
Backhoe	104	✓	✓					
Trench Roller	103	✓	✓					
Plate Compactor	104	✓	✓					
Water Cart	102	✓	✓	✓		✓	✓	
Pump	94	✓	✓	✓				
Welding / Generator	107	✓	✓			✓	✓	✓
Hand Tools	105	✓	✓					
HDD Drill	105			✓				
Drill Fluid Plant	101			✓				
Boring Machine	107				✓			
Vacuum Truck	106				✓			
Bulldozer	111					✓	✓	
Dump Truck	105					x3	x3	
Padfoot Roller (20t)	109					✓	✓	
Grader	113					✓	✓	
Smooth Drum Roller	107					✓	✓	
Crane	110						✓	
Franna	98						✓	
Hydraulic Jack	96						✓	
Concrete Truck / Pump	109							✓
Total Fleet SWL¹, dBA		114	116	112	113	118	119	112
L_{Amax} Noise Level, dBA		n/a	n/a	115	115	n/a	n/a	116²

Note 1: Includes an adjustment for duration.

Note 2: Ancillary site in use during trenchless installation.

5.5 Construction Road Traffic Noise Modelling

It is estimated that the project would generate the following traffic volumes:

- Heavy vehicles: up to 60 one-way movements per day (approximately 30 arrivals and 30 departures) associated with spoil removal, material delivery, pipe transport, trenchless support activities and waste transport;
- Light vehicles: approximately 20 movements per day (approximately 10 arrivals and 10 departures) associated with workforce travel to and from site compounds; and
- Peak hours: typically at shift start and finish, with an indicative peak of:
 - four to six light vehicle movements per hour, and
 - up to six heavy vehicle movements per hour.

Due to the low traffic volume generated by the project, road traffic noise calculation methods such as Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) by Department of Transport (UK) 1988 or Traffic Noise Model (TNM) by the United States Department of Transport, Federal Highway Administration are not considered appropriate as they are primarily intended to calculate noise emissions from motorways and highways. Whilst each method has a low volume correction, the project traffic volume is out of the scope of these methods.

Therefore, road traffic noise has been modelled using iNoise modelling software using ISO 9613-1 and ISO 9613-2 calculation methods, representing the road traffic as “moving sources” along the transport route using the parameters presented in **Table 21**.

Table 21 Road Traffic Noise Modelling Parameters

Noise Source/Item	Lw dBA re 10 ⁻¹² W	Local Roads		Sub-arterial / Arterial		Speed, km/h	Source Height, m ¹
		Day	Night	Day	Night		
Light Vehicles	96 ²	6	6	20	20	50	0.5
Heavy vehicle	102 ²	6	6	30	30		1.5

Note: Day period 7am to 10pm, night period 10pm to 7am.

Note 1: Height above ground level.

Note 2: Lw for vehicles dependent on speed, due to factors including tire noise and aerodynamic noise.

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6 Assessment Results

6.1 Operational Noise Results

Noise predictions from the Victoria Street Pump Station and Reservoir Site Pump Station to surrounding potentially sensitive receivers to the project site have been completed and are presented in **Table 22**.

The results of the assessment demonstrate that operational noise levels from the Victoria Street Pump Station and Reservoir Site Pump Station are anticipated to achieve the PNTLs at all assessed receiver locations.

Table 22 Noise Predictions – All Receivers¹

Location	Predicted Noise Level	PNTL			Compliant
	dB LAeq(15min)	dB LAeq(15min)			
	(All Assessment Periods ¹)	Day	Evening	Night	
Victoria Street Pump Station					
In1	41	68 (when in use)			✓
In2	40	68 (when in use)			✓
Reservoir Site Pump Station					
R1	<30	45	43	38	✓
R2	<30	45	43	38	✓
R3	<30	45	43	38	✓
R4	<30	45	43	38	✓
R5	<30	45	43	38	✓
R6	<30	45	43	38	✓
R7	<30	45	43	38	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

6.1.1 Maximum Noise Level Assessment

In assessing maximum noise events, typical L_{Amax} noise levels from transient events were assessed at the nearest residential receivers to the Reservoir Site Pump Station. For the maximum noise level assessment, a sound power level of 98dBA for a pressure valve release was adopted for maximum noise level (L_{Amax}) events during the night period.

Predicted noise levels from LAeq(15min) and L_{Amax} events for assessed receivers are presented in **Table 23**. Results identify that the maximum noise trigger levels will be satisfied for all assessed receivers.

Table 23 Maximum Noise Level Assessment (Night, Morning Shoulder, Evening Shoulder)¹

Receiver	Predicted Noise Level		Maximum Trigger Levels		Compliant
	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	
R1	<30	<30	40	52	✓
R2	<30	<30	40	52	✓
R#	<30	<30	40	52	✓
R4	<30	<30	40	52	✓
R5	<30	<30	40	52	✓
R6	<30	<30	40	52	✓
R7	<30	<30	40	52	✓

Note 1: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am. Morning Shoulder 5am to 7am; Evening Shoulder 10pm to 12am.

6.2 Construction Noise Results

Construction noise levels have been predicted for sensitive receiver locations for each of the construction scenarios described in **Section 5.4**. A summary of the predicted LAeq(15min) noise emissions is presented for the most affected receiver location for each NCA receiver type in **Table 24**. Predicted levels exceeding the NMLs are displayed **BOLD** text.

Table 24 Summary of Noise Assessment Results – Most Affected Receivers

Receiver Type	Period	NML (dB LAeq)	Highest Predicted dB LAeq Per Scenario ¹						
			P1	P2	T1	T2	R1	R2	S1
NCA 1 – Smithfield Suburban Residential Area / Industrial Area									
Residential	Standard	54	71	73	76	77	n/a	n/a	35
	OOH Evening	49	n/a	n/a	76	77	n/a	n/a	n/a
	OOH Night	47	n/a	n/a	76	77	n/a	n/a	n/a
Passive Recreation	When in use	60	61	63	60	60	n/a	n/a	33
Active Recreation	When in use	65	50	52	49	50	n/a	n/a	34
Commercial	When in use	70	67	60	55	56	n/a	n/a	43
Industrial	When in use	75	74	76	74	76	n/a	n/a	78
NCA 2 – Wetherill Park Suburban Residential Area									
Residential	Standard	52	64	68	63	63	n/a	n/a	34
	OOH Evening	46	n/a	n/a	63	63	n/a	n/a	n/a
	OOH Night	40	n/a	n/a	63	63	n/a	n/a	n/a
Educational Institute	When in use	55 ²	59	59	59	59	n/a	n/a	n/a
Active Recreation	When in use	65	58	61	56	56	n/a	n/a	42
NCA 3 – Wetherill Park Industrial Area									
Commercial	When in use	70	47	49	58	59	n/a	n/a	n/a
Industrial	When in use	75	64	67	77	78	n/a	n/a	n/a
NCA 4 – Horsley Park Large Lot Residential – West of Wetherill Parl Industrial Area									
Residential	Standard	57	62	64	55	56	n/a	n/a	n/a
	OOH Evening	50	n/a	n/a	55	56	n/a	n/a	n/a
	OOH Night	43	n/a	n/a	55	56	n/a	n/a	n/a
Industrial	When in use	75	63	66	48	49	n/a	n/a	n/a
NCA 5 – Horsley Park Large Lot Residential – Adjacent to M7 Motorway									
Residential	Standard	66	67	70	70	72	56	56	n/a
	OOH Evening	56	n/a	n/a	70	72	n/a	n/a	n/a
	OOH Night	49	n/a	n/a	70	72	n/a	n/a	n/a
Place of Worship	When in use	55 ²	60	62	65	66	42	42	n/a
NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway									
Residential	Standard	50	65	68	53	53	73	74	n/a
	OOH Evening	44	n/a	n/a	53	53	n/a	n/a	n/a
	OOH Night	40	n/a	n/a	53	53	n/a	n/a	n/a
Industrial	When in use	75	60	63	58	58	35	36	n/a

Note 1: Exceedance of relevant NMLs highlighted and shown in **BOLD**.

Note 2: Allows for a 10dB façade indoor/outdoor correction.

The results of the assessment demonstrate that $L_{Aeq}(15min)$ construction noise emissions would be up to 25dB above the relevant NMLs for residential receivers during standard work periods, with the highest $L_{Aeq}(15min)$ noise levels predicted at up to 77dB at residential receivers in NCA 1 and NCA 2 during microtunnelling works. Furthermore, construction noise emissions during HDD and microtunnelling works are predicted to exceed the highly affected NML of 75dB $L_{Aeq}(15min)$ at the nearest residential receivers in NCA 1 and NCA 2.

During OOH evening and OOH night works (HDD and microtunnelling), construction noise emissions would be up to 28dB and 30dB above the relevant NMLs respectively for residential receivers in NCA 1 and NCA 2.

The construction noise emissions are also predicted to exceed the NMLs at several non-residential receivers, including:

- Passive recreation areas (NCA 1) during open trench installation;
- Educational institutions (NCA 2) during open trench installation and trenchless installation;
- Places of worship (NCA 5) during open trench installation and trenchless installation; and
- Industrial premises in NCA 1 during open trench installation (hard rock variant) and trenchless installation, and in NCA 3 during trenchless installation.

Further analysis of the potential noise impacts, including affected distances and number of potentially affected receivers, is provided in the following sections for each construction activity.

6.2.1 Pipeline - Open Trench Installation

Open trench installation works (standard processing work front and hard rock variant) are expected to be undertaken across the project alignment during standard construction hours only. A summary of the affected distances for potentially sensitive receivers during open trench installation is presented for each NCA below. For detailed mapping of the affected areas, noise contours for open trench installation are presented in **Appendix E**.

NCA 1 – Smithfield Suburban Residential Area / Industrial Area

Within NCA 1, LAeq(15min) noise emissions from open trenching works are predicted at up to 71dB (17dB exceedance of NML) at the nearest residential receivers during standard processing front works, and up to 73dB (19dB exceedance of NML) during hard rock variant works.

The affected distances for residential and other sensitive receivers are provided in **Table 25**.

Table 25 Affected Distances – Open Trench Installation – NCA 1				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	P1 - Standard Processing	P2 - Hard Rock Variant
NCA 1 – Smithfield Suburban Residential Area / Industrial Area				
Residential	Standard Hours	54	~135m	~190m
	Highly Affected	75	~10m	~10m
Passive Recreation	When in use	60	~60m	~75m
Active Recreation	When in use	65	~30m	~40m
Commercial Premises	When in use	70	~25m	~30m
Industrial Premises	When in use	75	~10m	~10m

The results of the assessment demonstrate that residential receivers within approximately 135m and 190m of the project alignment may experience noise levels above the NMLs during open trench installation, for standard processing front works and hard rock variant respectively. It is noted that noise levels are not predicted to exceed the highly affected NML of 75dB LAeq(15min) at any residential receivers during open trench installation, within NCA 1.

For other receiver types (non-residential), construction noise levels are predicted to exceed the relevant NMLs for passive recreation areas within 60m of the project alignment for standard processing front works, and 75m for the hard rock variant, while industrial premises within 10m of the open trenching works (hard rock variant) are anticipated to experience noise levels above the relevant NMLs.

Construction noise emissions during open trenching works are predicted to meet the NMLs for all active recreation areas and commercial premises within NCA 1.

NCA 2 – Wetherill Park Suburban Residential Area

Within NCA 2, LAeq(15min) noise emissions from open trenching works are predicted at up to 64dB (12dB exceedance of NML) at the nearest residential receivers during standard processing front works, and up to 68dB (16dB exceedance of NML) during hard rock variant works.

The affected distances for residential and other sensitive receivers are provided in **Table 26**.

Table 26 Affected Distances – Open Trench Installation – NCA 2				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	P1 - Standard Processing	P2 - Hard Rock Variant
NCA 2 – Wetherill Park Suburban Residential Area				
Residential	Standard Hours	52	~55m	~70m
	Highly Affected	75	n/a	n/a
Educational Institution	When in use	55 ¹	~35m	~35m
Active Recreation	When in use	65	~20m	~20m

Note 1: External noise level allowing for 10dB attenuation across the building façade.

The results of the assessment demonstrate that residential receivers within approximately 55m and 70m of the project alignment may experience noise levels above the NMLs during open trench installation, for standard processing front works and hard rock variant respectively. It is noted that noise levels are not predicted to exceed the highly affected NML of 75dB LAeq(15min) at any residential receivers during open trench installation, within NCA 2.

For other receiver types (non-residential), construction noise levels are predicted to exceed the relevant NMLs for educational institutions (Wetherill Park TAFE) within 35m of the Victoria Street ancillary site. Construction noise emissions are predicted to meet the NMLs for all active recreation areas.

NCA 3 – Wetherill Park Industrial Area

Noise emissions from open trenching works are not expected to exceed the NMLs for commercial or industrial premises at any of the assessed commercial or industrial premises within NCA 3.

NCA 4 – Horsley Park Large Lot Residential – West of Wetherill Park Industrial Area

Within NCA 4, LAeq(15min) noise emissions from open trenching works are predicted at up to 62dB (5dB exceedance of NML) at the nearest residential receivers during standard processing front works, and up to 64dB (7dB exceedance of NML) during hard rock variant works.

The affected distances for residential and other sensitive receivers are provided in **Table 27**.

Table 27 Affected Distances – Open Trench Installation – NCA 4				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	P1 - Standard Processing	P2 - Hard Rock Variant
NCA 4 – Horsley Park Large Lot Residential – West of Wetherill Park Industrial Area				
Residential	Standard Hours	57	~40m	~55m
	Highly Affected	75	n/a	n/a
Industrial Premises	When in use	75	n/a	n/a

The results of the assessment demonstrate that residential receivers within approximately 40m and 55m of the project alignment may experience noise levels above the NMLs during open trench installation, for standard processing front works and hard rock variant respectively. It is noted that noise levels are not predicted to exceed the highly affected NML of 75dB LAeq(15min) at any residential receivers during open trench installation, within NCA 4.

Construction noise levels are not predicted to exceed the NML for industrial premises during open trench installation within NCA 4.

NCA 5 – Horsley Park Large Lot Residential – Adjacent to M7 Motorway

Within NCA 5, LAeq(15min) noise emissions from open trenching works are predicted at up to 67dB (1dB exceedance of NML) at the nearest residential receivers during standard processing front works, and up to 70dB (4dB exceedance of NML) during hard rock variant works.

The affected distances for residential and other sensitive receivers are provided in **Table 28**.

Table 28 Affected Distances – Open Trench Installation – NCA 5				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	P1 - Standard Processing	P2 - Hard Rock Variant
NCA 5 – Horsley Park Large Lot Residential – Adjacent to M7 Motorway				
Residential	Standard Hours	66	~20m	~25m
	Highly Affected	75	n/a	n/a
Place of Worship ¹	When in use	55	~65	~75

Note 1: External noise level allowing for 10dB attenuation across the building façade.

The results of the assessment demonstrate that residential receivers within approximately 20m and 25m of the project alignment may experience noise levels above the NMLs during open trench installation, for standard processing front works and hard rock variant respectively. It is noted that noise levels are not predicted to exceed the highly affected NML of 75dB LAeq(15min) at any residential receivers during open trench installation, within NCA 5.

Construction noise levels are anticipated to exceed the NML for Places of Worship at one receiver (Spanish Community Bible Church) during open trench installation within NCA 5.

NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway

Within NCA 6, LAeq(15min) noise emissions from open trenching works are predicted at up to 65dB (15dB exceedance of NML) at the nearest residential receivers during standard processing front works, and up to 68dB (18dB exceedance of NML) during hard rock variant works.

The affected distances for residential and other sensitive receivers are provided in **Table 29**.

Table 29 Affected Distances – Open Trench Installation – NCA 6				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	P1 - Standard Processing	P2 - Hard Rock Variant
NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway				
Residential	Standard Hours	50	~120m	~135m
	Highly Affected	75	n/a	n/a
Industrial Premises	When in use	75	n/a	n/a

The results of the assessment demonstrate that residential receivers within approximately 120m and 135m of the project alignment/ancillary site may experience noise levels above the NMLs during open trench installation, for standard processing front works and hard rock variant respectively. It is noted that noise levels are not predicted to exceed the highly affected NML of 75dB LAeq(15min) at any residential receivers during open trench installation, within NCA 6.

Construction noise levels are not predicted to exceed the NML for industrial premises during open trench installation within NCA 6.

6.2.2 Pipeline - Trenchless Installation

Trenchless installation works are expected to be undertaken at specific crossings along the project alignment, during standard construction hours and/or OOH work periods. A summary of the affected distances for potentially sensitive receivers during trenchless installation is presented for each NCA below. For detailed mapping of the affected areas, noise contours for trenchless installation are presented in **Appendix F**.

NCA 1 – Smithfield Suburban Residential Area / Industrial Area

Within NCA 1, LAeq(15min) noise emissions from trenchless installation works are predicted at up to 76dB (22dB exceedance of standard hours NML and up to 29dB exceedance of the OOH NMLs) at the nearest residential receivers during HDD crossings, and up to 77dB (23dB exceedance of standard hours NML and up to 30dB exceedance of the OOH NMLs) during microtunnel crossings.

The affected distances for residential and other sensitive receivers are provided in **Table 30**.

Table 30 Affected Distances – Trenchless Installation – NCA 1				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	T1 – HDD Crossing	T2 - Microtunnel
NCA 1 – Smithfield Suburban Residential Area / Industrial Area				
Residential	Standard Hours	54	~105m	~140m
	OOH Evening	49	~210m	~235m
	OOH Night	47	~280m	~295m
	Highly Affected	75	~15m	~20m
Passive Recreation	When in use	60	~85m	~100m
Active Recreation	When in use	65	~50m	~60m
Commercial Premises	When in use	70	~30m	~35
Industrial Premises	When in use	75	~15m	~20m

The results of the assessment demonstrate that during HDD crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 1 within approximately 105m of the project site during standard construction hours, within approximately 210m during the OOH evening period, and within approximately 280m during the OOH night period. Residential receivers within approximately 15m of the project area may also experience noise levels above the highly affected NML of 75dB LAeq(15min).

For microtunnel crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 1 within approximately 140m of the project site during standard construction hours, within approximately 235m during the OOH evening period, and within approximately 295m during the OOH night period. Residential receivers within approximately 20m of the project area may also experience noise levels above the highly affected NML of 75dB LAeq(15min).

For other receiver types (non-residential), construction noise levels are predicted to exceed the relevant NMLs for industrial premises within approximately 20m of the project site during microtunnel works. Construction noise emissions are predicted to meet the NMLs for all passive recreation areas, active recreation areas and commercial premises within NCA 1 during trenchless installation works.

NCA 2 – Wetherill Park Suburban Residential Area

A review of the project design identified that there are no proposed locations for trenchless installation immediately adjacent to residential receivers within NCA 2, with the closest works located on Redfern Street, approximately 175m west of residences on Hassell Street.

LAeq(15min) noise emissions from trenchless installation works are predicted at up to 53dB (1dB above the standard hours NML and up to 13dB above the OOH NMLs) at the nearest residential receivers during HDD crossings, and up to 54dB (2dB above the standard hours NML and up to 14dB above the OOH NMLs) during microtunnel crossings.

It is anticipated that where trenchless installation is undertaken at the Redfern Street location, the Victoria Street Ancillary Site, adjacent to the Wetherill Park TAFE, will be used. During operation of the Ancillary Site, LAeq(15min) noise emissions are predicted at up to 63dB (11dB above the standard hours NML and up to 23dB above the OOH NMLs) at the nearest residential receivers.

The affected distances for residential and other sensitive receivers are provided in **Table 31**.

Table 31 Affected Distances – Trenchless Installation – NCA 2					
Receiver Type	Assessment	NML	Affected Distance (m)		
	Period	dB LAeq(15min)	T1 – HDD Crossing	T2 - Microtunnel	Ancillary
NCA 2 – Wetherill Park Suburban Residential Area					
Residential	Standard Hours	52	~145m	~165m	~100m
	OOH Evening	46	~300m	~330m	~210m
	OOH Night	40	~650m	~660m	~450m
	Highly Affected	75	n/a	n/a	n/a
Educational Institution	When in use	55 ¹	n/a	n/a	~50m
Active Recreation	When in use	65	n/a	n/a	~25m

Note 1: External noise level allowing for 10dB attenuation across the building façade.

The results of the assessment demonstrate that during HDD crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 2 within approximately 145m of the project site during standard construction hours, within approximately 300m during the OOH evening period, and within approximately 650m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during HDD crossings.

For microtunnel crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 2 within approximately 165m of the project site during standard construction hours, within approximately 330m during the OOH evening period, and within approximately 660m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during microtunnel crossings.

During operation of the Victoria Street Ancillary Site, adjacent to the Wetherill Park TAFE, LAeq(15min) noise emissions would potentially exceed the relevant NMLs for residential receivers within approximately 100m of the ancillary site during standard construction hours, 210m during OOH evening and 450m during OOH night.

For other receiver types (non-residential), construction noise levels are predicted to exceed the relevant NMLs for educational institutions (Wetherill Park TAFE) within approximately 50m of the Victoria Street Ancillary Site.

NCA 3 – Wetherill Park Industrial Area

HDD crossings or microdrilling crossings would occur at six locations within the Wetherill Park Industrial Area, defined for the purpose of this assessment as NCA 3.

The results of the assessment indicate that industrial premises within approximately 10m of the HDD and microtunnel crossing sites may experience noise levels above the NML of 75dB LAeq(15min) for industrial receivers.

Noise emissions are not expected to exceed the NMLs for commercial premises during trenchless installation works.

NCA 4 – Horsley Park Large Lot Residential – West of Wetherill Park Industrial Area

Within NCA 4, LAeq(15min) noise emissions from trenchless installation works are predicted at up to 55dB (up to 12dB exceedance of the OOH NMLs) at the nearest residential receivers during HDD crossings, and up to 56dB (up to 13dB exceedance of the OOH NMLs) during microtunnel crossings.

Construction noise levels are predicted to achieve the NMLs for all industrial receivers during trenchless installation works.

The affected distances for residential and other sensitive receivers are provided in **Table 32**.

Table 32 Affected Distances – Trenchless Installation – NCA 4				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	T1 – HDD Crossing	T2 - Microtunnel
NCA 4 – Horsley Park Large Lot Residential – West of Wetherill Park Industrial Area				
Residential	Standard Hours	57	~100m	~110m
	OOH Evening	50	~230m	~245m
	OOH Night	43	~470m	~500m
	Highly Affected	75	n/a	n/a
Industrial Premises	When in use	75	n/a	n/a

The results of the assessment demonstrate that during HDD crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 4 within approximately 100m of the project site during standard construction hours, within approximately 230m during the OOH evening period, and within approximately 470m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during HDD crossings.

For microtunnel crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 4 within approximately 110m of the project site during standard construction hours, within approximately 245m during the OOH evening period, and within approximately 500m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during microtunnel crossings.

Construction noise levels are not predicted to exceed the NML for industrial premises during trenchless installation works within NCA 4.

NCA 5 – Horsley Park Large Lot Residential – Adjacent to M7 Motorway

Within NCA 5, LAeq(15min) noise emissions from trenchless installation works are predicted at up to 70dB (4dB exceedance of standard hours NML and up to 23dB exceedance of the OOH NMLs) at the nearest residential receivers during HDD crossings, and up to 72dB (6dB exceedance of standard hours NML and up to 25dB exceedance of the OOH NMLs) during microtunnel crossings.

The affected distances for residential and other sensitive receivers are provided in **Table 33**.

Table 33 Affected Distances – Trenchless Installation – NCA 5

Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	T1 – HDD Crossing	T2 - Microtunnel
NCA 5 – Horsley Park Large Lot Residential – Adjacent to M7 Motorway				
Residential	Standard Hours	66	~40m	~45m
	OOH Evening	56	~125m	~135m
	OOH Night	49	~265m	~275m
	Highly Affected	75	n/a	n/a
Place of Worship ¹	When in use	55	~110m	~120m

Note 1: External noise level allowing for 10dB attenuation across the building façade.

The results of the assessment demonstrate that during HDD crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 5 within approximately 40m of the project site during standard construction hours, within approximately 125m during the OOH evening period, and within approximately 265m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during HDD crossings.

For microtunnel crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 5 within approximately 45m of the project site during standard construction hours, within approximately 135m during the OOH evening period, and within approximately 275m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during microtunnel crossings.

Construction noise levels are anticipated to exceed the NML for Places of Worship at one receiver (Spanish Community Bible Church) during trenchless installation within NCA 5.

NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway

Within NCA 6, LAeq(15min) noise emissions from trenchless installation works are predicted at up to 53dB (3dB exceedance of standard hours NML and up to 13dB exceedance of the OOH NMLs) at the nearest residential receivers during trenchless installation.

The affected distances for residential and other sensitive receivers are provided in **Table 34**.

Table 34 Affected Distances – Trenchless Installation – NCA 6				
Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	T1 – HDD Crossing	T2 - Microtunnel
NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway				
Residential	Standard Hours	50	~240m	~275m
	OOH Evening	44	~450m	~460m
	OOH Night	40	~650m	~680m
	Highly Affected	75	n/a	n/a
Industrial Premises	When in use	75	n/a	n/a

The results of the assessment demonstrate that during HDD crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 6 within approximately 240m of the project site during standard construction hours, within approximately 450m during the OOH evening period, and within approximately 650m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during HDD crossings.

For microtunnel crossings, construction noise levels would potentially exceed the relevant NMLs for residential receivers in NCA 6 within approximately 275m of the project site during standard construction hours, within approximately 460m during the OOH evening period, and within approximately 680m during the OOH night period. There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during microtunnel crossings.

Construction noise levels are not predicted to exceed the NML for industrial premises during trenchless installation within NCA 6.

6.2.3 Reservoir Installation

The proposed reservoir site at 156-166 Walworth Road, Horsley Park, wholly within NCA 6. Construction noise levels are predicted at up to 73dB (23dB above the standard construction hours NML) during peak civil works (R1) and up to 74dB (24dB above the standard construction hours NML) during tank erection and structural works (R2). Construction noise levels during the reservoir installation are not predicted to exceed the NMLs for residential receivers in any other NCA, or for non-residential receivers in NCA 6. It is noted that reservoir installation works would occur during standard construction hours only.

The affected distances for residential and other sensitive receivers are provided in **Table 35**. For detailed mapping of the affected areas, noise contours for reservoir installation are presented in **Appendix G**.

Table 35 Affected Distances – Reservoir Installation – NCA 6

Receiver Type	Assessment	NML	Affected Distance (m)	
	Period	dB LAeq(15min)	R1 – Civil Works	R2 – Structural Works
NCA 6 – Horsley Park Large Lot Residential – West of M7 Motorway				
Residential	Standard Hours	50	~375m	~400m
	OOH Evening	44	n/a	n/a
	OOH Night	40	n/a	n/a
	Highly Affected	75	n/a	n/a
Industrial Premises	When in use	75	n/a	n/a

The results of the assessment demonstrate that during civil works (R1) to prepare the site for the installation of the reservoirs, construction noise levels would potentially exceed the NMLs for residential receivers within approximately 375m of the project site during standard construction hours. During tank erection and structural works (R2), construction noise levels would potentially exceed the NMLs for residential receivers within approximately 400m of the project site during standard construction hours.

There are no residential receivers predicted to experience noise levels above the highly affected NML of 75dB LAeq(15min) during reservoir installation works. Similarly, construction noise levels are not predicted to exceed the NML for industrial premises during reservoir installation works.

6.2.4 Pump Station Installation

The booster pump station will be installed within an existing industrial warehouse and office space at 46 Victoria Street, Smithfield. Surrounding receivers are described as industrial premises or commercial premises in an industrial land use zone.

During the installation of the pump station, $L_{Aeq}(15min)$ noise emissions are predicted at up to 78dB (3dB the relevant NML) for industrial receivers immediately adjacent to the pump station building. Construction noise levels of up to 43dB $L_{Aeq}(15min)$ are predicted at the closest identified commercial premises, which achieves the NML of 70dB $L_{Aeq}(15min)$ for commercial receivers.

The affected distances and number of potentially affected receivers are provided in **Table 36**. For detailed mapping of the affected areas, noise contours for pump station installation are presented in **Appendix H**.

Table 36 Affected Distances – Pump Station Installation

Receiver Type	Assessment Period	NML	Affected Distance (m)
		dB $L_{Aeq}(15min)$	
Commercial Premises	When in use	70	~30m
Industrial Premises	When in use	75	~15m

The results of the assessment demonstrate that during the installation of the pump station at 46 Victoria Street, industrial receivers within 15m of the project site may experience construction noise levels above the relevant NMLs. It is noted that there are no commercial receivers located within the potential affected distance.

6.3 Construction Sleep Disturbance

A maximum noise level assessment (sleep disturbance) was undertaken for activities associated with trenchless installation and use of ancillary sites during the trenchless installation. The results of the analysis (refer to **Appendix I**), demonstrates that maximum noise levels may exceed the L_{Amax} criteria of 65dB at residential receivers at the following locations:

- Low Street trenchless installation site and Smithfield Road compound / ancillary site (NCA 1) – L_{Amax} noise levels up to 81dB;
- Victoria Street compound / ancillary site (NCA 2) – L_{Amax} noise levels up to 77dB;
- Redmayne Road / Wallgrove Road trenchless installation site and compound / ancillary site (NCA 5) – L_{Amax} noise levels up to 72dB; and
- Burley Road trenchless installation site and compound / ancillary site (NCA 6) – L_{Amax} noise levels up to 78dB.

It is therefore recommended that the project proactively manages night-time noise emissions and implement reasonable and feasible noise control strategies to minimise the occurrence of sleep disturbance within the surrounding locality.

It is noted that there are no residential receivers located within NCA 3 that would potentially be susceptible to sleep disturbance effects. Additionally, there were no residential receivers within NCA 4 that were predicted to experience noise levels above the maximum noise trigger levels.

6.4 Construction Road Traffic Noise

It is estimated that the project would generate the following traffic volumes:

- Heavy vehicles: up to 60 one-way movements per day (approximately 30 arrivals and 30 departures) associated with spoil removal, material delivery, pipe transport, trenchless support activities and waste transport;
- Light vehicles: approximately 20 movements per day (approximately 10 arrivals and 10 departures) associated with workforce travel to and from site compounds; and
- Peak hours: typically at shift start and finish, with an indicative peak of:
 - four to six light vehicle movements per hour, and
 - up to six heavy vehicle movements per hour.

A review of residential receivers in the study area identified that the minimum setback between the closest residences is approximately 12m to the centreline of the adjacent carriageway for receivers on Chifley Street, Smithfield and Oxford Street, Smithfield. It is noted that Chifley Street and Oxford Street are categorised as local roads in accordance with the RNP.

The results of the traffic noise calculations are presented in **Table 37** for the closest residential receivers to the proposed travel routes. The traffic noise contribution from the project is predicted at up to 46.6dB LAeq(1hr) during the day and night periods, based on the noise modelling parameters in **Table 21**, which is below the relevant day period and night period assessment criteria for residential receivers.

The total traffic noise levels were calculated as the logarithmic sum of the project traffic noise level and the assessment criteria. In the event where existing traffic noise levels do exceed the criteria, the relative increase was calculated to be up to 0.6dB LAeq(1hr) during the day period, and up to 1.6dB LAeq(1hr) during the night period. Hence, it is anticipated that the increase in road traffic noise levels, due to additional project-related traffic movements at the closest residential receivers would be below the +2dBA increase criterion.

Table 37 Operational Road Traffic Noise Levels – Residential Receivers

Offset Distance (m)	Assessment Criteria ¹ dB LAeq(period)	Traffic Noise dB LAeq(period)		Relative Increase
		Project Traffic	Total Traffic ²	
12m	55 (Day)	46.6	55.6	+0.6dBA
	50 (Night)	46.6	51.6	+1.6dBA

Note 1: Day 7am to 10pm; Night 10pm to 7am.

Note 2: Assumes that existing traffic noise is equal to the assessment criteria.

6.5 Construction Vibration Assessment

A review of the construction methodology for the project identified that the items of equipment with the highest potential for vibration emissions include:

- Open trench installation (standard processing work front) – Plate compactor;
- Open trench installation (hard rock variant) – Large excavator (30t) with hammer;
- Trenchless installation – HDD or microtunnel (boring);
- Reservoir installation – Padfoot roller (vibratory); and
- Pump station installation – no significant items of equipment.

It is noted that the precise locations for the use of each type of equipment are not known in detail at this stage of the project design. Hence, a summary of the minimum working distances for each construction activity is presented in **Table 38. Appendix J, Figure J1 to Figure J6** (open trench installation – hard rock variant) and **Figure J7** (reservoir installation) provide a visual representation of the minimum working distances for significant vibration sources. Where the setback distance from the construction activities and buildings / structures are within the minimum working distances, vibration impacts may occur.

Table 38 Minimum Working Distances (m) for Construction Activities

Construction Activity	Scenario	Plant item	Description	Minimum working distance		
				Cosmetic damage	Heritage Items	Human response
Open Trench Installation	P1	Plate Compactor	Hand held	1m	2m	2m
	P1	Hydraulic Hammer	18-34t excavator	22m	44m	73m
Trenchless Installation	T1 / T2	Boring	≤800mm	2m	4m	4m
Reservoir Installation	R1 / T2	Vibratory Roller	>18t	20m	50m	100m
Pump Station Installation	S1	n/a	n/a	n/a	n/a	n/a

A review of the project alignment and setback distance to the nearest receiver buildings / structures, indicates that during open trench installation – standard processing work front (Scenario P1), receivers are typically located beyond the minimum working distances for potential structural damage or human response from the use of plate compactors. Where hydraulic hammers are required for the open trench installation – hard rock variant (Scenario P2), buildings / structures within 22m and 73m of the project alignment may experience vibration levels above the cosmetic damage and human response criteria respectively.

Two heritage structures have been identified at 45 Chifley Street and 76 Chifley Street, adjacent to open trench installation works within NCA 2. These structures are both located within the minimum working distance of 44m for sensitive structures during open trench installation – hard rock variant, with the 45 Chifley Street structure set back approximately 10m from the works area and the 76 Chifley Street structure set back approximately 20m from the works area.

During trenchless installation, vibration levels above the cosmetic damage and human response criteria may be experienced where the works are undertaken within 2m and 4m respectively of any adjacent potentially sensitive buildings / structures. A review of the project alignment indicates that trenchless installation works would not typically be undertaken within 4m of any potentially sensitive buildings / structures.

At the location of the proposed reservoir, where a vibratory roller is used for compaction of the site, vibration levels above the cosmetic damage and human response criteria may be experienced at sensitive buildings / structures within 20m and 100m of the project site respectively.

Construction activities at the pump station site at 46 Victoria Street are not anticipated to generate vibration levels above the relevant criteria at any of the adjacent receiver locations.

Based on the minimum working distances provided in **Table 38**, it is anticipated that vibration levels would potentially exceed the criteria for cosmetic damage (including heritage items) and / or the human response at residences for open trench installation where a hydraulic hammer is used, and for reservoir installation where a vibratory roller is used. Hence, it is recommended that once the final vibratory plant has been selected a review of minimum working distances should be conducted. Where works are planned within the minimum working distances (refer to **Table 15**), mitigation and management measures should be considered, including:

- Complete dilapidation survey of sensitive structures (ie heritage items) prior to the commencement of construction works;
- Choosing alternative, lower-impact equipment or methods, such as a static or oscillating roller;
- Scheduling the use of vibration intensive equipment during the least sensitive times of the day;
- Keeping equipment well maintained;
- Consultation with the community regarding the proposed activities; and
- Real-time vibration monitoring where the vibration intensive activities are undertaken within the minimum working distance for cosmetic damage.

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7 Construction Noise Management Measures

Noise modelling identifies that relevant NMLs for the project may be exceeded during each of the proposed construction activities, except for the pump station installation. The ICNG and Standards Australia AS 2436-2010 “Guide to Noise Control on Construction, Maintenance and Demolition Sites” outline noise management and mitigation initiatives to minimise the impact and improve the acoustic amenity of receivers potentially affected by construction projects.

Recommendations provided in the ICNG and AS2436 include combinations of operational strategies, source noise control strategies, noise barrier controls, and community consultation. Adopting strategies contained in this standard may result in the following noise attenuation:

- up to 10dBA where space requirements place limitations on the attenuation options available; and
- up to 20dBA in situations where noise source noise mitigation measures (silencers, mufflers, etc) can be combined with noise barriers and other management techniques.

The potential mitigation measures are provided in **Table 39**.

Table 39 Standard Mitigation Measures

Action Required	Management Measures
Universal Work Practices	
Pre-Construction / Site Inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • relevant noise and vibration mitigation measures • licence and approval conditions • permissible hours of work • limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times • environmental incident procedures.
	In the event of a noise complaint, undertake attended noise monitoring to quantify noise emissions from construction activities and guide practical reasonable and feasible noise control measures.
Plan Worksites	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Site Practices / Behavioural Practices	Conduct toolbox talks pre-shift to communicate awareness regarding the importance of noise emission management.
	Ensure site managers periodically check the site and nearby residences and other sensitive land uses for noise problems so that solutions can be quickly applied.
	Include in tenders, employment contracts, subcontractor agreements and work method statements clauses that require minimisation of noise and compliance with directions from management to minimise noise
	Avoid shouting and minimise talking loudly. Avoid dropping materials from height, throwing of metal items and slamming of doors.
	Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices
	Encourage workers to operate equipment in a conservative manner.

Table 39 Standard Mitigation Measures

Action Required	Management Measures
Notification	Provide information to neighbours detailing work activities, dates and hours, impacts and mitigation measures, work schedule over the night period, any operational noise benefits from the works (where applicable) and contact telephone number.
	Notifications should be a minimum of 7 calendar days prior to the start of the works.
	Use site information board at the front of the site with relevant details about site contacts, hours of operation and regular information updates.
Complaints Handling	Have a documented complaints handling procedure with an escalation procedure so that if a complaint is not satisfied, there is a clear path to follow.
	Implement all feasible and reasonable measures to address the source of the complaint.
	Keep a register of any complaints including all relevant details and provide a quick response to all complaints.
Construction Method	Use quieter and less vibration emitting construction methods where feasible and reasonable (eg bore piles rather than impact driven piles).
Equipment / Maintenance	Select the quietest plant to perform a specific function and consider the noise levels of plant and equipment in rental or purchasing decisions.
	Regularly inspect and maintain equipment to ensure that it is in good working order.
	Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address an annoying character of noise identified.
	Return any hired equipment that is causing noise that is not typical for the equipment – the increased noise may indicate the need for repair.
Site Practices	The offset distance between noisy plant and adjacent sensitive receivers should be maximised and restrict areas that mobile plant can be operated during sensitive times.
	Maximise shielding between plant and adjacent sensitive receivers by making use of natural landforms, temporary structures and stockpiles, and barriers.
	Operate plant in a quiet and efficient manner. Reduce throttle settings and turn off equipment when not being used.
	Where practicable, avoid the coincidence of noisy plant/machinery working simultaneously in close proximity to sensitive receivers.

Table 39 Standard Mitigation Measures

Action Required	Management Measures
	Minimise disturbance arising from delivery of goods to construction sites by: ● avoid queuing of vehicles where practicable or ensure engines are switched off to reduce their overall noise impacts on receivers ● minimise the use of engine brakes ● fit delivery vehicles with straps rather than chains ● select site access points and roads as far away as possible from sensitive receivers and provide shielding where practicable.
	Where feasible and reasonable, construction should be carried out during standard construction hours (daytime period). Work generating high noise and/or vibration should be scheduled during less sensitive time periods.
	Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impacts by concentrating noisy activities at one location and move to another as quickly as possible.
Work Scheduling	Schedule delivery of materials to occur during the day or early evening periods only.
	Organise deliveries and access to optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads.
	Reduce the line-of-sight transmission from noise emissions sources to residences or other sensitive land uses using temporary barriers, where practicable.
Physical Methods	Where required, erect temporary noise barriers before work commences to ensure noise is minimised during the entire shift.
	Consider the height of mobile screens and barriers to ensure adequate shielding to multistorey dwellings.
	Choosing alternative, lower-impact equipment or methods, such as a static roller.
	Scheduling the use of vibration intensive equipment during the least sensitive times of the day.
Vibration Measures	Keeping equipment well maintained.
	Consultation with the community regarding the proposed activities.
	Real-time vibration monitoring where the vibration intensive activities are undertaken within the safe working distance for cosmetic damage, including heritage items.

8 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise and Vibration Assessment (NVA) to quantify noise emissions associated with the extension of the Rosehill recycled water scheme between Smithfield and Horsley Park in Western Sydney, NSW.

The NVA demonstrates that operational noise levels from the Victoria Street Pump Station and Reservoir Site Pump Station are anticipated to achieve the PNTLs at all assessed receiver locations. Furthermore, maximum noise levels from transient events such as pressure valve release are predicted to satisfy the maximum noise trigger levels for all assessed receivers.

The NVA indicates that noise emissions from the construction works are anticipated to exceed the NMLs at residential receivers within each of the residential noise catchment areas (NCAs) during open trench installation and trenchless installation of the pipeline. Furthermore, construction noise levels during trenchless installation are anticipated to exceed the NMLs during out of hours (OOH) work periods within all residential NCAs, and the highly affected NML of 75dB LAeq(15min) for residential receivers within NCA 1.

During reservoir installation works, including civil works and structural works, construction noise levels are anticipated to exceed the relevant NMLs for standard hours for receivers within NCA 6. Construction noise levels are not expected to exceed the relevant NMLs for residential receivers during the installation of the Victoria Street pump station.

For non-residential receivers, construction noise levels are anticipated to exceed the relevant NMLs for passive recreation areas within NCA 1 during open trench installation, educational institutions (Wetherill Park TAFE) during operation of the Victoria Street compound / ancillary site in NCA 2, places of worship (Spanish Community Bible Church) in NCA 5 during open trench and trenchless installation and industrial receivers in NCA 1 during open trench installation (hard rock variant) and trenchless installation (microtunnel), and NCA 2 during trenchless installation.

During OOH works maximum noise levels are predicted to exceed the LAmax criteria of 65dB at residential receivers adjacent to the compound / ancillary sites at Burley Road, Victoria Street and Smithfield Road, and trenchless installation in NCA 5, NCA 4 and NCA 1.

It is recommended that to minimise and manage construction noise impacts, all reasonable and feasible mitigation measures, as presented in **Section 7**, should be implemented. Furthermore, the project should proactively manage night-time noise emissions and implement reasonable and feasible noise control strategies to minimise the occurrence of sleep disturbance within the community.

The construction road traffic noise assessment demonstrated that where existing levels exceed the relevant criteria, the increase in road traffic noise levels during the construction of the project would be below the +2dBA increase criterion.

The results of the vibration assessment demonstrates that vibration levels may exceed the relevant criteria when using hydraulic hammers during open trench installation – hard rock variant (Scenario P2). Hence, consideration should be given to the use of alternate equipment or construction methods, or the implementation of mitigation measures, as per **Section 6.5**.

Accordingly, the Noise and Vibration Assessment supports the Review of Environmental Factors for the project incorporating the recommendations and controls outlined in this report.

Appendix A – Glossary of Terms

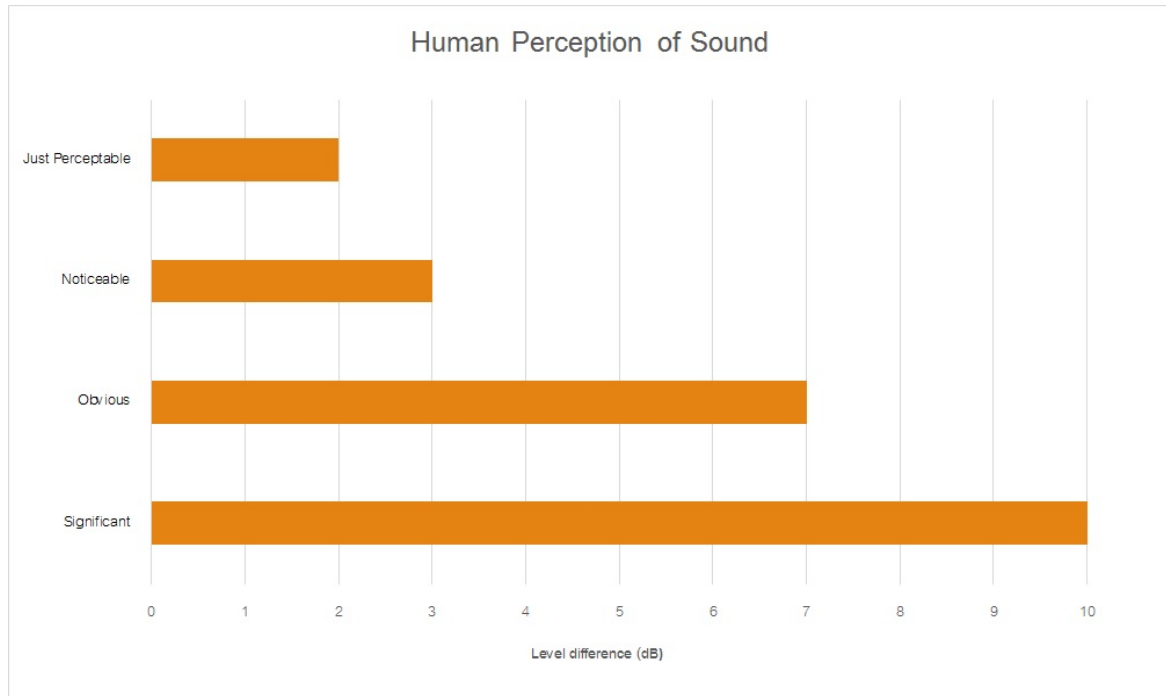
A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Acoustical Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmx	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by $10 \cdot \log_{10} (W/W_0)$. Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Pressure Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound

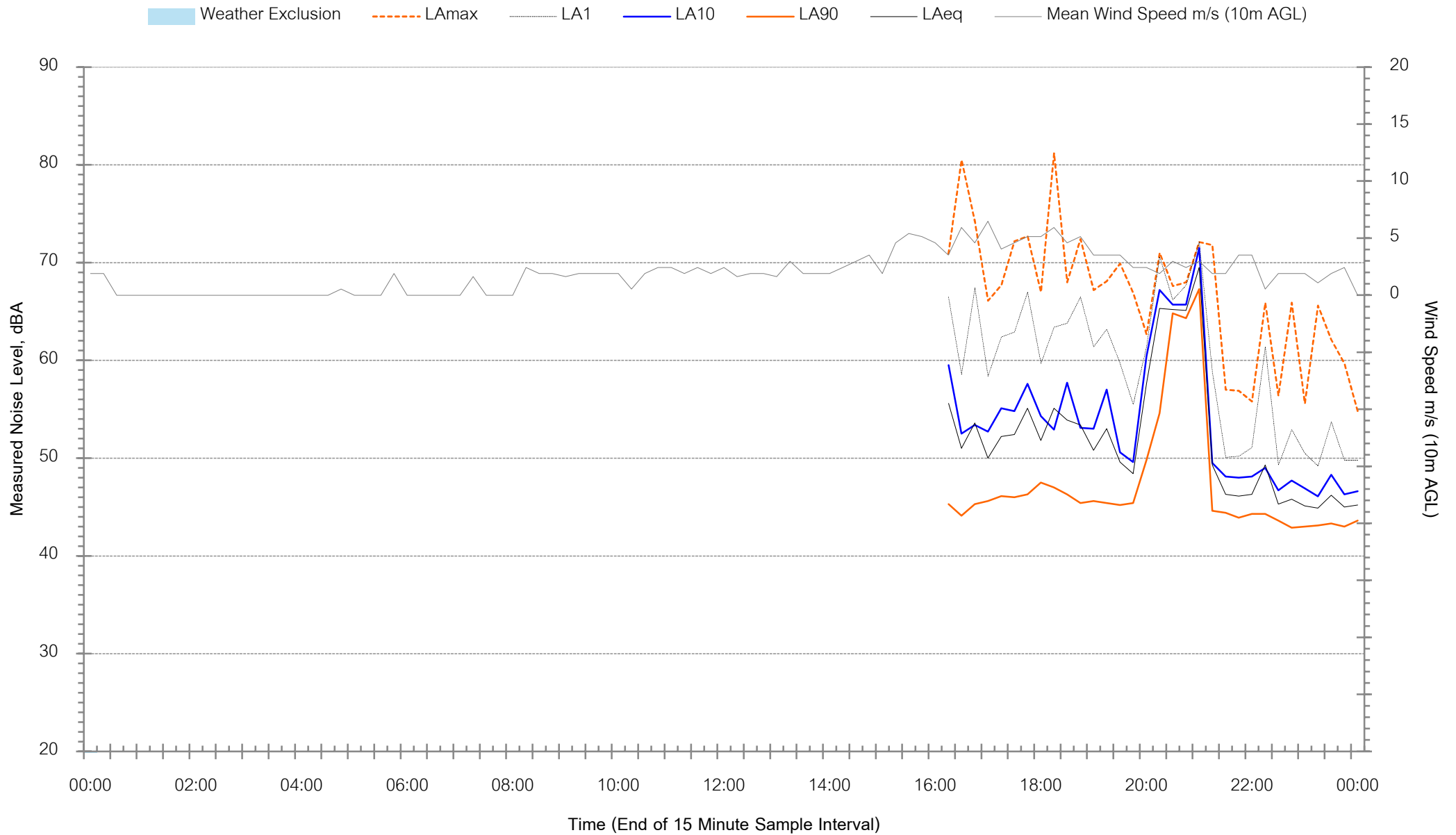


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Appendix B – Noise Monitoring Charts

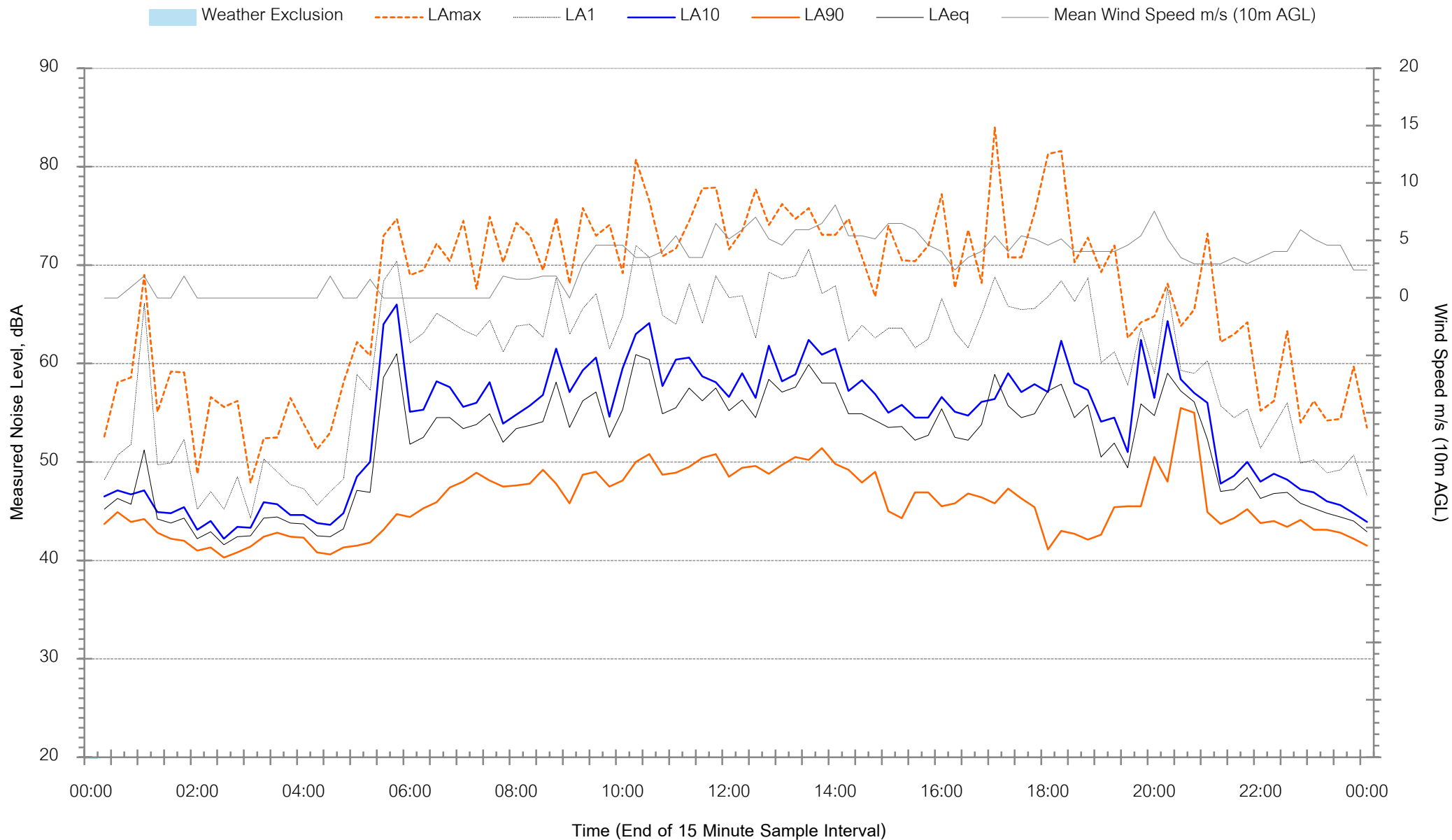
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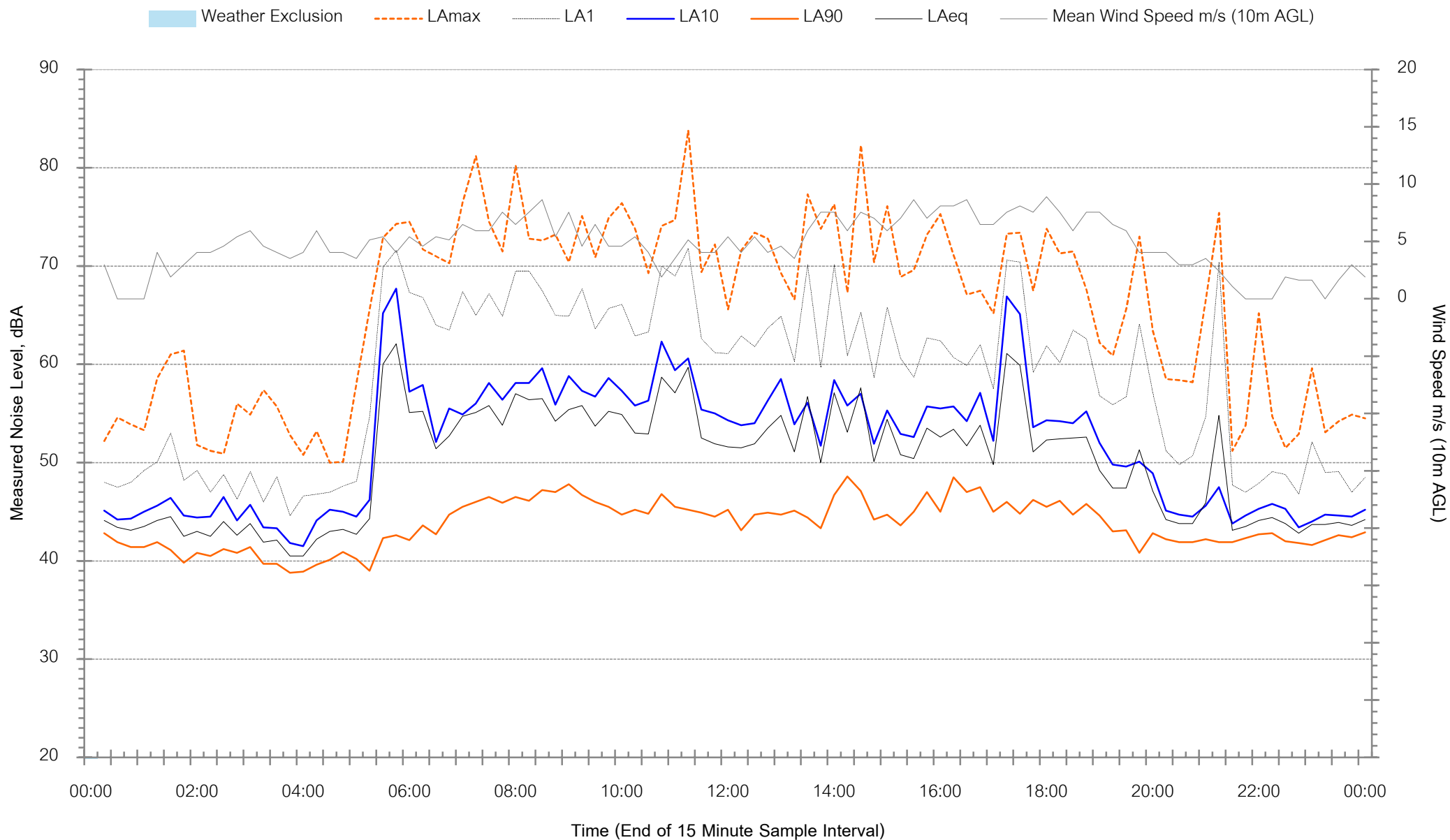
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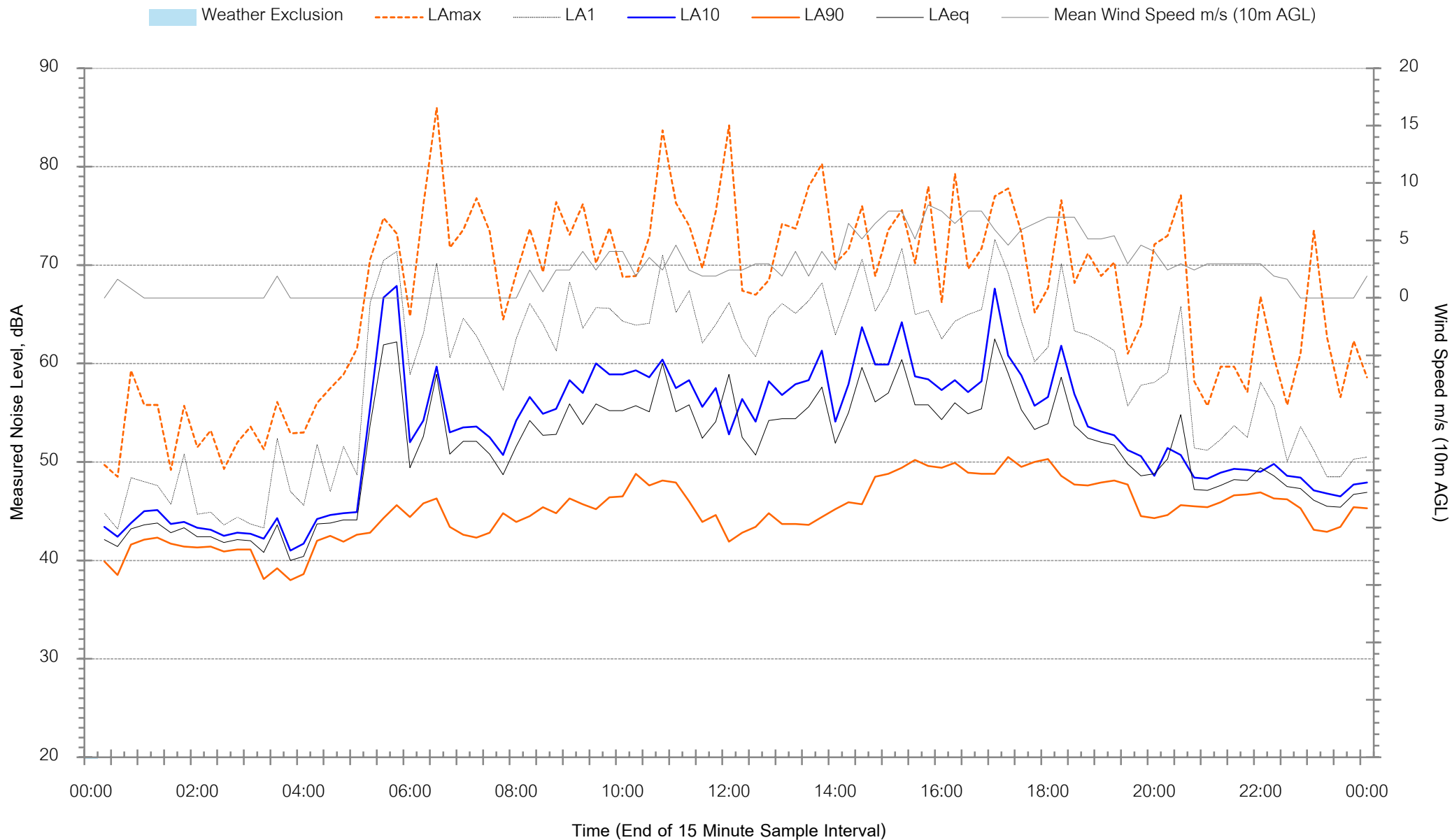
Background Noise Levels

31 Cooper Crescent, Smithfield, New South Wales - Sunday 9 November 2025



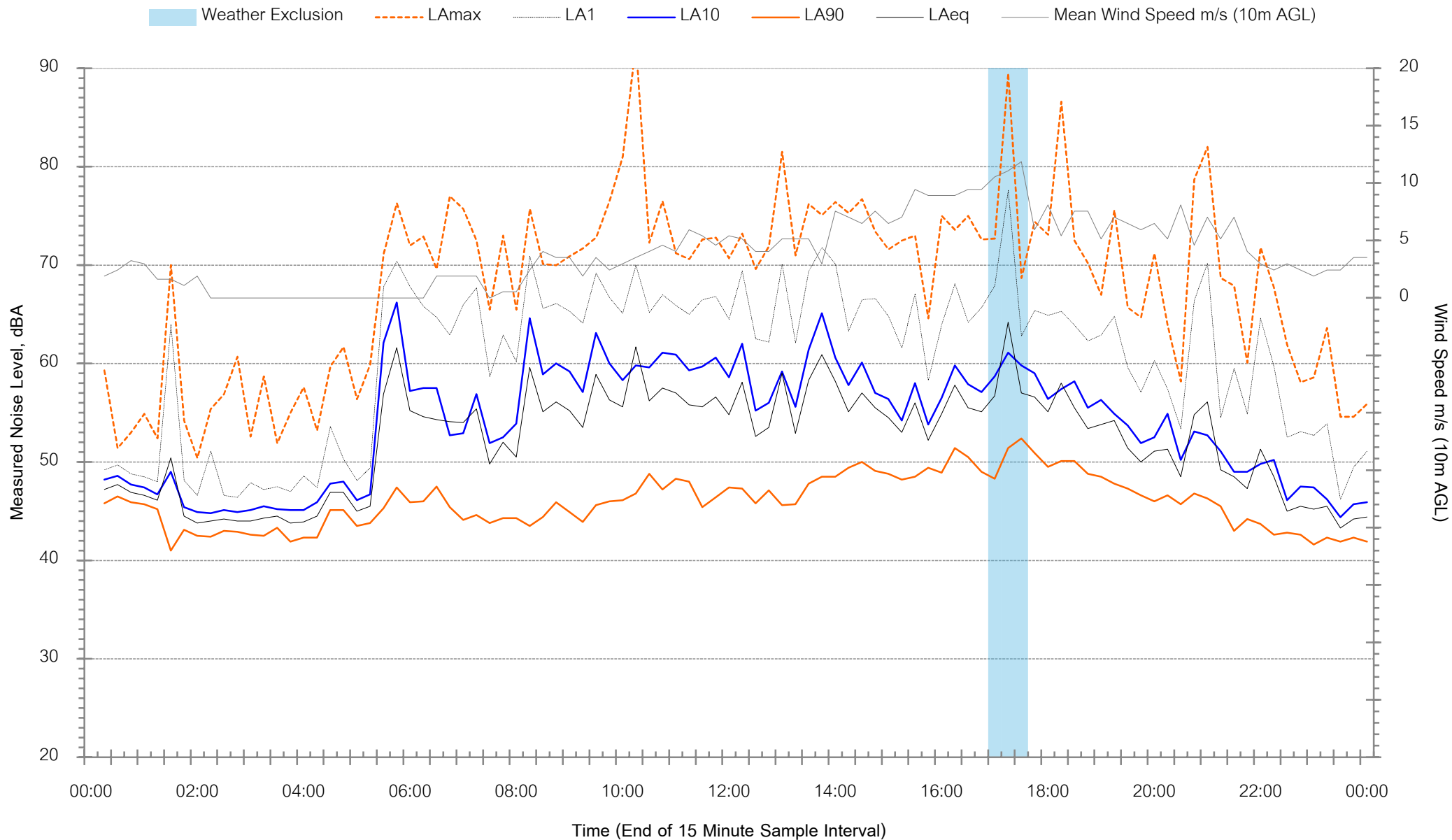
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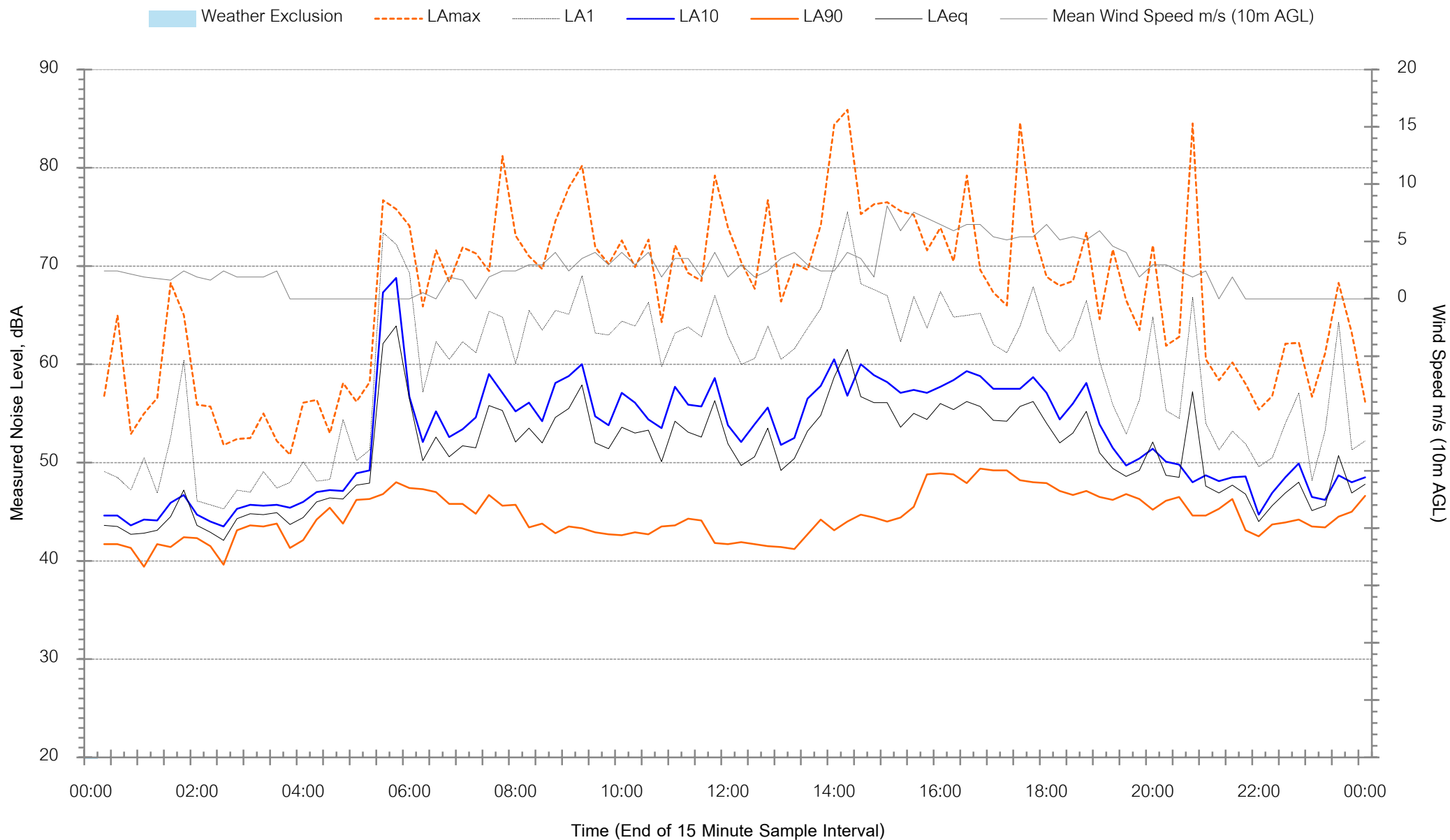
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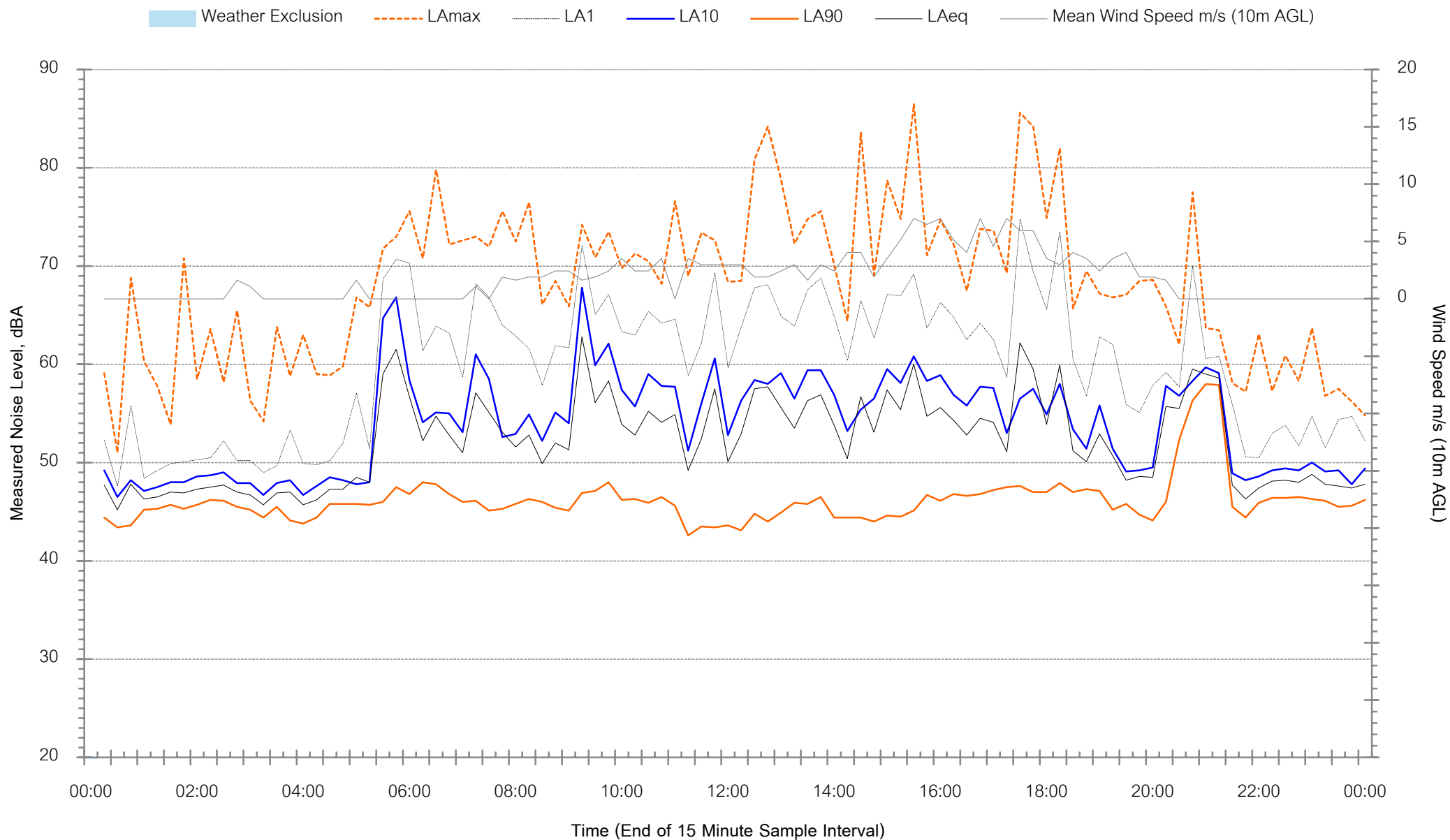
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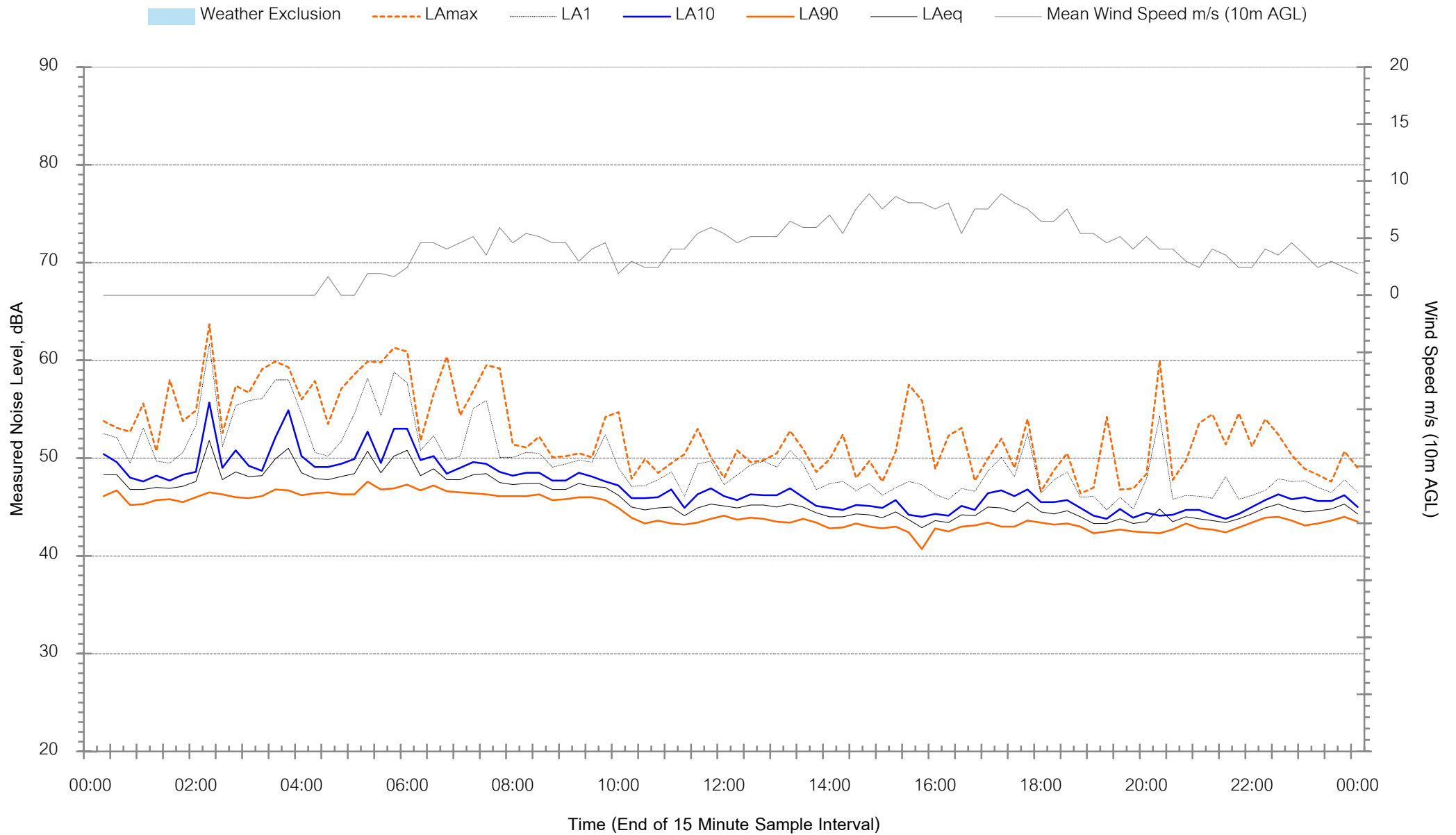
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31 Cooper Crescent, Smithfield, New South Wales - Thursday 13 November 2025



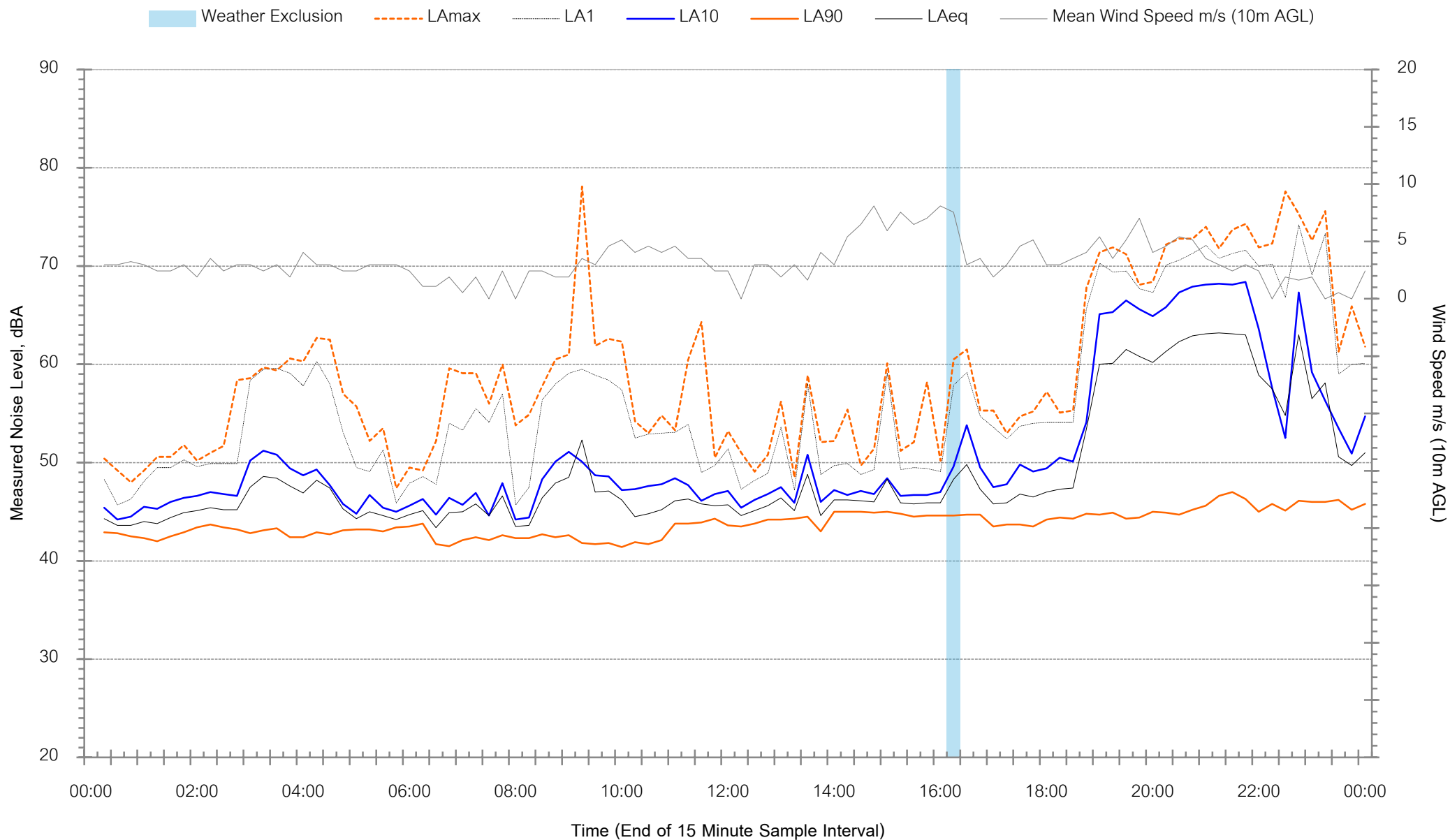
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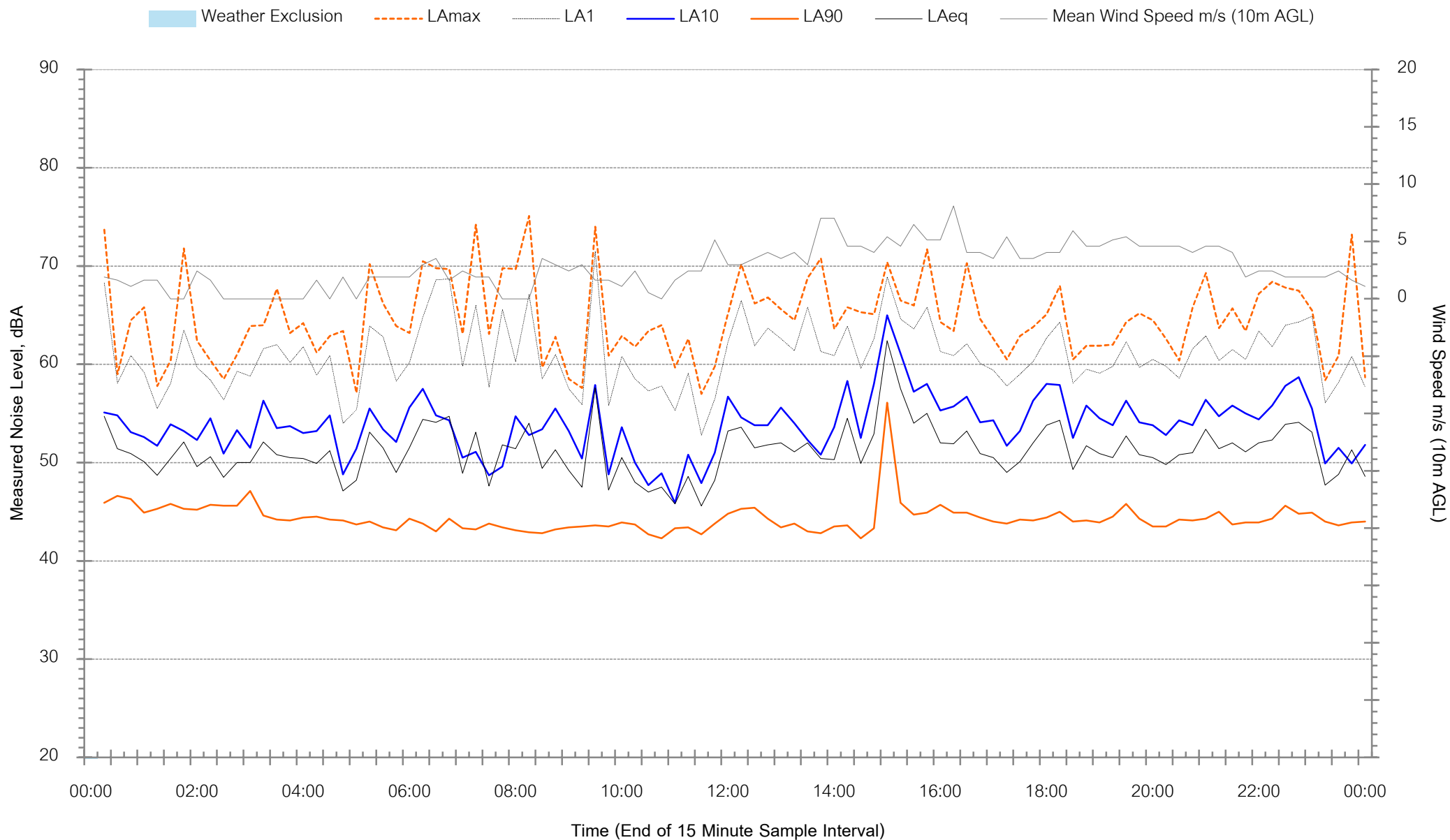
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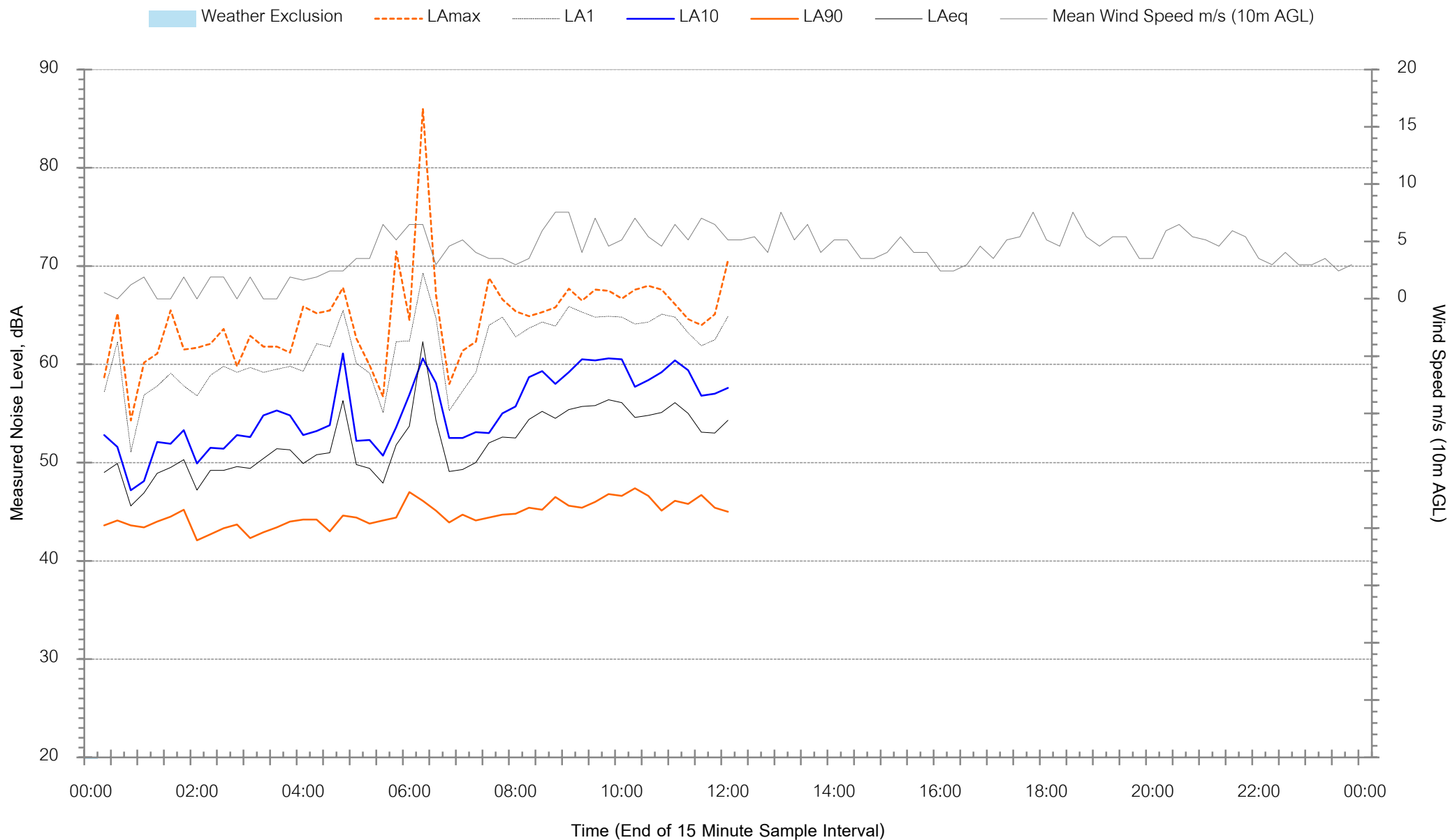
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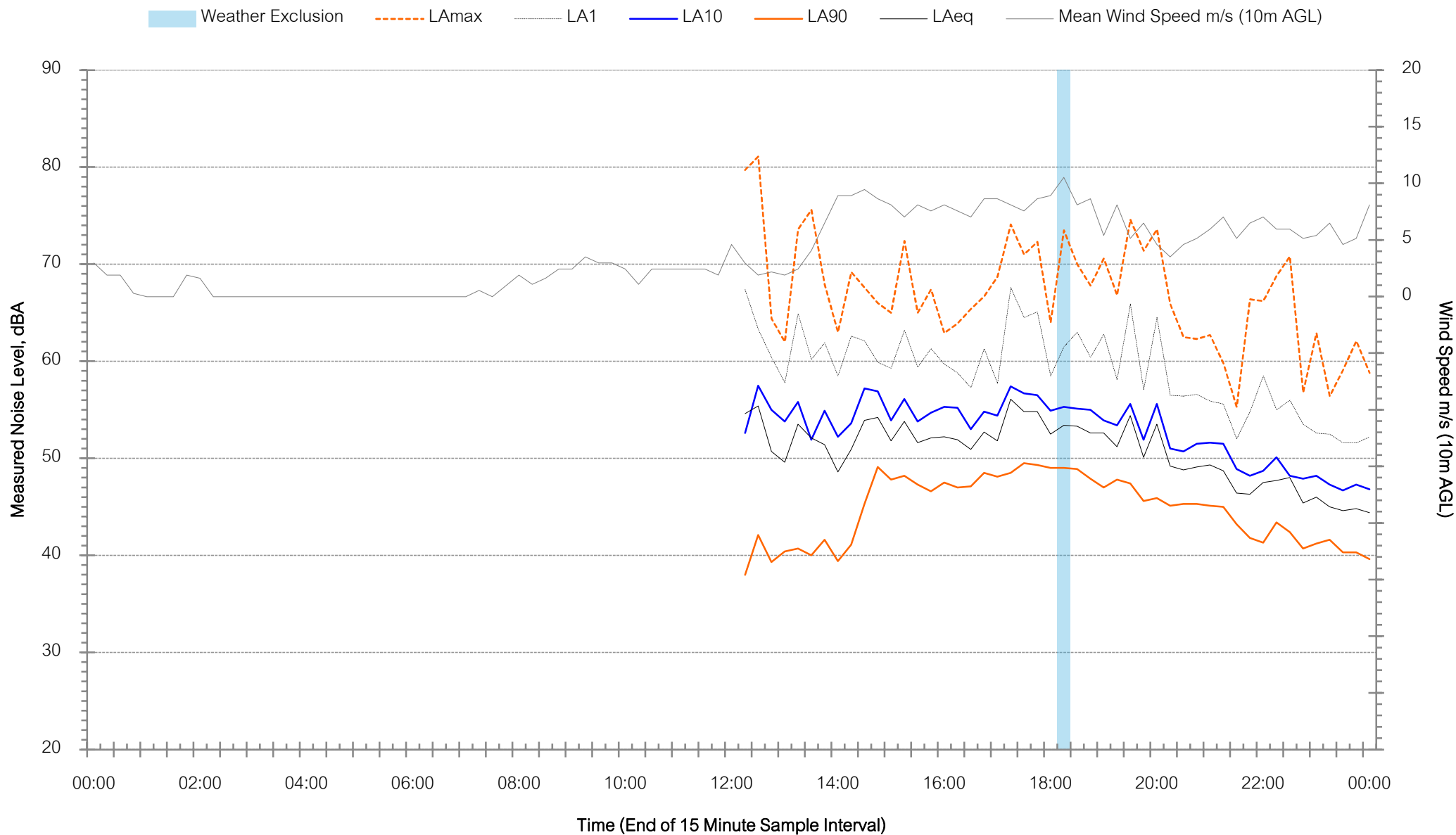
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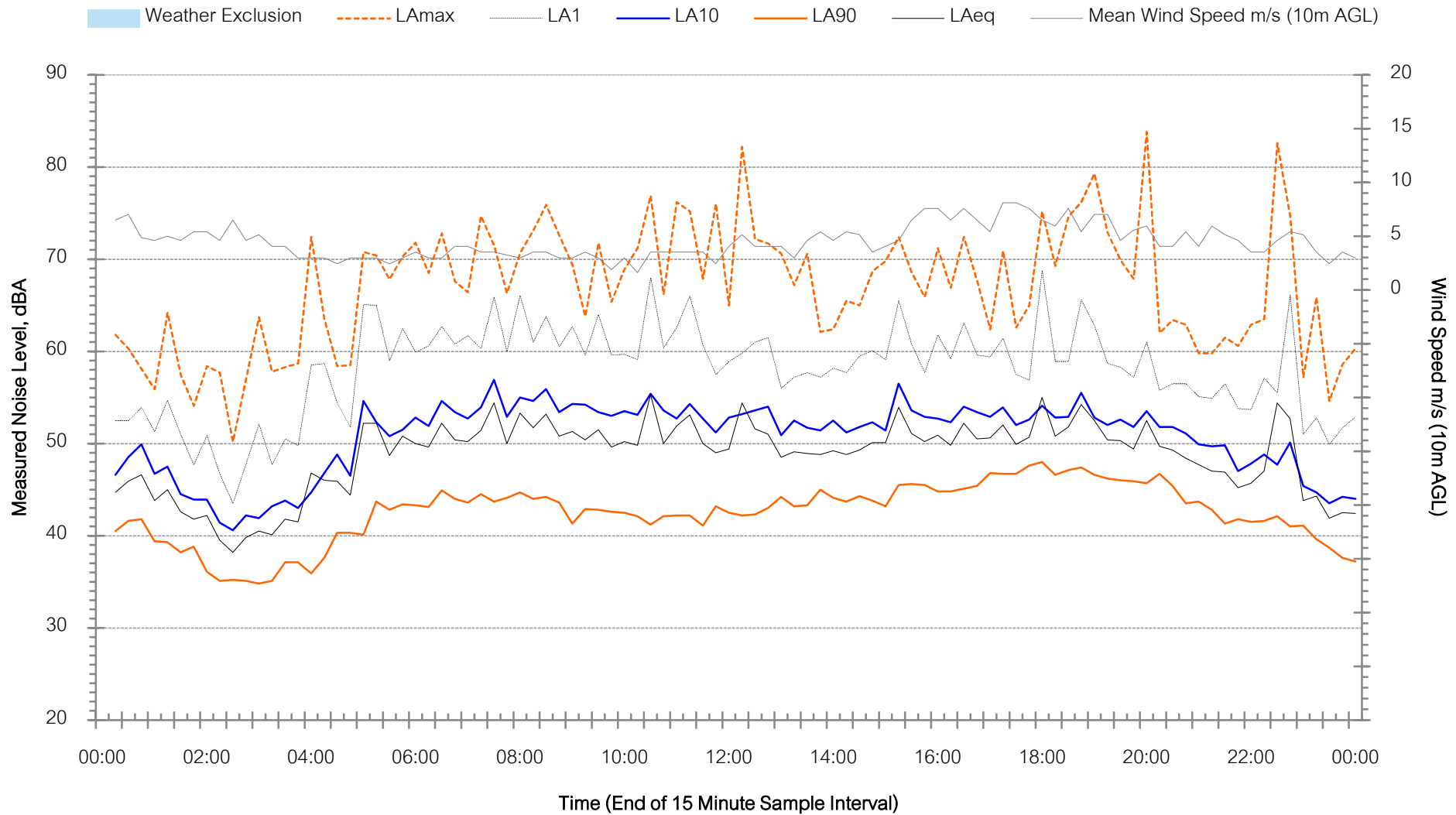
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Chifley Street, Smithfield, NSW - Tuesday 9 December 2025



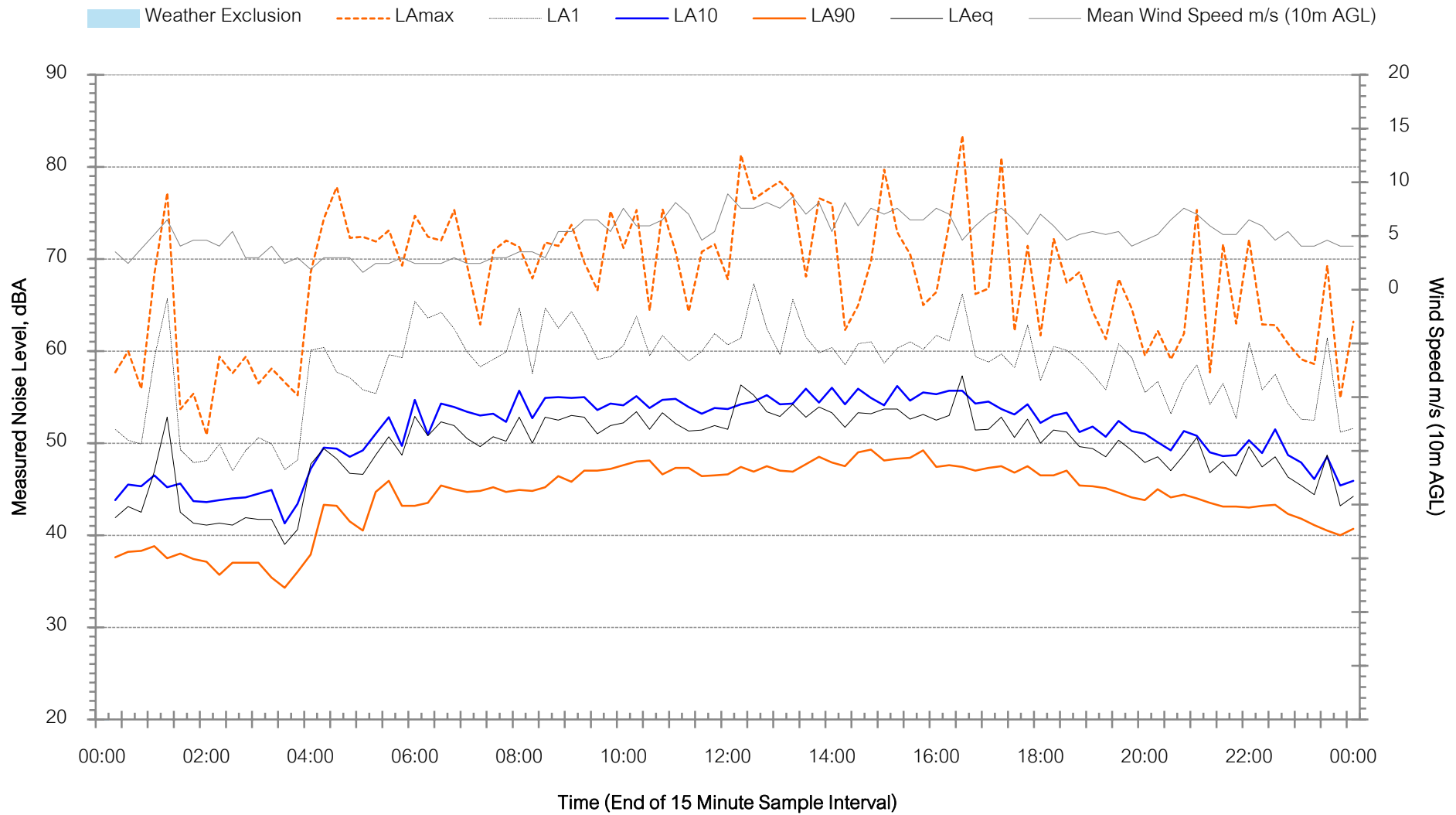
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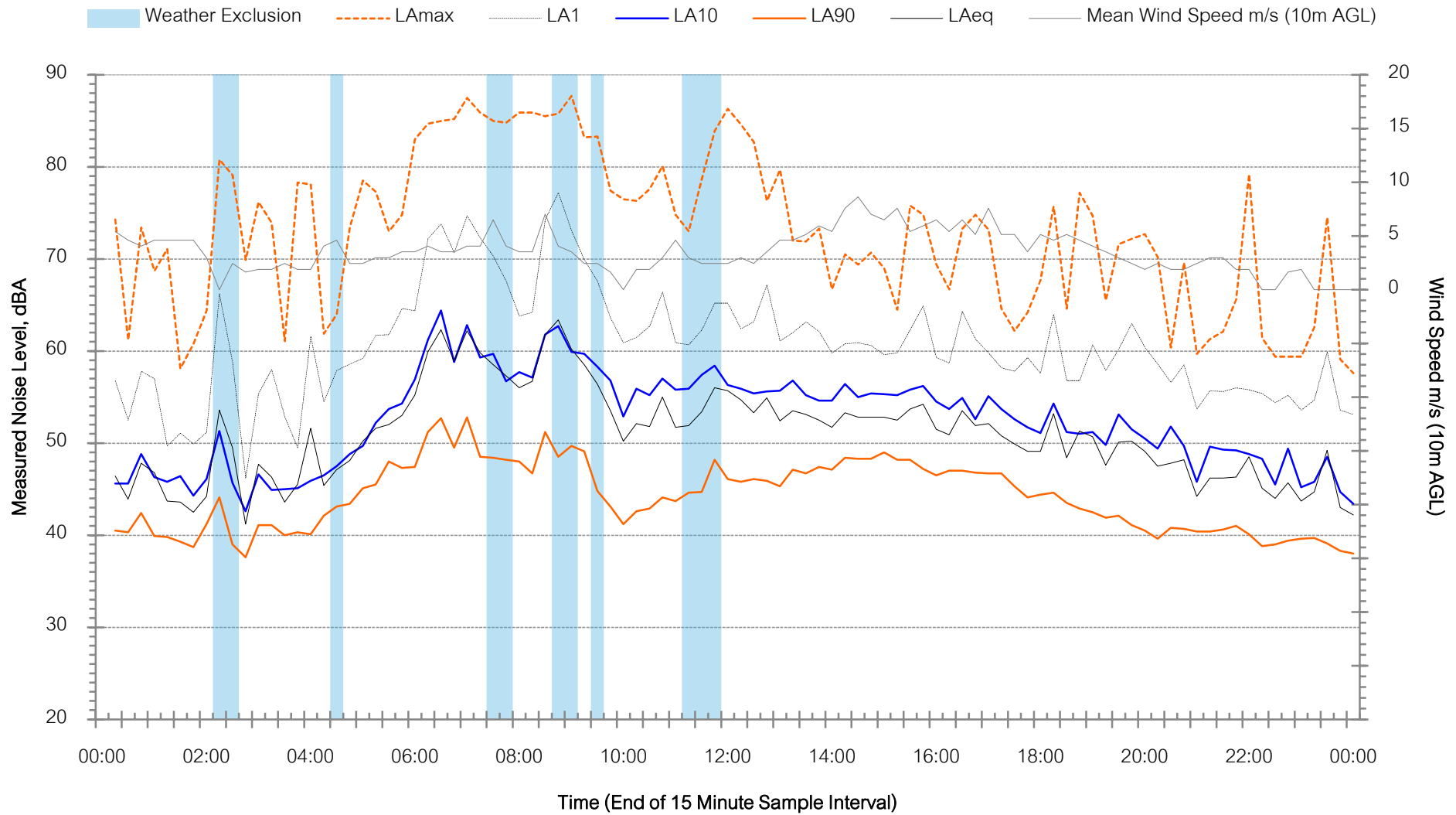
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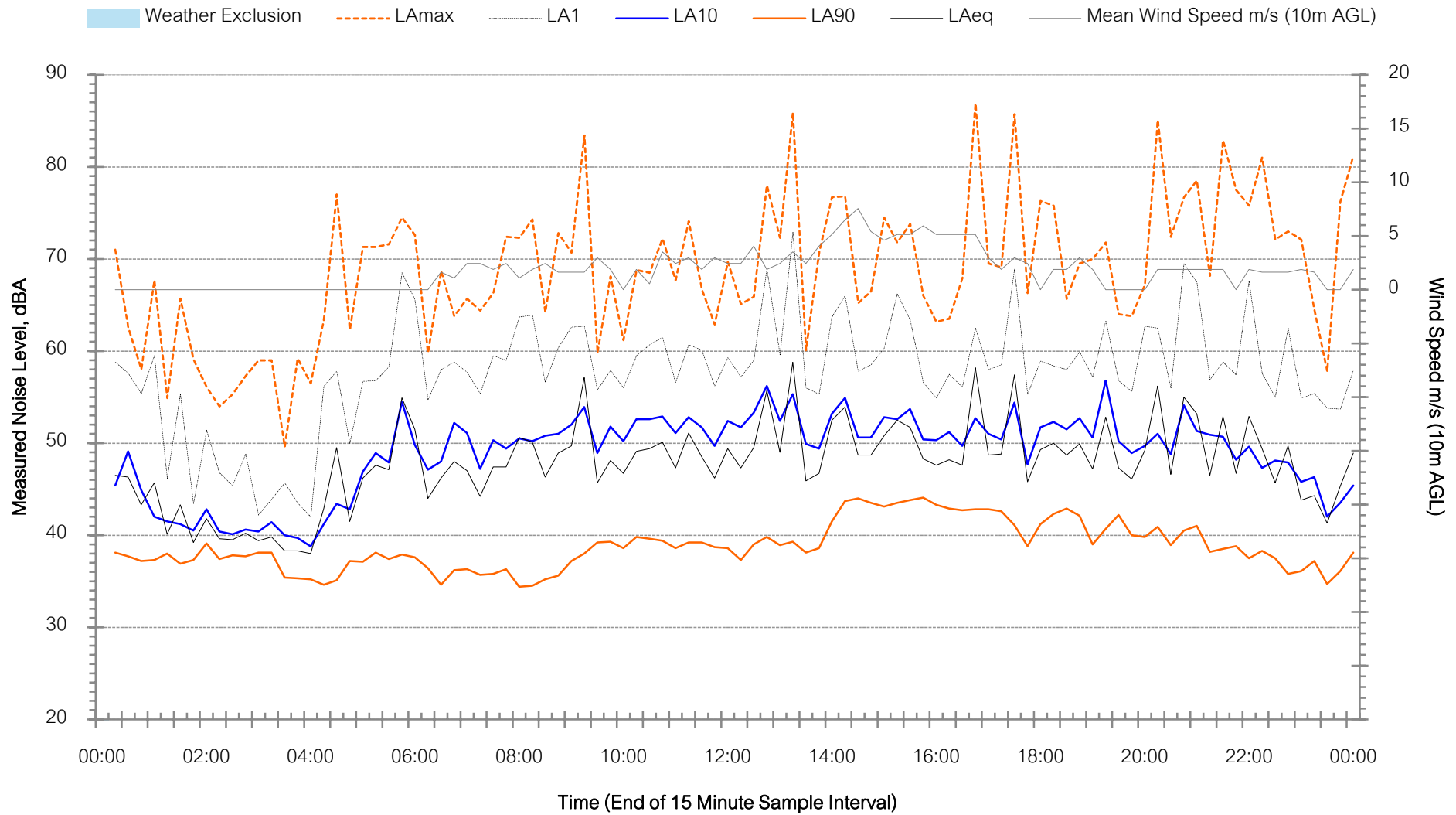
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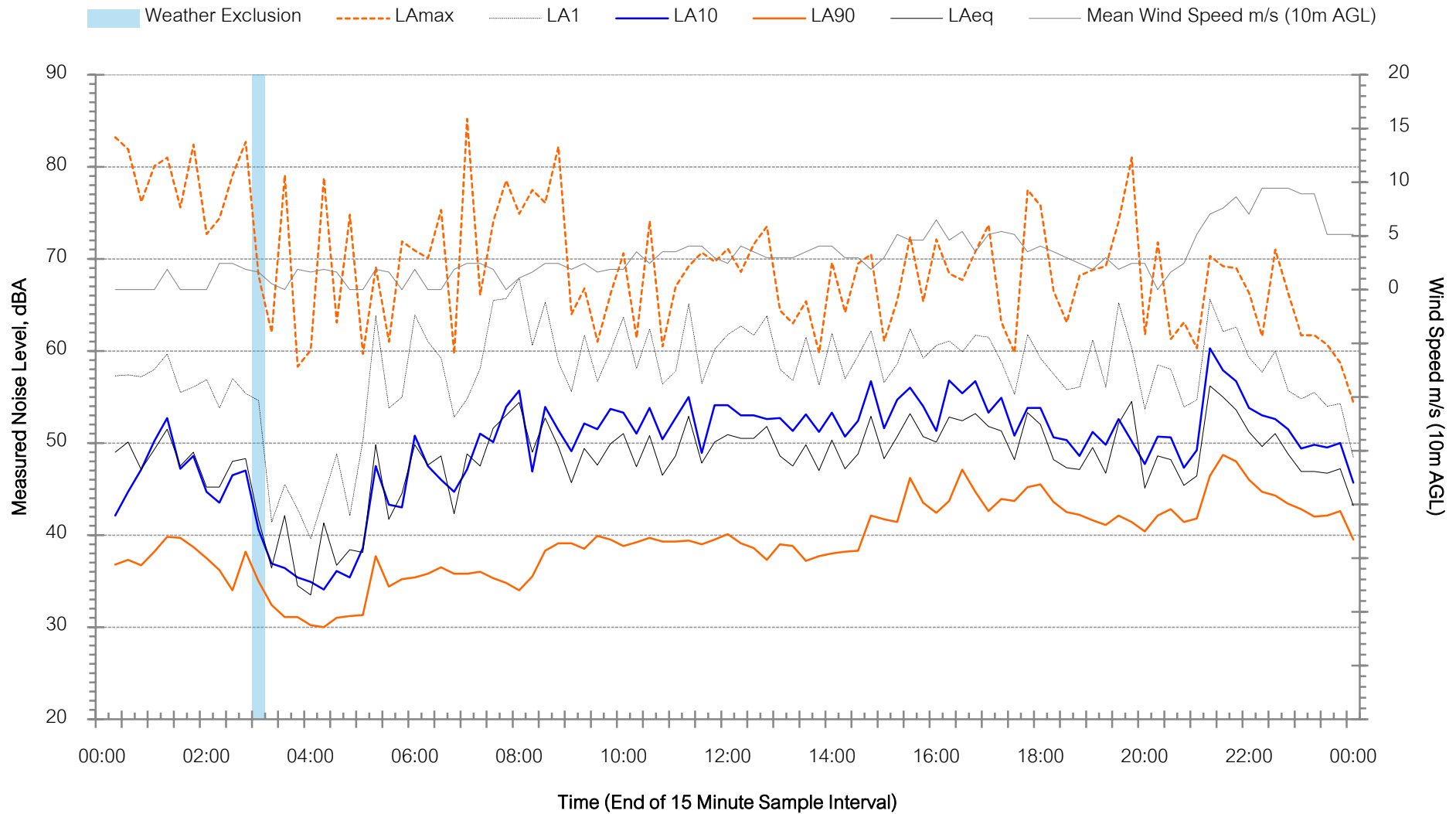
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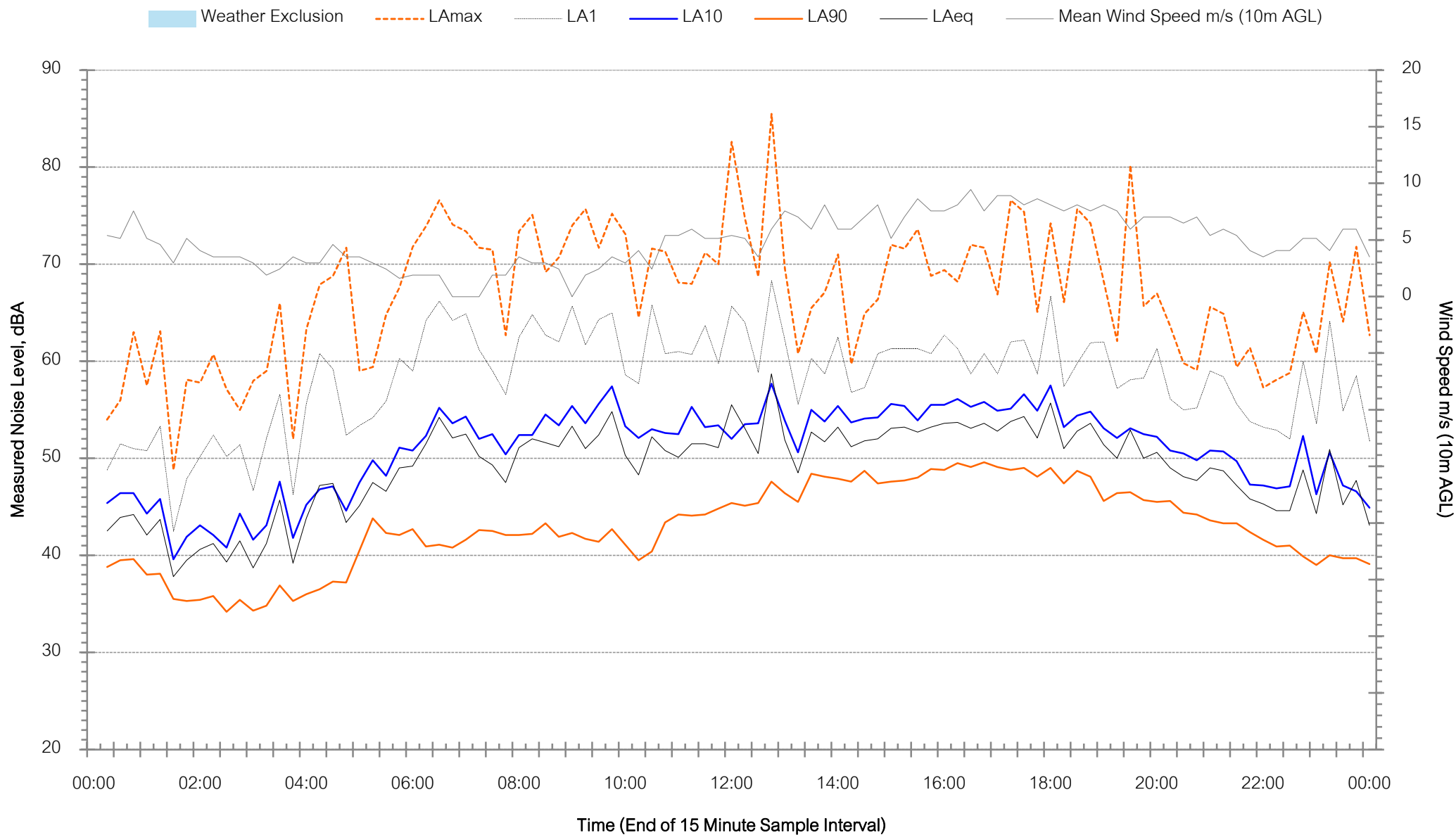
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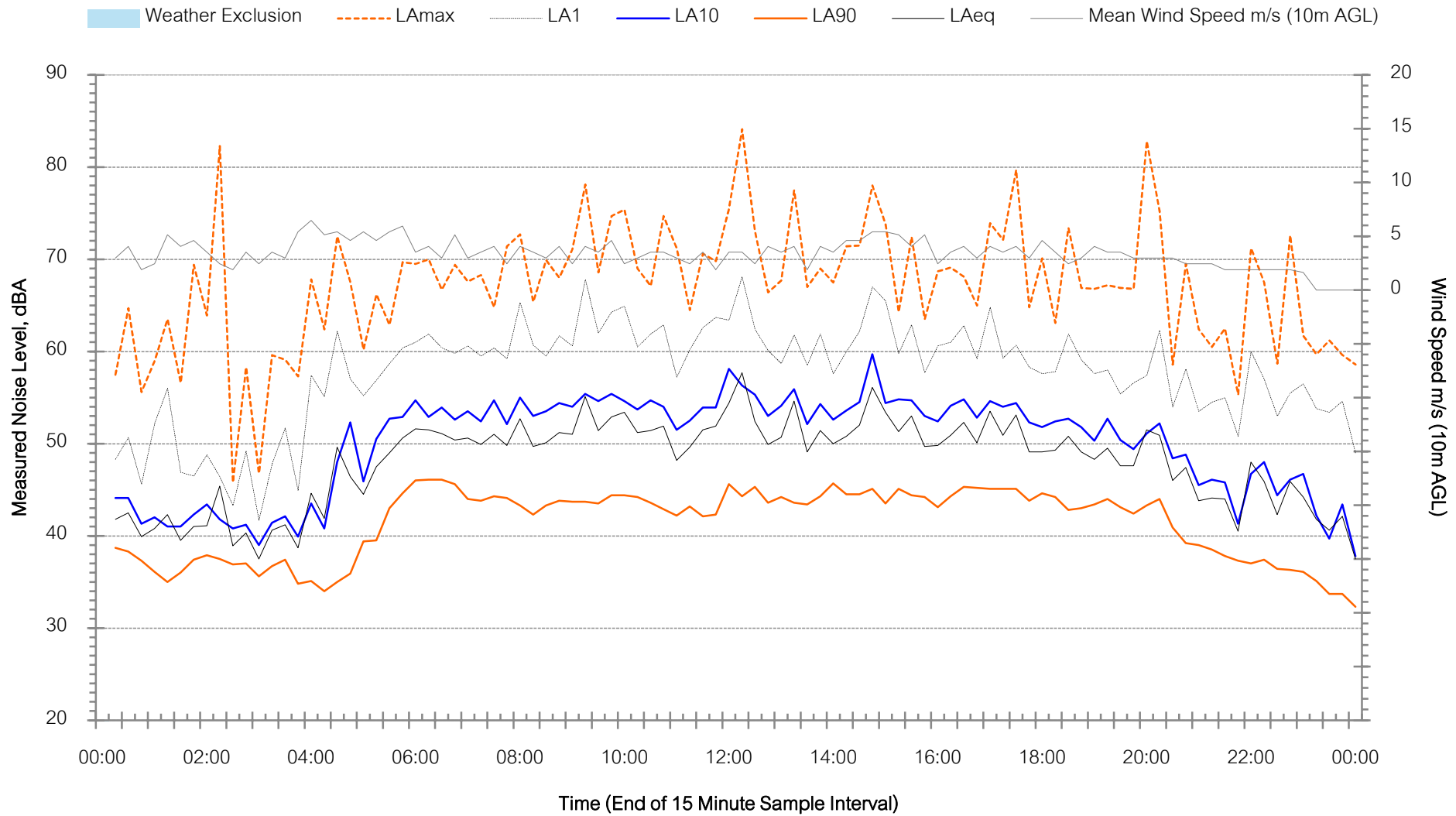
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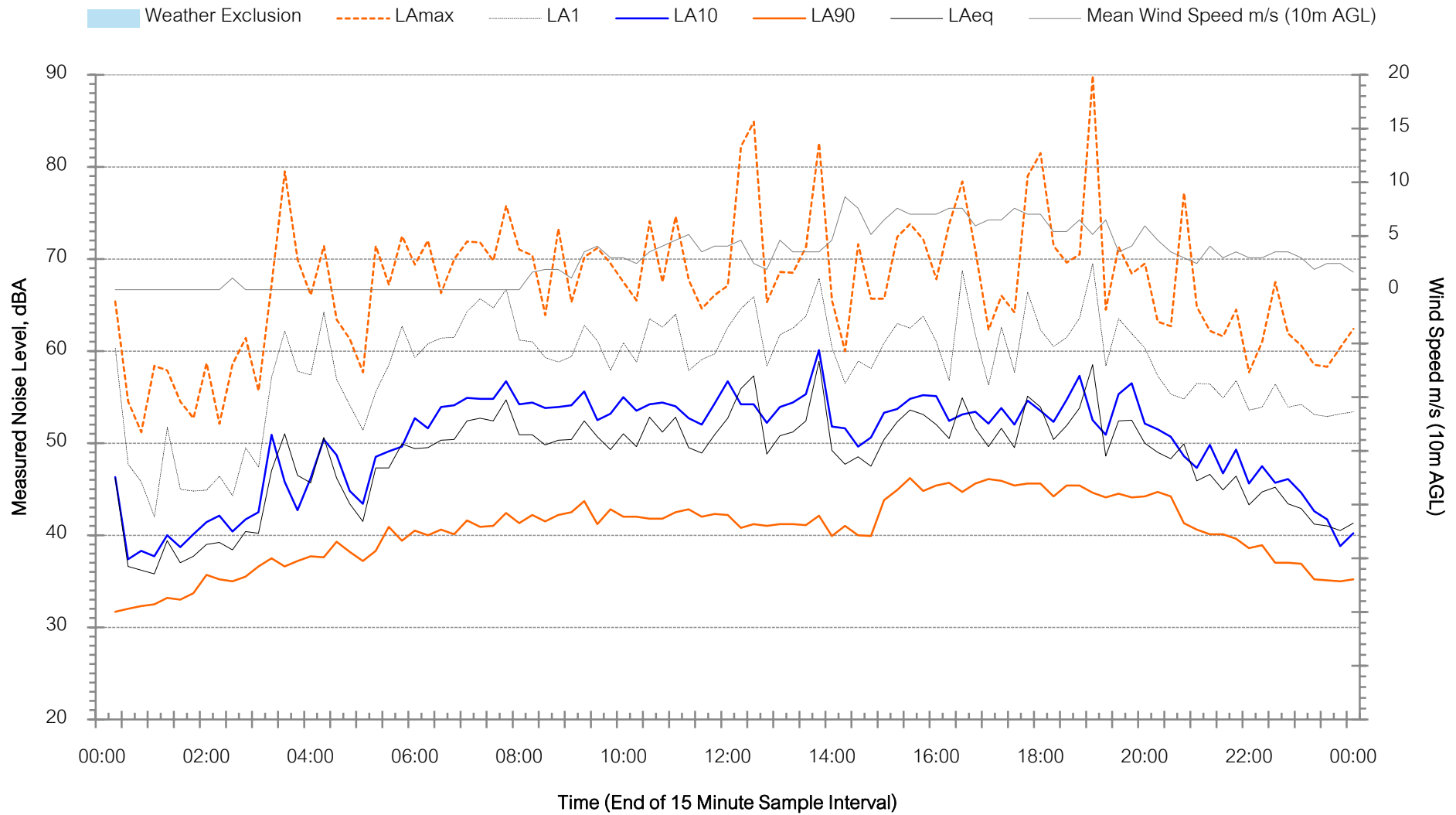
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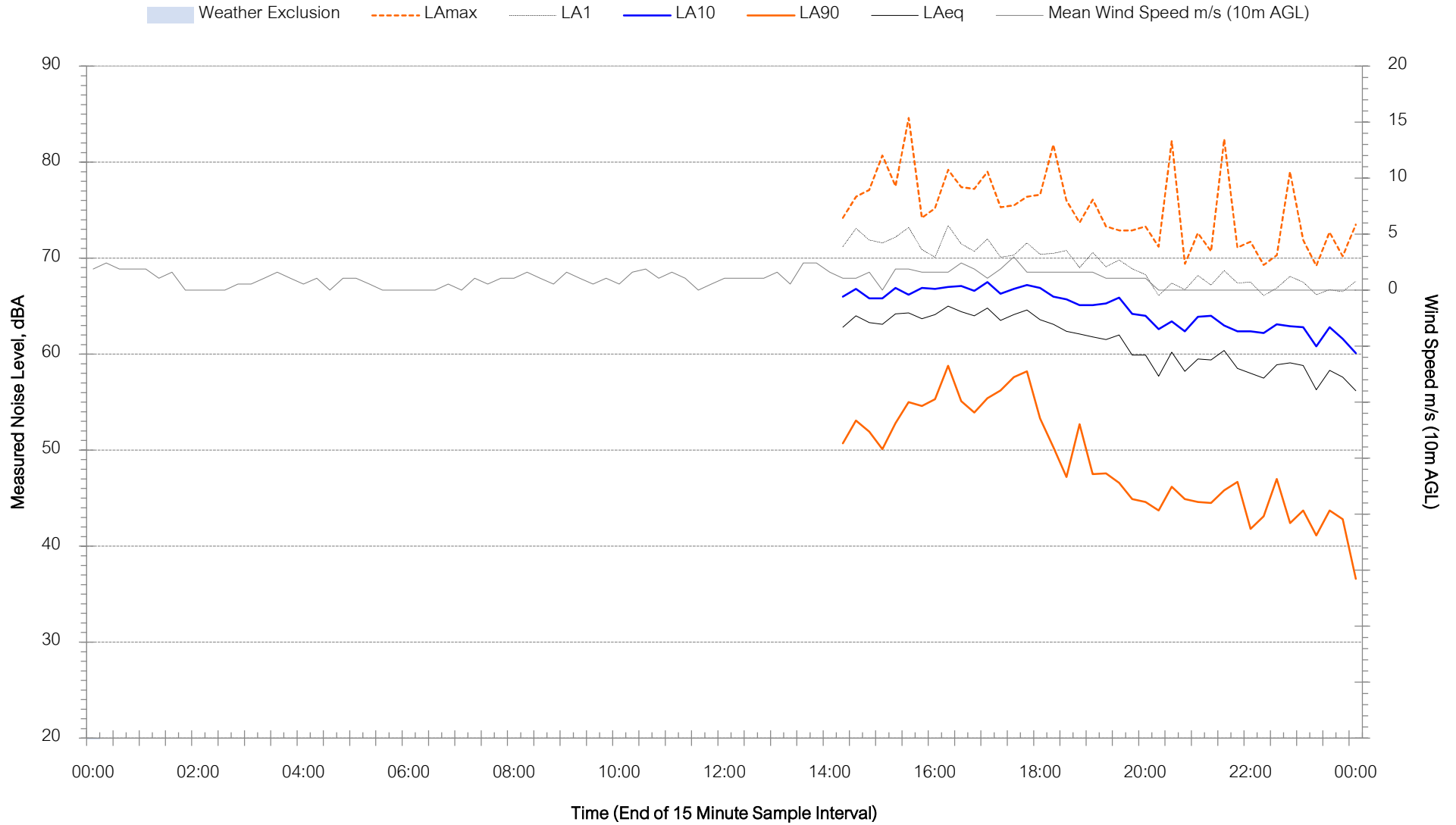
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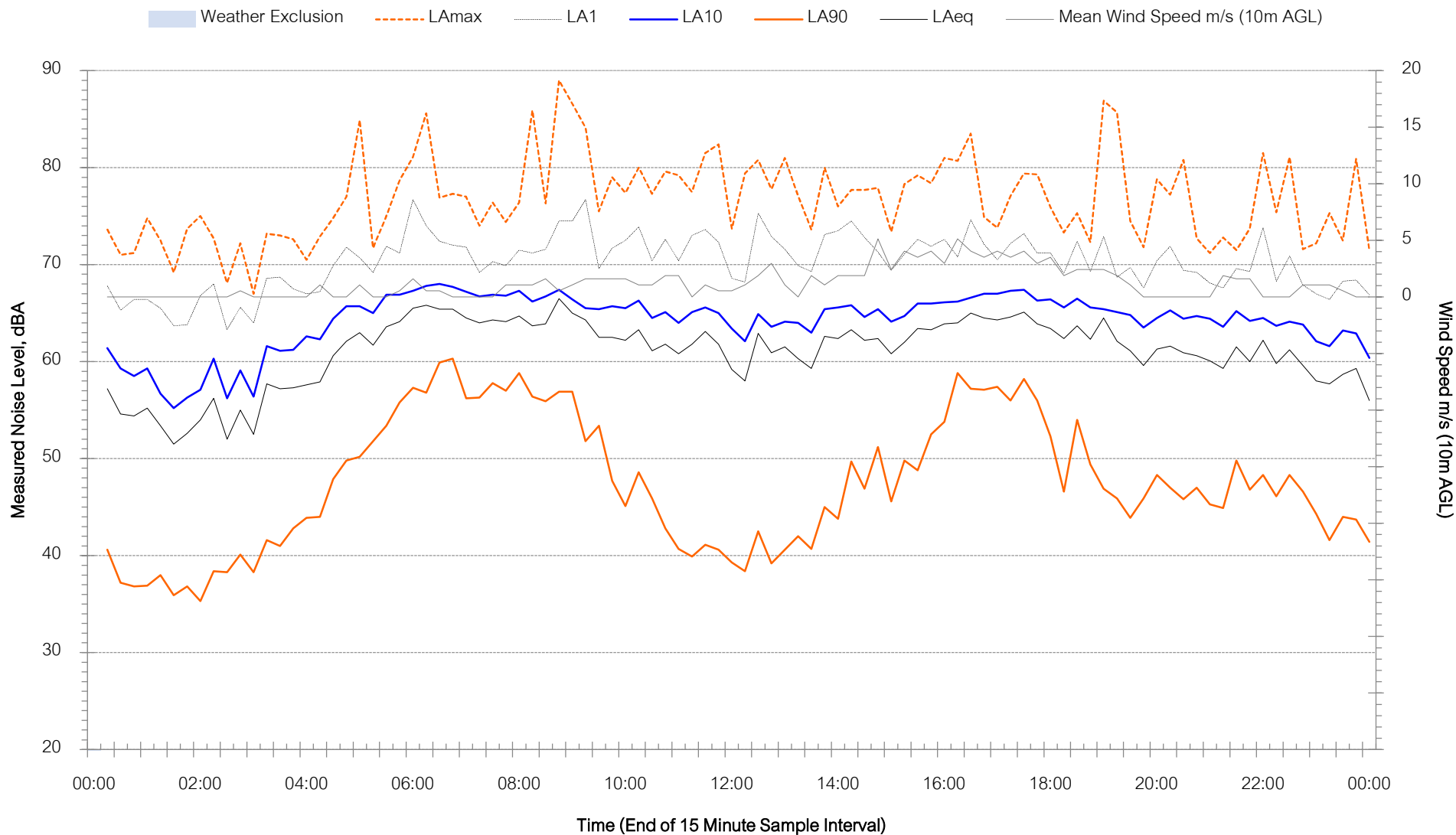
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Ferrers Road, Prospect - Tuesday 12 September 2023



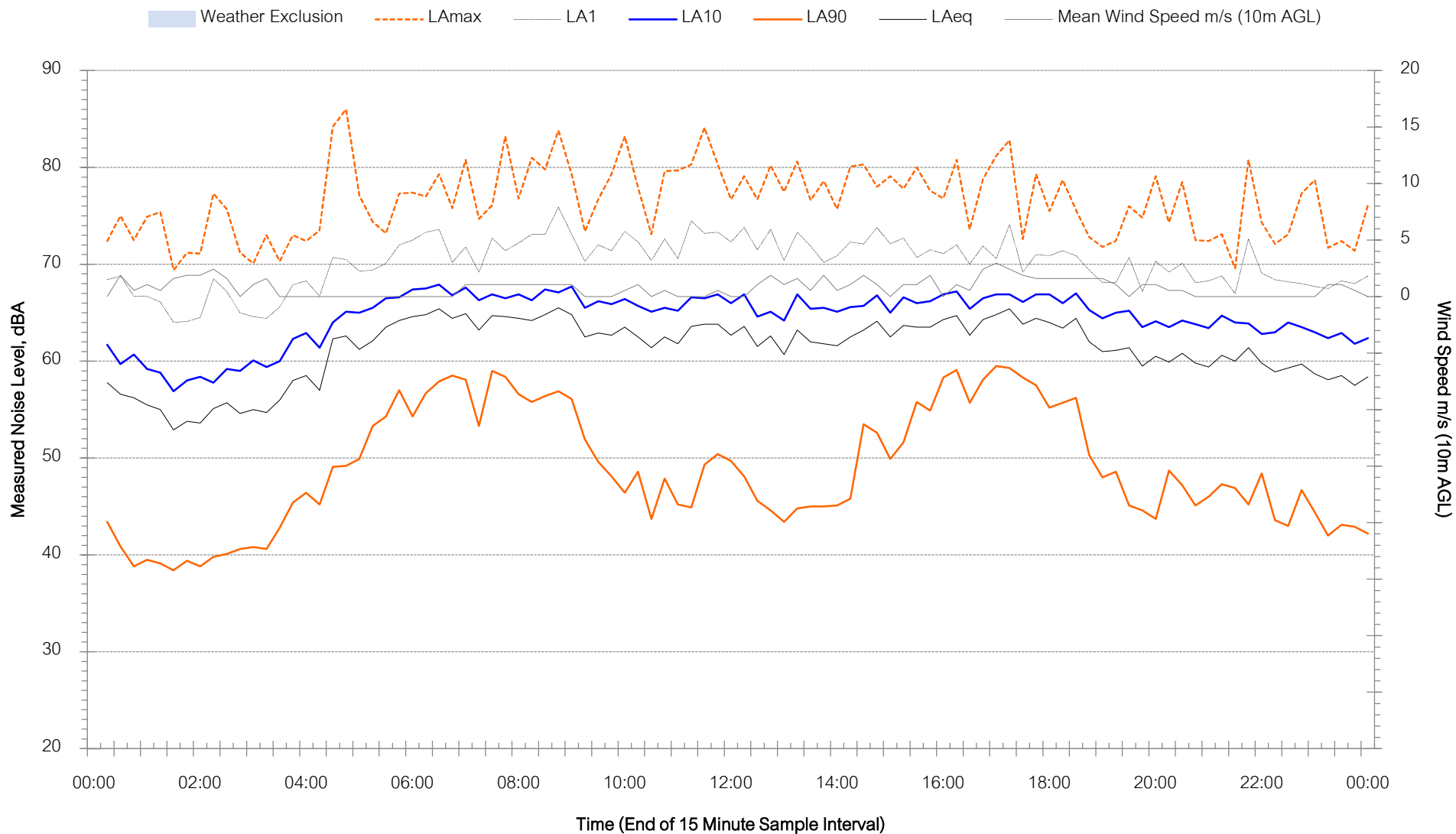
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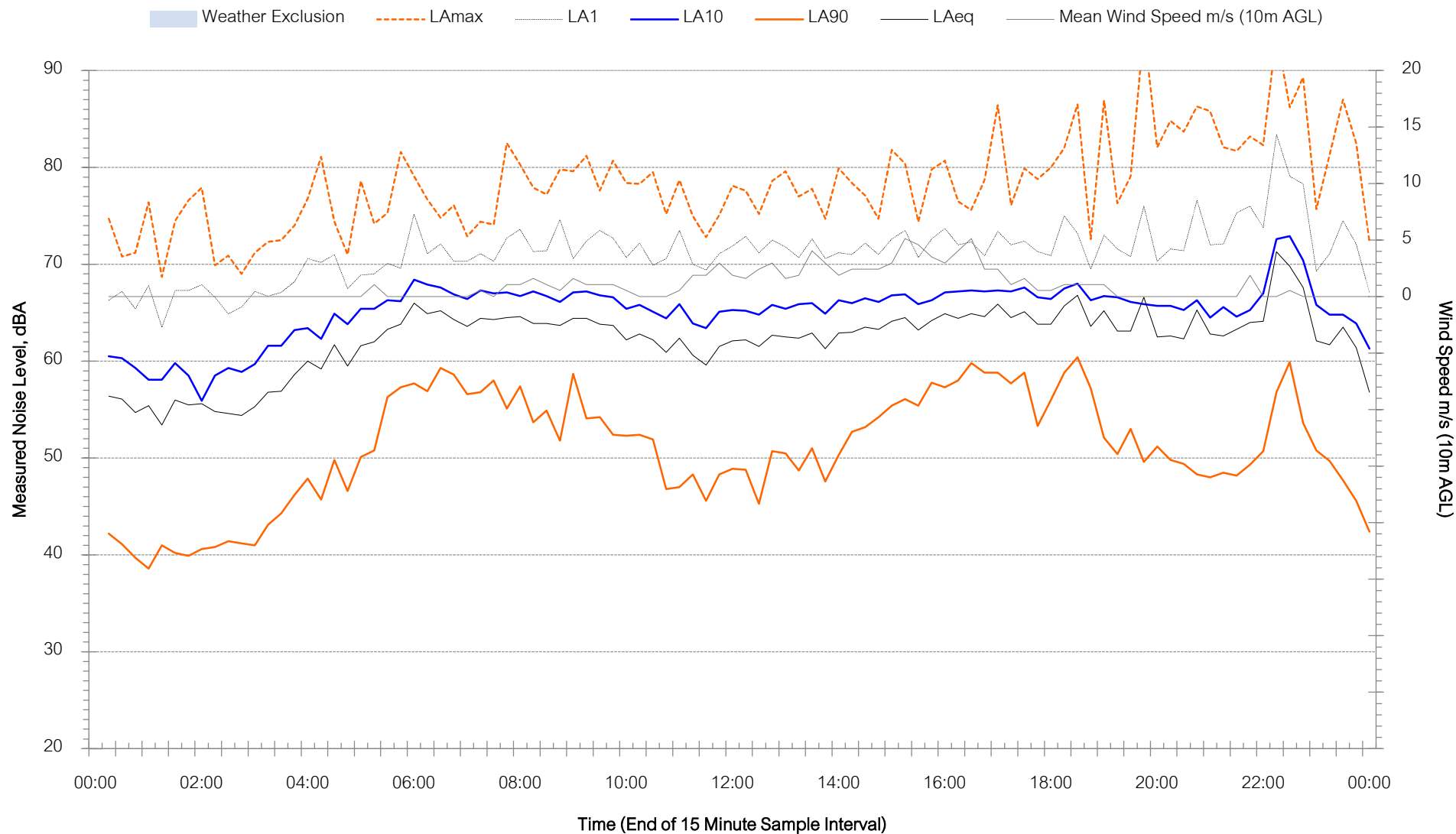
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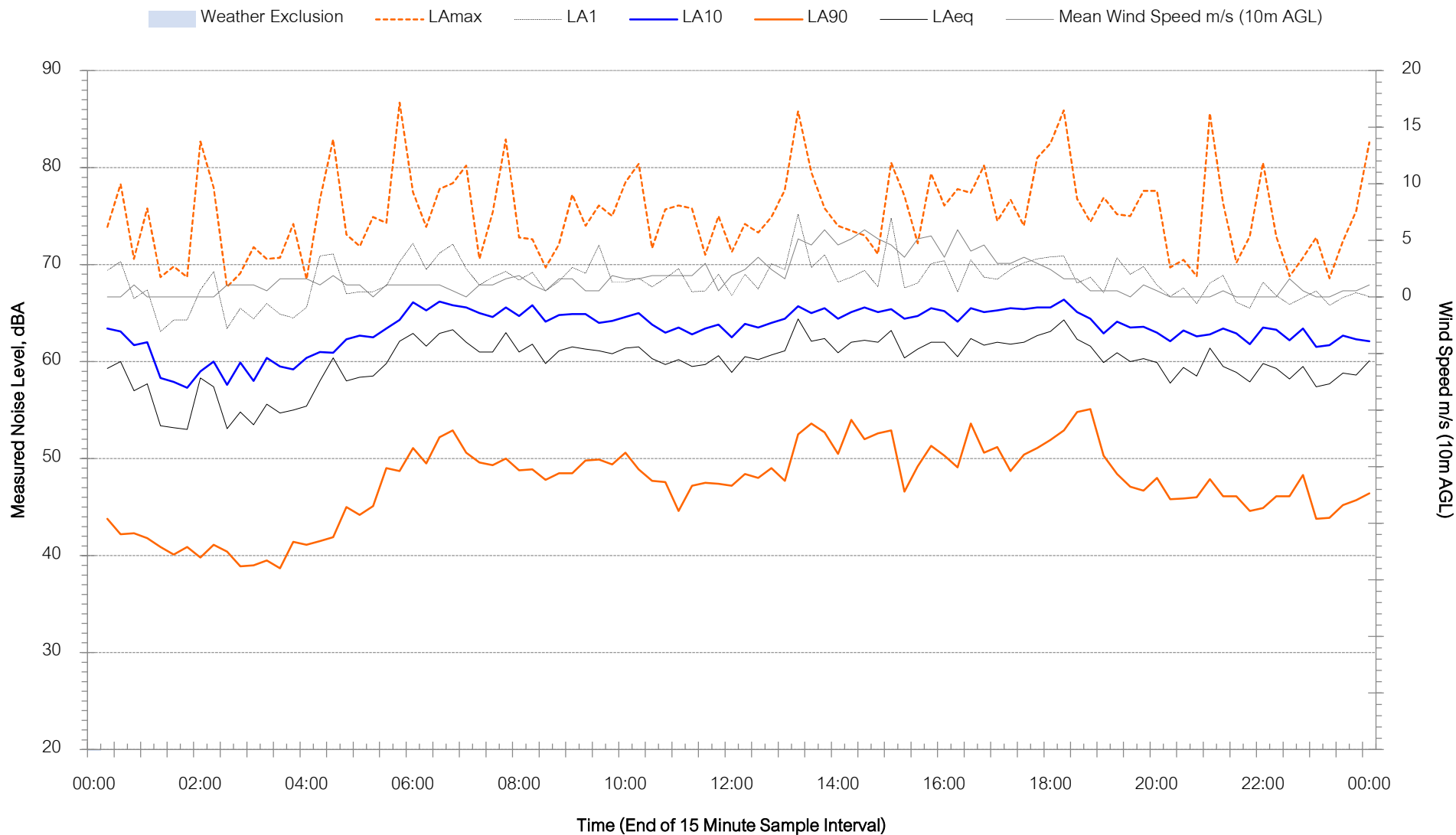
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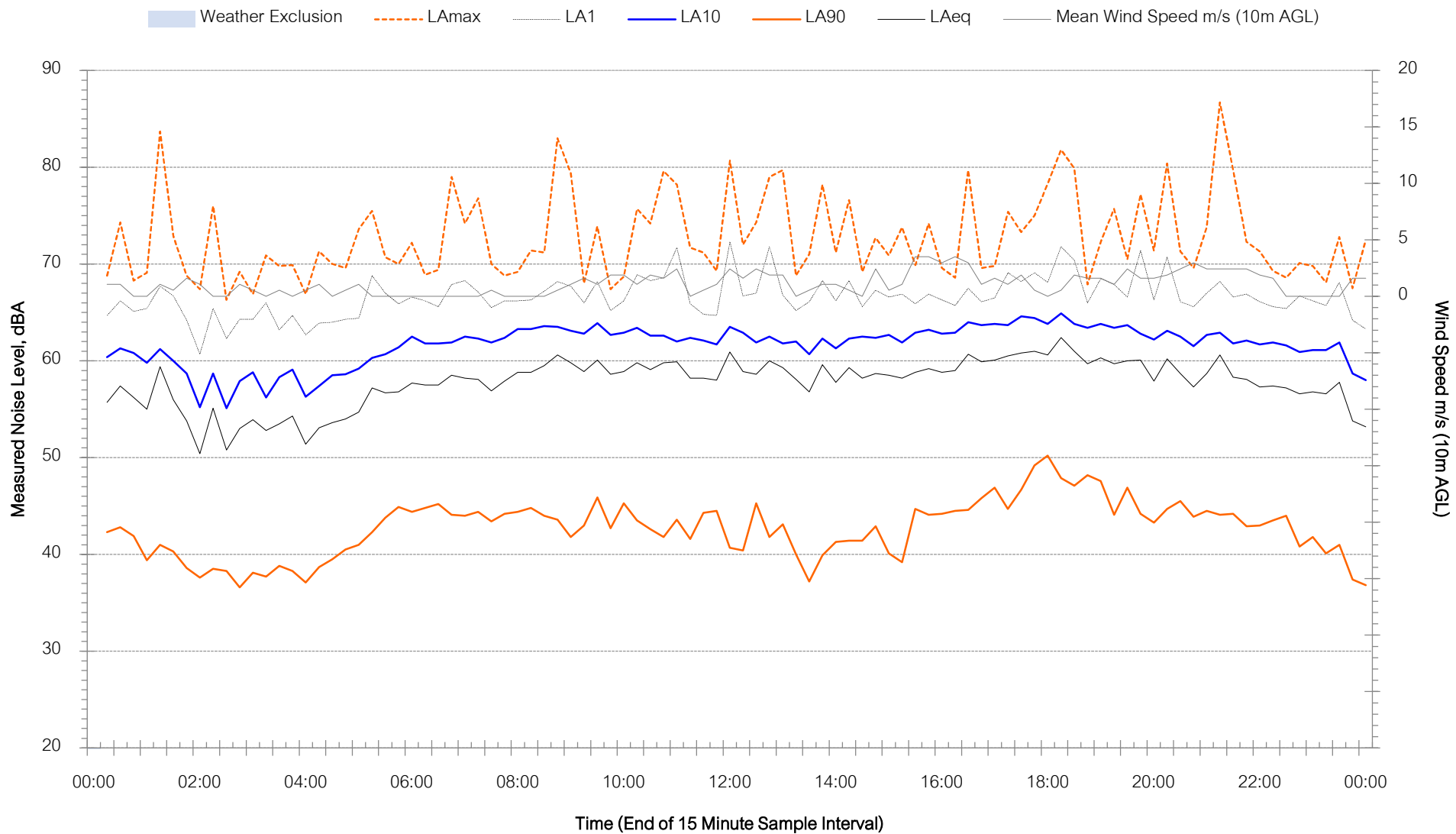
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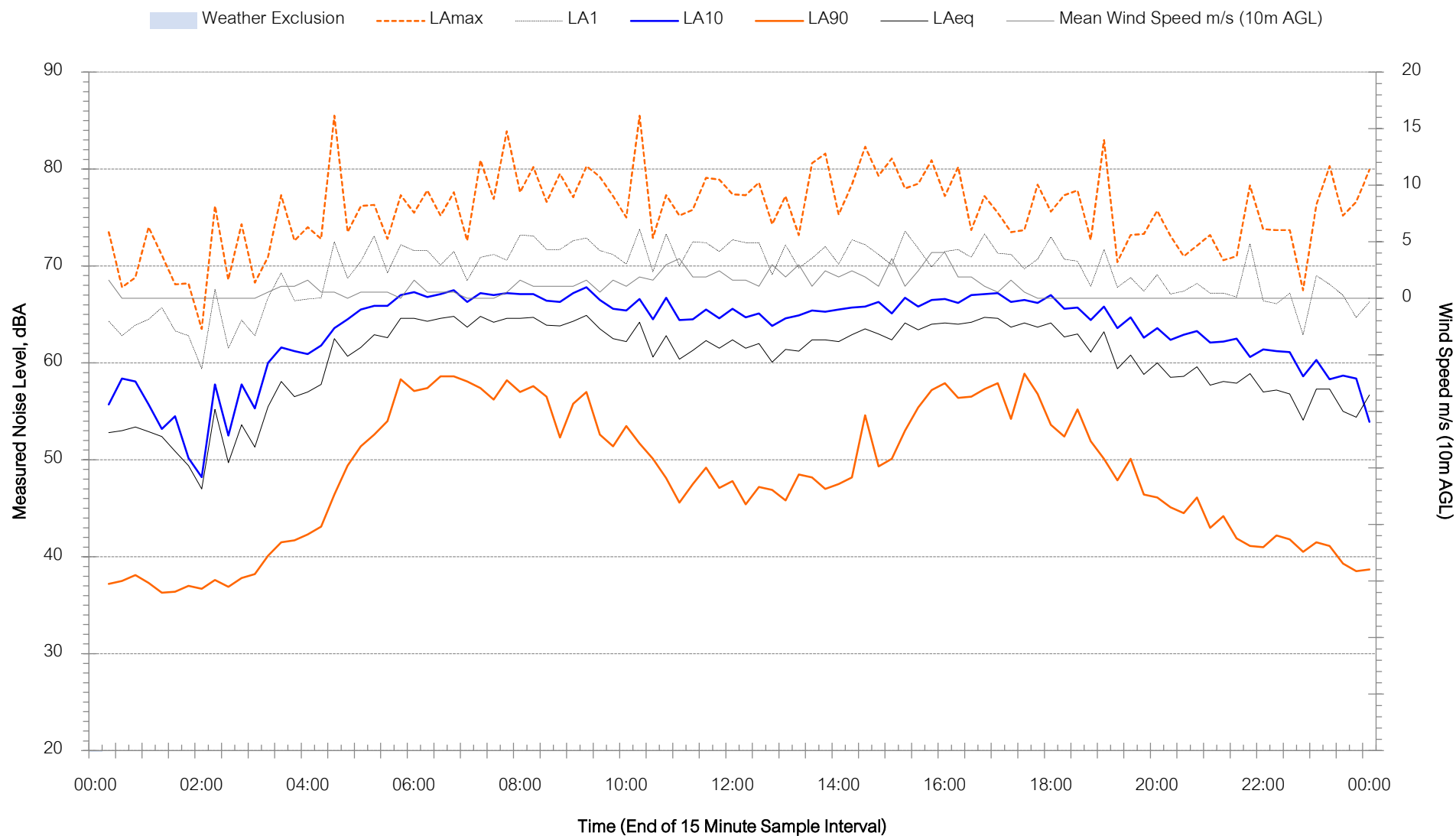
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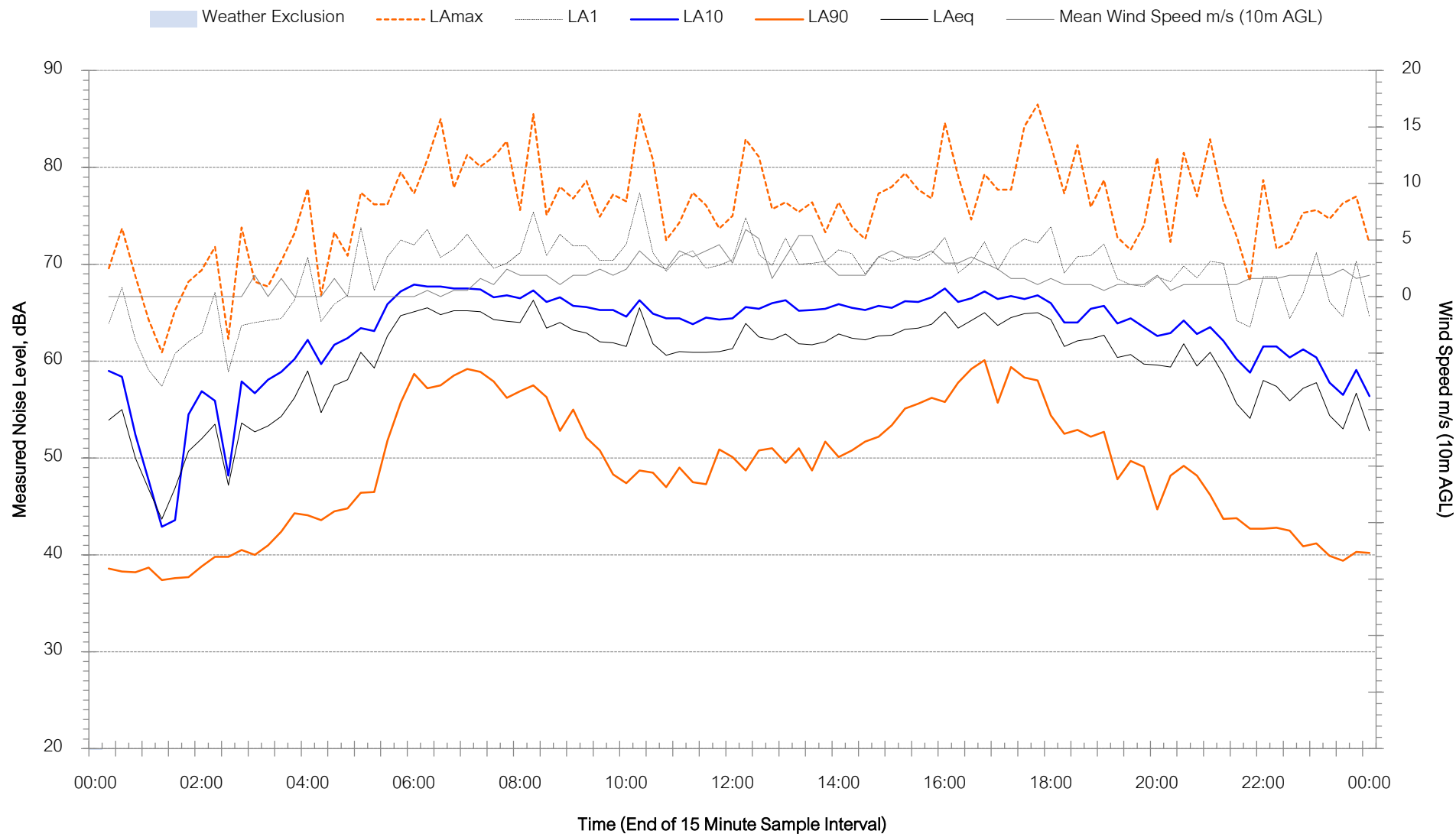
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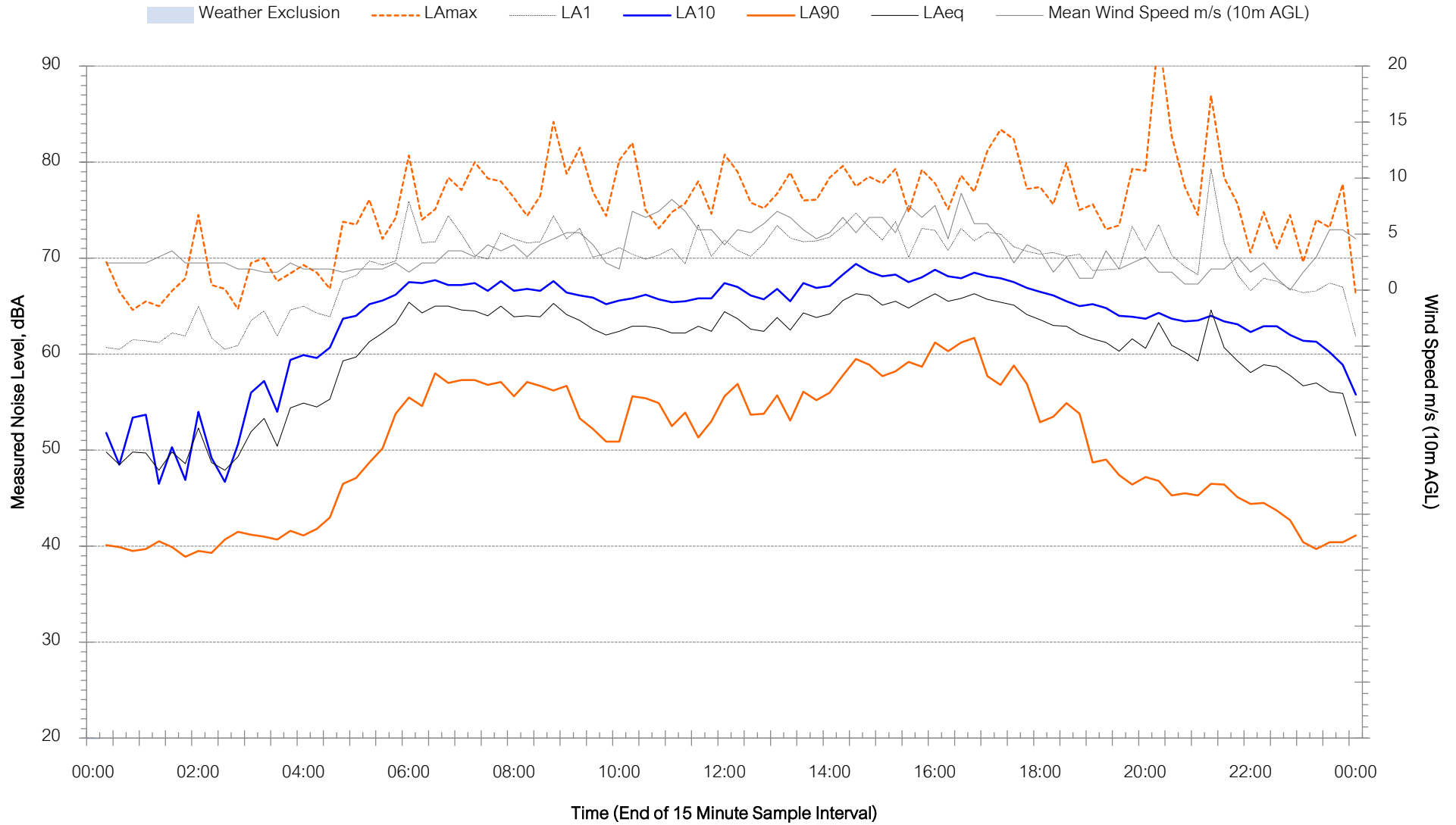
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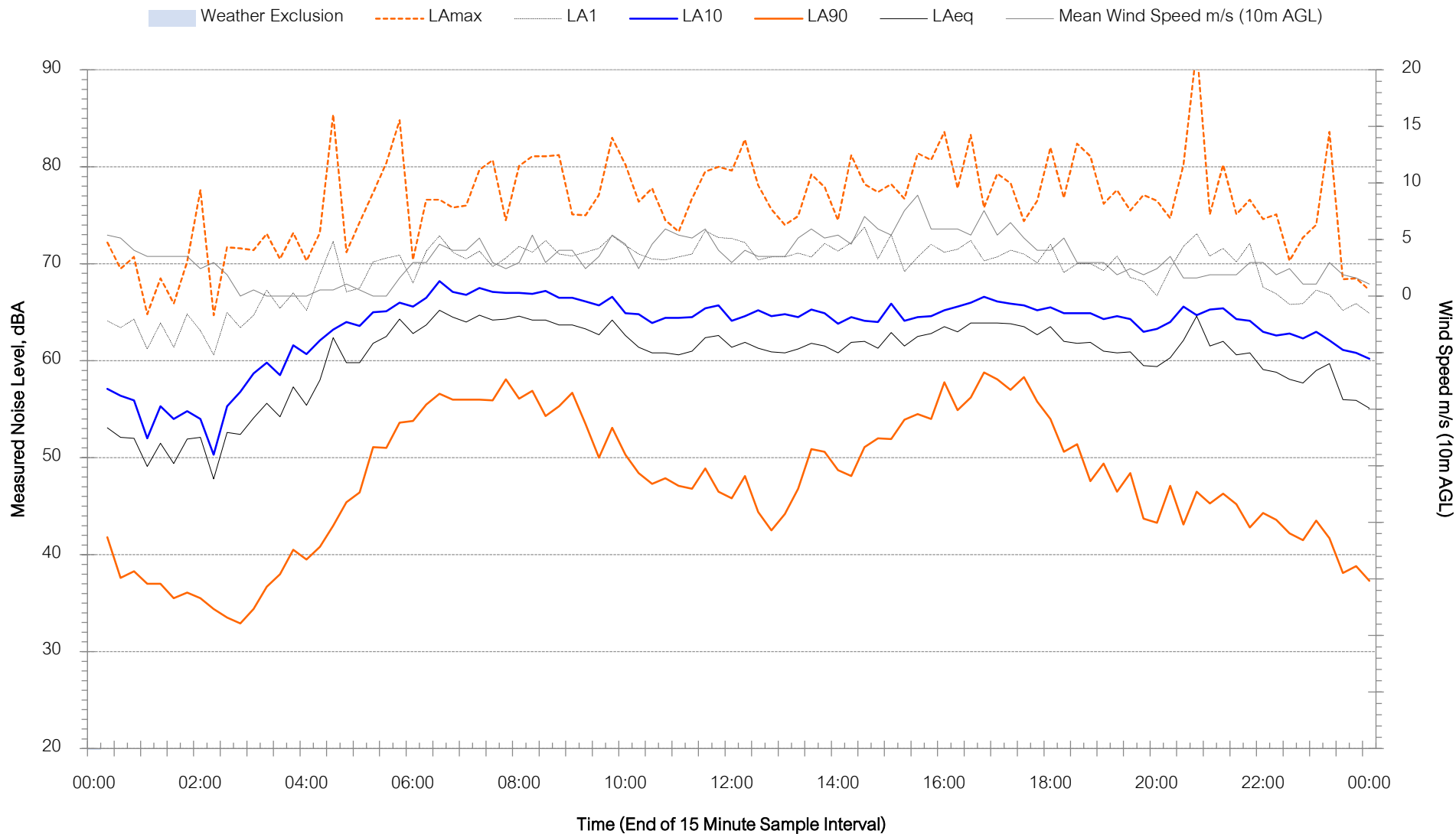
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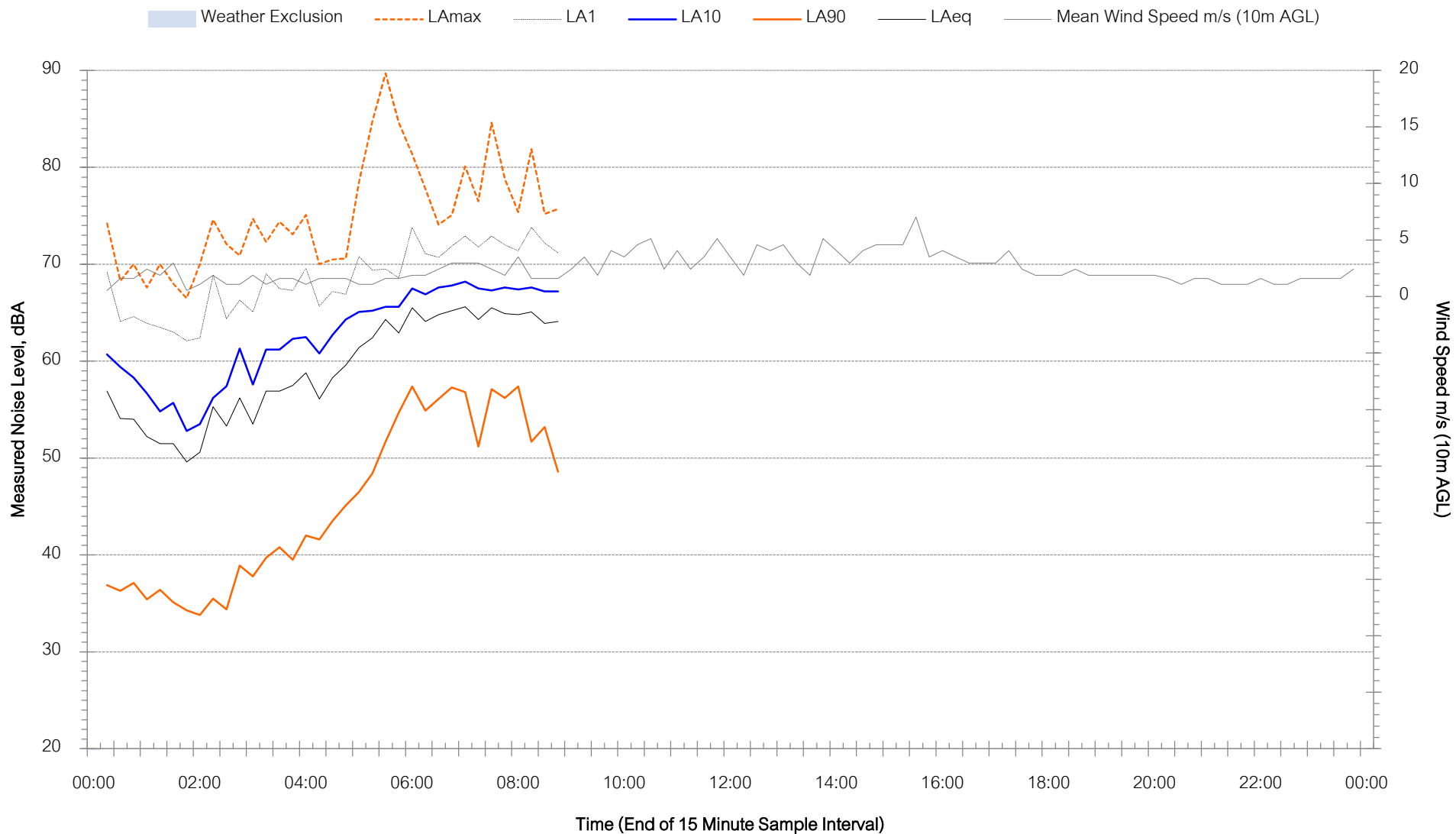
Background Noise Levels

Ferrers Road, Prospect - Thursday 21 September 2023



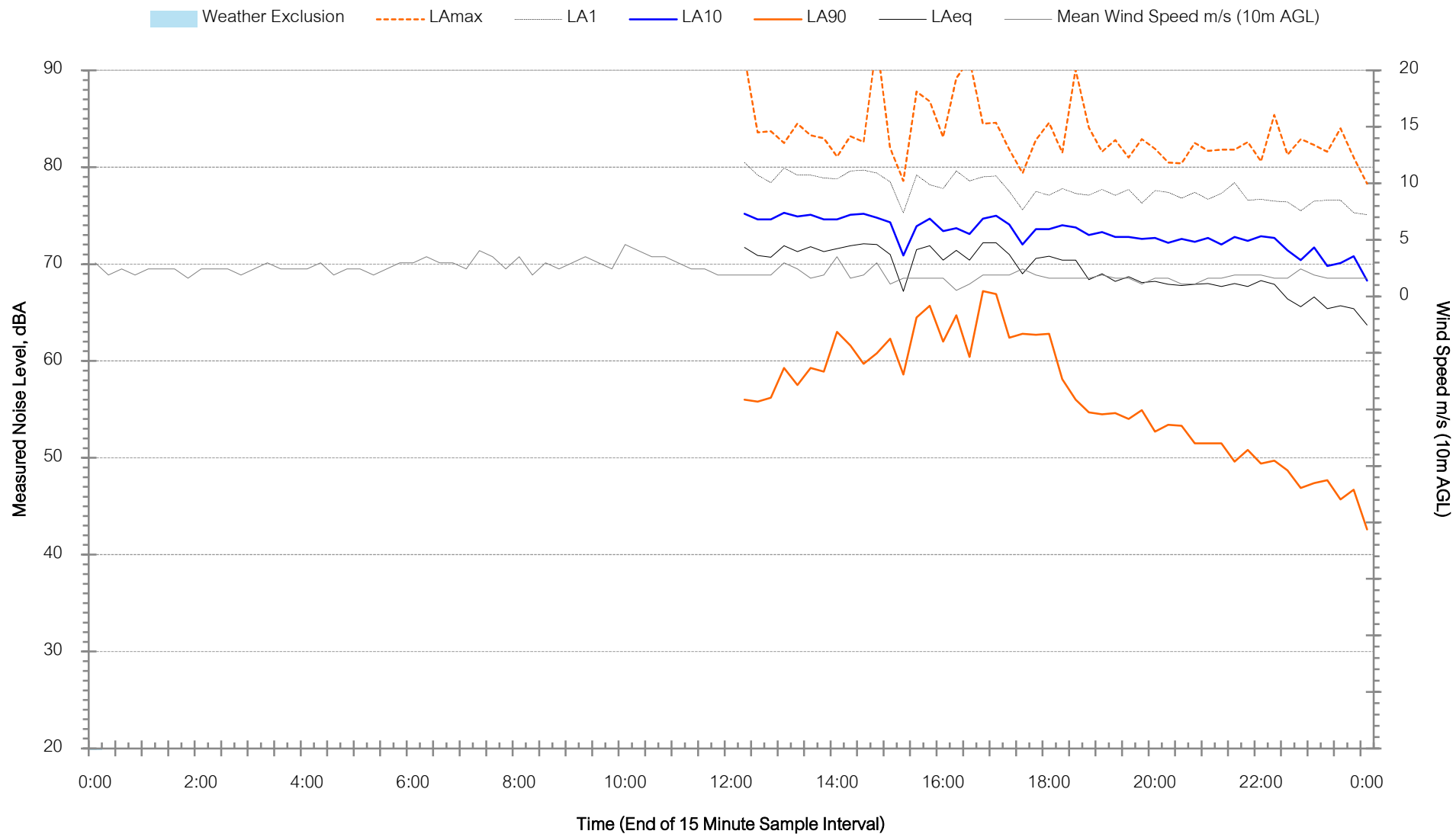
Background Noise Levels

Ferrers Road, Prospect - Friday 22 September 2023



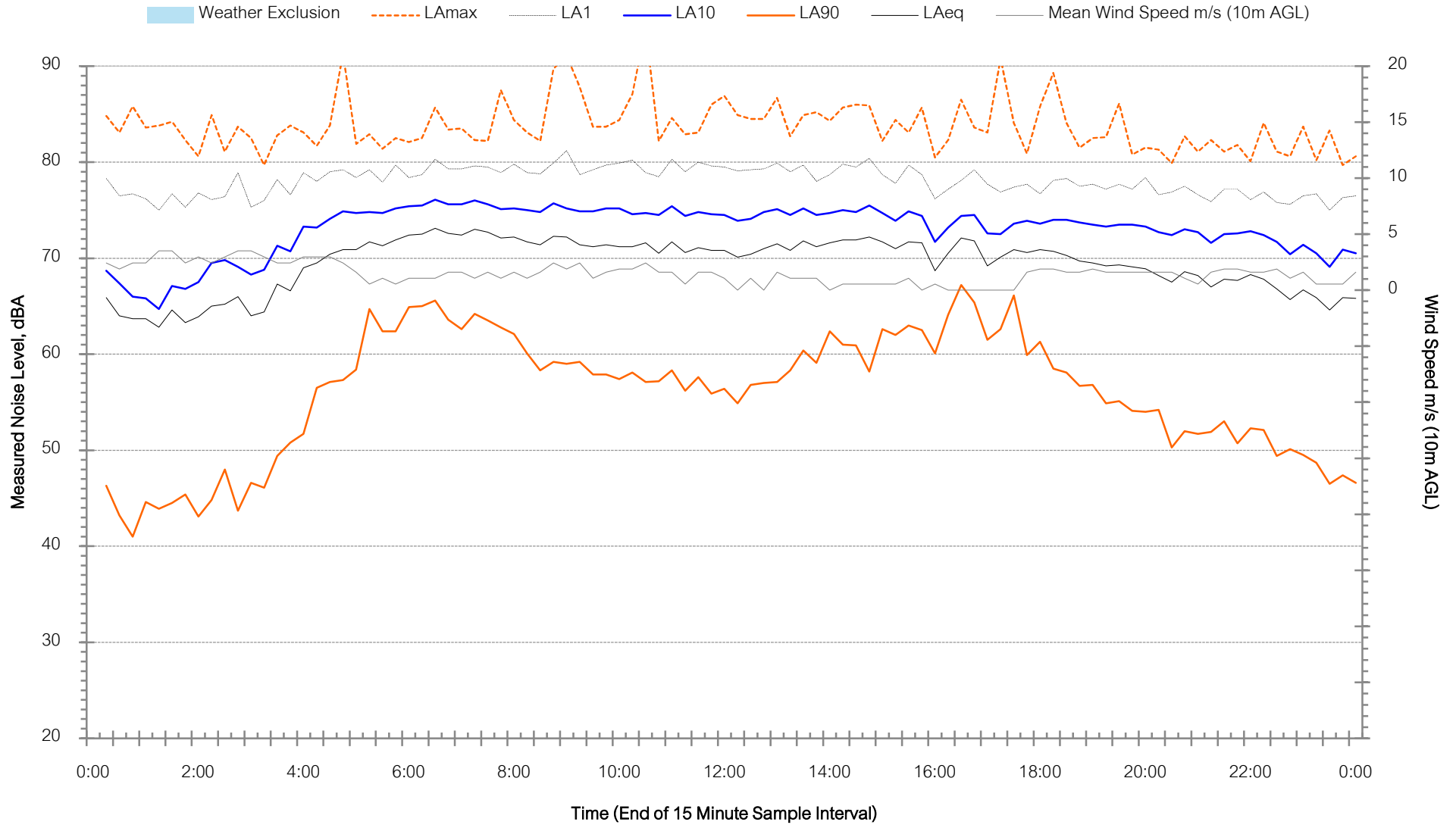
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Wednesday 22 May 2024



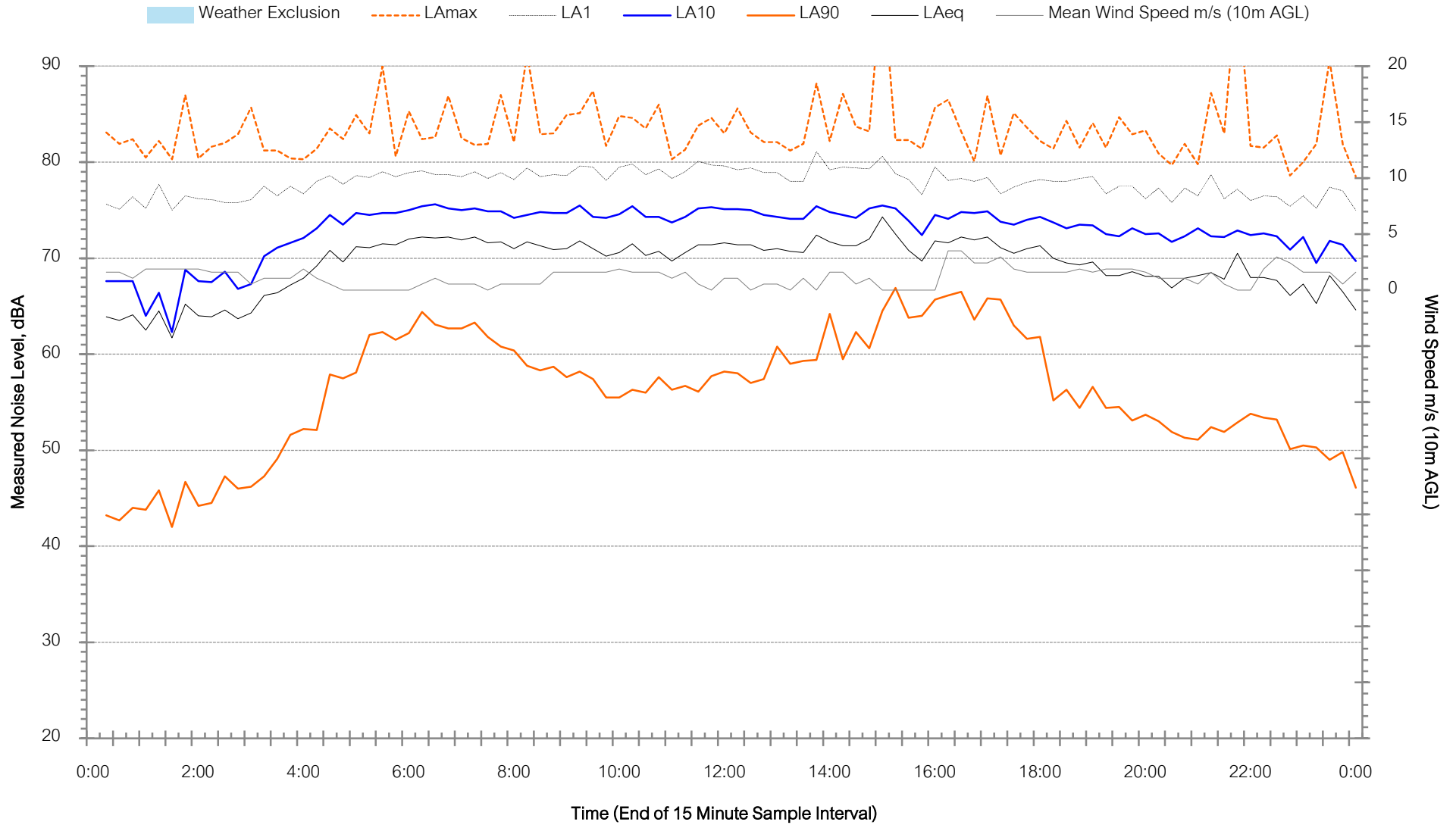
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Thursday 23 May 2024



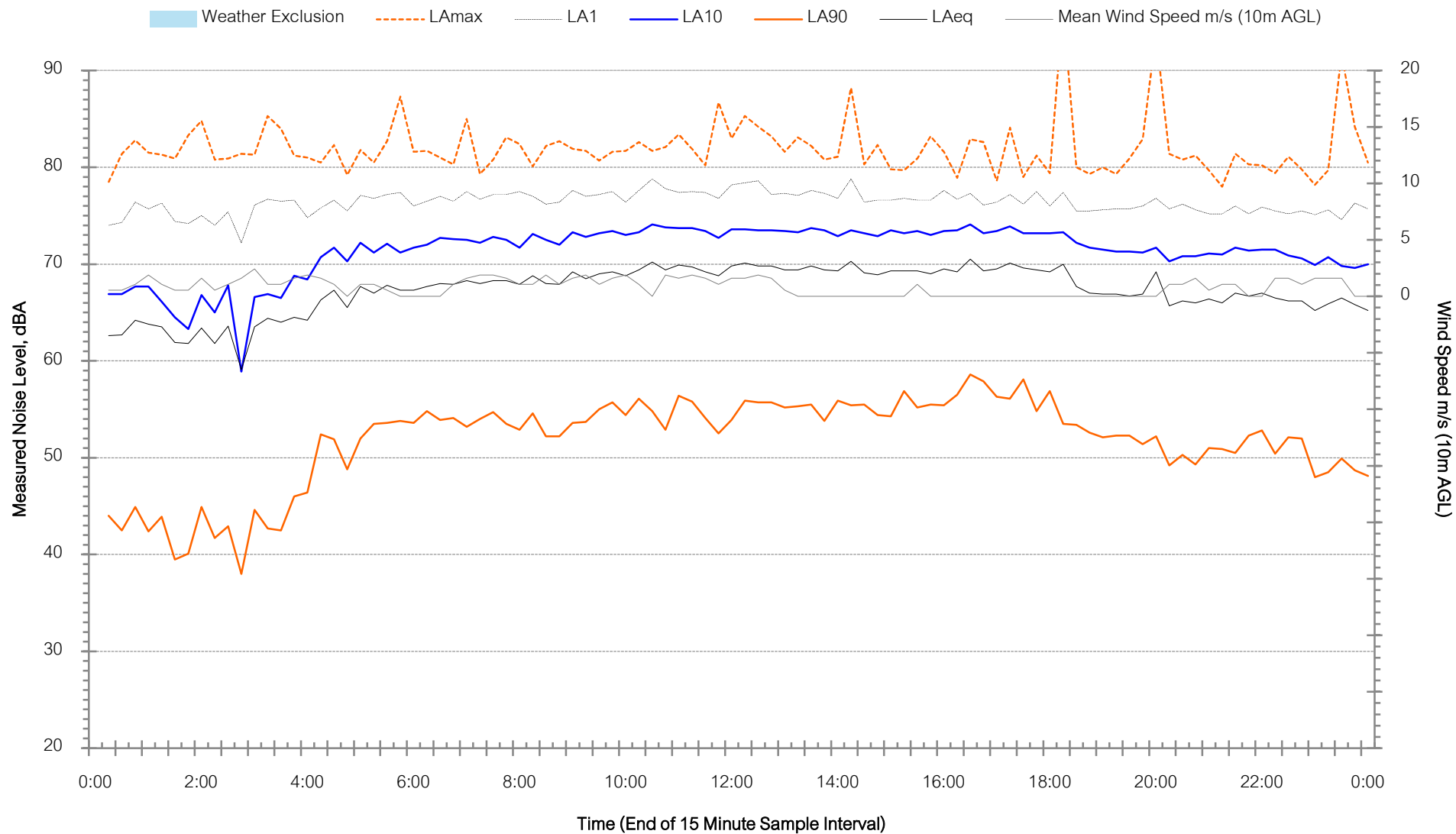
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Friday 24 May 2024



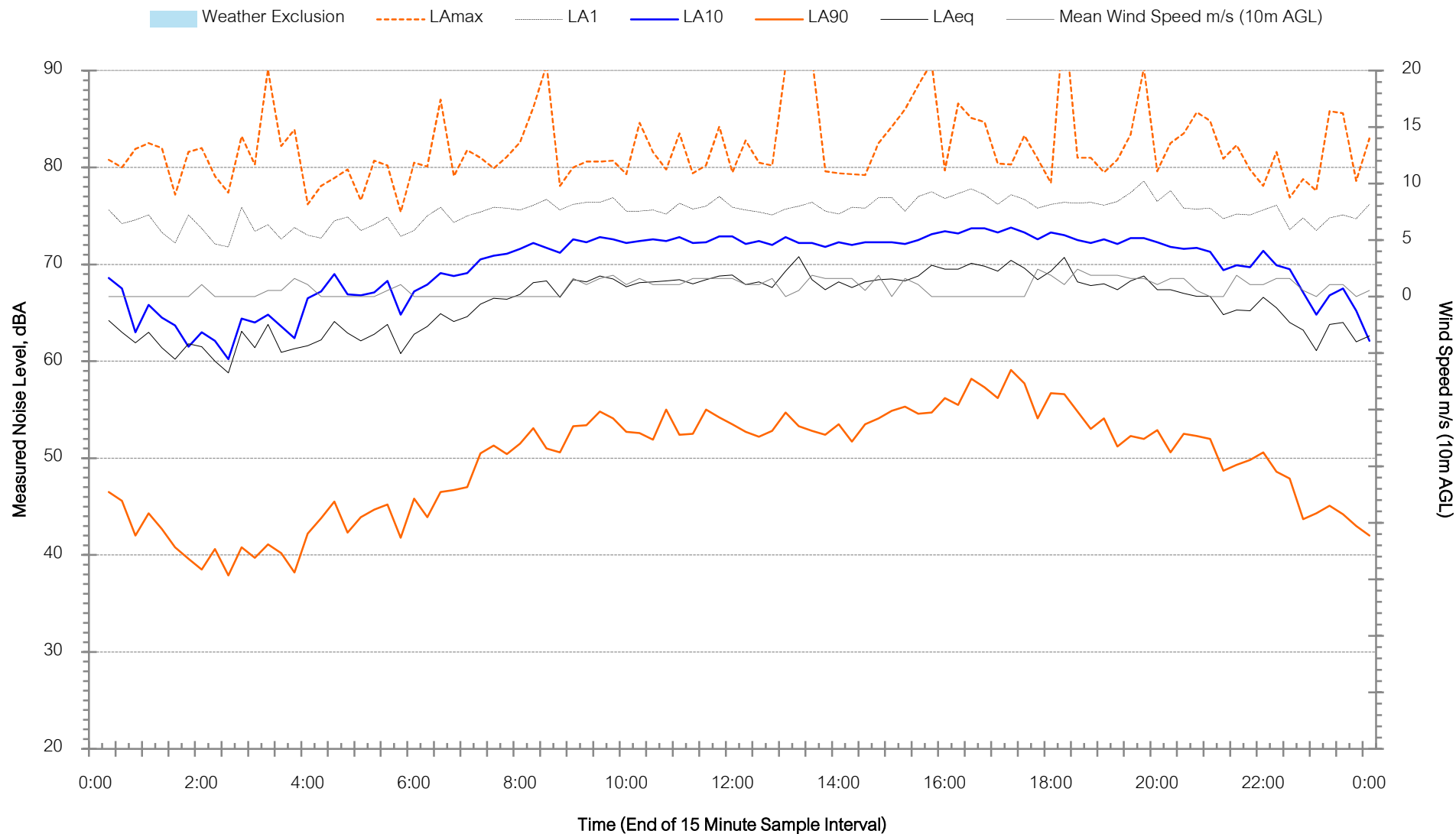
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Saturday 25 May 2024



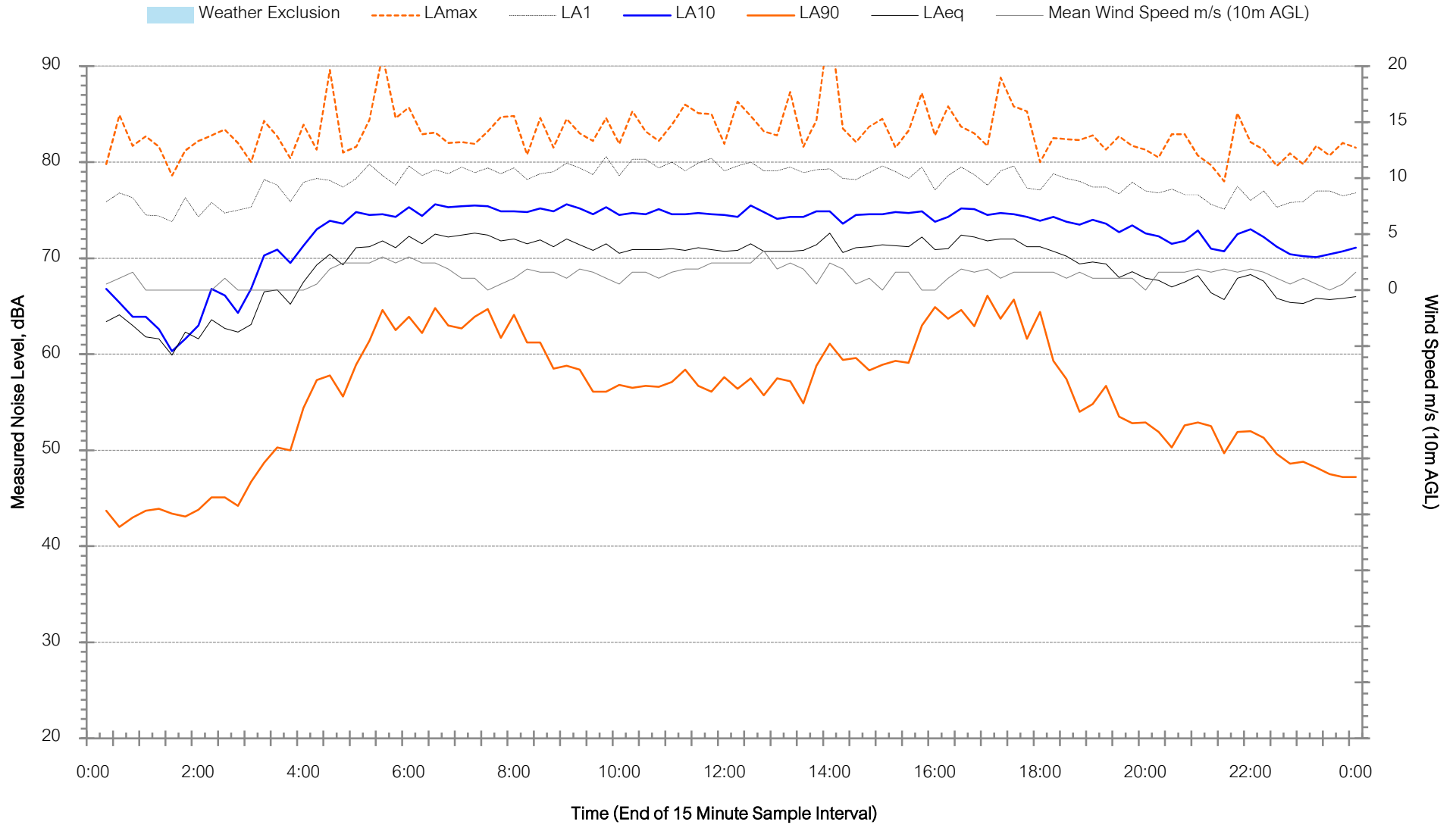
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Sunday 26 May 2024



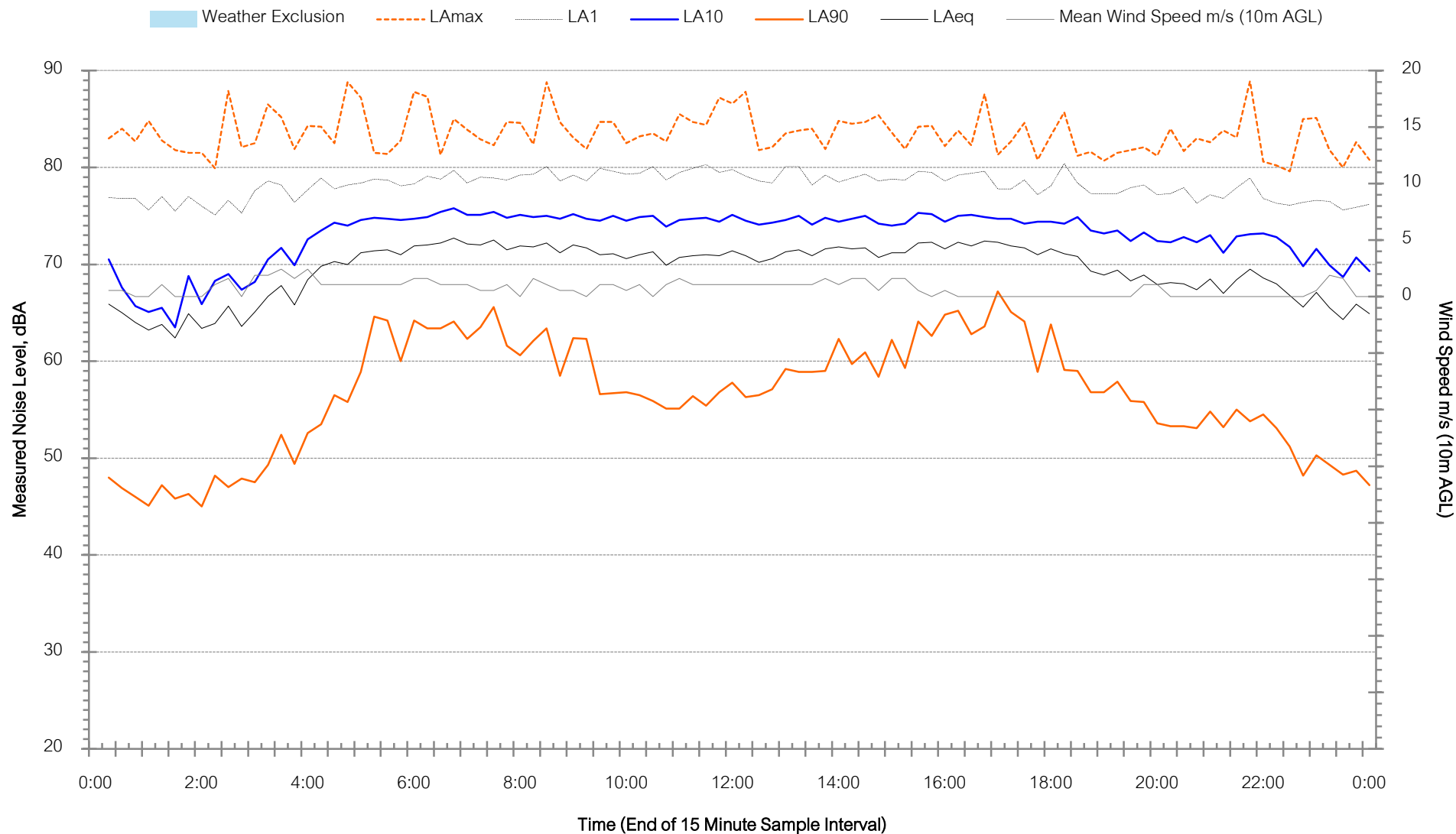
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Monday 27 May 2024



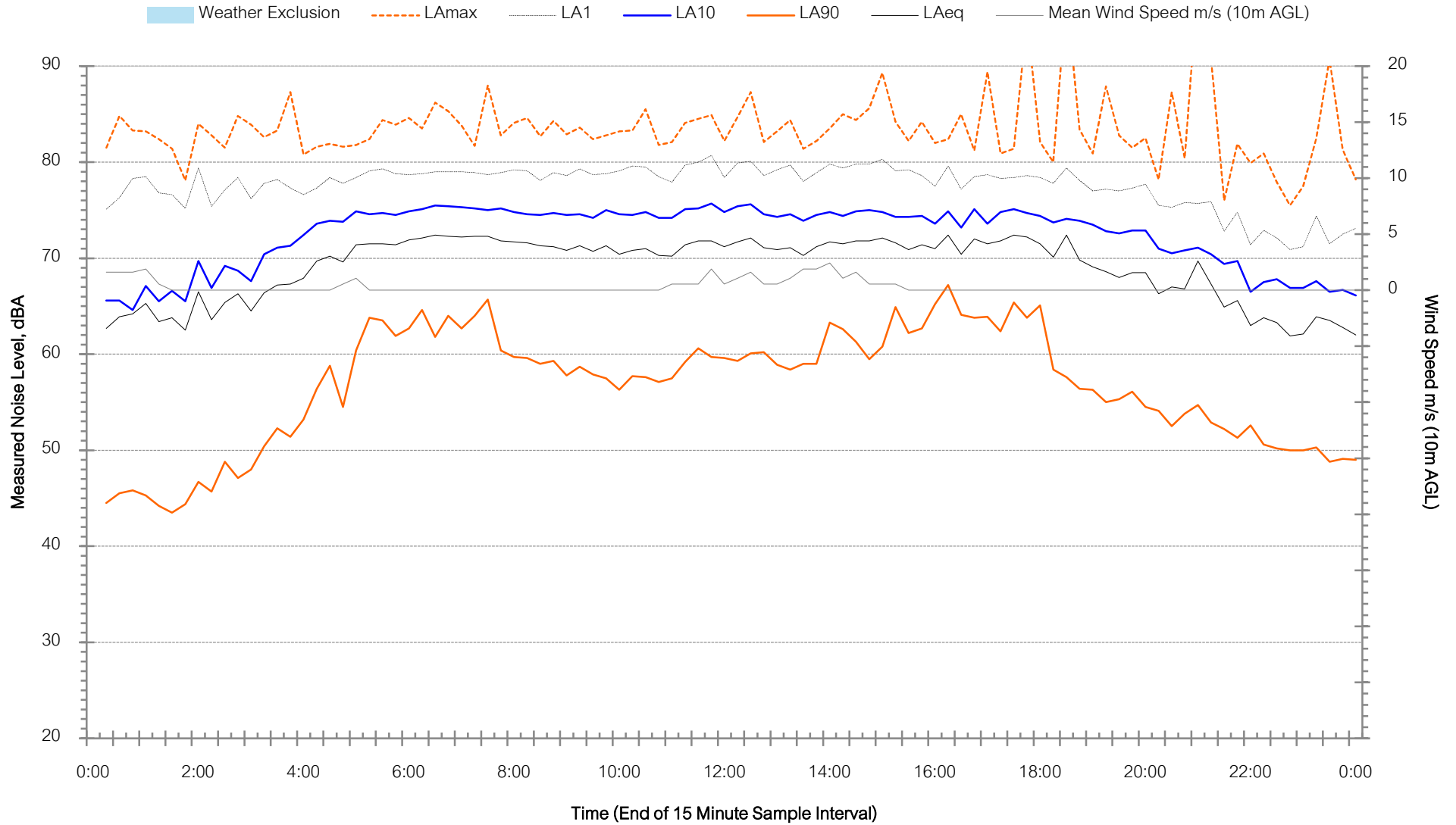
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Tuesday 28 May 2024



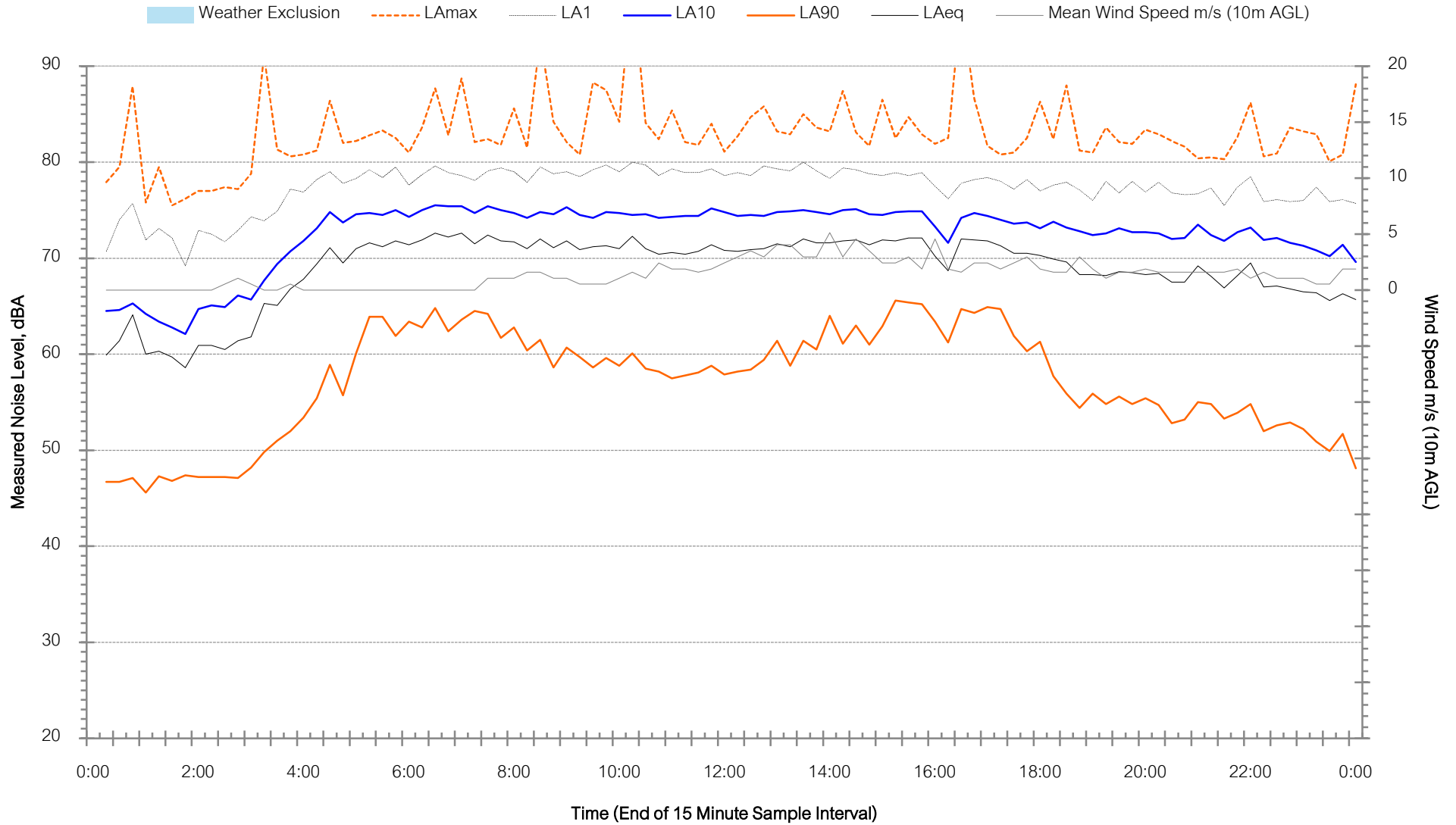
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Wednesday 29 May 2024



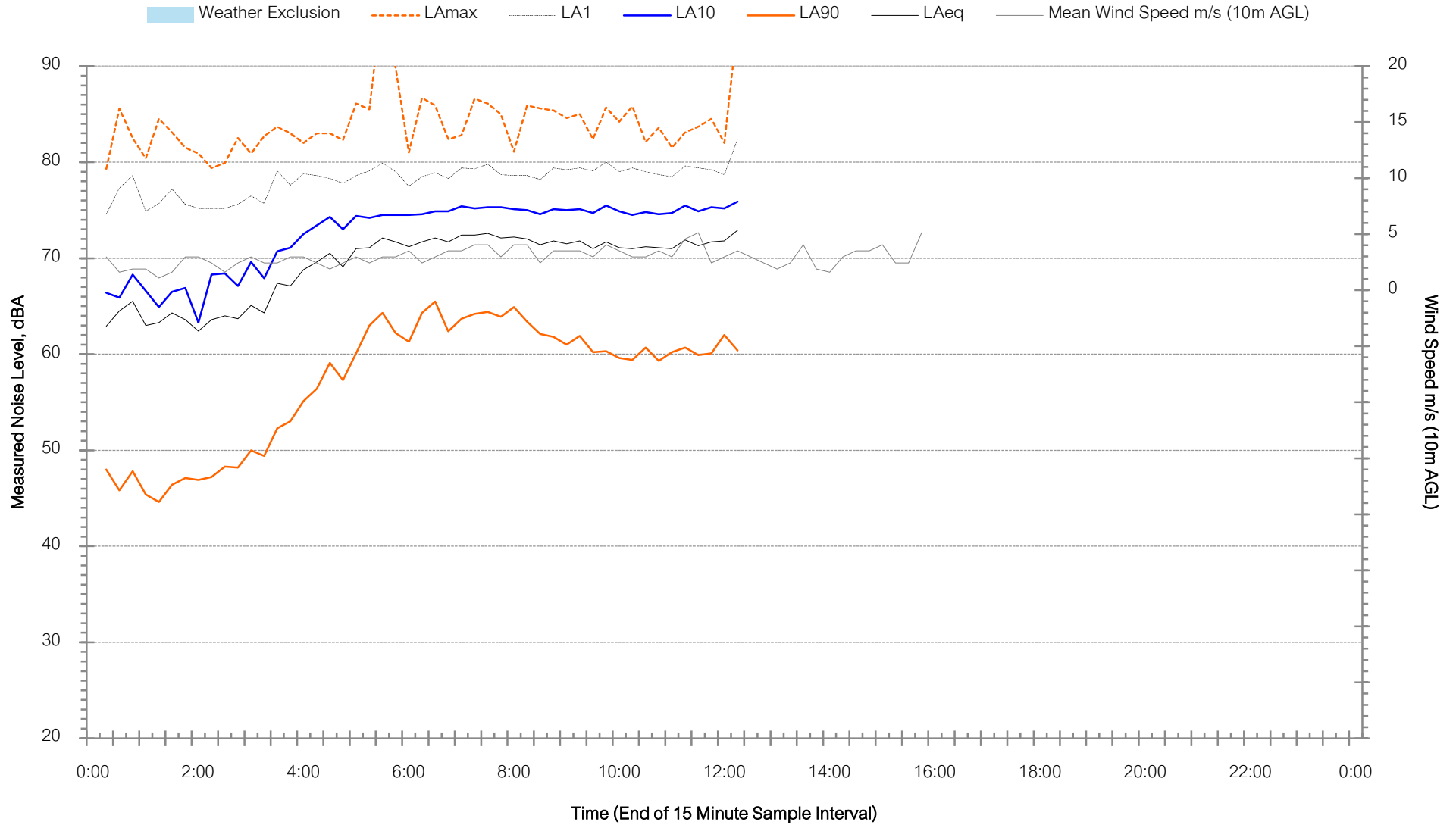
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Thursday 30 May 2024



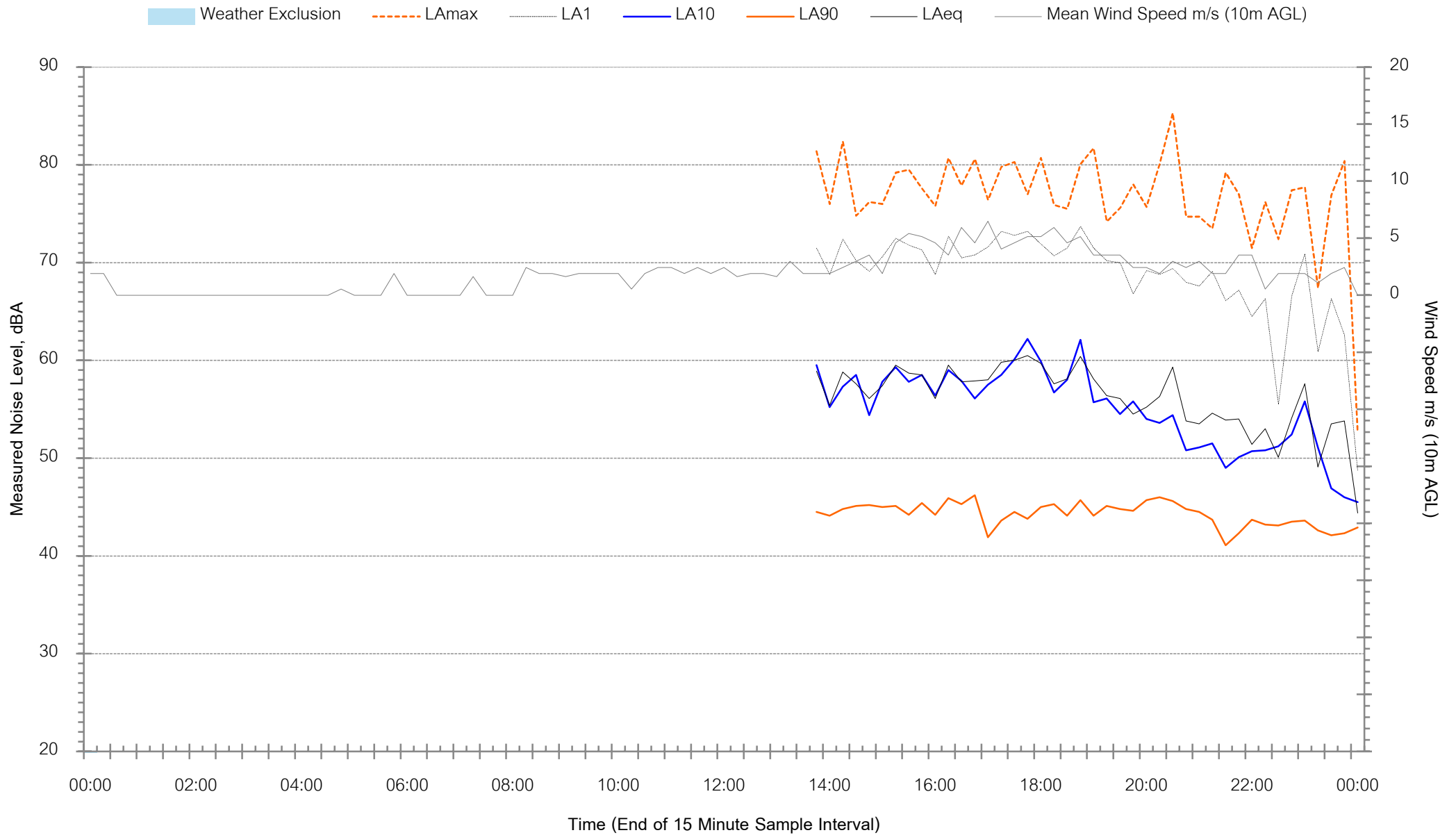
Background Noise Levels

Wallgrove Road, Horsley Park NSW - Friday 31 May 2024



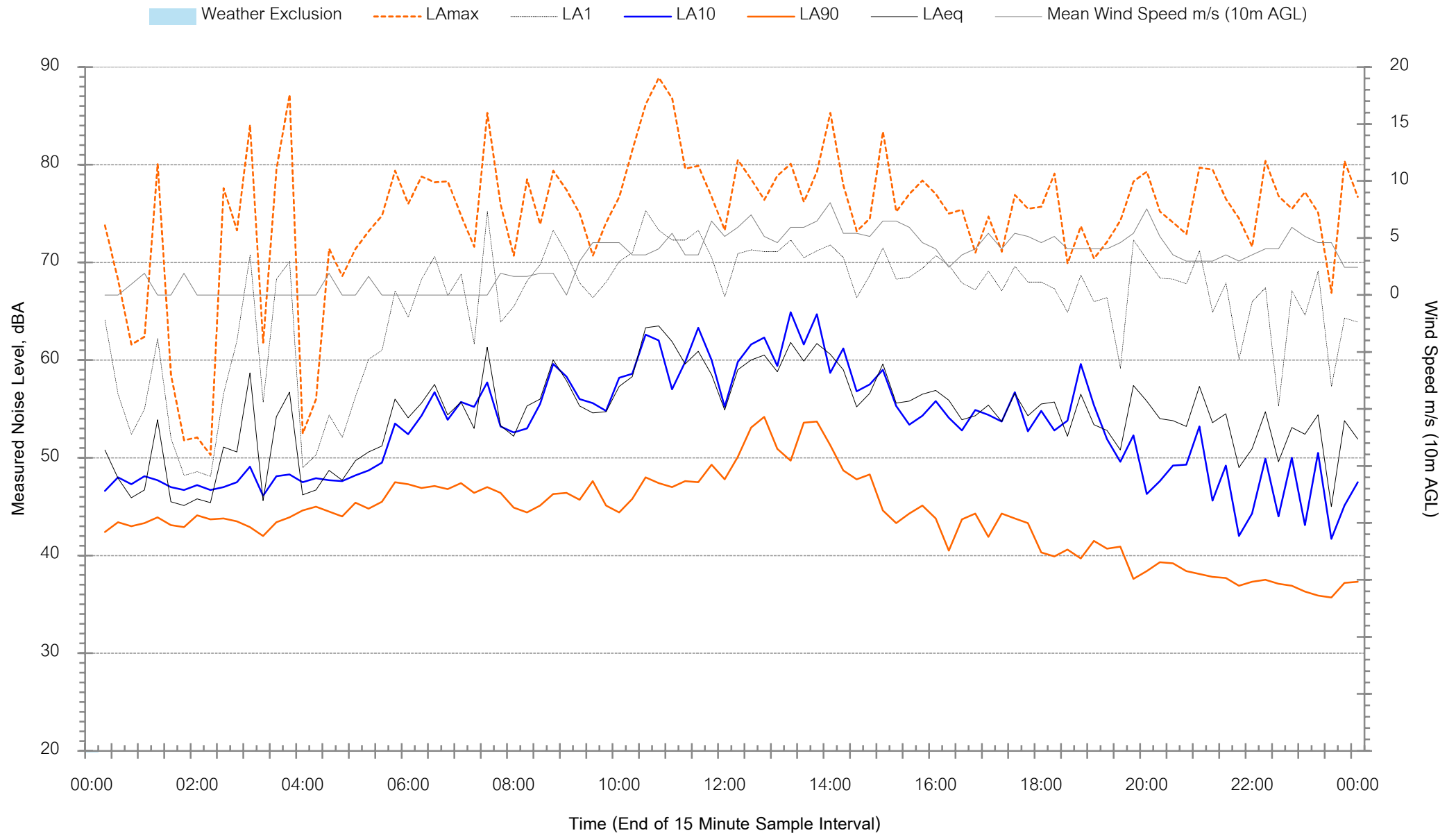
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Friday 7 November 2025



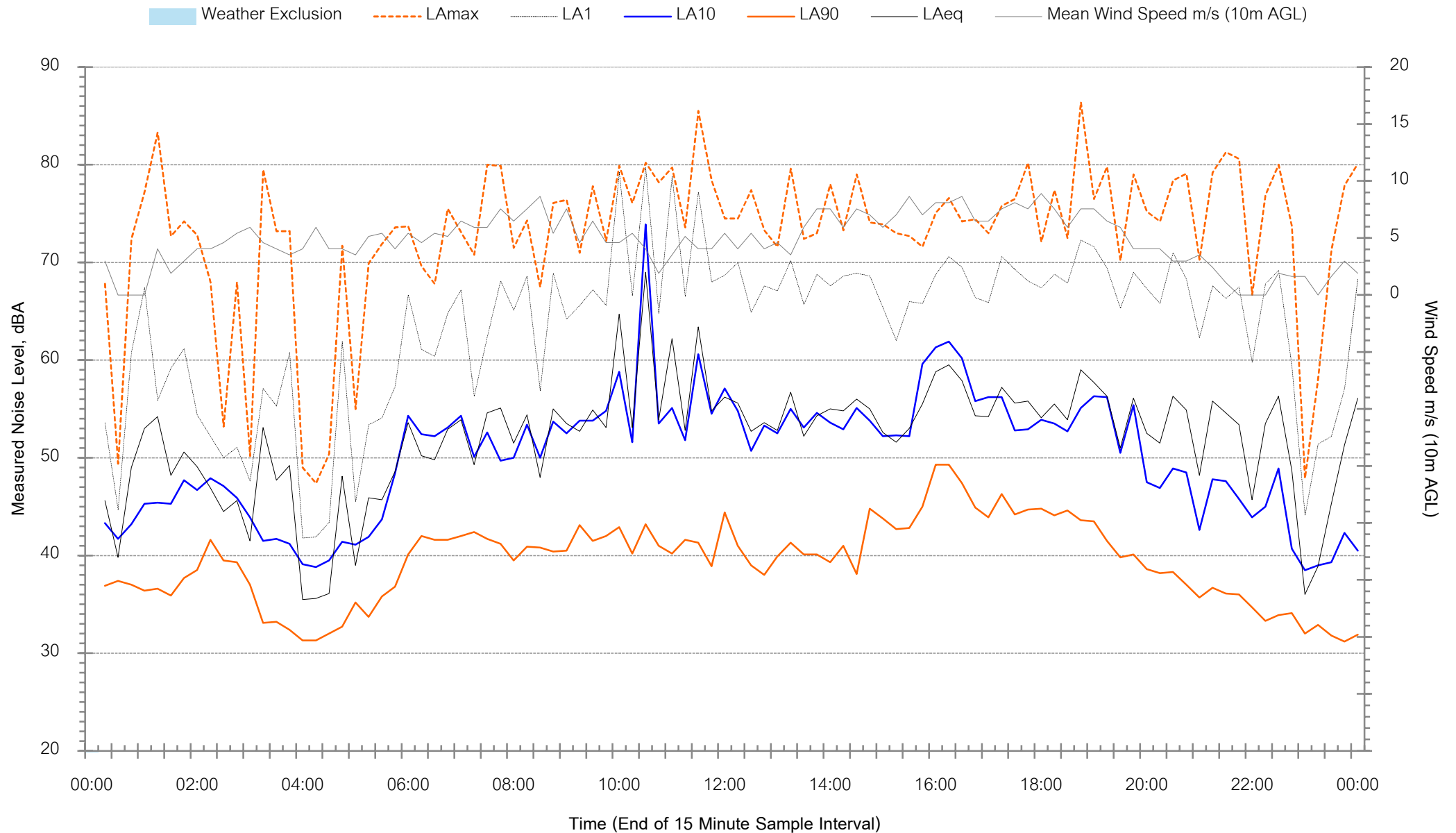
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Saturday 8 November 2025



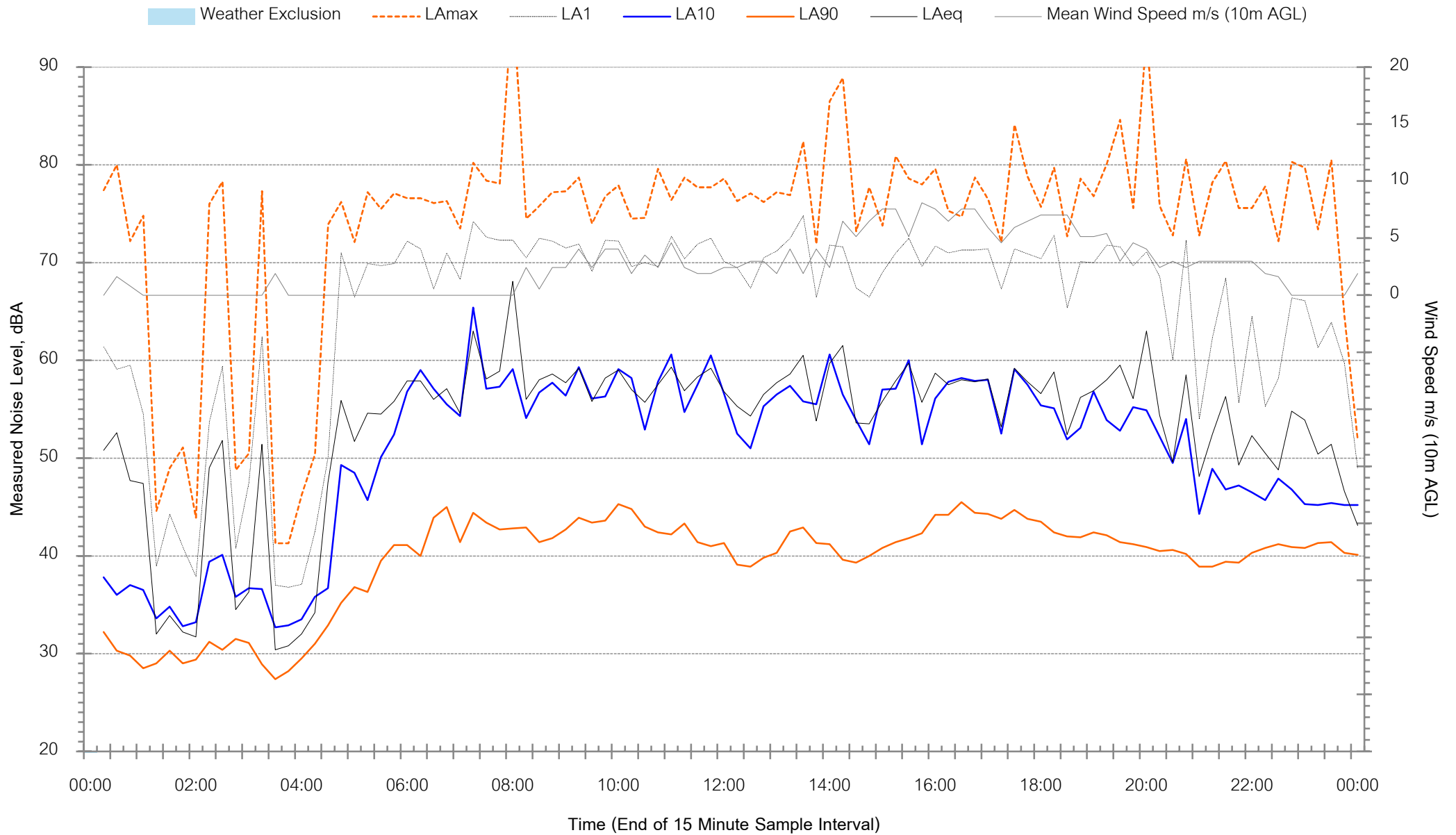
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Sunday 9 November 2025



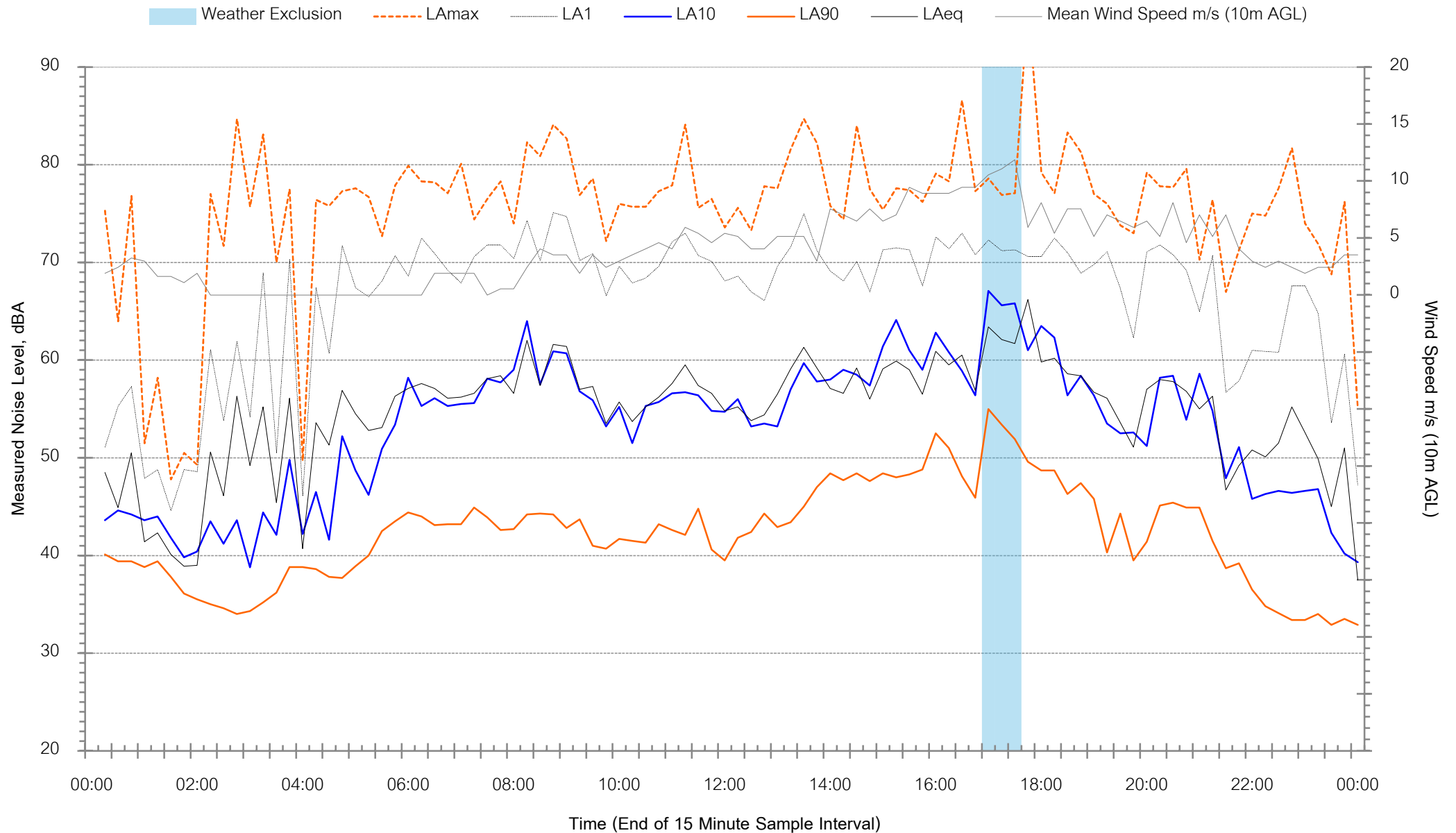
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Monday 10 November 2025



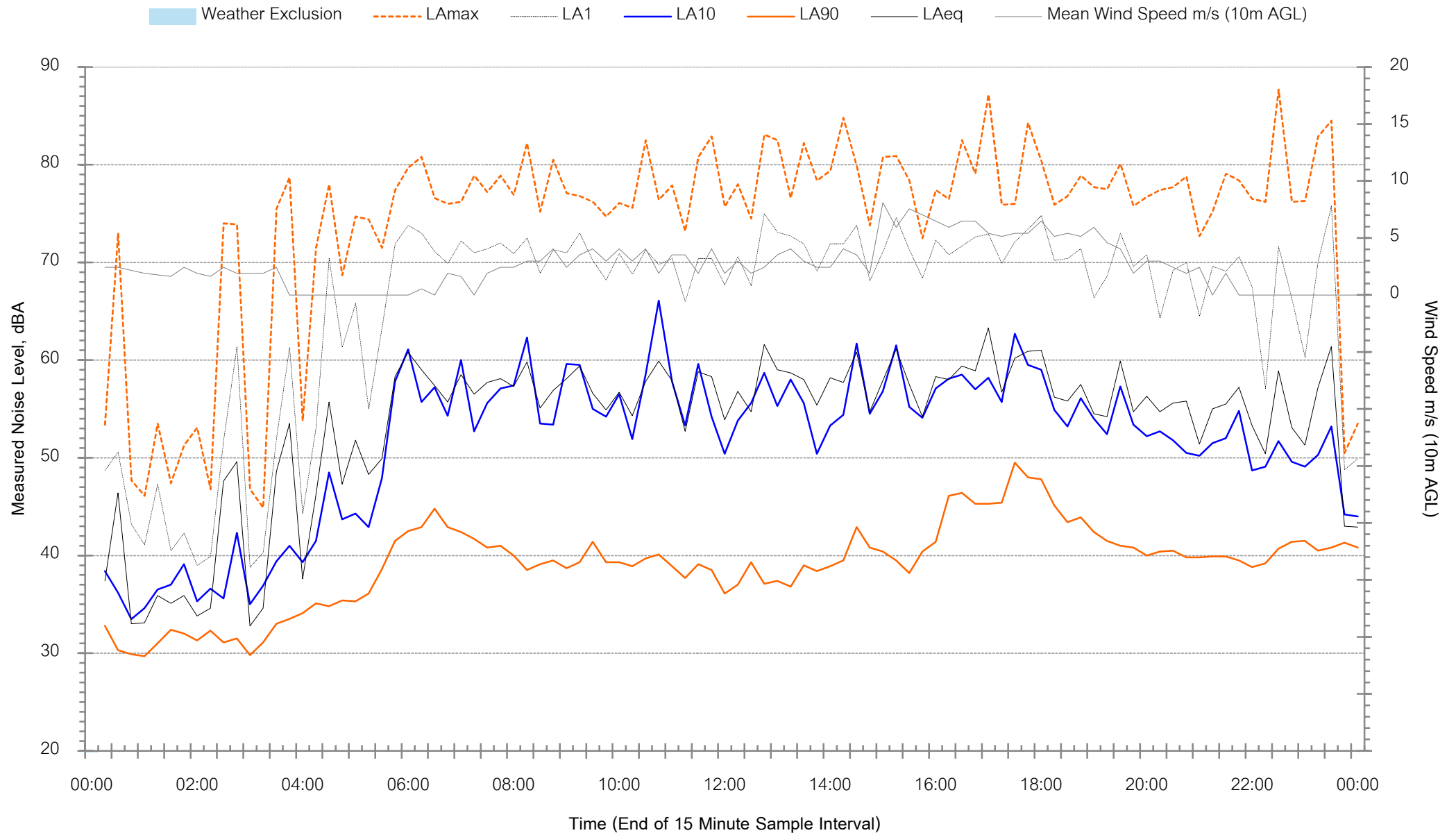
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Tuesday 11 November 2025



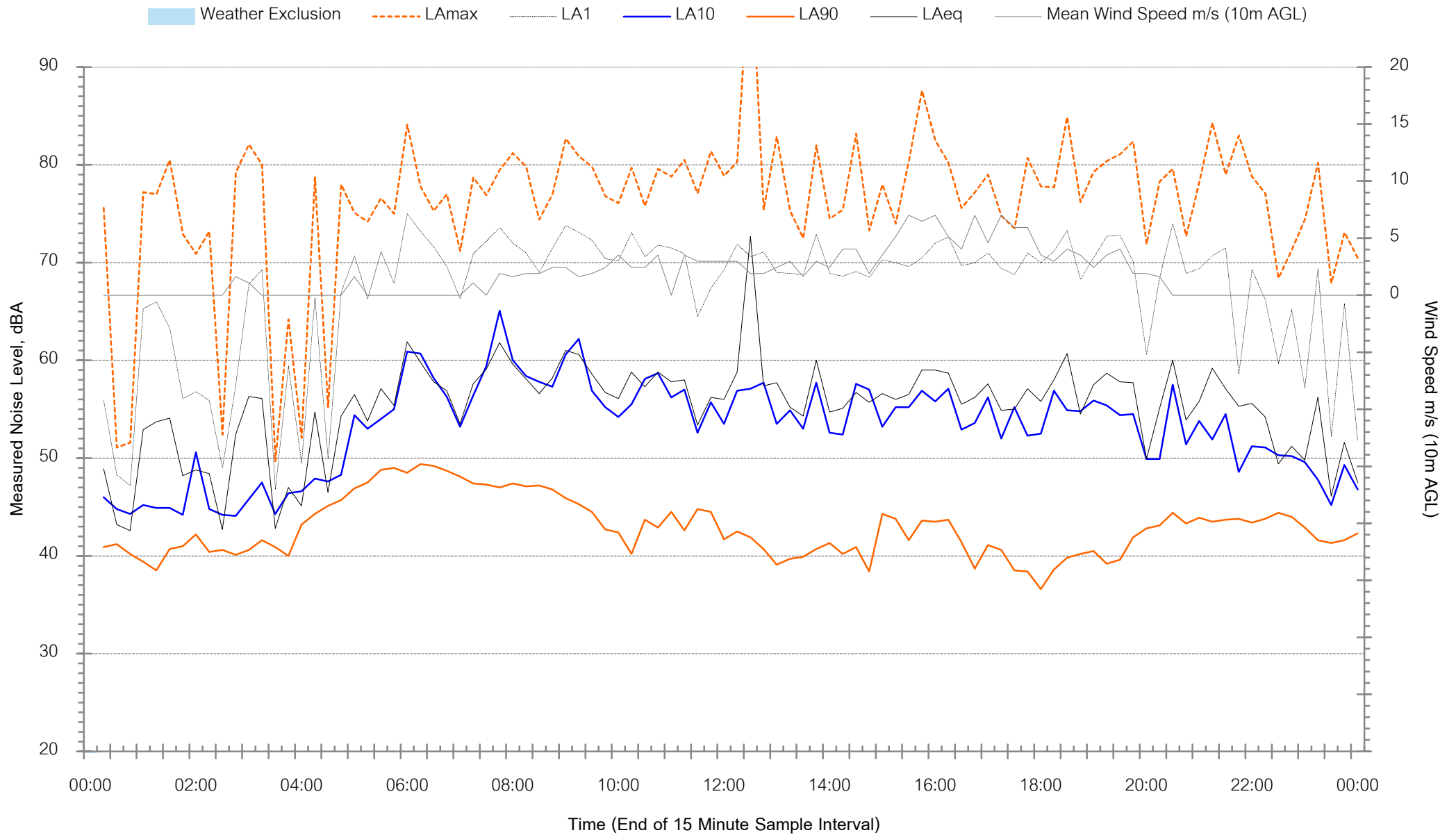
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Wednesday 12 November 2025



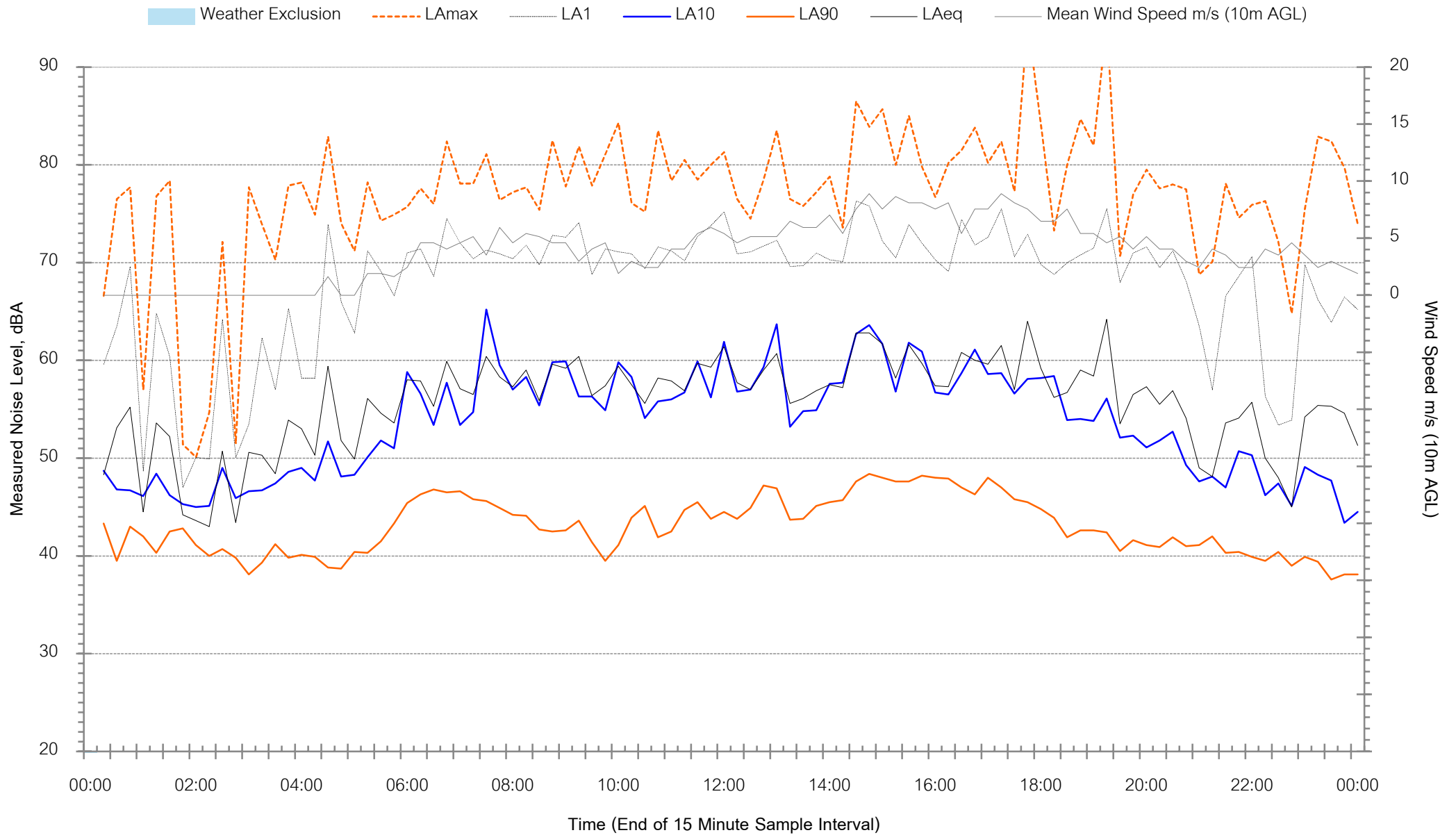
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Thursday 13 November 2025



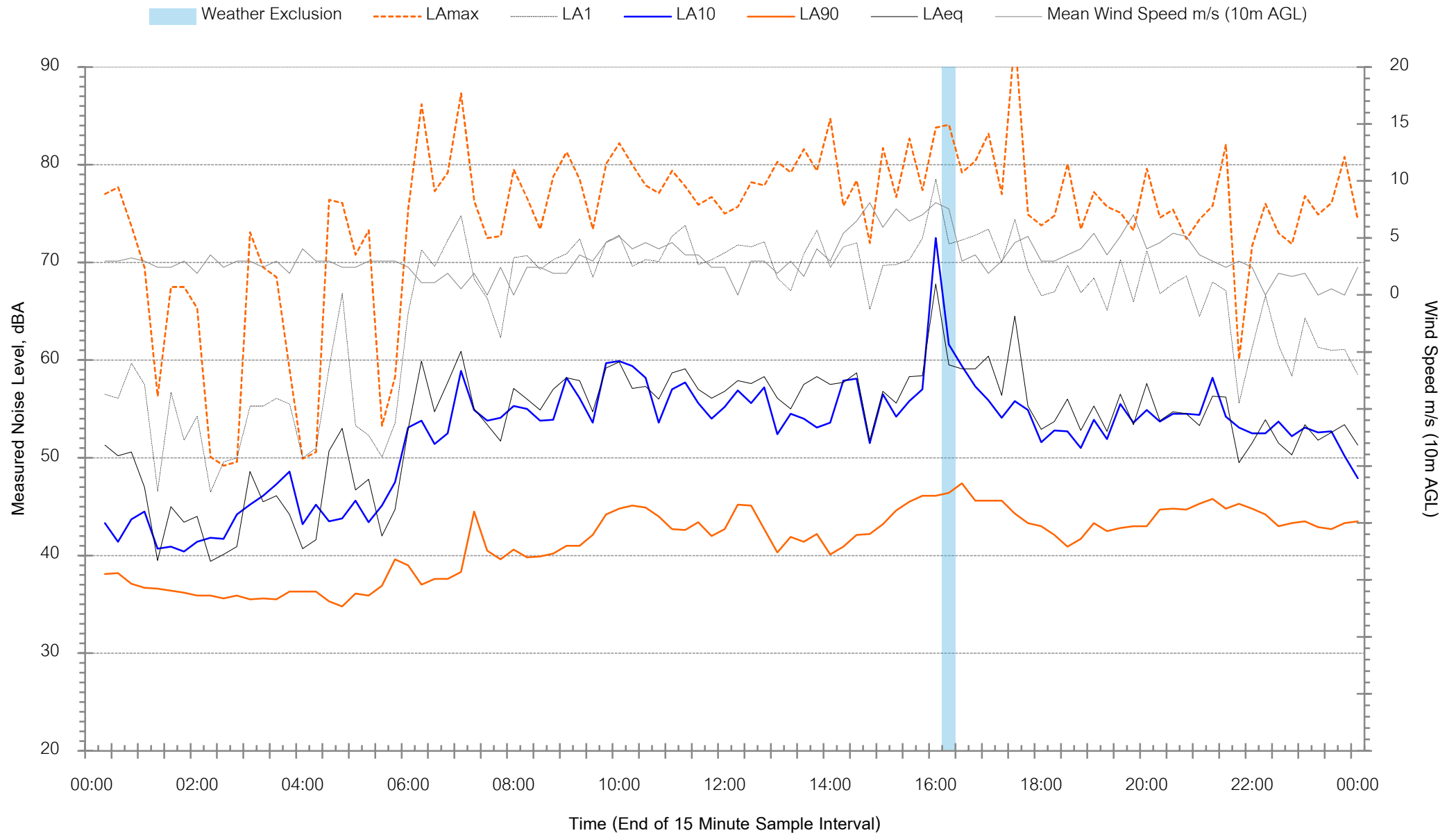
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Friday 14 November 2025



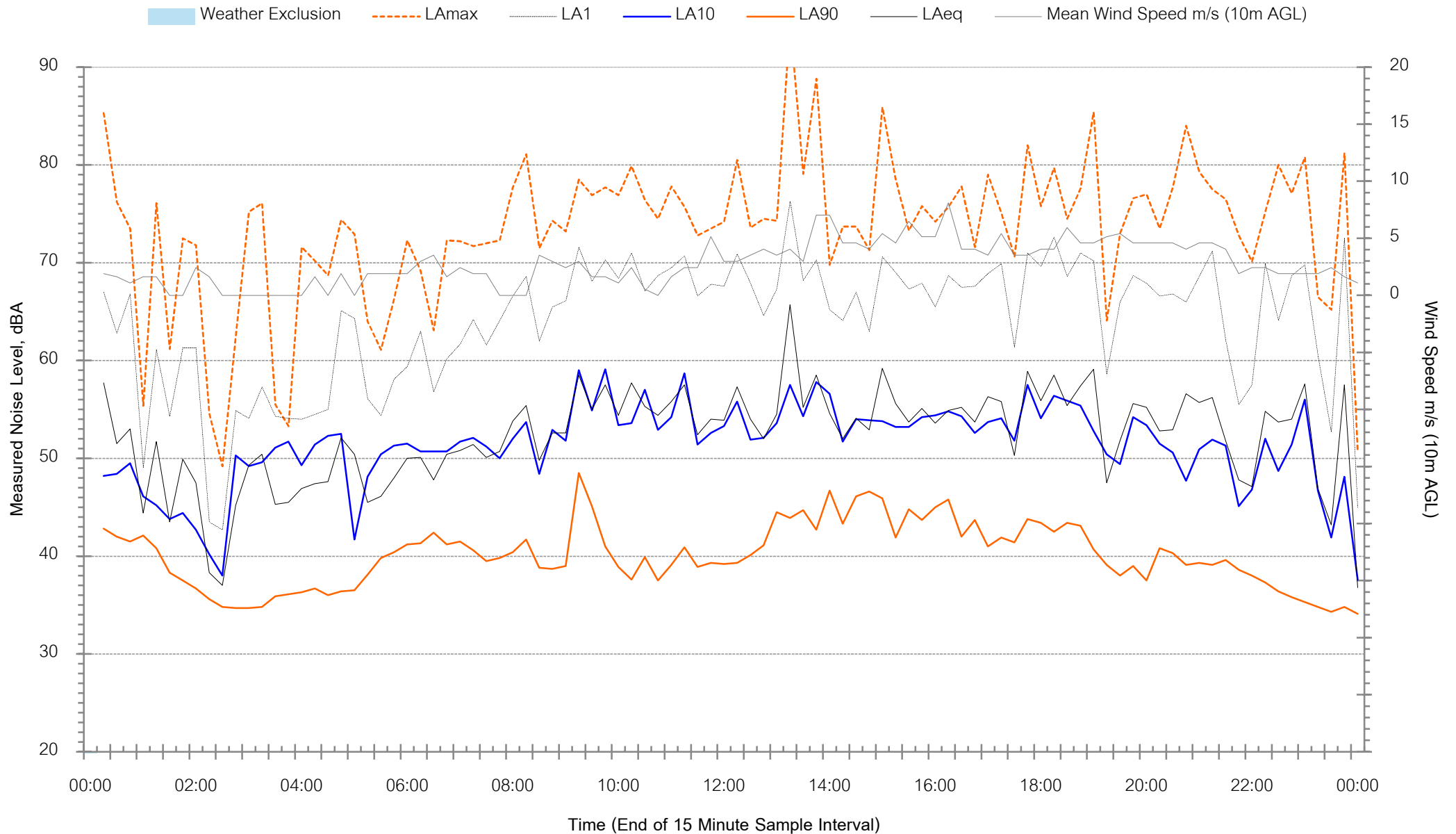
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Saturday 15 November 2025



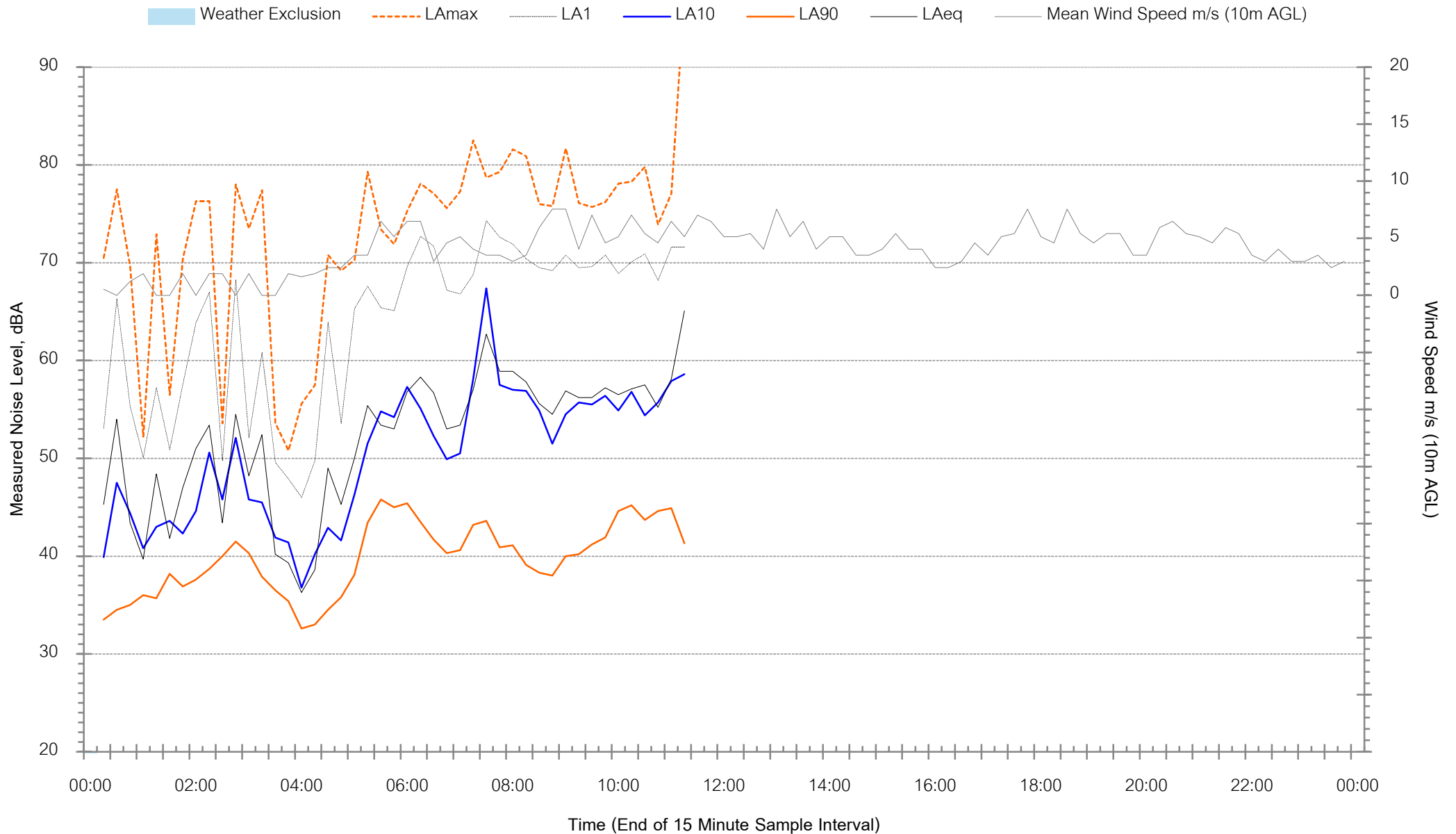
Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Sunday 16 November 2025



Background Noise Levels

5 Burley Road, Horsley Park, New South Wales - Monday 17 November 2025



Appendix C – Vibration Limits

British Standard BS 7385:Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2", gives guidance on the levels of vibration which building structures could be damaged. BS7385 also takes into consideration the frequency of the vibration which is critical when assessing the likelihood of building damage.

Guide values are set for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to result in a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and heavy commercial/industrial buildings are presented in **Table C1**. Where sources of continuous vibration may give rise to dynamic magnification due to resonance, the values provided in **Table C1** should be reduced by 50%, this is especially the case with respect to Peak Particle Velocity (PPV) at lower frequencies.

Table C1 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	50 mm/s at 4 Hz and above	
	Industrial and heavy commercial buildings		
2	Unreinforced or light framed structures	15 mm/s at 4 Hz	20 mm/s at 15 Hz
	Residential or light commercial type buildings	increasing to 20 mm/s at 15 Hz	increasing to 50 mm/s at 40 Hz and above

Human Comfort – Assessing Vibration a Technical Guideline

Humans are far more sensitive to vibration than is commonly realised and may detect vibration levels which are well below levels that may cause damage to buildings or structures. Assessing vibration: a technical guideline was published in February of 2006 by the DECC and is based on guidelines contained in BS 6472 – 1992, Evaluation of human exposure to vibration in buildings (1-80 Hz) and provides guidance on assessing vibration against human comfort.

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

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the guideline provides examples of the three vibration types and has been reproduced in **Table** .

Table C2 Examples of types of vibration (from Table 2.1 of the guideline)

Continuous Vibration	Impulsive Vibration	Intermittent Vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery)	Infrequent: Activities that create up to three distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990)	Trains, intermittent nearby construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer these would be assessed against impulsive vibration criteria.

Continuous Vibration

Appendix C of the guideline outlines acceptable criteria for human exposure to continuous vibration (1-80 Hz), the criteria are dependent on both the time of activity (usually daytime or night-time) and the occupied place being assessed. **Table** reproduces the preferred and maximum criteria relating to measured peak velocity.

Table C3 Criteria for Exposure to Continuous Vibration

Place	Time ¹	Peak Velocity (mm/s)	
		Preferred	Maximum
Critical working Areas (e.g. hospital operating theatres, precision laboratories)	Day or Night	0.14	0.28
Residences	Day	0.28	0.56
	Night	0.20	0.40
Offices	Day or Night	0.56	1.1
Workshops	Day or Night	1.1	2.2

Note: rms velocity (mm/s) and vibration velocity value (dB re 10^{-9} mm/s) values given for most critical frequency >8Hz assuming sinusoidal motion.

Note 1: Daytime is 7am to 10pm and Night-time is 10pm to 7am.

Impulsive Vibration

Appendix C of the guideline outlines acceptable criteria for human exposure to impulsive vibration (1-80 Hz), these criteria are dependent on both the time of activity (usually daytime or night-time) and the occupied place being assessed. Impulsive vibration (as defined in Section 2.1 of the guideline) is generally associated with infrequent activities that create up to three (3) distinct vibration events in an assessment period e.g. occasional dropping of heavy equipment, occasional loading and unloading. **Table** reproduces the preferred and maximum criteria relating to measured peak velocity.

Table C4 Criteria for Exposure to Impulsive Vibration

Place	Time ¹	Assessment Criteria	
		Peak Velocity (mm/s)	
		Preferred	Maximum
Critical working Areas (e.g. hospital operating theatres, precision laboratories)	Day or Night-time	0.14	0.28
Residences	Daytime	8.6	17.0
	Night-time	2.8	5.6
Offices	Day or Night-time	18.0	36.0
Workshops	Day or Night-time	18.0	36.0

Note 1: Daytime is 7am to 10pm and Night-time is 10pm to 7am.

Intermittent Vibration

Intermittent vibration (as defined in Section 2.1 of the guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time.

Intermittent vibration is representative of activities such as impact hammering, rolling or general excavation work (such as an excavator tracking).

Section 2.4 of the Guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted RMS (root mean square) acceleration levels over the frequency range 1-80 Hz. To calculate VDV the following formula (refer section 2.4.1 of the guideline) was used:

$$VDV = \left[\int_0^T a^4(t) dt \right]^{0.25}$$

Where VDV is the vibration dose value in $\text{m/s}^{1.75}$, $a(t)$ is the frequency-weighted RMS of acceleration in m/s^2 and T is the total period of the day (in seconds) during which vibration may occur.

The Acceptable Vibration Dose Values (VDV) for Intermittent Vibration is reproduced in **Table** .

Table C5 Acceptable Vibration Dose Values (VDV) for Intermittent Vibration				
Location	Daytime		Night-time	
	Preferred Value $\text{m/s}^{1.75}$	Maximum Value $\text{m/s}^{1.75}$	Preferred Value $\text{m/s}^{1.75}$	Maximum Value $\text{m/s}^{1.75}$
Critical Areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Note: Daytime is 7am to 10pm and Night-time is 10pm to 7am.

Note: These criteria are indicative only, and there may be a need to assess intermittent values against continuous or impulsive criteria for critical areas.

There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Adverse comment or complaints may be expected if vibration values approach the maximum values. The guideline states that activities should be designed to meet the preferred values where an area is not already exposed to vibration.

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Appendix D – Annoying Characteristics Assessment

Table APP-1 Tonality & Low Frequency Noise Assessment								
	Frequency (Hz)	Values (dBZ)	A-wt Spectrum	C-wt Spectrum	1/3 Octave Tonality Test	1/1 Octave Tonality Test	LFN Present (Table C1–NPI 2017)	NPI LFN Criteria (dBZ)
Inaudible Range	10		0	0			No	92
	12.5		0	0			No	89
	16		0	0			No	86
	20		0	0			No	77
LFN Range	25	-21	0	0			No	69
	31.5	-27	0	0	FALSE	FALSE	No	61
	40	-32	0	0	FALSE		No	54
	50	36	6	35	FALSE		No	50
	63	32	6	31	FALSE	FALSE	No	50
	80	28	6	28	FALSE		No	48
	100	21	2	21	FALSE		No	48
	125	18	2	18	FALSE	FALSE	No	46
	160	16	2	15	FALSE		No	44
	200	13	3	13	FALSE		Fact Sheet C – Table C1 Measure/ assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period. 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.	
	250	11	3	11	FALSE	FALSE		
	315	9	3	9	FALSE			
	400	12	7	12	FALSE			
	500	11	7	11	FALSE	FALSE		
	630	9	7	9	FALSE			
	800	6	5	6	FALSE			
	1000	5	5	5	FALSE	FALSE		
	1250	5	5	5	FALSE			
	1600	1	2	1	FALSE			
	2000	1	2	1	FALSE	FALSE		
2500	1	2	0	FALSE				
3150	-5	0	0	FALSE				
4000	-5	0	0	FALSE	FALSE			
5000	-4	0	0	FALSE				
6300	-14	0	0	FALSE				
8000	-13	0	0	FALSE	FALSE			
10000	-12	0	0					
12500		0	0					
16000		0	0					
20000		0	0					
			Total dBA	Total dBC	C-A			
Total SPL			18	37	18.7			
Assessment								
Low Frequency Noise Present					No			
Tonal Noise Present					No			

Appendix E – Construction Noise

Contour Plots – Open Trench

Installation

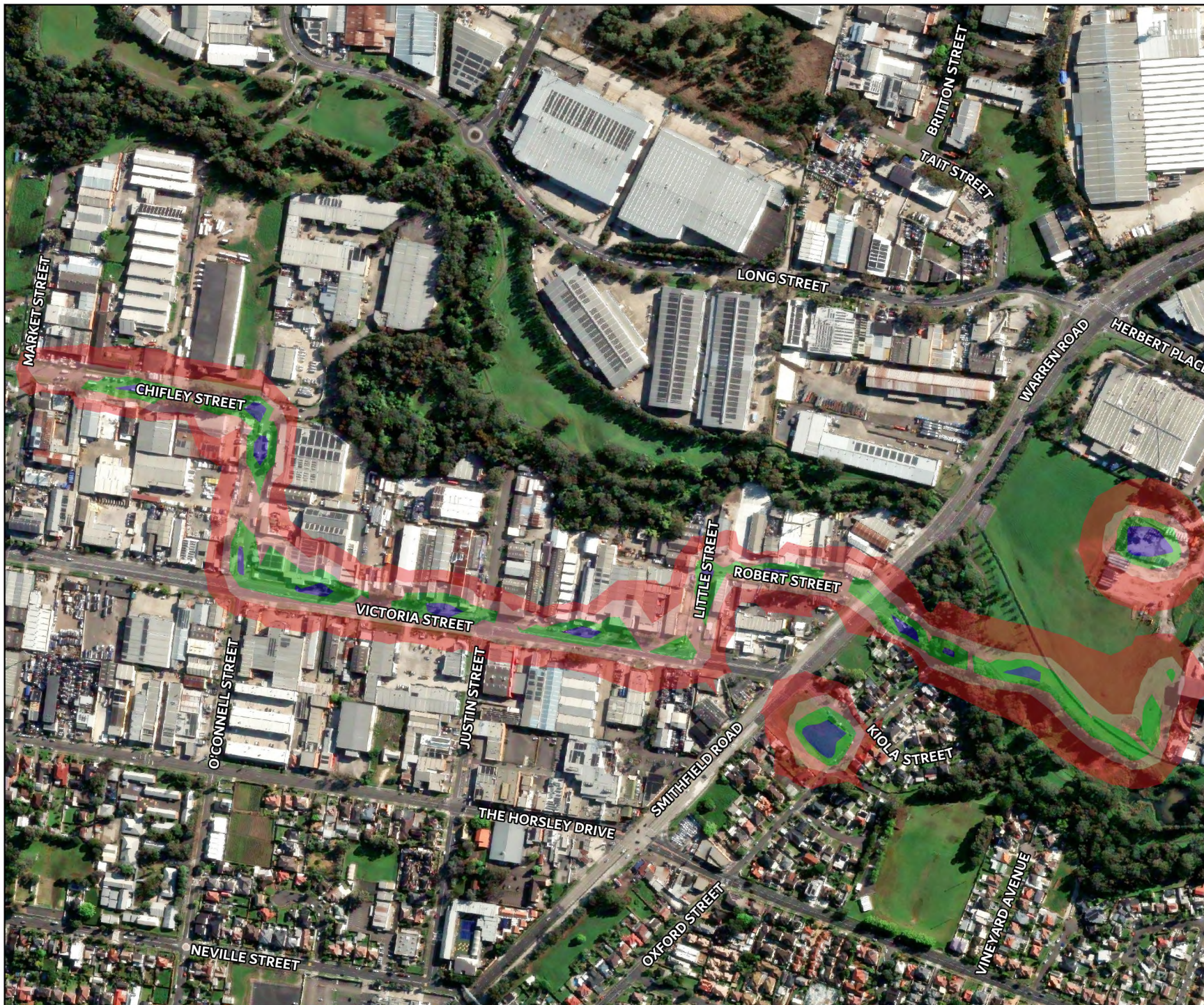


FIGURE E1
Noise Affected Areas
NCA 1 Receivers
P1 Open Trench Installation
(Standard Work Front)
MAC252543-01
Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (Standard Hours)
 - Passive Recreation
 - Active Recreation
 - Commercial Premises



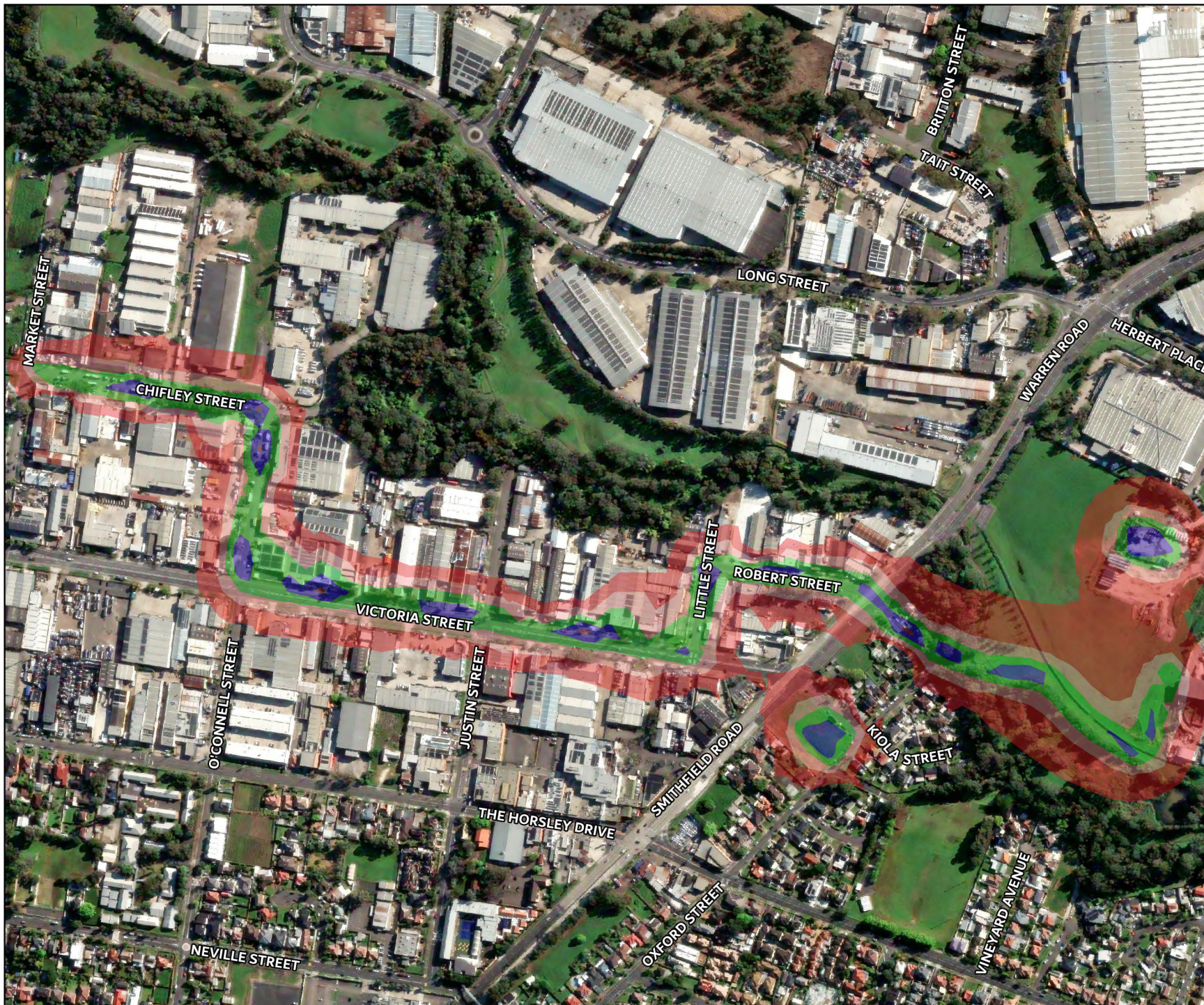


FIGURE E2
Noise Affected Areas
NCA 1 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (Standard Hours)
- Passive Recreation
- Active Recreation
- Commercial Premises





FIGURE E3
Noise Affected Areas
NCA 2 Receivers
P1 Open Trench Installation
(Standard Work Front)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (Standard Hours)
- Education Insitution
- Active Recreation





FIGURE E4
 Noise Affected Areas
 NCA 2 Receivers
 P2 Open Trench Installation
 (Hard Rock Variant)
 MAC252543-01
 Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (Standard Hours)
 - Education Institution
 - Active Recreation





FIGURE E5
Noise Affected Areas
NCA 4 Receivers
P1 Open Trench Installation
(Standard Work Front)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential (Standard Hours)



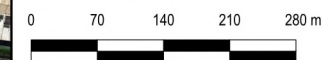


FIGURE E6
Noise Affected Areas
NCA 4 Receivers
P1 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential (Standard Hours)



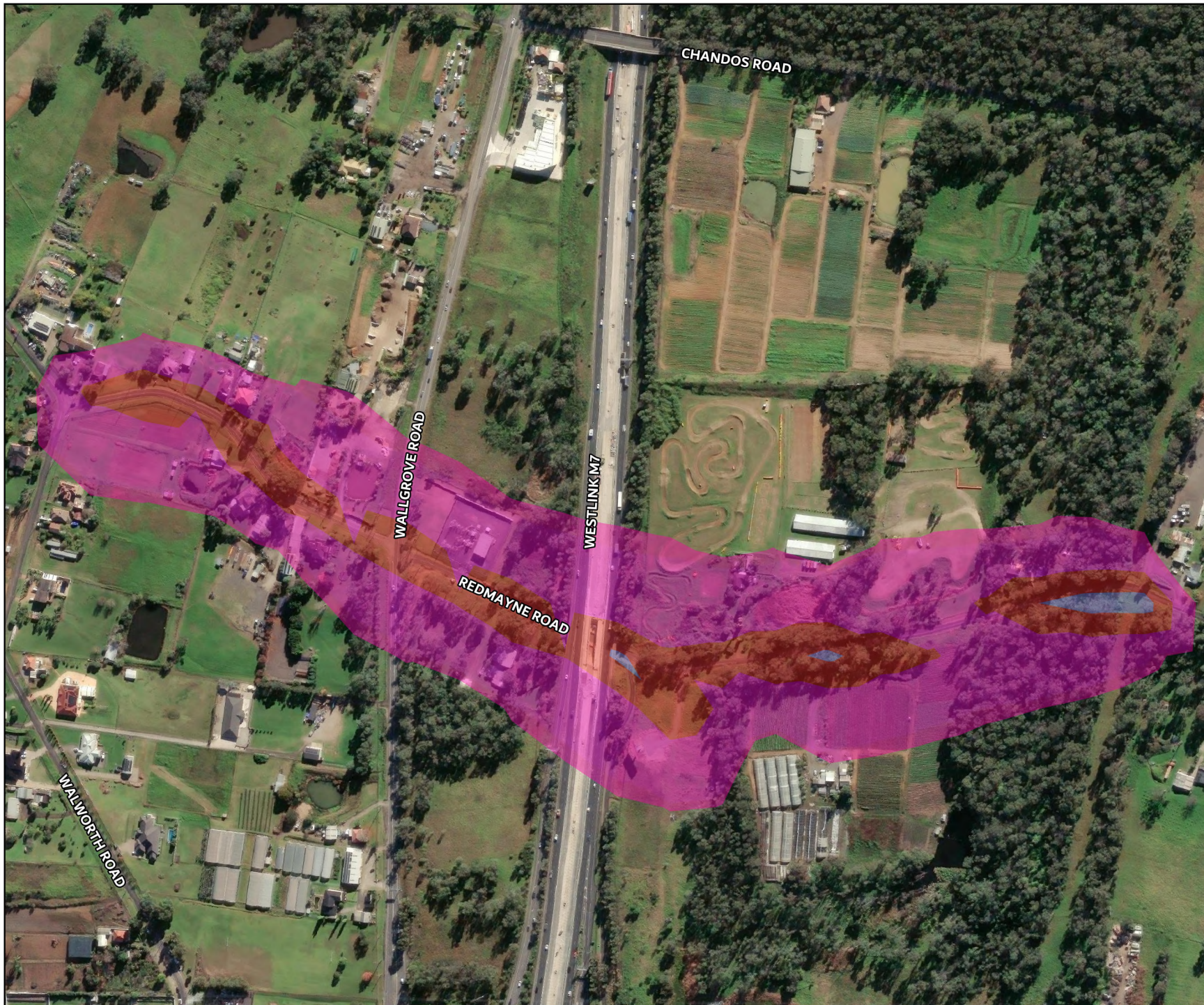


FIGURE E7
Noise Affected Areas
NCA 5 Receivers
P1 Open Trench Installation
(Standard Work Front)
MAC252543-01
Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (Standard Hours)
 - Place of Worship
 - Highly Noise Affected



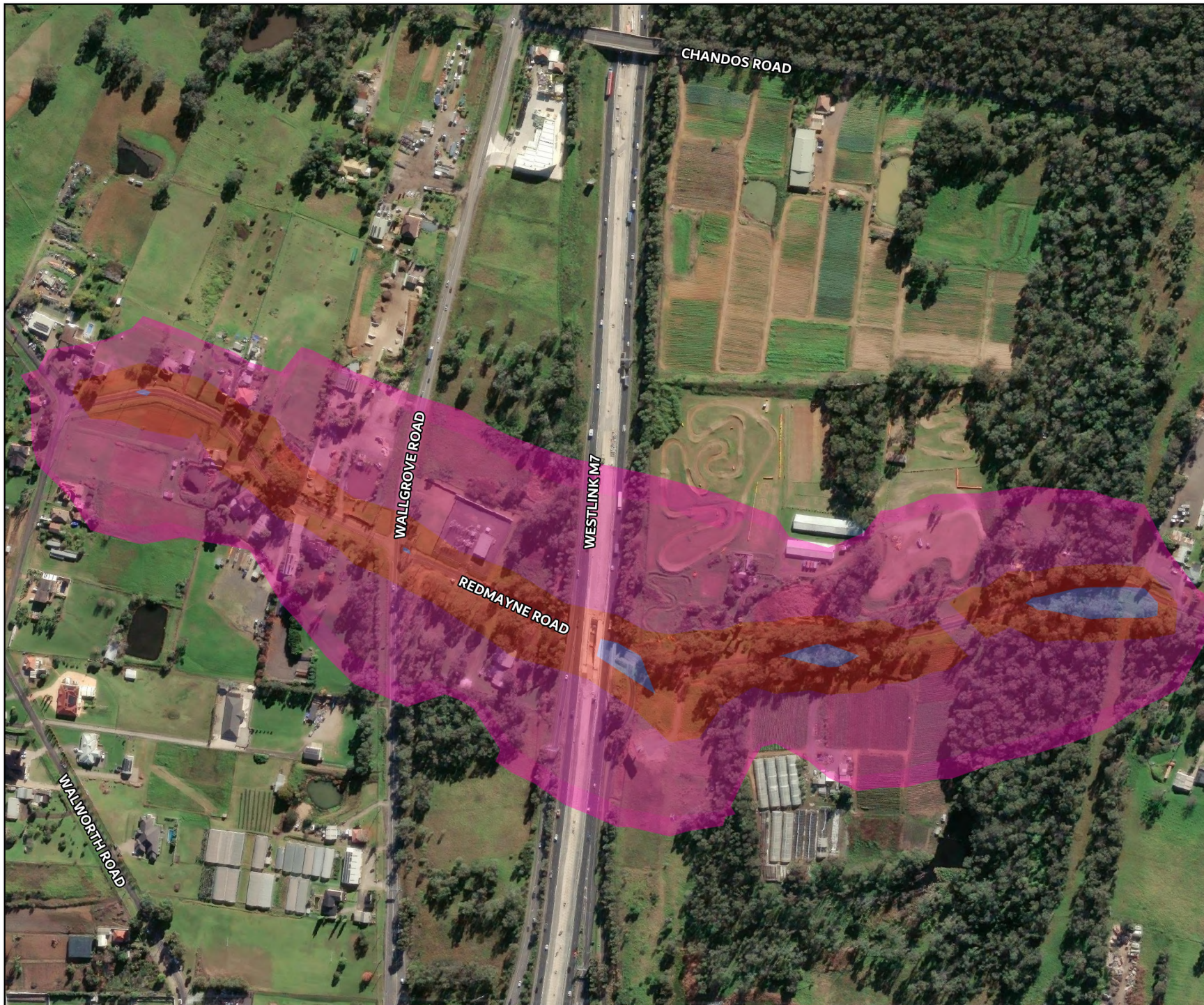


FIGURE E8
Noise Affected Areas
NCA 5 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (Standard Hours)
- Place of Worship
- Highly Noise Affected





FIGURE E9
Noise Affected Areas
NCA 6 Receivers
P1 Open Trench Installation
(Standard Work Front)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential (Standard Hours)





FIGURE E10
Noise Affected Areas
NCA 6 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas
Residential (Standard Hours)



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Appendix F – Construction Noise Contour Plots – Trenchless Installation

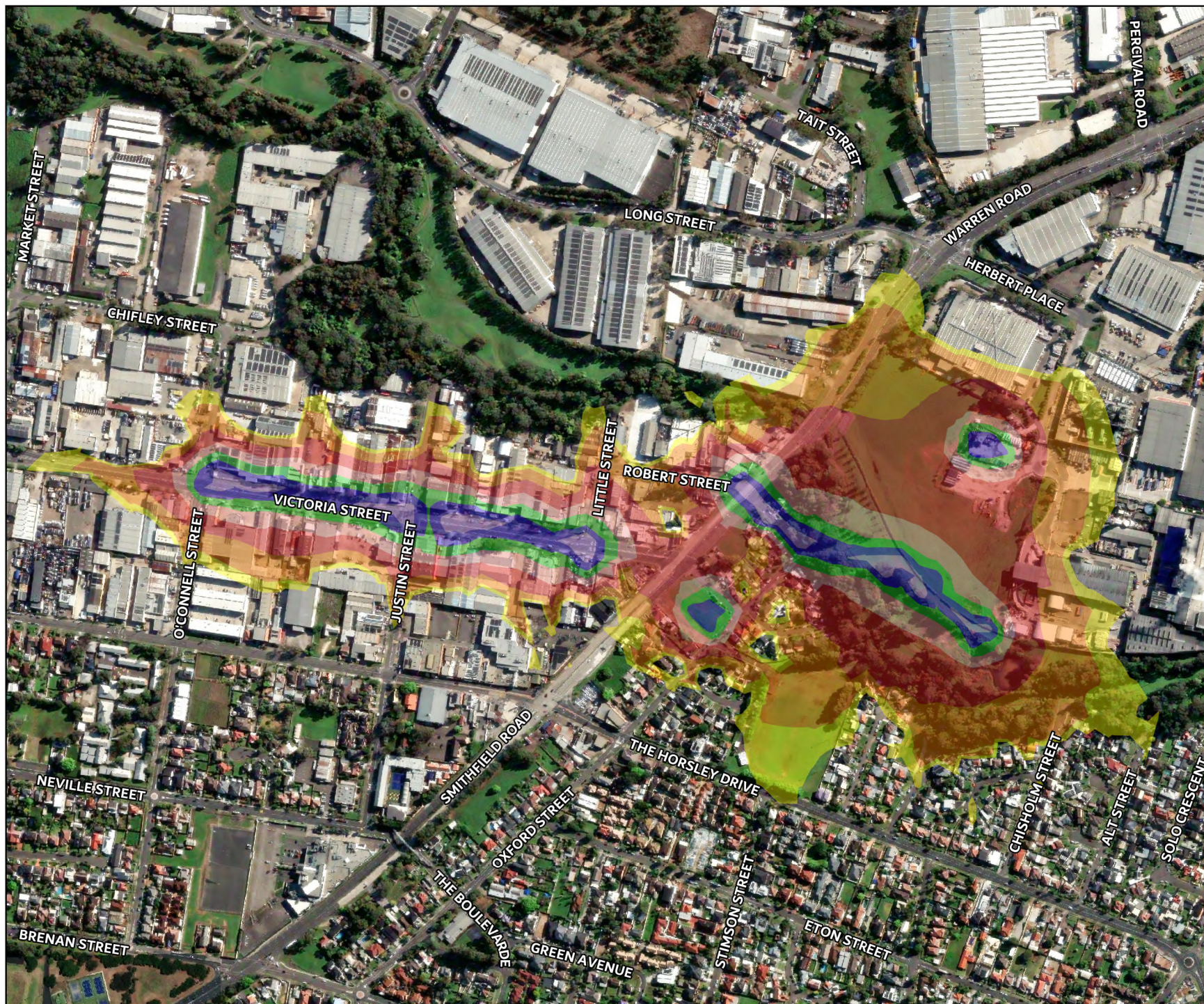


FIGURE F1
 Noise Affected Areas
 NCA 1 Receivers
 T1 Trenchless Installation
 (HDD Crossings)
 MAC252543-01
 Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (OOH Night)
 - Residential (OOH Evening)
 - Residential (Standard Hours)
 - Passive Recreation
 - Active Recreation
 - Commercial Premises
 - Industrial Premises / HNA



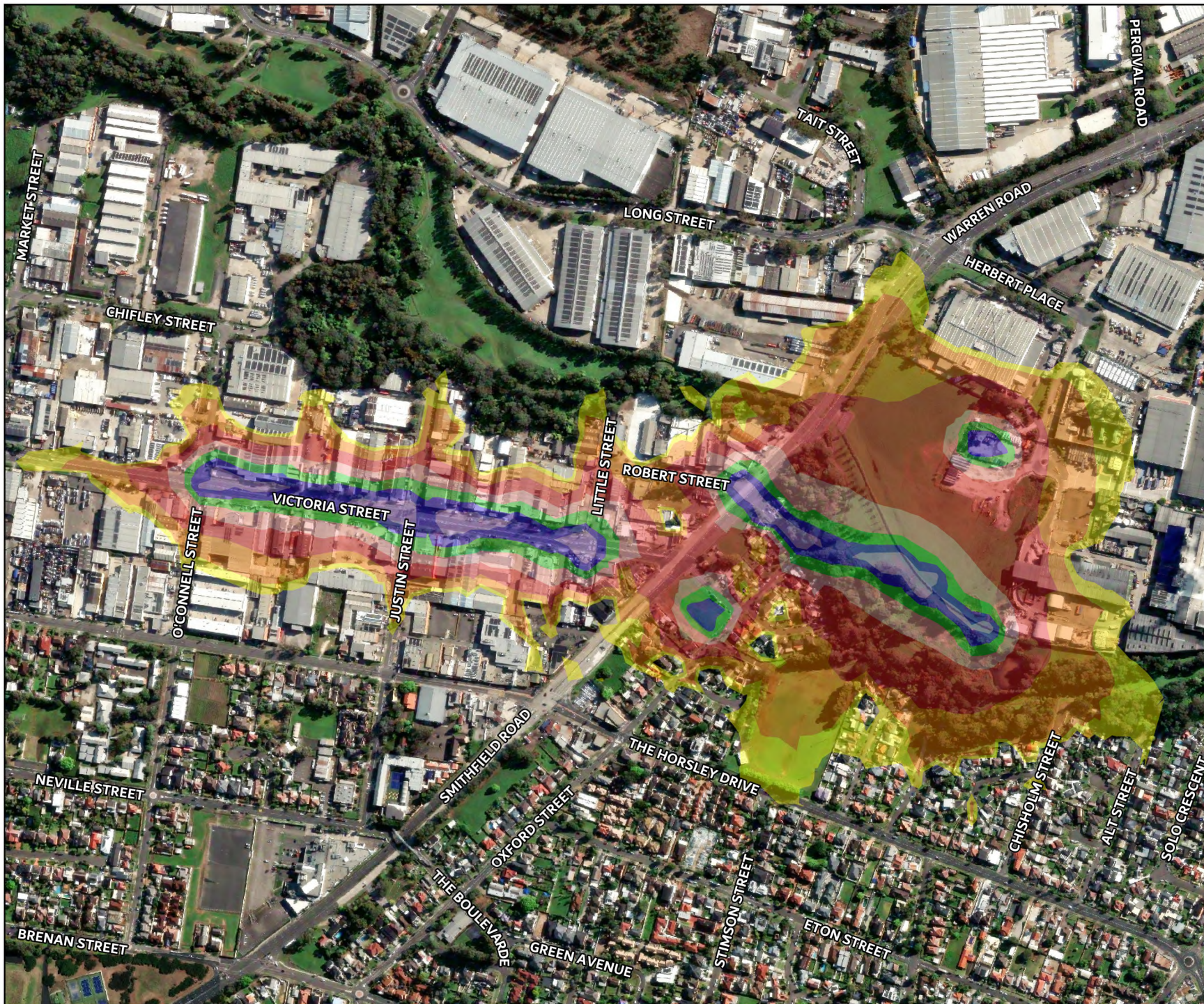


FIGURE F2
Noise Affected Areas
NCA 1 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (OOH Night)
- Residential (OOH Evening)
- Residential (Standard Hours)
- Passive Recreation
- Active Recreation
- Commercial Premises
- Industrial Premises / HNA

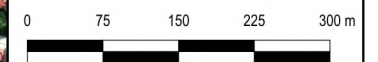




FIGURE F3
 Noise Affected Areas
 NCA 2 Receivers
 T1 Trenchless Installation
 (HDD Crossings)
 MAC252543-01
 Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (OOH Night)
 - Residential (OOH Evening)
 - Residential (Standard Hours)
 - Educational Institution
 - Active Recreation
 - Industrial Premises / HNA

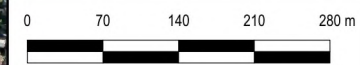




FIGURE F4
Noise Affected Areas
NCA 2 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential (OOH Night)	Yellow
Residential (OOH Evening)	Orange
Residential (Standard Hours)	Red
Educational Institution	Purple
Active Recreation	Green
Industrial Premises / HNA	Light Purple

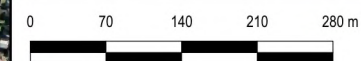




FIGURE F5a
 Noise Affected Areas
 NCA 3 Receivers
 T1 Trenchless Installation
 (HDD Crossings)
 MAC252543-01
 Aquanet Network Extension

KEY

- Noise Affected Areas
- Commercial Premises
 - Industrial Premises





FIGURE F5b
Noise Affected Areas
NCA 3 Receivers
T1 Trenchless Installation
(HDD Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Commercial Premises
- Industrial Premises

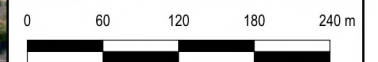




FIGURE F6a
 Noise Affected Areas
 NCA 3 Receivers
 T2 Trenchless Installation
 (Microtunnel Crossings)
 MAC252543-01
 Aquanet Network Extension

KEY

- Noise Affected Areas
- Commercial Premises
 - Industrial Premises



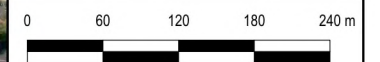


FIGURE F6b
Noise Affected Areas
NCA 3 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Commercial Premises
- Industrial Premises



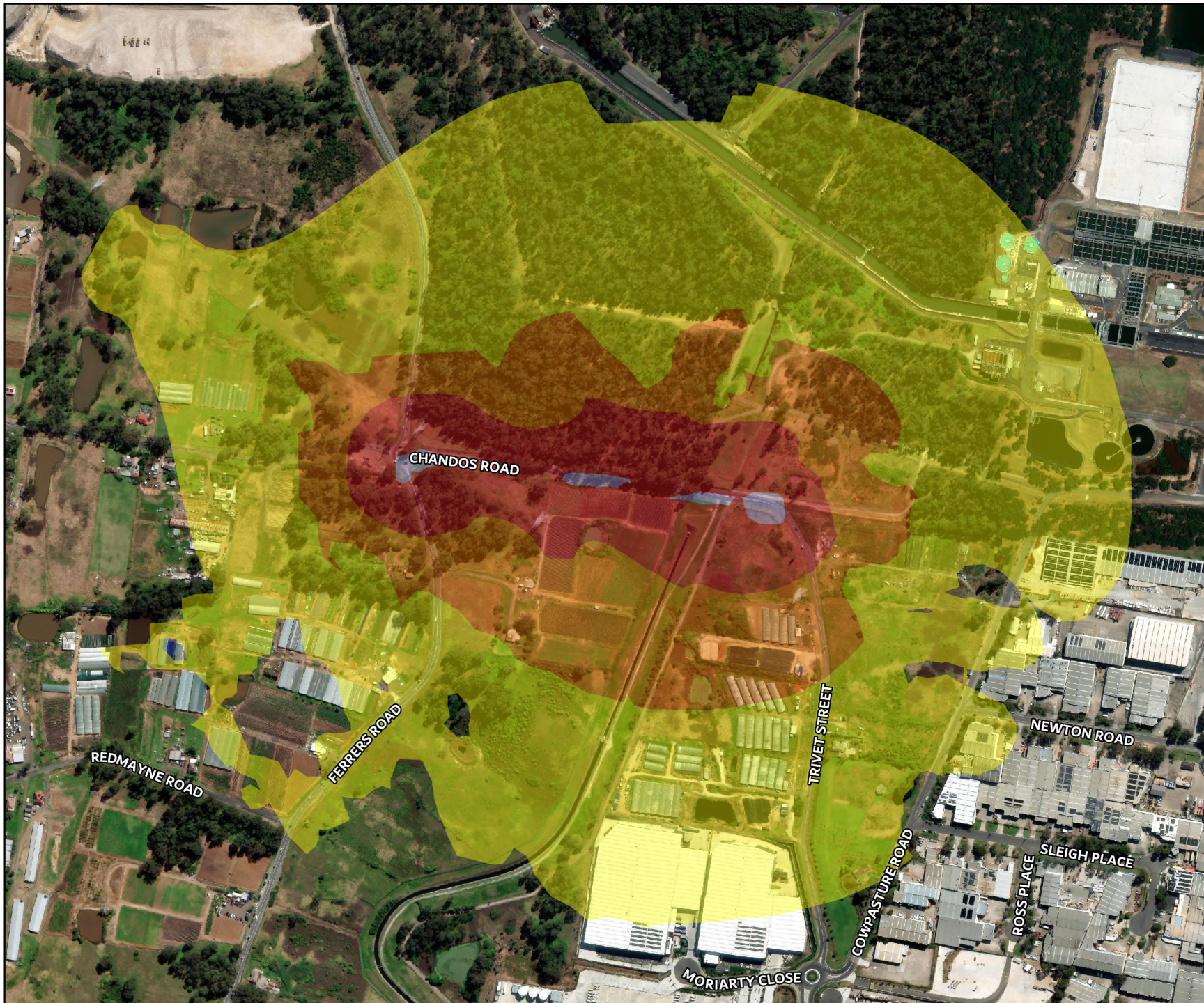
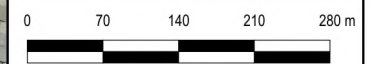


FIGURE F7
Noise Affected Areas
NCA 4 Receivers
T1 Trenchless Installation
(HDD Crossings)
MAC252543-01
Aquanet Network Extension

KEY

- Noise Affected Areas**
- Residential (OOH Night)
 - Residential (OOH Evening)
 - Residential (Standard Hours)
 - Industrial Premises / HNA



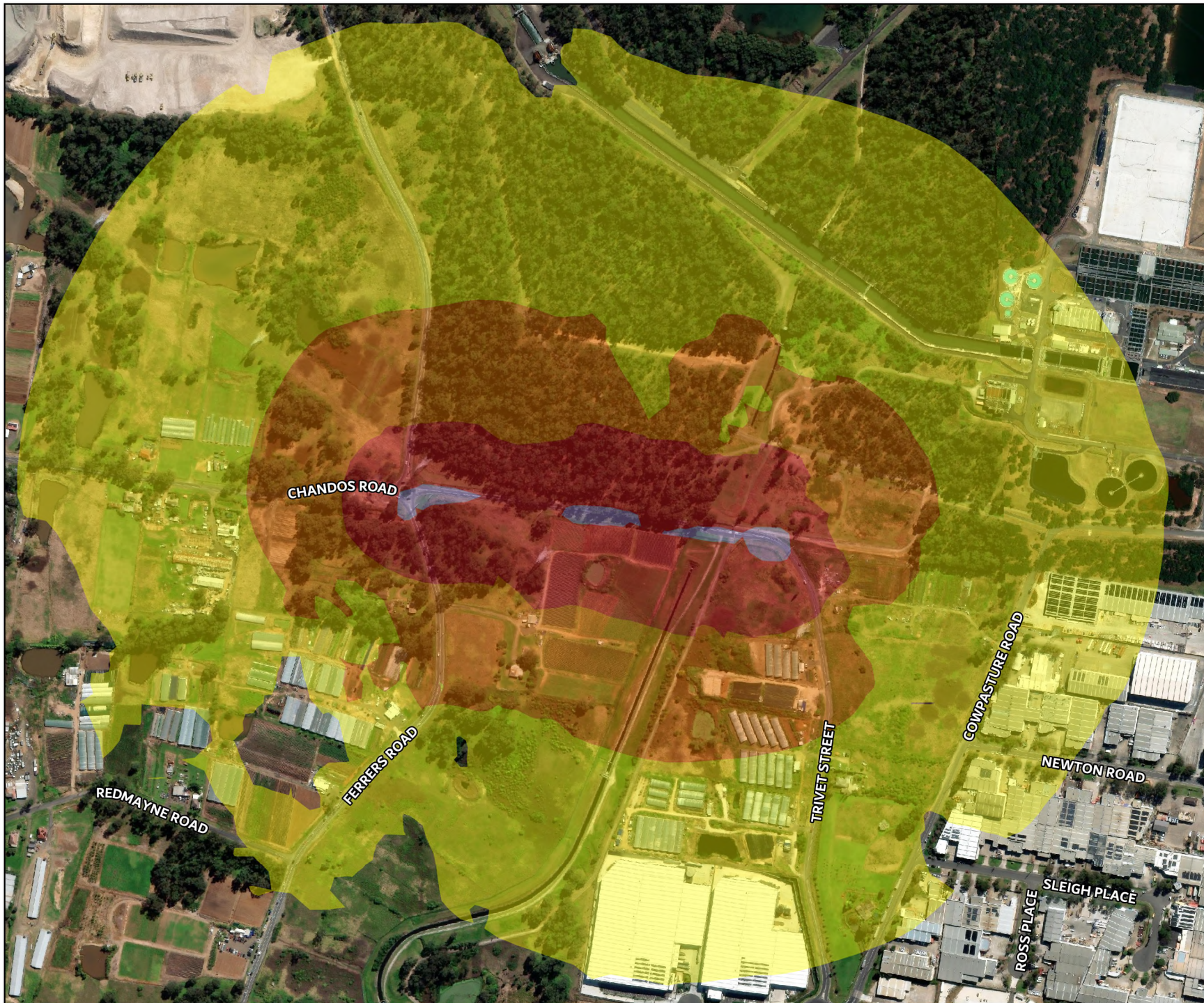
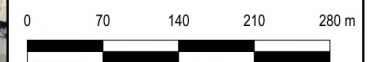


FIGURE F8
Noise Affected Areas
NCA 4 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (OOH Night)
- Residential (OOH Evening)
- Residential (Standard Hours)
- Industrial Premises / HNA



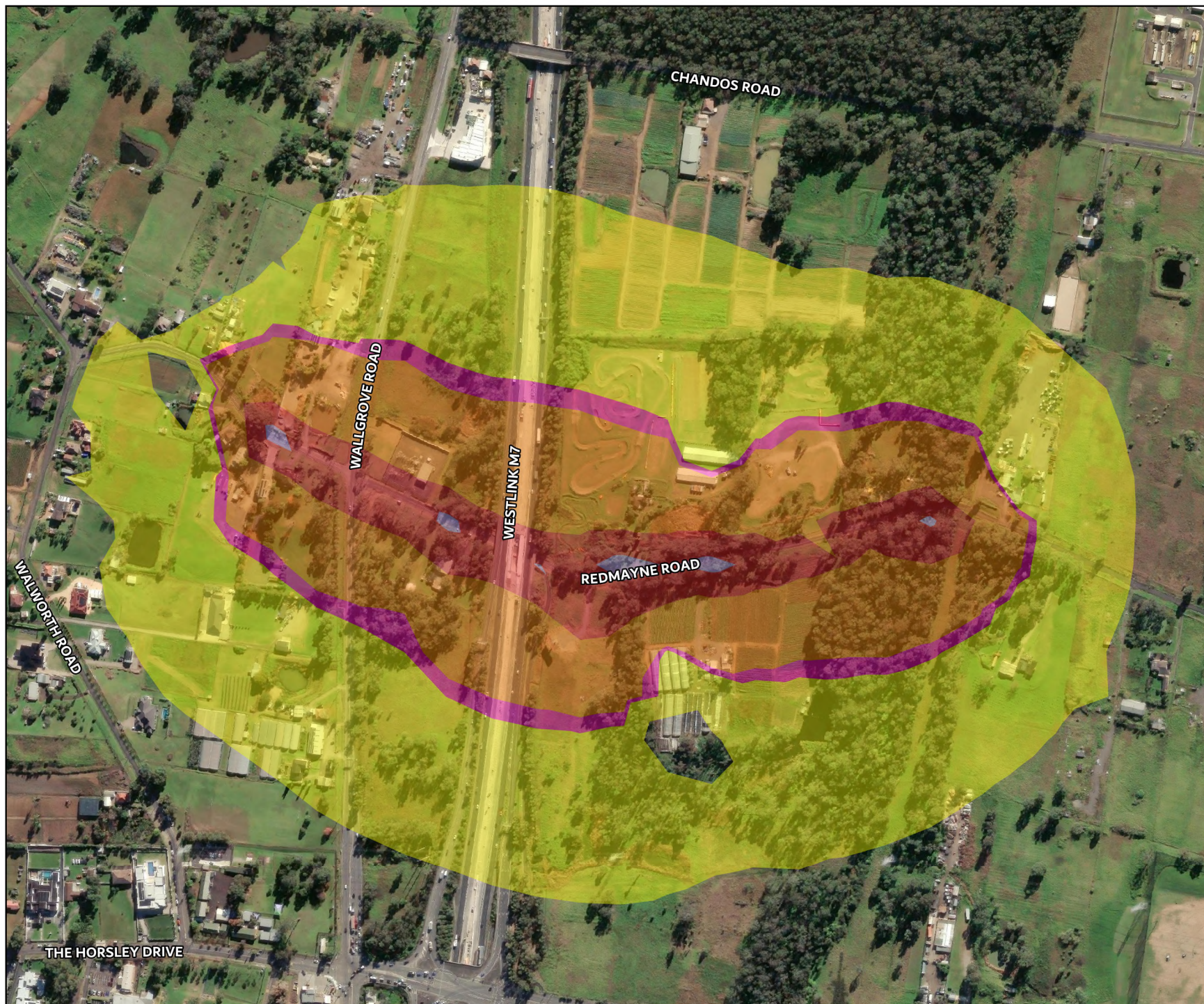
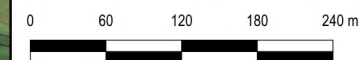


FIGURE F9
Noise Affected Areas
NCA 5 Receivers
T1 Trenchless Installation
(HDD Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (OOH Night)
- Residential (OOH Evening)
- Residential (Standard Hours)
- Residential (HNA)
- Place of Worship



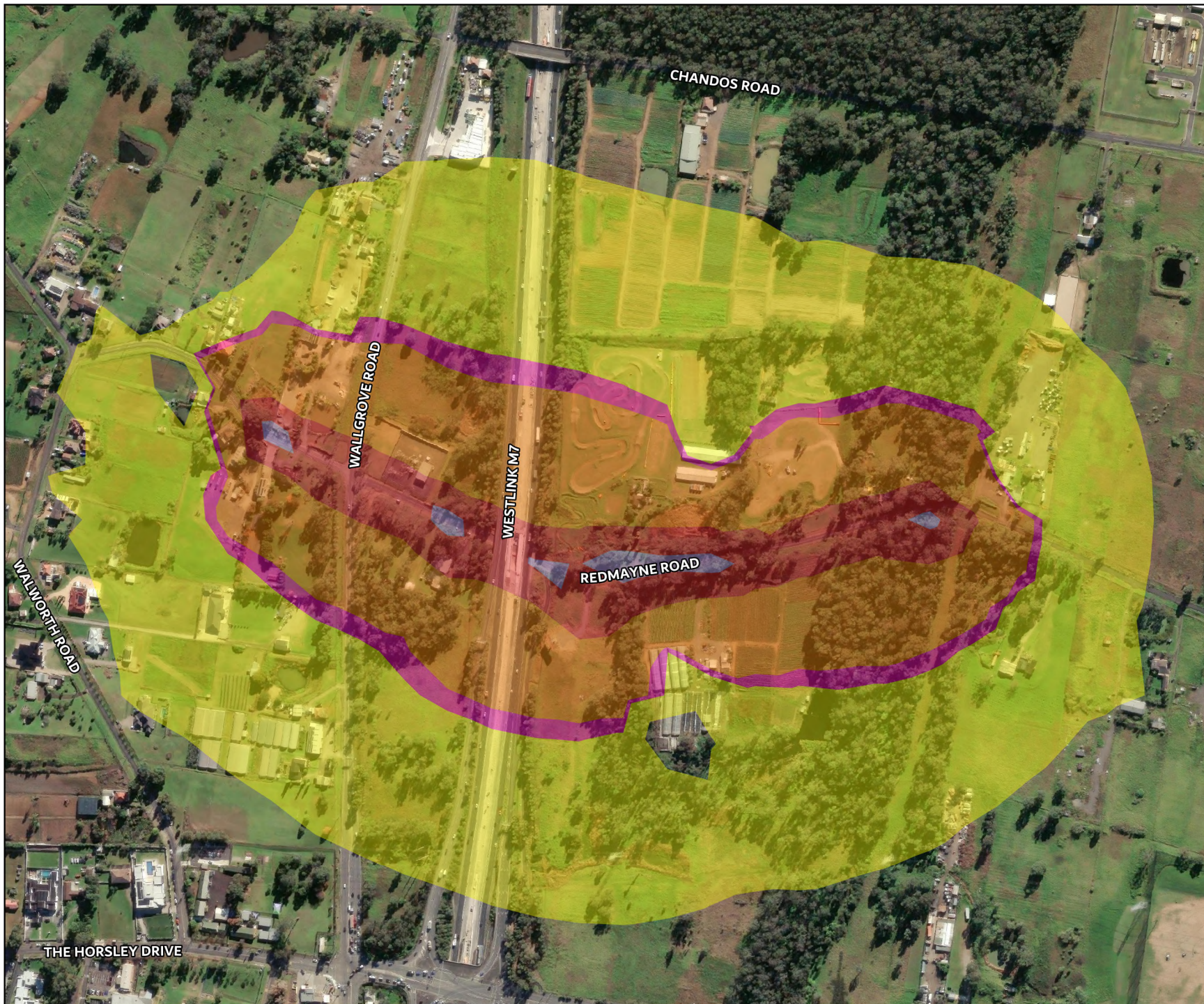


FIGURE F10
Noise Affected Areas
NCA 5 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (OOH Night)
- Residential (OOH Evening)
- Residential (Standard Hours)
- Residential (HNA)
- Place of Worship



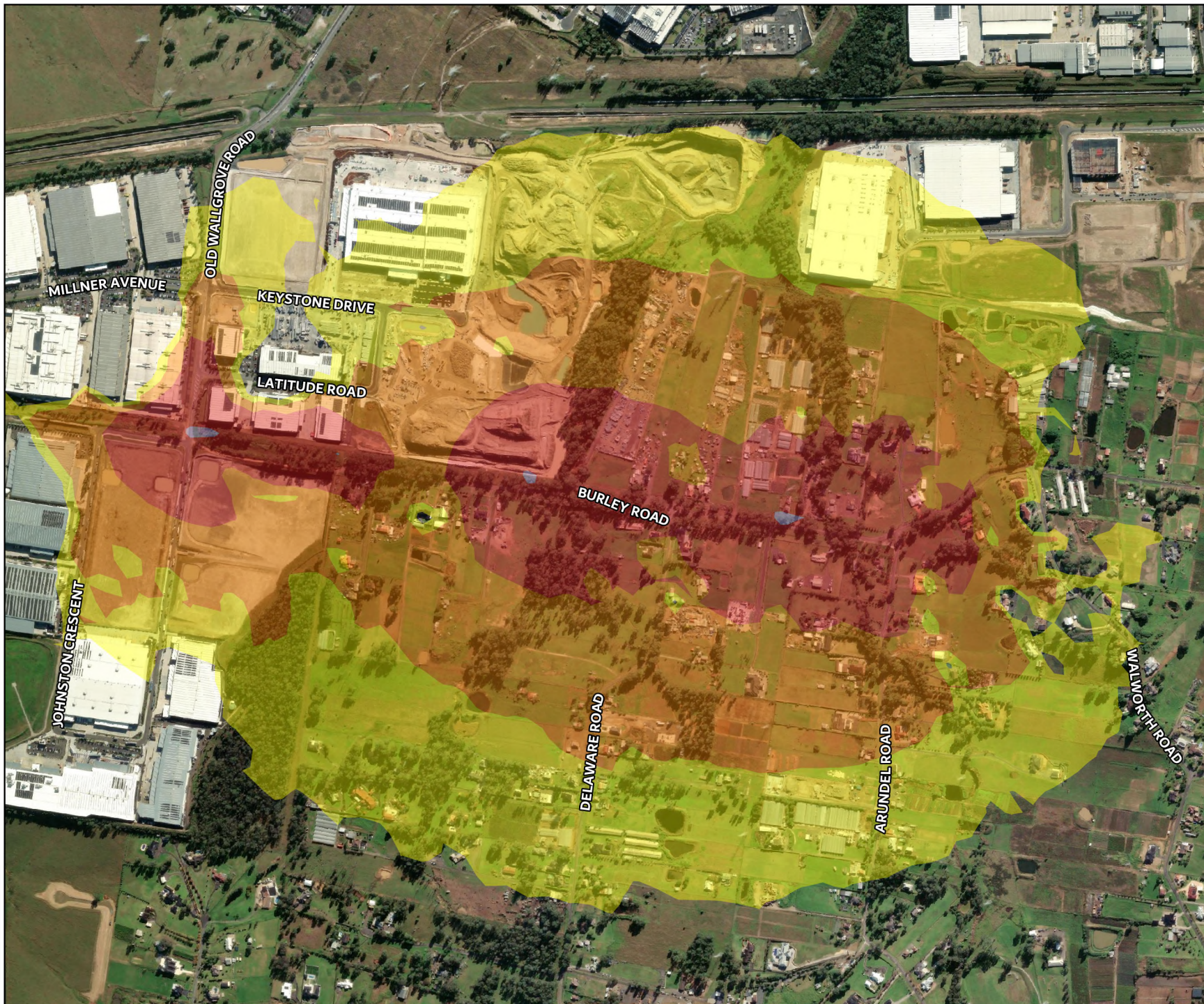


FIGURE F11
Noise Affected Areas
NCA 6 Receivers
T1 Trenchless Installation
(HDD Crossings)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (OOH Night)
- Residential (OOH Evening)
- Residential (Standard Hours)
- Residential (HNA)



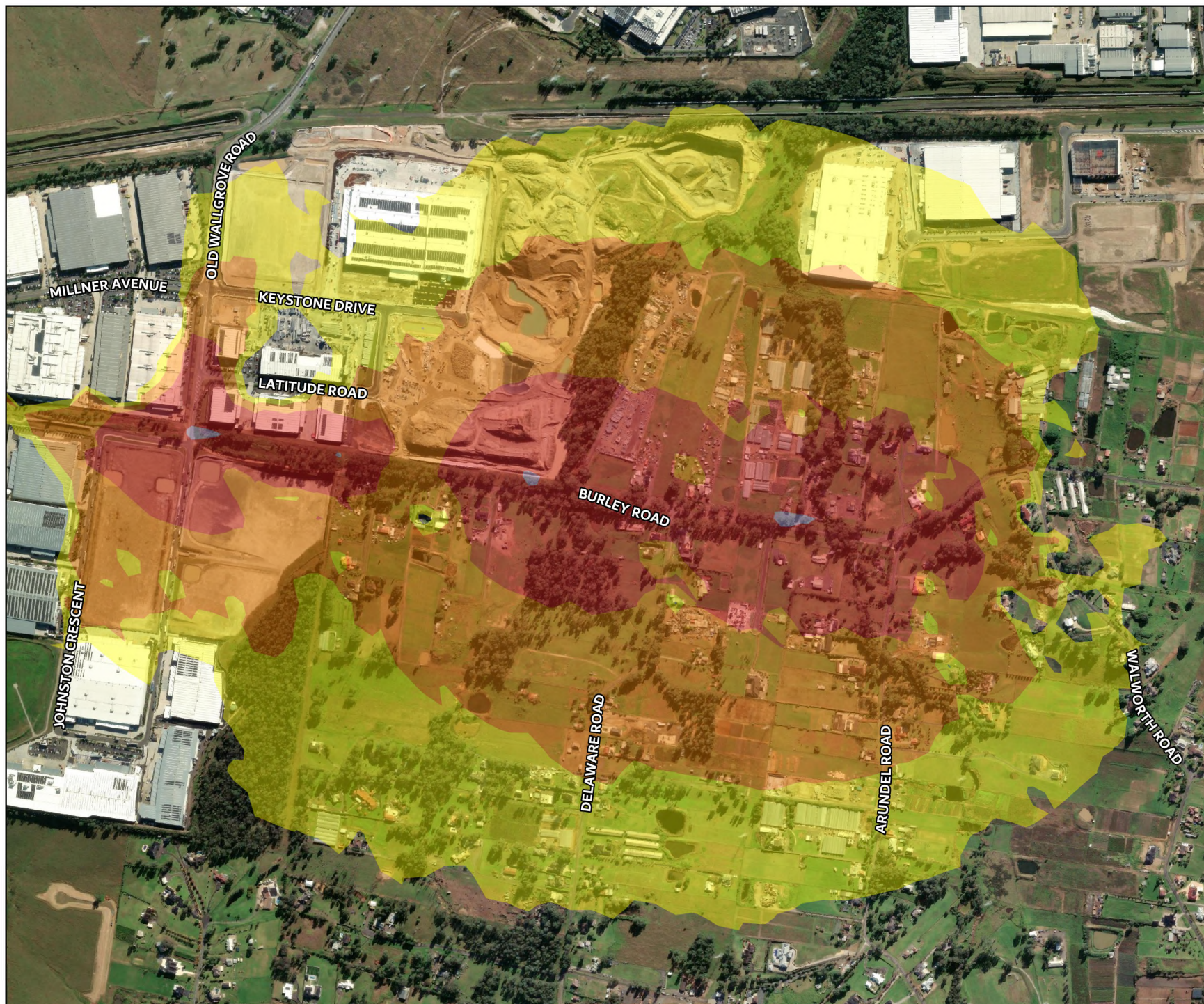


FIGURE F12
Noise Affected Areas
NCA 6 Receivers
T2 Trenchless Installation
(Microtunnel Crossings)
MAC252543-01
Aquanet Network Extension

KEY

- Noise Affected Areas
- Residential (OOH Night)
 - Residential (OOH Evening)
 - Residential (Standard Hours)
 - Residential (HNA)



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Appendix G – Construction Noise Contour Plots – Reservoir Installation

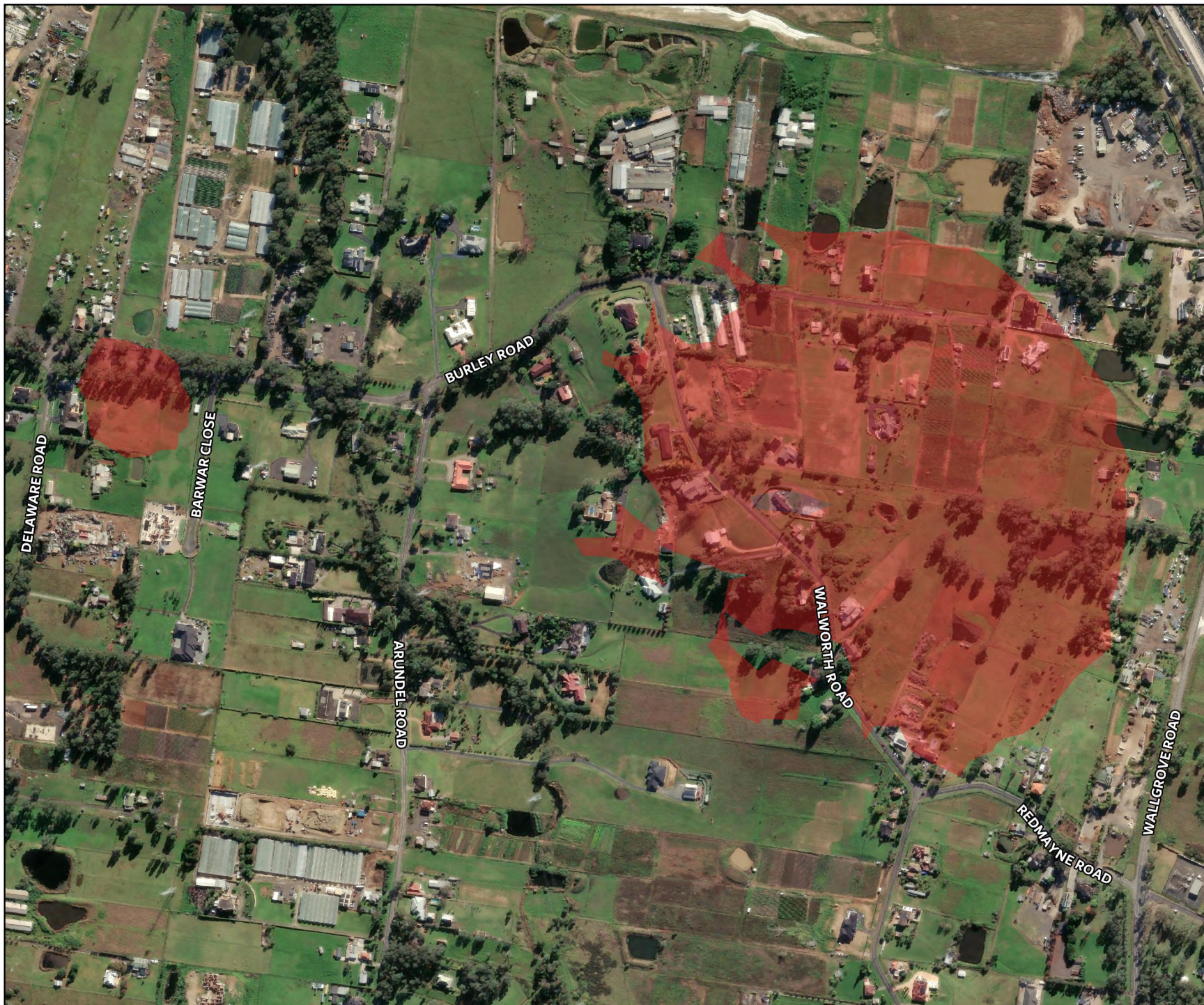
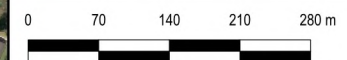


FIGURE G1
Noise Affected Areas
NCA 6 Receivers
R1 Reservoir Installation
(Civil Works)
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Residential (Standard Hours)
- Residential (HNA)



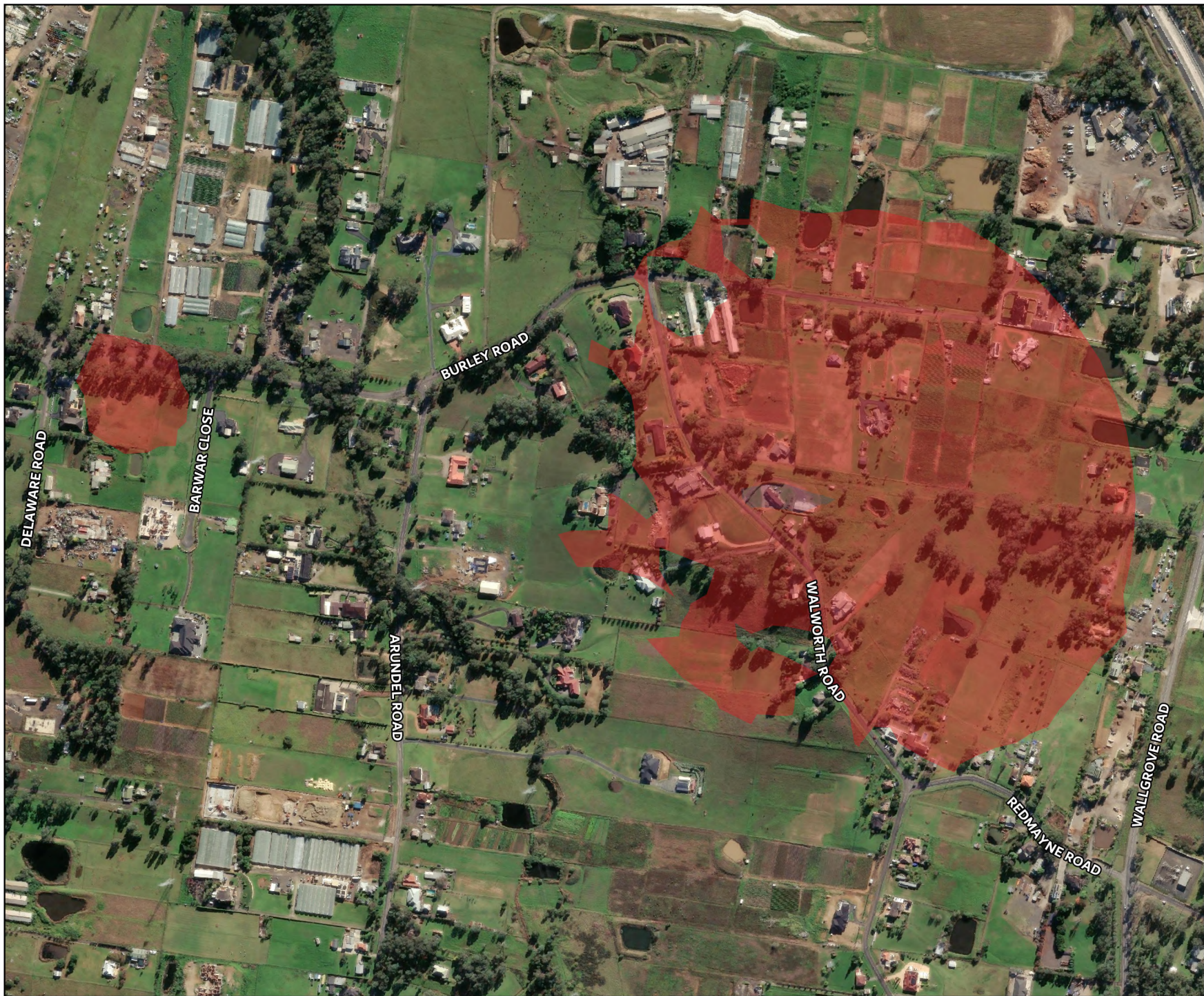


FIGURE G2
Noise Affected Areas
NCA 6 Receivers
R2 Reservoir Installation
(Structural Works)
MAC252543-01
Aquanet Network Extension

KEY

- Noise Affected Areas
- Residential (Standard Hours)
 - Residential (HNA)



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Appendix H – Construction Noise

Contour Plots – Pump Station

Installation

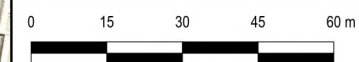


FIGURE H1
Noise Affected Areas
NCA 1 Receivers
S1 Pump Station Installation
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

- Commercial Premises
- Industrial Premises



Appendix I – Construction Noise Contour Plots – Maximum Noise Level Assessment



FIGURE I1
Noise Affected Areas
Maximum Noise Levels
NCA 1 Receivers
Trenchless / Compound
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential Receivers



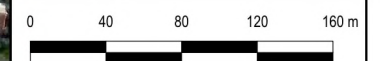


FIGURE I2
Noise Affected Areas
Maximum Noise Levels
NCA 2 Receivers
Trenchless / Compound
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

 Residential Receivers



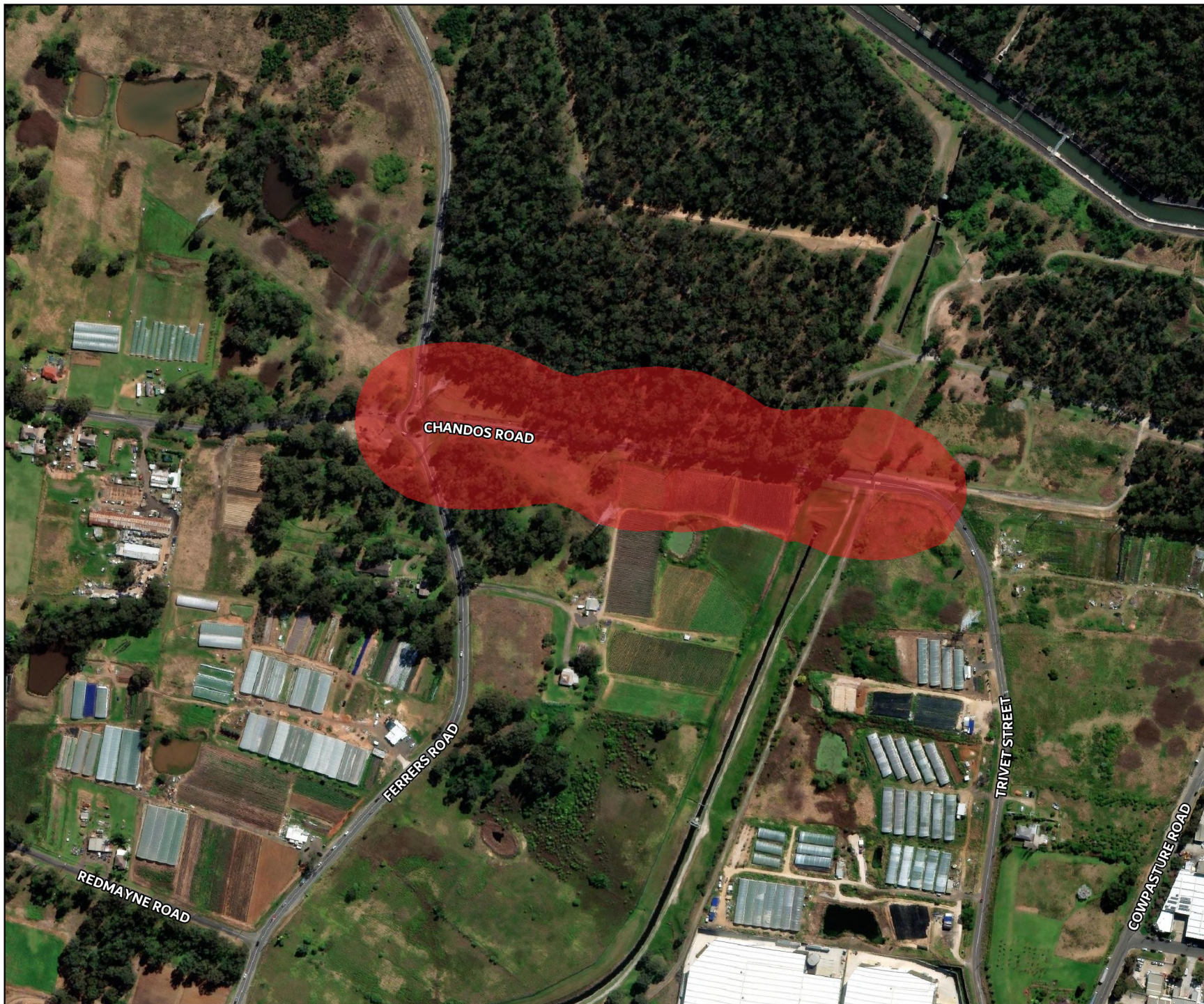


FIGURE I3
 Noise Affected Areas
 Maximum Noise Levels
 NCA 4 Receivers
 Trenchless / Compound
 MAC252543-01
 Aquanet Network Extension

KEY

Noise Affected Areas

Residential Receivers





FIGURE I4
Noise Affected Areas
Maximum Noise Levels
NCA 5 Receivers
Trenchless / Compound
MAC252543-01
Aquanet Network Extension

KEY
Noise Affected Areas

 Residential Receivers





FIGURE I5
Noise Affected Areas
Maximum Noise Levels
NCA 6 Receivers
Trenchless / Compound
MAC252543-01
Aquanet Network Extension

KEY

Noise Affected Areas

Residential Receivers



Appendix J – Vibration Affected Areas



FIGURE J1
Vibration Affected Areas
NCA 1 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

- Cosmetic Damage (22m)
- Human Comfort (73m)

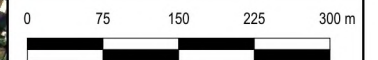




FIGURE J2
Vibration Affected Areas
NCA 2 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

- Cosmetic Damage (22m)
- Heritage Items (44m)
- Human Comfort (73m)





FIGURE J3a
 Vibration Affected Areas
 NCA 3 Receivers
 P2 Open Trench Installation
 (Hard Rock Variant)
 MAC252543-01
 Aquanet Network Extension

KEY

Vibration Affected Areas

- Cosmetic Damage (22m)
- Human Comfort (73m)

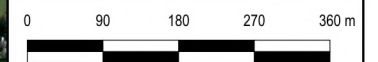




FIGURE J3b
Vibration Affected Areas
NCA 3 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

- Cosmetic Damage (22m)
- Human Comfort (73m)





FIGURE J4
Vibration Affected Areas
NCA 4 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

- Cosmetic Damage (22m)
- Human Comfort (73m)





FIGURE J5
Vibration Affected Areas
NCA 5 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

 Cosmetic Damage (22m)

 Human Comfort (73m)





FIGURE J6
Vibration Affected Areas
NCA 6 Receivers
P2 Open Trench Installation
(Hard Rock Variant)
MAC252543-01
Aquanet Network Extension

KEY

Vibration Affected Areas

-  Cosmetic Damage (22m)
-  Human Comfort (73m)

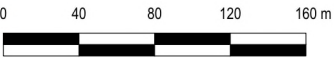




FIGURE J7
Vibration Affected Areas
NCA 6 Receivers
R1 Reservoir Installation
(Civil Works)
MAC252543-01
Aquanet Network Extension

KEY

- Vibration Affected Areas**
-  Cosmetic Damage (20m)
 -  Human Comfort (100m)





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