

Appendix G

Noise and Vibration Impact Assessment

PROJECT BOOST

Guildford West BESS – Noise and Vibration Assessment Report

AUSCONNEX

Reference: 527164-GFW-400-REP-EP-0003

Revision: B

2026-03-24



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Executive summary

Project overview

The Project proposes a grid-scale battery energy storage system (BESS), and associated infrastructure located within Endeavour Energy landholdings adjacent and to the east of the existing Guildford West Transmission Substation (Site).

This report documents the noise and vibration assessment for the construction and operational phase associated with the Site. The assessment has been undertaken in accordance with the, NSW Noise Policy for Industry (2017) (NPfI), the Interim Construction Noise Guideline (ICNG), NSW Road Noise Policy (DECCW, 2011), Guildford West DCP 2014 requirements and other relevant guidelines referenced in Section 3 of this report.

Construction noise and vibration

- Construction noise for the project has been assessed using a typical worst-case construction itinerary provided by the Ausconnex Project Manager, in the absence of a detailed construction program (which will be available during the detailed design phase).
- The construction phase will occur for a 15-month period. Construction noise has been assessed for a typical construction itinerary. Worst-case construction noise impacts were assessed having assumed that all construction equipment is positioned at a single location, closest to the most sensitive receiver, and operating at maximum load conditions. Assessment results indicate that construction noise criteria is predicted to be exceeded at the nearest residential receiver (R2 - 3 or 4 properties within NCA R2 facing the McCredie Road) and active recreation receiver (A2 - Guildford West Sportsground, Foray St, Guildford West NSW 2161), with the key affected area being the soccer field and open space near the site boundary. As such, standard and project-specific mitigation measures (refer to Section 8) for construction noise should be implemented to minimise exceedances over Noise Management Levels (NMLs) during construction.
- Traffic noise modelling outcome indicates with a conservative 5% increase of traffic on McCredie Road an increase of less than 0.5 dB (day and night time) at the nearest sensitive receiver. This increase is below the RNP criteria of 2 dB for additional traffic movements generated by the development during the construction phase and hence road traffic noise is compliant during the construction phase. In addition, the assessment of heavy equipment deliveries undertaken at night using OSOM vehicles is presented in Table 6-4. Noise levels at most surrounding properties are predicted to comply with the stringent night-time construction noise criteria except NCA R2. Residents at the nearest receivers, NCA R2 may experience noticeable noise during late-night activities when equipment installation works occur at the closest approach to these properties. Suitable mitigation measures outlined in Section 8 should be implemented to minimise potential impacts.
- Construction vibration is unlikely to cause structural damage or adversely affect human comfort based on experience of similar developments and typical, 'worst case' construction activities associated with these types of development as discussed in Section 6.5.1.
- Typical noise mitigation measures and management procedures that can be considered for a project of this type are presented in Section 7.4.

Operational noise and vibration

- Operational noise levels have been estimated using the CONCAWE sound propagation model within a detailed 3D computational noise model, considering worst-case operational scenarios for the BESS.
- The assessment indicates that unmitigated noise levels are likely to exceed the relevant noise criteria at NCA R2 for 38 residential receivers, particularly under standard and adverse weather conditions (Refer to Section 7.2).

- To attenuate the primary noise propagation path affecting the residential receivers, a 5-metre-high noise wall (Refer Figure 7-1) has been identified as a technically feasible and reasonable mitigation measure. Table 7-4 presents the predicted noise levels at the sensitive receivers with the noise wall in place, and Figure 7-1 shows the proposed location. Noise wall specifications are provided in Appendix I.
- The barrier should be designed to obstruct the direct line-of-sight between the primary noise sources (such as batteries and inverters) and residential properties, using solid materials with a minimum surface density of 10 kg/m², consistent with NPfI guidance. The proposed barrier aligns with the NPfI's noise control hierarchy, which prioritises source control, followed by path controls such as barriers, and receiver-based treatments where required.
- Based on the two feasible mitigation measures currently incorporated into the project design, namely the provision of perimeter noise walls and implementation of silencers, noise modelling results indicate that all sensitive receivers will comply with worst case noise criteria even during adverse weather conditions except 2 properties (125 and 127 McCredie Road Guildford West NSW). These properties show negligible residual noise exceedances (less than 2.0 dB above the stipulated criteria) and as such no additional mitigation measures are considered necessary.
- A tonal and low frequency noise assessment was undertaken in accordance with the EPA Noise Policy for Industry (NPfI). The analysis included one third octave band review and assessment of any defining tonal characteristics, as well as evaluation of low frequency content against the NPfI low frequency screening criteria. The predicted results include tonality penalties at the nearest receivers. More details in Appendix G.
- Vibration levels associated with construction activities are expected to be greater than those during operation of BESS equipment at the nearest receivers. Construction vibration is assessed as negligible based on the worst-case construction equipment; subsequently operational vibration impacts can be reasonably assumed to be negligible. In summary, operational vibration impacts are expected to remain below thresholds for structural damage and human comfort criterion in accordance with relevant international standards (e.g. DIN4150-3, ISO 2631) and NSW guidelines (e.g. NSW EPA's *Assessing Vibration: A Technical Guideline*).

Decommissioning noise

At the end of the 20-year lease or when components become non-functional, the BESS will be decommissioned in line with regulatory requirements. Non-operational equipment will be safely stored and transported to licensed recycling facilities. The site will be restored to its original condition, with materials reused or recycled where possible. Decommissioning activities will follow the same construction hours and impacts as those used during construction and are expected to generate similar noise levels from trucks and machinery. A detailed qualitative assessment of decommissioning impacts will be undertaken once a specific activity schedule is developed.

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1 Introduction

Ausconnex is proposing to develop, construct and operate a grid scale BESS including associated infrastructure for network connection in Guildford West, New South Wales (NSW) known as the Guildford West HV BESS project (“the Project”) as part of a larger portfolio named Project Boost. The Project comprising 60 large lithium ion BESS modules will have a capacity of up to 85 megawatts (MW) with four hours of storage (85MW/ 340 megawatt hours (MWh)).

The Project would connect to the NEM via two (2) x 33 kilovolt (kV) underground cable to the existing Guildford West Transmission Substation (Guildford West Substation) located directly west of the Project. The proposed development is situated on an approximately 2.31 hectare (ha) portion of land within the curtilage of the existing Guildford Transmission Substation 120-130 McCredie Road Guildford West NSW 2161 (development footprint).

1.1 Scope of this report

This report documents the construction and operational noise and vibration assessment associated with the Project, prepared in accordance with the Planning Secretary’s Environmental Assessment Requirements (SEARs). The assessment has been undertaken in accordance with the EPA NPfl, the Interim Construction Noise Guideline (ICNG) and other relevant guidelines referenced in Section 3 of this report.

The scope of this assessment includes:

- Establishing construction noise and vibration criteria and operational noise criteria for the Project in accordance with the SEARs as shown in Section 1.2, applicable Environment Protection Authority (EPA) regulations and other relevant guidelines.
- Quantitative assessment of the noise and vibration emissions from the construction, operation and decommissioning of the Project, at the boundary of the nearest sensitive receivers.
- Providing high-level options for noise and vibration mitigation, where relevant.

1.2 SEARs

Table 1-1 sets out the SEARs relevant to noise (Application No. SSD 83916959) and identifies the relevant Chapter where the requirements have been addressed in this assessment report.

Table 1-1: SEARs – Noise

Relevant SEARs	Where addressed
Noise – including: an assessment of the construction noise impacts (including impacts from proposed road upgrades) of the development in accordance with the <i>ICNG</i> operational noise impacts in accordance with the <i>NSW Noise Policy for Industry (2017)</i>, assess traffic noise having regards to the <i>NSW Road Noise Policy</i> (DECCW, 2011) and cumulative noise impacts (considering other developments in the area), including (where appropriate): ■ identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours; ■ details of noise monitoring survey, background noise levels and amenity noise levels at the most-affected residential receivers;	■ Construction noise impacts are considered in Section 6 ■ Operational noise impacts are considered in Section 7 ■ Traffic noise impacts are considered in Section 6.5 ■ Cumulative noise impacts are considered in Section 7.4 ■ Construction noise based on typical construction itinerary (Section 6.1.1) will exceed applicable criteria during standard construction hours, therefore noise management plan is required. However, general management measures in accordance with AS2436:2010 and other guidelines are proposed in Section 8.

Relevant SEARs	Where addressed
■ details of the likely daily charging/discharging load profile, manufacturer specifications for plant and equipment and noise source inventory (including intensity, quantity, location, directivity and frequency information); ■ an assessment of 'worst case' noise emission scenarios during periods of discharging and charging; ■ consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area; and ■ details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration impacts following application of these mitigation measures and details of any proposed compliance monitoring programs.	■ In accordance with the general SEARs requirements, consideration for decommissioning impacts is provided in Section 6.2.

2 Proposal description

2.1 Project background

The Guildford West BESS project involves the development, construction, operation and decommissioning of a grid-scale BESS with a capacity to supply up to 85MW of power and the ability to store up to 340MWh of energy adjacent to the existing Guildford West Substation to meet the growing demands of the local Guildford West community.

The Guildford West BESS project includes the following key components:

- Electrical infrastructure including:
 - an 85 MW/340 MWh HV BESS comprised of 60 lithium-ion battery containers;
 - 24 inverter stations each including an inverter, step up transformer and Ring Main Unit (RMU);
 - two auxiliary transformers;
 - six Core Support Enclosures (CSEs) for communications equipment;
 - 33 kV switch room/control room;
 - installation of two (2) x 33 kV underground cables and entry point for HV BESS cabling to connect to the Project to the existing Guildford Transmission Substation via new and existing conduits; and
 - one harmonic filter.
- Other permanent ancillary infrastructure including:
 - minor excavation for fire water retention basin (up to 2 mbgl) and earth grading and levelling works to enable installation of concrete pads for the HV BESS modules and associated infrastructure (total earthworks volume approximately 1,100 m³ of cut and 3,400 m³ of fill);
 - operation and maintenance (O&M) building;
 - car parking;
 - security fencing, lighting, signage and lightning protection;
 - fire hydrants, fire detection and suppression equipment;
 - internal access road (about 6m wide) and existing driveway access off McCredie Road;
 - stormwater drainage system and water detention (for drainage and fire water containment purposes);
 - seven (7) x 5m high noise attenuation walls; and
 - perimeter landscaping.
- Temporary construction facilities including:
 - site office and amenities;
 - construction laydown area;
 - construction worker parking area (light vehicles only); and
 - stormwater and sediment controls for the Site.

The overall project footprint is about 2.31 hectares. This includes the temporary construction facilities as well as the 33kV grid connection.

Typically, BESS modules are 2.8 metres in height, with a total associated footprint of 50 square metres in area per module. There are 60 battery modules proposed. The BESS modules typically contain internal heating, ventilation and cooling (HVAC) controls. Harmonic filters can be up to 6 metres tall while the step-up transformer tank would be up to about 3m high.

Figure 2-1 shows the project layout for the Guildford West BESS project. The final Guildford West BESS project configuration will be confirmed pending detailed design.

The project site (yellow boundary) within Figure 4-1, and all relevant figures throughout this report, is to be considered the site area assessed as part of the operational noise and vibration assessment for this project.

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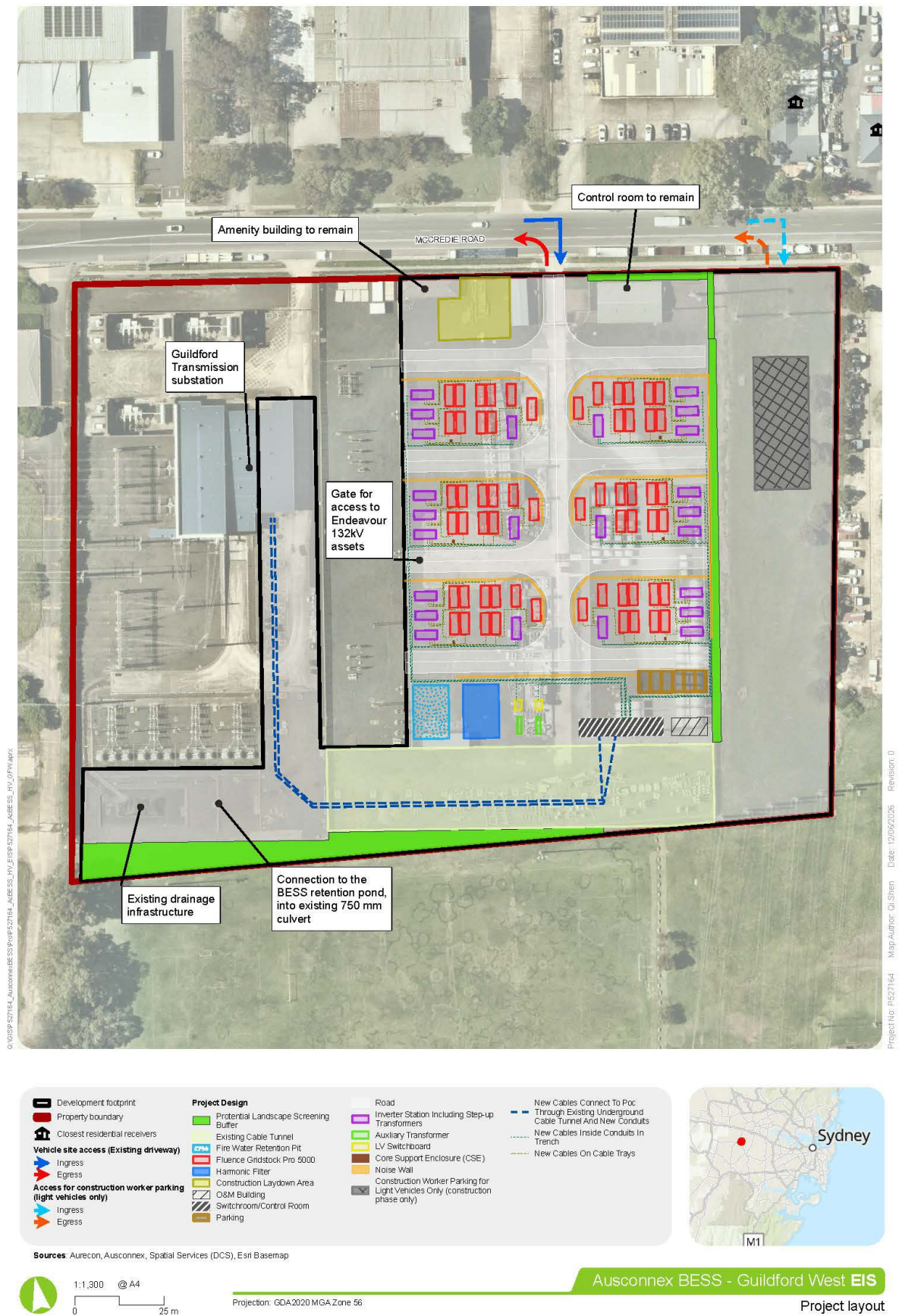


Figure 2-1: Proposed Guildford West BESS project layout

3 Policy and planning context

In NSW, the acceptability of noise and vibration impacts is regulated by the *Protection of the Environment Operations (Noise Control) Regulation* (POEO Noise Control Regulation) (NSW Government, 2017), which falls under the *Protection of the Environment Operations Act No 156* (POEO Act) (NSW Government, 1997).

Refer to Table 3-1 for a summary of the relevant acts and regulations.

Table 3-1: Relevant Acts and Regulation

Type	Title	Purpose
Act	<i>Protection of the Environment Operations Act</i> (1997) (NSW Government, 2017)	The POEO Act establishes the framework for noise control in NSW. A key objective of the POEO Act is to protect, restore and enhance the quality of the NSW environment. The POEO Act contains broad provisions to address noise issues.
Regulation	<i>Protection of the Environment Operations (Noise Control) Regulation</i> (NSW Government, 2017)	The POEO Noise Control Regulation includes specific provisions to manage common neighbourhood noise issues.

A summary of the relevant policies, standards and guidelines that apply to the Project is provided in Table 3-2. For a full description of how these policies and assessment guidelines apply, please refer to the relevant documents. Certain British and international standards are referenced in this document to clarify the applicable criteria; however, compliance with these specific standards is not mandatory.

Table 3-2: Relevant policies, standards and guidelines applicable for the assessment

Acoustic aspect	Purpose	Relevant assessment document		
		Type	Title	Description
Air-borne noise	Construction noise	Guideline	ICNG (NSW DECC, 2009)	The ICNG aims to mitigate disruptions due to noise during construction works and out of hours deliveries of BESS components. It sets permissible noise levels, timeframes, and acceptable work practices to minimize disturbance to residents and the environment.
		Standard	BS 5228-2:2009+A1:2014	Code of Practice for Noise and Vibration Control on Construction and Open Sites (Noise) (for reference)
	Sleep disturbance during night time period (10pm – 7am)	Guideline	ICNG (NSW DECC, 2009)	As described above.
		Policy	NSW Road Noise Policy (RNP), (DECCW, 2011)	The RNP aims to identify the strategies that address the issue of road traffic noise from: - Existing roads; - New road projects; - Road redevelopment projects; and - New traffic-generating developments. The RNP also defines criteria to be used in assessing the impact of such noise and provides guidance on assessing sleep disturbance.
	Construction traffic noise	Policy	NSW Road Noise Policy (RNP), (DECCW, 2011)	Construction traffic noise is assessed under the guidance of the RNP.

Acoustic aspect	Purpose	Relevant assessment document		
		Type	Title	Description
	Operational noise	Policy	NSW NPfl (EPA, 2017)	The purpose of the NPfl is to ensure noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. It provides a methodology for measuring the existing noise levels at a site. It provides noise levels for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures (refer to Section 3.2).
Vibration	Human comfort	Guideline	<i>Assessing Vibration: A Technical Guideline</i> (NSW DEC, 2006)	The Assessing Vibration: A Technical Guideline (AVATG) provides guidance on vibration assessment for human comfort.
		Standard	<i>BS 6472-1:2008</i>	Guide to Evaluation of Human Exposure to Vibration in Buildings (Part 1: Vibration Sources Other Than Blasting)
	Construction vibration effect on structures (cosmetic damage)	Standard	German Standard <i>DIN 4150: Part 3 – 2016 Effects of Vibration on Structures</i>	These standards provide guidance on the assessment of building damage caused by vibrations
		Guideline	<i>California Department of Transportation</i>	Transportation and Construction-Induced Vibration Guidance Manual (2004)
		Guideline	<i>FTA Transit Noise and Vibration Impact Assessment Manual</i> (2019)	Provides standard methodologies and criteria for assessing construction and transit-related noise and vibration, including PPV impact thresholds.

Note: refer to Section 3.1.2 for construction standard/ out of standard hours and Section 5.3.5.2 for operational day/ evening/ night time periods

3.1 Interim Construction Noise Guideline (ICNG)

The NSW DECC released the ICNG in July 2009 for the management of construction works' noise in NSW (Department of Environment & Climate Change NSW, 2009). This guideline provides recommendations on standard construction hours and construction noise management levels (NMLs) as shown in Table 3-2.

3.1.1 Objectives of the guideline

The main objectives of the Guideline are to:

- Promote a clear understanding of ways to identify and minimise noise from construction works (refer to construction itinerary in Section 6.1).
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts.
- Encourage construction to be undertaken only during the recommended standard hours (Section 3.1.2), unless approval is given for works that cannot be undertaken during these hours. Assessment of out of hours delivery of BESS components.
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage.

- Provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

3.1.2 Recommended standard hours of work

The construction phase of the Project will occur over a 15-month time frame. Section 2.2 of the ICNG recommends standard hours for construction work as follows:

- Monday to Friday: 7am to 6pm,
- Saturday: 8am to 1pm, and
- No work on Sundays or public holidays

Despite the above, the ICNG notes that the recommended standard hours of work are not mandatory and acknowledges that some activities could be undertaken outside the recommended standard hours of work. These activities include the following, with the final activity being particularly relevant to this Project:

- The delivery of oversized plant or structures that police or other authorities determine requires special arrangements to transport along public roads such as the 62 Oversize Overmass (OSOM) movements. All OSOM movements would occur during out-of-hour periods. This includes 60 OSOM movements (one per battery), 1 OSOM movement for harmonic filter and 1 OSOM movement for the switching room, which are expected during the construction phase. 61 OSOM movements would start from Port Botany (the port of arrival for the batteries and transformers). The Switchroom is likely to be sourced from local suppliers in Newcastle and the associated OSOM movement transporting it would originate from the Newcastle area.
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
- Maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours.
- Public infrastructure works that shorten the length of the project and are supported by the affected community.
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours (such as OSOM delivery of electrical equipment during late evenings).

3.1.3 Applying the ICNG

The steps for managing noise impacts from construction are:

- Identify sensitive land uses that may be affected.
- Identify hours for the proposed construction works.
- Identify noise impacts at sensitive land uses.
- Select and apply the best work practices to minimise noise impacts as per the Section 3.1.2).

3.2 EPA NPfl

The NPfl (Environment Protection Authority NSW, 2017) provides the framework and process for the assessment, control, and monitoring of operational noise from industries in NSW under the POEO Act.

The NPfl provides guidance on determining appropriate noise criteria for external noise emissions from industrial premises and industrial development proposals on surrounding sensitive receivers. The NPfl considers noise goals in terms of intrusiveness and amenity noise levels.

The intrusiveness noise level protects against significant changes in noise, while the amenity noise level seeks to protect against cumulative noise impacts from industry. Together, these levels are used to assess the potential impact of noise and assess reasonable and feasible noise mitigation measures. A project noise trigger level is developed through this process, which provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory threshold. The NPfl requires a project to take consideration of other industrial noise sources in setting amenity noise objectives.

3.3 NSW EPA Road Noise Policy

Construction traffic relates to Light vehicles (LV) and Heavy Vehicles (HV) movements associated with personnel travelling to and from construction sites and the transportation of construction materials and plant / equipment to and from construction compounds. Construction related traffic noise objectives are based on the provisions of the RNP. Construction related traffic movements and data will be provided by project team later in the design process.

3.4 Vibration guidelines

The effect of vibration impacts on buildings and structures can be divided into two categories:

- Human comfort impacts – where the occupants or users of the affected building are possibly disturbed by the construction vibration.
- Structural impacts – effects on building contents and structural integrity.

3.4.1 Human comfort

Construction vibration can adversely affect the amenity of occupants inside buildings as it may affect their quality of life or working efficiency. Human comfort impacts are experienced at levels well below those that can damage or affect a structure and its contents. Though it may not always be possible to comply with the more stringent human comfort criterion for infrastructure projects near residential dwellings, human comfort should always be used as the objective to aim for and be the basis of assessment.

Guidance in relation to acceptable vibration levels for human comfort are provided in *Assessing vibration a technical guideline (AVATG)* (Department of Environment and Conservation, 2006), which in turn is based on the guidelines contained in British Standard *BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*. *BS 6472-1:2008* superseded this British Standard in 2008. Although a new version of BS 6472 has been published, AVATG still references the 1992 version of this standard and the EPA still advises vibration to be assessed in accordance with this version of the standard.

AVATG classifies vibration as one of three types:

- Continuous – where vibration occurs uninterrupted and can include sources such as machinery and constant road traffic.
- Impulsive – where vibration occurs over a short duration (typically less than two seconds) and occurs less than three times during an assessment period. This may include activities such as occasional dropping of heavy equipment or loading / unloading activities.
- Intermittent – occurs where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, pile driving and pavement breakers.

3.4.2 Structural damage

Vibration transmission through the ground can cause a structure and structure coupled elements (walls, windows, roof etc.) to radiate. The transmitted vibration energy has the potential to damage and compromise the integrity of a structure as well as increase the risk of damage to building contents.

There is no current Australian Standard that sets criteria for the assessment of building damage caused by vibrations. Guidance on limiting vibration values with the potential to cause structural damage is typically referenced from the German Standard DIN 4150: Part 3 – 2016 *Effects of Vibration on Structures* (DIN guideline) (German Institute for Standardisation (Deutsches Institut für Normung), 2016).

4 Methodology

4.1 Noise assessment approach

A quantitative noise assessment has been undertaken for the project which involved the following steps based on the current design. The assessment will be updated based on the detailed design:

- Determining the baseline conditions for background and ambient noise levels at the sensitive receivers in accordance with NSW EPA (NPfI) and DECC ICNG.
- Deriving the relevant criteria for the project:
 - Deriving the project specific operational noise criteria based on measured background noise levels and the amenity noise levels.
 - Deriving the project specific construction noise criteria depending on the type of the sensitive receiver and considering the measured background noise levels.
 - Identifying the project specific construction vibration criteria.
- Identifying construction and operational equipment itineraries.
- Estimating the noise impacts at the nearest sensitive receivers using desktop-based modelling (Refer to Section 6 for construction itinerary).
- Estimating vibration impacts at the nearest sensitive receivers using empirical formulae.
- Comparison of the predicted impacts with the stipulated noise / vibration criteria.
- Developing feasible and reasonable mitigation measures to ameliorate the impacts in case of exceedances based on the worst-case scenario modelled on the assumed specifications of battery units operating at relevant capacities. The noise assessment shall be re-evaluated and updated if equipment selections are altered, refined, or replaced during the detailed design phase, to determine whether acoustic performance requirements remain valid and compliant with project criteria

4.2 Zoning

The study area was defined by examining the site context, the sensitive receivers and the surrounding area. An area spanning an approximately 500¹ metre radius from the site boundary was chosen to account of possible noise impacts at the nearest sensitive receivers including residences and users of the public recreation areas for compliance assessment.

The nearest residences were identified as the relevant noise sensitive receivers, as outlined in Section 5.1, in addition to identification of Noise Catchment Areas (NCAs). Noise assessment is conducted for the nearest property within each NCA. If this property complies with the stipulated criteria, compliance is considered to be achieved for all other properties within the same NCA

Figure 4-1 illustrates the surrounding land-use zoning in accordance with the Cumberland City council Local Environmental Plan 2021.

¹ A 500-metre assessment radius has been adopted for the noise impact assessment. This radius is commonly used for major NSW road, rail and linear infrastructure projects and captures the sensitive receivers most likely to experience measurable changes in noise due to the Project. The radius provides a pragmatic balance between modelling completeness and effort and is consistent with NSW guidance (ICNG; Noise Policy for Industry; Transport NSW Road/Rail noise guidance). Where initial modelling identifies potential impacts beyond 500 m, the assessment will be extended to include those receivers.

4.2.1 Surrounding land uses

The development footprint is located on land zoned General Industrial under Cumberland City Local Environmental Plan 2021 (CLEP 2021). The Site is located within an E4 General Industrial zone, which primarily accommodates a range of industrial and supporting land uses. The surrounding land uses include E4 General Industrial zoning to the north, providing for lighter industrial and warehousing activities.

To the south, the land is zoned RE1 Public Recreation, typically reserved for open space, parks, and recreational activities which comprise Holroyd Rangers Soccer fields, Guildford West Sportsground, Holroyd Giants Baseball Courts and Guildford West Tennis Courts. The closest noise sensitive residential receivers to the site is the residential area located to the north-east, zoned R2 Low Density Residential, characterised by single / two storey detached housing and three storey walk-up residential flat buildings.

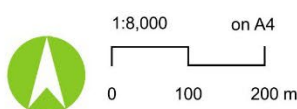


Legend

 Study Area	 C2 - Environmental Conservation	 Site Boundary
Structures/Receivers	 B5 - Business Development	 Project Site
On-Site	 E4 - General Industrial	 Lot
 Existing Structures on Site	 R2 - Low Density Residential	Base map
 Guildford West - Sensitive Receivers	 R3 - Medium Density Residential	Google Satellite
Guildford West - Land Zoning	 RE1 - Public Recreation	
 B1 - Neighbourhood Centre	 SP2 - Infrastructure	



Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



Projection: GDA2020 / MGA zone 56 (EPSG:7856)

BESS Noise Study- Guildford West Noise Impact Assessment

Study Area showing Land Use Zones

Figure 4-1: Land use zones

4.3 Vibration assessment methodology

Construction work has the potential to generate vibration which can impact human comfort and/or cause structural damage to buildings.

Vibration is generated when energy from equipment is transmitted into the ground and is generally attenuated with distance. Vibration level of a source is inversely proportional to the distance between the source and receiver. The magnitude and attenuation of ground vibration is dependent on the following:

- the ground type and topography;
- the impact medium stiffness;
- the efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment);
- the frequency content; and
- the type of wave (surface or body).

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data. To obtain an estimate, existing research data has been used to predict the vibration levels during certain vibration intensive tasks.

4.3.1 Geotech Soil Boring

The peak particle velocity (PPV) from impact pile drivers for Geotech bore hole investigation can be estimated by the following equation (California Department of Transportation, 2004):

$$PPV_{impact\ pile\ driver} = PPV_{ref} \left(\frac{D_{ref}}{D_{impact\ pile\ driver}} \right)^n \left(\frac{E_{impact\ pile\ driver}}{E_{ref}} \right)^{0.5} mm/s$$

Where:

- PPV_{ref} = 16.5mm/sec for a reference pile driver at D_{ref} 7.6 metres.
- D = distance from pile driver to the receiver in metres.
- E_{ref} = 48,809 Joules (rated energy of reference pile driver).
- $E_{impact\ pile\ driver}$ = rated energy of impact pile driver in Joules.
- n = 1.1 is a value related to the vibration amplitude rate through ground.
- Measured and suggested 'n' values based on soil class.

Vibration impact estimates may be refined further by using values of 'n' that are based on soil type classification or soil conditions at a site as illustrated in Table 4 9.

Table 4-1: Measured and suggested 'n' values based on soil

Description of soil material	n, slope or attenuation rate or composite value for geometric and material damping
Weak or soft soils: loose soils, mud, loose beach sand, dune sand, recently ploughed ground, top soil (shovel penetrates easily)	1.4
Competent soils: most sands, sandy clays, gravel, silts, weathered rock (can dig with a shovel)	1.3
Hard soils: dense compacted sand, dry consolidated clay, some exposed rock (need a pick to break up)	1.1
Hard, competent rock: bedrock, freshly exposed hard rock (difficult to break with hammer)	1.0

4.3.2 Other Construction equipment (bulldozers, excavators and rollers)

Typical rate of vibration attenuation can be calculated from the following regression analysis formula:

$$PPV_{equipment} = PPV_{ref} \left(\frac{D_{ref}}{D_{equipment}} \right)^n$$

Where,

- PPV_{ref} = reference PPV at D_{ref} metres.
- $D_{equipment}$ = distance from the equipment to the receiver in metres.
- n = site attenuation exponent as defined previously.
- The value of the site attenuation exponent, n , depends on the soil and ground type.
- Lower values of n imply a more efficient vibration transmission rate. Hence, a conservative site attenuation exponent value of 1 has been assumed for this assessment.

The *Environmental Noise Management Manual* (ENMM) (Road Transport Authority, 2001), *Transit Noise and Vibration Impact Assessment Manual* (FTA, 2019), *Transportation and Construction-Induced Vibration Guidance Manual* (California Department of Transportation, 2004) and *BS 5228.2* provides guidance on typical vibration levels from vibration intensive equipment. Typical vibration levels for vibration intensive equipment are presented in **Table 4-2** below.

Table 4-2: Typical vibration levels for vibration intensive construction equipment

Equipment	Reference PPV	Reference Distance (m)	Measured / others	Source	Description / Comments
Impact Pile Drivers (upper range)	38.6	7.6	Measured	FTA	upper range of operation
Impact Pile Drivers (typical)	16.5	7.6	Measured	FTA	typical/standard operation
Jackhammer	0.9	7.6	Measured	FTA	-
Vibratory Roller	5.3	7.6	Measured	FTA	-
Vibratory Roller (CAT CP533E)	2.3	20	Measured	RRL	on high vibratory setting
Vibratory Roller (CAT CS44)	11.0	5	Measured	NEPA	on high vibratory setting
30t Excavator (rock breaker)	9.3	5	Measured	NEPA	scooping large rocks with spoil
Compactor	11.0	5	Measured	RRL	Soil Compactor CAT CS44

Note:

FTA Federal Transit Administration - Transit noise and vibration impact assessment

NEPA North Eastern Program Alliance - NEPA 1 and 2

RRL Regional Rail Link - Sunshine, Footscray to Deer Park

4.4 Noise model

Operational Noise: A computational noise model was developed for the site to assess environmental noise emissions during the Project's operational phase. The model was built using the CONCAWE noise propagation algorithm within SoundPLAN noise software (version 9.1). CONCAWE is a well-established model widely applied for predicting noise emissions from industrial sound sources to surrounding communities. It accounts for various environmental factors such as meteorology, ground absorption, and topography to estimate noise propagation under realistic conditions.

Construction Noise: Construction noise levels were assessed using a desktop-based calculation methodology in accordance with AS 2436:2010 – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites, as well as relevant NSW guidelines (such as the ICNG and the EPA NPfI for industry where applicable). This approach typically involves identifying all plant and equipment expected to operate on-site, determining their sound power levels (from measured data or reputable equipment databases), and applying appropriate utilisation factors to reflect realistic operating conditions. These sound power levels are then propagated to nearby receivers using standard acoustic propagation methods, accounting for geometric spreading, shielding, and directivity factor to account for reflections from nearby surfaces. The methodology combines contributions from multiple plant items, assessing worst-case scenarios, and comparing predicted noise levels with applicable construction criteria.

The CONCAWE model incorporates the following with the calculations performed in 1/1 octave frequency bands between 63 Hz and 8000 Hz:

- noise attenuation over distance;
- atmospheric absorption;
- ground effects;
- source-height effects;
- shielding or screening from buildings, terrain and noise walls; and
- meteorological effects (moderate downwind propagation in all directions).

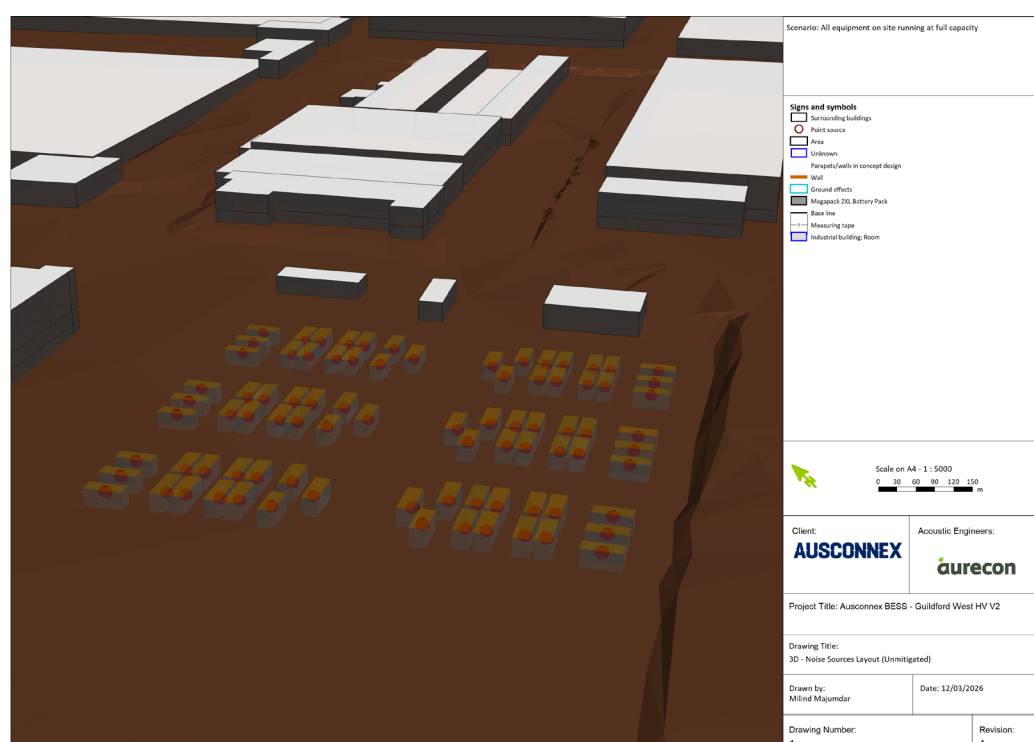


Figure 4-2: Noise source layout on site without mitigation (noise walls)

4.4.1 Key parameters and assumptions

Table 4-3 indicates the key parameters and assumptions for the noise modelling specific to operational noise only. Appendix F illustrates the layout of the noise sources for the Project.

Table 4-3: Parameters and assumptions for the computational noise modelling

Parameter	Comment
Calculation algorithms	Industrial noise – predictions for the noise from the site mechanical and electrical equipment have been completed using the CONCAWE noise propagation model.
Terrain	1 m contours were extracted from the Digital Elevation Model (DEM) available from Geoscience Australia via Elvis Elevation and Depth .
Buildings	Building information such as addresses, outlines and the heights were obtained from Open Street Maps. Where this data was not available, building outlines were hand-drawn and approximate heights were used for the buildings based on the number of storeys.
Ground Absorption	Ground absorption factor was set to 50% for the entire study area.
Sound Power Levels	Sound power levels are as presented in Appendix B for operational noise sources.
Source heights	Based on the specification provided for each equipment / plant in Appendix B.
Receiver heights	For single-storey buildings, the receiver is modelled at 1.5 m above ground level. For buildings with two or more storeys, the receiver is modelled at 1.5 m above the floor level of the relevant storey.
Reflection for buildings	1 dB reflection loss with 3 orders of reflection. Reflection loss is the loss of energy occurring at each reflection of sound waves off an object. The magnitude of the loss depends on the material of the wall, the impact angle, the frequency, and the size of the wall. For sound-reflecting surfaces, a reflection loss of 1.0 dB per reflection is generally assumed (corresponds to an absorption factor α of 0.21). This flat-rate factor includes scattering losses that occur in structured facades due to windows, balconies, etc. For sound absorbing structures/barriers a spectrum of the sound absorption coefficients for the relevant material is included in the model.
Receiver location	Receivers have been placed 30 m within the boundary of the dwelling and in free field.
Period of operation	The Project would operate any time over a 24-hour period 365 days per year.
Period of assessment	Operation: The worst-case 15-minute period has been assessed for day, evening and night periods as defined in the NPfl.
Meteorological conditions	A conservative approach has been taken by adopting noise enhancing meteorological conditions for all assessment periods in accordance with fact sheet D of the NPfl. Source-to-receiver wind vectors have been considered for all receivers with the following stability category and wind speed: ■ Standard meteorological conditions: – Day / evening / night – stability category D with wind speed up to 0.5 m/s at 10 m AGL. ■ Noise enhancing meteorological conditions: – Day / evening – stability category D with light winds - up to 3m/s at 10m AGL – Night – Stability category F with winds - up to 2 m/s at 10m AGL Other conditions: Relative Humidity: 90% (day, evening) / 90% (night) Temperature 20°C (day, evening) / 10°C(night) Air Pressure 101.3 kPa.

4.4.2 Limitations and uncertainty

The following are the main limitations for the noise modelling:

- The assessment is based on the assumptions in Section 4.4.1.
- It has been assumed that all equipment is operating continuously and simultaneously over the assessment period (in NSW a 15 minute duration is considered for the assessment of noise during day, evening or nighttime period) during both construction and operation of the project providing the most conservative noise predictions.
- A review and verification of the design shall be undertaken during the detailed design stage, and any necessary mitigation measures shall be reassessed and updated accordingly
- The noise modelling using SoundPLAN adopted a conservative approach to provide a precautionary estimate of potential impacts. Worst-case meteorological conditions, such as downwind propagation with low wind speeds and temperature inversions, were assumed without considering their actual frequency throughout the year. The highest documented sound power levels for each piece of equipment were used, representing peak operational noise rather than typical levels, and all equipment was assumed to operate simultaneously at maximum capacity. Predictions were made for the identified sensitive receivers under these conditions, with minor exceedances considered unlikely to be perceptible in practice.
- It has been presumed that data such as building heights from Open Street Maps or the elevation contours from ELVIS (Elevation and Depth - Foundation Spatial Data) are accurate and current at the time of the assessment.
- Audible noise from power lines has not been modelled and considered out of scope.

5 Existing environment

5.1 Study area

The study area was defined by considering the construction footprint, sensitive receivers and the surrounding area. An area covering receivers up 500m² from the construction footprint of the Project has been identified to have a potential of being affected by the noise and vibration impacts from the construction and operation of the site.

5.1.1 Noise catchment areas and sensitive receivers

The potentially most affected noise sensitive receivers have been listed in Table 5-1 (also refer to Figure 5-1 which also includes Noise Catchment Areas (NCAs) formed by grouping properties close to each other). NCAs are areas where receivers have a similar land use and background noise environment. The total number of sensitive receivers (residential) located within each of the NCAs are listed in Table 5-2.

Table 5-1: Nearest noise sensitive receivers

NCA	Receiver ID	Receiver category ¹	Distance from the nearest receiver to closest edge of Project footprint (m)	Nearest receiver address
	R1	Residential	456	51 Hemingway Cres, Fairfield NSW 2165
	R2		68	U1, 111 McCredie Rd, Guildford West NSW 2161
	R3		235	126 Fairfield Rd, Guildford West NSW 2161
	R4		283	109 McCredie Rd, Guildford West NSW 2161
ARA	A1	Active Recreation	224	Tom Uren Park, 20 Karani Ave, Guildford West NSW 2161
	A2		15	Guildford West Sportsground, Foray St, Guildford West NSW 2161
COM	C1	Commercial	210	121-133 Fairfield Rd, Guildford NSW 2161
	C2		123	Crown On McCredie, 135 Fairfield Rd, Guildford West NSW 2161
IND	I1	Industrial	37	1b/149 McCredie Rd, Smithfield NSW 2164
	I2		72	150/156 McCredie Rd, Smithfield NSW 2164
	I3		50	118 McCredie Rd, Guildford NSW 2161
	I4		135	141 Fairfield Rd, Guildford West NSW 2161
	I5		82	167-203 Foray St, Guildford West NSW 2161

Note 1: Receiver categories have been assigned as per the table 2.3 of the NSW EPA Noise Policy for Industry to assist in the selection of the appropriate amenity noise levels

² A 500-metre assessment radius has been adopted for the noise impact assessment. This radius is commonly used for major NSW road, rail and linear infrastructure projects and captures the sensitive receivers most likely to experience measurable changes in noise due to the Project. The radius provides a pragmatic balance between modelling completeness and effort and is consistent with NSW guidance (ICNG; Noise Policy for Industry; Transport NSW Road/Rail noise guidance). Where initial modelling identifies potential impacts beyond 500 m, the assessment will be extended to include those receivers.

Table 5-2: Total number of sensitive receivers in each NCA

NCA	Number of sensitive receivers	Type of receiver
R1	191	R2 – Low Density Residential
R2	81	R2 – Low Density Residential
R3	117	R2 – Low Density Residential
R4	120	R2- Low Density Residential
Total	509	



Legend

NCAs

NCAs - Guildford West

- A- ActiveRecreation
- C- Commercial
- I- Industrial
- R- Residential

Structures/Receivers

On-Site

Source: Aurecon, NSW Spatial Services, ESRI, Open street maps

Guildford West - Sensitive Receivers

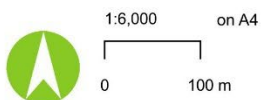
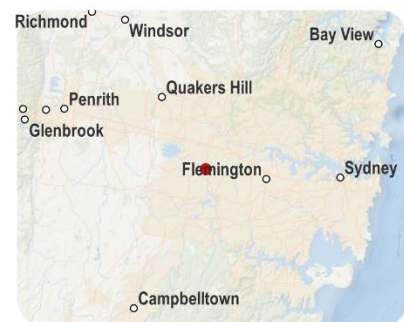
Site Boundary

Project Site

Lot

Base map

Google Satellite



Projection: GDA2020 / MGA zone 56 (EPSG:7856)

BESS Noise Study- Guildford West Noise Impact Assessment

Map of NCAs and Sensitive Receivers

Figure 5-1: Noise catchment areas and nearest noise sensitive receivers

5.2 Noise survey

Aurecon conducted long term unattended and short term attended noise monitoring within the study area to establish the project intrusiveness noise criteria. The measurement locations and results are described in the following sections. Long term noise monitoring was carried out by Aurecon from Monday 21 July 2025 to Tuesday 5 August 2025 at locations shown in Figure 5-2 and results in Table 5-2 and Table 5-3.

The locations are presented in Figure 5-2 also summarises the noise results, for daytime, evening and nighttime periods as defined in the DECC ICNG and the *NSW EPA NPfl*.

Table 5-3: Noise measurement locations

Location	Type of measurement	Address/Location
L1	Attended & Unattended	51 Hemingway Cres, Fairfield NSW 2165 (Backyard)
L2	Attended & Unattended	U1, 111 McCredie Rd, Guildford West NSW 2161 (Front Yard)
L3	Attended & Unattended	126 Fairfield Rd, Guildford West NSW 2161 (Front Yard)
M1	Attended	Intersection of Princes St and McCredie Rd
M2	Attended	Intersection of Princes St and King St
M3	Attended	Intersection of Pavel St and Fairfield Rd
M4	Attended	Intersection of Granville St and Siandra Ave

5.2.1 Long term noise monitoring

The monitoring was conducted using four noise loggers: one Rion NL-21 unit, one SVANTEK 958, and one SVANTEK 979 installed with a microphone at a height of 1.5 metres and at least 2.5 metres from any reflecting façade. The monitors were set to measure continuously using an A-weighted fast response mode. The monitors were calibrated before and after the monitoring period and no calibration drift exceeding ± 1 dB(A) was observed.

Data for the monitoring period was processed in accordance with the NPfl and results are summarised in Table 5-3 with further details provided in Appendix C. Invalid data was removed where appropriate. Invalid data generally refers to periods where average wind speeds were greater than 5m/s and/or when rainfall occurred.

The noise monitoring results were processed to exclude weather affected data following consultation of weather reports from the Bureau of Meteorology (BOM) Bankstown Airport AWS weather station (Station ID: 066137) which is approximately 8 kilometres from the site. The wind speeds measured by the station were corrected to microphone height wind speeds at the monitoring location using the methodology provided in AS/NZS 1170.2:2021 Structural design actions, Part 2: Wind actions.

As discussed, the locations presented in Figure 5-2 summarise the noise results, for daytime, evening and nighttime periods as defined in the DECC (ICNG and the *NSW NPfl*).

Table 5-4: Rating background and average noise levels for assessment

Location ID	Rating background noise level (RBL) ^{1,2} L _{A90} (period) dB			Average noise level ² L _{Aeq} (period) dB		
	Day	Evening	Night	Day	Evening	Night
L1	44	45	45	50	48	48
L2	52	47	45	66	63	62
L3	59	51	45	71	68	66

Note 1: RBL is the median of the measured L_{A90} noise level for each date during the day, evening, and night-time periods of the monitoring programme.

Note 2: For the rating background and ambient noise levels, the periods are defined as per the NPfI (EPA, 2017):

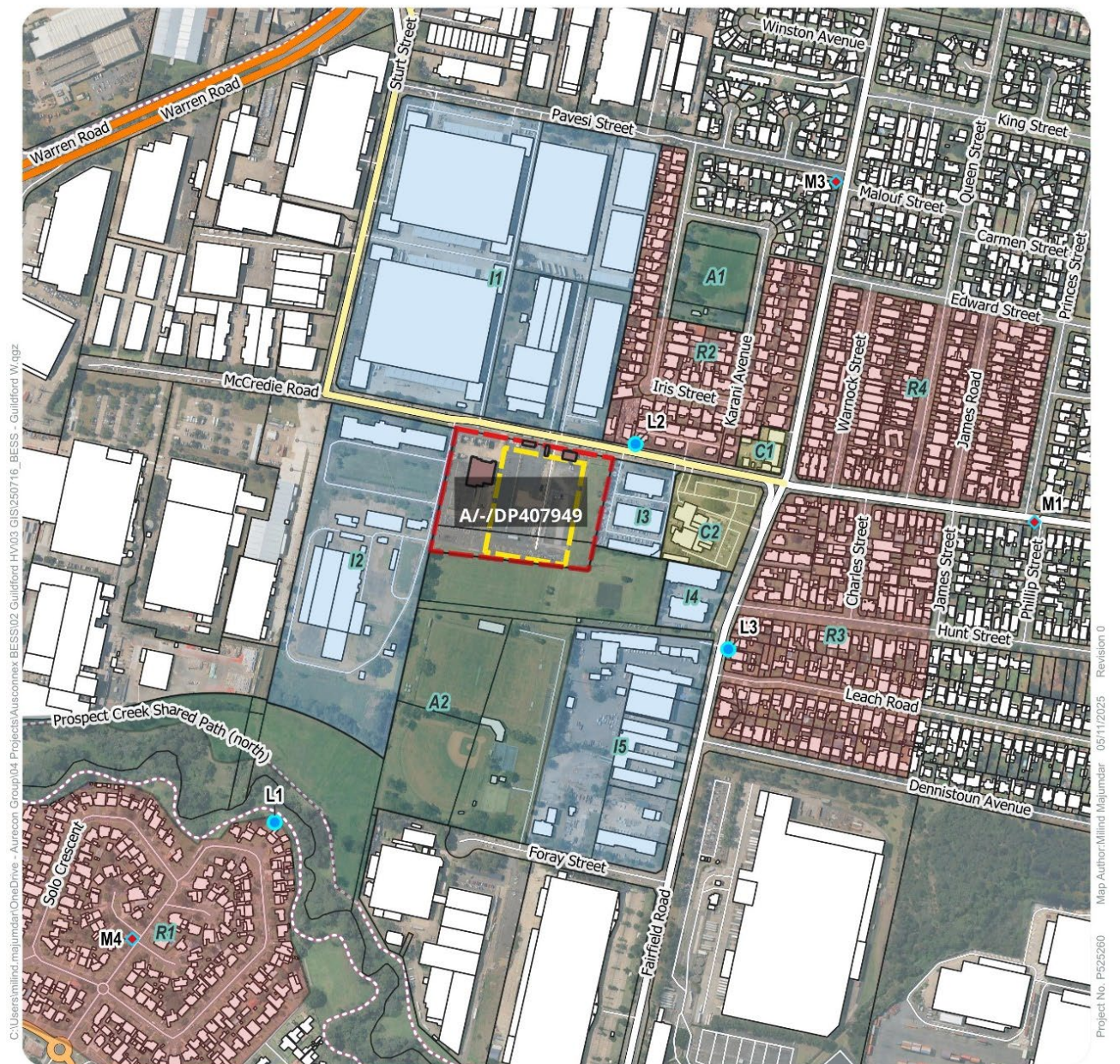
- Day: the period from 7.00 am to 6.00 pm Monday to Saturday or 8.00 am to 6.00 pm on Sundays and public holidays
- Evening: the period from 6.00 pm to 10.00 pm
- Night: the remaining periods.
- For the 15-hour and 9-hour ambient noise levels, as per the Development Near Rail Corridors and Busy Roads – Interim Guideline (NSW DoP, 2008), day refers to the 7am to 10pm while night refers to 10pm to 7am.

5.2.2 Short-term noise monitoring

Short term attended noise measurements were conducted during the day period on Monday 21 July 2025 and Tuesday 5 August 2025 to document the variation in ambient noise level across the site.

A Brüel & Kjær 2270 Sound Level Meter was used for these measurements and was set to Z-weighted frequency weighting for spectral measurements, A-weighting for broadband levels and fast-response time weighting. The sound level meter to Australian Standard AS/NZS IEC 61672.2:2019 *Electroacoustics – Sound level meters Pattern evaluation tests* and AS/NZS IEC 61672.3:2019 *Electroacoustics - Sound level meters Periodic tests* as a Class 1 precision sound level meter which has an accuracy suitable for field and laboratory use. The equipment carries current NATA calibration certificates and calibration was checked before and after each measurement. Prior to the measurements the instrument was calibrated to 93.9 dB at 1000 Hz. No calibration drift exceeding ±0.5 dB(A) was observed. All measurements were performed in accordance with the Australian Standard AS1055 2018 *Acoustics – Description and measurement of environmental noise*.

Results of the short-term noise monitoring at each location are presented in Appendix G.



Legend

Monitoring

- ◆ Attended Noise Monitoring Locations
- Unattended Noise Monitoring (Loggers)

NCAs

NCAs - Guildford West

- A- Active Recreation
- C- Commercial

I- Industrial

R- Residential

Structures/Receivers

On-Site

- Existing Structures on Site
- Guildford West - Sensitive Receivers
- Site Boundary

Project Site

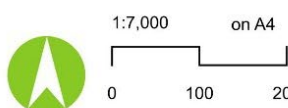
Lot

Base map

Google Satellite



Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



Projection: GDA2020 / MGA zone 56 (EPSG:7856)

BESS Noise Study- Guildford West Noise Impact Assessment

Map of Noise Monitoring Locations

Figure 5-2: Noise monitoring locations

5.2.3 Summary of measurements

The short-term measurements taken by Aurecon note that background noise levels are typically affected by occasional traffic movements. Refer to Appendix G for all the details of attended noise measurements.

Site observations undertaken on 21 July and 5 August 2025 indicate that the noise environment in Guildford West varies significantly across locations, ranging from high traffic-influenced areas to quiet residential streets. Monitoring along Fairfield Road revealed consistently elevated traffic noise levels dominated by trucks, trailers and light vehicles, with no identifiable quiet periods, and with a continuous industrial hum near the Fairfield Road substation; construction equipment observed near McCredie Road was inactive during measurements. In contrast, monitoring within residential areas such as Hemingway Crescent and several McCredie Road intersections—including Palmer Road, King Street, and Pavesi Street—showed generally quiet to low-traffic conditions, characterised by occasional cars and trucks, intermittent idling vehicles, bird activity, faint industrial hum from the north, and distant background traffic. Overall, the acoustic environment transitions from heavy traffic noise on major roads to predominantly low-level residential noise within local streets.

5.3 Criteria adopted

5.3.1 ICNG construction noise management levels

Recommended construction Noise Management Levels (NMLs) for residential and industrial receivers based on methodologies as provided in the ICNG are presented in Table 5-4.

The NMLs represent a noise level that, if exceeded, would require management measures including the following:

- Reasonable and feasible work practices.
- Contact with residences to inform them of the nature of works to be carried out, the expected noise levels and durations and contact details.

Mitigation management measures aim to reduce noise impacts on the nearest residential receivers; however, it may not be reasonable and feasible to reduce noise levels to below the noise affected management level. The construction NMLs during recommended standard hours of work are not intended as a noise limit but rather a level where noise management is required.

The construction NMLs outside of recommended standard hours (except for delivery of BESS equipment and construction equipment via OSOM vehicle which is assessed against the RNP criteria) would be considered as noise limits.

Table 5-5: ICNG Construction noise criteria

Time of day	Noise Management level LAeq, 15min dB ¹	How to apply
Residential Receiver		
Recommended standard hours: - Monday to Friday 7am to 6pm - Saturday 8am to 1pm	Noise affected RBL ² + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq,15min² 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 works to be carried out, the expected noise levels and duration, as well as contact details.

Time of day	Noise Management level L _{Aeq, 15min} dB ¹	How to apply
■ No work on Sundays or public holidays.	Highly noise affected 75 dB(A)	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, considering: ■ times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); and ■ if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours (OOHW) ³	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.
Industrial		
When property is in use	L _{Aeq, 15min} 75 dB (A)	The external noise levels should be assessed at the most-affected occupied point of the premises.
Commercial		
When property is in use	L _{Aeq, 15min} 70 dB (A)	The external noise levels should be assessed at the most-affected occupied point of the premises.
Active recreation areas	L _{Aeq, 15min} 65 dB (A)	The external noise levels should be assessed at the most-affected occupied point of the premises.
Educational institutions	L _{Aeq, 15min} 45 dB (A) – Internal L _{Aeq, 15min} 55 dB (A) – External	Schools or other educational institutions are included.

Note 1: Noise levels apply at the residential or non-residential property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Note 2: Refer to glossary for definition. A conservative estimate of the difference between internal and external noise levels is 10 dB for buildings other than residential.

Note 3: OOHW Period 1 (Day) – Saturdays 7am to 8am and 1pm to 6pm; Sundays and public holidays 8am to 6pm.

OOHW Period 1 (Evening) – Monday to Saturday 6pm to 10pm.

OOHW Period 2 – Monday to Saturday 10pm to 7am; Sundays and public holidays 6pm to 8am.

5.3.2 Project construction noise criteria

The relevant project specific construction NMLs are presented in Table 5-5 for residential and industrial receivers. The NMLs have been calculated based on the background noise survey (See Section 5.2).

Table 5-6: Project-specific construction Noise Management Levels (NML)

Location	Recommended standard hours NML L _{Aeq} (15min) dB	Outside of standard hours ¹ NML L _{Aeq} (15min) dB(A)			Highly affected NML L _{Aeq} (15min) dB
		OOHW period 1 (day)	OOHW period 1 (evening)	OOHW period 2 (night)	
R1	54	49	50	50	75
R2	62	57	52	50	75
R3	69	64	56	50	75
R4	69	64	56	50	75
All affected surrounding industrial receivers	75	75	75	N/A	N/A
All affected surrounding commercial receivers	70	70	70	70	N/A
Active recreation area	65	65	65	65	N/A
Educational institution	55	55	55	N/A	N/A

Note 1: OOHW Period 1 (Day) – Saturdays 7am to 8am and 1pm to 6pm; Sundays and public holidays 8am to 6pm.
OOHW Period 1 (Evening) – Monday to Saturday 6pm to 10pm.
OOHW Period 2 (Night) – Monday to Saturday 10pm to 7am; Sundays and public holidays 6pm to 8am.

5.3.3 Construction traffic noise criteria

The RNP (Department of Environment Climate Change & Water NSW, 2011) states that any increase in the total traffic noise levels should be limited to 2 dB above the existing road traffic noise levels, as an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. This applies for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments.

5.3.4 Construction vibration criteria

5.3.4.1 Human comfort

The vibration limits for human comfort relevant to the surrounding sensitive receiver types are based on the *Assessing vibration a technical guideline (AVATG)* and presented in Table 5-6.

Table 5-7: Human comfort intermittent vibration limits

Receiver type	Assessment Period ¹		Peak particle velocity mm/s	
		Preferred	Maximum	
Residences	Day-time		8.6	17
Workshops	Day-time		18	36

Note 1: The NSW EPA's *Assessing Vibration guideline* defines day-time period as 7am – 10pm.
The NSW EPA's *Assessing Vibration guideline* defines night-time period as 10pm – 7am.

5.3.4.2 Structural damage

The DIN guideline recommends maximum permissible levels of vibration (expressed as peak particle velocity or PPV) that reduce the likelihood of building damage caused by vibration and are presented in Table 5-7. PPV is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 5-8: Guideline values for short-term vibration on structures

Type of Structure	Peak Particle Velocity (PPV), mm/s				
	At foundation for x, y, z direction			Topmost floor slab for x, y direction	Topmost floor slab for z direction
	1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz ¹	All Frequencies	All Frequencies
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
Residential dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15	20

Note 1: At frequencies above 100 Hz, the values given in this column may be used as minimum values.

5.3.5 Operational noise criteria

5.3.5.1 Project intrusiveness noise level

The intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment. A noise source would generally be considered non-intrusive if the monitored average noise level (L_{Aeq}) for a period does not exceed the RBL by more than 5 dB(A) at the boundary of residential receivers. Intrusive noise levels are only applied to residential receivers (residences).

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

5.3.5.2 Project amenity noise level

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 5-8 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.

Since the night-time (10pm – 7am) amenity noise criterion is the most stringent, it is the controlling time-period. To account for converting $L_{Aeq, \text{period}}$ to $L_{Aeq, 15min}$, the NPfI accepts a default conversion factor of $L_{Aeq, 15min} = L_{Aeq, \text{period}} + 3 \text{ dB}$. 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:

$$\text{Project Amenity noise level } L_{Aeq, 15min} = \text{recommended amenity noise level} - 5 \text{ dB} + 3 \text{ dB}$$

The amenity noise levels have been presented in Table 5-8. For this Project, all residential receivers have been identified as ‘Urban’. This classification is based on factors such as land-use zoning, measured existing ambient noise levels and the description of noise environments specified in the NPfI.

Time of the day is defined as follows:

- Day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- Evening – the period from 6 pm to 10 pm
- Night – the period from 10pm to 7am.

Table 5-9: Operational noise amenity levels

Receiver	Noise amenity area	Time of the day	Recommended Amenity noise level, $L_{Aeq, period}$ dB	Project amenity noise level ¹ $L_{Aeq, 15min}$ dB
Residential	Urban	Day	60	58
		Evening	50	48
		Night	45	43
Commercial	All	When in use	65	63
Industrial	All	When in use	70	68
Active recreation	All	When in use	55	53

Note 1: Adjusted level calculated by applying 5 dB reduction to account for cumulative existing and future industrial noise sources and 3 dB addition to adjust the amenity noise level from $L_{Aeq, period}$ to $L_{Aeq, 15min}$

Note 2: Refer to glossary for definition. A conservative estimate of the difference between internal and external noise levels is 10 dB for buildings other than residential.

5.3.5.3 Tonal noise characteristics

Table C1 of the NPfl provides corrections for tonality, intermittency, irregularity, or dominant low-frequency content. It should be noted that in accordance with the NPfl, it is not important in the assessment of modifying factors if the actual individual noise sources contain tonal, intermittent, or low frequency noise characteristics, but whether or not the resulting noise impact (as measured or assessed at the sensitive receivers) contains tonal, intermittent, or low frequency noise characteristics.

A corrections specified for tonal, intermittent, and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion. Refer to Section 7.2 and Appendix G for more information.

One third octave band analysis is used for assessing the audibility of tones in noise as per ISO 1996.2-2007 – Annex D. 5 dB correction is applied if any of the below criteria is exceeded for adjacent one third octave bands.

- 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz
- 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz
- 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.

5.3.5.4 Low frequency noise correction

A difference of 15 dB or more between the C- and A-weighted noise measurements, identifies the potential for an unbalanced spectrum and an increased likelihood of low frequency noise annoyance.

The difference between C- and A-weighted noise levels is typically used as a screening tool to determine if further investigation is required to determine potential annoyance (i.e. where the difference is 15 dB or more). Additionally, noise levels with an unbalanced spectrum and containing major components within the low frequency range (10-160hz) are assessed post screening as per below prior to allocating penalties:

- where any of the one-third octave noise levels in Table C2 of NPfl (refer to Table 5-9 below) are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(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 of NPfl (refer to Table 5-9 below) are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(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.

Table 5-10: One third octave low-frequency noise thresholds

Hz	One third octave $L_{Zeq, 15min}$ threshold level												
Frequency	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The NPfl identifies that the corrections should “reflect external assessment locations”, or sensitive receiver locations so the existing noise environment should be considered. Based on the low frequency assessment for this project, there is no penalty to be applied. Refer to Appendix G for more details.

5.3.5.5 Project noise trigger levels

Project noise trigger level (PNTL) is the lowest value of intrusiveness or project amenity noise level after conversion to the $L_{Aeq, 15 \text{ minute}}$ dBA equivalent level. Table 5-10 specifies the PNTL for the Project based on the noise survey undertaken (see Section 5.2) and considering the project amenity / intrusive noise levels.

Table 5-11: Project noise trigger levels for the nearest sensitive receivers

NCA	Project intrusiveness noise level $L_{Aeq, 15min}$ dB			Project amenity noise level $L_{Aeq, 15min}$ dB			Project noise trigger levels $L_{Aeq, 15min}$ dB		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
R1	49	49	49	58	48	43	49	48	43
R2	57	52	50	58	48	43	57	48	43
R3	64	56	50	58	48	43	58	48	43
R4	64	56	50	58	48	43	58	48	43
COM	N/A	N/A	N/A	63	63	63	63	63	63
IND	N/A	N/A	N/A	68	68	68	68	68	68
ARA	N/A	N/A	N/A	53	53	53	53	53	53
W	N/A	N/A	N/A	48	48	48	48	48	48

5.3.6 Sleep disturbance impacts

The NPfI contains guidance on sleep disturbance and the following screening levels are used to identify where further investigation of sleep disturbance should be undertaken for residential properties:

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

This assessment has considered both the night-time $L_{Aeq,15min}$ noise levels and L_{Amax} noise levels, where they are relevant. Table 5-11 specifies the sleep disturbance screening levels for the nearest residential receivers.

Table 5-12: Sleep disturbance screening criteria

NCA	Night $L_{Aeq, 15min}$ dB	Night L_{Amax} dB
R1	50	60
R2	50	60
R3	50	60
R4	50	60

6 Construction impacts

6.1 Proposed works

When evaluating feasible and reasonable noise mitigation measures, the noise levels from construction sites are considered separately from road traffic or operational noise, as construction noise is distinct from operational noise. This distinction is acknowledged in the ICNG and EPA's/ TfNSW's Construction Noise and Vibration Guidelines (Roads), which focus on how construction noise compares to background noise levels.

Construction vehicle traffic and any necessary traffic diversions are evaluated and mitigated using standard road traffic noise procedures.

6.1.1 Construction program

The Guildford West project is anticipated to take approximately 15 months to construct. However, the final construction program may vary following planning approval subject to the availability of supply of BESS equipment components. While a detailed construction program is not available at the time of this draft report submission, below is the construction itinerary provided by the developer. Construction activities for a BESS development would involve the following activities:

- installation and maintenance of environmental controls;
- establishment of temporary construction facilities including upgrading and/or construction of the access and internal access roads, laydown area(s), fencing, temporary parking and construction facilities including site office and amenities;
- site enabling works including relocation and removal of existing services;
- site preparation including clearing of vegetation such as tree removal, ground clearing, shallow excavation and other ground disturbance activities including concrete slab construction and gravel laying to support battery modules, control room, switch houses and a substation;
- infrastructure construction including new drainage, drainage upgrades, laying of cabling and collector units, construction of accesses, perimeter and internal roads, security fencing, lighting and other ancillary infrastructure;
- equipment installation including battery units and ancillary infrastructure;
- testing and commissioning activities; and
- removal of temporary facilities and demobilisation.

6.1.2 Construction hours

Construction activities would primarily be undertaken during standard day time construction hours as follows:

- Monday to Friday – 7 am to 6 pm;
- Saturdays - 8 am to 1 pm; and
- Sundays or public holidays - no work.

Where activities are required outside of the above standard construction hours (such as OSOM movements) these would be agreed in advance with the relevant authorities, to provide advanced warning of potential disruptions to sensitive receivers (e.g. traffic movements, noise impacts and duration).

Refer to Section 5.3.6 for sleep disturbance impacts during night time periods.

6.2 Decommissioning

Following the end of the 20 year lease for the site, decommissioning of the BESS would involve safe removal of BESS components / equipment and repurposing any salvageable above ground components, with the site returned to its original state.

The standard and out of standard (refer to Section 5.3.1) construction hours for the Guildford West BESS project would apply to decommissioning. As discussed, likely sources of noise would be similar to those required in construction phases.

A qualitative assessment has to be completed to assess the likely impacts from the decommissioning phase once a detailed itinerary is provided.

6.3 Construction phases

A detailed construction program (for a duration of 15 month timeframe) is not available at the time of this draft report submission. An overview of construction activities are provided in Table 6-1.

Table 6-1: Typical Construction overview

Construction Activity	Description
1. Environmental control installation	- Duration of activity - 2 weeks and ongoing maintenance throughout the program - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, silt fence installer, light vehicle, plant float - Tonnage and capacity (where applicable). 5t excavator, 12t bogie - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required.
2. Construction compound establishment	- Duration of activity - 2 weeks - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, diesel generators where temporary power is required, light vehicles, heavy vehicle delivery, jackhammer for building tie downs with generator / compressor to suit - Tonnage and capacity (where applicable). 5t excavator, 12t bogie - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required, jackhammer single day for a few hours
3. Workzone utility relocations	- Duration of activity - 1 month - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, skid steer, light vehicles, heavy vehicles, vac truck, diesel generators where temporary power is required, trench compactors / rollers - Tonnage and capacity (where applicable). 13t & 30t excavator, 2x 12t bogie, 9000L vac truck, 7t roller - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required
4. Workzone preparation	- Duration of activity - 3 months - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, chainsaws, woodchipper, stump grinders, light vehicle, heavy vehicle, diesel generators where temporary power is required, 2x concrete trucks, concrete pump, franna crane, trench compactors / rollers, skid steer - Tonnage and capacity (where applicable). 13t & 30t excavator, 2x 12t bogie, 40t franna, 7t roller - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required, concrete trucks/pump used for pours (1 month duration over the 3 months)

Construction Activity	Description
5. New infrastructure construction	- Duration of activity - 3 months - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, light vehicle, heavy vehicle, diesel generators where temporary power is required, spray seal truck, asphaltting rollers, franna crane, skid steer - Tonnage and capacity (where applicable). 13t & 30t excavator, 2x 12t bogie, 7t asphalt roller, 40t franna - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required, asphaltting plant required for asphalt works (1 month duration over the 3 months)
6. Equipment installation	- Duration of activity - 3 months - Equipment type (e.g., excavators, generators, compressors, cranes). Franna crane, light vehicle, heavy vehicle, forklift, diesel generators where temporary power is required - Tonnage and capacity (where applicable). 300t, & 40t crane, 3t forklift - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required - Weekend and out-of-hours work requirements, including midnight equipment drop-offs or deliveries. OSOM movements including 60 batteries and 2 harmonic filters.
7. Test and commissioning	- Duration of activity - 2 months - Equipment type (e.g., excavators, generators, compressors, cranes). Diesel generators where temporary power is required - Tonnage and capacity (where applicable). 4 – 6t - Percentage of daily/weekly utilisation. 90% usage on plant as required
8. Removal and demobilisation	- Duration of activity - 2 months - Equipment type (e.g., excavators, generators, compressors, cranes). Excavators, light vehicle, heavy vehicles, roller, franna crane, skid steer - Tonnage and capacity (where applicable). 13t excavator, 12t bogie, 7t roller, 40t franna - Percentage of daily/weekly utilisation. 90% usage on all plant, light vehicle and plant float as required

6.3.1 Equipment noise sources

List of typical equipment to be used for typical construction activities provided below are referenced from AS 2436-2010.

Table 6-2: Typical construction equipment

Plant item	Plant item SWL dB(A) ¹	Number of equipment ¹
Excavator (6 tonne)	95	1
Bogie truck	103	1
Vehicle (light commercial)	106	1
Generator (Diesel)	99	1
Jackhammer	113	1
Compressor (Silenced)	101	1
Skid Steer Front end loader	80	1
Vacuum Truck	85	1
Compactor	113	1
12t Excavator	100	1

Plant item	Plant item SWL dB(A) ¹	Number of equipment ¹
20T excavator	100	1
Bogie truck	103	2
Franna crane	98	1
Roller (vibrator)	108	1
Construction truck (20t)	107	2
Concrete pump	109	1
Water truck	107	1
Forklift	106	1
30t Crane	104	1
300t Crane	110	1

Note1: It is assumed that one unit of each equipment typology is used simultaneously. More detailed assessment will be undertaken when further information on equipment number and movements are received

6.4 Construction noise impacts

Table 6-3 provides the modelled outcomes for the construction noise levels at the sensitive receivers.

The construction noise impacts will primarily arise from on-site construction equipment, with additional contributions expected from construction-related traffic, both of which have been considered in noise modelling. Construction noise predictions are typically based on a highly conservative approach to assess worst-case impacts. This involves assuming that all construction equipment is positioned at a single location, closest to the most sensitive receiver, and operating at maximum load conditions.

To account for realistic usage patterns, the duration of equipment operation within a standard 15-minute assessment period is adjusted based on typical duty cycles. This methodology ensures that predicted noise levels represent the highest potential impact, providing a robust basis for identifying necessary mitigation measures and ensuring compliance with environmental noise regulations.

As per the predicted construction impacts outlined in Table 6-3, construction noise criteria will be exceeded at the nearest residential and active recreation receivers during standard hours of operations for the majority of construction activities. It should be noted that project-specific mitigation measures (refer to Section 8) for construction noise should be implemented to minimise exceedances on NMLs during construction.

The assessment of heavy equipment deliveries undertaken at night using OSOM vehicles is presented in Table 6-4. Noise levels at most surrounding properties are predicted to comply with the stringent night-time construction noise criteria except NCA R2. Residents at the nearest receivers, NCA R2 may experience noticeable noise during late-night activities when equipment installation works occur at the closest approach to these properties. Suitable mitigation measures outlined in Chapter 8 should be implemented to minimise potential impacts.

Table 6-3: Construction noise impacts (Standard construction hours)

NCA ¹	NML L _{Aeq} , 15min dB	Predicted construction noise levels ^{2,3}							
	Standard hours	Environmental control installation	Construction facility establishment	Workzone utility relocation	Workzone preparation	New infrastructure construction	Equipment installation	Test and Commissioning	Removal and demobilisation
R1	54	40	44	45	48	45	42	31	44
R2	62	61	65	66	68	66	63	52	65
R3	69	42	47	47	50	47	44	33	46
R4	69	40	45	45	48	45	42	31	44
A1	65	43	47	48	51	48	45	34	47
A2	65	77	82	82	85	82	79	68	81
C1	70	43	48	49	51	48	46	34	47
C2	70	54	59	60	62	59	56	45	58
I1	75	67	72	73	75	72	69	58	71
I2	75	60	65	65	68	65	62	51	64
I3	75	64	68	69	72	69	66	55	68
I4	75	53	58	59	61	58	55	44	57
I5	75	59	63	64	66	64	61	50	63

*Note 1: Refer to **Table 5-1** for receiver addresses.*

Note 2: Predicted noise levels have been rounded to the nearest integer.

Note 3: Highlighted text indicate the worst-case construction noise impacts exceeding the stipulated Standard hours NML

Table 6-4: Construction noise impacts (OSOM delivery during night time)

NCA ¹	NML L _{Aeq, 15min} dB	Predicted construction noise levels ^{2,3} L _{Aeq, 15min} dB
	OOHW Period 2	Equipment installation
R1	50	40
R2	50	61
R3	50	42
R4	50	40

*Note 1: Refer to **Table 5-1** for receiver addresses.*

Note 2: Predicted noise levels have been rounded to the nearest integer.

Note 3: Highlighted text indicate the worst-case construction noise impacts exceeding the stipulated Standard hours and Out of Hours Period 2 (night time) NML

6.5 Construction road traffic

The assessment of traffic noise impacts is currently constrained by the lack of detailed information on the construction itinerary (refer to Section 6.3) and associated construction traffic movements. As a result, this section provides a preliminary evaluation based on available data and reasonable assumptions. Preliminary data shows 62 OSOM movements during out of hours. Once more detailed traffic information becomes available, including vehicle types, routes, and scheduling, the assessment will be refined to provide a more accurate representation of potential noise and vibration impacts at the detailed design stage post determination.

An estimate of the existing traffic noise levels and the noise due to addition of the construction traffic was obtained by using the Calculation of Road Traffic Noise (CoRTN) model. Long term (10 days of logging) background noise levels were utilized to calibrate the CoRTN model using traffic volumes.

Based on the information available at the time of the assessment it is anticipated that construction traffic during works would impact the nearest sensitive receivers at McCredie Road, Guildford West NSW. Therefore, traffic noise assessment was undertaken for NCAs R2.

However, the modelling outcome indicates with a conservative 5% increase of traffic on McCredie Road an increase of less than 0.5 dB (day and night time) at the nearest sensitive receiver. This increase is below the RNP criteria of 2 dB for additional traffic movements generated by the development during the construction phase and hence road traffic noise is compliant during the construction phase.

Night-time traffic noise associated with OSOM (Over-Size Over-Mass) vehicle movements for the delivery of heavy plant items such as batteries and transformers has been assessed in accordance with the RNP criteria. The predicted relative increase in night-time road traffic noise is less than 0.2 dBA, which is acoustically insignificant and remains well below the 2 dBA screening threshold specified in the Road Noise Policy. As such, OSOM delivery movements are expected to comply with night-time traffic noise requirements, with no perceptible change to existing acoustic conditions at surrounding receivers.

Table 6-5: Predicted construction traffic noise levels (Day time)

Receiver	Measured existing traffic Noise level ¹ L _{Aeq} , 18hr dB	Predicted traffic noise due to additional construction traffic ¹ L _{Aeq} , 18hr dB	Difference dB
R2	66.4	66.6	0.2

Note 1: noise levels have been rounded to the nearest 1 decimal place in accordance with the RMS Road Noise Policy.

Table 6-6: Predicted construction traffic noise levels (Night time)

Receiver	Measured existing traffic Noise level ¹ L _{Aeq} , 9hr dB	Predicted traffic noise due to additional construction traffic ¹ L _{Aeq} , 9hr dB	Difference dB
R2	61.0	61.2	0.2

6.5.1 Parking area

Construction vehicle movement and parking within the project premises is expected to include up to 23 light vehicles and no heavy vehicles associated with workforce access and site operations. Vehicle movements and parking activities are anticipated to occur intermittently during standard construction hours and are generally limited to low-speed manoeuvring, engine start-up, and short-duration idling. Based on typical vehicle sound power levels reported in construction noise databases and applying the acoustic principle of point source attenuation (geometric spreading) over distance, the combined noise contribution from approximately 23 light vehicles and no heavy vehicles operating within the parking area is estimated to be in the order of 31–34 dB(A) at a distance of approximately 60 m. This estimate assumes a conservative

scenario where all vehicles are simultaneously idling or running, representing a steady low-level background noise condition rather than short-duration peak activities such as door slamming or brief acceleration events. Accordingly, noise generated from construction vehicle parking activities is expected to remain well below the applicable construction Noise Management Levels (NMLs) of 62 dBA during standard hours at the nearest noise-sensitive receivers NCA R2.

6.6 Construction vibration

In the case of the Project, the nearest residential receivers are about 68 metre away from the edge of the Project footprint. The construction stages have some equipment capable of generating vibration which can impact human comfort and / or cause structural damage to buildings.

To determine the potential for vibration impacts from the proposed construction methodology, indicative vibration levels from construction equipment / machinery are estimated and assessed against both the human comfort and structural damage vibration limits detailed in Section 5.3.4, in accordance with the methodology detailed in ENMM.

6.6.1 Predicted vibration levels

Based on the expected vibration intensive construction equipment, typical vibration levels (see Section 5.3.4) and the methodology detailed in the ENMM³, indicative vibration levels have been predicted at set distances and are detailed in Table 6-7. These predicted levels are based on typical ground conditions and provide an indication of the expected vibration impacts. Predictions have been presented starting at 10 metres, as vibration predictions are not reliable at less than or equal to 5 metres.

Table 6-7: Estimated construction vibration levels

Equipment / machinery	Distance to source / PPV, mm/s				Human comfort criteria	Structural damage criteria, PPV
	10 m	20 m	50 m	100 m		
Excavators	2.5	1.4	0.7	0.4	Residences - 8.6 mm/s Workshops – 18 mm/s	■ Heritage structures – 3 mm/s
Compactor (up to 7 tonnes)	7.0	4.0	1.9	1.1		■ Residential structures – 5 mm/s
Backhoe	1.0	0.6	0.3	0.2		■ Commercial, industrial and all other non-residential structures – 20 mm/s

Based on the preliminary estimated vibration levels presented in Table 6-7 and assumed ‘worst case’ activities during construction:

- The nearest residences (NCA R2) are 68 m away from the nearest BESS equipment (as indicated in Figure 6-1) and are unlikely to be affected by vibration for both human comfort and structural damage.

Safe working buffer distances have been calculated based on the indicative levels predicted in Table 6-7, to determine indicative distances below which human comfort and structural damage criteria may be exceeded. These are listed in Table 6-8. The safe working buffer distances are dependent on the equipment that the construction contractor selects and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. It is anticipated that vibration impacts from the construction phase would be mainly due to vibration intensive construction equipment such as compactors, excavators with a rock breaker attachment etc.

No vibration impacts are anticipated at the sensitive receivers since the construction area is located beyond the safe working buffer distances provided in Table 6-8. Delivery of BESS equipment will utilise OSOM which are considered as heavy vehicles for vibration impacts. Table 6-8 provides impacts from heavy vehicles.

³ Vibration level of a source is inversely proportional to the distance between the source and receiver, expressed as:

$$PPV_{receiver} = PPV_{reference} \left(\frac{d_{reference}}{d} \right)^{0.8} \text{ where } PPV_{reference} \text{ is the reference PPV at the reference distance } d_{reference}$$

Table 6-8: Vibration safe working buffer distances

Equipment/machinery	Human comfort	Structural damage
Vibration criteria	8.6 mm/s (Residential)	5 mm/s (Residential)
Criteria source	BS 5228-2	DIN 4150-3
Excavators	2 m	6 m
Compactor (up to 7 tonnes)	8 m	18 m
Backhoe	1 m	2 m
Heavy vehicles (OSOM)	9 m	18 m

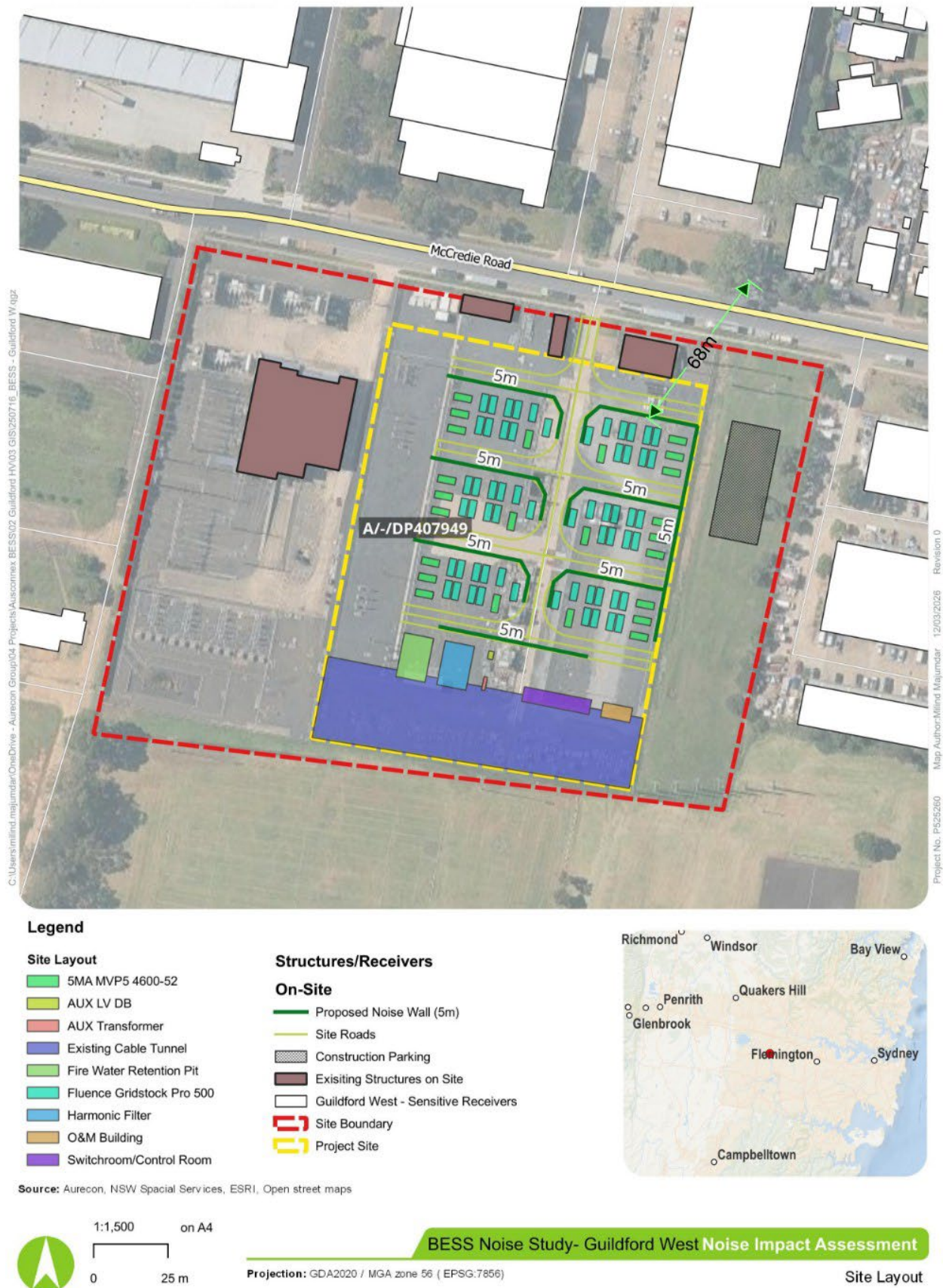


Figure 6-1: Distance between Project site boundary and the nearest sensitive receiver

7 Operational impacts

7.1 Equipment and sources

Table 7-1 provides a summary of equipment being used for Guildford West BESS facility. A preliminary assessment of the equipment operating without exhaust silencers indicated substantial exceedances of the applicable noise criteria at nearby residential receivers. Consequently, the design was refined to incorporate equipment fitted with exhaust silencers to achieve a more suitable outcome. Table 7-1 provides a summary of equipment (with silencers) being used for Guildford West BESS facility.

Table 7-1: Operational noise data of equipment

Parent item	No. of units on site	Noise source location	Sound Power Level (dBA)	Modelling Methodology
Battery (Silenced)	10 x 6 (60)	1.45 m above ground level	79	Point Sources
Power Transformer/ Inverter (Silenced)	4 x 6 (24)	2 m above ground level	83	Point Sources
Switch room ³	1	NA	~80 (1-2 instances per year)	NA

Note1: The transformer's spectrum data was unavailable at the time of this report. Therefore, reference spectrum data from a previous project was adjusted and used.

Note2: The batteries were modelled as noise sources based on the instructions provided in the manufacturer document.

Note3: Switch room not modelled at this stage of the project, contribution assumed to be insignificant

7.2 Continuous noise emission

Table 7-2 presents the preliminary modelled outcomes for the operational noise for standard and noise-enhancing meteorological conditions based on the BESS equipment noise data, representing the normal and worst-case weather scenarios.

Attachment D presents the noise contours for the various meteorological scenarios. Note contours have been presented only for the operation of the BESS when it is fully operational.

Table 7-2: Predicted operational noise levels (without mitigation measures)

NCA	Project noise trigger level L _{Aeq, 15min} dB (Day / Evening / Night)	Additional penalty applied	Worst Predicted levels ¹ L _{Aeq, 15min} dB			
			Standard meteorological conditions (D class 0.5m/s winds)(Night)	Noise-enhancing meteorological conditions (D class 3m/s winds) (Evening)	Noise-enhancing meteorological conditions (F class 2m/s winds) (Night)	Compliance ²
R1	49 / 48 / 43	Yes	33 (38)	36 (41)	37 (42)	✓
R2	57 / 48 / 43	Yes	50 (55)	51 (56)	51 (56)	⊘
R3	58 / 48 / 43	Yes	38 (43)	41 (46)	41 (46)	⊘
R4	58 / 48 / 43	Yes	35 (40)	38 (43)	39 (44)	⊘
IND	68	Not required	52	52	53	✓

NCA	Project noise trigger level L _{Aeq, 15min} dB (Day / Evening / Night)	Additional penalty applied	Worst Predicted levels ¹ L _{Aeq, 15min} dB			
			Standard meteorological conditions (D class 0.5m/s winds)(Night)	Noise-enhancing meteorological conditions (D class 3m/s winds) (Evening)	Noise-enhancing meteorological conditions (F class 2m/s winds) (Night)	Compliance ²
COM	63	Not required	43	46	46	✓
ARA	53	Not required	49	50	51	✓

Note 1: Predicted noise levels have been rounded to the nearest integer in accordance with the NPfl.

Note 2: ✓ and ⓧ refers to compliance and non-compliances with respect to PNTL respectively.

Note 3: For each entry, the unbracketed value is the predicted noise level from the model, while the value in parentheses represents the predicted level after application of the +5 dB(A) tonality penalty. This convention is used throughout the table. Eg: 38 is the predicted levels from the model; (43) is after adding +5 dBA penalty.

Without standard or project-specific mitigation measures applied, preliminary modelled outcomes for the operational noise impacts (predominantly from the BESS equipment operation) are exceeding the stipulated noise criteria during noise-enhancing meteorological weather conditions at the nearest sensitive receivers of NCAs R2, R3 and R4. Refer to Section 8 for noise mitigation measures.

Table 7-3: Estimated summary of residential properties exceeding noise limits (without mitigation)

Item	Number
Total residential properties assessed (Houses/ apartments)	509
Compliant properties during nighttime period	471
Non-Compliant properties during nighttime period	38

Noise levels generated by the BESS equipment, even with the incorporation of exhaust silencers, are predicted to exceed the applicable noise criteria once tonal penalties are applied. As a result, additional mitigation measures are required. A range of noise control options has been assessed, including the installation of noise barriers surrounding the BESS units.

Following application of all reasonable and feasible mitigation measures, 2 properties within NCA R2 (Table 7-5) exhibit residual noise levels above the stipulated criteria, with exceedances of less than 2.0 dBA after installation of noise walls. Given the low magnitude of these exceedances—well within the prediction uncertainty—the residual noise impact is considered ‘negligible’ in accordance with EPA NPfl assessment of residual noise. Refer to Table for detailed breakdown of noise exceedances for these 2 properties. As such, these low exceedances are not expected to cause any perceptible disturbance to the affected receivers, and no additional receiver-specific mitigation measures are required at this stage. Refer to Section 7.4.4 for more details on residual noise and Section 7.4.1 for noise wall design.

Table 7-4: Predicted operational noise levels (with 5m high noise walls)

NCA	Project noise trigger level L _{Aeq, 15min} dB (Day / Evening / Night)	Additional penalty required	Worst Predicted levels ¹ L _{Aeq, 15min} dB			
			Standard meteorological conditions (Day) 100% Load	Noise-enhancing meteorological conditions (Evening) 100% Load	Noise-enhancing meteorological conditions (Night) 100% Load	Compliance
R1	49 / 48 / 43	Yes	28 (33)	31 (36)	31 (36)	✓
R2	57 / 48 / 43	Yes	39 (44)	40 (45)	40 (45) ²	ⓧ

NCA	Project noise trigger level L _{Aeq, 15min} dB (Day / Evening / Night)	Additional penalty required	Worst Predicted levels ¹ L _{Aeq, 15min} dB			
			Standard meteorological conditions (Day) 100% Load	Noise-enhancing meteorological conditions (Evening) 100% Load	Noise-enhancing meteorological conditions (Night) 100% Load	Compliance
R3	58 / 48 / 43	Yes	33 (38)	36 (41)	36 (41)	✓
R4	58 / 48 / 43	Yes	28 (33)	31 (36)	32 (37)	✓
IND	68	Not required	47	49	48	✓
CO M	63	Not required	37	40	40	✓
ARA	63	Not required	43	44	44	✓

Note 1: Predicted noise levels have been rounded to the nearest integer in accordance with the NPfI.

Note 2: Two residential properties (NCA R2) do not comply with nighttime criteria with +5dB penalty applied due to tonality detection at property. Summarized in Table 7-5 For each entry, the unbracketed value is the predicted noise level from the model, while the value in parentheses represents the predicted level after application of the +5 dB(A) tonality penalty. This convention is used throughout the table. Eg: 38 is the predicted levels from the model; (43) is after adding +5 dBA penalty.

Table 7-5: Summary of residential properties exceeding night-time noise limits after tonality penalty application

Address/ Receiver	NCA	Project noise trigger level L _{Aeq, 15min} dB (Night)	Additional penalty required	Worst Predicted levels (After tonality penalty application +5dB) L _{Aeq, 15min} dB		Residual Noise Level	
				Noise-enhancing meteorological conditions (Night) 100% Load	Compliance	Level	Significance
127 McCredie Road	R2	43	Yes	45 (40+5)	⊘	≤ 2 dB(A)	Negligible
125 McCredie Road	R2	43	Yes	45 (40+5)	⊘	≤ 2 dB(A)	Negligible

Table 7-6: Summary of residential properties exceeding noise limits after mitigation

Item	Number
Total residential properties assessed (Houses/ apartments)	509
Compliant properties (during night time period)	507
Non-Compliant properties (during night time period)	2

Two residential properties (125 and 127 McCredie Road, Guildford West) showing non-compliance due to addition of 5 dBA tonality penalty. Refer to Section 7.4.5 for more details on residual noise and mitigation measures.

7.3 Sleep disturbance

In assessing noise emissions from equipment such as batteries and transformers, it is a conservative practice to apply an adjustment factor to account for transient or impulsive noise events, particularly those associated with equipment start-up, switching, or brief operational peaks. For such equipment, the L_{Amax} level—representing the maximum instantaneous sound pressure level—is often significantly higher than the L_{Aeq} , which represents the equivalent continuous sound level over a period of time

A 10 dB difference between L_{Amax} and L_{Aeq} is adopted in environmental noise assessment for this project to conservatively account for this brief, but acoustically significant, events. This adjustment reflects Start-up surges or brief operational peaks (e.g., cooling fans activating, contactors switching) that may not substantially affect the L_{Aeq} but can result in sharp L_{Amax} spikes. This approach ensures that potential peak noise impacts are not underestimated and that the design and mitigation measures account for both continuous and peak acoustic emissions.

Table 7-7 presents the modelled outcomes (in the absence of noise mitigation measures) for operational activities likely to cause a sleep disturbance at the nearest sensitive receivers during night time period. Operational noise impacts during night-time periods at all the nearest sensitive receivers are also exceeding the stipulated sleep disturbance criteria for residential properties.

Feasible and reasonable noise mitigation measures proposed for the Project to mitigate noise exceedances are discussed in Section 7.4 and Table 7-9, with additional noise management strategies provided in Section 8.

Table 7-7: Sleep disturbance assessment (without mitigation)

NCA/ Usage	Land Use Category	Sleep Disturbance Criteria		Noise Predictions – Night time					
				Compliance	Night L _{Aeq} 15min		L _{Amax}		Compliance ¹
		Night L _{Aeq} 15min dB	Night L _{Amax} dB		0.5m/s winds		2m/s winds		
					Standard Conditions - D Class Temperature inversions		Noise Enhancing conditions - F Class Temperature inversions		
R1	Residential	50	60	33	43	✓	37	47 ²	✓
R2		50	60	50	60	✓	51	61	✗
R3		50	60	38	48	✓	41	51	✓
R4		50	60	35	45	✓	39	49	✓

Note 1: ✓ and ✗ refers to compliance and non-compliances with respect to sleep disturbance criteria respectively.]

Note 2: L_{Amax} is assumed to be 10dB higher than L_{Aeq} predicted values as a conservative approach for sleep disturbance assessment.

Note 2: L_{Amax} is assumed to be 10 dB higher than L_{Aeq} predicted values as a conservative approach for sleep disturbance assessment.

Table 7-8: Sleep disturbance assessment (with mitigation measures- 5m high noise walls)

NCA/ Usage	Land Use Category	Sleep Disturbance Criteria		Noise Predictions – Night time		
		Night L_{Aeq} 15min dB	Night L_{Amax} dB	Night L_{Aeq} 15min	L_{Amax}	Compliance
				2m/s winds		
				Noise Enhancing conditions - F Class Temperature inversions		
R1	Residential	50	60	31	41	✓
R2		50	60	40	50	✓
R3		50	60	36	46	✓
R4		50	60	32	42	✓

Note 1: ✓ and ✗ refers to compliance and non-compliances with respect to sleep disturbance criteria respectively.

Note 2: L_{Amax} is assumed to be 10dB higher than L_{Aeq} predicted values as a conservative approach for sleep disturbance assessment.

7.4 Operational noise – Mitigation measures

Based on the assumed equipment and plant data, mitigation measures are currently required for the operational phase of the Project. Table 7-9 provides a summary of reasonable and feasible mitigation measures that have been considered for this project to reduce the noise impacts.

Table 7-9: Summary of reasonable and feasible mitigation measures

Mitigation measure	Details	Reasonable	Feasible	To be incorporated within design
Move batteries to alternative location within the site	Relocation of batteries towards eastern side of the site	Yes	No	Relocating the equipment is not considered feasible, as alternative locations both within the site and offsite have been assessed. The vacant land to the west of the project site were examined. These lands are not feasible due to the lack of capacity to support the required BESS infrastructure and the need to accommodate the existing substation operations. Other offsite options were also explored; however, they were found to be neither technically feasible nor reasonable within the context of the project's operational, logistical, and planning requirements given the need for a suitable grid connection immediately adjoining the project site. Therefore, the current location remains the most suitable and practicable option for the BESS installation.
Reorientation of batteries	Swap the batteries location with Transformers	Yes	No	Reorient of equipment within the site is not expected to result in any meaningful improvement in noise impacts for the upper-floor at the nearest houses (125 McCredie Rd, Guildford West NSW 2161). The current design has already been optimised to achieve the best possible noise outcomes within the constraints of the project boundary. Alternative orientations have been thoroughly considered; however, they would not result in a material change to the overall noise assessment. As such, further refinement of the equipment layout is not considered feasible

Mitigation measure	Details	Reasonable	Feasible	To be incorporated within design
Production curtailment at night-time (10pm - 7am)	Lower production at night time	No	No	Production curtailment is not considered a feasible mitigation option for this BESS project, as it would directly affect the core performance and operational efficiency of the system. The primary function of the BESS is to store and discharge energy in response to grid demand, and curtailing its operation would undermine its ability to perform this role effectively during peak demands. Curtailment may only be considered reasonable or feasible in specific circumstances where it does not compromise the technical performance, reliability, or intended functionality of the system—conditions which do not apply to this project.
At source treatment (Fan duty curtailment at evening (6pm - 10pm) and night-time) (10pm - 7am)	Lower operating loads of duty fans for batteries	Yes	No	Not considered for this equipment.
At source treatment (Manufacturer approved solutions)	Silencers on top of Battery fan outlet	Yes	Yes	Refer to Section 7.4.3
Noise wall (various heights)	6m NW	No	Yes	Refer to Section 7.4.1 for more details. A maximum of 5-metre-high noise wall has been identified as the most suitable and effective mitigation measure for this project based on detailed acoustic modelling and site-specific considerations. This height achieves the optimal balance between effective noise attenuation and practical implementation within the project boundary. Increasing the noise wall height beyond 5 metres was assessed and found to offer diminishing returns in terms of noise reduction benefits, particularly for residential properties, with only marginal improvements in predicted noise levels and no significant change in compliance outcomes. Conversely, reducing the height to 4 metres or lower results in notable increases in noise exposure for nearby sensitive receivers and leads to greater non-compliances.
	5m NW	Yes	Yes	
	4m NW	No	Yes	
Absorption on noise walls	Absorption	Yes	Yes	A 100 mm thick acoustic absorption layer is recommended to minimise noise reflections from the inner face of the barrier. More details in Section 7.4.2
At property treatment	Upgrade of external glazing, façade, artificial ventilation, etc	Yes	Yes	Refer to Section 7.4.5
Noise compliance monitoring program	Attended and unattended noise monitoring post completion.	Yes	Yes	Refer to Section 7.4.6

Note:

Yes - Refers to measure is suitable and option has been explored for this project

No - Refers to measure being impractical, and would not provide intended results

7.4.1 Noise wall design

Noise mitigation strategies have been developed to protect all nearby sensitive receivers and ensure the BESS operates in full compliance with applicable noise criteria. Fact sheet F of EPA NPfI describes feasible noise mitigation measures that can be engineered and are practical to build or implement given project constraints. Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. As part of this strategy, a purpose-designed noise wall has been incorporated to provide effective acoustic shielding and reduce operational noise emissions from the facility.

Noise modelling has assumed the worst-case scenario for the project based on assumed specifications for a utility scaled BESS. To reduce the noise from the 24x7 operation of the BESS project, noise walls (refer to Figure 7-1: Noise wall location with respect to BESS and Figure 7-2) must be considered for this project. Below are some typical considerations for noise wall design to mitigate equipment noise contributions at the sensitive receiver locations.

- **Location:** Most effective location for a noise wall is as close as practical to the noise source except where the receiver is higher than the source. In this case, based on the site conditions, the noise wall has been designed at the eastern property boundary.
- **Height:** A general rule for the height of the noise wall is to break line of sight from the top of the source to the window at the top floor of the residential receiver. 5m noise walls have been included in the model to provide potential effective attenuation at the receivers (Refer to Figure 7-1: Noise wall location with respect to BESS)
- **Continuity:** Noise barrier must be solid and continuous with no gaps in the vertical or horizontal plane.
- **Material:** Due to structural and durability considerations, material of the noise wall with a minimum surface density of 10kg/m² should be used (dependant on detailed analysis). The material should be non-combustible as per AS 1530.1 requirements. Refer to Section 7.4.2 for the requirement for absorptive inner surface on all the noise walls. Acoustically rated doors should be included at periodic gaps within the design of noise wall for access to the batteries and transformers for regular maintenance.

7.4.2 Absorption lining on noise wall

In order to reduce the contribution of noise reflections from the inner face of the noise barrier, a 100 millimetres thick absorption material is recommended to reduce these levels. An example of a high-performance absorption material is the Megasorber P100 (or similar product with NRC 1.0) with a water repellent option. Alternatively, materials can be utilised which can achieve NRC >0.9 and are suitable for outdoor installation.



Legend

Site Layout

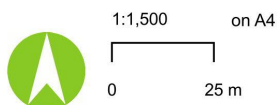
- 5MA MVP5 4600-52
- AUX LV DB
- AUX Transformer
- Existing Cable Tunnel
- Fire Water Retention Pit
- Fluence Gridstock Pro 500
- Harmonic Filter
- O&M Building
- Switchroom/Control Room

Structures/Receivers

On-Site

- Proposed Noise Wall (5m)
- Site Roads
- Construction Parking
- Existing Structures on Site
- Guildford West - Sensitive Receivers
- Site Boundary
- Project Site

Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



Projection: GDA2020 / MGA zone 56 (EPSG:7856)



BESS Noise Study- Guildford West Noise Impact Assessment

Site Layout

Figure 7-1: Noise wall location with respect to BESS



Figure 7-2: 3D view of the noise wall with respect to current equipment layout

7.4.3 Low noise equipment

Most of the equipment specifications and noise data are based on preliminary selections and worst case scenario operational duty.

A generic list of mitigation measures which are considered for all equipment are given below:

- Selecting quieter equipment.
- Screening or enclosing the source (if available); the design of the enclosure and materials used to absorb sound would determine the level of attenuation achieved.
- Silencing exhausts – Muffler design on the fans above the batteries.

Table 7-10: Comparison of equipment noise data with and without the silencers

Parent Item	Data type	No. of units on site	Noise Data Type	Overall sound power level dB(A)
Battery	Silenced / With noise control kit	60	SWL/Unit	79
Power Transformer / Inverter		24	SWL/Unit	83
Battery	Unsilenced / Without noise control kit / Equipment as it is	N/A	SWL/Unit	90
Power Transformer / Inverter		N/A	SWL/Unit	91

Note: N/A Equipment not used in the project. Provided for reference only.

7.4.4 Residual noise

As per NPfI, a residual noise impact may exist where the best-achievable noise level from a development, when assessed at a sensitive receiver location, remains above the project noise trigger levels. Residual noise impacts are identified after all source and pathway feasible and reasonable noise mitigation measures have been considered. The significance of the residual impact and the need to assess receiver-based treatment options may need to be considered as part of an authority's determination/approval process. Table 7-11 and Table 7-12 provides strategy to assess residual noise impacts and typical mitigation measures to reduce the impacts.

After implementation of all feasible and practicable noise mitigation measures, 2 properties (125 and 127 McCredie Road, Guildford West) exhibit residual noise levels above the stipulated criteria, with exceedances of less than 2.0 dBA. Given the low magnitude of these exceedances—well within the prediction uncertainty—the residual noise impact is considered 'negligible' in accordance with EPA NPfI assessment of residual noise. Refer to Table 7-11 for detailed breakdown of noise exceedances. As such, these low exceedances are not expected to cause any perceptible disturbance to the affected receivers, and no additional receiver-specific mitigation measures are required at this stage. This demonstrates that the adopted mitigation strategy effectively manages noise impacts for all nearby sensitive receivers.

However, a revised noise assessment will be required at the detailed design stage of the project once equipment selection is finalised, to confirm that the predicted noise levels and effectiveness of mitigation measures remain consistent with the design criteria and nearby receiver protection requirements.

Table 7-11: Significance of residual noise impacts

If the predicted noise levels minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Then the significance of residual noise level is:
≤ 2 dB(A)	Not applicable	Negligible
≥ 3 but ≤ 5 dB(A)	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1d	Marginal
≥ 3 but ≤ 5 dB(A)	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dB(A)	≤ recommended amenity noise level	Moderate
> 5 dB(A)	> recommended amenity noise level	Significant

Note: This approach is designed for new and substantially modified developments and should be applied with caution to assessments of existing operations.

Table 7-12 Example of receiver based treatment to mitigate residual noise

Significance of residual noise	Example of potential treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for 'marginal', but also upgraded façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

7.4.5 At Property treatment

Under the NSW NPI, at-property treatment is considered a viable mitigation measure when other noise control options, such as source reduction or path controls (e.g., barriers), are not feasible or are insufficient to achieve compliance at nearby sensitive receivers. This approach involves implementing noise reduction measures directly at the affected property—typically at the building façade—to reduce internal noise levels.

Common at-property treatments include upgrading window glazing, sealing gaps in the building envelope, and improving insulation of walls and roofs, providing artificial ventilation so that the doors/ windows can remain shut. These measures are particularly relevant for noise-sensitive land uses, such as residential dwellings, schools, and hospitals.

At-property treatment is generally considered only after all reasonable and feasible noise mitigation measures at the source and along the transmission path have been exhausted. It is applied in accordance with NPI guidelines and usually in consultation with affected landowners. Table 7-6 provides a summary of properties exceeding the operational noise criteria. These results will be revised once the equipment selection is complete, and design iterations are finalised.

Two properties (125 and 127 McCredie Road, Guildford West) will experience (less than 2.0 dB above the stipulated criteria) after all the feasible mitigation measures are employed. Less than 2 dBA residual noise is considered “negligible”, therefore no further mitigation measure is required for these 2 properties at this stage. However, revised noise assessment is required in the detailed design stage of this project after equipment selection is finalised.

Table 7-13: Properties with Residual Noise Levels (nighttime)

Item	>0 & ≤2 Negligible	>2 & ≤5 Marginal	>5 Significant
With mitigation measures Night 5m Noise Wall	2	0	0

7.4.6 Compliance noise program

A targeted compliance noise monitoring program (verification measurements upon operation of the BESS facility) have to be developed for residential properties identified as non-compliant with the NSW NPfL. Verification monitoring should be carried out upon commencement of BESS operations to confirm that noise levels comply with the acceptable limits defined in the Noise and Vibration Impact Assessment report. The program aims to verify operational noise levels, assess the effectiveness of mitigation measures, and determine whether operational noise emissions meet the applicable PNTLs. Monitoring should be conducted using Class 1 sound level meters during normal operations under meteorologically suitable conditions.

The noise monitoring program should combine long-term unattended monitoring and short-term attended measurements to provide a comprehensive assessment of noise emissions from the site. This dual approach provides both continuous data collection and real-time observation of noise characteristics, source identification, and environmental influences.

Unattended long-term monitoring typically involves deploying calibrated Class 1 noise loggers at selected receiver locations for a minimum of 7 consecutive days. These loggers operate continuously to capture variations across different times of day and operating conditions, providing statistically robust data suitable for comparison against the NSW NPfL criteria. Meteorological exclusions (e.g., high wind, rain) are applied during analysis to ensure compliance with NPfL guidance.

Attended short-term monitoring should also be conducted during key operational periods to supplement the long-term data. It allows for immediate correlation between observed activities and measured noise levels, and provides qualitative information such as tonality, impulsiveness, or the presence of extraneous sources. This insight is essential for accurate interpretation of long-term data and for confirming dominant noise sources.

Measured noise data should be assessed against the stipulated PNTL. A technical report should be prepared detailing measured levels, comparison with thresholds, and any exceedances or required follow-up actions. This program excludes construction noise, vibration, and emissions unrelated to the project.

7.5 Operational vibration

Operational vibration impacts are expected to remain below thresholds for structural damage and human comfort in accordance with relevant international standards (e.g. DIN4150-3, ISO 2631) and NSW guidelines (e.g. NSW EPA's Assessing Vibration: A Technical Guideline), with compliance anticipated at all times during the day.

7.6 Cumulative impacts

Potential effects of cumulative noise must be considered, and reasonable steps must be demonstrated to avoid exceedance by the combined noise contribution from all commercial, industrial and trade premises, above noise criteria at each of the NCAs.

As per NPfI the project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for sensitive receivers. It states that the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels:

“Where an existing cluster of industry, for example, an industrial estate or port area, is undergoing redevelopment and/or expansion and the development constitutes a single premises addition or expansion, with no other redevelopment planned in the foreseeable future, the project amenity noise level approach procedure in NPfI can be applied.”

Since this Project and other future project constitutes less than 4 industrial premises planned in the foreseeable future, the project amenity noise levels presented in Table 5-10 (amenity levels) control the cumulative noise impacts from all sources as per EPA NPfI. Refer to Section 7.6.1 and Section 7.6.2 for more information on cumulative impacts.

7.6.1 Cumulative Construction Impacts

Section 5.3.1 of the report outlines the construction Noise Management Levels (NML), which have been developed to control cumulative impacts. The assessment confirms that the BESS (15-month program) may have some overlapping construction periods with other projects in the vicinity.

The Guildford West BESS project is not anticipated to be a large generator of construction traffic and associated noise. However, during construction and decommissioning, potential cumulative impacts would be largely related to impacts for road users and the road network as a result of projects utilising the same heavy vehicle haulage routes along local and State road networks, in particular McCredie Road and Fairfield Road.

The construction program for the Project Pluto Data Centre is expected to overlap with the 15-month construction period for the Guildford West development, resulting in a period of concurrent construction activity within the area. The southern boundary Noise Catchment Area (NCA R1) will be exposed to construction noise contributions from both developments. Noise predictions undertaken for the Guildford West project indicates that its predicted noise levels at NCA R1 are approximately 10 dBA below the relevant Noise Management Level (NML), meaning its contribution is expected to be acoustically negligible in the context of cumulative impacts. In contrast, the Project Pluto construction works are positioned closer to the receiver and are therefore anticipated to generate more discernible construction noise levels at NCA R1. Notwithstanding this, the cumulative assessment confirms that Guildford West’s contribution remains minimal, with any perceptible cumulative impact at the receiver primarily attributable to the Project Pluto activities. All other identified projects in the vicinity are located at distances greater than 900 m from the site, and as such are not expected to generate any discernible construction noise impacts at the sensitive receivers due to substantial distance attenuation and intervening built form providing additional shielding.

Any potential non-compliances will be addressed through targeted noise management practices, including scheduling of high-noise activities, equipment selection, and temporary noise barriers where necessary to minimise noise impacts on the affected sensitive receivers (further details provided in Section 8).

7.6.2 Operational Phase – BESS

For the operational phase, the BESS has been assessed against the Project Noise Trigger Levels (PNTL), with outcomes cross-referenced against the future development projects around the site. A review of publicly available planning data has identified a small number of future development projects within a 2 Km radius of the subject site (e.g, Project Pluto Data Centre SSD EIS submitted, Smithfield BESS, etc). Refer to Table 7-14 and Figure 7-3 for details on all nearby projects.

Within a 2 km radius of the project site, ten surrounding developments were identified; however, only the Project Pluto Data Centre—located approximately 150 m from the site—is positioned close enough to generate any discernible acoustic contribution at nearby noise-sensitive receivers. A cumulative noise assessment, undertaken in accordance with the NSW EPA Noise Policy for Industry (NPfI), indicates that cumulative noise at NCA R1 is expected to be approximately 46 dBA during the day, 40 dBA in the evening, and 39 dBA at night, all of which remain below the corresponding cumulative amenity criteria of 58 dBA,

48 dBA, and 43 dBA respectively. All remaining identified projects, located more than 900 m from the site, are predicted to have negligible impact due to distance attenuation and shielding by existing built form acting as effective noise barriers.

Additionally, due to the proximity and scale of this project relative to other smaller developments, the cumulative noise impacts in the area will be primarily governed by emissions from this site⁴. This is due to a our site being located closer to relevant sensitive receiver will have a higher noise impact than a similarly noisy development situated much further away. In cumulative noise assessments, this means that the project nearest to the receiver often dominates the overall noise level, especially when the other sources are separated by large distance.

The mitigation measures proposed (refer to Section 7.4)—including noise barriers and silencers—are expected to significantly reduce operational noise levels at nearby sensitive receivers. These controls are likely to be the dominant factor in managing cumulative acoustic impacts in the local context.

It is also noted that background noise levels in the area are elevated due to continuous traffic flow along McCredie Road and Fairfield Road. This existing environmental noise has contributed to an increase in the applicable noise criteria at surrounding receivers. As a result, the marginal noise contribution from more distant developments is expected to be minimal and unlikely to materially influence the overall ambient noise environment.

The mitigation and monitoring strategies embedded into the operational noise management framework to reduce ambient noise levels to be consistent with established PNTL and regulatory expectations proposed (refer to Section 8)—including noise barriers and silencers on equipment—are expected to significantly reduce operational noise levels at nearby sensitive receivers. These controls are likely to be the dominant factor in managing cumulative acoustic impacts in the local context.

⁴ In environmental acoustics, the contribution of a noise source to the overall ambient noise level at a receiver decreases significantly with distance, primarily due to geometric spreading, atmospheric absorption, and ground attenuation. As sound travels away from its source, it disperses over a larger area and loses energy. This results in a logarithmic reduction in sound pressure level—typically around 6 dB reduction for every doubling of distance in free field conditions.

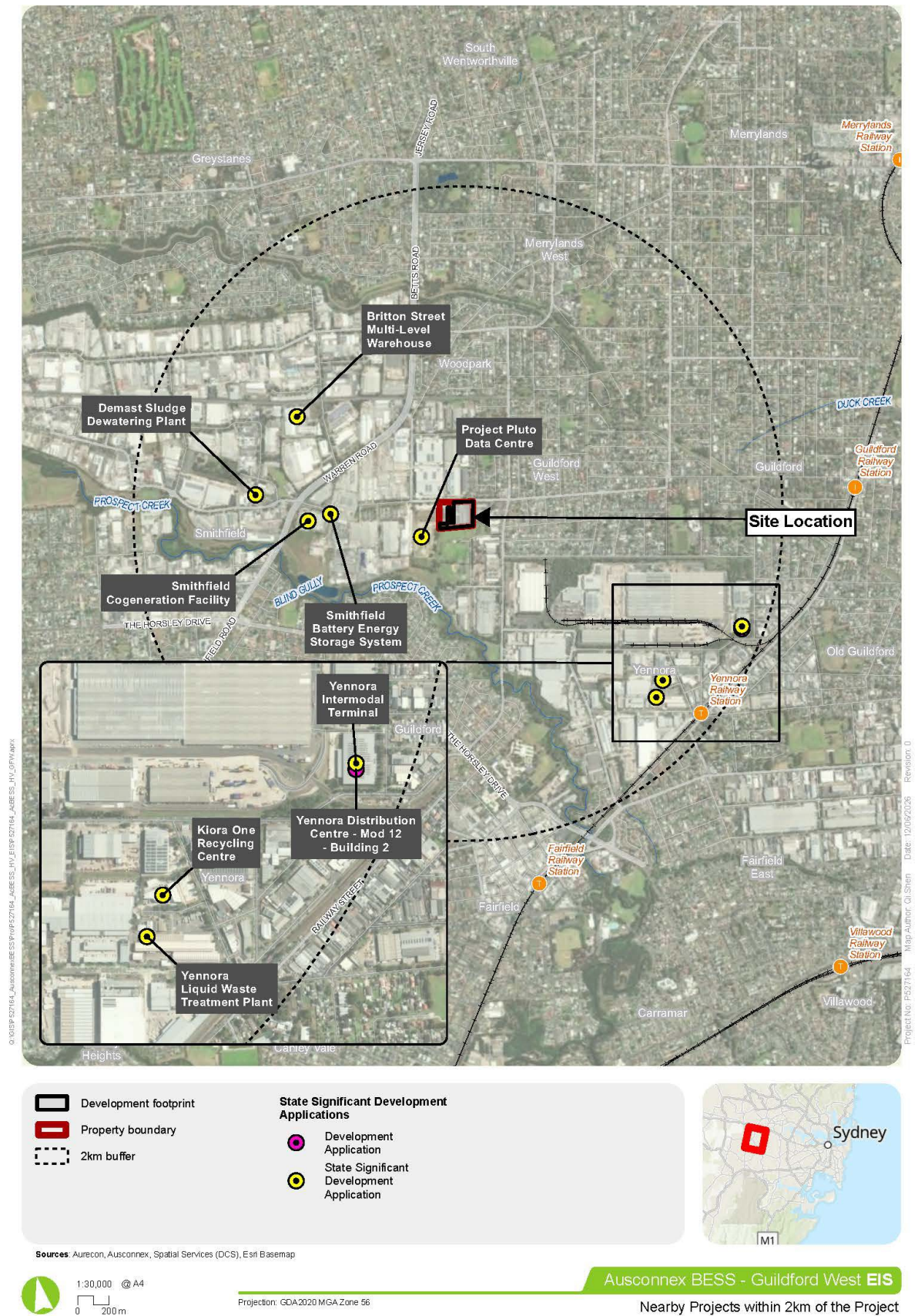


Figure 7-3: Projects within 2km of the Project

Table 7-14: Summary of nearby future projects

Future project	Approximate distance from Project and key features	Project status/overlap	Potential cumulative impacts
			Noise
Project Pluto Data Centre (SSD-69223466)	150m west of the development footprint and adjoins the western boundary of the Site. Key features: Construction, fit out and operation of a 68MW data centre with a maximum building height of 25.77m and total gross floor area of 29,444m²	Assessment Works anticipated to commence in January 2026 and take 36 months to complete. Overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	Worst-case scenario of continuous noise emissions from the project during the overlapping operation period is anticipated to result in cumulative impacts.
Smithfield Battery Energy Storage System (SSD-59325460)	830m west of the development footprint. Key features: Construction and operation of a 65MW/130MWh battery system.	Under construction (determined 7 May 2024) Works commenced January 2025 and anticipated to be operational by December 2025. Overlap in 20 year operation.	No cumulative impacts are anticipated.
Smithfield Cogeneration Facility (DA94/162)	900m west of the indicative development footprint.	DA and Modification 1 & 2 determined (modification determined 6 November 2024).	No cumulative impacts are anticipated.
Britton Street Multi-Level Warehouse (SSD-67368956)	1.2km northwest of the development footprint. Key features: - Demolition of on-site structures - Construction and 24/7 operation of a multi-level warehouse buildings across two allotments.	Assessment Construction anticipated to commence Quarter 3 of 2025 and take up to 24 months to complete. Potential overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	No cumulative impacts are anticipated.
Demast Sludge Dewatering Plan (SSD-72775222)	1.2km west of the development footprint. Key features: Upgrade to an existing Sludge Dewatering Plant to increase processing capacity.	Response to Submissions Potential overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	No cumulative impacts are anticipated.
Cobra Waste Solutions Resource Recovery Facility (SSD-9320662)	1.5km southeast of the development footprint. Key features: Operation of a Resource Recovery Facility to process up to 150,000 tonnes per annum of general solid waste (non-putrescible) consisting of construction and demolition waste and commercial and industrial waste.	Operational (approved 17 November 2023) Potential for overlap in operation.	No cumulative impacts are anticipated.

Future project	Approximate distance from Project and key features	Project status/overlap	Potential cumulative impacts
			Noise
Kiora One Recycling Centre (SSD-72229458)	1.65km southeast of the development footprint. Key features: Development of a waste and resource recovery facility including the fit-out of an existing warehouse complex for processing 180,000 tonnes per year of liquid waste, 20,000 tonnes per year of product destruction and 20,000 tonnes per year of hazardous waste.	Determination (approved 04 June 2026) Potential for overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	No cumulative impacts are anticipated.
Yennora Liquid Waste Treatment Plant (SSD-10407)	1.7km southeast of the development footprint. Key features: Increasing the processing capacity of an existing resource recovery facility to 110,000 tonnes per year of liquid waste.	EIS and Modification 1 determined. Potential overlap in operation	No cumulative impacts are anticipated
Yennora Intermodal Terminal (SSD-59076719)	1.95km southeast of the development footprint. Key features: Modernisation and expansion of an existing warehouse and distribution facility.	Prepare EIS Potential for overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	No cumulative impacts are anticipated.
Yennora Distribution Centre (DA264-09-01)	1.95km southeast of the development footprint. Key features: Upgrade of existing distribution centre through construction of new warehouse buildings and associated infrastructure.	DA and 12 modifications approved (latest modification approved 17 March 2025) Potential for overlap in construction as BESS program is anticipated to commence January 2027 with a 15 month timeframe and 20 years operation.	No cumulative impacts are anticipated.

8 Management measures

The following noise mitigation measures and management strategies shall be considered for the relevant phases of the Project.

Table 8-1: Noise Management Measures

ID	Management measures: remedial actions, work practices and complaints handling	Timing
NV1	■ For certain construction equipment/machinery, the use of manufacturers exhaust silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts. ■ Noise levels of plant and equipment must have an operating sound power or sound pressure level compliant with AS 2436-2010. ■ Scheduling work generating noise with special audible characteristics and / or vibration levels should be enclosed by erection of temporary noise barriers as per AS 2436:1981 to shield residential receivers from noise. ■ Use low-vibration construction equipment where feasible (e.g., smaller rollers, non-vibratory rollers). ■ Implement buffer zones between heavy plant and sensitive receptors (residences, substations, instrumentation). ■ Stage or sequence works to avoid multiple vibration-generating activities occurring simultaneously. ■ Adopt soft-start procedures for vibratory rollers or impact equipment. ■ Use alternative construction methods such as: – non-vibratory compaction ■ Install anti-vibration mounts (spring or elastomeric isolators) under inverters, HVAC, and transformers. ■ Ensure proper balancing of fans, motors, and rotating machinery to reduce operational vibration. ■ Conduct regular maintenance (bearing checks, belt tensioning, alignment).	Construction and operation
NV2	■ The contractor should regularly service and maintain all equipment and machinery at optimum operating conditions, to minimise excessive noise emissions generated by faulty, overused, or unmaintained machinery.	Construction
NV3	■ All employees, contractors, and subcontractors must receive an environmental induction covering site operating and delivery times, nearby sensitive receivers, scheduling of noise- or vibration-generating works, designated parking and loading/unloading areas, and environmental incident procedures including but not limited to: – no amplified music or use of radios, loud conversation or shouting, – use designated access pathways, – turn off plant and equipment when not in use if feasible and practical – avoid obstruction of operational areas (such as public roads) by construction materials and equipment. – Controlled release of compressed air – Site opening / closing times (including deliveries) – Locations of nearest sensitive receivers – Scheduling of work generating noise with special audible characteristics and / or vibration levels scheduling – Construction employee parking areas – Designated loading / unloading areas and procedures – Environmental incident procedures	Construction

ID	Management measures: remedial actions, work practices and complaints handling	Timing
NV4	To mitigate construction noise impacts on nearby sensitive receivers, temporary noise barriers should be installed where feasible and effective. These barriers should be positioned between noisy equipment and affected receivers to provide a physical sound buffer, particularly during high-noise activities. The use of temporary noise barriers can significantly reduce noise levels by blocking direct line-of-sight sound transmission, and their design, height, and location will be selected based on site-specific conditions and the nature of surrounding land uses.	Construction
NV5	Queries and complaints handling: - A documented complaint process, including an escalation procedure so that if a complainant is not satisfied there is a clear procedure. - Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information. - Implement all feasible and reasonable measures to address the source of complaint. Complaints should be treated sensibly and be given a fair hearing in consultation with communications personnel, stakeholders, and an acoustic consultant where required. - Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, time of verbal response and timeframe for written response where appropriate. - Noise nuisance complaints would be managed through the Construction Environmental Management Plan (CEMP) prepared by the Principal Contractor during operations. - During construction, the contractor will keep the local community well informed about construction activities. Any complaints regarding environmental noise emissions from the construction site are to be recorded and investigated. - Maintain good communication between the community and project staff and appoint a community liaison officer to facilitate where required. - In the event of an unforeseen breakdown of construction equipment, a response protocol should be implemented to minimise impacts on surrounding sensitive receivers. Construction personnel should be required to report any such breakdowns immediately to the site supervisor. Temporary mitigation measures, such as relocating equipment or using quieter alternatives, should be deployed as soon as practicable, with a target response time of within 1 hour during standard working hours. A nominated site contact should be available to manage these issues during standard hours, while a dedicated 24/7 out-of-hours contact should be provided to address emergency concerns or complaints. These contact details will be shared with nearby stakeholders and displayed prominently on-site	Construction and operation
NV6	During the construction phase, particularly for out-of-hours activities such as OSOM (Over Size Over Mass) and heavy vehicle deliveries of BESS modules from the port to the site mitigation measures should be implemented. These measures include the careful scheduling of high-noise activities to occur within standard construction hours where possible, the use of quieter equipment or noise-suppressed machinery, as per AS2436:2010 and the deployment of temporary noise barriers or enclosures (considering site topography) to reduce impacts on nearby sensitive receivers. For out-of-hours deliveries or construction activities likely to generate elevated noise levels or traffic disruptions, additional management measures will be adopted to minimise disruption to the local community including time period when work will be undertaken and to determine the level of exceedance.. These include a requirement to provide periodic project specific notifications to affected sensitive receivers no later than seven calendar days in advance of any anticipated disruptions. Notifications will detail the nature of the upcoming works (e.g. traffic changes, night works, or activities likely to exceed noise criteria) and will be distributed through letterbox drops, targeted email mailing lists, or published updates on the project website, ensuring transparency and adequate time for community preparation.	Construction
NV7	The design of the Project shall incorporate 5m high noise walls as shown in Figure 7-1 to reduce noise levels as much as is practical. The design shall include an absorptive lining with a minimum thickness of 100mm to further reduce operational noise levels	Operation
NV8	During detailed design, silencers shall be integrated into the equipment.	Operation
NV9	Operational noise monitoring program will be implemented within three months of the Project commissioning to validate the noise modelling predictions and confirm compliance with applicable noise criteria.	Operation

9 Conclusion

Aurecon has conducted this noise and vibration assessment for the proposed Guildford West BESS. The findings of the assessment are summarised below.

9.1 Construction noise and vibration

- Construction noise for the project has been assessed using a typical worst-case construction itinerary provided by the Ausconnex Project Manager, in the absence of a detailed construction program (which will be available during the detailed design phase).
- Construction noise has been assessed for a typical construction itinerary. Worst-case construction noise impacts were assessed having assumed that all construction equipment is positioned at a single location, closest to the most sensitive receiver, and operating at maximum load conditions. Assessment results indicate that construction noise criteria would be exceeded at the nearest residential receiver (R2 - 3 or 4 properties within NCA R2 facing the McCredie Road) and active recreation receiver (A2 - Guildford West Sportsground, Foray St, Guildford West NSW 2161), with the key affected area being the soccer field and open space near the site boundary, during standard hours of operations for the majority of construction activities. As such, standard and project-specific mitigation measures (refer to Section 8) for construction noise would be implemented to minimise exceedances on NMLs during construction.
- Traffic noise modelling outcome indicates with a conservative 5% increase of traffic on McCredie Road an increase of less than 0.5 dB (day and night time) at the nearest sensitive receiver. This increase is below the RNP criteria of 2 dB for additional traffic movements generated by the development during the construction phase and hence road traffic noise is compliant during the construction phase. In addition, the assessment of heavy equipment deliveries undertaken at night using OSOM vehicles is presented in Table 6-4. Noise levels at most surrounding properties are predicted to comply with the stringent night-time construction noise criteria except NCA R2. Residents at the nearest receivers, NCA R2 may experience noticeable noise during late-night activities when equipment installation works occur at the closest approach to these properties. Suitable mitigation measures outlined in Section 8 should be implemented to minimise potential impacts.
- Construction vibration is unlikely to cause structural damage or adversely affect human comfort based on experience of similar developments and assumed list of typical vibration inducing equipment within this document.
- Typical noise mitigation measures and management procedures that can be considered for a project of this type are presented in Section 8.

9.2 Operational noise and vibration

- Operational noise levels have been estimated using the CONCAWE sound propagation model within a detailed 3D computational noise model, considering worst-case operational scenarios for the BESS.
- The assessment indicates that unmitigated noise levels are likely to exceed the relevant noise criteria at NCA R2 for 38 residential receivers, particularly under standard and adverse weather conditions without any mitigation measures employed (refer to Section 7.2).
- To attenuate the primary noise propagation path affecting the residential receivers, a 5-metre-high noise wall (Refer Figure 7-1) has been identified as a technically feasible and reasonable mitigation measure. Table 7-4 presents the predicted noise levels at the sensitive receivers with the noise wall in place, and Figure 7-1 shows the proposed location. Noise wall specifications are provided in Appendix I.

The barrier should be designed to obstruct the direct line-of-sight between the primary noise sources (such as batteries and inverters) and residential properties, using solid materials with a minimum surface density of 10 kg/m², consistent with NPfI guidance. The proposed barrier aligns with the NPfI's noise control hierarchy, which prioritises source control, followed by path controls such as barriers, and receiver-based treatments where required.

- Based on the two feasible mitigation measures currently incorporated into the project design—namely the provision of perimeter noise walls and implementation of silencers, noise modelling results indicate that all sensitive receivers will comply with worst case noise criteria even during adverse weather conditions except 2 properties (125 and 127 McCredie Road Guildford West NSW). Non compliances are due to applying 5 dBA penalty based on the tonality assessment at these 2 properties (Details in Section 7.4.5 and Appendix G). These properties shows negligible residual noise exceedances (less than 2.0 dB above the stipulated criteria).
- The barrier should be designed to obstruct the direct line-of-sight between the primary noise sources (such as batteries and inverters) and residential properties, using solid materials with a minimum surface density of 10 kg/m², consistent with NPfI guidance. The proposed barrier aligns with the NPfI's noise control hierarchy, which prioritises source control, followed by path controls such as barriers, and receiver-based treatments where required.
- A tonal and low-frequency noise assessment was undertaken in accordance with the EPA Noise Policy for Industry (NPfI). The analysis included one-third octave band review and assessment of any defining tonal characteristics, as well as evaluation of low-frequency content against the NPfI low-frequency screening criteria. The predicted results include tonality penalties at the nearest receivers. More details in Appendix G.
- Operational noise monitoring program should be implemented within three months of the Project commissioning to validate the noise modelling predictions and confirm compliance with applicable noise criteria. No further mitigation measure is required for any of the sensitive receivers at this stage.
- Vibration levels associated with construction activities are expected to be greater than those during operation of BESS equipment at the nearest receivers. Construction vibration is assessed as negligible based on the worst case construction equipment, subsequently operational vibration impacts can be reasonably assumed to be negligible. In summary, operational vibration impacts are expected to remain below thresholds for structural damage and human comfort criterion in accordance with relevant international standards (e.g. DIN4150-3, ISO 2631) and NSW guidelines (e.g. NSW EPA's Assessing Vibration: A Technical Guideline), with compliance anticipated at all times during the day.

9.3 Decommissioning noise

At the end of the 20-year lease or when components become non-functional, the BESS will be decommissioned in line with regulatory requirements. Non-operational equipment will be safely stored and transported to licensed recycling facilities. Following decommission of the BESS installation, the site will be restored to its original condition, with materials reused (aside from the BESS components/ equipment) or recycled where possible.

Decommissioning activities will follow the same construction hours as those used during initial construction. A detailed qualitative assessment of decommissioning impacts will be undertaken once a specific activity schedule is developed.

10 References

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- NSW Environmental Protection Authority Noise Policy for Industry (NPfI) 2017

Appendices



Appendix A

Glossary of terms

Table A 1: Abbreviations

Term	Definition
ABL	Assessment background level
AGL	Above ground level
AVATG	Assessing Vibration: A Technical Guideline
CONCAWE	A noise propagation model developed by the European Oil Company Organisation for Environment, Health and Safety (Belgium).
CoRTN	Calculation of Road Traffic Noise
dB	decibel
dB(A)	A-weighted decibel level
dB(C)	C-weighted decibel level
DDA	Disability Discrimination Act 1992
DECC	Department of Environment Climate Change & Water NSW. Currently named as Department of Planning Housing and Infrastructure
DPE	Department of Planning & Environment, NSW
DEFRA	Department for Environment Food and Rural Affairs, UK
DPHI	Department of Planning Housing and Infrastructure
EPA	Environment Protection Authority, NSW
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EV	Electric Vehicle
FID	Final investment decision
GFA	Gross Floor Area
ICNG	NSW Interim Construction Noise Guidelines (2009)
ISO 9613-2:1996	Acoustics: Attenuation of sound during propagation outdoors, Part 2: General method of calculation
MW	Megawatts
MWh	Megawatt hour
NEM	National Electricity Market
NPfI	New South Wales Noise Policy for Industry (2017)
NSW	New South Wales
OSOM	Oversize over mass equipment
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
PPV	Peak Particle Velocity
RBL	Rating background level

Table A 2: Glossary of acoustic terms

Term	Definition
Assessment Background Level (ABL)	The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night-time) for each day. It is determined in accordance with the methods described in Fact Sheet B of the Noise Policy for Industry (NSW) by calculating the 10 th percentile (lowest 10 th percent) background level (L _{A90}) for each period.
Ambient Noise Level	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. Generally measured as a dB(A) noise level.
The Act	Protection of the Environment Operations Act 1997 (POEO)
Background Noise Level	The A-weighted sound pressure level that is exceeded for 90 percent of the measurement period, L _{A90} .
Background relevant area	A noise sensitive area within a rural area where background levels may be higher than usual. This includes areas where freeway or highway traffic is a significant audible background noise source.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative industrial noise level	The total level of noise from all industrial sources.
Decibel	The decibel is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage, intensity, or other parameters.
dB(A)	The A-weighted sound pressure level in decibels, denoted dB(A) is the unit generally used for the measurement of environmental, transportation or industrial noise. The A-weighting scale approximates the sensitivity of the human ear when exposed to normal levels and correlates well with subjective perception of typical sounds. An increase or decrease in sound level of approximately 10 dB(A) corresponds to a subjective doubling or halving in loudness. A change in sound level of 3 dB(A) is considered subjectively just noticeable and a change of 1 to 2 dB(A) is subjectively not noticeable.
dB (C)	C-weighting is an adjustment made to sound-level measurements that takes account of low-frequency components of noise within the audibility range of humans.
Frequency	The rate of repetition of a sound wave. The unit of frequency is Hertz (Hz), defined as one cycle per second. Human hearing ranges approximately from 20 Hz to 20,000 Hz. Octave bands are the most used frequency bands. For more detailed analysis each octave band may be split into three one-third octave bands or narrow frequency bands.
Habitable Room	Any room of a dwelling or residential building other than a bathroom, laundry, toilet, pantry, walk-in wardrobe, corridor, stair, lobby, photographic darkroom, clothes drying room and other space of a specialised nature occupied neither frequently nor for extended periods.
L _{Aeq, T}	The equivalent continuous A-weighted sound pressure level is the value of the A-weighted sound pressure level of a continuous steady sound that has the same mean square sound pressure level as a sound under consideration with a level that varies with time when determined over the same measurement period.
L _{Aeq, 15min} dB	A-weighted energy averaged noise level over a 15-minute period. Used in the EPA ICNG.
L _{AFmax}	The maximum sound pressure level of an event measured with a sound level meter satisfying AS IEC 61672.1-2004 set to 'A' frequency weighting and fast time weighting
L _{A10, 15min} dB	The A-weighted sound pressure level that is exceeded for 10% of the 15-minute measurement period.
L _{A90, 15min} dB	The A-weighted sound pressure level measured using fast time weighting that is exceeded for 90% of the time over a 15-minute assessment period. This is a measure of background noise.

Term	Definition
LAF90,(day, evening, night) dB	The A-weighted sound pressure level measured using fast time weighting that is exceeded for 90% of the time over a day, evening or night-time assessment period. This is a measure of background noise.
Low frequency	Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum.
Median	The middle value in a number of values sorted in ascending or descending order. Hence, for an odd number of values, the value of the median is simply the middle value. If there is an even number of values, the median is the arithmetic average of the two middle values.
Meteorological conditions	Wind and temperature-inversion conditions.
Noise	Noise is unwanted, harmful, or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid, or solid.
Noise impact assessment (NIA)	The component of an Environmental Impact Statement, Environmental Assessment, Statement of Environmental Effects, or licence application that considers the impacts of noise resulting from a development or activity.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels which the proponent has predicted can be met during the environmental assessment.
Noise-sensitive land uses	Land uses that are sensitive to noise, such as residential areas, churches, schools, and recreation areas.
Noise catchment area (NCA)	NCAs are areas where receivers have a similar land use and ambient noise environment and are applicable to residential receivers only.
Noise Management Level (NML)	These are the guidance noise levels for airborne noise at sensitive land uses during any construction work as prescribed in the Interim Construction Noise Guideline
Non-compliance	Any exceedance of a consent/licence limit is considered a non-compliance. However, the type of regulatory action taken by a regulatory authority will depend on a number of factors, in accordance with the authority's prosecution policies and guidelines.
1/1 Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit. For example, the 1000 Hz (1 kHz) octave band contains noise energy at all frequencies from 707 to 1414 Hz.
1/3 Octave Band	The one-third octave bands are subintervals of one octave. An octave is spanned by three 1/3-octave bands.
Project noise trigger levels	Target noise levels for a particular noise-generating facility during its operational phase. They are based on the most stringent of the project intrusiveness noise level or the project amenity noise level.
Rating Background Level (RBL)	The Rating Background Level for each period is the median value of the ABL values for the period over all the days measured. There is therefore an RBL value for each period – daytime, evening and night-time.
Residence	A lawful and permanent structure erected in a land-use zone that permits residential use (or for which existing use rights under the EP&A Act apply) where a person/s permanently reside and is not, nor associated with, a commercial undertaking such as caretakers' quarters, hotel, motel, transient holiday accommodation or caravan park.
Reasonably most affected location	Locations that experience (or will experience) the greatest noise impact from the noise source under consideration. In determining these locations, one needs to consider existing background levels, exact noise source location(s), distance from source (or proposed source) to receiver, and any shielding between source and receiver. This should not be construed to mean that limits only apply at the worst, most-affected location
Receiver	The noise-sensitive land use at which noise from a development can be heard.

Term	Definition
Sound Power	The total airborne sound energy emitted by a sound source per unit time. The unit of sound power is Watts (W). The sound power level allows us to objectively compare the sound output of different devices, without any knowledge of the environment in which they were tested or the distance at which measurements were taken.
Sound pressure or acoustic pressure	Sound pressure at a point is the local pressure deviation from the ambient (average or equilibrium) atmospheric pressure, caused by a sound wave. In air, sound pressure can be measured using a microphone, and in water with a hydrophone. The SI unit of sound pressure is the pascal (Pa).
Sound Pressure Level (SPL or L_p)	Sound pressure level is equal to 10 times the logarithm (to base 10) of the ratio of the rms sound pressure squared to a reference sound pressure squared. The reference value for sound pressure levels is 20 μPa. $L_p = 10 \log_{10} \frac{p^2}{p_0^2}$
Sound Power Level (SWL or L_w)	Sound power level is equal to 10 times the logarithm (to base 10) of the ratio of the rms sound power to a reference sound power. the reference value for sound power levels is 1 pW. $L_w = 10 \log_{10} \frac{W}{W_0}$
Tenth (10 th) percentile method	Method to establish the rating background levels as described in the Fact Sheet B of the NSW Noise Policy for Industry
Tonality	Sound containing a prominent discrete frequency or frequencies and characterised by a definite pitch.
Temperature inversion	A factor that can impact sound propagation over long distances is temperature gradients in the atmosphere. On a typical sunny afternoon, air is warmest near the ground and temperature decreases at higher altitudes. This temperature gradient causes sound waves to refract upward, away from the ground and results in lower noise levels being heard at the listener's position. In the evening, this temperature gradient will reverse, resulting in cooler temperatures near the ground. This condition, often referred to is a temperature inversion will cause sound to bend downward toward the ground and results in louder noise levels at the listener position.
Wind gradient	Wind alters sound propagation by the mechanism of refraction; that is, wind bends sound waves. Wind nearer to the ground moves more slowly than wind at higher altitudes, due to surface characteristics such as hills, trees, and man-made structures that interfere with the wind. This wind gradient, with faster wind at higher elevation and slower wind at lower elevation causes sound waves to bend downward when they are traveling to a location downwind of the source and to bend upward when traveling toward a location upwind of the source. Waves bending downward means that a listener standing downwind of the source will hear louder noise levels than the listener standing upwind of the source. This phenomenon can significantly impact sound propagation over long distances and when wind speeds are high.

Indicative noise levels of typical sources



Qualitative interpretation of construction noise impacts

This qualitative description of construction noise impacts has been provided to assist interpretation of the results presented in this report, and to facilitate understanding of the level of impact for affected receivers. The qualitative descriptions are:

Table A 3 Qualitative interpretation of construction noise impacts

$L_{Aeq}(15\text{minute})$	Perception by a human being
5 to 10 dB(A) above the background	Noticeable.
10 to 20 dB(A) above the background	Clearly noticeable
20 to 30 dB(A) above the background	Moderately intrusive
More than 30 dB(A) above the background	Highly intrusive

Table A 4 Glossary of vibration terms

Term	Definition
Amplitude	The measurement of energy or movement in a vibrating object. Amplitude is measured and expressed in three ways: ■ Displacement (typically in mm Pk-Pk); ■ Velocity (typically in mm/s Pk); and ■ Acceleration (typically in m/s² RMS). Amplitude is also the y-axis of the vibration time waveform and spectrum; it helps define the severity of the vibration.
Frequency	The repetition rate of a periodic vibration, per unit of time, determined by taking the reciprocal of the period (T). Frequency is expressed in: Hz (how many cycles per second); Frequency is also the x-axis of the vibration spectrum.
Hertz (Hz)	Vibration can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. The frequency of vibration and sound is measured in hertz (Hz). Once hertz is one cycle per second. Structural Vibration is generally measured over the frequency range from 1Hz to 500Hz (0.5kHz).
Peak to Peak (Pk-Pk)	This is the measure of the vibration amplitude, maximum to minimum, equal to twice of the RMS value of a sine wave.
Peak particle velocity (PPV or $V_{i\text{ max}}$)	The maximum resultant particle velocity $V_{i\text{ max}}$ characterizes the vibration severity
Peak vector sum	The resultant particle velocity magnitude or vector sum of the transverse, vertical and longitudinal particle velocity components.
RMS velocity	For most applications where there is continuous vibration, vibration is measured in terms of root mean square RMS velocity (mm/s).

Appendix B

Equipment noise data

Table B 1: Operational equipment noise data (Silenced / With Silencer Kit)

Parent Item	Data type	No. of units on site	Noise Data Type	Octave Band Centre Frequency (Hz) Linear weighted dB(Z)																										Overall sound power level dB(A)	
				25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k		10k
Battery	Silenced / With noise control kit	60	SWL/Unit	-	-	-	80	85	90	83	83	82	79	77	74	71	69	67	66	67	72	61	60	59	58	58	58	54	-	-	79
Power Transformer / Inverter		24	SWL/Unit	75	79	77	82	81	80	84	75	72	74	74	77	69	67	67	65	64	60	58	57	71	80	60	63	74	68	69	83
Battery	Unsilenced / Without noise control kit / Equipment as it is	N/A	SWL/Unit	-	-	-	78	83	87	94	84	84	88	86	85	83	81	81	81	80	77	75	74	72	70	68	65	-	-	90	
Power Transformer / Inverter		N/A	SWL/Unit	87	88	85	84	84	84	85	81	80	82	82	83	82	80	75	77	74	73	74	72	77	87	66	70	80	67	67	91

Note: N/A Equipment not used in the project. Provided for reference only.

Appendix C

Long term noise monitoring



Ambient noise monitoring results - NPfl & ICNG time periods			
	Day 11 hr	Evening 4 hr	Night 9 hr
RBLs L _{A90} , period dB	44	45	45

Ambient noise monitoring results - RNP time periods		
	Day 15 hr	Night 9 hr
L _{Aeq} period dB	50	48
L _{Aeq} , 1hr dB	51	50

Notes:

Ambient noise during the observation period was generally low, A faint, continuous industrial or machinery-type hum was audible from the north

Time periods for NPfl & ICNG

Day 7 am to 6 pm Monday to Saturday
8 am to 6 pm Sundays and Public Holidays

Evening 6 pm to 10 pm

Night Remaining periods

Time periods for RNP

Day 7 am to 10 pm

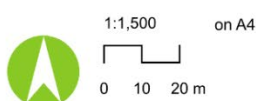
Night 10 pm to 7 am

Legend

Unattended Noise Monitoring (Loggers)



Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



BESS Noise Study- Guildford West Noise Impact Assessment

Projection: GDA2020 / MGA zone 56 (EPSG:7856)

Noise monitoring location - Logger L1

Location ID:		L1			Aerial Image 	
Address:		51 Hemingway Cres, Fairfield NSW 2165				
Logger Model Name:		Rion NL-21	Latest calibration date:			
Logger Serial No.:		709528	Time weighting:	Fast		
Start Date:		21/07/2025	Frequency Weighting:	A		
Finish Date:		5/08/2025	Location:	Back Yard		
Logger Notes:						
The monitoring location is situated in a very quiet residential suburb and positioned in the backyard of the property, facing towards the side boundary of the site. Ambient noise during the observation period was generally low, with natural sounds such as bird calls being the most prominent. A faint, continuous industrial or machinery-type hum was audible from the north, likely originating from a distance, towards the side of the site.						
Ambient noise monitoring results - NPfl & ICNG time periods						Logger Photo 
	Day 11 hr	Evening 4hr	Night 9 hr			
RBLs LA90, period dB	44	45	45			
Ambient noise monitoring results - RNP time periods						
	Day 15 hr	Night 9hr				
LAeq period dB	50	52				
LA1hr period dB	60	57				
Time periods for NPfl & ICNG						
Day		7 am to 6 pm Monday to 8 am to 6 pm Sundays and Public Holidays				
Evening		6 pm to 10 pm				
Night		remaining periods				
Time periods for RNP						
Day		7am to 10 pm				
Night		10 pm to 7am				

Location ID:	L1
Address:	51 Hemingway Cres, Fairfield NSW 2165

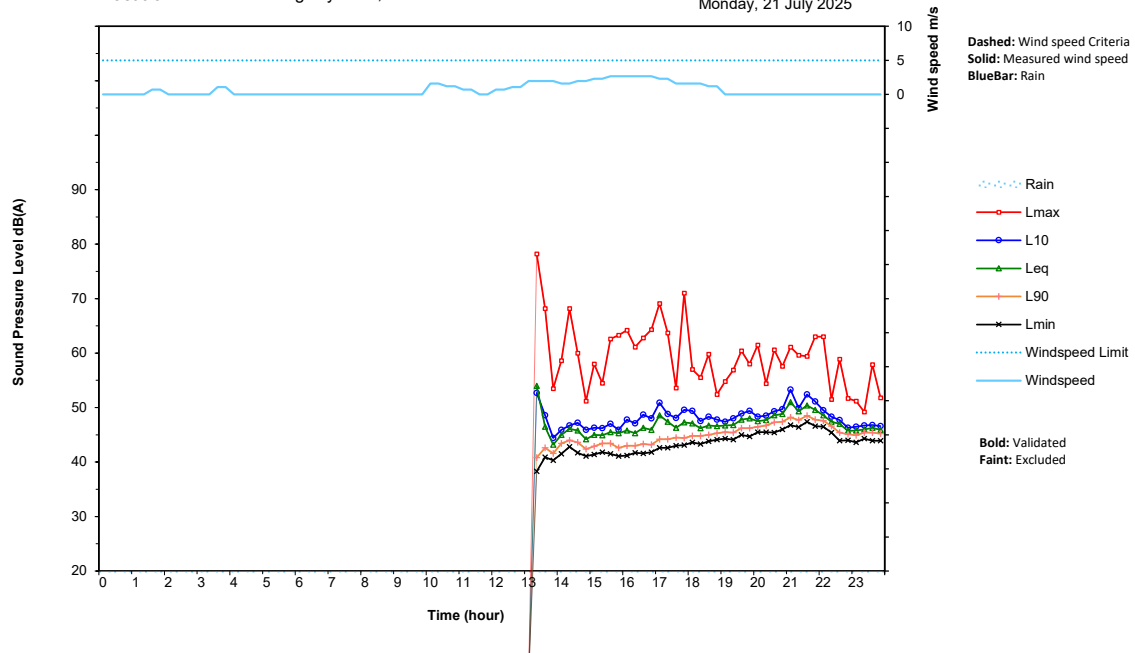
NPfl based noise monitoring results

Date	L _{A90} Assessment Background Levels dB			L _{Aeq} Ambient Noise Levels dB		
	Day	Evening	Night	Day	Evening	Night
Monday, 21 July 2025		45	45		48	48
Tuesday, 22 July 2025	46	47		50	49	
Wednesday, 23 July 2025	44	46	45	49	48	47
Thursday, 24 July 2025	42	44	46	49	47	49
Friday, 25 July 2025	41	45		49	48	
Saturday, 26 July 2025	46	47	47	50	50	49
Sunday, 27 July 2025	47	47	46	51	50	50
Monday, 28 July 2025	47	47	47	51	50	49
Tuesday, 29 July 2025	44	46	44	50	48	47
Wednesday, 30 July 2025						
Thursday, 31 July 2025		43	43		46	46
Friday, 1 August 2025	42			48		
Saturday, 2 August 2025						
Sunday, 3 August 2025		44			47	
Monday, 4 August 2025	40	43	41	48	46	44
	RBL			Logarithmic average		
	44	45	45	50	48	48

Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

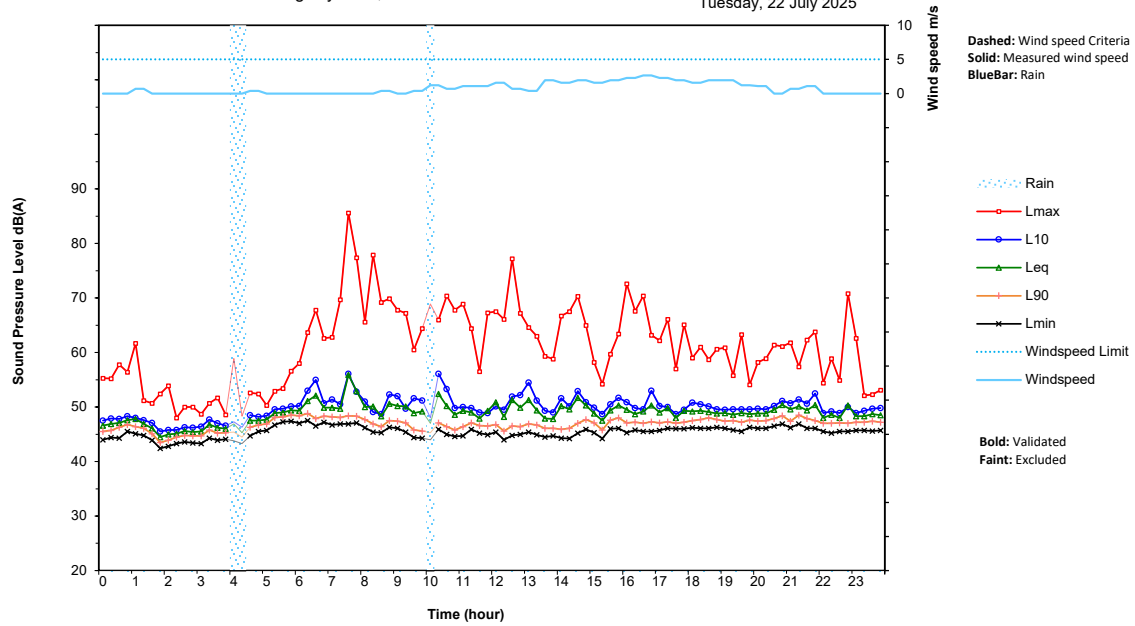
Monday, 21 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

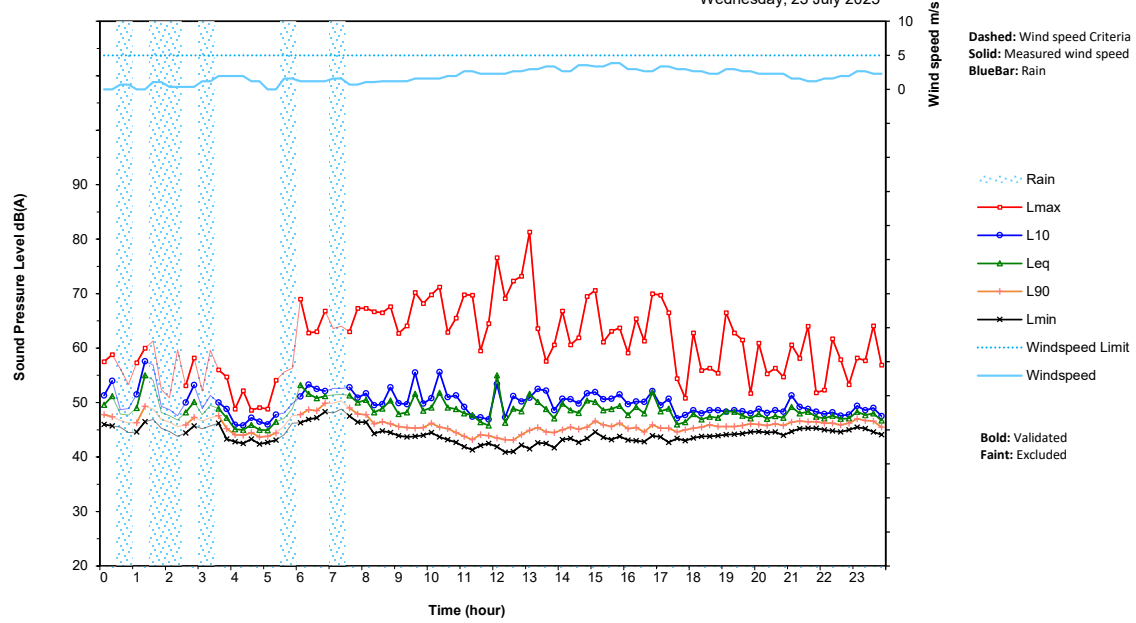
Tuesday, 22 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

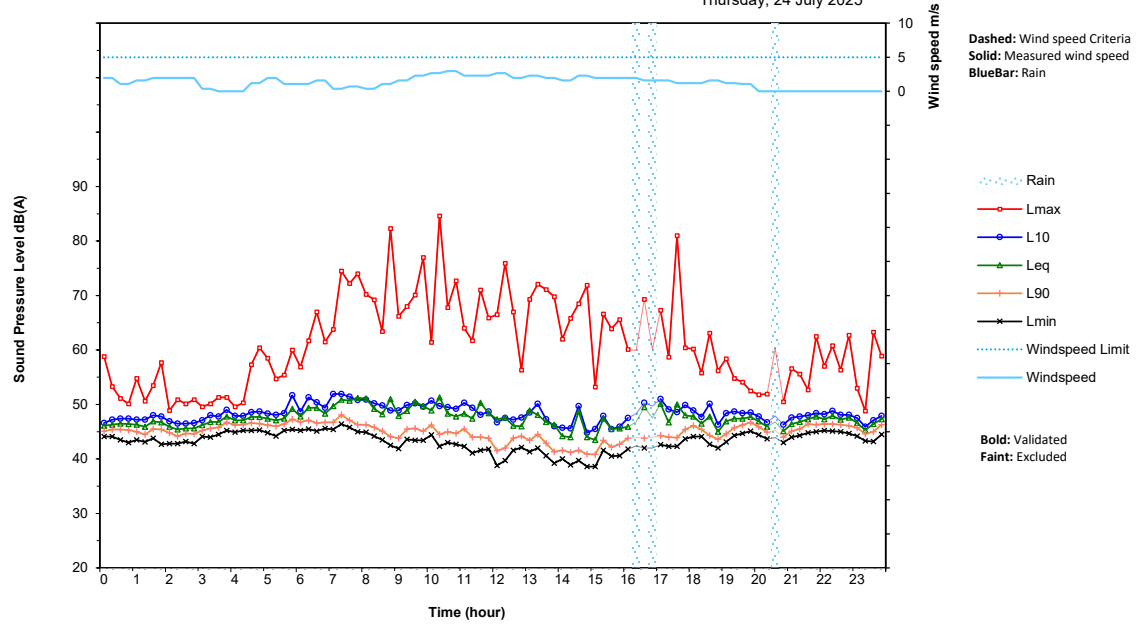
Wednesday, 23 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

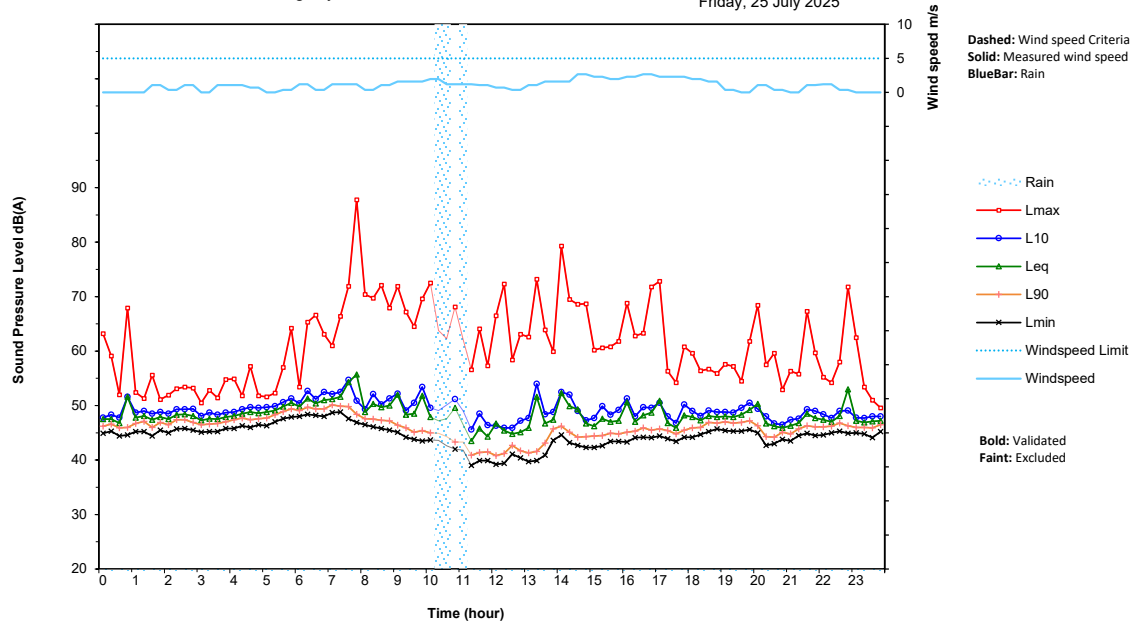
Thursday, 24 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

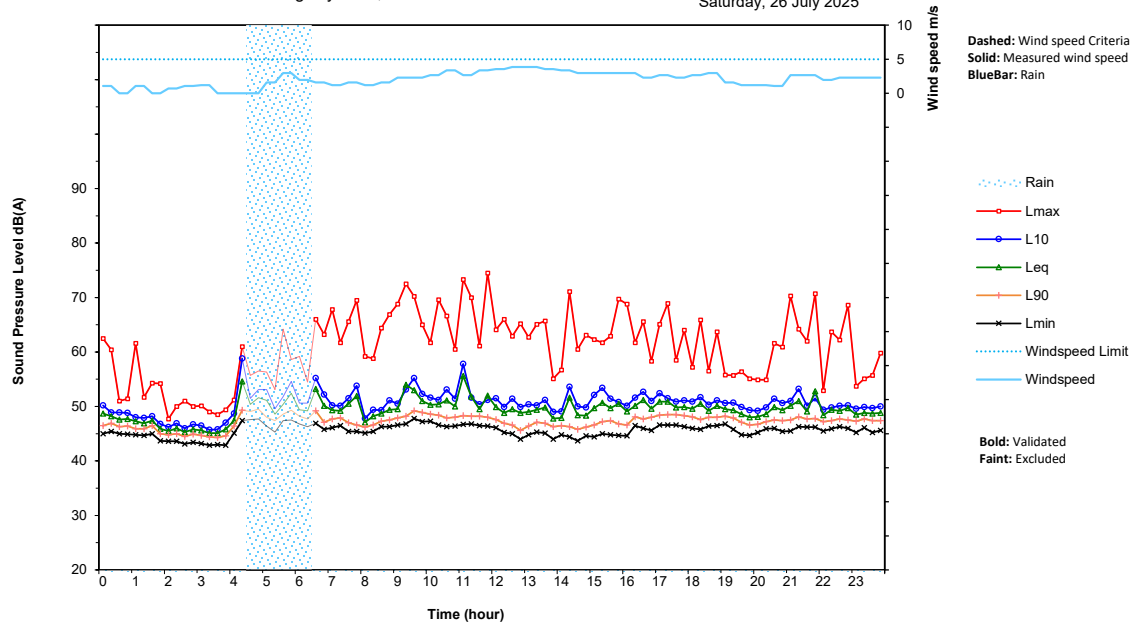
Friday, 25 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

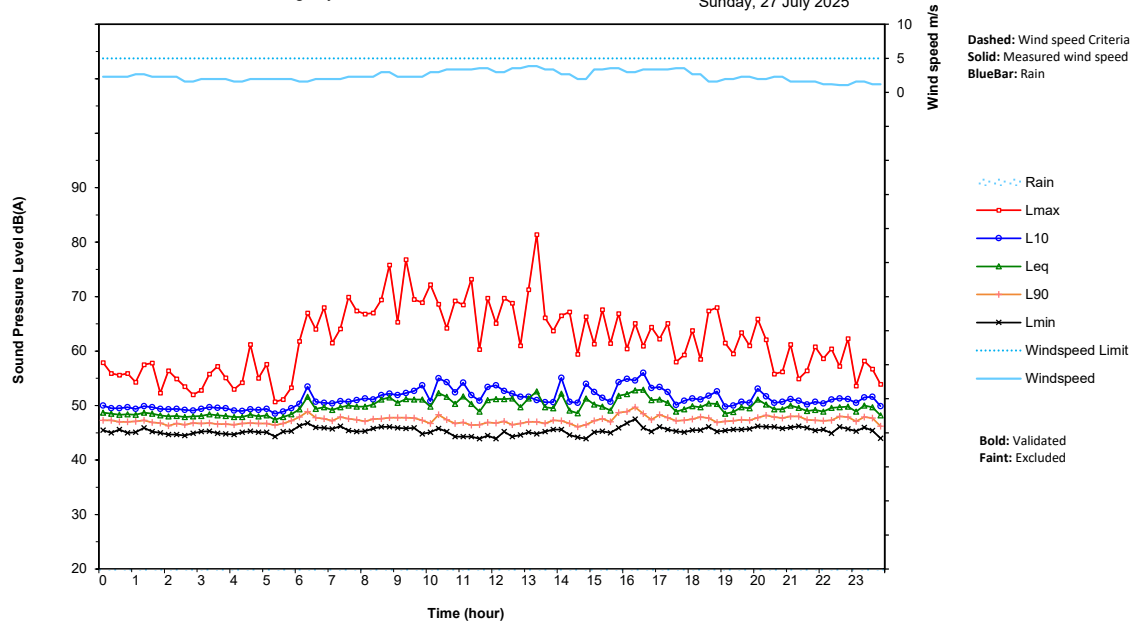
Saturday, 26 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

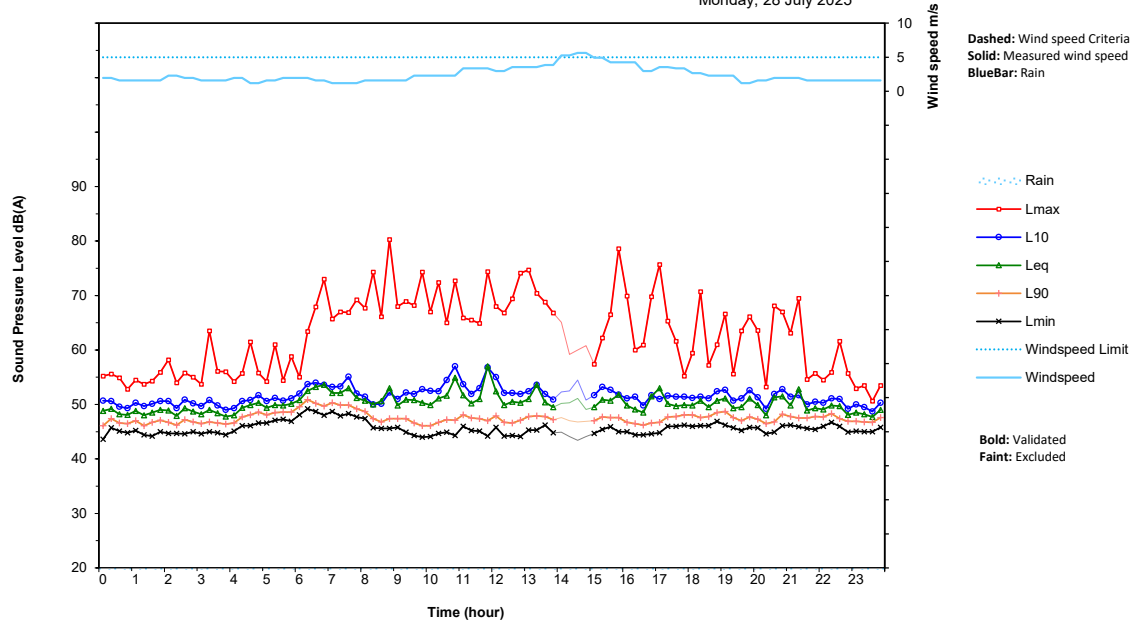
Sunday, 27 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

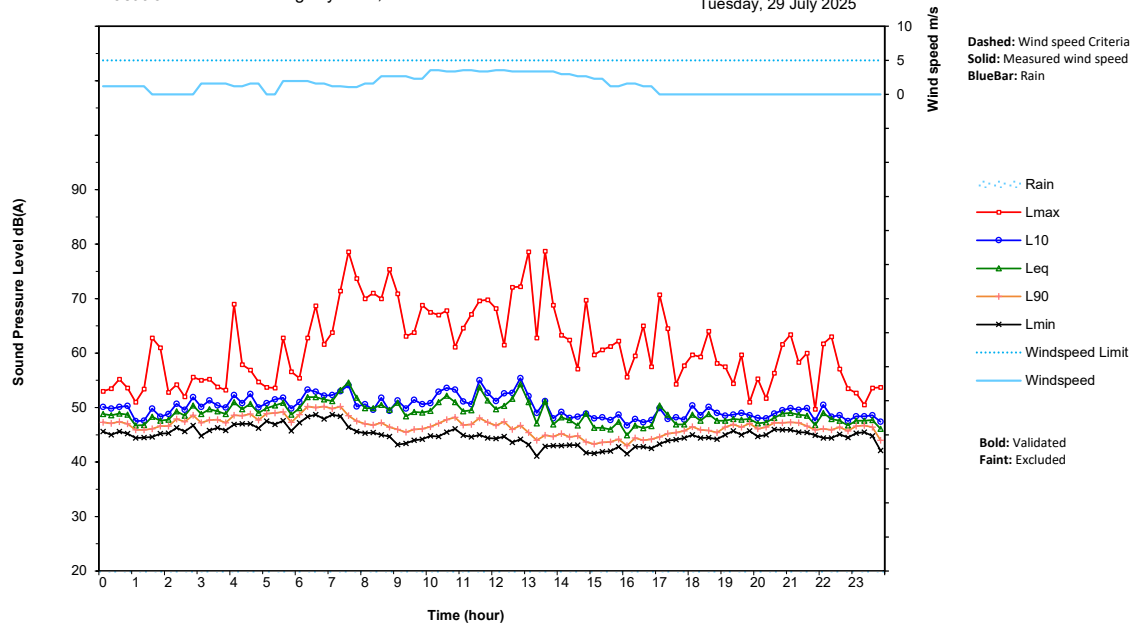
Monday, 28 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

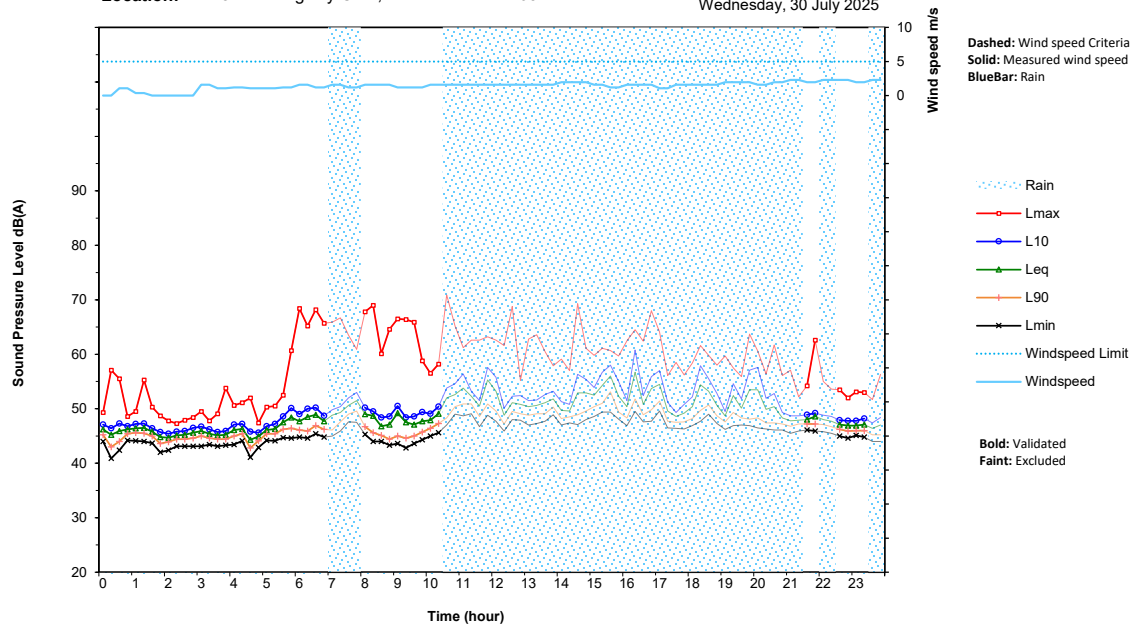
Tuesday, 29 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

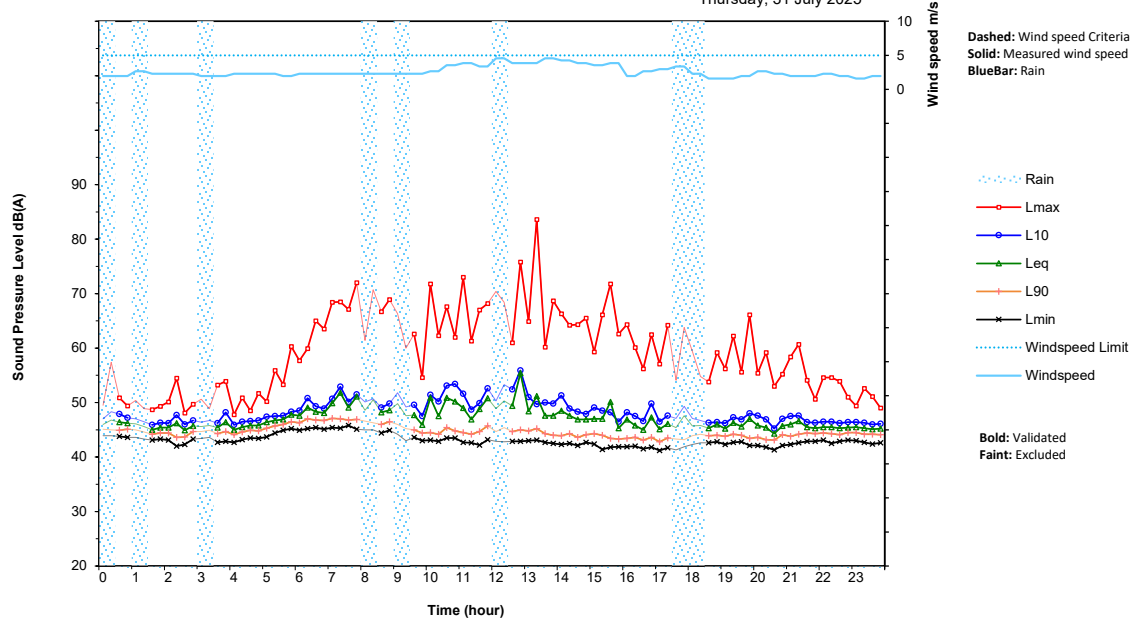
Wednesday, 30 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

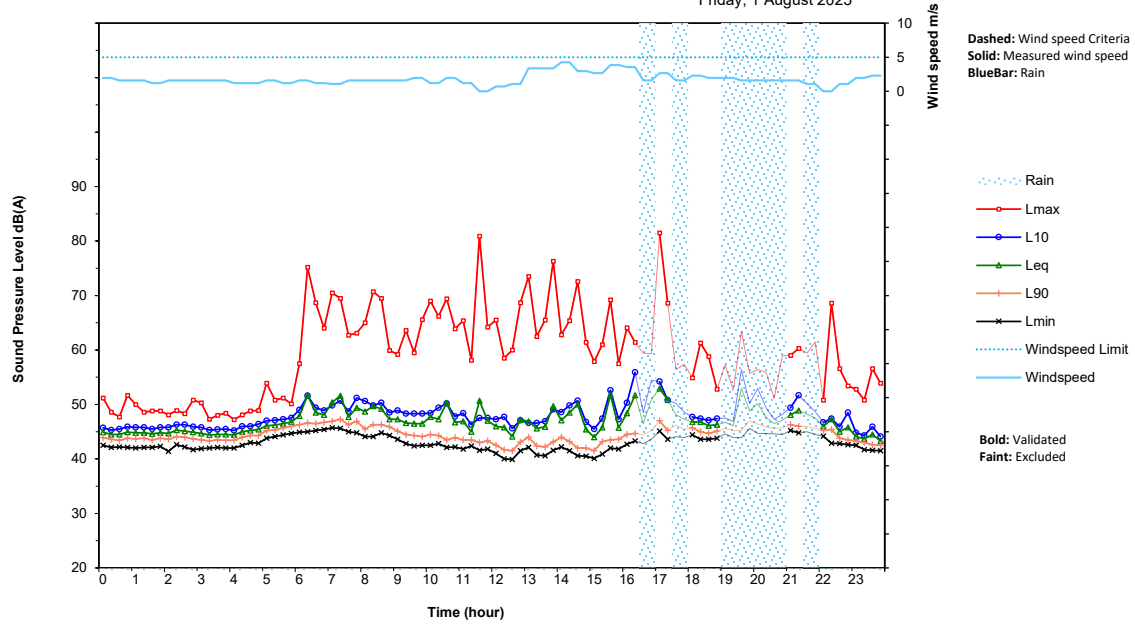
Thursday, 31 July 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

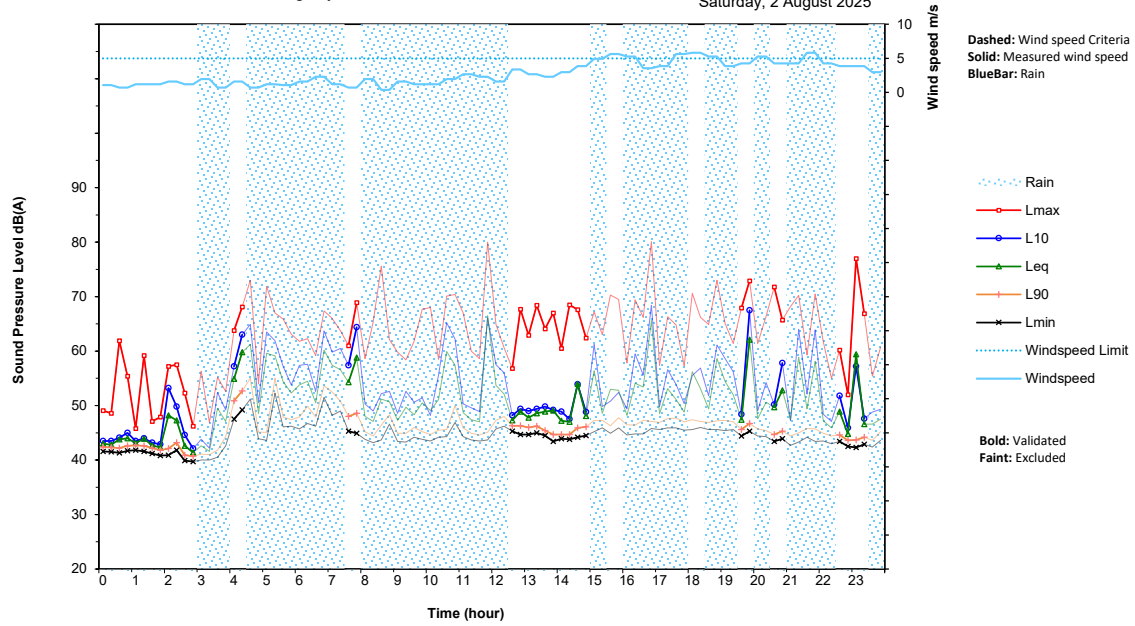
Friday, 1 August 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

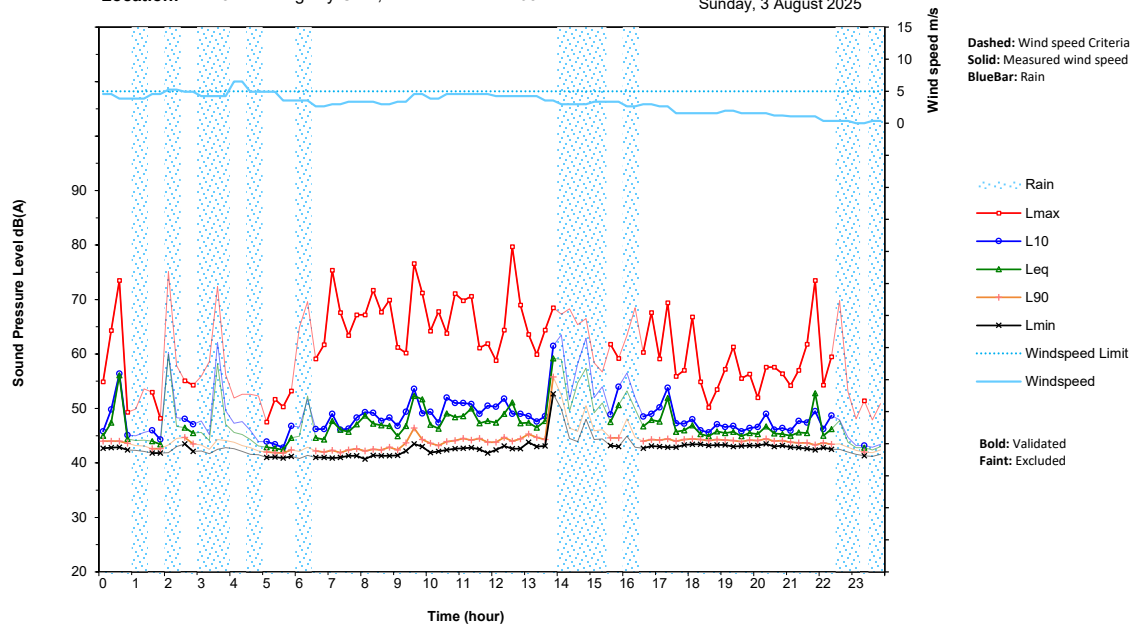
Saturday, 2 August 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

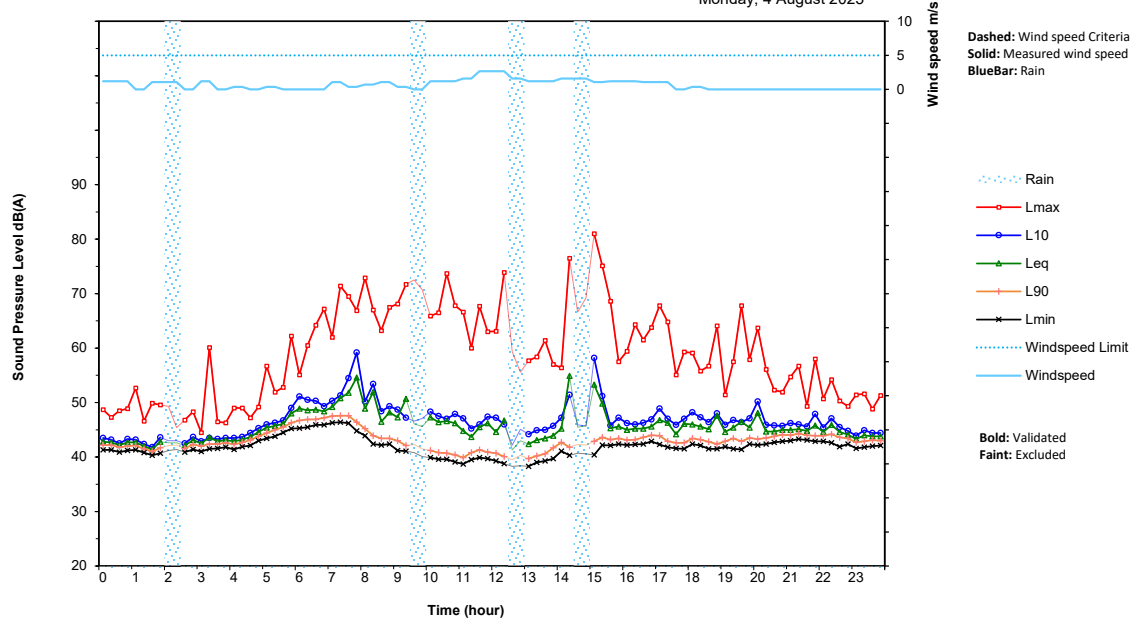
Sunday, 3 August 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

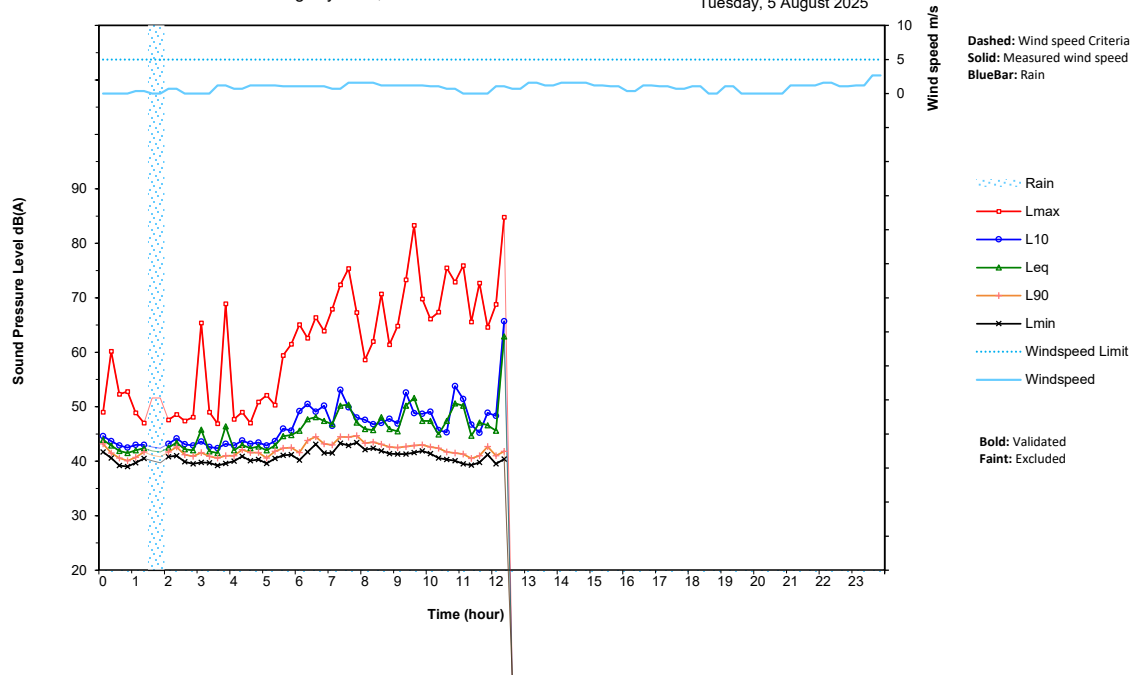
Monday, 4 August 2025



Logger ID: L1

Location: 51 Hemingway Cres, Fairfield NSW 2165

Tuesday, 5 August 2025





Ambient noise monitoring results - NPfl & ICNG time periods			
RBLs L_{A90} , period dB	Day 11 hr	Evening 4 hr	Night 9 hr
	52	47	45

Ambient noise monitoring results - RNP time periods		
L_{Aeq} period dB	Day 15 hr	Night 9 hr
	66	61
L_{Aeq} , 1hr dB	67	66

Notes:

The monitoring location is positioned adjacent to a very busy roadway with high traffic volumes throughout the observation period. Heavy vehicles, including trucks, trailers, and vans, were the dominant traffic type

Time periods for NPfl & ICNG

Day 7 am to 6 pm Monday to Saturday
8 am to 6 pm Sundays and Public Holidays

Evening 6 pm to 10 pm

Night Remaining periods

Time periods for RNP

Day 7 am to 10 pm

Night 10 pm to 7 am

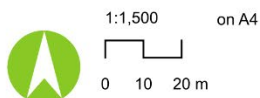
Legend

Site Boundary

Unattended Noise Monitoring (Loggers)



Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



BESS Noise Study- Guildford West Noise Impact Assessment

Projection: GDA2020 / MGA zone 56 (EPSG:7856)

Noise monitoring location - Logger L2

Location ID:	L2			Aerial Image 										
Address:	U1, 111 McCredie Rd, Guildford West NSW 2161													
Logger Model Name:	SVANTEK 979	Latest calibration date:												
Logger Serial No.:	35873	Time weighting:	Fast											
Start Date:	21/07/2025	Frequency Weighting:	A											
Finish Date:	5/08/2025	Location:	Front Yard											
Logger Notes: The monitoring location is positioned adjacent to a very busy roadway with high traffic volumes throughout the observation period. Heavy vehicles, including trucks, trailers, and vans, were the dominant traffic type, with no discernible quiet periods during either the logger deployment or the attended measurement session. Traffic volumes were manually counted during the attended measurement over a one-minute interval. The count recorded was as follows: Cars: 10; Trucks: 17 The high proportion of heavy vehicles indicates that road traffic noise is likely a significant contributor to the measured noise levels at this location.														
Ambient noise monitoring results - NPfl & ICNG time periods <table><tr><td></td><td>Day 11 hr</td><td>Evening 4hr</td><td>Night 9 hr</td><td rowspan="2"></td></tr><tr><td>RBLs $L_{A90, \text{period}}$ dB</td><td>52</td><td>47</td><td>45</td></tr></table>						Day 11 hr	Evening 4hr	Night 9 hr		RBLs $L_{A90, \text{period}}$ dB	52	47	45	
	Day 11 hr	Evening 4hr	Night 9 hr											
RBLs $L_{A90, \text{period}}$ dB	52	47	45											
Ambient noise monitoring results - RNP time periods <table><tr><td></td><td>Day 15hr</td><td>Night 9 hr</td><td rowspan="3"></td></tr><tr><td>$L_{Aeq \text{ period}}$ dB</td><td>74.1</td><td>71.0</td></tr><tr><td>$L_{Aeq, 1hr}$ dB</td><td>75.0</td><td>74.3</td></tr></table>						Day 15hr	Night 9 hr		$L_{Aeq \text{ period}}$ dB	74.1	71.0	$L_{Aeq, 1hr}$ dB	75.0	74.3
	Day 15hr	Night 9 hr												
$L_{Aeq \text{ period}}$ dB	74.1	71.0												
$L_{Aeq, 1hr}$ dB	75.0	74.3												
Time periods for NPfl & ICNG <table><tr><td>Day</td><td>7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays</td></tr><tr><td>Evening</td><td>6 pm to 10 pm</td></tr><tr><td>Night</td><td>remaining periods</td></tr></table> Time periods for RNP <table><tr><td>Day</td><td>7am to 10 pm</td></tr><tr><td>Night</td><td>10 pm to 7am</td></tr></table>					Day	7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays	Evening	6 pm to 10 pm	Night	remaining periods	Day	7am to 10 pm	Night	10 pm to 7am
Day	7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays													
Evening	6 pm to 10 pm													
Night	remaining periods													
Day	7am to 10 pm													
Night	10 pm to 7am													
Ausconnex BESS Noise logger L2														

Location ID:	L2
Address:	U1, 111 McCredie Rd, Guildford West NSW 2161

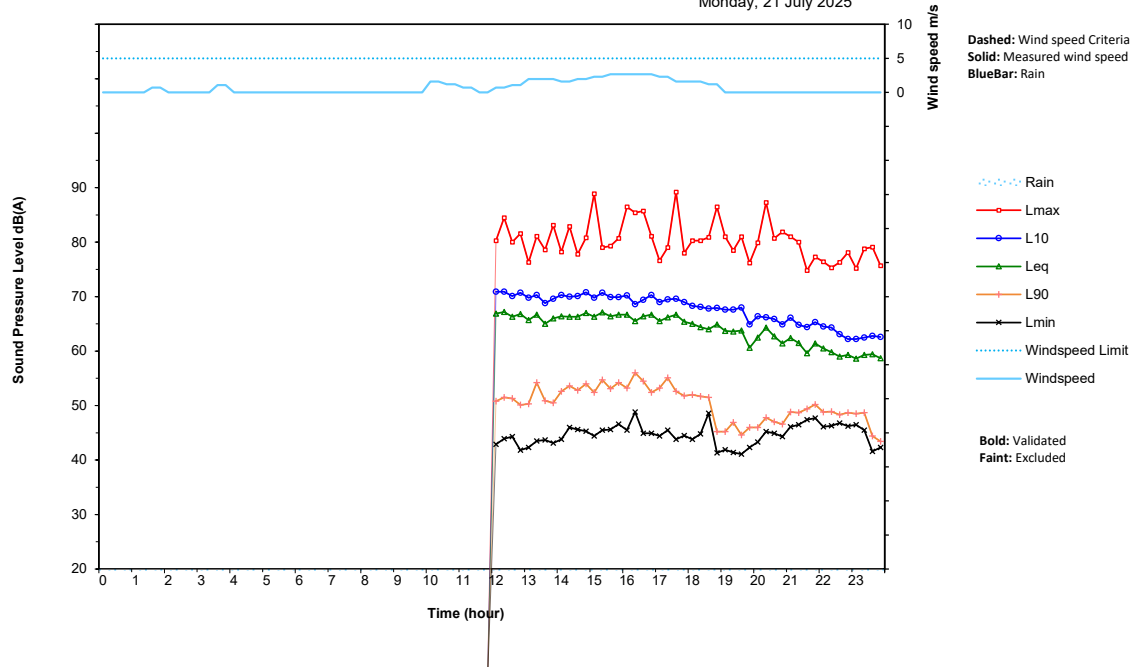
NPfl based noise monitoring results

Date	L _{A90} Assessment Background Levels dB			L _{Aeq} Ambient Noise Levels dB		
	Day	Evening	Night	Day	Evening	Night
Monday, 21 July 2025		45	43		63	62
Tuesday, 22 July 2025	52	45		67	63	
Wednesday, 23 July 2025	52	48	45	67	64	62
Thursday, 24 July 2025	52	48	46	67	63	62
Friday, 25 July 2025	51	43		67	63	
Saturday, 26 July 2025	49	46	41	64	61	56
Sunday, 27 July 2025	49	47	45	63	61	61
Monday, 28 July 2025	52	48	46	66	63	62
Tuesday, 29 July 2025	53	48	45	67	63	62
Wednesday, 30 July 2025						
Thursday, 31 July 2025		48	46		63	62
Friday, 1 August 2025	52			67		
Saturday, 2 August 2025						
Sunday, 3 August 2025		46			62	
Monday, 4 August 2025	52	44	39	68	63	62
	RBL			Logarithmic average		
	52	47	45	66	63	62

Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

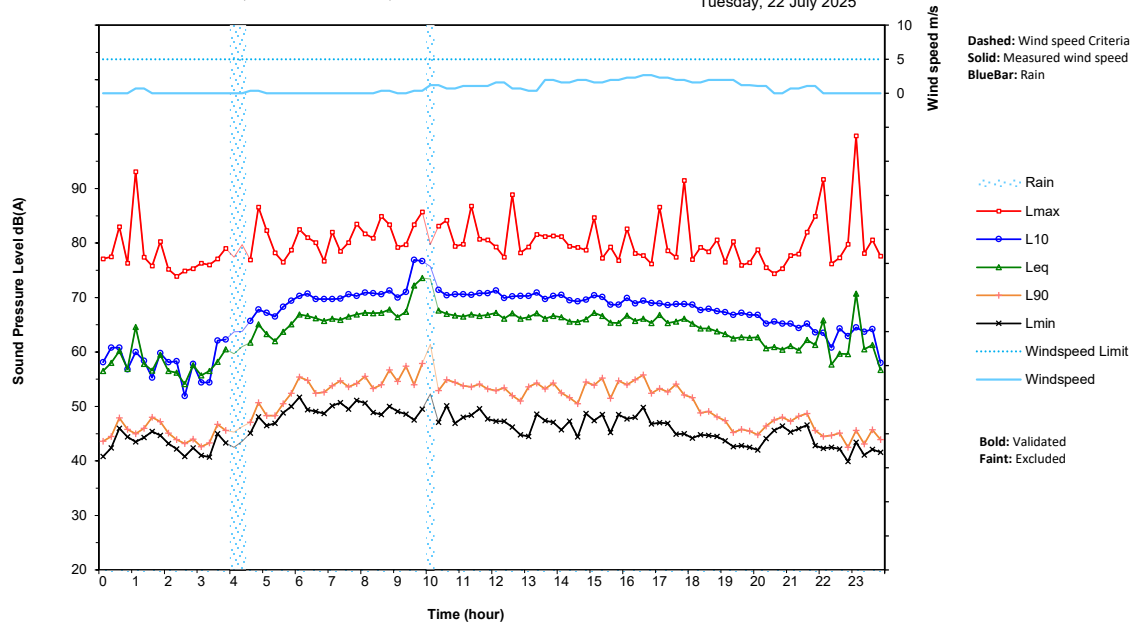
Monday, 21 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

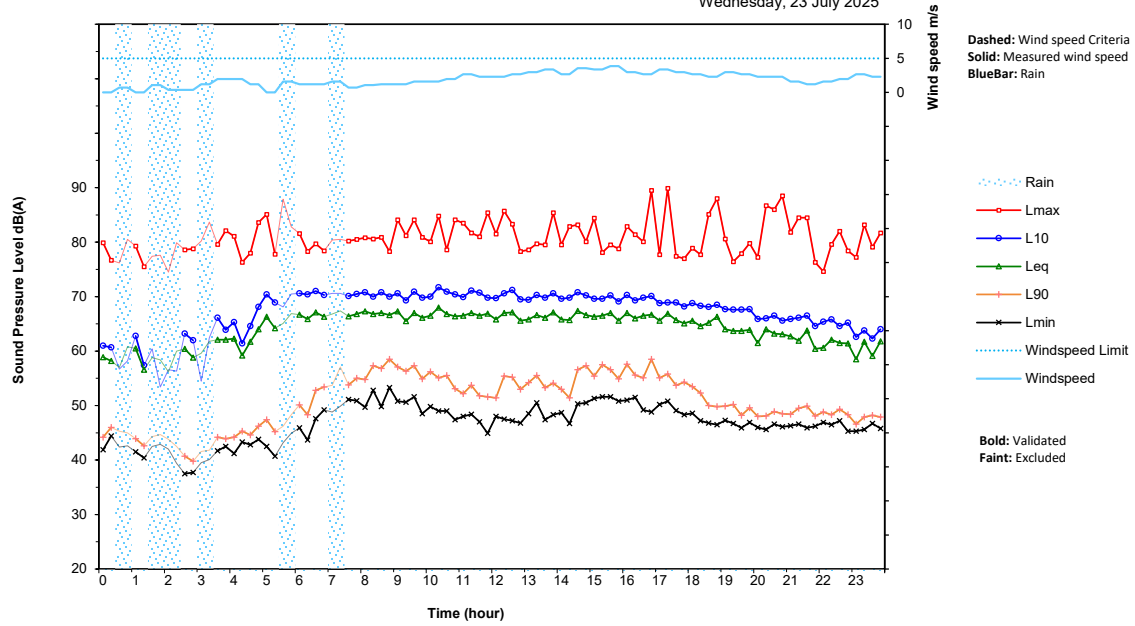
Tuesday, 22 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

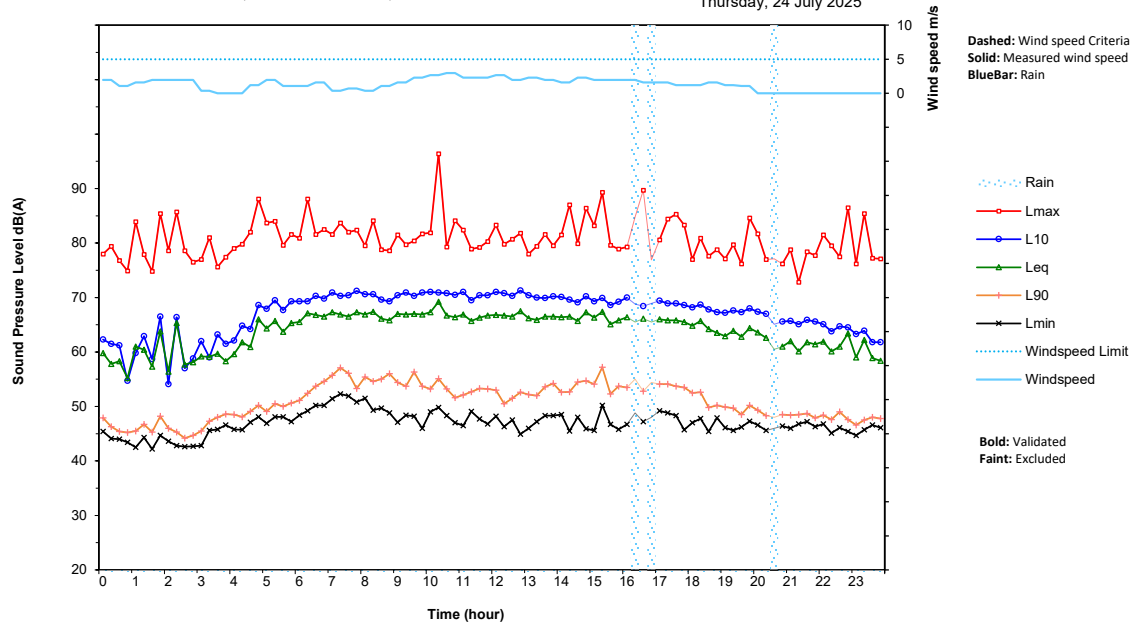
Wednesday, 23 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

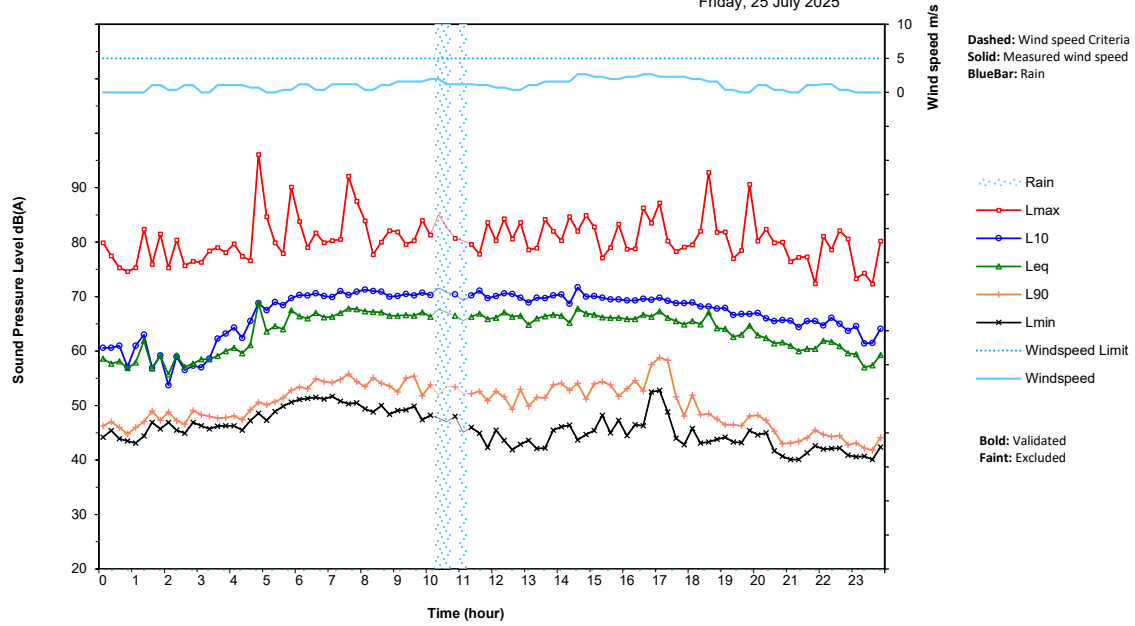
Thursday, 24 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

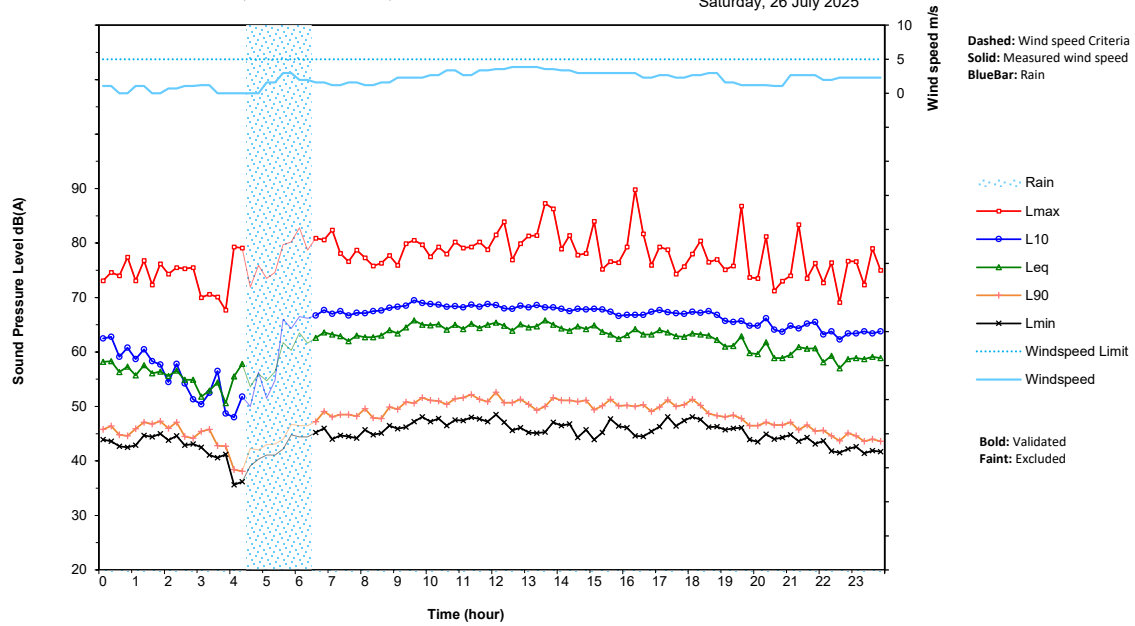
Friday, 25 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

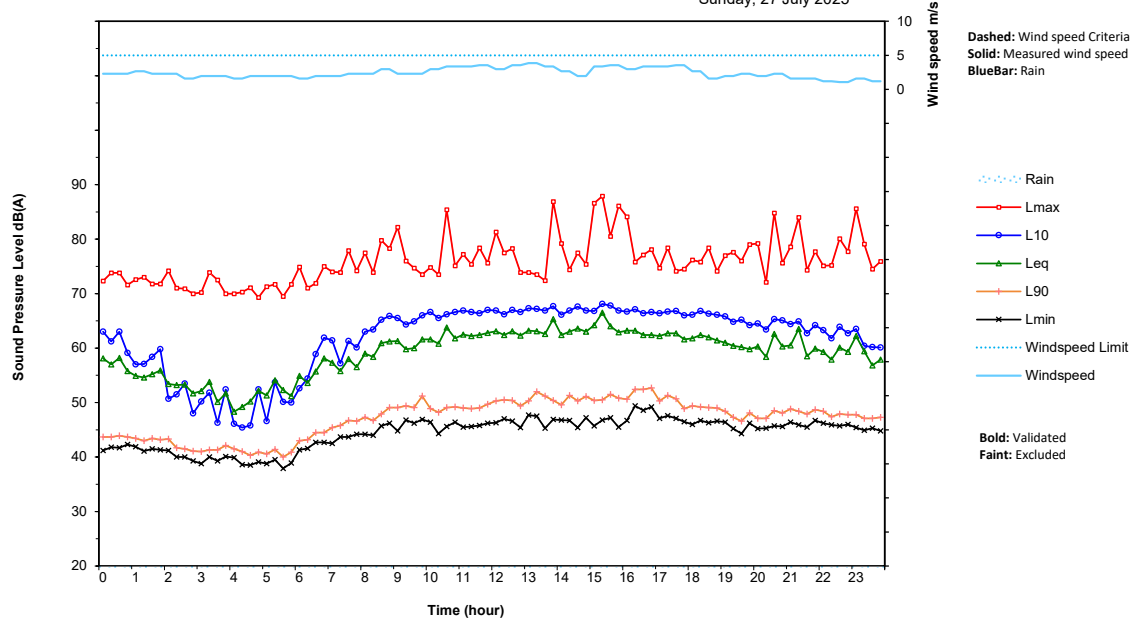
Saturday, 26 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

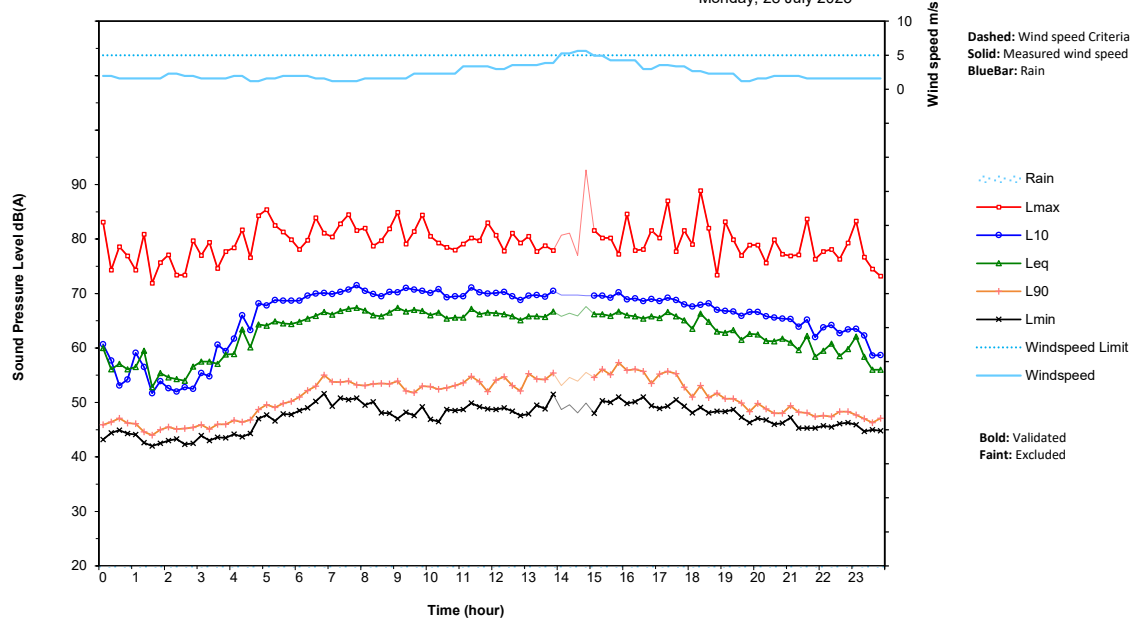
Sunday, 27 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

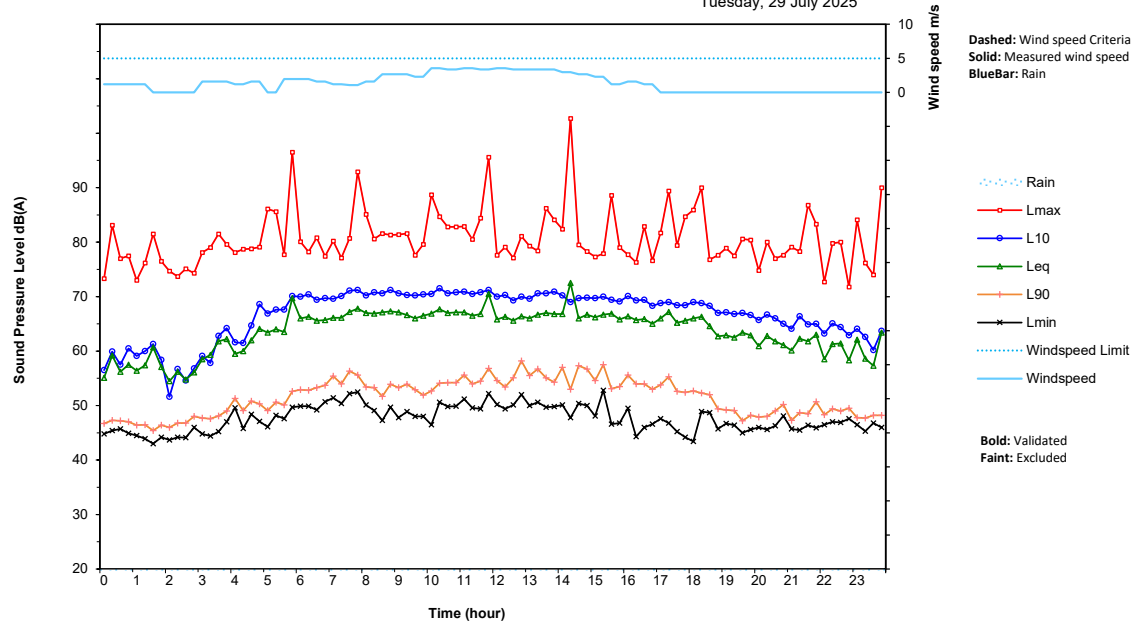
Monday, 28 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

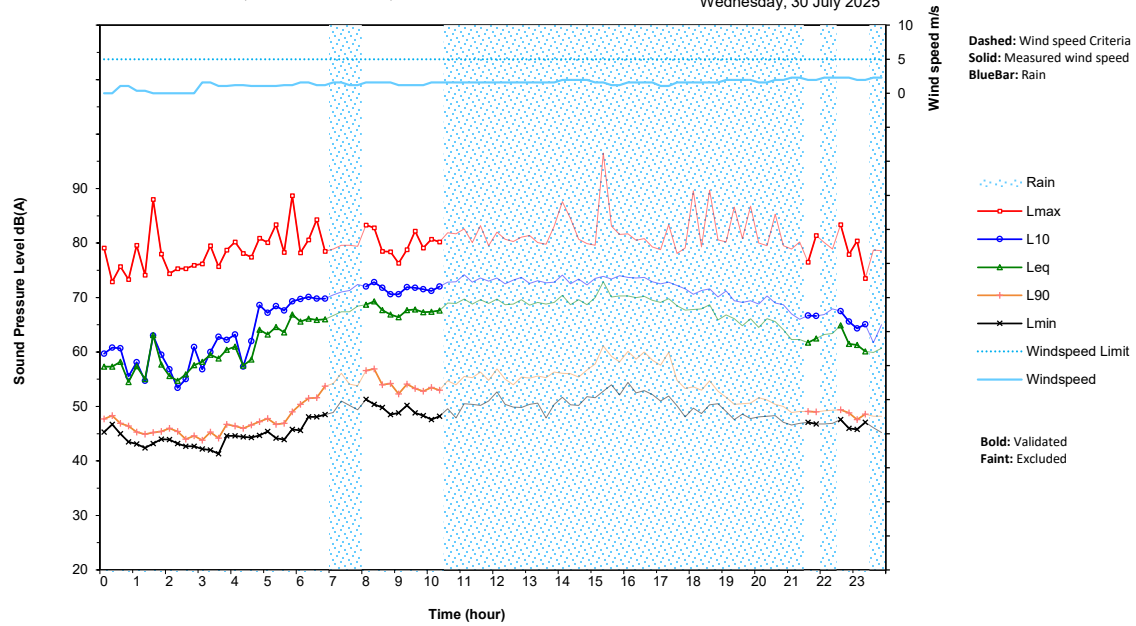
Tuesday, 29 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

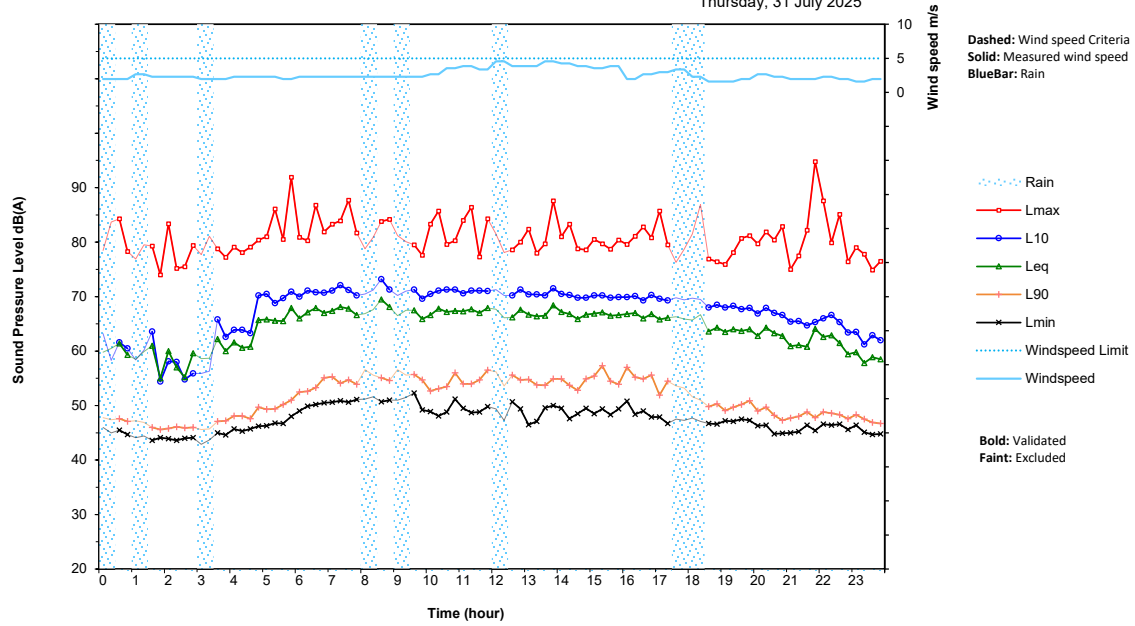
Wednesday, 30 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

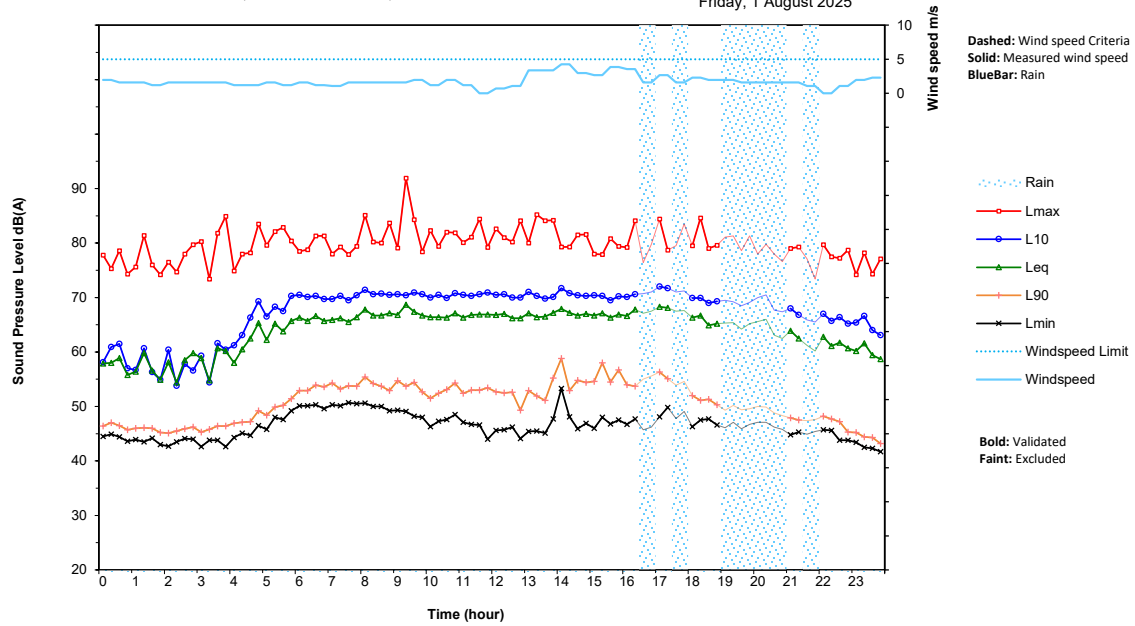
Thursday, 31 July 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

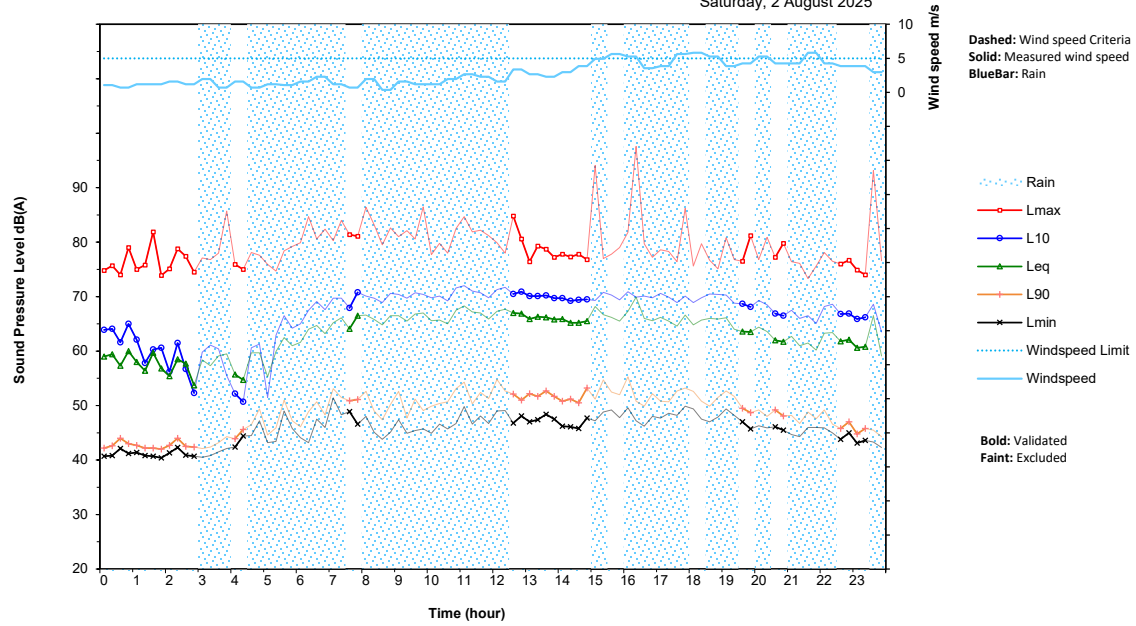
Friday, 1 August 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

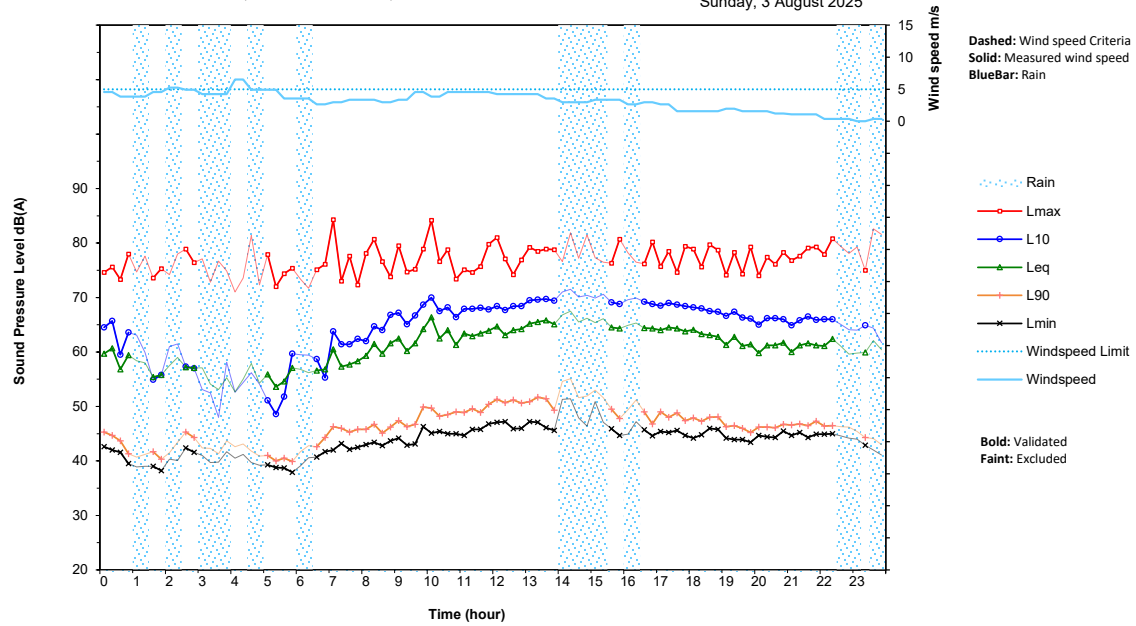
Saturday, 2 August 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

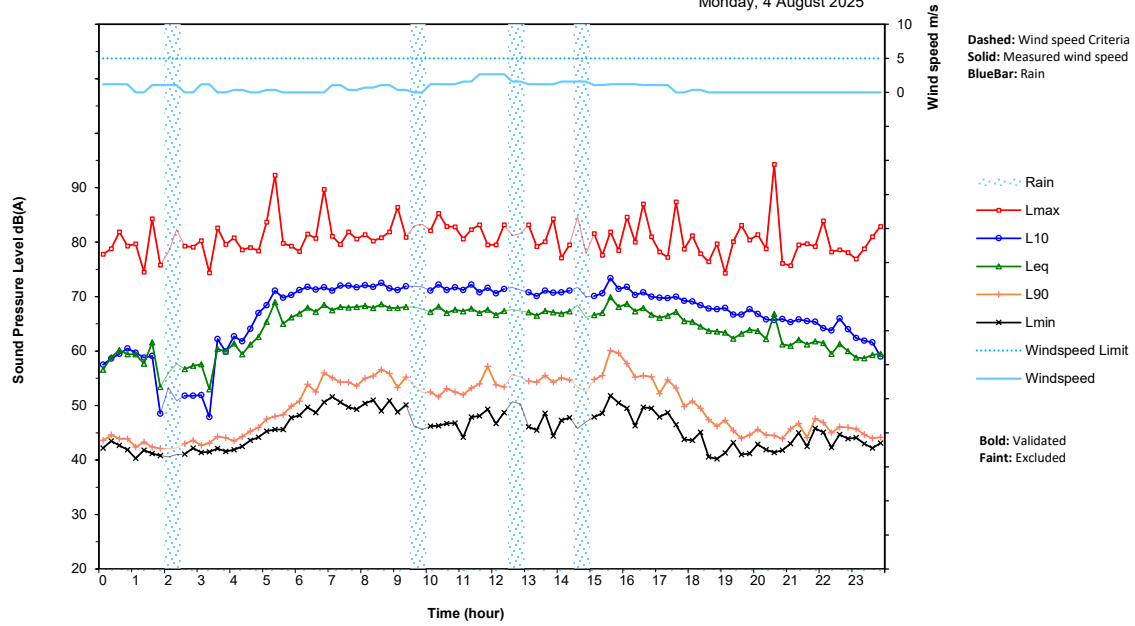
Sunday, 3 August 2025



Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

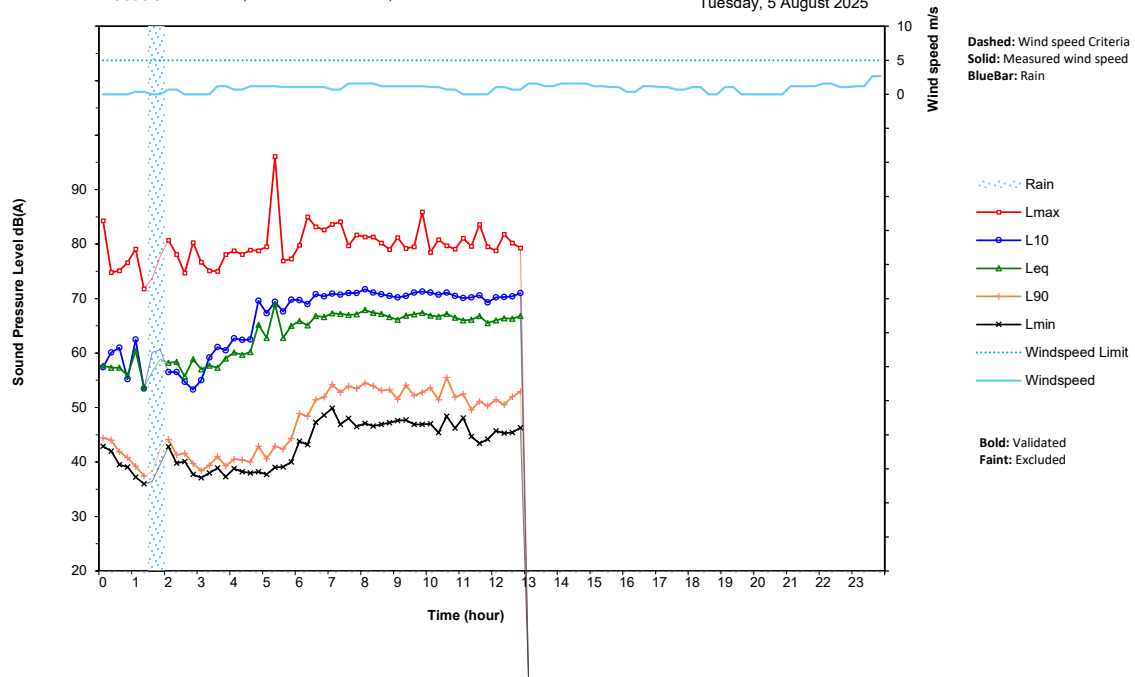
Monday, 4 August 2025

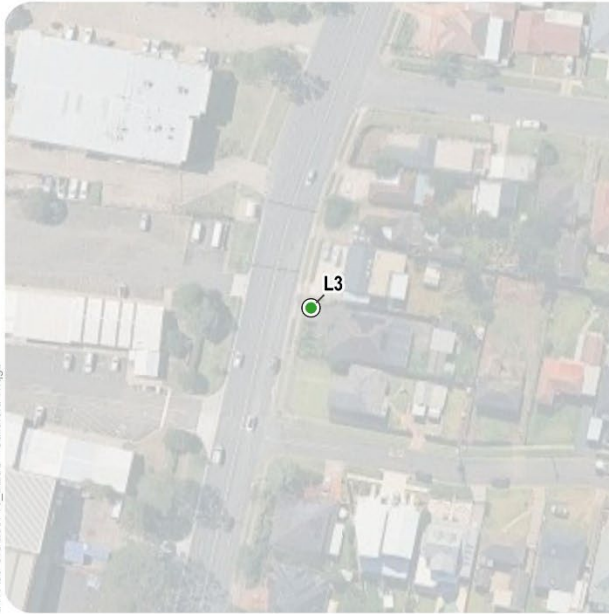


Logger ID: L2

Location: U1, 111 McCredie Rd, Guildford West NSW 2161

Tuesday, 5 August 2025





ID	Model	SI No	Address	Start Date	Finish Date	Cal Date	Time Weight	Freq Weight	Location
L3	SVANTEK 958	59827	126 Fairfield Rd, Guildford West NSW 2161	2025-07-21	2025-08-05	2025-07-07	F	A	Front Yard

Ambient noise monitoring results - NPfl & ICNG time periods			
	Day 11 hr	Evening 4 hr	Night 9 hr
RBLs L_{Aeq} , period dB	59	51	45

Ambient noise monitoring results - RNP time periods		
	Day 15 hr	Night 9 hr
L_{Aeq} period dB	70	66
L_{Aeq} , 1hr dB	72	70

Notes:

The monitoring location is adjacent to a very busy four-lane roadway, carrying a continuous flow of both light and heavy vehicles. Traffic conditions were generally similar to those observed at Location L2

Time periods for NPfl & ICNG

Day 7 am to 6 pm Monday to Saturday
8 am to 6 pm Sundays and Public Holidays

Evening 6 pm to 10 pm

Night Remaining periods

Time periods for RNP

Day 7 am to 10 pm

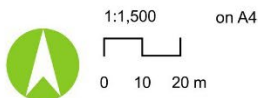
Night 10 pm to 7 am

Legend

- Unattended Noise Monitoring (Loggers)



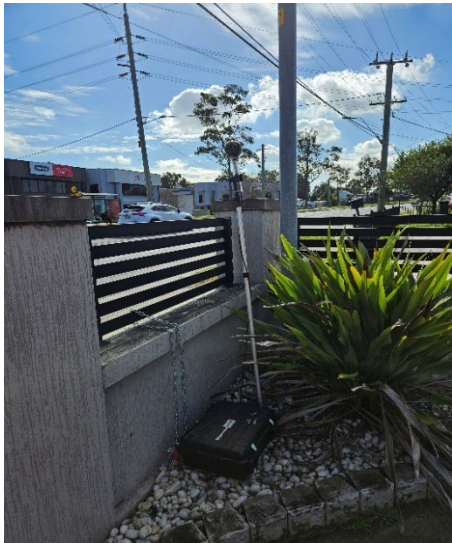
Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



BESS Noise Study- Guildford West Noise Impact Assessment

Projection: GDA2020 / MGA zone 56 (EPSG:7856)

Noise monitoring location - Logger L3

Location ID:		L3		Aerial Image 												
Address:		126 Fairfield Rd, Guildford West NSW 2161														
Logger Model Name:		SVANTEK 958	Latest calibration date:													
Logger Serial No.:		59827	Time weighting:		Fast											
Start Date:		21/07/2025	Frequency Weighting:		A											
Finish Date:		5/08/2025	Location:		Front Yard											
Logger Notes: The monitoring location is adjacent to a very busy four-lane roadway, carrying a continuous flow of both light and heavy vehicles. Traffic conditions were generally similar to those observed at Location L2, with the primary difference being the presence of four lanes at this site. Heavy vehicles were present but not as dominant as at L2. During logger deployment and attended measurements, a distinct, continuous industrial hum was noted, originating from the direction of the nearby substation. Traffic volumes were manually counted over a one-minute period during the attended measurement, with the following results: Cars: 40; Trucks: 9																
Ambient noise monitoring results - NPfl & ICNG time periods <table><tr><td></td><td>Day 11 hr</td><td>Evening 4hr</td><td>Night 9 hr</td><td></td></tr><tr><td>RBLs LA90, period dB</td><td>59</td><td>51</td><td>45</td><td></td></tr></table>						Day 11 hr	Evening 4hr	Night 9 hr		RBLs LA90, period dB	59	51	45			
	Day 11 hr	Evening 4hr	Night 9 hr													
RBLs LA90, period dB	59	51	45													
Ambient noise monitoring results - RNP time periods <table><tr><td></td><td>Day 15hr</td><td>Night 9 hr</td><td></td></tr><tr><td>LAeq period dB</td><td>70</td><td>66</td><td></td></tr><tr><td>LAeq, 1hr dB</td><td>72</td><td>70</td><td></td></tr></table>						Day 15hr	Night 9 hr		LAeq period dB	70	66		LAeq, 1hr dB	72	70	
	Day 15hr	Night 9 hr														
LAeq period dB	70	66														
LAeq, 1hr dB	72	70														
Time periods for NPfl & ICNG <table><tr><td>Day</td><td>7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays</td></tr><tr><td>Evening</td><td>6 pm to 10 pm</td></tr><tr><td>Night</td><td>remaining periods</td></tr></table> Time periods for RNP <table><tr><td>Day</td><td>7am to 10 pm</td></tr><tr><td>Night</td><td>10 pm to 7am</td></tr></table>					Day	7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays	Evening	6 pm to 10 pm	Night	remaining periods	Day	7am to 10 pm	Night	10 pm to 7am		
Day	7 am to 6 pm Monday to Saturday 8 am to 6 pm Sundays and Public Holidays															
Evening	6 pm to 10 pm															
Night	remaining periods															
Day	7am to 10 pm															
Night	10 pm to 7am															
				Logger Photo 												
Ausconnex BESS Noise logger L3																

Location ID:	L3
Address:	126 Fairfield Rd, Guildford West NSW 2161

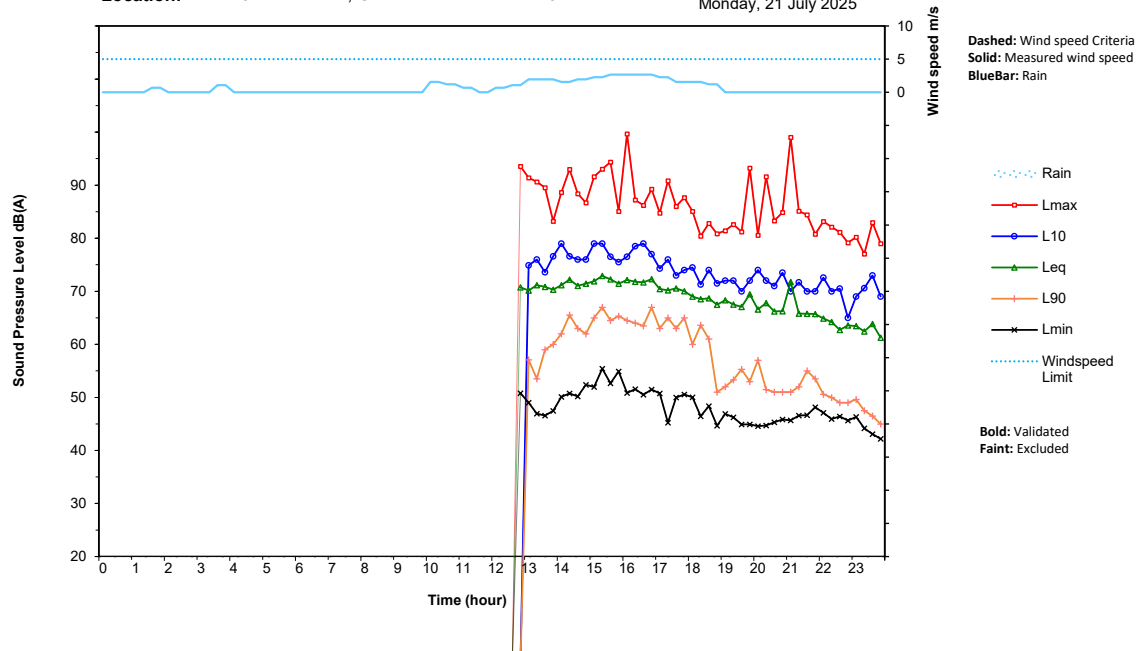
NPfl based noise monitoring results

Date	L _{A90} Assessment Background Levels dB			L _{Aeq} Ambient Noise Levels dB		
	Day	Evening	Night	Day	Evening	Night
Monday, 21 July 2025		51	44		68	66
Tuesday, 22 July 2025	60	51		71	69	
Wednesday, 23 July 2025	60	51	46	72	69	67
Thursday, 24 July 2025	59	54	47	71	69	67
Friday, 25 July 2025	59	51		71	68	
Saturday, 26 July 2025	56	51	44	70	67	64
Sunday, 27 July 2025	54	51	45	68	67	66
Monday, 28 July 2025	60	51	47	71	68	66
Tuesday, 29 July 2025	60	52	43	71	69	67
Wednesday, 30 July 2025						
Thursday, 31 July 2025		50	45		68	66
Friday, 1 August 2025	59			72		
Saturday, 2 August 2025						
Sunday, 3 August 2025		51			67	
Monday, 4 August 2025						
	RBL			Logarithmic average		
	59	51	45	71	68	66

Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

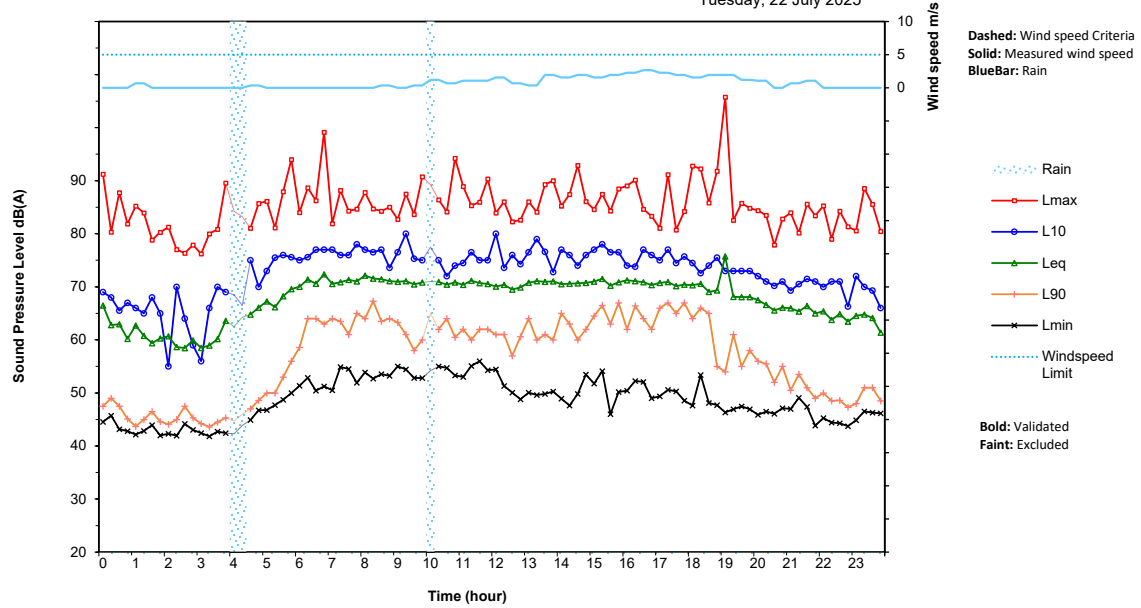
Monday, 21 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

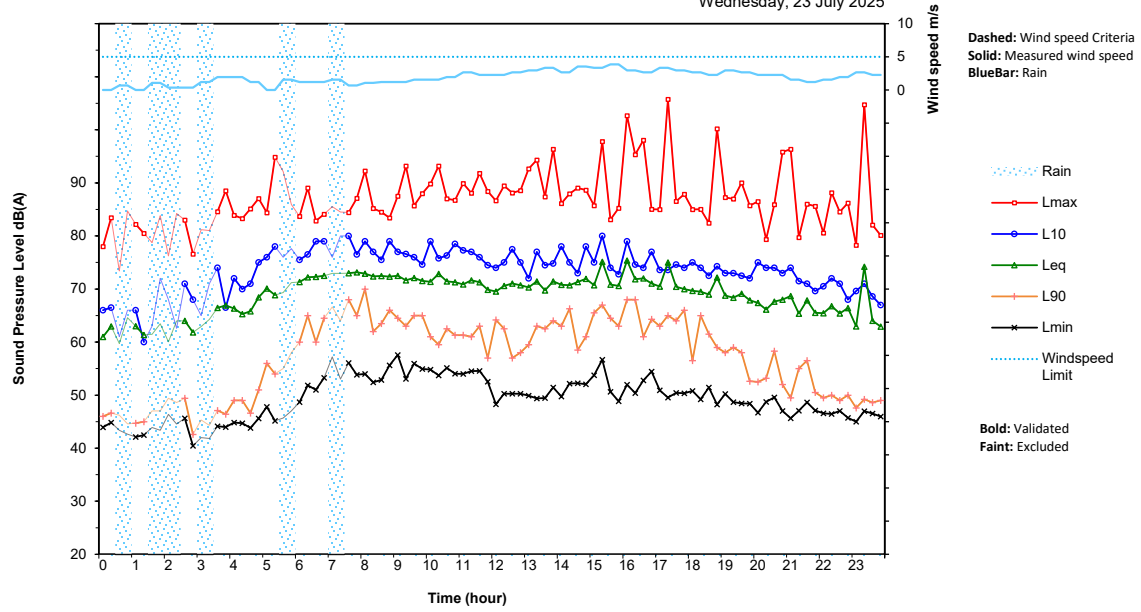
Tuesday, 22 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

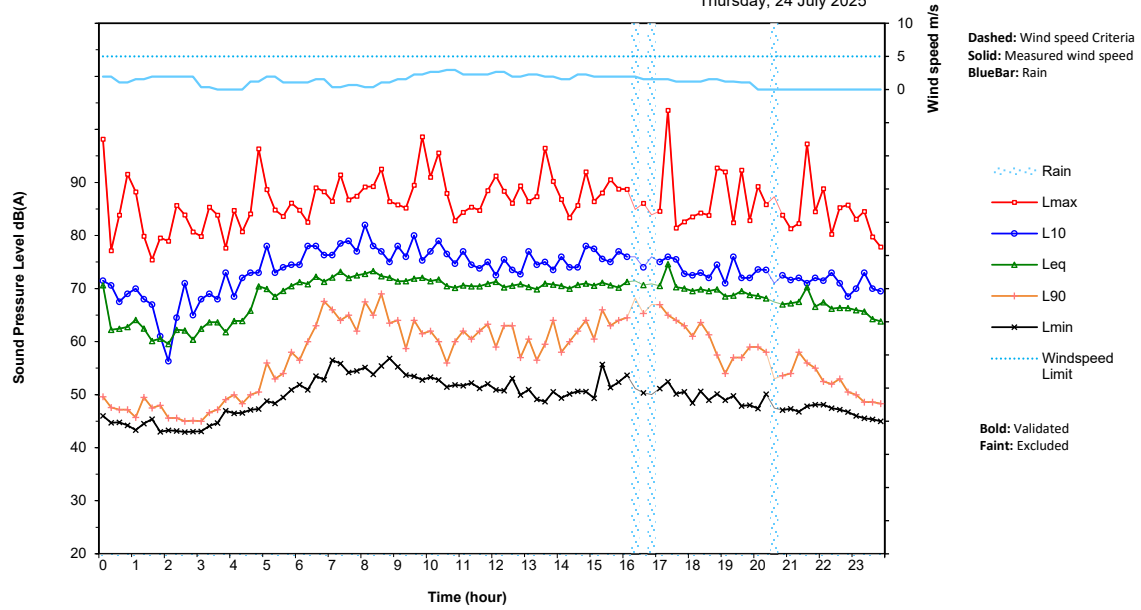
Wednesday, 23 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

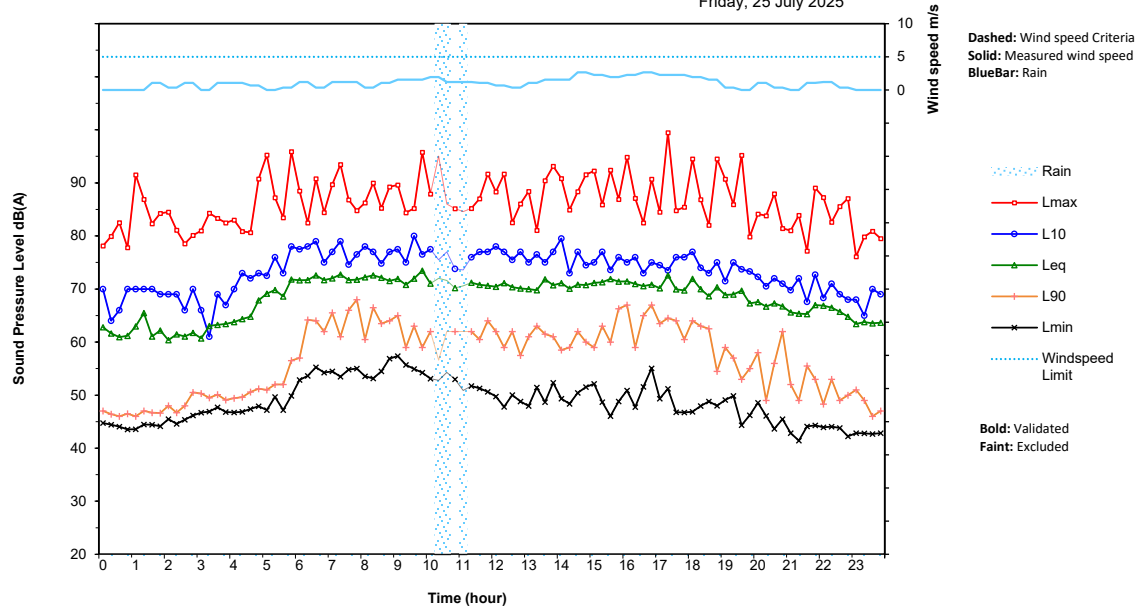
Thursday, 24 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

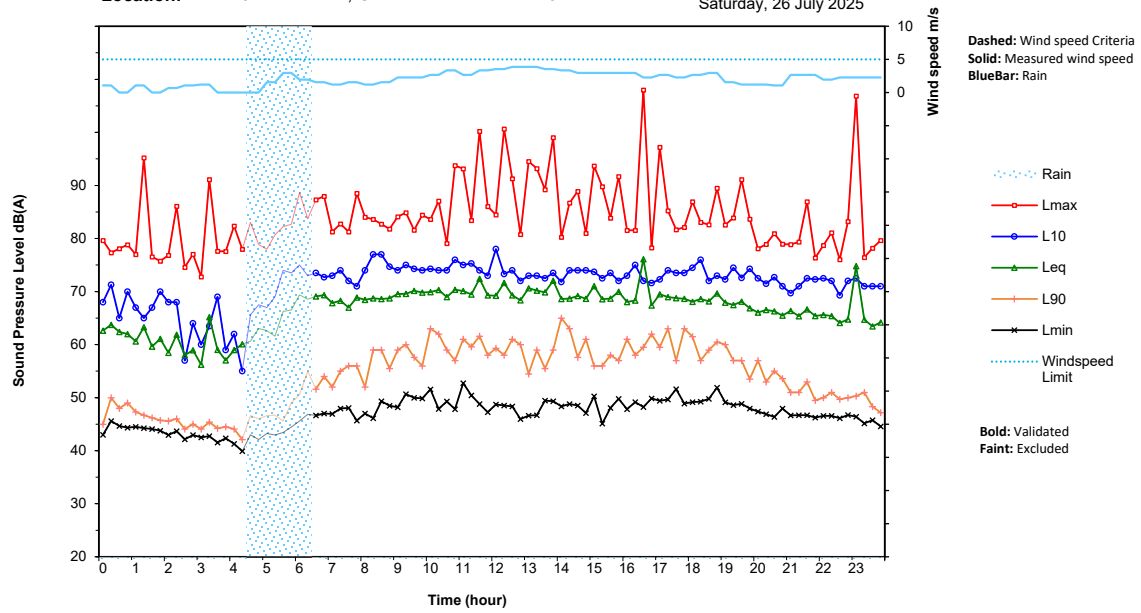
Friday, 25 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

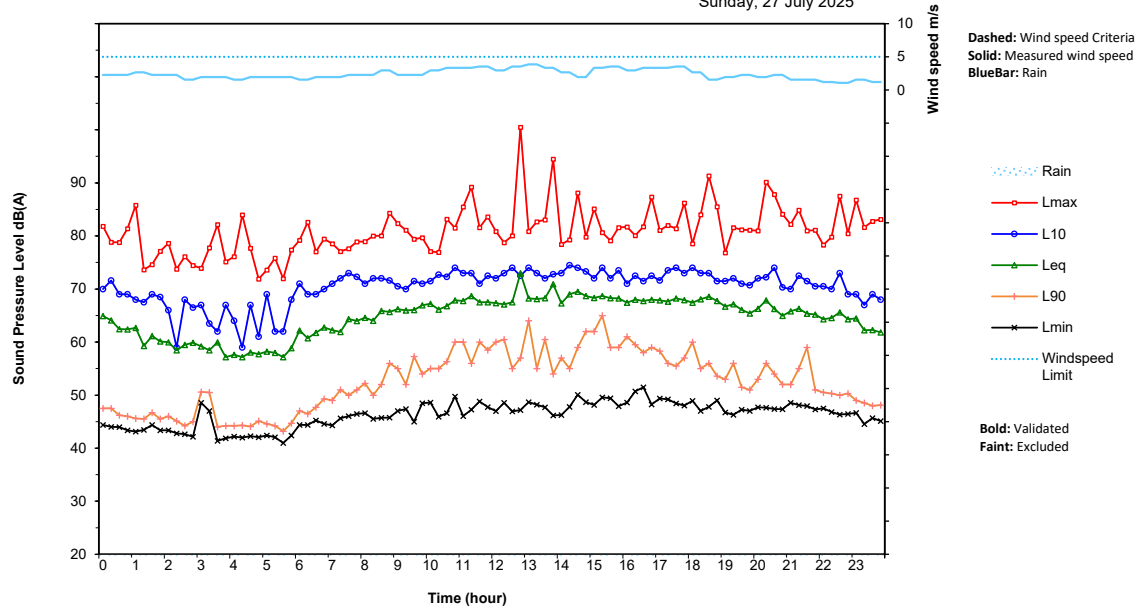
Saturday, 26 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

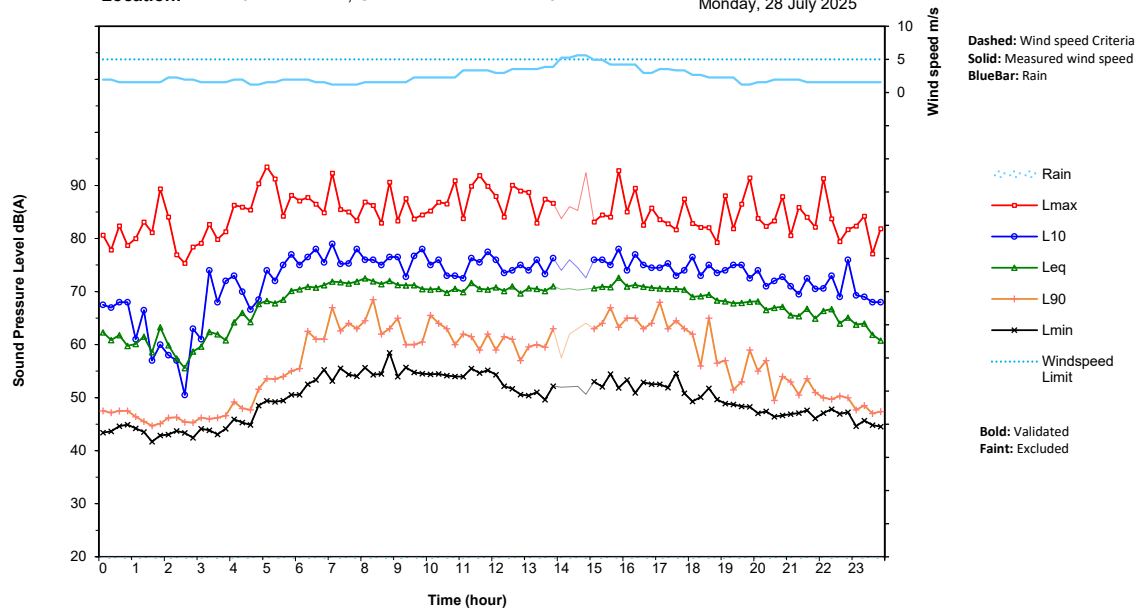
Sunday, 27 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

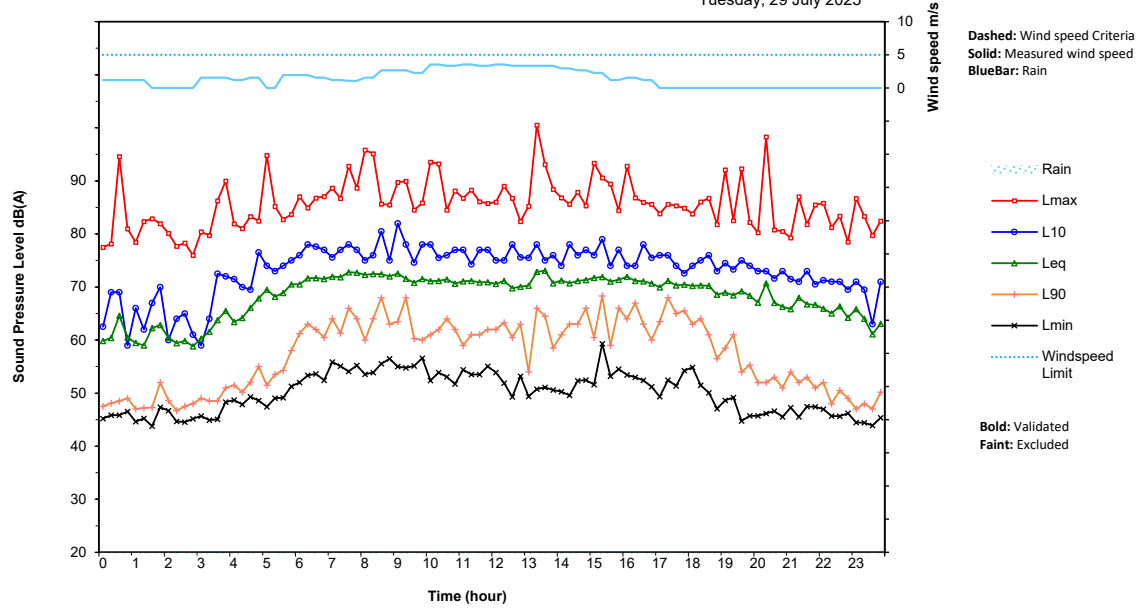
Monday, 28 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

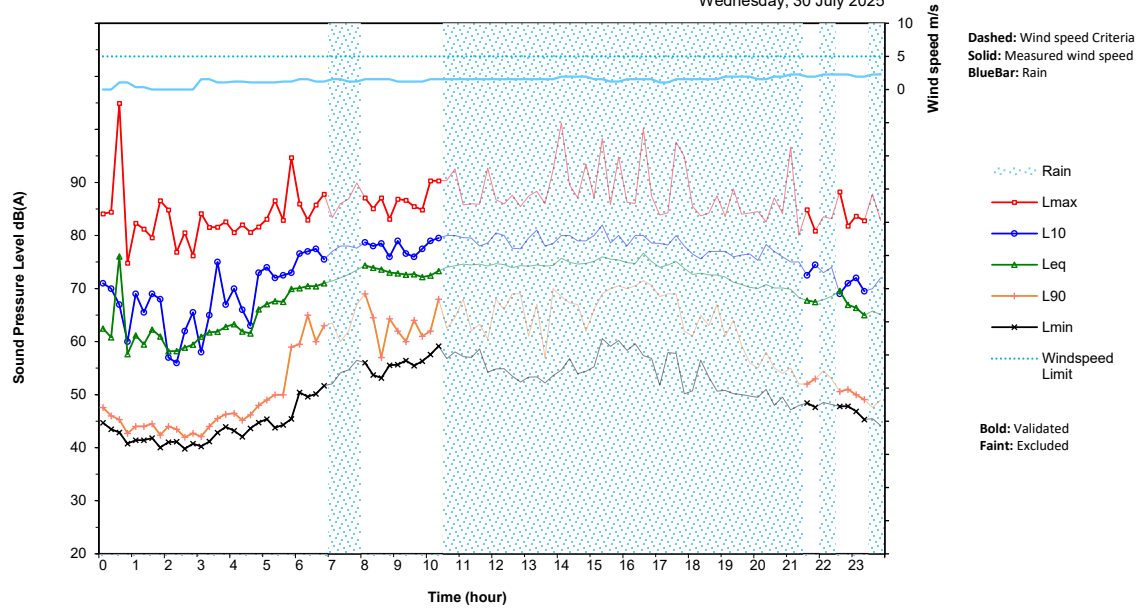
Tuesday, 29 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

Wednesday, 30 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

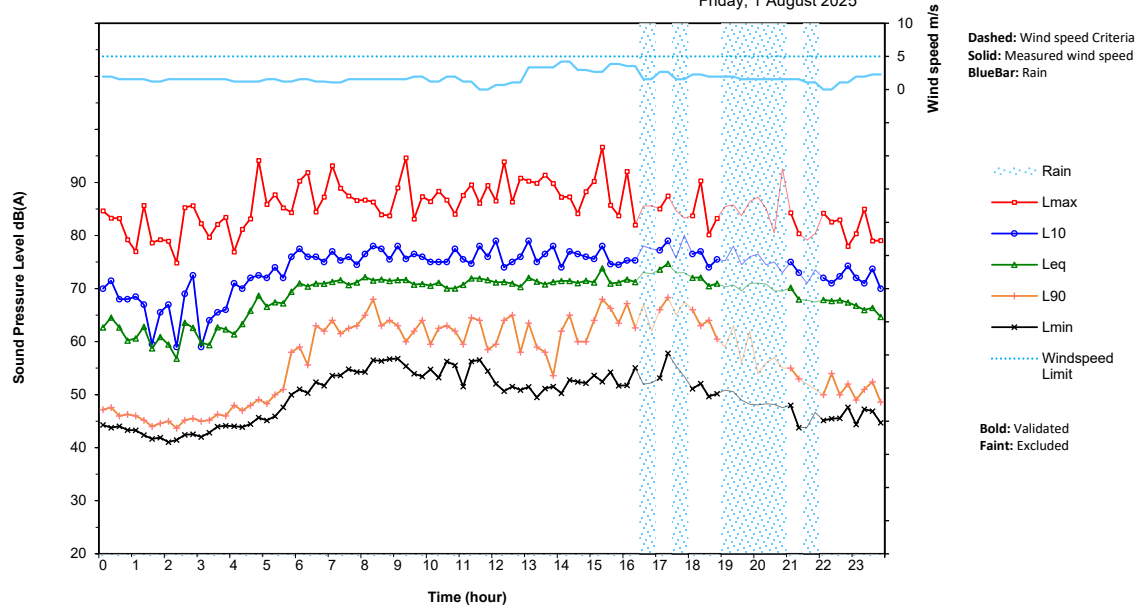
Thursday, 31 July 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

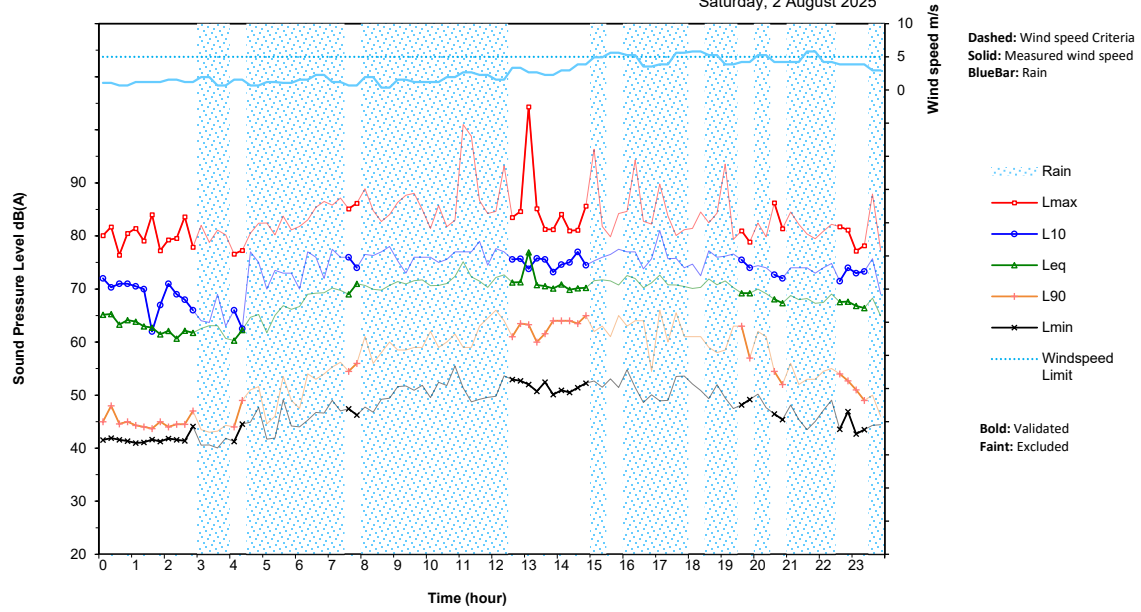
Friday, 1 August 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

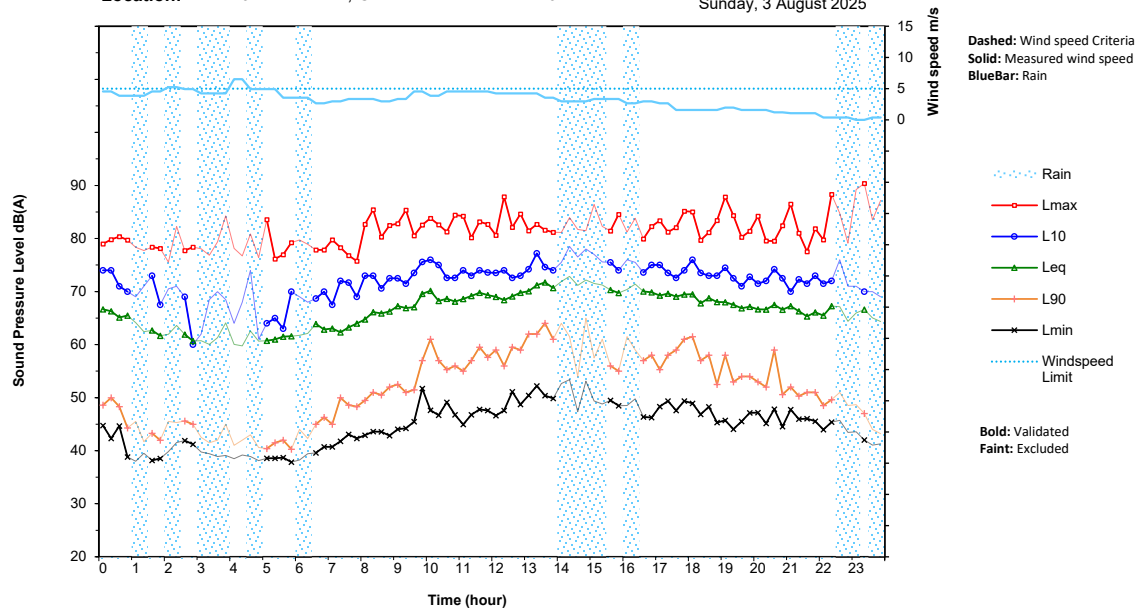
Saturday, 2 August 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

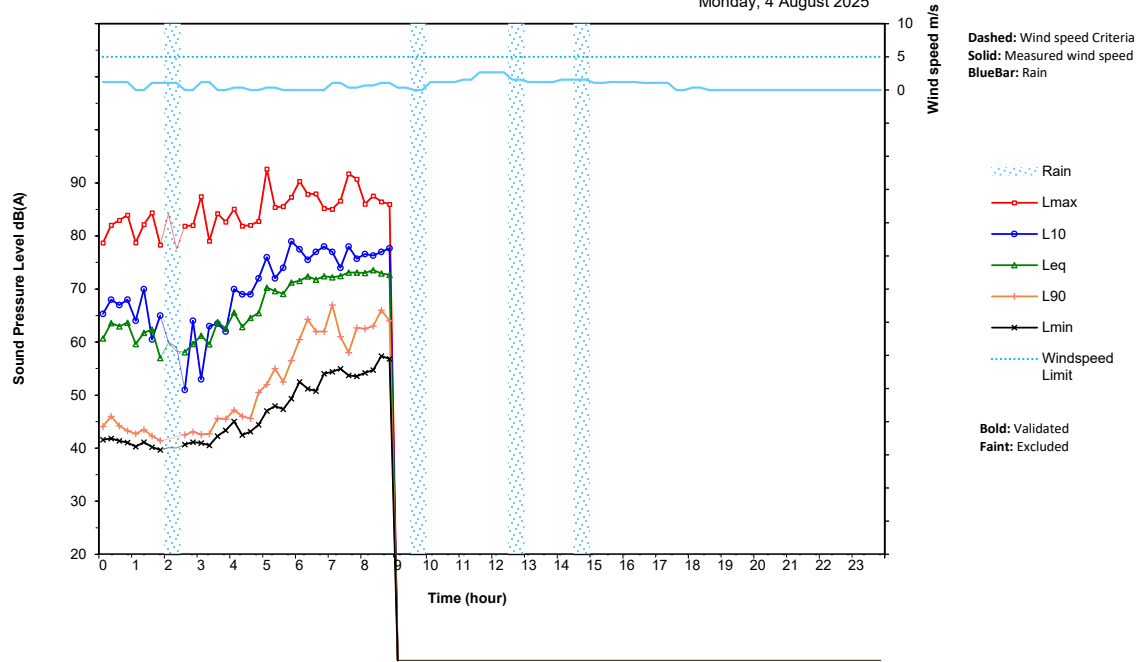
Sunday, 3 August 2025



Logger ID: L3

Location: 126 Fairfield Rd, Guildford West NSW 2161

Monday, 4 August 2025



Appendix D

Predicted noise at all sensitive receivers

Without mitigation measures

Table D 2: Standard Operation (100% 24/7) | FNM - Various Met Conditions (Day/Evening/Night) – Without any mitigation measures

NCA	Project noise trigger level L _{Aeq} , 15min dB (Day / Evening / Night)	Additional penalty applied	Worst Predicted levels ¹ L _{Aeq} , 15min dB			
			Standard meteorological conditions (D class 0.5m/s winds)(Night)	Noise-enhancing meteorological conditions (D class 3m/s winds) (Evening)	Noise-enhancing meteorological conditions (F class 2m/s winds) (Night)	Compliance ²
R1	49 / 48 / 43	No	33 (38)	36 (41)	37 (42)	✓
R2	57 / 48 / 43	Yes	50 (55)	51 (56)	51 (56)	⊘
R3	58 / 48 / 43	No	38 (43)	41 (46)	41 (46)	⊘
R4	58 / 48 / 43	No	35 (40)	38 (43)	39 (44)	⊘
IND	68	No	52	52	53	✓
COM	63	No	43	46	46	✓
ARA	53	No	49	50	51	✓

Note 1: Predicted noise levels have been rounded to the nearest integer in accordance with the NPfI.

Note 2: ✓ and ⊘ refers to compliance and non-compliances with respect to PNTL respectively.

Note 3: For each entry, the unbracketed value is the predicted noise level from the model, while the value in parentheses represents the predicted level after application of the +5 dB(A) tonality penalty. This convention is used throughout the table. Eg: 38 is the predicted levels from the model; (43) is after adding +5 dBA penalty.

With mitigation measures – 5m Noise walls

Table D 3: Standard Operation (100% 24/7) | FNM - Various Met Conditions (Day/Evening/Night) – With mitigation measures

NCA	Project noise trigger level L _{Aeq, 15min} dB (Day / Evening / Night)	Additional penalty applied	Worst Predicted levels ¹ L _{Aeq, 15min} dB			
			Standard meteorological conditions (D class 0.5m/s winds)(Night)	Noise-enhancing meteorological conditions (D class 3m/s winds) (Evening)	Noise-enhancing meteorological conditions (F class 2m/s winds) (Night)	Compliance ²
R1	49 / 48 / 43	Not required	28 (33)	31 (36)	31 (36)	✓
R2 ⁵	57 / 48 / 43	Yes	39 (44)	40 (45)	40 (45) ³	✗
R3	58 / 48 / 43	Not required	33 (38)	36 (41)	36 (41)	✓
R4	58 / 48 / 43	Not required	28 (33)	31 (36)	32 (37)	✓
IND	68	Not required	47	49	48	✓
COM	63	Not required	37	40	40	✓
ARA	53	Not required	43	44	44	✓

Note 1: Predicted noise levels have been rounded to the nearest integer in accordance with the NPfI.

Note 2: ✓ and ✗ refers to compliance and non-compliances with respect to PNTL respectively.

Note 3: For each entry, the unbracketed value is the predicted noise level from the model, while the value in parentheses represents the predicted level after application of the +5 dB(A) tonality penalty. This convention is used throughout the table. Eg: 38 is the predicted levels from the model; (43) is after adding +5 dBA penalty.

⁵ 2 Properties (125 and 127 McCredie Road, Guildford West NSW) exceeding the noise criteria by 2.0dBA which is considered negligible.

Appendix E

Noise contours

Without mitigation measures

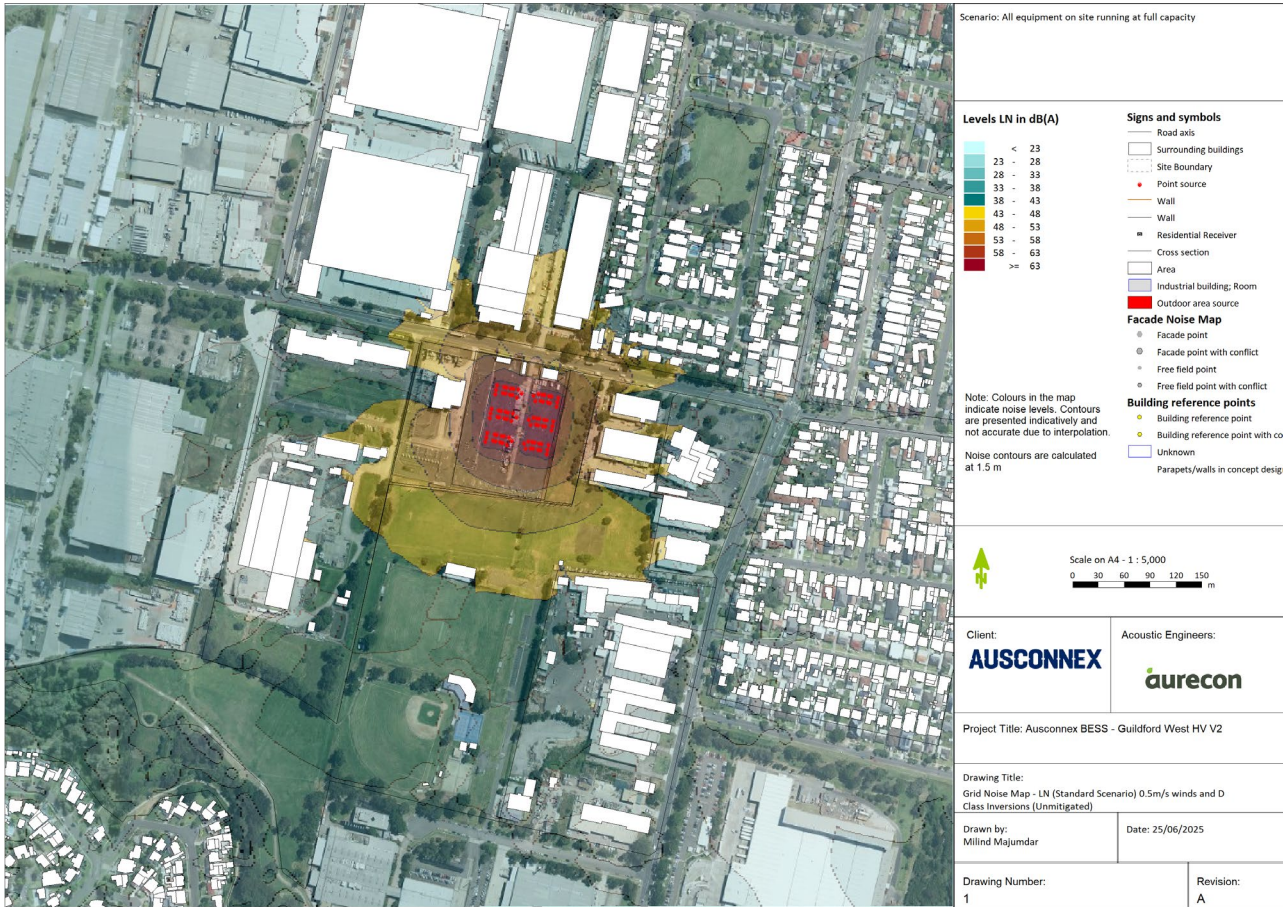


Figure E 1: Noise Contours (Unmitigated) – Standard Met Conditions (D class | 0.5m/s winds) Day/Evening/Night

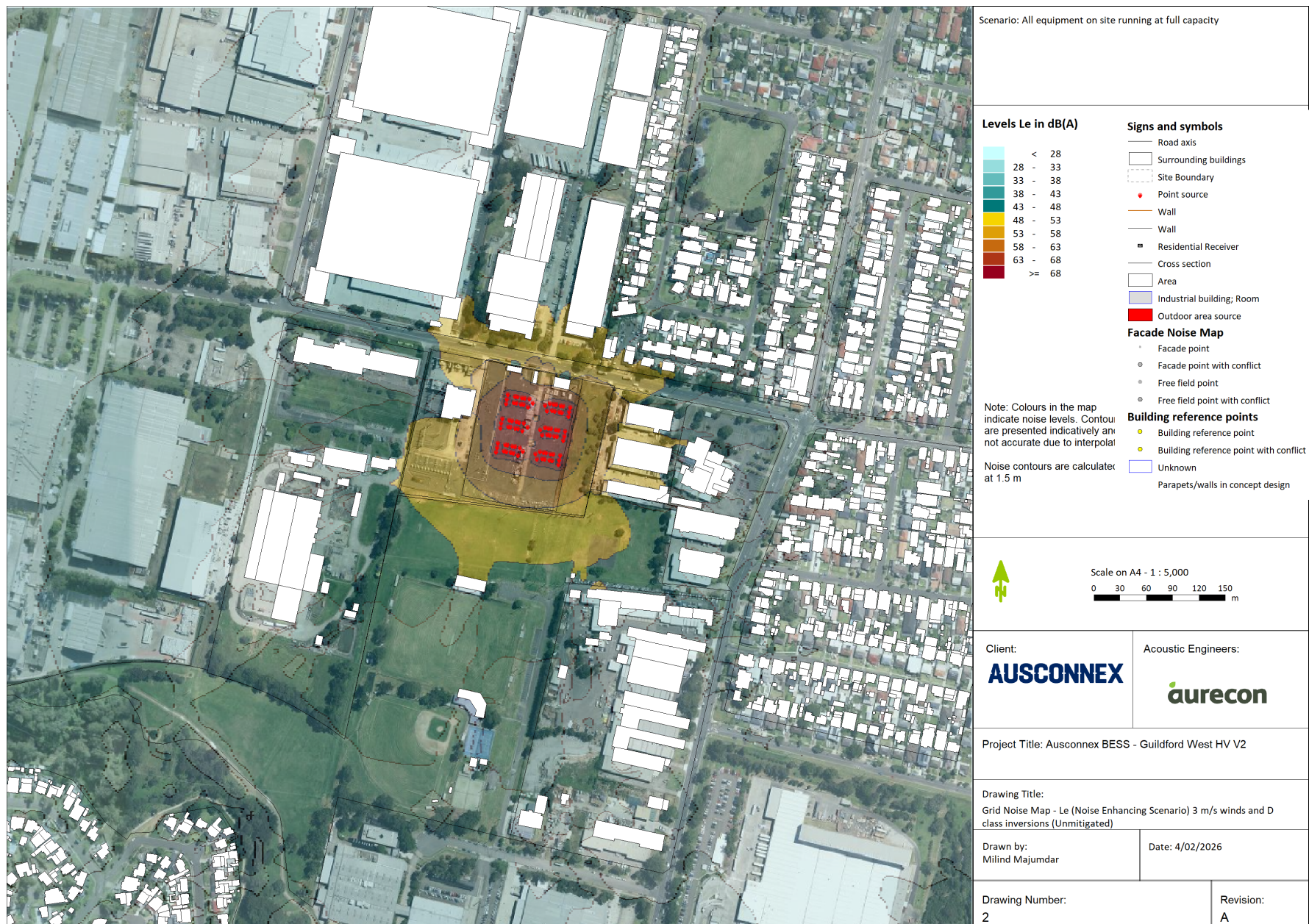


Figure E 2: Noise Contours (Unmitigated) – Adverse Met Conditions (D class | 3m/s winds) Day/Evening

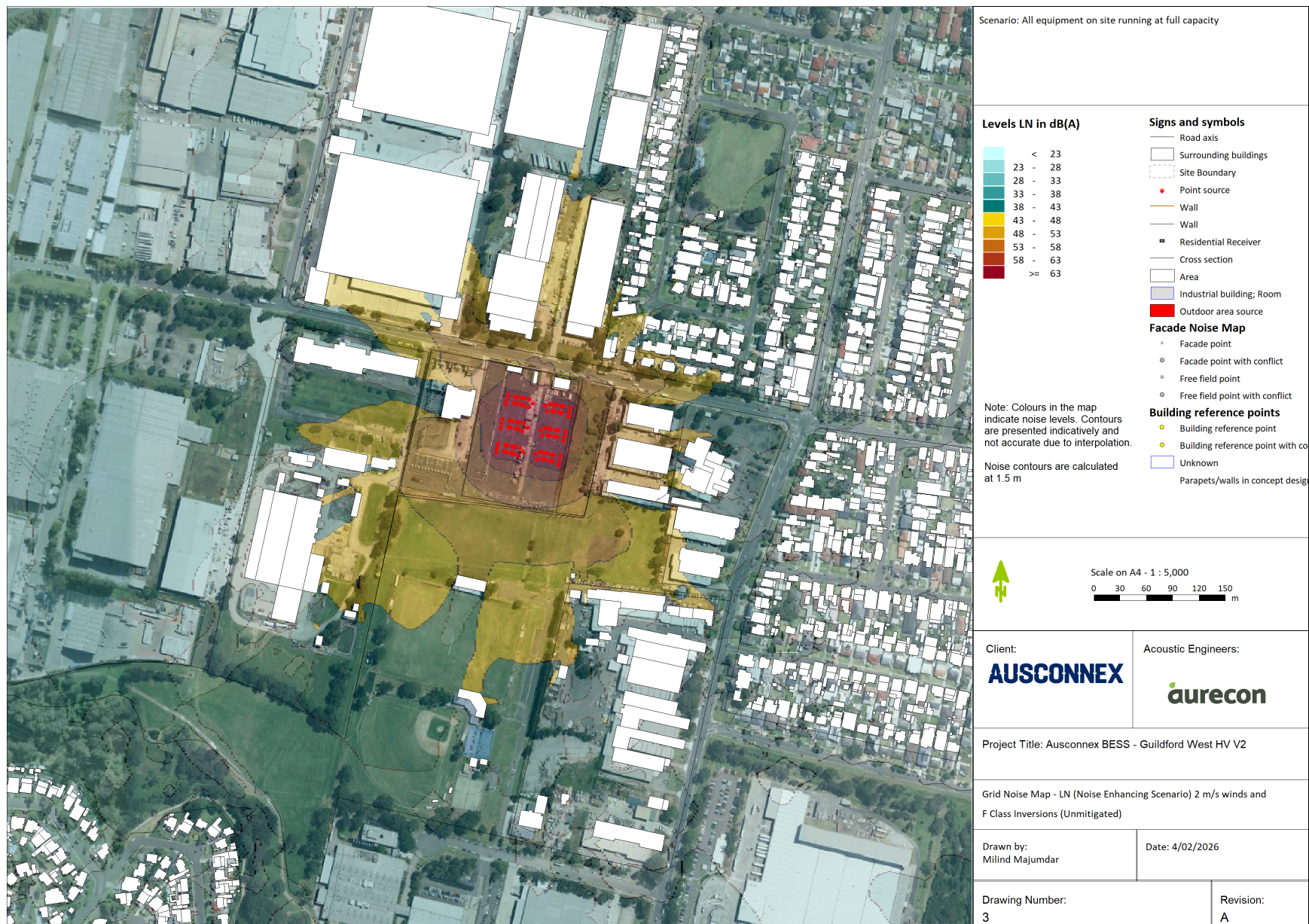


Figure E 3: Noise Contours (Unmitigated) – Noise Enhancing Adverse Met Conditions (F class | 2m/s winds) Night

With Mitigation measures – 5m high noise walls

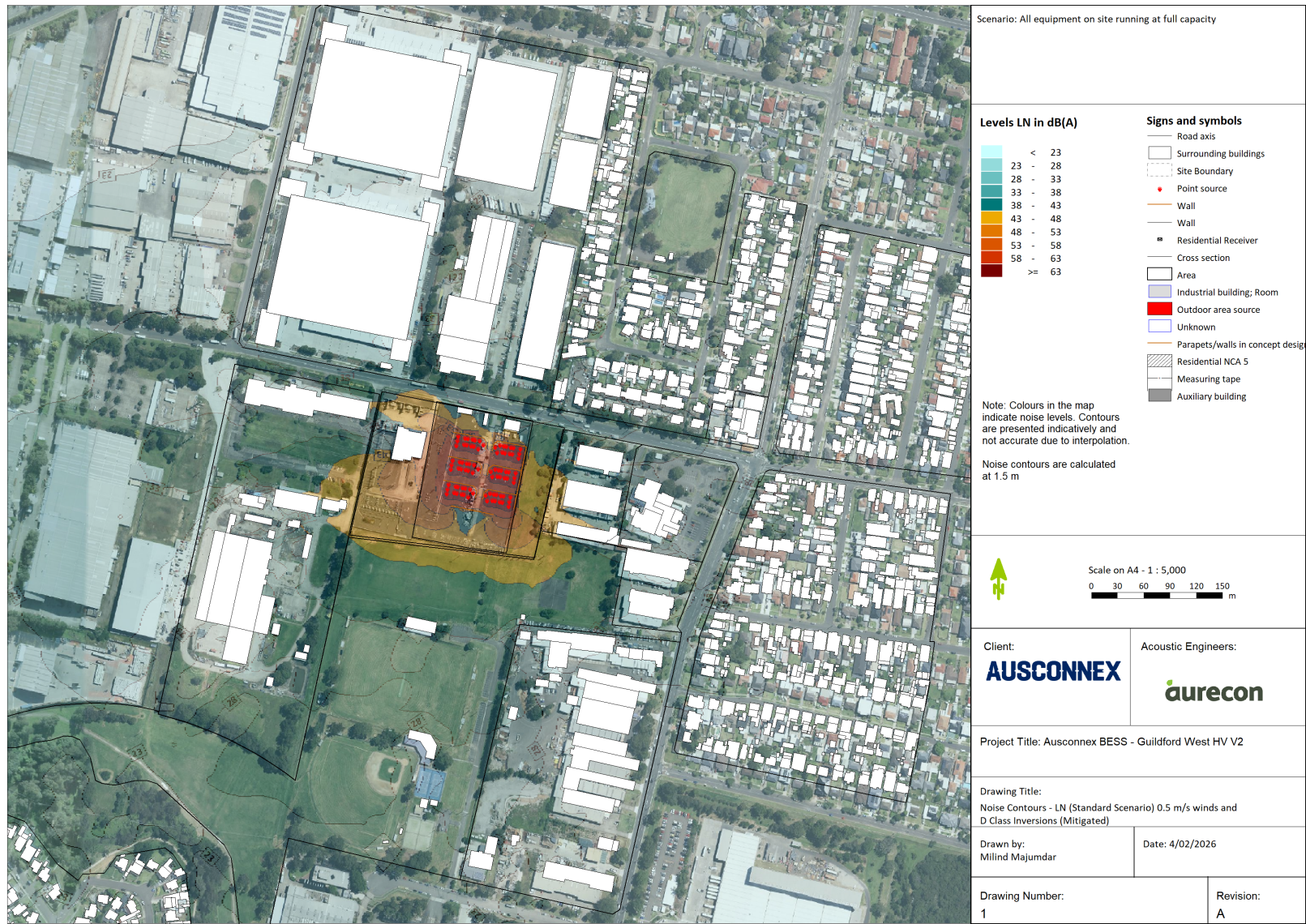


Figure E 4: Noise Contours – Night (Mitigated)- Standard Met Conditions (D class | 0.5m/s winds) Day/Evening/Night

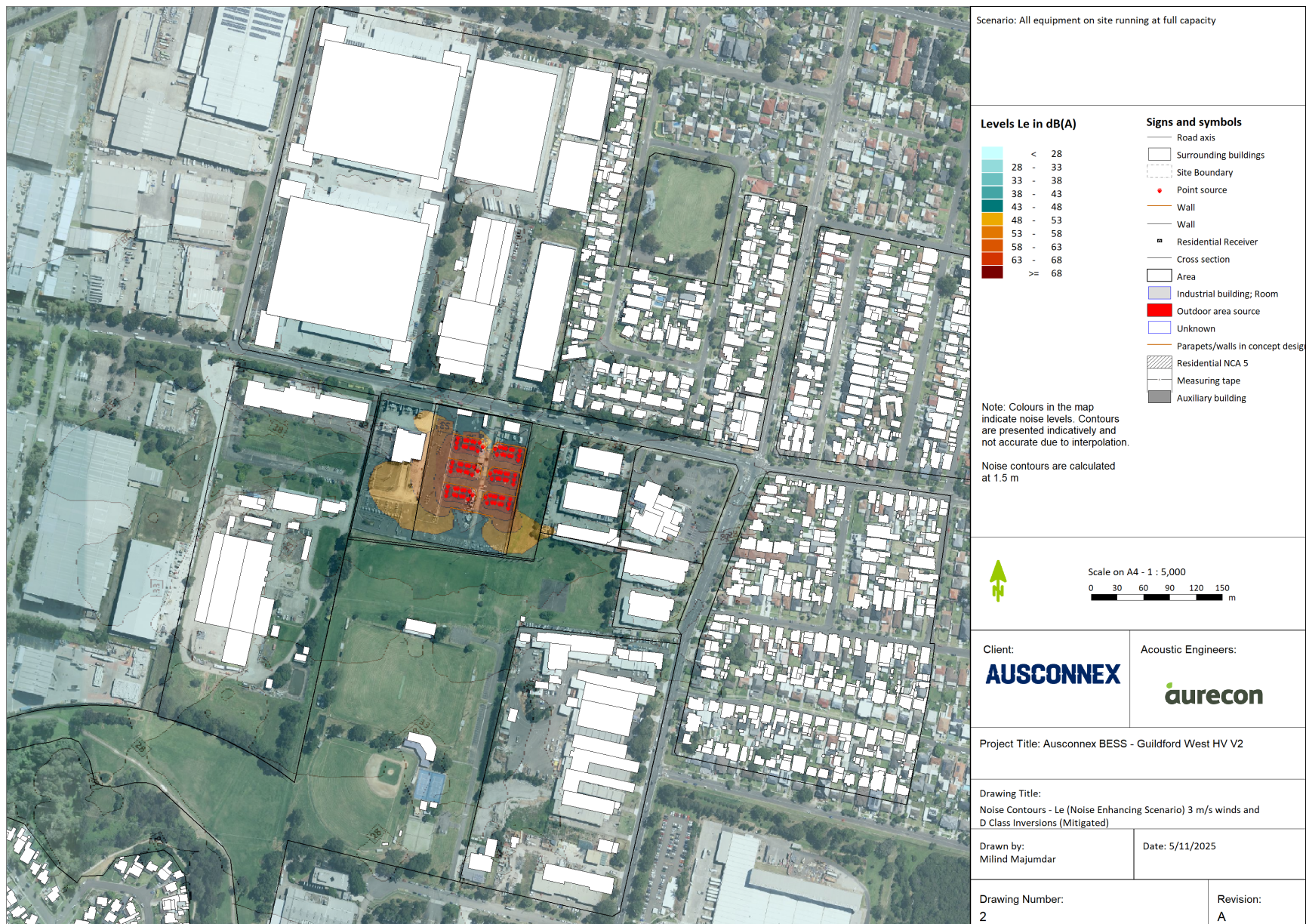


Figure E 5: Noise Contours- Evening (Mitigated) – Noise Enhancing Met Conditions (D class | 3m/s winds) Day/Evening

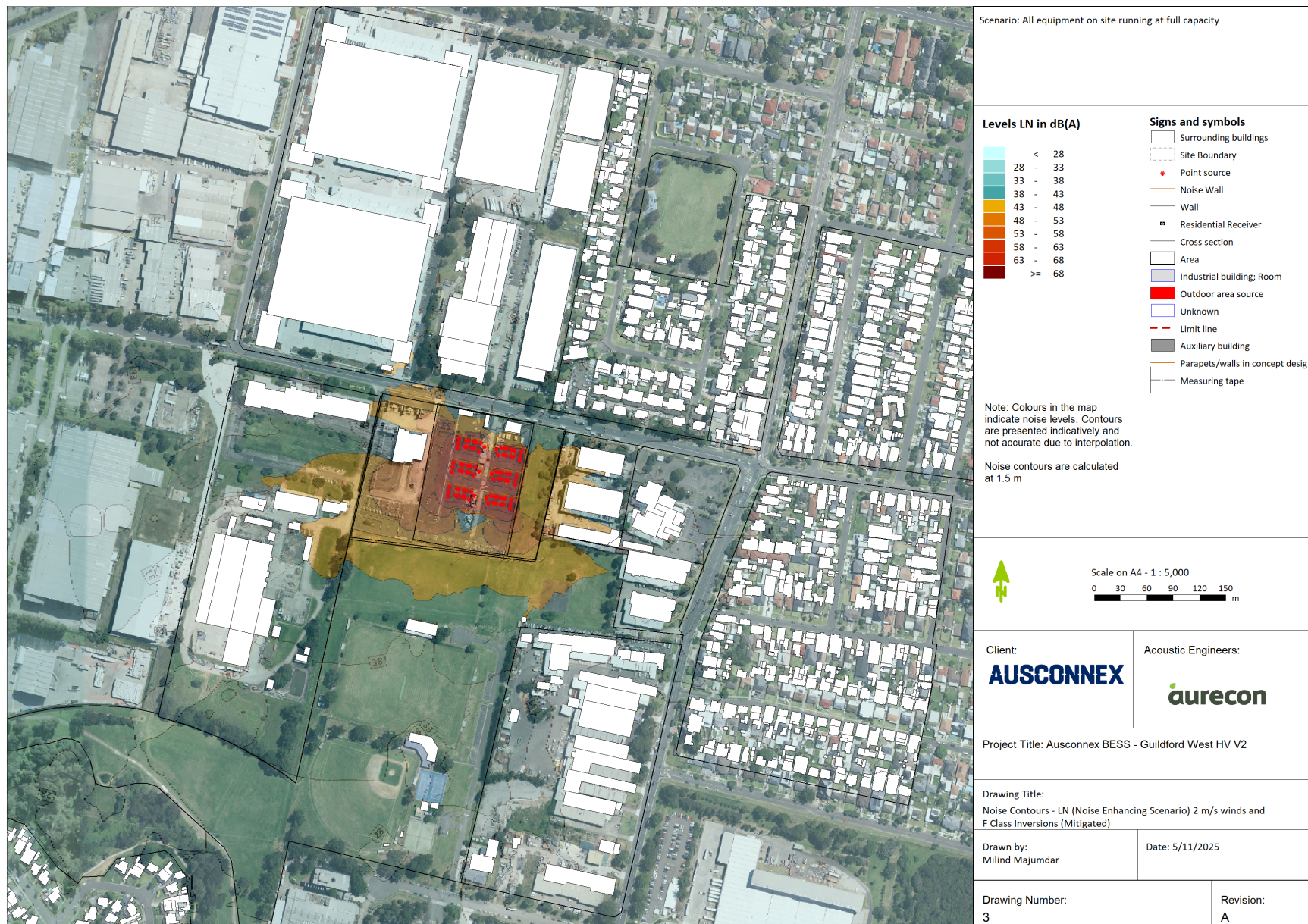


Figure E 6: Noise Contours (Mitigated) – Noise Enhancing Adverse Met Conditions (F class | 2m/s winds) Night

Appendix F

Guildford West BESS layouts



Legend

Site Layout

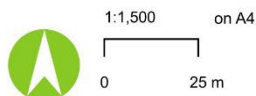
- 5MA MVP5 4600-52
- AUX LV DB
- AUX Transformer
- Existing Cable Tunnel
- Fire Water Retention Pit
- Fluence Gridstock Pro 500
- Harmonic Filter
- O&M Building
- Switchroom/Control Room

Structures/Receivers

On-Site

- Proposed Noise Wall (5m)
- Site Roads
- Construction Parking
- Existing Structures on Site
- Guildford West - Sensitive Receivers
- Site Boundary
- Project Site

Source: Aurecon, NSW Spatial Services, ESRI, Open street maps



Projection: GDA2020 / MGA zone 56 (EPSG:7856)

BESS Noise Study- Guildford West Noise Impact Assessment

Site Layout



Appendix G

Tonality and Low Frequency assessment

Table G-1: Low frequency check at top 10 worst effected receivers

Receiver (Top 10 worst effected)	Rating/Broadband/Input - 1/3 Octave Band Centre Frequency, Hz																													
	dB(C)-dB(A)	dB(C)	dB(A)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
127 McCredie Road	15	55	40	38	42	39	45	48	52	47	44	42	38	36	36	28	26	24	24	23	27	19	17	26	34	16	17	24	14	11
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
125 McCredie Road	15	55	40	38	42	39	45	48	52	47	44	43	38	36	36	28	25	24	24	23	27	18	17	25	34	15	16	23	13	9
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 1, 111-123 McCredie Road	16	53	37	37	40	37	44	46	50	44	42	40	36	33	33	25	23	21	21	21	25	16	14	22	30	12	13	20	10	5
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 8, 111-123 McCredie Road	14	51	37	33	36	33	40	43	48	41	39	38	33	31	31	24	22	20	21	20	22	14	12	23	32	12	14	22	11	6
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 3, 111-123 McCredie Road	16	53	36	36	39	36	43	46	49	43	41	39	34	32	31	24	21	19	20	19	23	14	12	21	29	11	11	19	8	4
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
132a Fairfield Road	12	48	36	29	32	29	37	41	45	37	36	36	33	31	30	26	23	22	22	23	27	17	17	22	30	13	12	17	3	-5
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 7, 111-123 McCredie Road	14	50	36	32	36	33	40	43	47	40	38	36	32	30	29	22	20	19	20	19	22	14	12	23	32	11	13	20	9	4
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 8, 111-123 McCredie Road	15	50	35	33	36	33	40	43	47	40	38	36	31	29	28	22	19	18	18	18	21	12	11	21	30	10	11	19	8	3
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
Unit 5, 111-123 McCredie Road	16	51	35	34	37	34	42	44	48	41	39	38	33	31	30	23	20	19	19	18	21	13	11	20	29	9	10	17	6	0
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	
116 Fairfield Road	3	38	35	25	27	23	28	28	31	23	20	18	14	12	11	6	20	22	22	23	28	17	16	22	31	13	12	17	4	-4
	Low Freq Presence:			No	No	No	No	No	No	No	No	No	NA																	

Table G-2: Tonality Check at top 10 worst effected receivers

Receiver (Top 10 worst effected)	Rating/Broadband/Input - 1/3 Octave Band Centre Frequency, Hz																													
	dB(C)-dB(A)	dB(C)	dB(A)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
127 McCredie Road	15	55	40	38	42	39	45	48	52	47	44	42	38	36	36	28	26	24	24	23	27	19	17	26	34	16	17	24	14	11
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
125 McCredie Road	15	55	40	38	42	39	45	48	52	47	44	43	38	36	36	28	25	24	24	23	27	18	17	25	34	15	16	23	13	9
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
Unit 1, 111-123 McCredie Road	16	53	37	37	40	37	44	46	50	44	42	40	36	33	33	25	23	21	21	21	25	16	14	22	30	12	13	20	10	5
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
Unit 8, 111-123 McCredie Road	14	51	37	33	36	33	40	43	48	41	39	38	33	31	31	24	22	20	21	20	22	14	12	23	32	12	14	22	11	6
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
Unit 3, 111-123 McCredie Road	16	53	36	36	39	36	43	46	49	43	41	39	34	32	31	24	21	19	20	19	23	14	12	21	29	11	11	19	8	4
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
132a Fairfield Road	12	48	36	29	32	29	37	41	45	37	36	36	33	31	30	26	23	22	22	23	27	17	17	22	30	13	12	17	3	-5
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	-
Unit 7, 111-123 McCredie Road	14	50	36	32	36	33	40	43	47	40	38	36	32	30	29	22	20	19	20	19	22	14	12	23	32	11	13	20	9	4
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
Unit 8, 111-123 McCredie Road	15	50	35	33	36	33	40	43	47	40	38	36	31	29	28	22	19	18	18	18	21	12	11	21	30	10	11	19	8	3
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
Unit 5, 111-123 McCredie Road	16	51	35	34	37	34	42	44	48	41	39	38	33	31	30	23	20	19	19	18	21	13	11	20	29	9	10	17	6	0
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-
116 Fairfield Road	3	38	35	25	27	23	28	28	31	23	20	18	14	12	11	6	20	22	22	23	28	17	16	22	31	13	12	17	4	-4
	Tonality Presence:			-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	-

Table G-3: Tonality Check at worst affected property per NCA (Excluding R2)

Receiver	Rating/Broadband/Input - 1/3 Octave Band Centre Frequency, Hz																												
	NCA	dB(A)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
53 Hemingway Crescent	R1	31	26	30	28	37	40	43	36	34	32	28	27	27	22	20	18	18	17	20	10	8	16	25	3	3	7	-10	-25
	Tonality Presence:		-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	-
132A Fairfield Road	R3	36	29	32	29	37	41	45	37	36	36	33	31	30	26	23	22	22	23	27	17	17	22	30	13	12	17	4	-5
	Tonality Presence:		-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	-
33 Warnock Street	R4	32	31	34	31	38	41	45	37	35	33	29	27	26	21	18	16	16	15	17	8	6	17	26	4	5	10	-4	-14
	Tonality Presence:		-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	-

Appendix H

Short term measurements

Table H 1: Summary of short term noise measurements

Measurement number	Location	Start Time	Finish Time	Broadband Statistical Noise Levels dB(A)					Comments
				L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A90}	
21/07/2025									
1	L2	11:45	12:00	70	86	44	75	53	Monitoring at McCredie Road showed constant traffic noise from trucks and trailers with no quiet periods; construction equipment was visible but inactive.
2	NA	NA	NA	94	94	93	94	94	Calibration check (Pre-Cal)
3	L3	12:30	12:45	74	93	52	77	60	Monitoring at Fairfield Road showed constant traffic noise from trucks and light vehicles, with a continuous industrial hum from the nearby substation; no quiet periods were observed.
4	L1	13:15	13:30	46	64	38	48	40	Monitoring at Hemingway Crescent showed a quiet residential street with low traffic and a faint industrial hum audible from the north
05/08/2025									
1	NA	NA	NA	94	94	93	94	94	Calibration check (Pre-Cal)
2	M1	10:30	10:45	64	85	41	68	46	Monitoring at the intersection of McCredie Road and Palmer Road showed frequent car traffic with occasional trucks; otherwise, the area was relatively quiet.
3	M2	11:00	11:15	55	73	40	59	42	Monitoring at the intersection of McCredie Road and King Street showed generally quiet conditions with low traffic, occasional trucks, idling cars, bird activity, and intermittent noise from overhead planes
4	M3	11:30	11:45	65	82	44	68	54	Monitoring at the intersection of McCredie Road and Pavesi Street showed generally quiet conditions with low traffic, occasional trucks, idling cars, with road traffic being the predominant noise source.
5	M4	12:00	12:15	55	79	38	56	42	Monitoring indicated a quiet location with minimal traffic noise, a few birds, a dog barking, and distant traffic audible in the background.
6	NA	NA	NA	94	94	93	94	94	Calibration check (Post-Cal)

Appendix I

Noise wall design

Specification of the noise walls are provided below. Refer to Figure 7-2 for a 3D image showing the layout of the noise wall and noise sources on site.

Acoustic Performance Requirements:

- Compliance: Must meet local environmental noise regulations (e.g., NSW EPA Noise Policy, IEC 60076-10 for transformers).
- Minimum Sound Reduction Index (R_w): 25–35 dB

Construction Materials:

- Panel Type:
 - Precast concrete (minimum thickness 100–150mm).
 - Composite steel with absorptive lining (e.g., perforated steel with mineral wool).
 - Polycarbonate/acrylic if transparency is required (acoustically treated).
- Density Requirement: $\geq 10 \text{ kg/m}^2$ for effective noise reduction.
- Absorptive Facing: Internal surface of the noise walls to be cladded with Megasorber P100. – Min NRC 0.95

Wall Dimensions:

- Height: Minimum 5m.
- Length: As per the design in the figure
- Gaps & Openings: Fully sealed—no gaps at the base or between panels.
- Access Doors (if required): Acoustically sealed doors with R_w rating matching the wall.

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