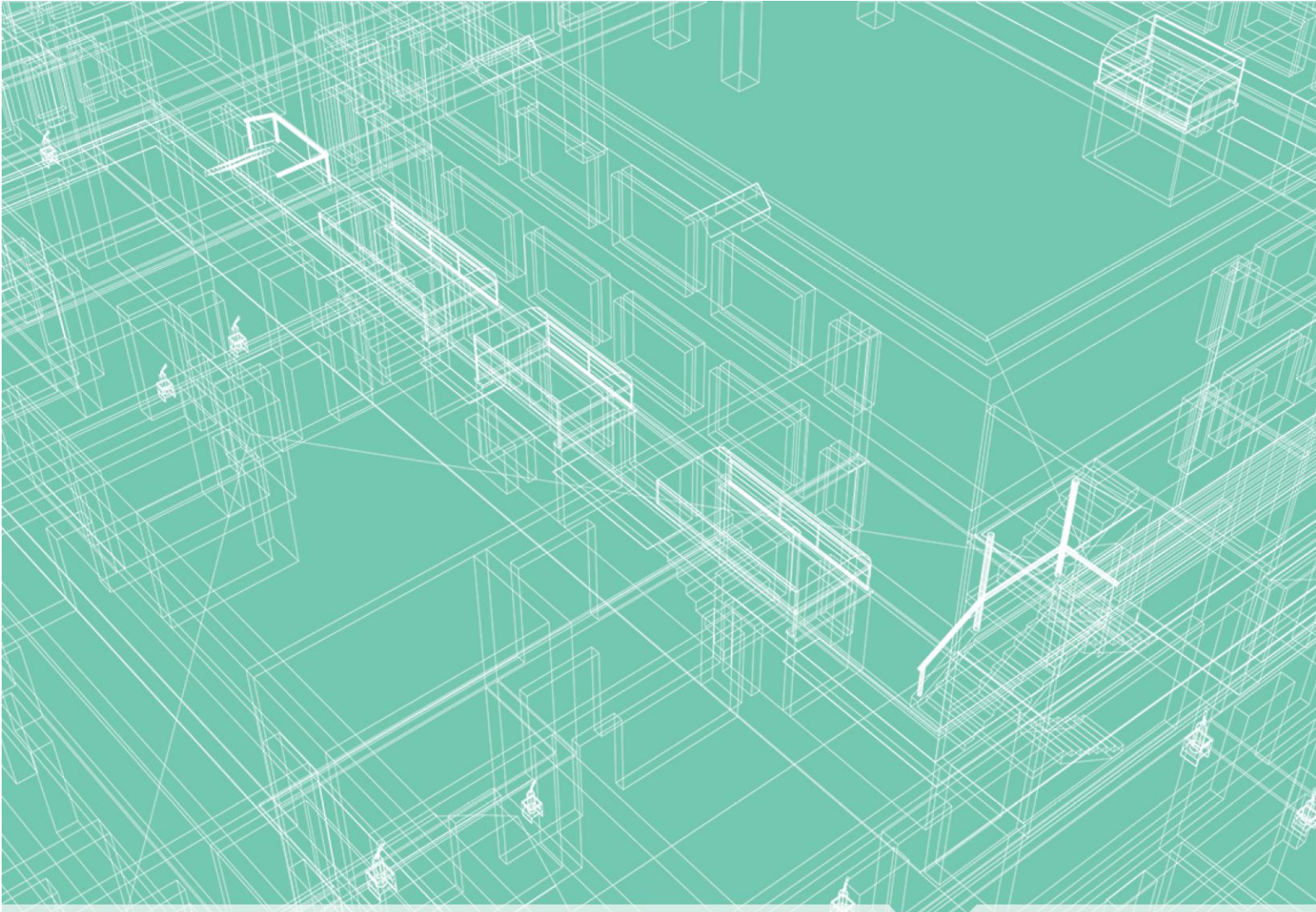

NOISE & VIBRATION IMPACT ASSESSMENT

LEPPINGTON PUBLIC SCHOOL UPGRADE,

JHA

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CONTENTS

1 INTRODUCTION

This Noise and Vibration Impact Assessment has been prepared to support a Review of Environmental Factors (REF) for the Department of Education (DoE) for the upgrade of Leppington Public School (LPS). The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37 of the T&I SEPP.

The Department of Education (DoE) is the proponent and determining authority pursuant to Section 5.1 of the Environmental Planning and Assessment Act 1979 (the Act).

The proposed activity is for upgrades to the existing LPS at 144 Rickard Road, Leppington, NSW, 2179 (the site).

The Purpose of this report is to:

- Identify noise sensitive receivers that will potentially be affected by the operation and construction of the proposed activity.
- Carry out noise survey to monitor existing ambient noise levels existing ambient and background noise levels on site.
- Establish appropriate noise criteria based on the noise survey, in accordance with the relevant standards, guidelines and legislation for the following noise emissions:
  - Mechanical plant from the activity to the surrounding receivers.
  - Activities within Hall.
  - Public address and school bell systems.
  - Activities on the outdoor playground.
  - Noise emissions from car park.
  - Traffic Noise Generation.
  - Other noise sources.
- Determine whether the relevant criteria can be achieved based on the proposed operations. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the activity or use to ensure with the assessment criteria.
- Establish noise and vibration criteria for construction work based on noise survey conducted by JHA Consulting Engineers, in accordance with standards and guidelines.
- Provide preliminary recommendations for Construction Noise and Vibration Planning.

This report provides:

- A statement of compliance with the relevant statutory criteria for the proposed activity within the vicinity of the nearest potentially affected receivers.
- Recommendations for noise mitigation measures for the proposed activity in order to meet the relevant criteria when compliance is not achieved.

The following documentation has been used for the preparation of this report:

- Site drawings of the proposed activity by Pedavoli Architects dated 16/01/2025.
- Noise data collected on site through the use of noise loggers and a handheld spectrum analyser.

This document and related work have been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001:2015 and ISO 14001:2015 respectively.

2 DESCRIPTION OF THE PROPOSAL

2.1 LOCATION / SITE DESCRIPTION

Leppington is a suburb of Sydney in the Local Government Area of the City of Camden, approximately 40km southwest of Sydney CBD.

LPS is located at 144 Rickard Road, Leppington, on the eastern side of Rickard Road, north of Ingleburn Road and south of Byron Road. The site has an area of 3.013ha and comprises 4 allotments, legally described as:

- Lot 1/DP127446
- Lot 39C/DP8979
- Lot 1/DP439310
- Lot 38E/DP8979

The site currently comprises an existing co-education primary (K-6) public school with:

- 14 permanent buildings;
- 11 demountable structures (including 2 male/female toilet blocks);
- interconnected paths;
- covered walkways;
- play areas; and
- at-grade parking.

The site also contains locally listed heritage buildings along its southern boundary.

The buildings are 1 storey in height and there is a sports oval in the eastern portion of the site. The existing buildings are clustered in the north-western part of the site.

Figure 1: Aerial image of the site, outlined in red (Source: NearMap, taken 24 Sept 2024)

2.2 PROPOSED WORK

The proposed activity involves upgrades to the existing LPS, including the following:

- Demolition of existing structures and trees;
- Erection of a new 3-storey teaching space along the northern boundary that includes 20 permanent teaching spaces and 3 support teaching spaces;
- Erection of a new hall and COLA comprising of a hall, canteen and OSHC hub towards the eastern boundary of site;
- Extension of the existing library (Building E) and adjoining playground;
- Upgraded sports and play facilities;
- Relocation of the Yarning Circle;
- Erection of a substation and upgrades to site services;
- Footpaths, fencing and associated works; and
- Landscaping.

The intent of the activity is to allow for upgrades to LPS that will provide a 'CORE 35' school standard in line with the Educational Facilities Standards and Guidelines (EFSG). The activity will increase the capacity of the school from 430 to 621 students.

Figure 2 below show the scope of works for the proposed activity.

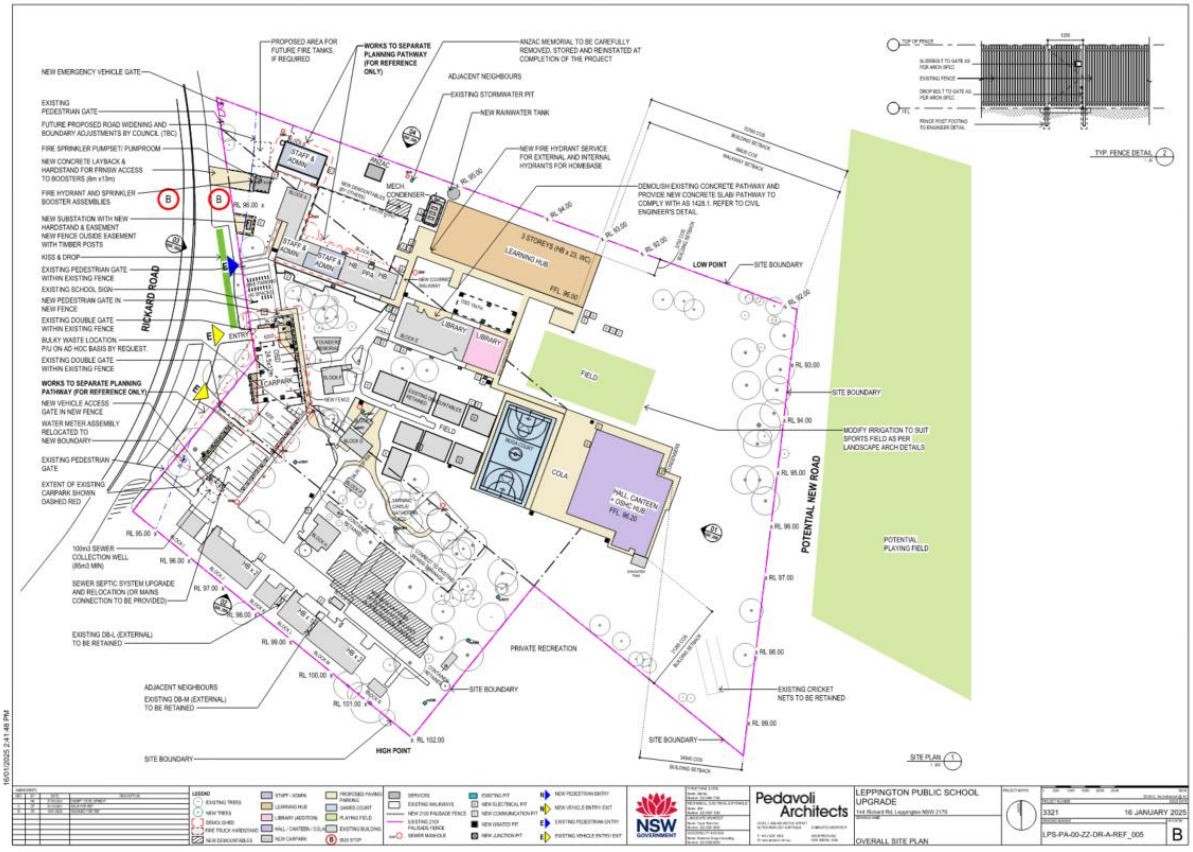


Figure 2: Proposed Activity (Source: Pedavoli Architects, Overall Site Plan (Rev B)).

2.3 EXISTING SURROUNDING RECEIVERS

A summary of the nearest noise sensitive receivers surrounding the site is shown in Table 1, including assumed approximate distances from the buildings with noise sources to the receiver boundaries, noting the type of noise receiver.

Noise Catchment Area	*Sensitive Receiver*	*Receiver Status*	*Receiver Type*	*Approx. Distance, m*
1	156 Rickard Road	Existing	Residential (Business Park – B7)	<5
2	153, 159, 163 & 173 Byron Road	Existing	Residential (Business Park – B7)	<5
3	134 Rickard Road & 141 Byron Road	Existing	Residential (Business Park – B7)	<5
4	151 Rickard Road	Existing	Residential (Commercial Core -B3)	15

Table 1: Nearest current sensitive receivers surrounding the site.

If noise impacts associated with the proposed activity are controlled at the nearest noise-sensitive receivers (as identified above) then compliance with the recommended criteria at all noise-sensitive receivers will be achieved. Figure 3 shows the nearest noise receivers surrounding the site location.

Figure 3: Nearest noise sensitive recievers surrounding the site location.

There is a current Planning Proposal (PP) for the Leppington Town Centre (PP-2023-284), which includes the LPS site. The PP proposes alternative land uses for some of the lots identified above. If successful, the re-zoning will transform the area adjacent to the site. Specifically, NCAs 1, 2 and 4 will become residential/mixed used and NCA 3 is the site for the proposed new Leppington High School. Based on this as a worst-case scenario, it has been assumed that NCAs 1, 2 and 4 will be residential receivers and NCA 3 will be an educational receiver.

3 SITE MEASUREMENTS

3.1 GENERAL

Attended and unattended noise surveys were conducted at the locations shown in Figure 4 to establish the ambient and background noise levels at the site. JHA Consulting Engineers carried out the noise surveys, in accordance with the method described in the AS/NZS 1055:2018 *'Acoustics – Description and measurement of environmental noise'*.

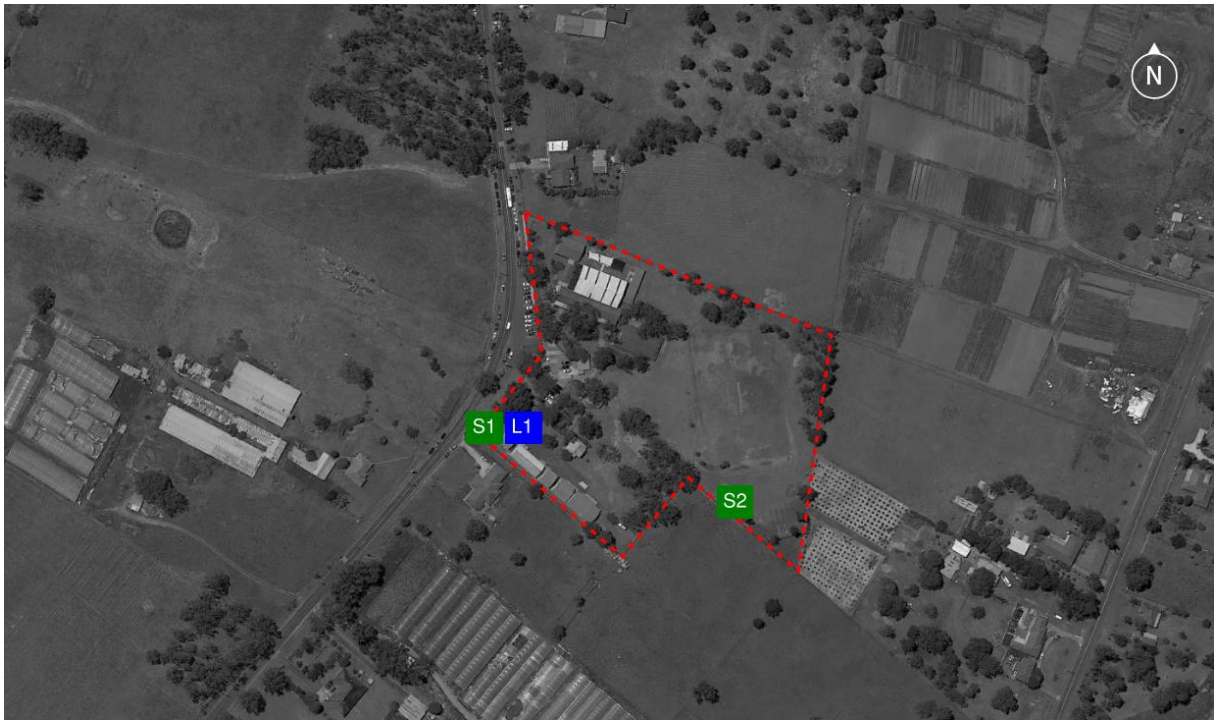


Figure 4: Noise survey locations and boundary of the site. (Long-term monitoring - L1, short-term monitoring S1 & S2).

3.2 LONG-TERM NOISE MONITORING

Long-term noise monitoring was carried out from Thursday, 16th February 2023 to Monday, 27th February 2023 with a Rion NL-52 noise logger (Serial Number 175549). The noise logger recorded L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise parameters at 15-minute intervals during the measurement period. The calibration of the noise logger was checked before and after use and no deviations were recorded.

The noise logger location is shown in Figure 4. The location was secured and is considered to be representative of the typical ambient and background noise levels. The noise logger microphone was mounted 1.5 metres above the ground and a windshield was used to protect the microphone. Weather conditions were monitored during the unattended noise monitoring period.

The detailed results of the long-term noise monitoring are presented graphically in Appendix A. As stated in the NSW EPA Noise Policy for Industry (NPI) 2017, any data likely to be affected by rain, wind or other extraneous noise has been excluded from the calculations (shadowed in the Appendix A graphs).

The Rating Background Levels (RBLs) have been established in general accordance with the methodology described in the NSW NPI – i.e., 10th percentile background noise level (L_{A90}) for each period of each day of the ambient noise level. The median of these levels is then presented as the RBL for each assessment period.

These RBLs are shown in Table 2 together with the ambient noise levels (L_{Aeq}) measured for each period.

Date	Assessment Background Levels, dB(A)			L_{Aeq} Ambient Noise Levels, dB(A)		
	Day 0700-1800	Evening 1800-2200	Night 2200-0700	Day 0700-1800	Evening 1800-2200	Night 2200-0700
Thursday, 16 February 2023	---	42	45	---	58	56
Friday, 17 February 2023	43	41	46	58	58	58
Saturday, 18 February 2023	39	---	49	57	---	56
Sunday, 19 February 2023	36	38	40	55	56	57
Monday, 20 February 2023	45	43	45	60	57	59
Tuesday, 21 February 2023	44	44	---	58	57	---
Wednesday, 22 February 2023	43	45	54	59	62	61
Thursday, 23 February 2023	40	46	47	60	64	63
Friday, 24 February 2023	42	46	48	59	58	59
Saturday, 25 February 2023	41	43	53	58	60	61
Sunday, 26 February 2023	38	41	43	56	58	60
Monday, 27 February 2023	41	44	39	58	59	59
Rating Background Levels	**41**	**43**	**46**	---	---	---
Ambient Noise Levels	---	---	---	**58**	**59**	**59**

Table 2: Results of long-term noise monitoring.

The noise environment surrounding the site is dominated by; natural noise (i.e., birds, insects, etc.), agricultural activites and intermittent road noise from Rickard Road. We note that the increased noise levels recorded at night-time period are likely due to increased wildlife activity at night, in particular from insects.

3.3 SHORT-TERM NOISE MONITORING

Short-term noise monitoring was carried out to obtain representative third-octave band noise levels of the site on Thursday, 16th February 2023 and Tuesday, 28th February 2023, during the day-time period. Short-term noise measurements were carried out with a NTi XL-2 hand-held Sound Level Meter (SLM) (Serial Number A2A-13742-E0). The calibration of the SLM was checked before and after each use, and no deviations were recorded.

The SLM microphone was mounted 1.5 metres above the ground, and a windshield was used to protect the microphone. Measurements were undertaken in the free field – i.e., more than 3 metres away from any building façade or vertical reflective surface. Weather conditions were calm and dry during the attended noise monitoring.

Location	Date and Time	Parameter	Sound Pressure Level, dB (re 20μPa)								
			Overall dB(A)	Octave Band Centre Frequency, Hz							
				63	125	250	500	1k	2k	4k	8k
S1	16/02/2023 11.05pm – 11:20pm	$L_{90,15min}$	50	52	45	37	34	36	34	48	36
		$L_{eq,15min}$	62	70	64	60	57	57	53	52	41
		$L_{10,15min}$	63	67	63	61	57	60	55	52	42
S2	28/02/2023 11.51pm – 12.07pm	$L_{90,15min}$	36	44	38	32	32	33	27	22	16
		$L_{eq,15min}$	43	51	44	38	37	38	34	35	24
		$L_{10,15min}$	44	52	45	39	38	39	34	39	26

Table 3: Results of short-term noise monitoring.

3.4 TRAFFIC NOISE MONITORING

Based on the long-term noise monitoring results at location L1, the traffic noise levels from Rickard Road are summarised in Table 4 below.

Location	Measured Traffic Noise Levels, dB(A)			
	Day (7am-10pm)		Night (10pm-7am)	
L1	$L_{Aeq,15hour}$ 59	Noisiest $L_{Aeq,1hour}$ 62	$L_{Aeq,9hour}$ 60	Noisiest $L_{Aeq,1hour}$ 62

Table 4: Results of unattended long-term noise monitoring for traffic.

4 RELEVANT NOISE STANDARDS AND GUIDELINES

4.1 STANDARDS AND GUIDELINES

The following standards and guidelines are considered relevant to the project and have been referenced in developing the project noise level criteria.

Regulatory Framework:

- Environmental Planning and Assessment (EP&A) Act 1979.
- Protection of the Environmental Operations (POEO) Act 1997.
- NSW Environment Protection Authority (EPA), Noise Guide for Local Government (NGLG) 2023.

Planning Framework:

- State Environmental Planning Policy (Precincts—Western Parkland City) 2021.

Noise Emissions and Intrusions:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017.
- AAAC Guideline for Child Care Centre v3.0 September 2020.
- State Environmental Planning Policy, (Transport and Infrastructure) 2021.
- NSW Department of Education. Educational Facilities Standards and Guidelines (EFSG).

Transport Noise:

- NSW DECCW, Road Noise Policy (RNP) 2011.
- Australian Standard AS2021:2015 *'Acoustics – Aircraft Noise Intrusion – Building Sitting and Construction'*.

Construction Noise and Vibration:

- NSW DECCW, Interim Construction Noise Guideline (ICNG) 2009.
- NSW DECC, Assessing Vibration: A Technical Guideline 2006.
- NSW Road Maritime Service (RMS), Construction Noise and Vibration Guideline 2016.
- Australian Standard AS 2436:2010 '*Acoustics – Guide to Noise Control on Construction, Maintenance & Demolition Sites*'.

4.2 REGULATORY FRAMEWORK

4.2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT (EP&A) ACT 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevantly about planning matters and ensuring that "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria which may be defined in a Development Control Plan or derived from principles using guidelines like NSW EPA Noise Policy for Industry (NPI 2017) or Noise Guide for Local Government (NGLG 2023).

4.2.2 PROTECTION OF THE ENVIRONMENTAL OPERATIONS (POEO) ACT 1997

The Protection of the Environment Operations (POEO) Act 1997 has the objective of protecting, restoring and enhancing the quality of NSW environment. Abatement of noise pollution is underpinned by the definition of "offensive noise" as follows:

"...

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

...

4.2.3 NOISE GUIDE FOR LOCAL GOVERNMENT

NGLG 2023 is a guideline that it is aimed at councils and planners to provide guidance in the management of local noise problems and in the interpretation of existing policy and legislation. Table 6 of NGLG 2023 contains the management for common neighbourhood noise issues and describes the responsibilities of EPA as the Appropriate Regulatory Authority (ARA).

NGLG 2023 provides a consideration checklist to determine an "offensive noise". The "offensive noise" test aids in making a systematic judgment about the offensive nature of noise emissions. The NGLG 2023 offensive noise test considers that noise may be offensive in three ways, according to:

- Audibility.
- Duration.
- Inherently offensive characteristics.

4.3 PLANNING FRAMEWORK

The SEPP (Precincts—Western Parkland City) 2021 is the environmental planning instrument that applies to the site and sets the land zoning of the site and surroundings. Leppington public school is zoned as Business Park (B7), as is the surrounding land to the north, east and south. Land to the west is zoned as Commercial Core (B3).

Figure 5 shows the land zoning as per information extracted NSW Planning Portal Spatial Viewer Land Zoning Map.

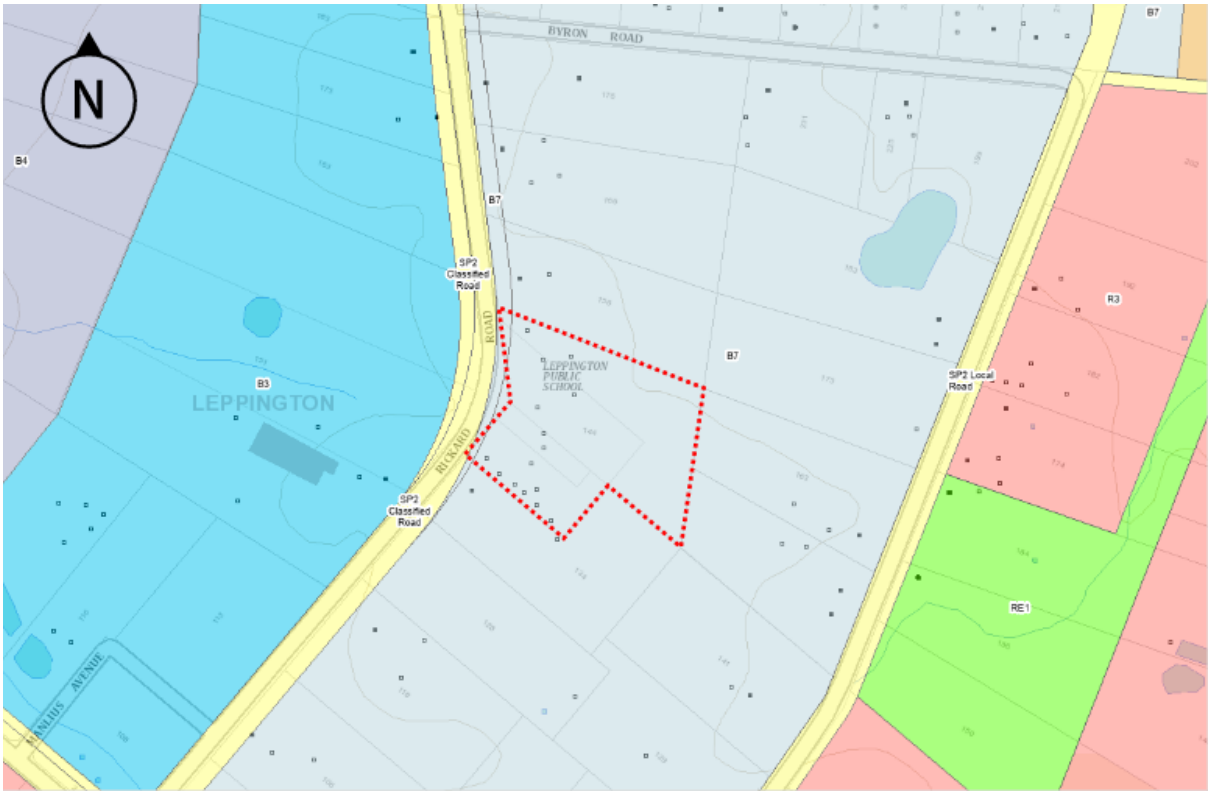


Figure 5: Land zoning of the site (red outline) and surroundings.

As noted in Section 2.3, there is a current Planning Proposal (PP) for the Leppington Town Centre (PP-2023-284), which includes the LPS site. The PP proposes alternative land uses and urban design response to the redevelopment of the Leppington Town Centre which will transform the area adjacent to the site from a proposed business park and medium density residential area (under the current controls) to one that acknowledges the existing school and proposes an educational precinct, residential lots, parklands and new roads surrounding the site. Based on this as a worst-case scenario, it has been assumed that lots to the north, east and west of the site will be residential receivers and the New Leppington High School will be immediately to the south.

4.4 OPERATIONAL NOISE

4.4.1 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry 2017 assesses noise from industrial noise sources - scheduled under the POEO. Mechanical noise from the activity shall be addressed following the recommendations in the NSW NPI.

The assessment is carried out based on the existing ambient and background noise levels addressing the following:

- Intrusiveness Criteria, to control intrusive noise into nearby sensitive receivers.
- Amenity Criteria, to maintain the noise level amenity for particular land uses.

These criteria are established for each assessment period (day, evening and night) and the more stringent of the two criteria sets the Project Noise Trigger Level (PNTL).

4.4.1.1 Intrusiveness Criteria

The NSW NPI defines the intrusiveness criteria as follows:

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, and does not exceed the background noise level by more than 5dB when beyond a minimum threshold."

The noise environment at the site is dominated by natural sounds and the surrounding area is sparsely populated greenfield land with residential properties to the north, east and south of the site. Based on the existing noise environment plus surrounding land use, the nearest potentially noise affected receivers have been categories as rural residential.

Based on the intrusiveness criteria definition and the measured background noise levels on site conducted by JHA Consulting Engineers, Table 5 shows the intrusiveness criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Rating Background Level dB(A)*	*Intrusiveness Criterion dB(A)*
Rural Residential	Day	41	46
	Evening	43	46*
	Night	46	46*

Table 5: Determination of the intrusiveness criterion. ***Note**: As per NSW NPI, the night time criteria cannot be higher than the evening time criteria which cannot be higher than the daytime criteria.

4.4.1.2 Amenity Criteria

The NSW NPI states the following to define the amenity criteria:

"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 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance."

Based on the amenity criteria definition and the land zoning, Table 6 shows the amenity criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Recommended Amenity Noise Level ($L_{Aeq,period}$) dB(A)*	*Amenity Criterion ($L_{Aeq,15min}$) dB(A)*
Rural Residential	Day	50	48 (50-5+3)
	Evening	45	43 (45-5+3)
	Night	40	38 (40-5+3)

Table 6: Determination of amenity criterion.

4.4.1.3 Project Noise Trigger Levels

The PNTL's are shown in Table 7 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point of the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criterion dB(A)*	*Amenity Criterion dB(A)*
Rural Residential	Day	46	48
	Evening	46*	43
	Night	46*	38

Table 7: PNTLs for noise sensitive receivers (light grey). *Note: As per NSW NPI, the night time criteria cannot be higher than the evening time criteria which cannot be higher than the daytime criteria.

Receiver Type	*Period*	*Criterion L_{Aeq} dB(A)*
Educational	Nosiest 1-hour when in use	35dB(A) (Internal) 45dB(A) (External)

Table 8: PNTLs for non-residential receivers.

4.4.2 SEPP TRANSPORT AND INFRASTRUCTURE

In the absence of operational noise level criteria for development without consent, the NSW State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021 has been used and provides the noise criteria for the use of the school in Schedule 6, Chapter 3. The policy states:

"A new building or (if the development is an alteration or addition to an existing building for the purpose of changing its use) an existing building that is to be used for the purpose of a school or school-based childcare must be designed so as not to emit noise exceeding an L_{Aeq} of 5dB(A) above background noise when measured at any lot boundary."

It has been assumed for this assessment that the school will operate within typical school hours with occasional evening use. Based on the long-term unattended noise results of background noise levels, the school's operational noise level criterion for the daytime and evening time periods are shown in Table 9.

Indicative Noise Amenity Area	*Period*	*Noise Level Criteria, L_{Aeq} dB(A)*
Rural Residential	Day (7am-6pm)	46
	Evening (6pm-10pm)	48

Table 9: Noise level emissions criteria as per EECCF SEPP.

4.4.3 PLAYGROUND NOISE BASED ON AAAC GUIDELINES

There are no prescribed regulations or legislation that applies to outdoor playground noise from schools. Therefore, there is no noise criteria that can be used. Furthermore, we understand that the common approach of "offensive noise" is not appropriate for a planning situation such as this proposal.

Our noise assessment approach is based on:

- NSW tribunal decisions when assessing noise from the use of child care centres.

- 'Guideline for Childcare Centre Acoustic Assessment' prepared by the Association of Australasian Acoustical Consultants (AAAC).

The AAAC guideline is addressed for assessment of childcare centres, and its noise level criterion for outdoor spaces have been considered as deemed adequate by NSW tribunal decisions. As children do not play outdoors continuously for long periods of time, and as the duration of time for children playing outside is reduced, the overall noise annoyance reduces. Therefore, it is reasonable to allow a higher level of noise impact for a shorter duration.

Whilst the AAAC guideline does not apply to schools, there are similarities in noise emissions from uses of outdoor playground areas for schools and childcare centres. Therefore, we recommend that the following noise criteria shall be applied to noise impacts arising from schools' outdoor playgrounds.

Table 10 shows the noise level criteria proposed by the AAAC guideline for assessing noise from outdoor spaces. These are the noise levels at which it is considered that complaints are unlikely.

Use of outdoor area	*Noise Level Criteria*	*Criteria (daytime)*
Up to 4 hours (total) per day[1]	$L_{Aeq,15min}$ noise level from outdoor area not to exceed the existing background noise level ($L_{A90,15min}$) plus 10dB $L_{Aeq,15min} < L_{A90,15min} + 10dB(A)$	$L_{Aeq,15min} < 51dB(A)$
More than 4 hours (total) per day	$L_{Aeq,15min}$ noise level from outdoor area not to exceed the existing background noise level ($L_{A90,15min}$) plus 5dB $L_{Aeq,15min} < L_{A90,15min} + 5dB(A)$	$L_{Aeq,15min} < 46dB(A)$

Table 10: Noise level criteria for the playground areas as per AAAC guideline.

4.4.4 SUMMARY OF OPERATIONAL NOISE LEVELS

Based on the criteria from the relevant noise standards and guidelines detailed above, Table 11 summarises the operational noise level criteria.

Noise Emission	*Standard / Guideline*	*Time Period*	*Noise Level Criteria (dBA)*
External Mechanical Plant (Applicable to residential receivers)	NSW EPA NPI	Day Time (7am-6pm)	46
		Evening Time (6pm-10pm)	43
		Night Time (10pm-7am)	38
External Mechanical Plant (Applicable to educational receivers)		Nosiest 1-hour when in use	35dB(A) (Internal) 45dB(A) (External)
Operational Noise	SEPP	Day Time (7am-6pm)	46
		Evening Time (6pm-10pm)	48
Outdoor playground	AAAC Guideline	Up to 4 hours	51
		More than 4 hours	46

Table 11: Summary of the noise level criteria at the nearest noise sensitive receivers based on the noise emission.

[1] 4 hours are set in 2 hours in the morning and 2 hours in the afternoon.

4.5 TRANSPORT NOISE

4.5.1 TRAFFIC NOISE

The NSW Road Noise Policy (RNP) establishes criteria for traffic noise from:

- Existing roads,
- New road projects,
- Road development projects,
- New traffic generated by developments.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited up to 2.0dB above the existing noise levels. An increase of up to 2.0dB represents a minor impact that is considered barely perceptible to the average person.

In cases where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.

4.5.2 AVIATION NOISE

As per information obtained from Western Sydney Airport Environmental Impact Statement, it can be confirmed that the proposed activity is located outside the Australian Noise Exposure Concept (ANEC). Therefore, as per AS 2021:2015 *'Acoustics – Aircraft Noise Intrusion – Building Sitting and Construction'*, the site is considered acceptable and there is no requirement to carry out an aircraft noise assessment to define additional noise control requirements for aircraft noise. Appendix B contains the Western Sydney Airport ANEC contours.

4.6 CONSTRUCTION NOISE AND VIBRATION

4.6.1 NOISE CRITERIA

The ICNG suggest construction noise management levels that may minimise the likelihood of annoyance being caused to noise sensitive residential receivers depending on the duration of works. The management levels for long-term duration works are as follows:

- Within recommended standard hours.

  The Management Level ($L_{Aeq,15min}$) measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background noise level (RBL) by more than 10dB(A). This noise level represents the point above which there may be some community reaction to noise.

  However, in the case of a highly noise affected area, the Management Level ($L_{Aeq,15min}$) at the most exposed boundary of any affected residential receiver when the construction site is in operation should not exceed 75dB(A). This level represents the point above which there may be strong community reaction to noise.

- Outside recommended standard hours.

  The Management Level ($L_{Aeq,15min}$) measured at the most exposed boundary of any affected residential receiver when the construction site is in operation must not exceed the background

noise level (RBL) by more than 5dB(A). It is noted that a strong justification is required for works outside the recommended standard hours.

ICNG suggests construction noise management levels for other sensitive land uses surrounding construction sites. Table 12 below summarises the airborne construction noise criteria for receivers surrounding the site.

Sensitive Receiver		*Airborne Construction Noise Criteria, L_{Aeq} dB(A)*	
		Within Standard Hours	*Outside Standard Hours*
Residential Receivers	Noise affected / External	RBL+10	RBL+5
	Highly noise affected / External	75	N/A
Active Recreation	External	65	N/A
Existing Classrooms	Internal	45	N/A

Table 12: ICNG construction airborne noise criteria for noise sensitive receivers surrounding the site.

The ICNG recommends internal ground-borne noise maximum levels at residences affected by nearby construction activities. Ground-borne noise is noise generated by vibration transmitted through the ground into a structure and can be more noticeable than airborne noise for some sensitive receivers. The ground-borne noise levels presented below from the ICNG are for residential receivers during evening and night-time periods only, as the objective is to protect the amenity and sleep of people when they are at home.

- Evening: $L_{Aeq,15min}$ 40dB(A) - internal
- Night: $L_{Aeq,15min}$ 35dB(A) - internal

The internal noise levels are assessed at the centre of the most affected habitable room.

4.6.2 VIBRATION CRITERIA

4.6.2.1 Human Comfort

The Department of Environment and Climate Change (DECC) developed the document '*Assessing Vibration: A Technical Guideline*' in February 2006 to assist in preventing people from exposure to excessive vibration levels within buildings. It is based on the guidelines contained in BS 6472.1:2008 '*Guide to evaluation of human exposure to vibration in buildings – Vibration sources other than blasting*'.

The guideline does not address vibration induced damage to structures or structure-borne noise effects. Vibration and its associated effects are usually classified as continuous (with magnitudes varying or remaining constant with time), impulsive (such as shocks) or intermittent (with the magnitude of each event being either constant or varying with time). Vibration criteria for continuous and impulsive vibration are presented in Table 13 below, in terms of vibration velocity levels.

Place	Time	r.m.s. velocity, mm/s [dB ref 10^{-6}mm/s]			
		Continuous Vibration		Impulsive Vibration	
		Preferred	Maximum	Preferred	Maximum
Residences	Day-time	0.20 [106 dB]	0.40 [112 dB]	6.00 [136 dB]	12.00 [142 dB]
	Night-time	0.14 [103 dB]	0.28 [109 dB]	2.00 [126 dB]	4.00 [132 dB]
Offices, schools, educational and worship	When in use	0.40 [112 dB]	0.80 [118 dB]	13.00 [142 dB]	26.00 [148 dB]

Table 13: Continuous and impulsive vibration criteria applicable to the site.

When assessing intermittent vibration comprising a number of events, the Vibration Dose Value (VDV) it is recommended to be used. Table 14 shows the acceptable VDV values for intermittent vibration.

Place	Time	Vibration Dose Values, $m/s^{1.75}$	
		Preferred	Maximum
Residences	Day-time	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational and worship	When in use	0.40	0.80

Table 14: Intermittent vibration criteria applicable to the site.

4.6.2.2 Structural Building Damage

Ground vibration from construction activities can damage surrounding buildings or structures. For occupied buildings, the vibration criteria given in previous section for Human Comfort shall generally form the limiting vibration criteria for the Project.

For unoccupied buildings, or during periods where the buildings are unoccupied, the vibration criteria for building damage suggested by German Standard DIN 4150.3:2016 *'Vibration in Buildings – Effects on Structures'* are to be adopted. Guideline values from DIN 4150.3:2016 are presented in Table 15.

Structural type	*Vibration velocity, mm/s (Peak Particle Velocity - PPV)*				
	Foundation			*Plane of floor uppermost full storey in horizontal direction*	*Floor slabs, vertical direction*
	1Hz to 10Hz	*10Hz to 50Hz*	*50Hz to 100Hz*	*All frequencies*	*All frequencies*
Type 1: Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
Type 2: Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
Type 3: Structures that because their particular sensitivity to vibration, cannot be classified under Type 1 and 2 and are of great intrinsic value (e.g. heritage buildings)	3	3 to 8	8 to 10	8	20

Table 15: DIN 4150.3:2016 Guideline values of vibration velocity (PPV) for evaluating the effects of short-term vibration.

5 OPERATIONAL NOISE EMISSIONS ASSESSMENT

Noise emissions from the proposed activity have the potential to impact on existing noise sensitive receivers surrounding the site. For the purpose of this noise impact assessment, the noise sources associated with the activity are assumed as follows:

- Mechanical plant from the activity to the surrounding receivers.
- Indoor learning activities.
- Activities and events within the Hall.
- Public address and school bell systems.
- Activities on the outdoor playground.
- Noise emissions from car park.
- Traffic Noise Generation.
- Other noise sources.

Each of these noise sources have been considered in the noise impact assessment. The noise impact assessments have also considered the following:

- Noise levels have been considered as continuous over the assessment time period to provide the worst-case scenario.
- Distance attenuation, building reflections and directivity.
- Lowest background noise levels measured.

5.1 EXTERNAL MECHANICAL PLANT

Noise from mechanical plant from the proposed activity should be controlled to ensure external noise emissions are not intrusive and do not impact the amenity of noise sensitive receivers. The noise emissions must meet the noise limits as set out in accordance with the NSW NPI.

Noise controls may need to be incorporated with the design of the mechanical plant to ensure that cumulative noise levels from plant to the nearest noise sensitive receivers meets the noise level criteria. Mechanical plant will operate continuously during school's operational hours and no night-time operation (10pm to 7am) of the external mechanical plant should be allowed.

At this stage, final mechanical plant selections have not been made; therefore, it is not possible to undertake a detailed assessment of the mechanical plant noise emissions. Noise controls will need to be incorporated with the design of the mechanical plant rooms to ensure that the cumulative noise levels from plant to the nearest noise sensitive receivers meets the NSW NPI noise level criteria.

Residential receivers to the north have been assumed as the most affected due to the proposed location and footprint of the external mechanical plantrooms. These noise sensitive receivers will be affected by the noise emissions from the plant Figure 6.

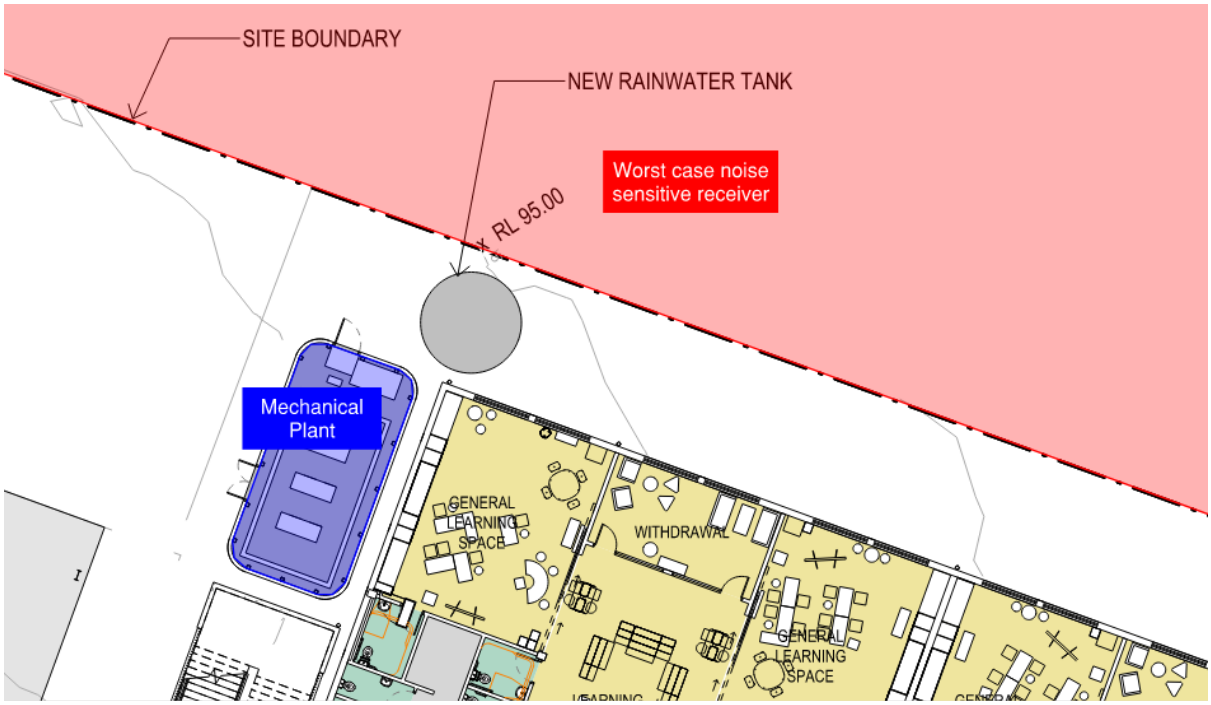


Figure 6: Proposed location of the external mechanical plant.

Approximate distance from the boundary of the mechanical plant area and the boundary of the nearest residential receivers is approximately 5m. A worst-case scenario has been used, considering the noise level criteria during daytime period and the distance from the proposed mechanical plant areas to the nearest noise sensitive receivers. Therefore, the maximum allowable cumulative noise emissions from the external mechanical plant to the worst-case receiver, has been predicted and shall be limited to $L_{Aeq,15min}$ 56dB(A) at 1 metre from the plant boundary:

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of mechanical plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
  - In-duct attenuation.
  - Noise enclosures as required.
  - Sound absorptive panels.
  - Acoustic louvres as required.
  - Noise barriers as required.

Acoustic assessment of mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

5.2 INDOOR LEARNING ACTIVITIES

Noise from indoor learning activities has the potential to impact the nearby sensitive receivers. A high-level assessment of classroom noise break-out to the nearest receives has been conducted by JHA Consulting Engineers

The following assumptions have been considered for the classroom noise break-out assessment:

- The sound power level for 30 students is 85dB(A).
- The reverberation time within the classroom is 0.5 seconds.
- The nearest noise sensitive receiver is Receiver 1 – to the north, approximately 5m from the classroom façade. See Figure 3.
- External glazing achieves sound reduction index of R_W32.
- The façade provides a sound reduction index of R_W50.

Based on the assumptions above, the resulting noise break-out from classroom activities at the boundary of the nearest noise sensitive receiver to the north is 32dB(A). Therefore, noise emissions from classroom learning activities are predicted to comply with the operational noise criteria, as per Section 4.4.2.

The building façade shall be reviewed during the detailed design of the project once glazing and façade areas will be defined. The window acoustic requirements are to be achieved based on the performance of the framing and glass together.

5.3 PUBLIC ADDRESS AND SCHOOL BELL SYSTEMS

Noise from proposed activity public address and school bell systems should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of noise sensitive receivers.

At this stage, public address and school bell systems selections have been not made; therefore, it is not possible to undertake a detailed assessment of the public address and school bell noise emissions. However, a preliminary noise impact assessment has been carried out. Acoustic assessment of public address and school bell systems shall continue during the design phases of the project once location, number and type of loudspeakers will be nominated.

Noise emissions of the systems shall not exceed the noise level criteria shown in 4.4.2 when assessed cumulatively with all operational noise emissions from the school.

It is assumed that, as a worst case, loudspeakers will be oriented to the field to the north of the new Hall/Canteen building, therefore, the noise impact to the nearest noise sensitive receivers to the north has been assessed. An approximate distance of 60m from the COLA to the boundary of the nearest noise sensitive receiver has been assumed and given the noise level criteria as per Section 4.4.2 and directivity of typical loudspeakers, noise emissions from the loudspeakers shall be limited to L_{Aeq} 75 dB(A) at 1m. It should be noted that this prediction is conservative due to the unknown location of the speakers at this design stage.

The EPA notes numerous reports of community concern arising from inadequate design and installation as well as inappropriate use of school public address and bell systems. EPA considers that appropriate design, installation and use of those systems can both:

- Meet the proponent's objectives of proper administration of the school and ensuring safety of students, staff and visitors, and
- Avoid interfering unreasonably with the comfort and repose of occupants of nearby residences.

The public address and school bell systems shall be designed, installed and operated such that the systems do not interfere unreasonably with the comfort and repose of occupants of nearby residences. It is anticipated that the noise impact to the nearest sensitive receivers will be negligible if following recommendations are implemented:

- Low-powered horn-type speakers shall be located and orientated to provide a good coverage of the school areas whilst being directly away from residences and near sensitive receivers. System coverage shall be reviewed during the design phases.
- Speakers shall be mounted with a downward angle and as close to the floor as possible.
- The noise level of the systems shall be adjusted on site so they will be clearly audible on the school site without being excessive. The systems shall initially be set so that the noise at nearby residences and sensitive receivers do not exceed noise level criteria.
- Once the appropriate noise level has been determined on site, the systems shall be limited to these noise levels so that staff cannot increase the noise levels.
- The systems shall be set so that it only occurs on school hours – to not operate out of hours.

Acoustic assessment of the public address and school bell systems shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

5.4 ACTIVITIES WITHIN HALL

Operational noise from the proposed Hall should be controlled to ensure external noise emissions are not intrusive and do not impact the amenity of noise sensitive receivers. The Hall's noise level emissions must meet the noise limits as set out in accordance with the SEPP in Section 4.4.2. An acoustic assessment of the noise emissions of the Hall use has been conducted.

The following assumptions have been made for the assessment:

- The noise assessment has considered the proposed layout as shown in Figure 7.
- Building shielding, directivity and distance attenuation.
- Events will occasionally occur during out of school hours (Evening time period from 6.00pm to 10.00pm).
- Two scenarios have been assessed:
  - Scenario 1: Hall operating with open doors and open window.
  - Scenario 2: Hall operating with closed doors and window.
- Hall bi-fold doors are located in the western façade.
- The glazing for doors (when applicable) and windows provides a minimum sound reduction index of R_W32 which is achieved using a 6.38mm laminated fixed single glazing system.

The location of the Hall, relative to the site boundaries is shown (highlighted red) in Figure 7.

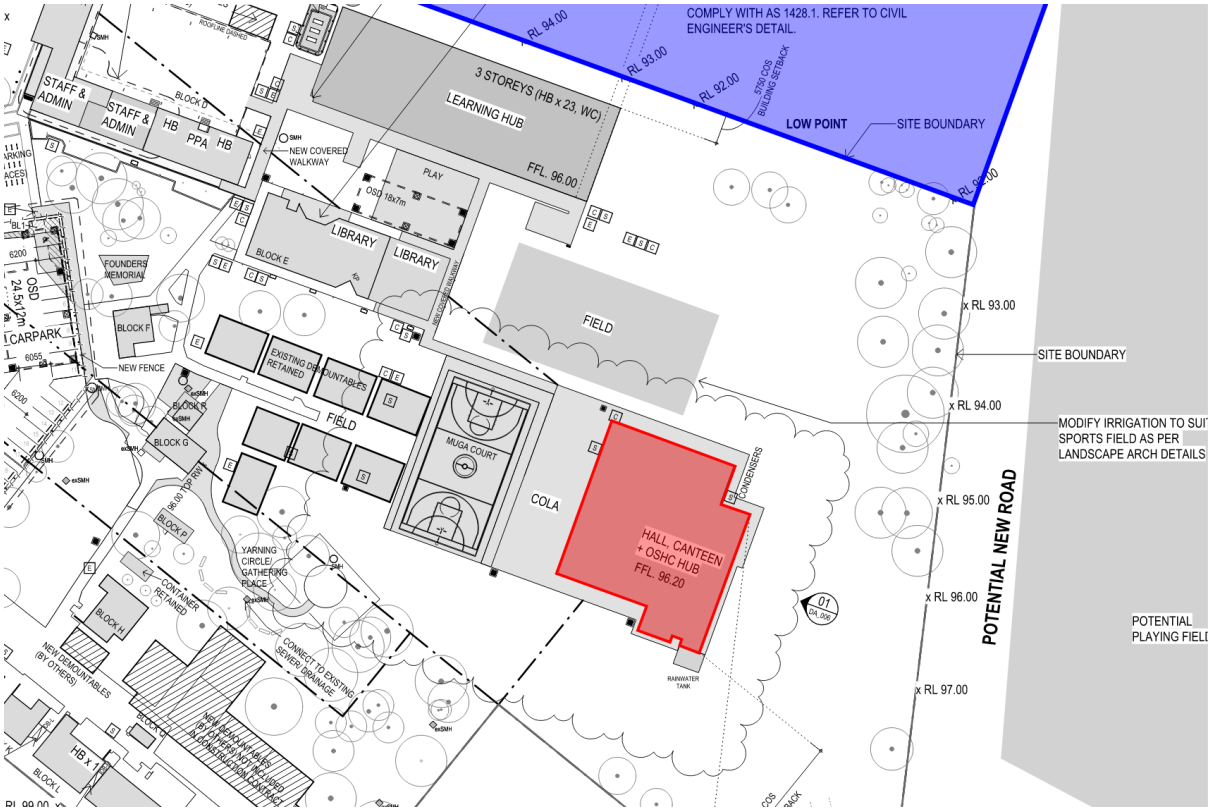


Figure 7: Location of the new Hall building (red highlight) and most affected residential receiver (blue highlight).

The proposed Hall is expected to be used by students and teachers during the day-time as well as by parents and community occasionally during the evening period (6pm to 10pm) for out-of-hours events. Halls are typically used for school assemblies, presentations, examinations and student concerts during school hours. The noise assessment within this section has considered amplified noise sources (such as music performances, etc.) during the daytime period as a worst-case scenario.

The predicted noise levels at the nearest residential receiver, as a results of noise emissions from the Hall for each scenario, are shown in Table 16.

Calculation	*Noise Level dB(A)*	
	Scenario 1 Doors & Windows Open	*Scenario 2 Doors & Windows Closed*
Reverberant $L_{Aeq,15min}$ within Hall	95	95
Composite Sound Insulation of Façade, dB	-10	-34
Correction Surface Area of Façade, dB	20	20
Correction for Distance, dB	-34	-34
Correction for reflections, directivity, shielding, dB	-17	-17
Predicted Noise Level at Boundary of the Nearest Receiver, dB(A)	54	30
Noise Level Criteria during day-time, L_{Aeq} / Complies?	46 / No	46 / Yes

Table 16: Predicted noise levels from Hall with doors and windows open (Scenario 1) and doors and windows closed (Scenario 2) to the nearest residential receiver.

Based on the assessment above, the predicted noise level the boundary of nearest receiver will comply with the SEPP daytime and evening criteria with the windows closed. However, with windows open the noise level at the nearest receiver will exceed both the daytime and evening criteria. Compliance with windows and doors open is expected if amplified music within the Hall is limited to 84dB(A). Therefore, it is recommended to implement a noise operational management plan for the use of the Hall to minimise amenity disruption of the nearest noise sensitive receivers.

5.5 OUTDOOR PLAYGROUND

Noise emissions from the outdoor playground have the potential to impact on the nearest noise sensitive receivers. A high-level noise assessment of the outdoor playground has been conducted at the nearest residential receiver boundary.

Based on the projected increase in student numbers of approximately 191 students the noise levels as a result of the additional student population will increase the noise level on site by less than 2dB(A). An increase of less than 2dB(A) can be considered negligible and it would not be discernible by the average listener, and therefore, would not warrant receiver-based treatments or controls.

Therefore, noise from the outdoor playground is not expected to affect the amenity of the surrounding noise sensitive receivers.

5.6 CARPARK

The existing number of carparking space will retained as part of the proposed activity. Therefore, no additional vehicle activity is expected in the carpark and noise emissions from carpark activity are not expected to impact the amenity of the nearest noise sensitive receivers.

5.7 TRAFFIC NOISE GENERATION

Noise impact of the traffic flows generated by the proposed activity are required to meet the NSW Road Noise Policy (RNP).

As noted in Section 4.5 when considering land use redevelopment and the impact on sensitive land uses (residential / schools / hospitals / recreational) the RNP states that an increase up to 2.0dB in relation to existing noise levels is anticipated to be insignificant. Based on the proposed works, and our review of the traffic impact assessment prepared by Stantec, dated 05/12/2024, the traffic increase due to the activity is not expected to result in any noticeable change in traffic noise levels and is expected to meet the NSW Road Noise Policy recommendations.

5.8 OTHER NOISE SOURCES

Noise emissions from the waste collection have the potential to impact on the nearest noise sensitive receivers.

It is anticipated that the noise impact from waste collection to the nearest noise sensitive receivers will be negligible if following recommendations are implemented:

- Waste collection and servicing is to be carried out during daytime hours. (7am – 6pm)
- Waste collection and servicing is to be carried out within the confines of the school.

5.9 CUMULATIVE IMPACT ASSESSMENT

Cumulative impact refers to the combined effect of multiple projects or activities on the environment over time. It is critical to evaluate how the proposed project, in conjunction with other past, present, and reasonably foreseeable future actions, might affect the environment during both construction and operation.

Being located in the South West Growth Area (SWGA), the site and surrounds are likely to experience significant growth and densification. Further, the recently exhibited draft Leppington Town Centre Rezoning review, and associated draft Indicative Layout Plan, seeks to amend the land use zone, density and height of buildings in and around the Leppington Town Centre. This growth generally, together with the establishment of a new High School to the immediate south, will necessitate the need to address cumulative impacts of the proposal in context of the growing population in the area.

The cumulative impacts of the upgraded school with potential future adjacent developments have been considered with the application of the NSW NPI.

The NSW NPI specifies amenity noise level objects for the total noise levels at a receiver locations within different noise amenity areas. To ensure that cumulative noise levels remain within the recommended amenity objectives, the project amenity noise level is set at 5dB(A) lower that the amenity noise level.

Each neighbouring development is expected to apply the same strategy from the NPI in order to maintain the acoustic amenity of the area.

6 NOISE INTRUSION ASSESSMENT

Traffic noise from Rickard Road has the potential to impact upon the facades of the proposed activity. In order to meet the EFSG internal noise levels requirements, JHA has carried out a review of traffic noise impacts and recommends the minimum glazing thickness for the buildings based on the noise monitoring conducted by JHA Consulting Engineers

The following assumptions have been considered for the traffic noise impacts:

- Traffic noise levels for the assessment are as per measured levels on site by JHA Consulting Engineers. Refer to Section 3.4.
- Internal noise levels are predicted based on noise levels incident at the façade of each space, which are based on the above measurements.
- External glazing is the weakest elements of the façade, and solid sections of the façade are typically to provide a sound reduction index of R_W50.
- Calculations have been based on achieving the internal noise targets as per EFSG.

To achieve the internal noise levels in accordance with Educational Facilitates Standards and Guidelines (EFSG), and based on the above assumptions, the following is required:

- External glazing is recommended to provide a minimum sound reduction index of R_W32. A 6.38mm laminated fixed single glazing system achieves the nominated sound reduction index.

Notwithstanding with the glazing recommendations provided above, the acoustic performance of the glazing and building façade shall be reviewed during the detailed design of the project once glazing and façade areas will be defined. The acoustic requirements are to be achieved based on the performance of the framing and glass together.

7 CONSTRUCTION NOISE AND VIBRATION PLANNING

Currently a detailed construction program is not yet full defined. This section of the Construction Noise and Vibration Planning provides general preliminary recommendations only and provides applicable criteria together with feasible and reasonable noise and vibration control practices to be observed during the construction of the proposed activity.

This preliminary advice in relation to construction noise and vibration management shall form the basis for the Contractor's Construction Noise and Vibration Management Plan (CNVMP) which shall identify any noise criteria exceedance once construction methods and stages are known.

Any noise from demolition and construction activities to be carried out on site must not result in *'offensive noise'* to any noise sensitive receiver. To this end, the Contractor employed to undertake the demolition and/or construction works is responsible for ensuring that any site noise and, in particular, any complaints shall be monitored, investigated, managed and controlled.

7.1 RELEVANT STANDARDS FOR CONSTRUCTION NOISE AND VIBRATION CRITERIA

Section 4.6 of this report contains the relevant legislation, codes, and standards in addition to construction noise and vibration criteria for this project.

7.2 WORKING HOURS

The following construction hours are proposed as follows:

- Monday to Friday: 7am to 6pm.
- Saturday: 8am to 1pm.
- Sundays and Public Holidays: No excavation or construction works.

It is noted that the proposed construction hours are within the recommended EPA hours. Noise control measures are to be implemented during these hours following consultation and engagement with the community.

It is recommended that high noise level works – i.e. piling, excavation, etc – shall be scheduled to not occur during shoulder periods of the recommended standard hours – i.e 7am to 8am and 5pm to 6pm. A detailed Construction Noise & Vibration Management Plan (CNVMP) shall further assess the noise impact of construction works and shall include a protocol to minimise any potential noise impacts to identified sensitive receivers and ensure that appropriate noise control measures are defined and implemented to comply with all relevant noise guidelines.

7.3 PRELIMINARY CONSTRUCTION NOISE ASSESSMENT

A preliminary construction noise assessment has been carried out based on typical plant and machinery expected throughout the construction stages. The preliminary noise assessment has been considered at the nearest existing residential receivers plus existing school buildings.

7.3.1 CONSTRUCTION STAGING

Construction will be carried in three stages. Figure 8 shows the three main stages of the construction.

Stage 1A

Stage 1B

Stage 1C

Figure 8: Construction staging plan.

Based on the construction site compound as shown in Figure 8 it has been assumed that as a worst case, generally works are within 5m and 10m of affected residential receiver boundaries and occupied school areas, respectively.

7.3.2 NOISE

A high-level noise assessment has been carried out to predict the worst-case noise level at the nearest noise sensitive receivers. The existing school has also been considered as a sensitive receiver for this high-level assessment as during construction there will be students attending the existing school. We note that the predicted noise levels consider the worst-case scenario, i.e., construction activities being carried out at the boundary of the construction site compound as per Figure 8.

A Detailed CNVMP addressing impacts should be conducted during the construction stages when specific information around construction methodology is known, to provide acoustic mitigation measures and management measures based on specific construction works, equipment and locations.

The expected construction noise sources and the predicted noise levels at the nearest residential receivers plus existing school receivers are shown below in Table 17. The equipment noise levels are based on the database published by the UK Department for Environmental, Food and Rural Affairs (DEFRA) & Australian Standard AS2436:2010 *'Guide to Noise Control on Construction, Maintenance & Demolition Sites'* for a 15-minute period.

Item	*Typical Power Noise Level L_{A10} (dB ref 1pW)*	*Typical Noise Level $L_{A10,15m}$ at 7m (dB ref 20µPa)*	*Predicted Noise Level $L_{Aeq,15m}$*		*Complies with Highly Noise Affected Criteria*
			Nearest Residential	*Existing school receivers*	
Angle grinders	104	76	77 – 82	71 – 76	No
Truck (>20 tonne)	108	80	81 – 86	75 – 80	No
Circular saw	115	87	88 – 93	82 – 87	No
Piling rig	120	92	93 – 98	87 – 92	No
10-40tn Excavator	117	89	90 – 95	84 – 89	No
40-50tn Mobile crane	111	83	84 – 89	78 – 83	No
Concrete pump	114	86	87 – 92	81 – 86	No
Concrete truck	110	82	83 – 88	77 – 82	No
Drill	94	66	67 – 72	61 – 66	Yes

Table 17: Anticipated airborne noise levels for construction equipment / plant used during construction works.

Based on the results of the preliminary assessment as shown above, the noise associated with the construction works is expected to exceed the noise limits for highly noise affected receivers within standard hours. This assessment is based on typical noise levels associated with construction sites and machinery.

Nevertheless, compliance with the relevant construction noise criteria can be achieved through specific noise mitigation measures such as acoustic screening around the site. These noise mitigation measures are to be provided in a detailed Construction Noise & Vibration Management Plan and prepared by a qualified acoustic consultant prior to Construction Certificate.

7.3.3 VIBRATION

The NSW RMS '*Construction Noise and Vibration Guideline*' provides safe working distances for vibration intensive plant and are quoted for both 'cosmetic' damage (in accordance with BS 7385.2:1993) and human comfort (in accordance with DECC's '*Assessing Vibration: A Technical Guideline*'). The recommended safe working distances for typical construction plant are provided in Table 18.

Plant Item	*Description*	*Cosmetic Damage*	*Human Response*
Small Hydraulic Hammer	5-12 tonne	2m	7m
Medium Hydraulic Hammer	12-18 tonne	7m	23m
Large Hydraulic Hammer	18-34 tonne	22m	73m
Vibratory Pile Driver	Sheet piles	2-20m	20m
Pile Boring	<800mm	2m	N/A
Jackhammer	Handheld	1m	Avoid Contact with Structure

Table 18: Recommended minimum working distances for vibration intensive plant from sensitive receivers.

For any vibration intensive plant expected to be within proximity of the minimum distances described above, the contractor must engage a qualified engineer to carry out a vibration survey in order to assess any potential risks.

The vibration survey and assessment will determine whether the vibration levels might exceed the relevant criteria then vibration mitigation and management measures will need to be put in place to ensure vibration impacts are minimized as far as practicable.

7.4 MITIGATION MEASURES

In order to meet the noise and vibration requirements of the site, the Contractor will be required to engage a qualified acoustic consultant to assist in the compilation of a CNVMP and undertake noise and vibration monitoring for the duration of the project.

7.4.1 PROJECT SPECIFIC ACOUSTIC MEASURES

Acoustic amelioration measures will be required due to the expected exceedances of the noise level criteria. Temporary shielding such as solid hoarding/acoustic curtains may reduce the expected noise impacts and is proposed as a noise control measure during construction. The location and extent of the shielding are to be defined in the detailed Construction Noise and Vibration Management Plan (CNVMP).

7.4.2 GENERAL CONTROL ELEMENTS

As a general rule, minimising noise and vibration should be applied as universal work practice at any time of day, but especially for any construction works to be undertaken at critical times outside normal daytime/weekday periods.

It is noted that the reduction of noise and vibration at the source and the control of the transmission path between the construction site and the receiver(s) are the preferred options for noise minimisation. Providing treatments at the affected receivers should only be considered as a last resort. Construction noise and vibration shall be managed by implementing the strategies listed below:

- *Plant and equipment*. In terms of both cost and results, controlling noise and vibration at the sources is one of the most effective methods of minimising the impacts from any work site activities. Work practices that will reduce noise and vibration at the source include:
  - Employing quieter techniques for all high noise activities such as rock breaking, concrete sawing, and using power and pneumatic tools.

  - Use quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
  - Selecting plant and equipment with low vibration generation characteristics.
  - Operate plant in a quietest and most effective manner.
  - Where appropriate, limit the operating noise of equipment.
  - Regularly inspecting and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.
- *On site noise management*. Practices that will reduce noise from the site include:
  - Maximising the distance between noise activities and noise sensitive receivers. Strategically locate equipment and plant.
  - Undertaking noisy fabrication work off-site where possible.
  - Avoid the use of reversing beeping alarms or provide for alternative systems, such as broadband reversing alarms
  - Maintaining any pre-existing barriers or walls on a demolition or excavation site as long as possible to provide optimum sound propagation control.
  - Constructing barriers that are part of the project design early in the project to afford mitigation against site noise.
  - Using temporary site building and material stockpiles as noise barriers. These can often be created using site earthworks and may be included as a part of final landscape design.
  - Installing purpose built noise barriers, acoustic sheds and enclosures.
- *Work scheduling*. Scheduling work during periods when people are least affected is an important way of reducing adverse impacts. The following scheduling aspects may reduce impacts:
  - Provide respite periods, including restricting very noisy activities to daytime, restricting the number of nights that after-hours work is conducted near residences, or by determining any specific requirements, particularly those needed for noise sensitive receivers.
  - Scheduling activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events.
  - Scheduling work to coincide with non-sensitive periods, to reduce impact on examinations.
  - Scheduling noisy activities to coincide with high levels of neighbourhood noise so that noise from the activities is partially masked and not as intrusive.
  - Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from sensitive receivers.
  - Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.
  - Designating, designing and maintaining access routes to the site to minimise impacts.
  - Including contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling.
- *Consultation, notification and complaints handling*.
  - Provide information to neighbours before and during construction.
  - Maintain good communication between the community and Project staff.
  - Have a documented complaints process and keep register of any complaints.
  - Give complaints a fair hearing and provide for a quick response.
  - Implement all feasible and reasonable measures to address the source of complaint. Implementation of all reasonable and feasible mitigation measures for all works will ensure that

any adverse noise impacts to surrounding receivers are minimised when noise goals cannot be met due to safety or space constraints.

7.4.3 ADDITIONAL NOISE AND VIBRATION CONTROL MEASURES

If, during construction, an item of equipment exceeds ether the noise criteria at any location or the equipment noise level limits, the following noise control measures, together with construction best practices, shall be considered to minimise the noise impacts on the neighbourhood.

- Schedule noisy activities to occur outside of the most sensitive times of the day for each nominated receiver.
- Consider implementing equipment-specific screening or other noise control measures recommended in Appendix C of AS 2436:2010.
- Limit the number of trucks on site at the commencement of site activities to the minimum required by the loading facilities on site.
- When loading trucks, adopt best practice noise management strategies to avoid materials being dropped from height into dump trucks.
- Avoid unnecessary idling of trucks and equipment.
- Ensure that any miscellaneous equipment (extraction fans, hand tools, etc) not specifically identified in this plan incorporates silencing/shielding equipment as required to meet the noise criteria.

Implementation of all reasonable and feasible mitigation measures for all internal and underground works will ensure that any adverse noise impacts to surrounding residential, commercial and recreational receivers are minimised when noise goals cannot be met due to safety or space constraints.

8 SUMMARY AND CONCLUSIONS

A noise impact assessment for Review of Environmental Factors has been carried out for the proposed works at Leppington Public School at 144 Rickard Road, Leppington NSW.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed activity. Ambient and background noise surveys have been undertaken at the existing site to establish the appropriate noise criteria in accordance with the relevant guidelines.

8.1 SUMMARY

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries.

A summary of the noise assessments and their outcomes is listed below:

Mechanical Services: At this stage, mechanical plant selections have not been made. Therefore, a detailed noise assessment has not been able to be carried out. Acoustic assessment of the mechanical plant will be conducted during the design phase of the project in order to confirm any noise control measure requirements. However, based on the proposed location of the mechanical plant, in order to comply with the NSW NPI criteria for noise emissions to the nearest residential receiver, the maximum allowable cumulative noise emissions from the external mechanical plant shall be controlled to achieve $L_{Aeq,15min}$ 56dB(A) at 1 metre from the plant boundary.

Public address and School Bell Systems: At this stage, public address and school bell systems selections have been not made; therefore, it is not possible to undertake a detailed assessment of the public address and school bell noise emissions. A preliminary noise impact assessment has been carried out. Based on the assumed location and orientation of the loudspeakers, noise emissions from the loudspeakers shall be limited to L_{Aeq} 75 dB(A) at 1m. It should be noted that this prediction is conservative due to the unknown location of the speakers at this design stage. Acoustic assessment of public address and school bell systems shall continue during the detailed design phase of the project in order to confirm any further noise control measures required to achieve the relevant noise criteria at the nearest noise sensitive receivers.

Activities within the Hall: Noise emission from new Hall to the nearest residential receiver has been carried out and shows that the noise emissions from the Hall will be comply with SEPP day time and evening criteria with windows and doors closed. However, with windows open the noise level at the nearest receiver will exceed both the daytime and evening criteria. Compliance with windows and doors open is expected if amplified music within the Hall is limited to 87dB(A). Therefore, it is recommended to implement a noise operational management plan for the use of the Hall to minimise amenity disruption of the nearest noise sensitive receivers.

Outdoor Playground: External noise emissions associated with the outdoor playgrounds have been assessed. Based on the projected increase in student numbers, the noise levels as a result of the additional student population will increase the noise level on site by less than 2dB(A). An increase of less than 2dB(A) can be considered as negligible and it would not be discernible by the average listener. Therefore, noise from the outdoor playground is not expected to affect the amenity of the surrounding noise sensitive receivers.

Car Park Noise: Noise impacts of car movements in the carpark have been assessed. As the number of car parking spaces will remain the same, noise emissions from carpark activity are not expected to increase and therefore, will not impact the amenity of the nearest noise sensitive receivers.

Traffic Noise Generation: Traffic noise impact due to the likely generated vehicle movements of the proposed activity is anticipated to be insignificant, as the noise levels are not expected to increase by more than 2dB at the nearby noise sensitive receivers. This will be confirmed pending review of the finalised traffic report.

Other noise Sources: Noise emissions from the waste collection have the potential to impact on the nearest noise sensitive receivers. It is anticipated that the noise impact from waste collection to the nearest noise sensitive receivers will be negligible provided that it is to be carried out within the confines of the school and during daytime hours. (7am – 6pm).

Noise Intrusion: Traffic noise from Rickard Road has the potential to impact upon the facades of the proposed activity. A minimum sound insulation performance has been obtained to meet the internal noise level criteria as per EFSG criteria. Acoustic design of the façade, other external building elements and ventilation openings of the school will need to be considered throughout the design stages in order to meet the noise level criteria.

Construction Noise and Vibration Planning: A preliminary construction noise assessment has been carried out. Based on the results of the preliminary assessment, noise associated with worst-case scenario construction works is expected to exceed the noise limits in accordance with the ICNG Guideline. Nevertheless, compliance with the relevant construction noise criteria can be achieved through specific noise mitigation measures. These noise mitigation measures are to be provided in a detailed Construction Noise & Vibration Management Plan prepared by a qualified acoustic consultant prior to Construction Certificate. The detailed CNVMP is to include noise impacts and mitigation measures for the surrounding noise sensitive receivers plus the existing school.

The information presented in this report shall be reviewed if any modifications to the features of the activity specified in this report occur, including and not restricted to selection of mechanical plant, modifications to the building and introduction of any additional noise sources.

8.2 MITIGATION MEASURES

Mitigation Number/Name	*Aspect / Section*	*Mitigation Measures*	*Reason for Mitigation Measure*
Building Services Noise	Design / Section 5.1	At this stage, mechanical plant selections have not been made. Therefore, a detailed noise assessment has not been able to be carried out. A preliminary review has been carried out based on the location, distance to noise sensitive receivers and the most restrictive criteria. In order to comply with the NSW NPI criteria, the maximum allowable cumulative noise emissions from the external mechanical plant shall be controlled to achieve $L_{Aeq,15min}$ 56dB(A) at 1 metre from the plant boundary.	To comply with the established noise level criteria
Public address and school bell systems Noise	Design & operation / Section 5.3	At this stage, public address and school bell systems selections have been not made; therefore, it is not possible to undertake a detailed assessment of the public address and school bell noise emissions. The public address and school bell systems shall be designed, installed and operated such that the systems do not interfere unreasonably with the comfort and repose of occupants of nearby residences. Noise emissions from public address and school bell systems shall be restricted to the noise levels as per Section 5.3. Acoustic assessment of public address and school bell systems shall continue during the detailed design phase of the project in order to confirm any noise control measures required to achieve the relevant noise criteria at the nearest noise sensitive receivers.	To comply with the established noise level criteria
Activities and events within the Hall	Operation / Section 5.4	Noise emission from Hall to the nearest residential receiver has been carried out and show that the noise emissions from the Hall will be comply with SEPP daytime and evening criteria with windows and doors closed. Therefore, high noise generating activities within the hall shall be carried out with windows and doors shut. Additionally, a maximum noise level for amplified music within the hall has been provided in Section 5.4.	To comply with the established noise level criteria
Traffic Noise Intrusion	Design / Section 5.7	Recommendations have been provided for the minimum sound insulation performance of the external glazing likely required to meet the internal noise levels for the spaces.	To comply with the internal noise level criteria
Other Noise Sources – Waste Collection	Operation / Section 5.8	Recommendations for times and location restrictions of waste collection has been provided in order to reduce acoustic impact to surrounding sensitive receivers. These can be found in Section 5.8.	To comply with the established noise level criteria

Mitigation Number/Name	*Aspect / Section*	*Mitigation Measures*	*Reason for Mitigation Measure*
Construction Noise and Vibration Planning	Prior to commencement of any construction work / Section 7.3	Currently a detailed construction program is not yet fully defined. This report has provided general Construction Noise and Vibration Planning recommendations only, applicable criteria plus feasible and reasonable noise and vibration control practices to be observed during the construction of the proposed activity. The preliminary advice in relation to construction noise and vibration management shall form the basis for the Contractor's Construction Noise and Vibration Management Plan (CNVMP) which shall identify any noise criteria exceedance once construction methods and stages are known.	To comply with the established noise level criteria

8.3 EVALUATION OF ENVIRONMENTAL IMPACTS

Based on the information presented in this report, impacts are able to be adequately mitigated through recommended measures and it is not considered to be a significant impact. Therefore, compliance with relevant guidelines is expected.

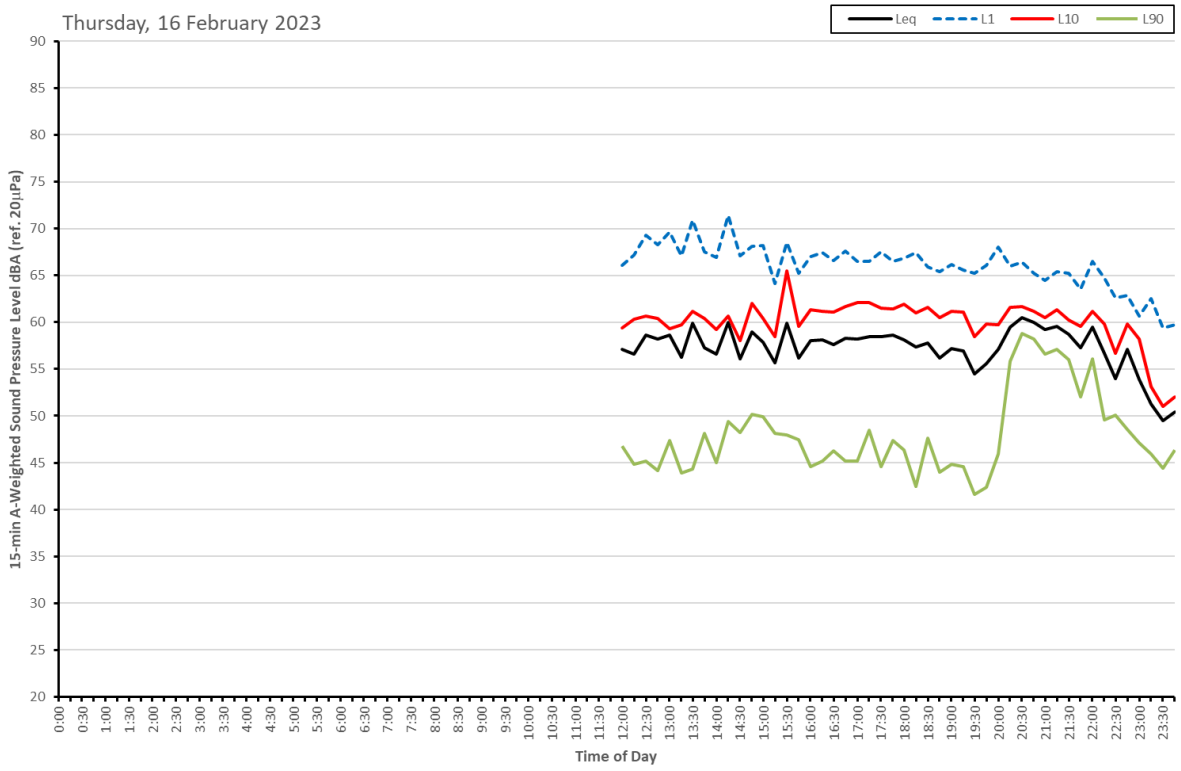
APPENDIX A: LONG-TERM NOISE MONITORING

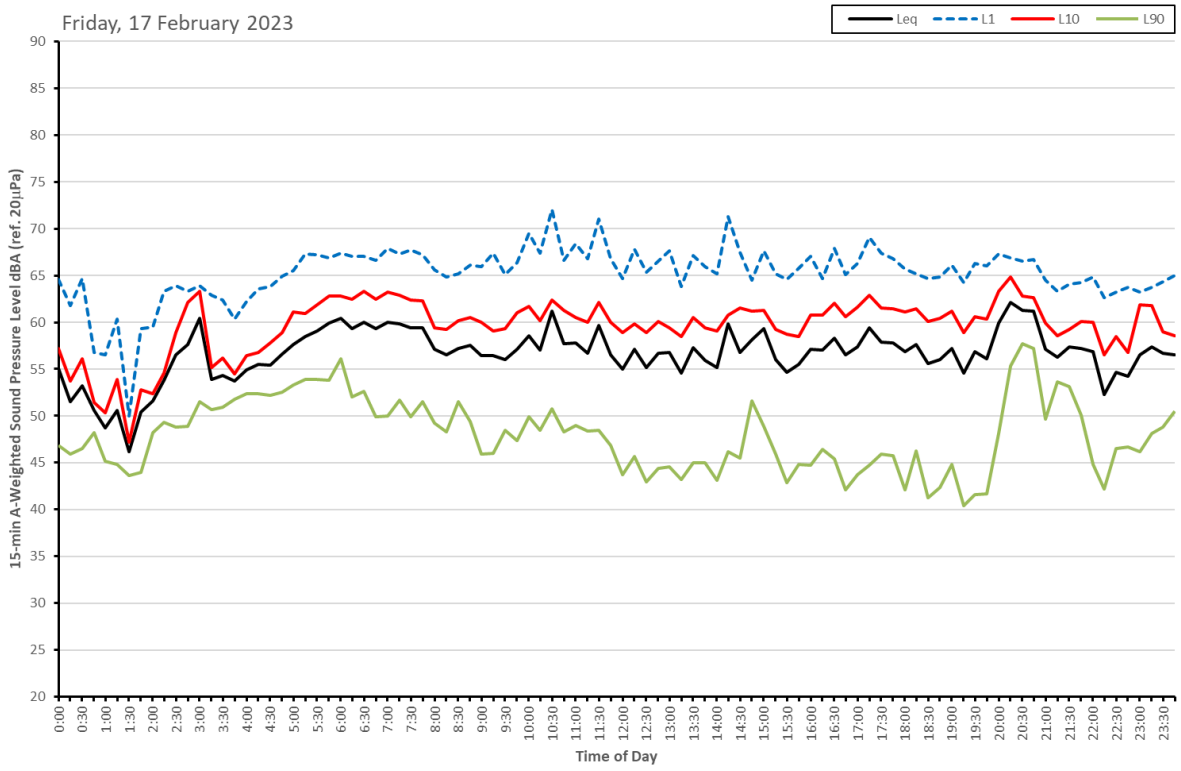
L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.


Thursday, 16 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day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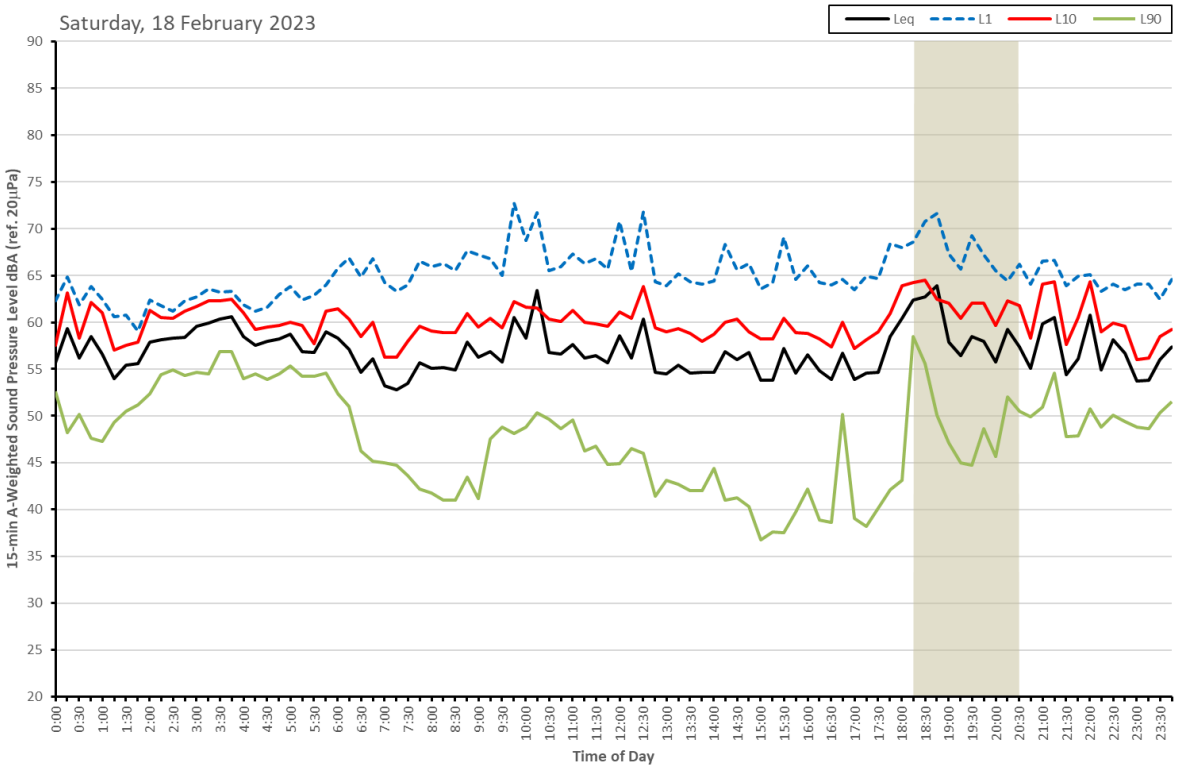
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day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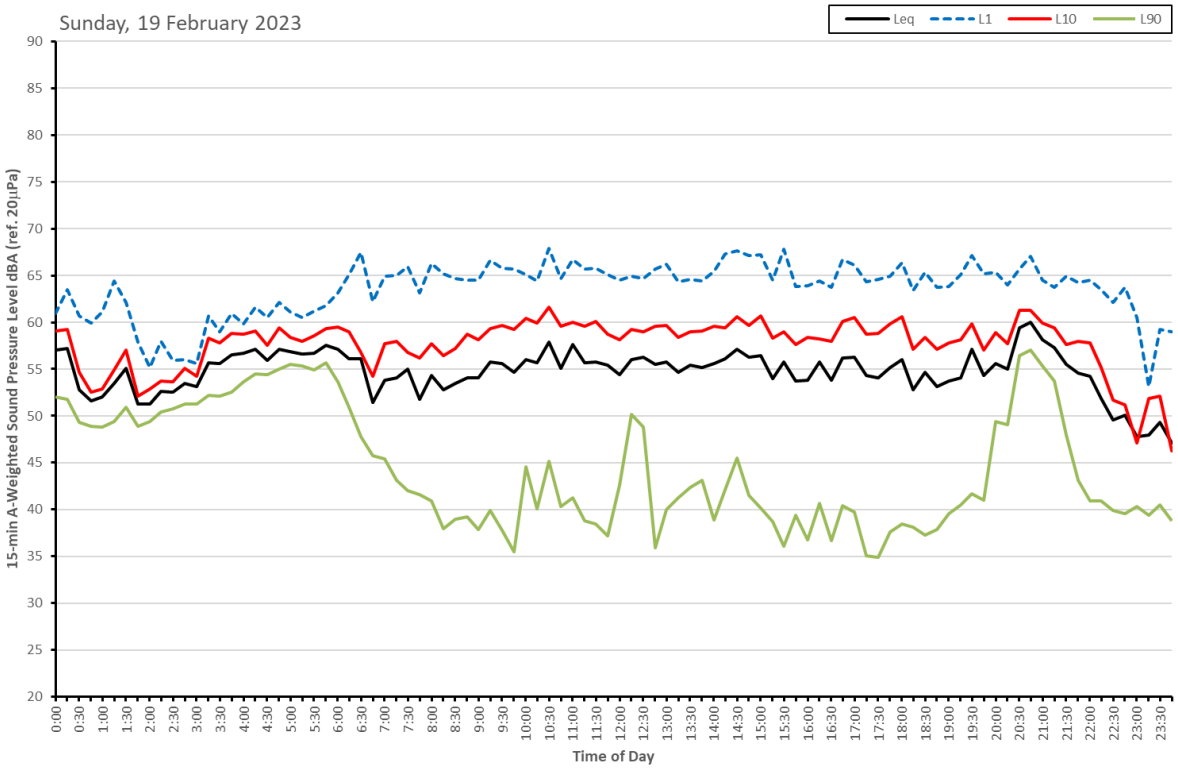
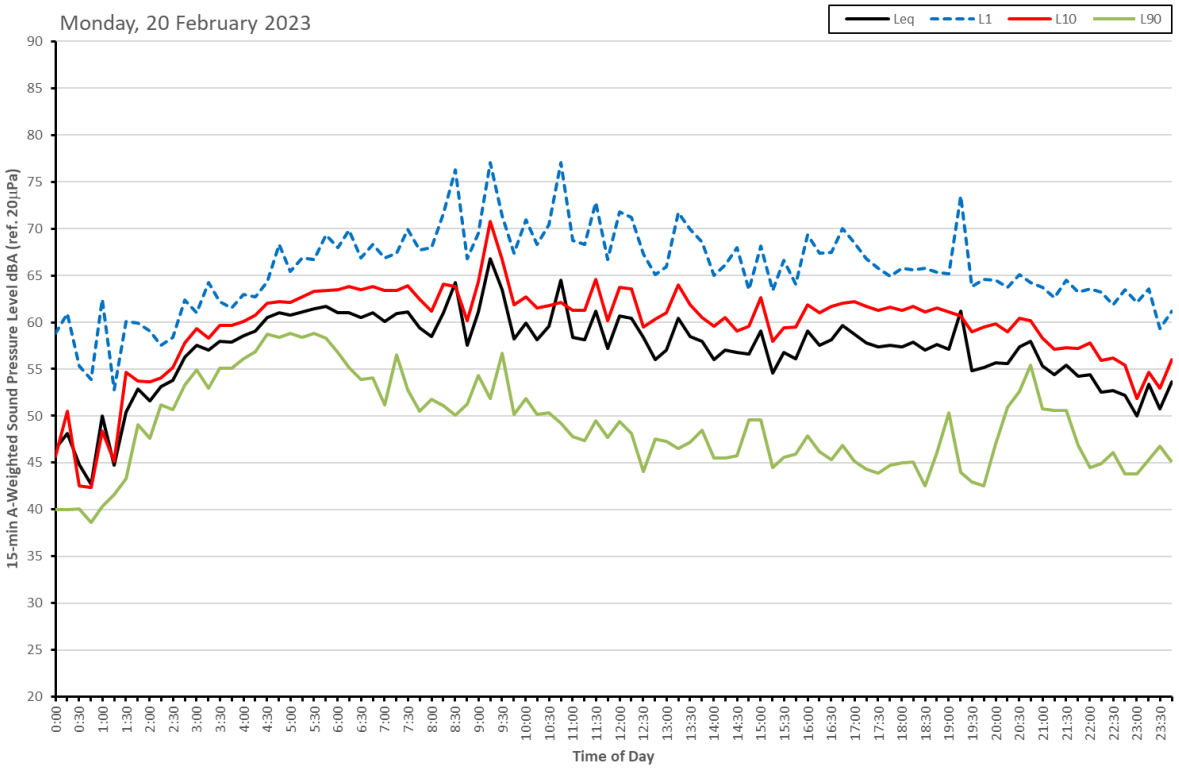
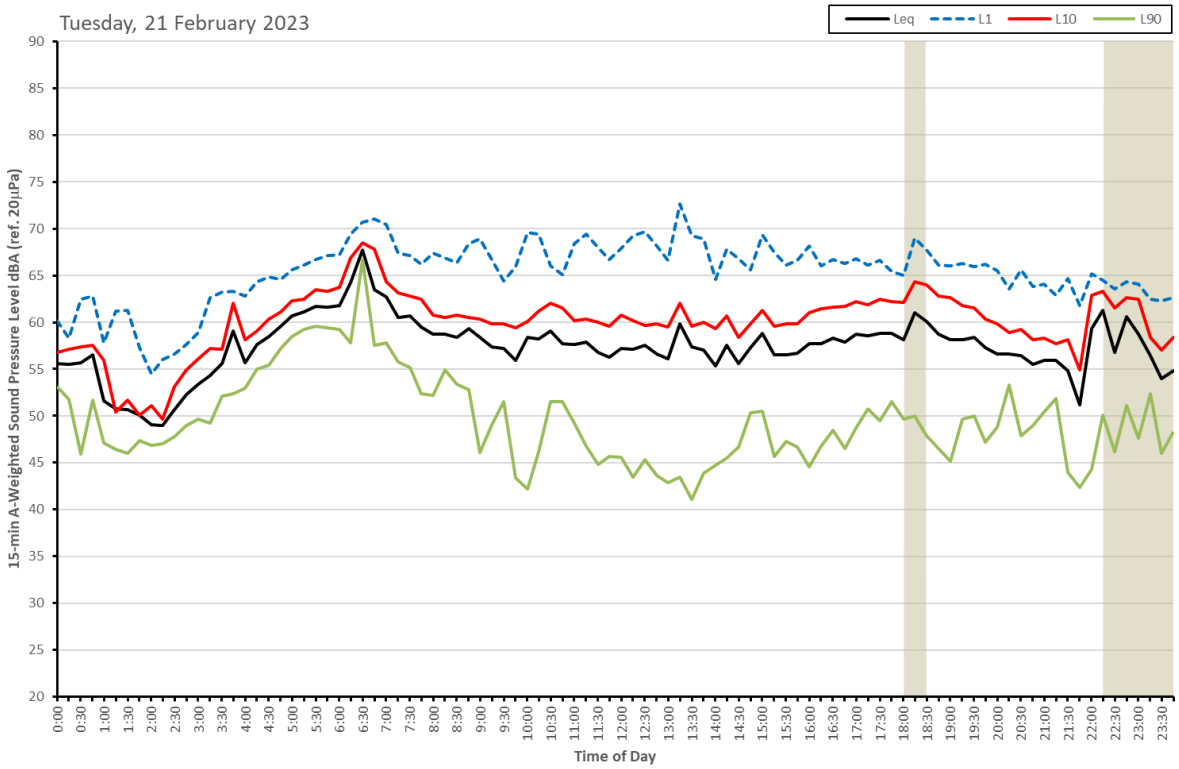
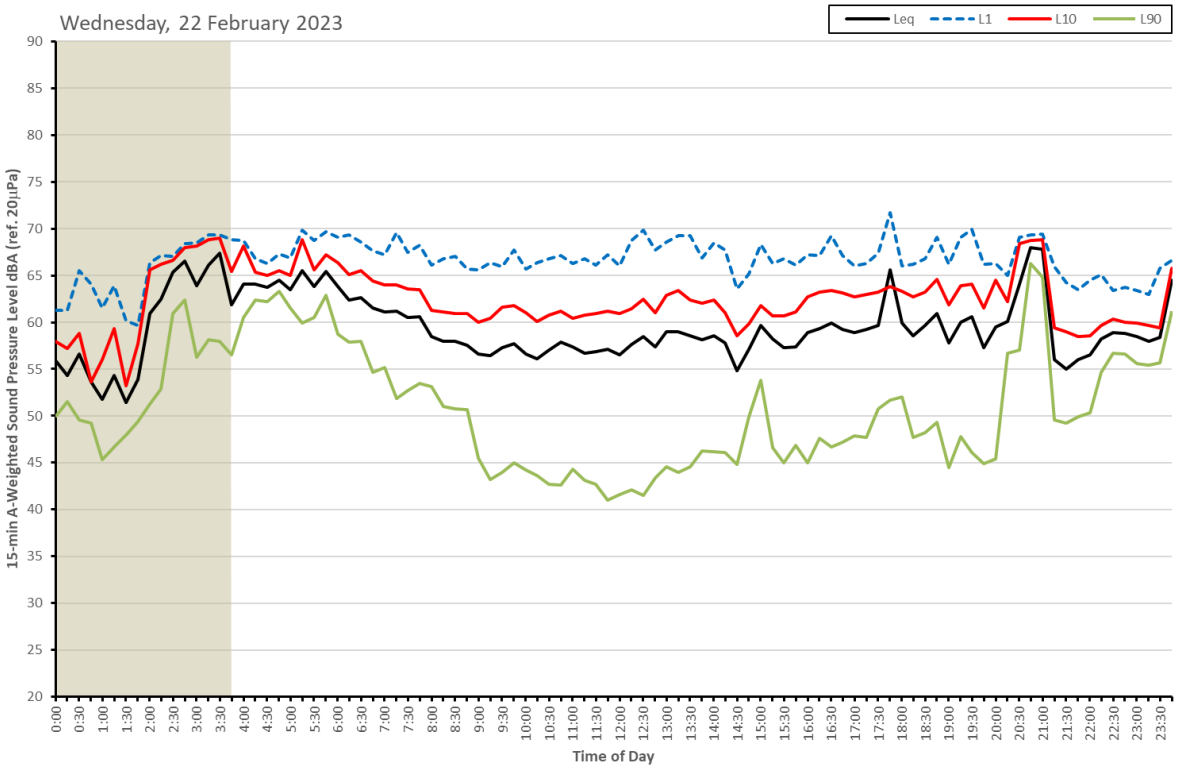
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Sunday, 19 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Monday, 20 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Tuesday, 21 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day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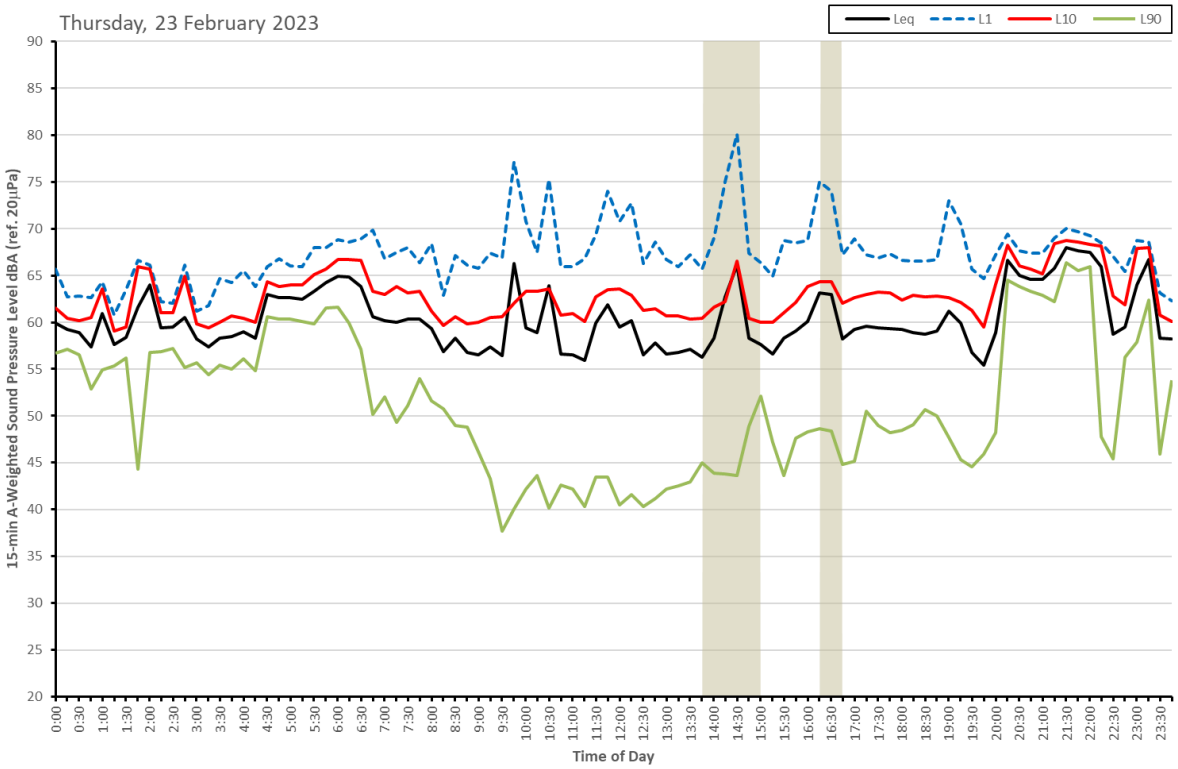
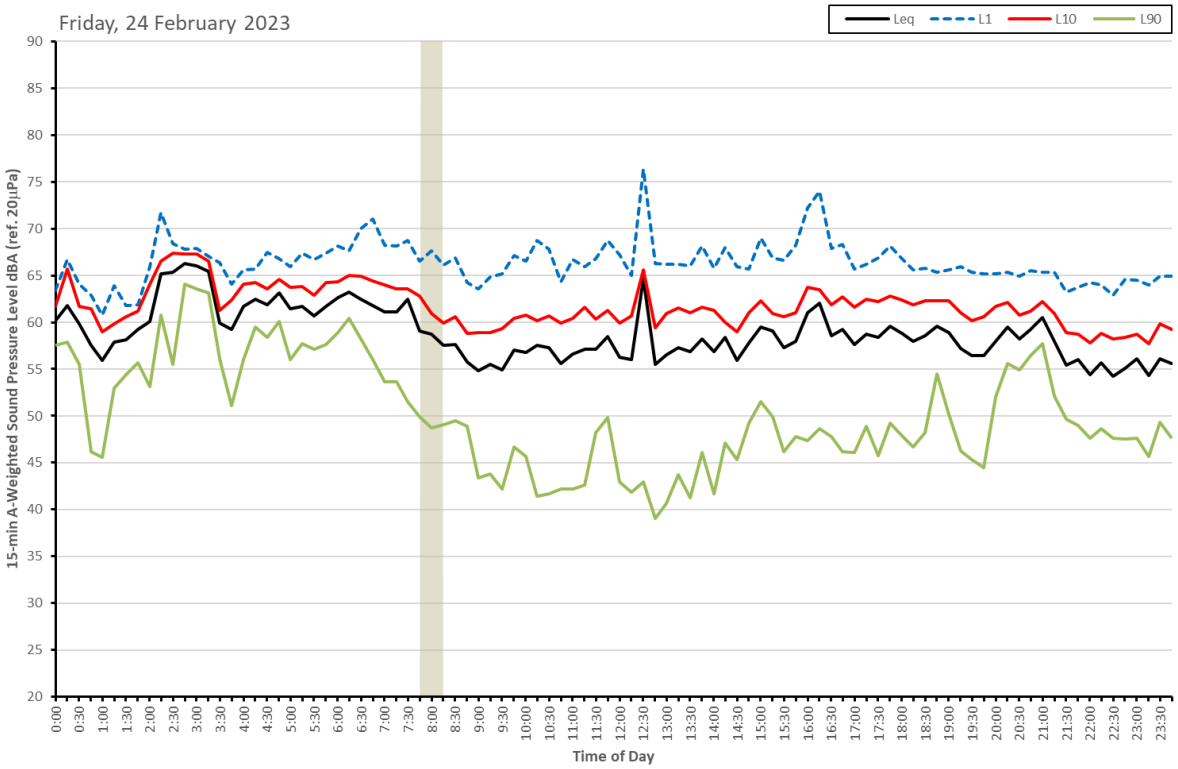
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Thursday, 23 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day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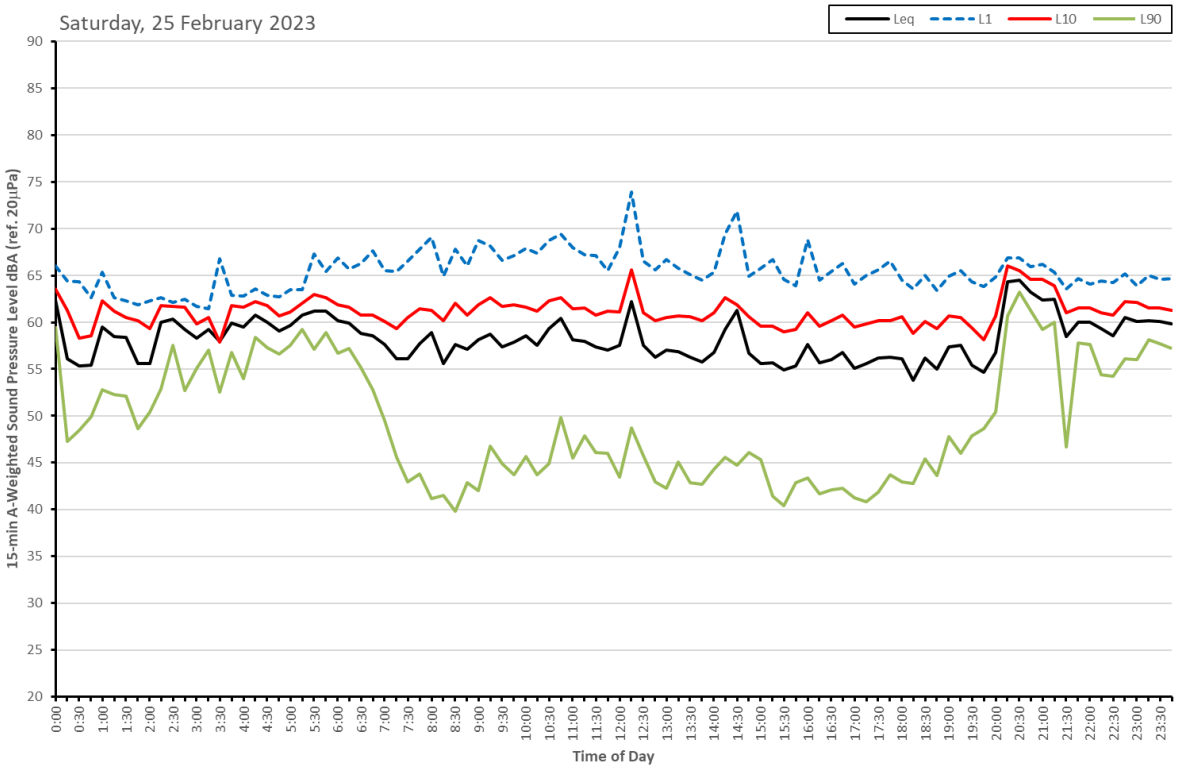
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day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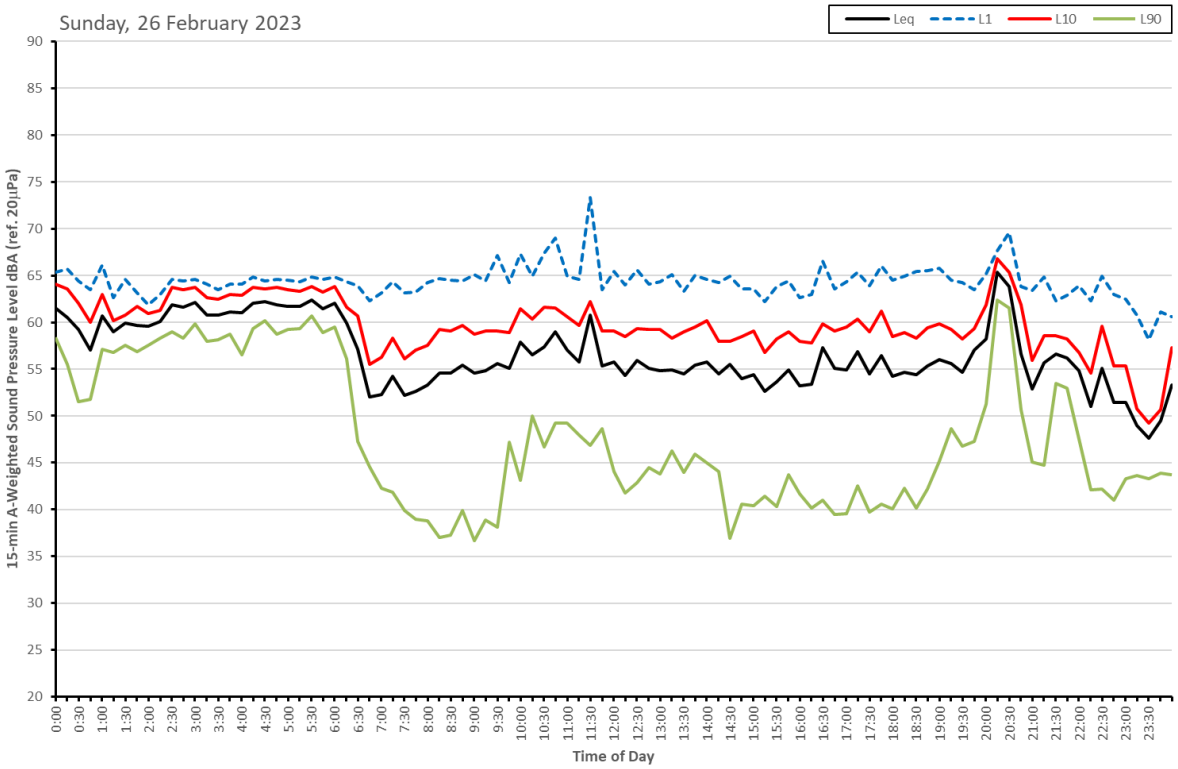
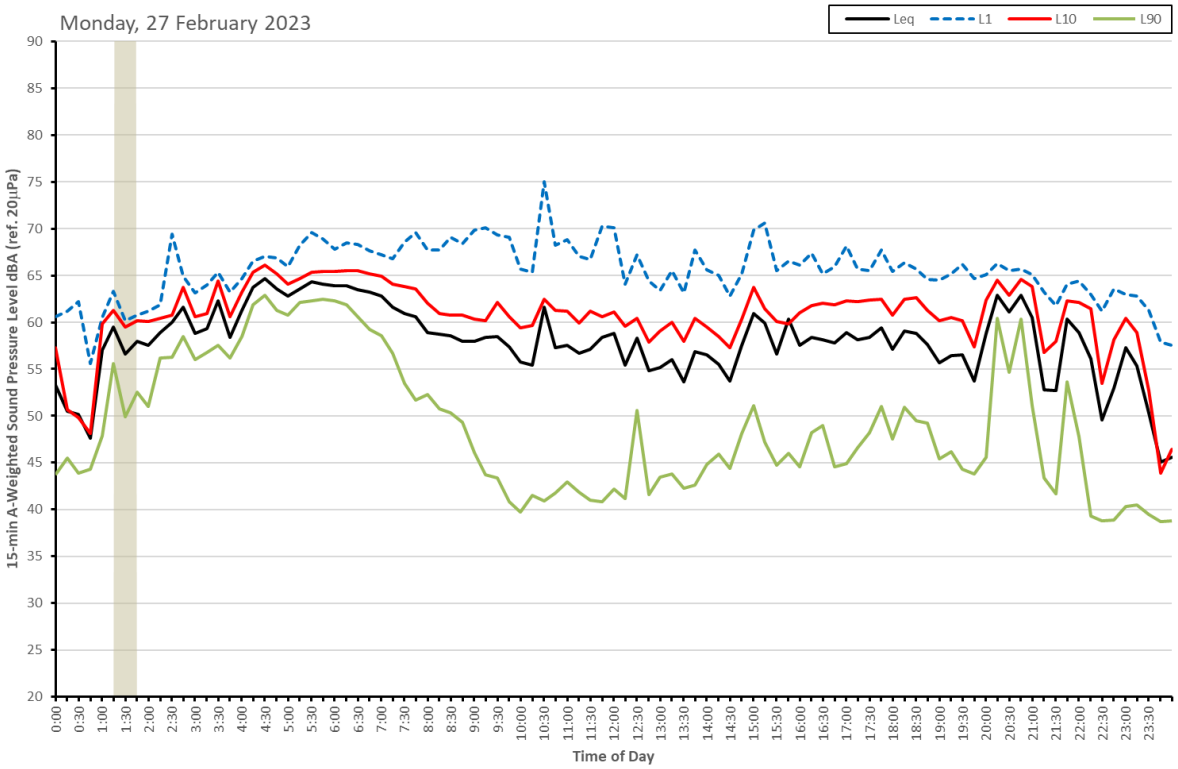
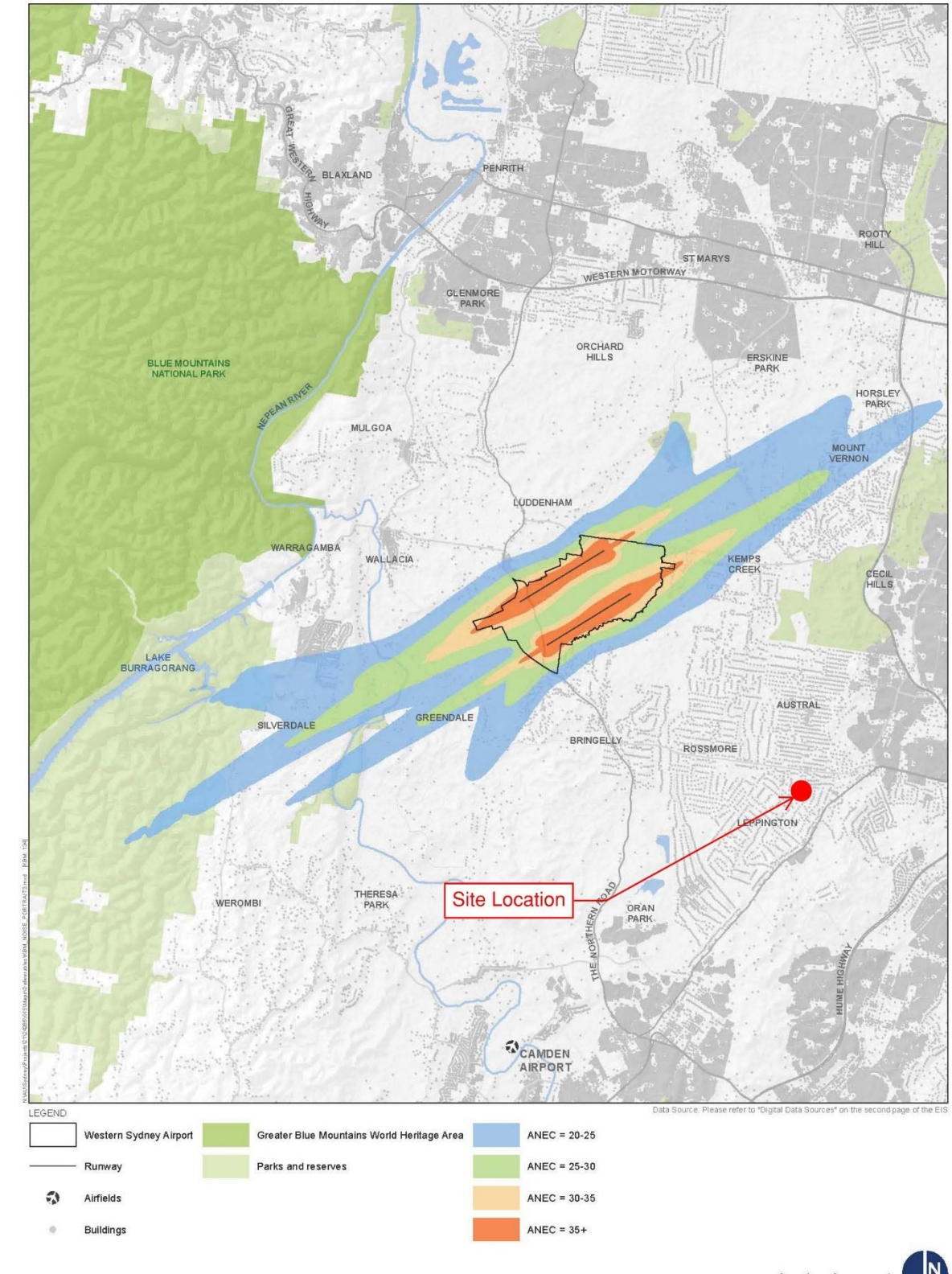
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Sunday, 26 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Monday, 27 February 2023
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day

APPENDIX B: WESTERN SYDNEY AIRPORT ANEC CURVES



ES 19 - ANEC contours for Prefer 05 and Prefer 23 operating strategy (2063)