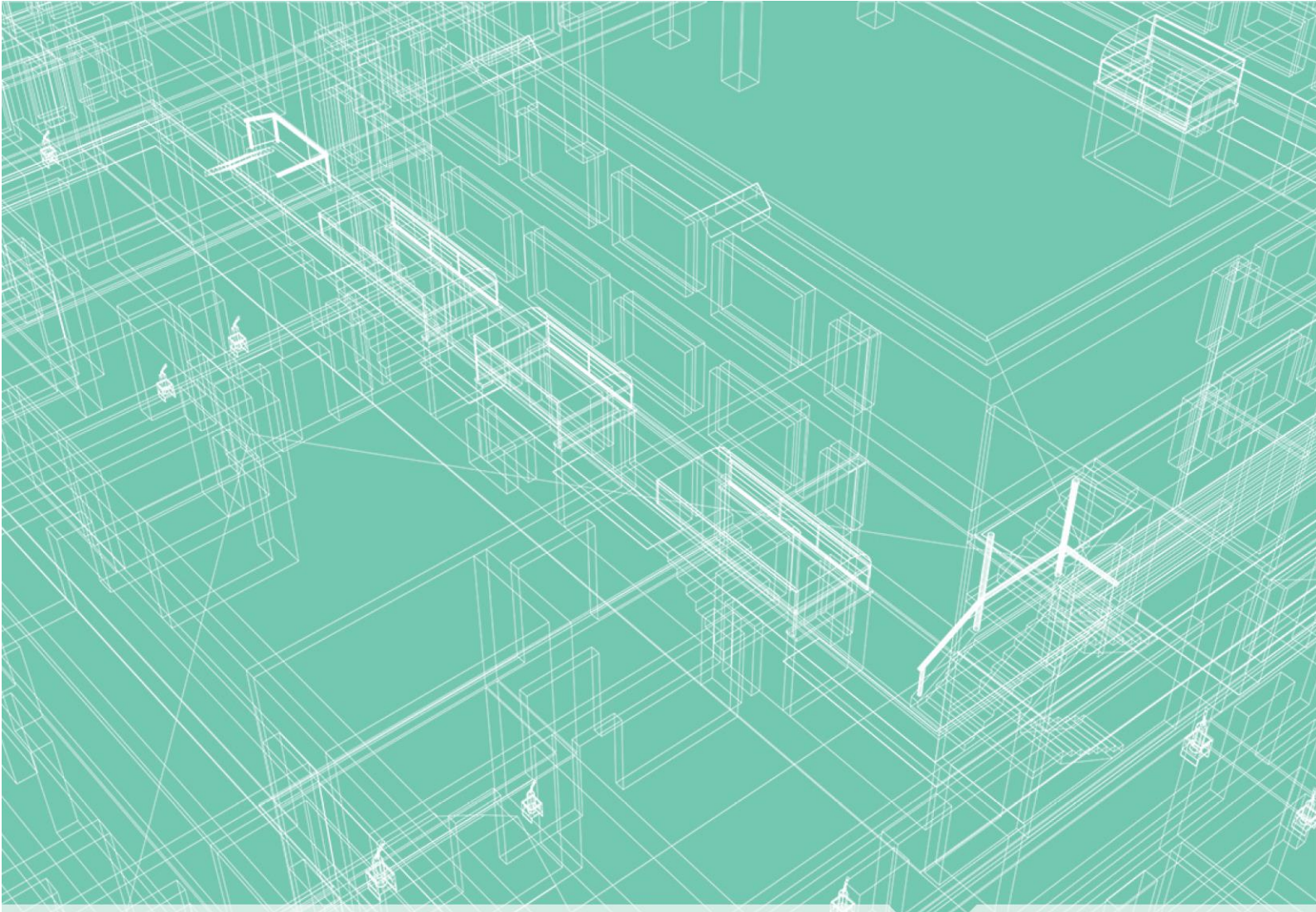

NOISE & VIBRATION IMPACT ASSESSMENT FOR SSDA (SSD-11920082)

HASTINGS SECONDARY COLLEGE – PORT MACQUARIE CAMPUS

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1 INTRODUCTION

JHA Consulting Engineers has been commissioned by School Infrastructure NSW (SINSW) on behalf of the Department of Education (DOE) to prepare a noise and vibration impact assessment to accompany a development application (DA) to the NSW Department of Planning, Industry and Environment (DPIE) for proposed upgrades to Hastings Secondary College (Port Macquarie Campus), previously known as Port Macquarie High School.

Hastings Secondary College consists of two campuses, being Westport and Port Macquarie. This report has been prepared for proposed works at the Port Macquarie Campus, which consists of two properties, the main campus and the Ag Plot.

The works subject to this proposal relate are to be carried out on the main Port Macquarie campus which is located at 16 Owen Street, Port Macquarie (the site). The site has a secondary street frontage to Burrawan Street and adjoins Oxley Oval along the eastern boundary.

On 23 December 2020, the Secretary of the DPIE issued Secretary's Environmental Assessment Requirements (SEARs) for SSD Application No. 11920082. This report has been prepared in accordance with the SEARs requirements.

1.1 OVERVIEW

This Noise and Vibration Impact Assessment accompanies an Environmental Impact Statement in support of State Significant Development Application (SSD-11920082) for the site. The proposed development seeks consent for the following works at the site:

- Demolition of demountable spaces, landscape and removal of internal and external walls.
- Refurbishment of existing buildings B and L.
- Construction of new CAPA building and PCYC building.
- Associated landscaping.

It shall be noted that the upgrade of the school will not increase the students and staff population.

This report shall be read in conjunction with the Architectural design drawings and other consultant design reports submitted as part of the application. The objectives of this acoustic assessment are:

- Identify noise sensitive receivers that will potentially be affected by the operation and construction of the proposed development.
- Carry out noise surveys to determine existing ambient and background noise levels on site.
- Establish the appropriate noise level and vibration criteria in accordance with the relevant standards, guidelines and legislation for the following noise emissions:
  - Mechanical plant from the development to the surrounding receivers.
  - Public address and school bell systems.
  - Activities within the PCYC building.
  - Construction works.
- Determine whether the relevant criteria can be achieved based on the proposed operations and construction methods. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure with the assessment criteria.
- Provide recommendations for Construction Noise and Vibration Planning.

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

- Architectural drawings of the proposed development prepared by FJMT Architects
- Noise data collected on site through the use of noise loggers and a hand held spectrum analyser.
- Traffic Report prepared by Ason Group.

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

1.2 RESPONSE TO SEARS

The acoustic report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD-11920082. This table identifies the relevant SEARs and corresponding reference/s within this report.

SEARs Item	*Report Reference*
10. Noise and Vibration • *Provide a noise and vibration impact assessment that:*	
o *Includes a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation and construction.*	
o *Details the proposed construction hours and provides details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours.*	
o *Includes a quantitative assessment of the main sources of operational noise, including consideration of any public-address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc. (both during and outside school hours) and any out of hours community use of school facilities.*	Section 5 and 6
o *Outlines measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers.*	
o *Considers sources of external noise intrusion in proximity to the site (including, road rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards.*	
o *Demonstrates that the assessment has been prepared in accordance with polices and guidelines relevant to the context of the site and the nature of the proposed development.*	
Relevant Policies and Guidelines: • *NSW EPA Noise Policy for Industry (2017).* • *Interim Construction Noise Guideline (DECC).* • *Assessing Vibration: A Technical Guideline 2006.* • *Australian Standard 2363 Acoustics – Measurement of noise from helicopter operations.*	Section 4

Table 1: SEARs and relevant references.

2 DESCRIPTION OF THE PROPOSAL

2.1 LOCATION / SITE DESCRIPTION

The site is located approximately 1.2km south east of the Port Macquarie town centre, with access from Oxley Highway (Gordon Street) via Owen Street to the centre, William Street via Owen Street to the north and Burrawan Street via Owen Street to the south. A maintenance access road exists to the east of the site along Burrawan Street.

The site is located at 16 Owen Street, Port Macquarie and is legally known as Lot 111 in DP 1270315. The Port Macquarie Campus site is located within a coastal setting (east), with residential (single two storey and residential flat buildings) located to the west and south and Port Macquarie Bowling Club to the north. The surrounding street network provides on-street parking. Maintenance vehicular access is located off Burrawan Street.

No Natural watercourses are mapped as traversing the site. Scattered vegetation is located throughout the site, with a small area of vegetation concentrated towards the pedestrian access area.

The Port Macquarie Campus site is gently sloping downwards in three general 'platforms' towards the north, with distinct views out towards the ocean and the Hastings River. It also has a distinct view line to the row of Norfolk pine trees along the coastline. The siting of the campus provides many opportunities for ongoing cultural connection to Country. Current built form has an established language of two (2) story, face brick, low pitched metal roof buildings.

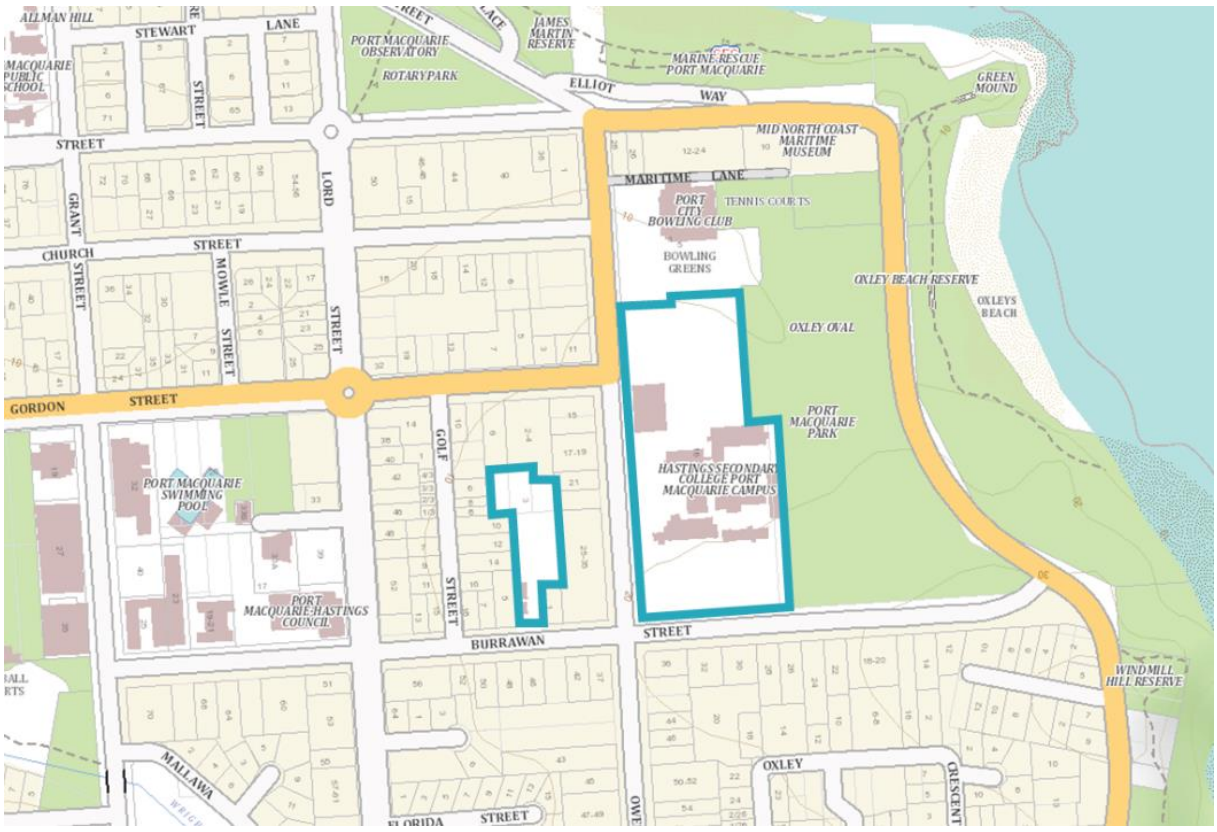


Figure 1: Map showing location of the Site.

2.2 PROPOSED WORKS

The upgrades will support high-quality educational outcomes to meet the needs of students within the local community and deliver innovative learning and teaching spaces as follows:

- Demolition works to accommodate new works;
- Upgrade to school entry;
- Construction of new two (2) storey Creative and Performing Arts (CAPA) building;
- Construction of new Police Citizens Youth Club (PCYC);
- Partial refurbishment of Building L;
- Refurbishment and alteration to Building B;
- Removal of Building S and demountable buildings;
- New lift connections, covered outdoor learning area (COLA) and covered walkways;
- Associated earthworks, landscaping, stormwater works, service upgrades; and
- Tree removal/ tree safety works.

No change to current staff or student numbers is proposed.

2.3 SURROUNDING RECEIVERS

A summary of the nearest noise sensitive receivers surrounding the site is shown in Table 2, including approximate distances from the buildings with noise sources to the receiver boundaries, noting the type of noise receiver.

ID	*Sensitive Receiver*	*Receiver Type*	*Distance (m)*
1	Port City Bowling Club	Active Recreational	6
2	Oxley Oval	Active Recreational	50
3	28 Burrawan Street	Medium Residential (R3)	140
4	29 Owen Street	General Residential (R1)	30
5	1 Gordon Street	Medium Residential (R3)	30

Table 2: Nearest sensitive receivers surrounding the site location.

Figure 2 shows the location of the Hastings Secondary College site and the nearest noise sensitive receivers as described in table above.

Figure 2: Aerial view of the site showing location of Hastings Secondary College and nearest noise sensitive receivers.

It is noted that if noise impacts associated with the proposed development are controlled at the nearest noise sensitive receivers, then compliance with the recommended noise criteria at all noise sensitive receivers will be achieved.

3 SITE MEASUREMENTS

3.1 GENERAL

Attended and unattended noise surveys were conducted in the locations shown in Figure 3 to establish the ambient and background noise levels of the site and surrounds. JHA Consulting Engineers carried out the noise surveys, in accordance with the method described in the *'AS/NZS 1055:2018 Description and measurement of environmental noise'*.

Figure 3: Noise survey locations and boundary of the site.

3.2 SHORT-TERM NOISE MONITORING

Short-term noise monitoring was carried out to obtain representative third-octave band noise levels of the site. On Tuesday 8th December 2020, short-term noise measurements were carried out during day-time. 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.

From observations during the noise survey, it is noted that ambient noise levels are dominated by low activity of students in the school grounds and low traffic flows.

A summary of the results of the short-term noise monitoring are shown in Table 3.

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	08/12/2020 10:33am – 10:48am	$L_{90,15min}$	49	54	51	45	43	45	41	32	26
		$L_{eq,15min}$	53	60	59	53	47	49	46	37	34
		$L_{10,15min}$	54	63	60	53	48	51	46	38	37
S2	08/12/2020 10:59am – 11:14am	$L_{90,15min}$	49	55	52	47	44	44	41	35	29
		$L_{eq,15min}$	62	69	62	63	60	57	54	49	42
		$L_{10,15min}$	63	68	63	61	60	59	55	50	43
S3	08/12/2020 11:20am – 11:35am	$L_{90,15min}$	48	54	49	44	42	43	39	36	29
		$L_{eq,15min}$	57	62	58	55	53	54	49	46	39
		$L_{10,15min}$	60	64	60	58	55	57	51	46	39
S4	08/12/2020 11:37am – 11:52am	$L_{90,15min}$	49	56	53	48	44	44	40	35	26
		$L_{eq,15min}$	59	65	65	58	55	56	51	44	38
		$L_{10,15min}$	63	67	65	61	58	59	54	48	39

Table 3: Results of short-term noise monitoring.

3.3 LONG-TERM NOISE MONITORING

Long-term noise monitoring was carried out from Tuesday 8th December to Tuesday 15th December 2020 with a Rion NL-52 noise logger (Serial Number 00175549). 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 was located on the proposed development site – facing Owen Street – as shown in Figure 3. The location was secured and is considered to be representative of the typical ambient and background noise levels plus traffic noise levels along Owen Street.

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 NPI, any data likely to be affected by rain, wind or other extraneous noise has been excluded from the calculations (shaded in the Appendix A graphs).

The Ambient Background Levels (ABLs) 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 survey. The median of these levels is then presented as the RBLs (Rating Background Levels) for each assessment period.

These RBLs are shown in Table 4 , together with the ambient noise levels (L_{Aeq}) measured for each period. Traffic noise monitoring results are shown in Table 5 below.

Location	Rating Background Levels, dB(A)			L_{Aeq} Ambient Noise Levels, dB(A)		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
L1	46	39	38	58	55	50

Table 4: Results of long-term noise monitoring.

Location	Period, dB(A)		Noisiest 1 Hour Period, dB(A)	
	Day $L_{Aeq,15h}$	Night $L_{Aeq,9h}$	Day $L_{Aeq,1h}$	Night $L_{Aeq,1h}$
L1	60	56	66	59

Table 5: Results of long-term traffic noise monitoring.

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.
- Planning
  - Port Macquarie-Hastings Council Local Environmental Plan (PMH-LEP) 2011.
  - Port Macquarie-Hastings Council Development Control Plan (PMH-DCP) 2013.
- Noise Emissions and Intrusions
  - NSW EPA Noise Policy for Industry (NPI) 2017.
  - Educational Establishments and Child Care Facilities State Environmental Planning Policy (ESEPP) 2017.
  - NSW Department of Education. Educational Facilities Standards and Guidelines (EFSG) – Section DG11.
  - NSW Department of Planning, Development Near Rail Corridors or Busy Roads – Interim Guideline 2008.
- Demolition and Construction Noise and Vibration
  - NSW DECCW Interim Construction Noise Guideline (ICNG) 2009.
  - NSW DEC Assessing Vibration: A Technical Guideline 2006.
  - Australian Standard AS 2436:2010 '*Acoustics – Guide to Noise Control on Construction, Maintenance & Demolition Sites*'.

4.2 REGULATORY FRAMEWORK

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 use 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 2013).

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.

..."

4.3 PLANNING FRAMEWORK

Relevant planning documents of Port Macquarie-Hastings Council Legislation have been reviewed for any noise requirement or criteria.

The Port Macquarie-Hasting Local Environmental Plan (PMH-LEP 2011) sets the land zoning for the site and surrounds as per land zoning map 6300_COM_LZN_013FA_010_20180419. The site boundary and approximate proposed development site location are shown in Figure 4.

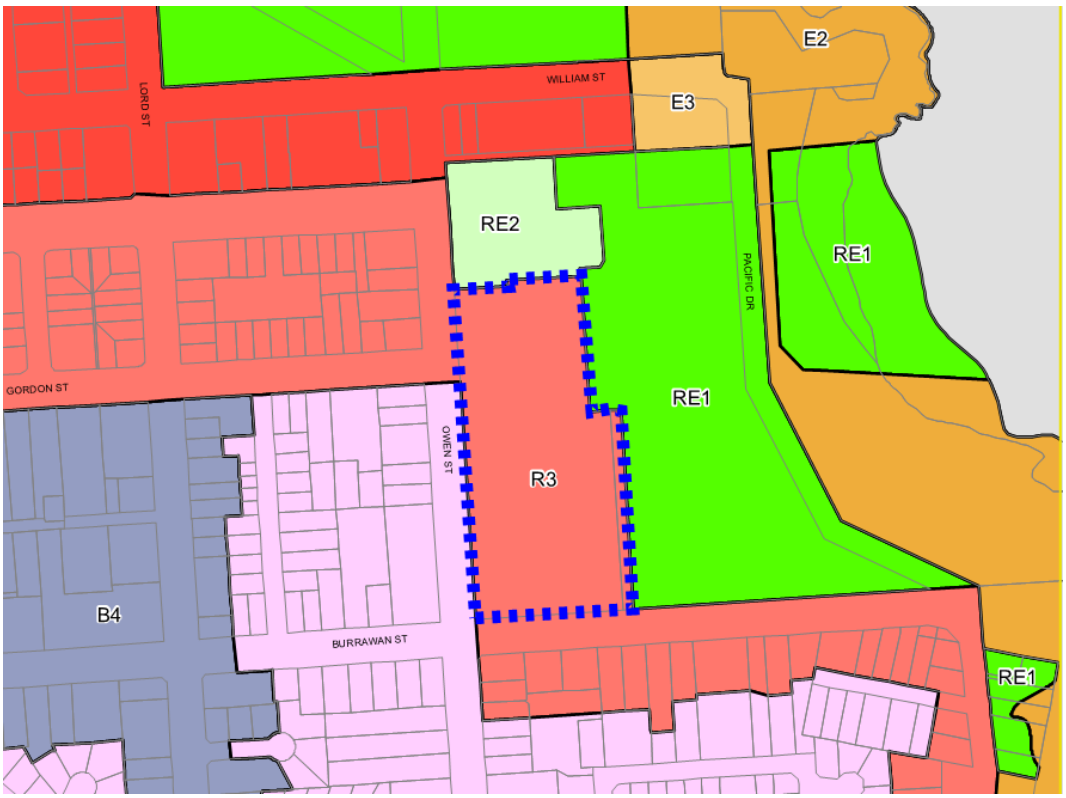


Figure 4: PMH-LEP 2011 land zoning map with the site boundary and location of proposed development.

The Port Macquarie-Hastings Council Development Control Plan (PMH-DCP 2013) has been reviewed and no information that is relevant to the development has been found.

4.4 NOISE EMISSIONS AND INTRUSIVE NOISE

4.4.1 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry (NPI) 2017 assesses noise from industrial noise sources - scheduled under the POEO. Mechanical noise from the development shall be addressed following the recommendations in the NSW NPI. The use of the noise monitoring procedures and background noise assessment methodology are commonly recommended by other relevant guidelines.

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."

Based on the intrusiveness criteria definition and the estimated background noise levels on site, Table 6 shows the intrusiveness criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Rating Background Level $L_{A90,period}$ dB(A)*	*Intrusiveness Criteria $L_{Aeq,15min}$ dB(A)*
Medium Density Residential (R3) and General Residential (R1)	Day	45	50
	Evening	39	44
	Night	38	43

Table 6: Determination of the intrusiveness criteria for residential noise sensitive receivers.

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 land zoning of the noise sensitive receivers plus amenity criteria definition, Table 7 shows the amenity criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Amenity Noise Level $L_{Aeq,period}$ dB(A)*	*Adjusted Amenity Criteria $L_{Aeq,15min}$ dB(A)*
Medium Density Residential (R3)	Day	55	53 (55-5+3)
	Evening	45	43 (45-5+3)
	Night	40	38 (40-5+3)
General Residential (R1)	Day	60	58 (60-5+3)
	Evening	50	48 (50-5+3)
	Night	45	43 (45-5+3)
Active Recreation (RE1)	When in use	55	53 (55-5+3)

Table 7: Determination of amenity criteria for noise sensitive receivers.

4.4.1.3 Project Noise Trigger Levels

The PNTL's are shown in Table 8 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point on or within the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criteria, $L_{Aeq,15min}$ dB(A)*	*Amenity Criteria, $L_{Aeq,15min}$ dB(A)*
Medium Density Residential (R3)	Day	50	53
	Evening	44	43
	Night	43	38
General Residential (R1)	Day	50	58
	Evening	44	48
	Night	43	43
Active Recreation (RE1)	When in use		55

Table 8: Determination of PNTL's (light grey highlight) for noise sensitive receivers.

4.4.2 EDUCATIONAL ESTABLISHMENTS AND CHILD CARE FACILITIES

Under the Schedule 2 Schools of the EECCF SEPP, Clause 6 establishes the following:

"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 child care 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."

This noise level criterion will be applied for operating hours of the development – day-time and evening time period. Based on the long-term unattended noise results of background noise levels, following table shows the noise level criteria for operational noise.

Period	*Measured Rating Background Level (RBL), L_{A90} dB(A)*	*Operational Noise Level Criteria, L_{Aeq} dB(A)*
Day (7am-6pm)	45	50
Evening (6pm-10pm)	39	44

Table 9: Operational Noise Level Criteria.

4.4.3 EFSG DG11

The design of the school shall ensure that noise emissions associated with operational events of completed buildings are controlled to achieve appropriate levels at neighbouring noise sensitive receivers.

At the same time, the total noise level within the spaces will be a result of the combination of external noise intrusion and background noise from the building services. The EFSG DG11 provides internal noise levels that should be achieved within educational facilities which are required to be met. Therefore, the criteria outlined in EFSG DG11 have been adopted for this project.

4.5 TRANSPORT NOISE

4.5.1 NSW ROAD NOISE POLICY

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.

4.5.2 DEVELOPMENT NEAR RAIL CORRIDORS OR BUSY ROADS – INTERIM GUIDELINE

The guideline details the application of clauses 85, 86, 87, 102 and 103 of the Infrastructure State Environmental Planning Policy (SEPP) which is required to be used when a development is adjacent to a rail corridor, a freeway, a toll-way, a transit-way or a road with an Annual Average Daily Traffic volume (AADT) of more than 40,000 vehicles.

At this stage, as per NSW Roads & Maritime Services traffic volume data, roads surrounding the campus have an AADT lower than 40,000 vehicles. Also the campus is not adjacent to a rail corridor. Therefore, we understand that NSW DoP *'Development near Rail Corridors and Busy Roads – Interim Guideline'* guideline does not apply to the project.

4.5.3 HELICOPTER NOISE

The Australian Standard 2363:1999 *'Acoustics – Measurement of noise from helicopter operations'* has been included in the relevant policies and guidelines from the SEARs. This standard provides methods for the measurement of noise from existing or proposed helicopter landing sites and helicopter overflights.

The nearest helicopter landing site is the Port Macquarie Hospital (≈4.3km) to the Southwest. Based on the distance between the site and the helicopter landing site plus the helicopter flying paths, we understand that helicopter noise will not impact in the proposed development and therefore, neither a helicopter noise assessment nor the standard apply to the project.

4.5.4 AIRCRAFT NOISE

As per information obtained from Port Macquarie Airport Master Plan 2010, it can be confirmed that the proposed development is located outside the Australian Noise Exposure Forecast (ANEF) contours. Therefore, as per AS 2021:2015 *'Acoustics – Aircraft Noise Intrusion – Building Sitting and Construction'*, the building site is considered acceptable and there is no requirement to carry out an aircraft noise assessment. Appendix B contains the Port Macquarie Airport ANEF contours.

4.6 CONSTRUCTION NOISE AND VIBRATION

4.6.1 NOISE CRITERIA

The DECC's Interim Construction Noise Guideline (ICNG) suggests construction Noise Management Levels (NML) that may minimise the likelihood of annoyance being caused to noise sensitive receivers depending on the works. Table 10 contains the NML's details for residential receivers as per ICNG.

Time of Day	*NML $L_{Aeq,15min}$*	*How to Apply*
Recommended Standard Hours: Mon-Fri 7am-6pm Sat 8am-1pm No work on Sundays or public holidays	Noise affected: RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where predicted or measured $L_{Aeq,15min}$ is greater that 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.
	Highly noise affected: 75dB(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 may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise affected: RBL + 5dB	▪ A strong justification would typically be required for work outside the recommended standard hours. ▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community.

Table 10: ICNG construction airborne noise criteria for residential receivers surrounding the construction site.

ICNG additionally suggests construction noise management levels for noise sensitive land other than residential surrounding construction sites. Refer to Table 11 for the noise management levels of non-residential receivers.

Land use	*Management level, $L_{Aeq\ (15min)}$ (applies when properties are being used)*
Classrooms at schools and other educational institutions	Internal noise level 45dB(A)
Active recreation areas	External noise level 65dB(A)

Table 11: ICNG construction airborne noise criteria for sensitive receivers surrounding the construction 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 with doors and windows closed.

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 12 below, in terms of vibration velocity levels.

Place	*Time*	*r.m.s. velocity, mm/s [dB ref 10^{-9}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]
Educational	When in use	0.40 [112 dB]	0.80 [118 dB]	13.00 [142 dB]	26.00 [148 dB]

Table 12: 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 13 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
Educational	When in use	0.40	0.80

Table 13: 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 4150.3:1993 '*Structural Vibration – Effects of Vibration on Structures*' and British Standard BS 7385.2:1993 '*Evaluation and Measurement for Vibration in Buildings*' are to be adopted. Guideline values from DIN 4150.3:1993 and BS 7385.2:1993 are presented in Table 14 and Table 15 respectively.

Structural type	*r.m.s. velocity, mm/s*			
	Foundation			*Plane of floor uppermost full storey*
	Less than 10Hz	*10 to 50Hz*	*50 to 100Hz*	*Frequency mixture*
Dwellings or similar	5	5 to 15	15 to 20	15
Particularly sensitive	3	3 to 8	8 to 10	8

Table 14: DIN 4150.3:1993 Guideline values of vibration velocity for evaluating the effects of short-term vibration.

Structural type	*Peak particle velocity, mm/s*	
	4 to 15Hz	*15Hz and above*
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s @ 4Hz increasing to 20mm/s @ 15Hz	20mm/s @ 15Hz increasing to 50mm/s @ 40Hz and above

Table 15: BS 7385.2:1993 Guideline values of vibration velocity for evaluating cosmetic damage.

5 OPERATIONAL NOISE EMISSIONS ASSESSMENT

Noise break-out from the proposed development has the potential to impact on existing noise sensitive receivers. For the purpose of this noise impact assessment, the noise sources are assumed as follows:

- Noise emissions from mechanical plant.
- Noise emissions from recess and lunch bells, public address systems.
- Noise emissions from use of PCYC building.
- Noise impact of traffic generated by the development.

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

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

5.1 EXTERNAL MECHANICAL PLANT

Noise from proposed development mechanical plant rooms should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of the noise sensitive receivers.

At this stage, 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 – refer to Section 4.4.1.

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 are 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 all 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 PUBLIC ADDRESS AND SCHOOL BELL SYSTEMS

Noise from proposed development 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.

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 does 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 measures 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 detailed design phase.
- 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 sot 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 days.

5.3 PCYC ACTIVITIES

Activities within the PCYC building could potentially have a noise impact to the nearest noise sensitive receivers. The PCYC building will comprise:

- Police Citizens Youth Club (PCYC).
- Multipurpose Sporting Courts.
- Gymnasium.
- Multipurpose Rooms.
- Meeting Rooms.
- Ancillary Spaces.

The PCYC facilities will be used by students during school hours for activities such as indoor sport and fitness. Also they will be used by community groups during school hours and outside of school hours. Operating hours of the PCYC premises are from 6am to 10pm, 7 days per week.

To assess the potential noise impacts at the nearest noise sensitive receivers from indoor activities within PCYC, the following worst-case operation noise sources have been assumed during evening time:

- Indoor sport games with spectators in Multipurpose Sporting Courts.
- Dance / Disco event in Multipurpose Rooms.

It shall be noted that noise leakage via natural ventilation openings will be critical. Therefore, the sound insulation rating for natural ventilation openings is required to match that for the façade / roof. Attenuated air intakes (at low level in the façade) and outlets (at roof level) are required to achieve this sound insulation rating.

The following assumptions have been made for the assessments:

- All noisy activities in the Multipurpose Sporting Courts and Multipurpose Rooms will commence after 7am and will end by 10pm.
- Noise levels have been considered as continuous over a 15-minute assessment period to provide a worst-case scenario.
- The noise assessment has considered the proposed layout as shown on the architectural drawings.
- Building shielding and distance attenuation.
- Nearest residential noise sensitive receiver is 1 Gordon Street which is approximately at 30m to the west.

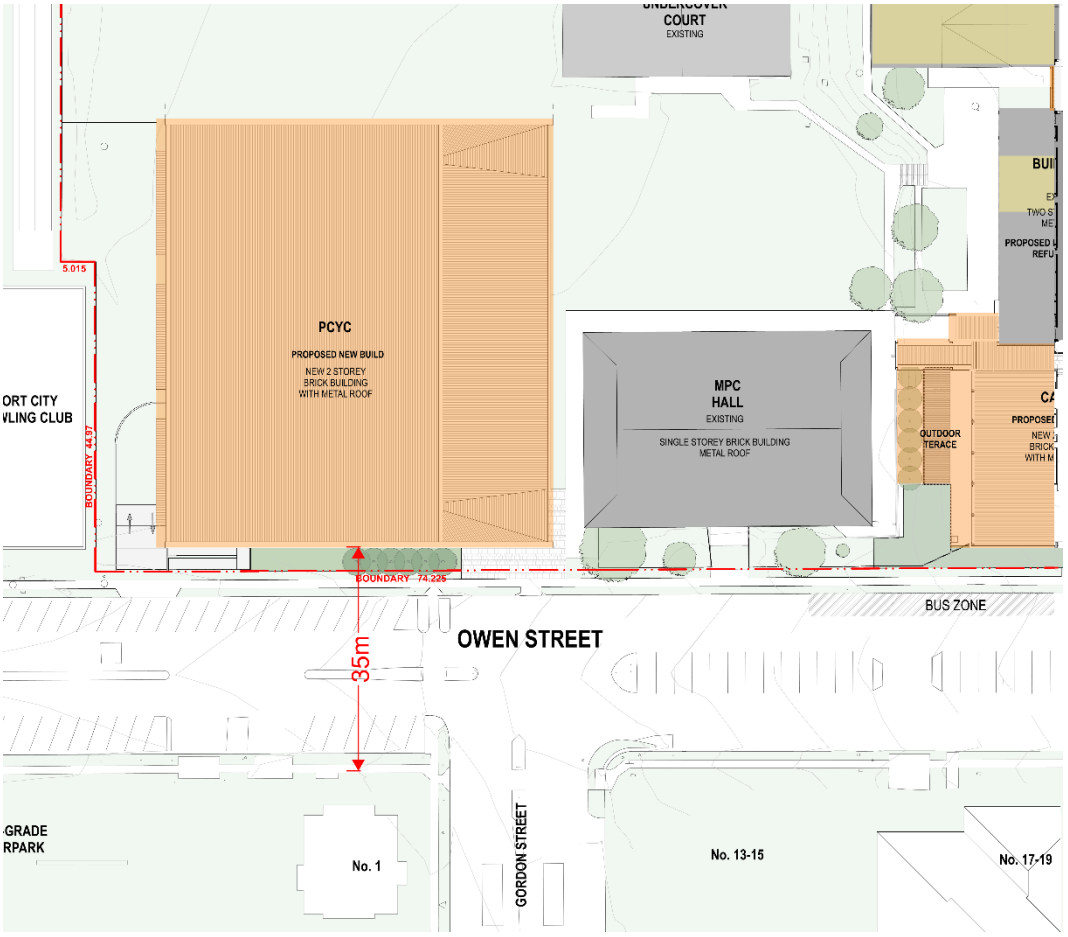


Figure 5: PCYC Building and distance to boundary of nearest residential noise sensitive receiver.

Noise break-out from indoor sport games with spectators in the Multipurpose Sporting Courts is assessed at the nearest residential receiver. At this stage, the PCYC building western façade comprises a combination of masonry and glazing, being the glazing the weakest component. The roof is metal roof sheeting.

Calculation	*Sound Pressure Level*
Reverberant Internal Noise Level of indoor sport games $L_{Aeq,15min}$, dB(A)	84
Building fabric sound reduction, dB	-30
Distance attenuation, dB	-31
Predicted noise level at nearest receiver, $L_{Aeq,15min}$ dB(A)	23
Noise Level Criteria (Evening-time), $L_{Aeq,15min}$ dB(A)	44 / Yes

Table 16: Predicted noise levels from Multipurpose Sporting Courts during indoor games with spectators.

Given the result of the assessments above, operational noise from the Multipurpose Sporting Courts is expected to meet the required criteria during the evening time (6pm – 10pm) at residential receivers if windows and doors are closed.

At this stage, Multipurpose Rooms are located in the upper level facing south and there is direct line-of-sight with nearby residential receivers. The building fabric comprises a combination of mostly glazing with cladding and the roof is metal roof sheeting.

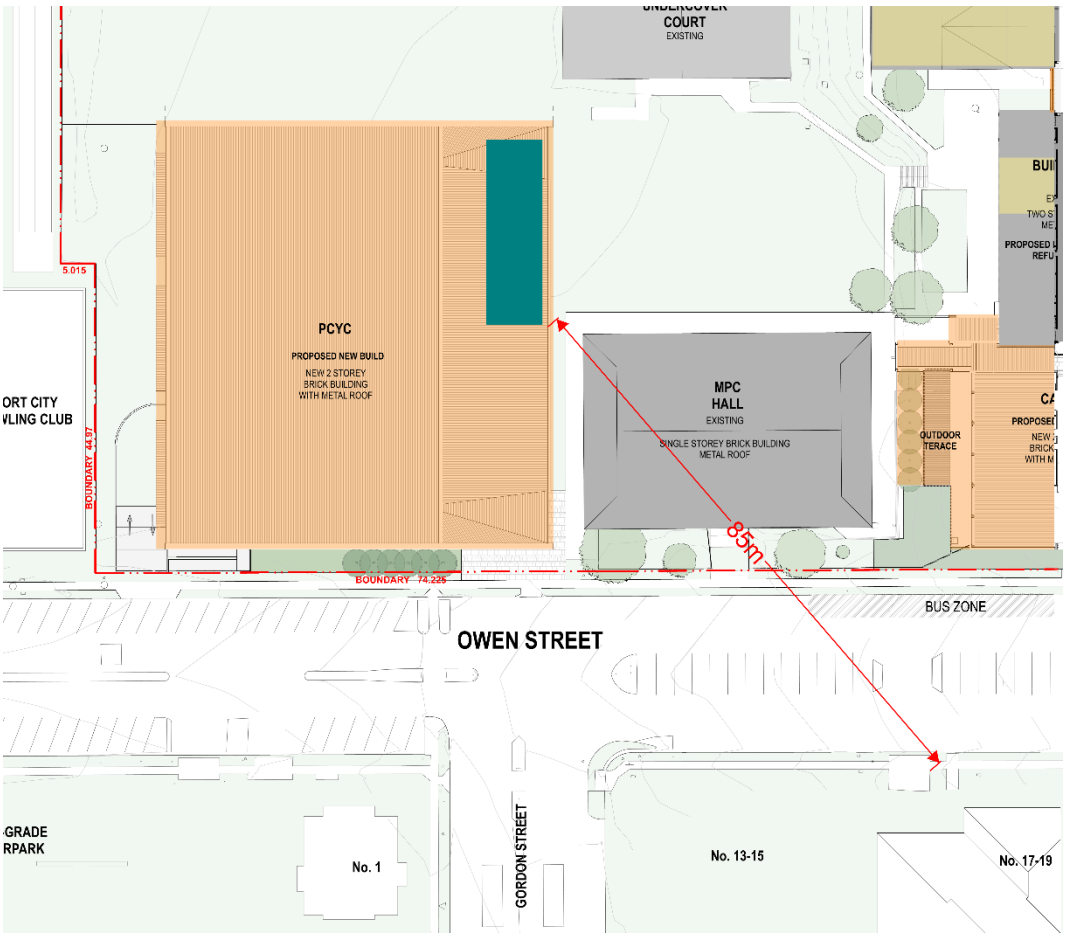


Figure 6: PCYC Building with location of Multipurpose Rooms plus distance to boundary of nearest residential noise sensitive receiver.

Noise impact assessment of noise break-out from Dance / Disco events in Multipurpose Rooms is presented in Table 17.

Calculation	*Sound Pressure Level*
Reverberant Internal Noise Level of dance / disco event $L_{Aeq,15min}$, dB(A)	94
Building fabric sound reduction, dB	-30
Distance attenuation, dB	-39
Predicted noise level at nearest receiver, $L_{Aeq,15min}$ dB(A)	25
Noise Level Criteria (Evening-time), $L_{Aeq,15min}$ dB(A)	44 / Yes

Table 17: Predicted noise levels from Multipurpose Rooms during Disco / Dance events.

Given the result of the assessments above, operational noise from Dance / Disco events in the Multipurpose Rooms is expected to meet the required criteria during the evening time (6pm – 10pm) at residential receivers if windows are closed.

Acoustic design of the building fabric and ventilation openings of the PCYC building will need to be considered throughout the detailed design stage in order to meet the noise level criteria in the nearest noise sensitive receivers.

5.4 TRAFFIC NOISE GENERATED

A traffic generation noise assessment has been undertaken in order to determine the potential noise impact of traffic generated by the PCYC, as there will not be an increase in the student and staff population.

As noted in Section 4.5.1, when considering land use development and the impact on sensitive land uses, the NSW RNP states that an increase up to 2.0dB in relation to existing noise levels is anticipated to be insignificant.

Based on the traffic report prepared by Ason Group, the additional vehicle trips from the PCYC post development are presented in Table 18.

	Existing	*Post development*	*dB*
PM Peak Traffic Flow (vehicles/hour)	481	585	0.85

Table 18: Predicted traffic noise level increase for the roads around the PCYC (2021 – post development).

Based on the assessment shown above, traffic generated as a result of the proposed school development is not expected to exceed the criteria of 2.0dB increase based as per the NSW RNP.

6 NOISE INTRUSSION ASSESSMENT

Traffic noise from Owen Street will affect the proposed development. In order to meet the EFSG DG11 internal noise levels requirements, JHA has carried out a review of traffic noise impacts with the following assumptions:

- Noise levels are based on measurement data for the worst-case 1-hour noise level – refer to Table 5.
- Internal noise levels are predicted based on levels incident at the façade of each space, which are based on unattended results.
- Attenuation provided by the façade construction, with the weakest elements being external glazing.
- Internal noise levels have been considered for two scenarios:
  - Windows closed.
  - Windows opened sufficiently to provide cross ventilation, where it is understood that the open area requirements for natural ventilation (5% of floor area) will be provided.

From the assessment, JHA has identified that achieving internal noise levels in accordance with EFSG DG11 will typically require the following:

- Windows to be kept closed where required.
- External glazing will be designed to control traffic noise intrusion as required.

Acoustic design of the glazing and building fabric of the relevant buildings will need to be considered throughout the detailed design stage in order to ensure the requirements of EFSG DG11 are achieved.

7 CONSTRUCTION NOISE AND VIBRATION PLANNING

Currently the project is at an early design stage and a detailed construction program is not yet full defined. This section of the Construction Noise and Vibration Planning provides general recommendations only and provides applicable criteria together with best noise and vibration control practices to be observed during the construction of the proposed development.

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).

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 plus 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

7.3 PRELIMINARY CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

At this stage, there is no information regarding construction plant / equipment plus work activities / duration. Therefore, a preliminary construction noise and vibration assessment has been carried out in order to identify the likely potential impact of various generic construction plant / equipment on sensitive receivers surrounding the site. The Contractor will be responsible for preparing a Works Plan and Schedule which include all relevant noise and vibration information, plus a CNVMP.

7.3.1 NOISE

The key noise sources on site during demolition and construction stages will be from heavy plant / equipment such as excavators, bulldozers, hand held pneumatic tools, grinders, etc. It is anticipated that the key construction activities to occur are as follows:

- Site establishment.
- Demolition, excavation, foundation and piling.
- Structure, façade and fit-out works.
- Landscaping.

A detailed noise assessment shall be carried out for the CNVMP when details for the construction plant, equipment plus activities and duration will be known.

Assumed 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.

The expected construction noise sources and the predicted noise levels at the nearest residential receivers are shown below in Table 19.

Item	*Typical Power Noise Level L_{A10} (dB ref 1pW)*	*Typical Noise Level $L_{A10,15m}$ at 7m (dB ref 20μPa)*	*Predicted Noise Level $L_{Aeq,15m}$ at nearest residential receiver*	*Complies with Highly Noise Affected Criteria?*
Angle grinders	104	76	58 – 66	Yes
Truck (>20 tonne)	108	80	62 – 70	Yes
Circular saw	115	87	69 – 77	No
Piling rig	120	92	74 – 82	No
10-40tn Excavator	117	89	71 – 79	No
40-50tn Mobile crane	111	83	65 – 73	Yes
Concrete pump	114	86	68 – 76	No
Concrete truck	110	82	64 – 72	Yes
Drill	94	66	48 – 56	Yes

Table 19: Anticipated airborne noise levels for equipment / plant used during construction works.

Based on the results of the preliminary assessment as shown above, the noise associated with the normal 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. These noise mitigation measures are to be provided in a detailed CNVMP and prepared by a qualified acoustic consultant prior to Construction Certificate.

7.3.2 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 DEC's *'Assessing Vibration: A Technical Guideline'*). The recommended safe working distances for typical construction plant are provided in Table 20.

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	Hand held	1m	Avoid Contact with Structure

Table 20: Recommended minimum working distances for vibration intensive plant from sensitive receivers.

If Contractor has concerns for the disruptions at nearest sensitive receivers due to vibration intensive plant use, it is recommended that prior to the commencement of the works, to undertake a preliminary vibration survey on each key vibration generating activity / equipment.

The preliminary 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 minimised as far possible.

7.4 CONTROL ELEMENTS

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 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 or weekday periods. Therefore, it is recommended that noisy construction works will not be undertaken between 6am and 7am in order to minimise any sleep disturbance to the nearest residential receivers.

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, particularly during night or out-of-hours works.
  - 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.
  - 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.

7.4.2 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 and vibration impact assessment has been carried out for the Hastings Secondary College upgrade at Port Macquarie, NSW. This report forms part of the documentation package submitted to the Department of Planning as part of the State Significant Development Application (SSD-11920082).

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

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.

At this stage, mechanical plant selections have not been made. Therefore, a detailed noise assessment has not been able to be carried out. Recommendations have been provided to minimise the impact of external noise emissions associated with the mechanical plant of the proposed development to the nearest sensitive receivers.

At this stage, public address and school bell systems have not been selected. Therefore, recommendations have been provided to minimise the impact of external noise emissions associated with the public address and school bell systems of the proposed development to the nearest sensitive receivers.

Operational noise from the PCYC building is expected to meet the required criteria during the evening time (6pm – 10pm) at the nearest noise sensitive receivers with windows and doors closed. Acoustic design of the building fabric shall be continued during the detailed design stage to confirm that noise levels will met during the operation of the PCYC building.

Traffic generation noise has been assessed, and it is expected to meet the established noise level criteria.

External noise impact from traffic noise is expected to be insignificant. Therefore, traffic noise intrusion levels are not expected to exceed the established noise criteria within the premises.

A preliminary construction noise assessment has been carried out. Based on the results of the preliminary assessment, the noise associated with the normal construction works is expected to exceed the noise limits for standard hours in accordance with the ICNG Guideline.

In order to minimise any potential construction noise and vibration impacts on the nearest residential receivers, recommendations have been provided based on the relevant guidelines. If, during any construction work, equipment exceeds the established noise and / or vibration level criteria at any sensitive receiver, the additional noise and vibration control measures shall be considered to minimise the noise and vibration impacts.

Based on the information presented in this report, relevant objectives will be satisfied and therefore approval is recommended to be granted.

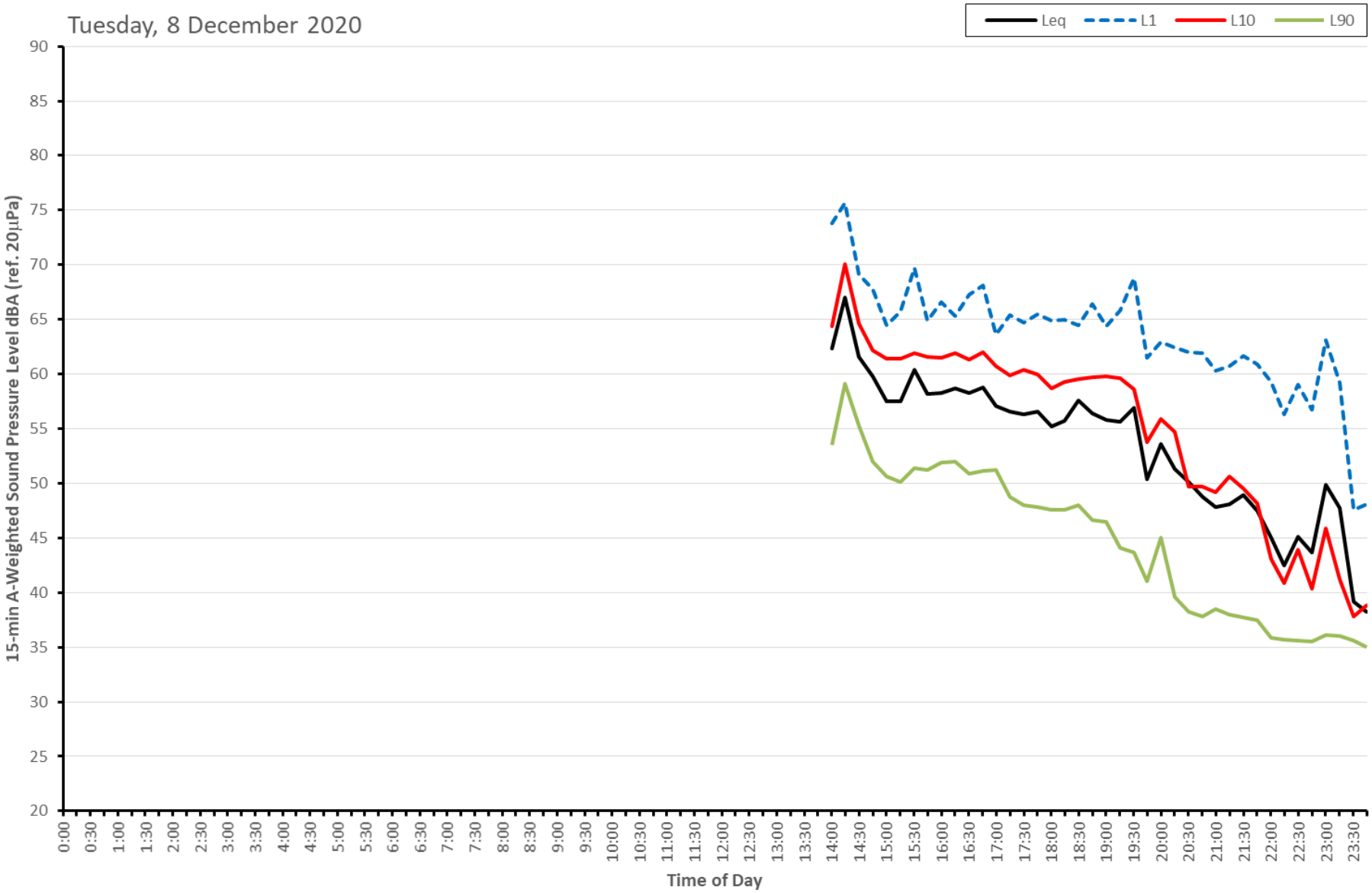
APPENDIX A: LONG-TERM NOISE MONITORING RESULTS

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.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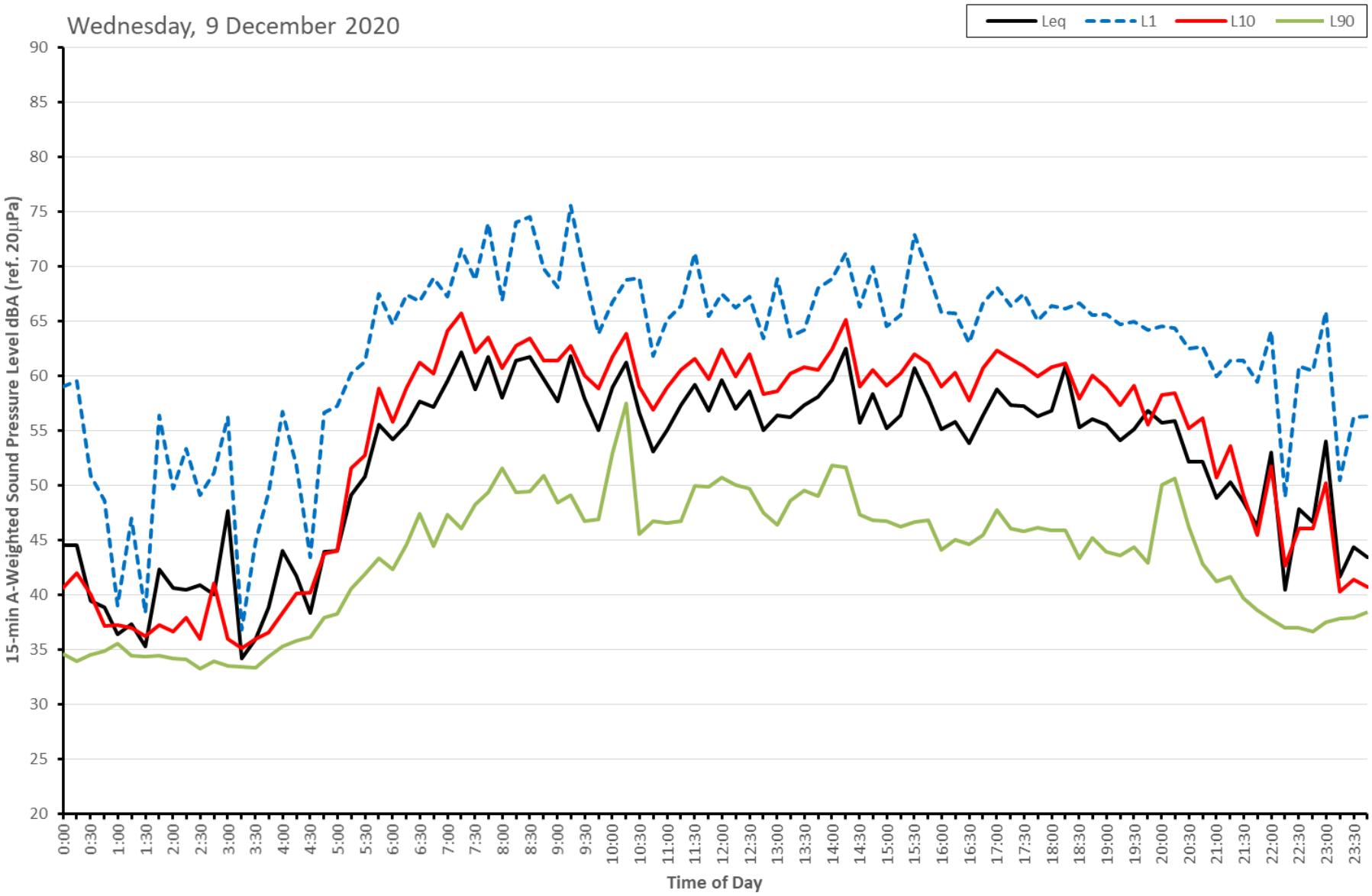
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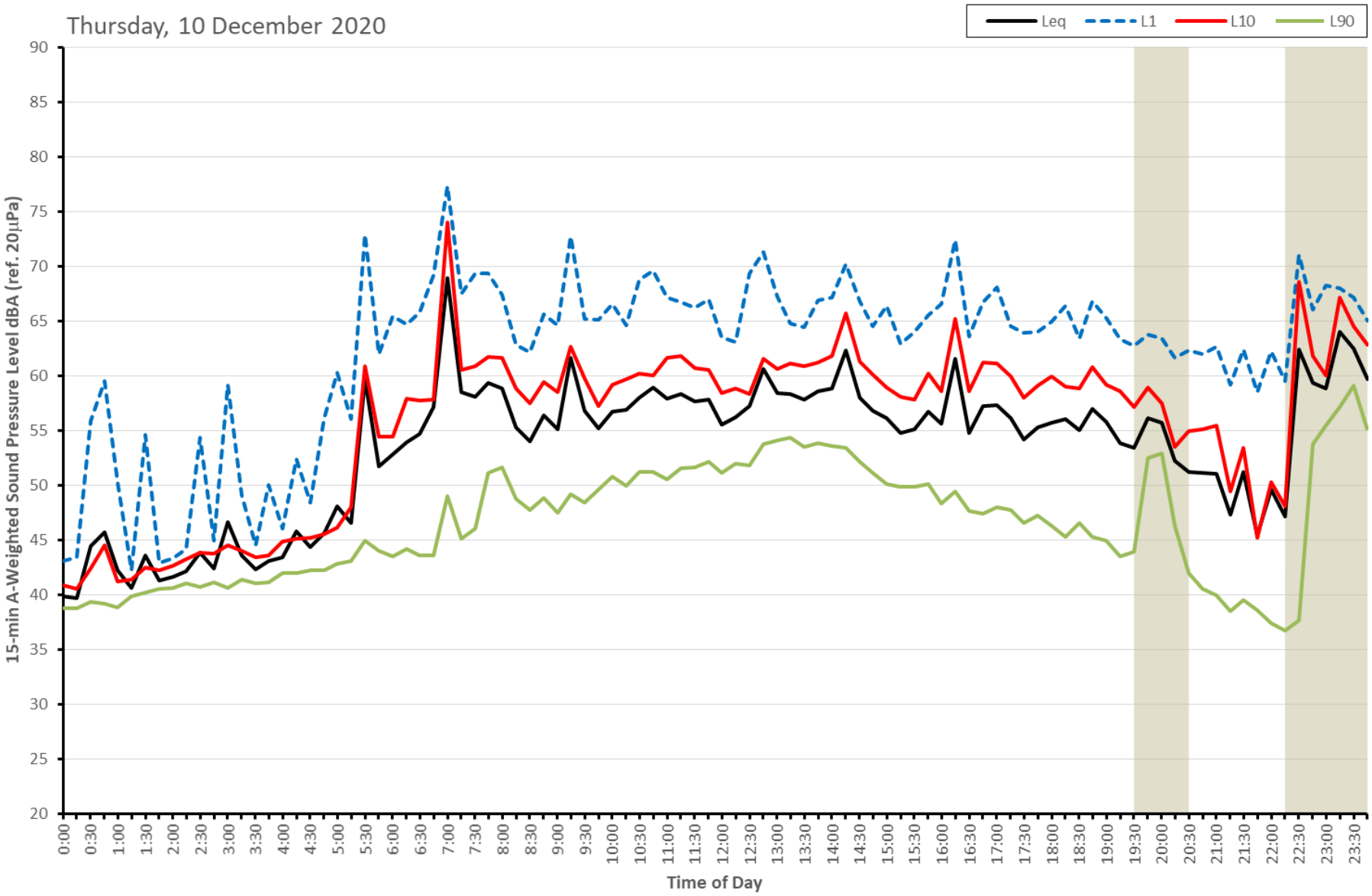
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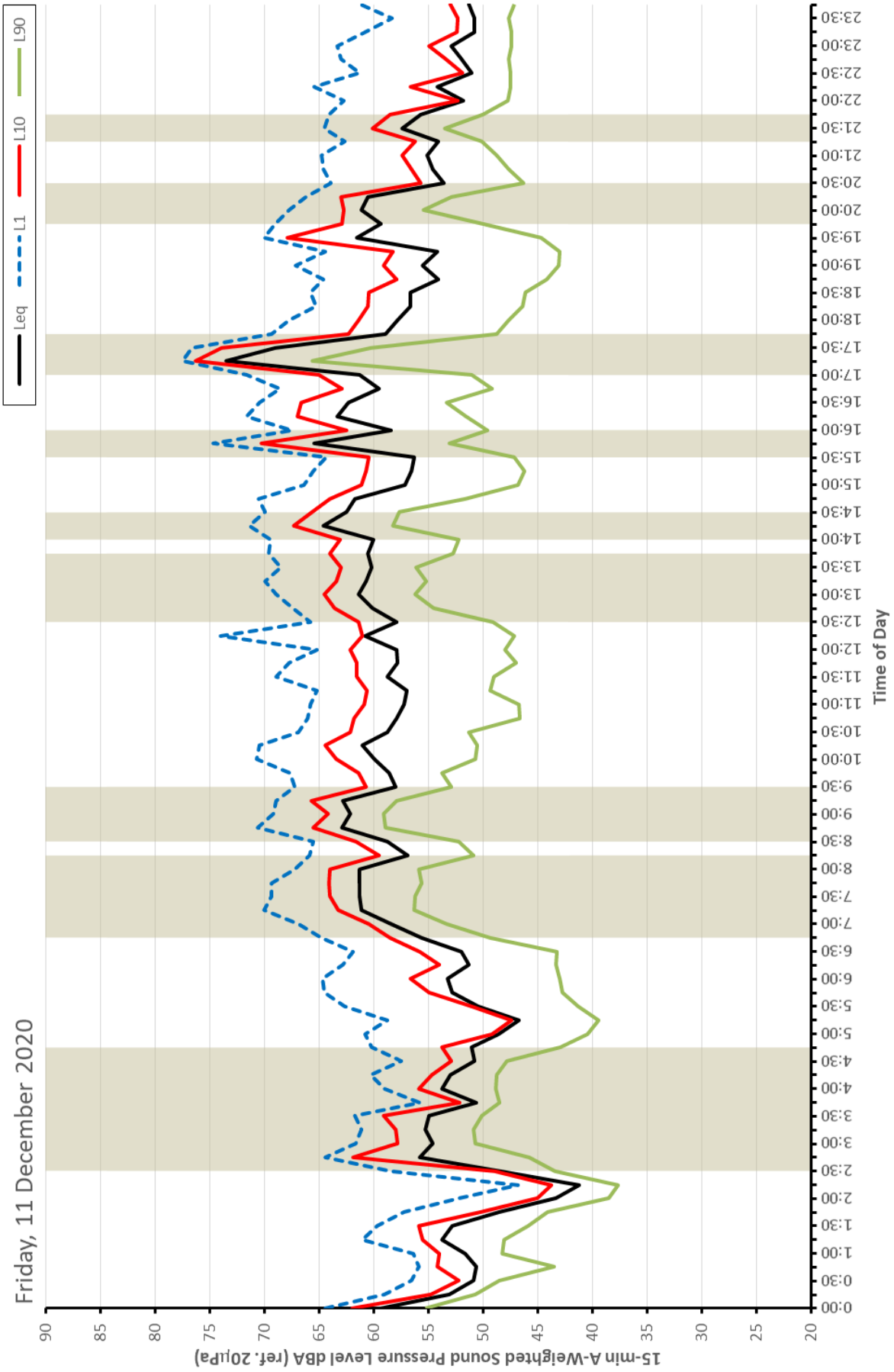
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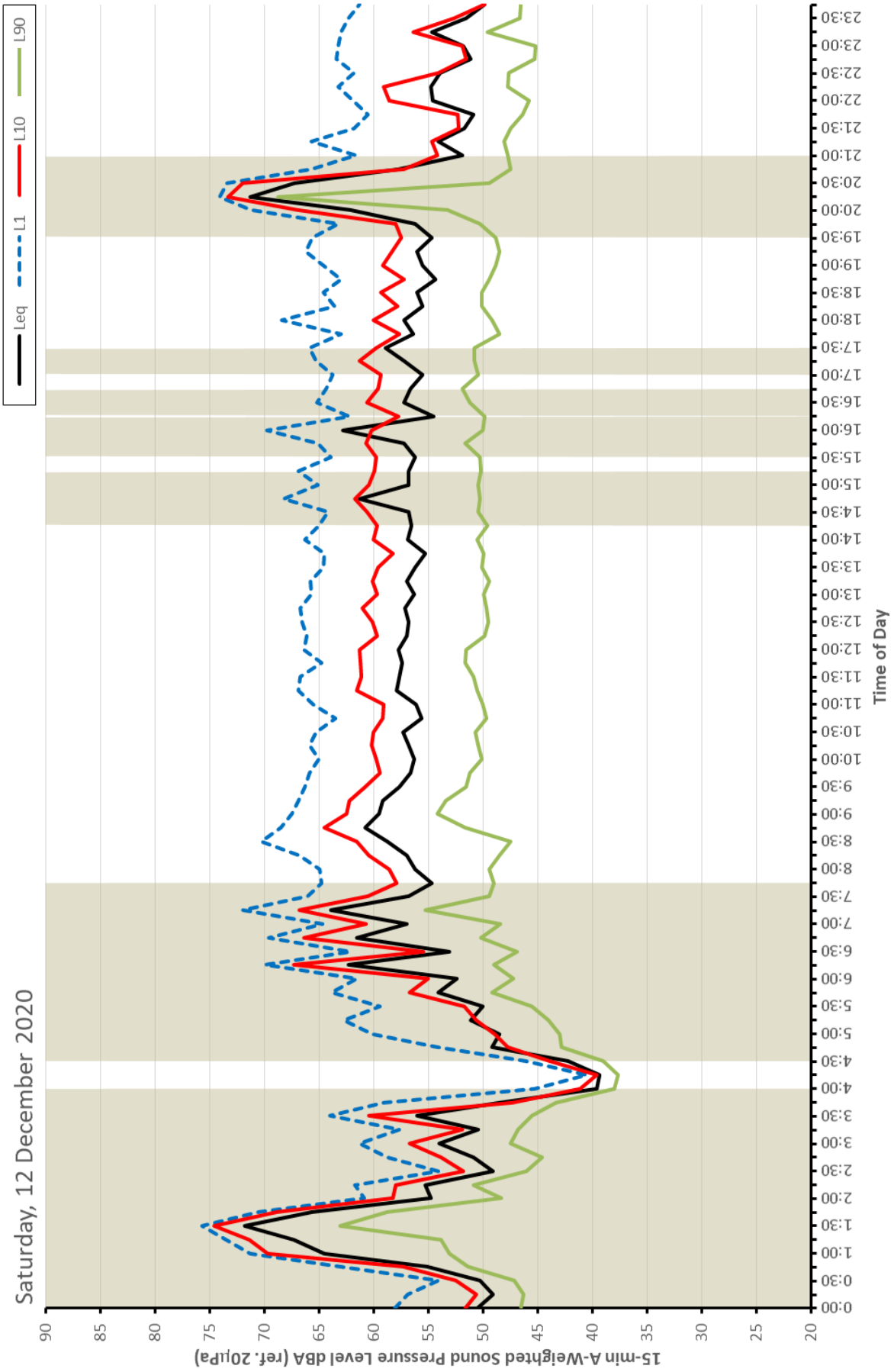
Saturday, 12 December 2020
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15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
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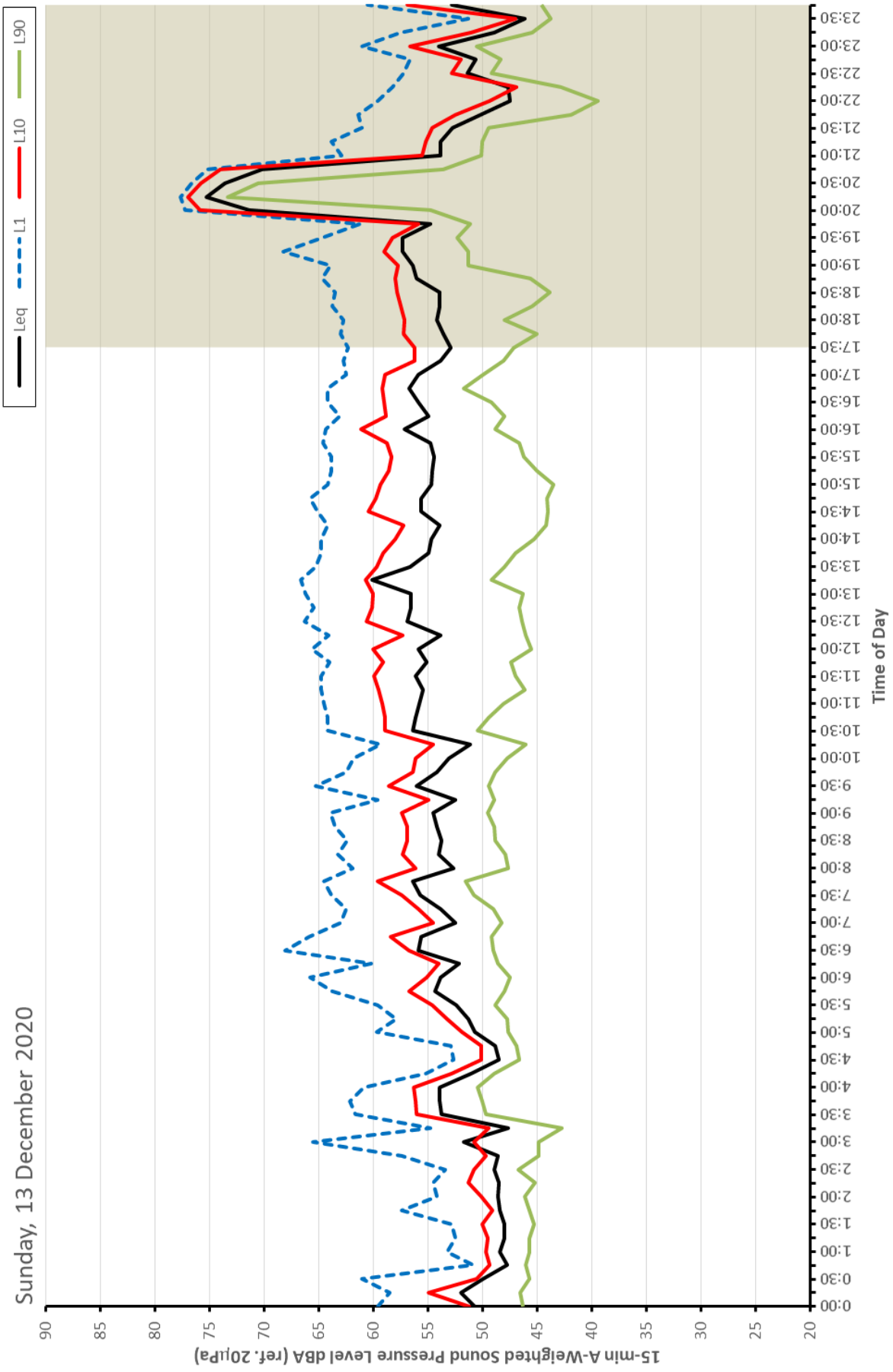
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Sunday, 13 December 2020
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
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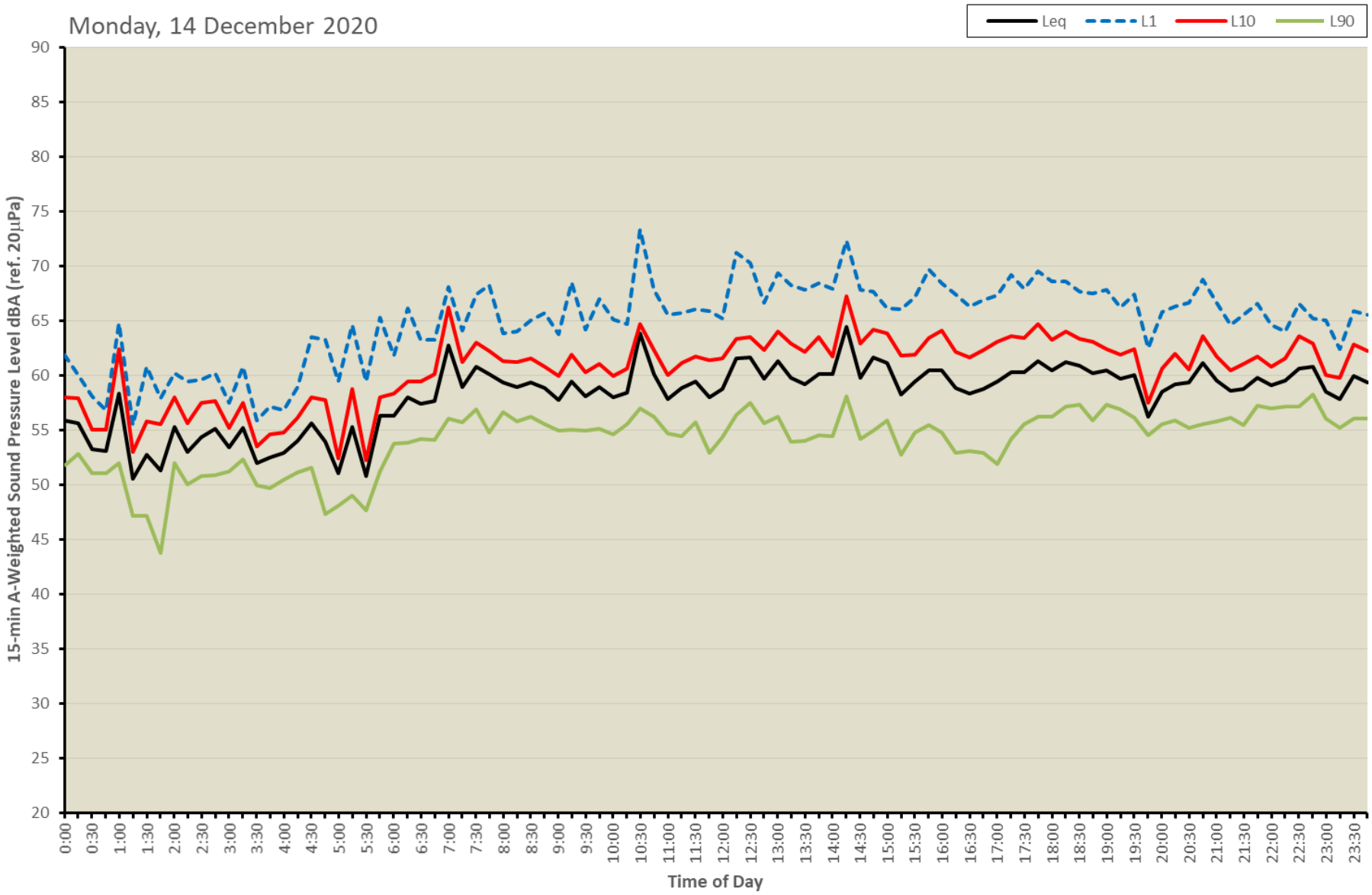
Monday, 14 December 2020
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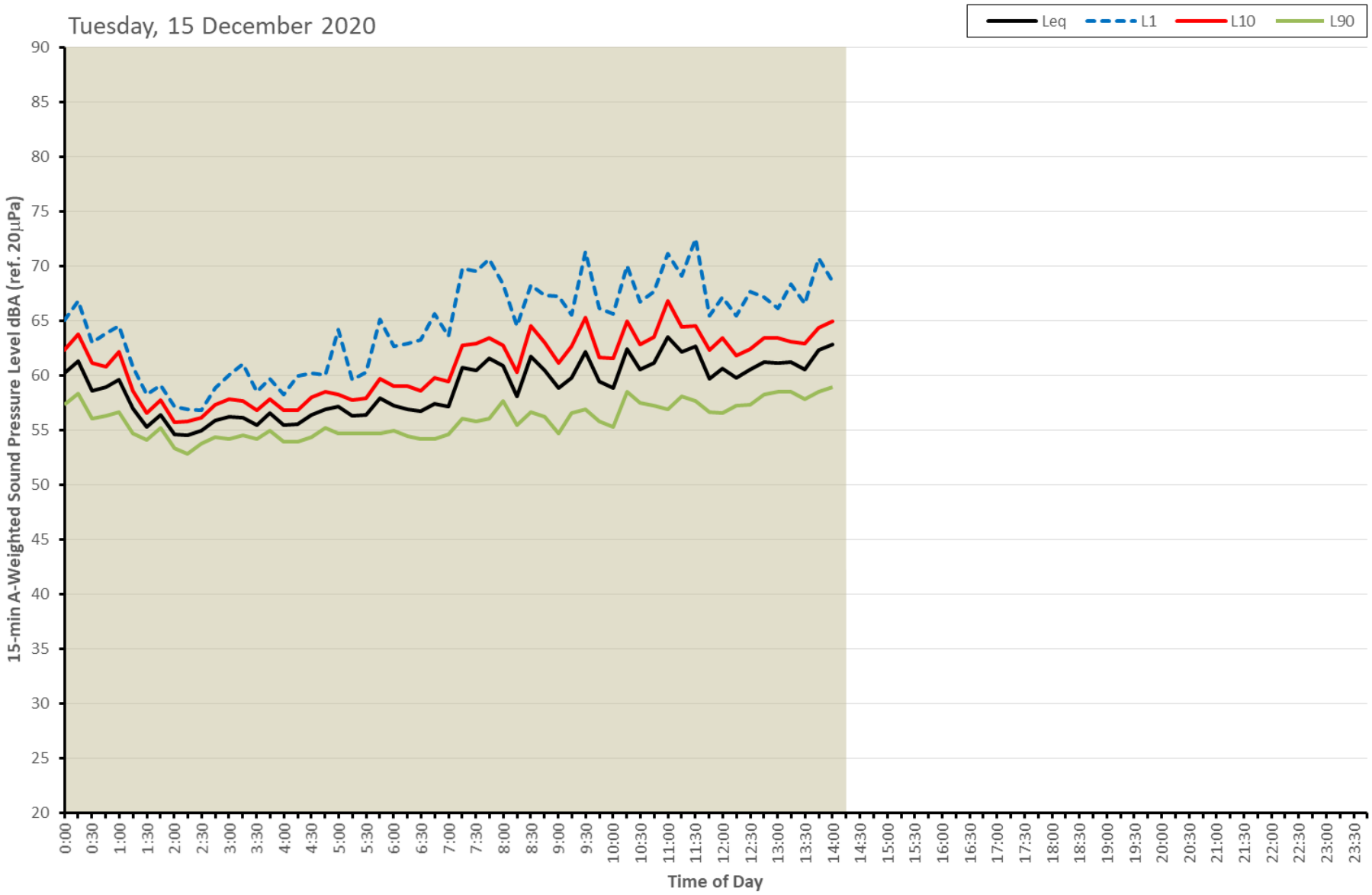
Tuesday, 15 December 2020
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15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
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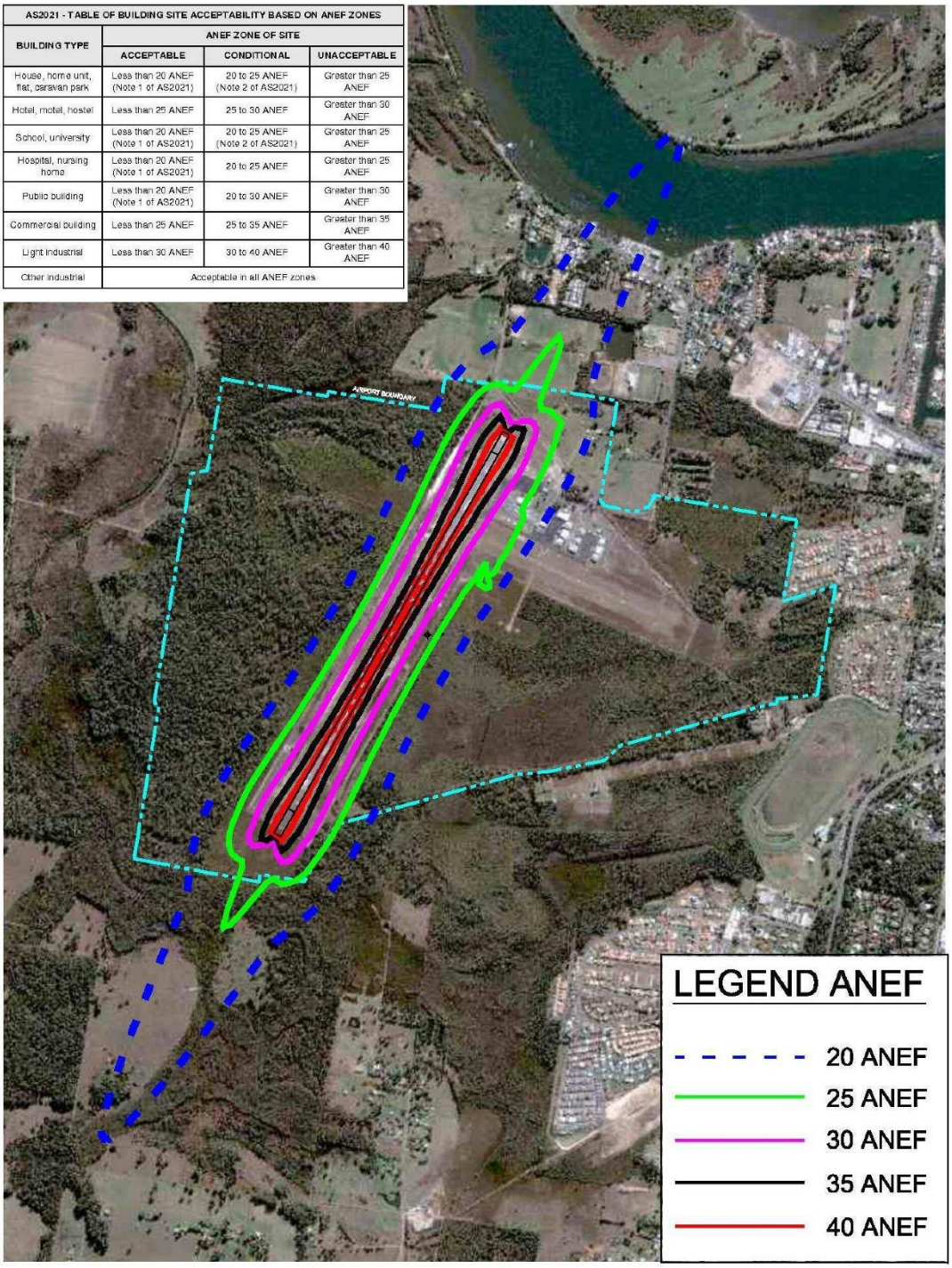
APPENDIX B: PORT MACQUARIE AIRPORT ANEF 2030

AS2021 - TABLE OF BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES			
BUILDING TYPE	ANEF ZONE OF SITE		
	ACCEPTABLE	CONDITIONAL	UNACCEPTABLE
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1 of AS2021)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		



DATE: 03-04-13

AMPC
Airport Master Planning Consultants

Base Image: © Land and Property Information, Panorama Dr. Bathurst (2013)

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PORT MACQUARIE AIRPORT

PORT MACQUARIE AIRPORT MASTER PLAN 2010 ADDENDUM

FIGURE 12-4

2030 ANEF

(BASED ON A2 DRAWING PMAN 104C)