WARRIEWOOD COMMUNITY CENTRE

DECEMBER 2020

PREPARED FOR

NORTHERN BEACHES COUNCIL

PREPARED BY

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SPOKE ACOUSTICS

TABLE OF CONTENTS

1 INTRODUCTION

Spoke Acoustics Pty Ltd was engaged by Northern Beaches Council to prepare a noise assessment. This assessment is to support a Development Application (DA) for the proposed new Warriewood Community Centre. This centre comprises six new buildings and a new carpark.

Based on the Concept Design we understand the main areas of concern regarding noise for the DA are:

- Emission from mechanical HVAC plant impacting residents
- Intrusion from traffic on Pittwater Road
- Emission from amplified music impacting residents
- Self impact within the centre between different buildings

2 BACKGROUND AND SITE DESCRIPTION

The proposed community centre is to be located on the corner of Pittwater Road and Jacksons Road with carpark access from Boondah Road. There is an existing facility on the site. A site plan with the proposed building is shown below in Figure 1.

Figure 1 Proposed centre and surrounding areas

An aerial of this area is shown in Figure 2 which shows more detail of the nearest residential receivers on Jackson's Road and Pittwater Road. The potentially worst affected receivers (A, B and C) are indicated in Figure 2.

Figure 2 Aerial photo showing the current site and worst affected receivers

Source: Sixmaps

Figure 3 shows the internal layout of the proposed buildings. The building is proposed to use a mix of fixed windows, operable windows, air vents and louvres to provide ventilation to mechanical plant. The final configuration will be confirmed during detail design.

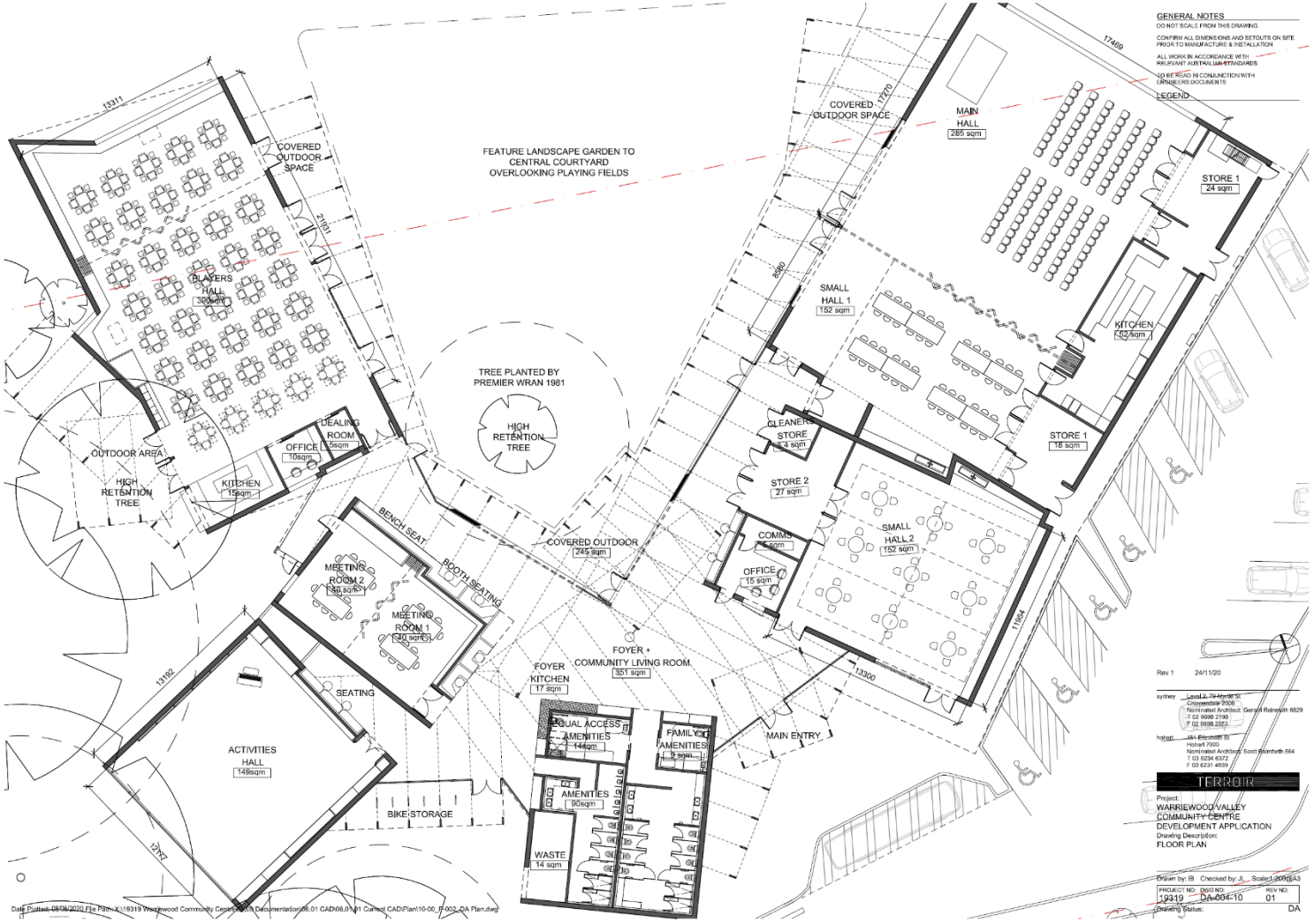
The key items relating to noise are the six buildings and areas comprising:

- Main Hall
- Small Hall 1 which is formed by closing an operable wall within Main Hall
- Small Hall 2
- Activities Hall
- Meeting Rooms 1 and 2
- Players Hall
- Amenities Block

It is Spoke's understanding that the intended uses which may produce noise are:

- Main Hall/Small Hall 1, general function area which may include weddings. Noise may be generated from music and live bands until 11pm. The hall closes at midnight.
- Small 2, general function area which may include weddings. Noise may be generated from music but no live bands until 11pm. The hall closes at midnight.
- Activities Hall, general use includes dance club and lessons. Noise may be generated from music but not live bands. Music is assumed to be at a lower level to facilitate instruction during lessons. Use may be until 10pm.
- Meeting Rooms, general space for use by community and staff for meetings.
- Players Hall, card games and others with some low level music for ambience.

Figure 3 Internal building layout



3 NOISE CRITERIA

Internal Noise Criteria

Some functions of the community centre may be considered as educational. Internal noise criteria for educational establishments (which may be a use of the centre) are outlined in the Department of Planning's guideline (*Development Near Rail Corridors and Busy Roads - 2008*) and the NSW Environment Protection Authority's *Road Noise Policy*. The recommended internal noise level for educational establishments due to traffic is 40dBA.

Further guidance may be taken from Australian Standard 2107 *Recommended design sound levels and reverberation times for building interiors.* Under this standard the recommend internal noise levels are:

- Municipal Building, Function Areas 40-45dBA
- Offices, 40-45dBA

Existing noise levels

Noise logging was completed between 9 November and 23 November 2020 in locations A and B which are shown in Figure 2. This was supplemented by attended measurements which confirmed the noise logging locations were representative of the area. Logging at Location A was repeated for a second week after tampering with the logger microphone at 4am 10 November affected further data.

Figure 4 Noise logging and attended measurement locations

Source: Sixmaps

The measured noise levels are reported below. Logger A was representative of receivers (A and B) on Pittwater Road and Logger B representative for receivers (C) on Jackson's Road.

Table 1 Background noise levels (RBL, L_{A90})

Location	Day	Evening	Night	
	(7am to 6pm)	(6pm to 10pm)	(10pm to 11pm)	(11pm to 7am)
Receivers A	58	52	40	37
Receivers B	58	52	40	37
Receivers C	51	39	36	34

Please see Attachment A for detailed logger results.

Environmental Noise Criteria at Residences - Operational

Based on the intended uses, without regular wedding functions with medium to high levels of amplified music or a live band, Spoke Acoustics proposes the use of the NSW EPA's Noise Guide for Local Government (NGLG) which outlines approaches to manage noise and to protect against offensive noise as defined in the NSW Protection of the Environment Operations Act.

This approach is consistent with Department Infrastructure, Planning and Environment SSD approvals for school halls with medium to high levels of amplified music up to 5 times per year.

The NGLG identifies that criteria should be set equal to the background noise plus 5dBA.

Based on the existing noise levels and the EPA's NGLG, the relevant criteria for mechanical plant and music are outlined below in Table 2. The night time criteria assume the centre and mechanical plant do not function after 12pm and music from the main and two smaller halls after 11pm.

Table 2 Operational noise criteria

Location	**Mechanical noise, $L_{Aeq\ (15minute)}$**		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Receivers A	63	57	42
Receivers B	63	57	42
Receivers C	56	44	39

Location	**Music, $L_{Aeq\ (15minute)}$**		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 11pm)
Receivers A	63	57	45
Receivers B	63	57	45
Receivers C	56	44	41

4 CALCULATION ASSUMPTIONS

Mechanical Plant

Final mechanical plant for the building will be selected during detail design. For this noise assessment the following sound power levels have been assumed to be emitted from each building mechanical HVAC systems.

Building	**Estimated SWL, dBA**
Activities Hall	84
Main Hall and Small Hall 1	87
Players Hall	80
Small Hall 2	84
Meeting Rooms	70

We understand this plant will be located within internal plant rooms that have fresh air ventilation through external louvres.

Road Traffic Noise

The measured road traffic noise spectrum on Pittwater Road used in this assessment for traffic noise intrusion is indicated in Table 3.

Table 3 Measured Pittwater Road traffic noise spectrum, L_{eq}

dBA	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
69	77	73	65	65	66	61	56

Music

The following music noise spectra and levels have been used in this assessment. The assessment has assumed the worst case with all spaces having music played concurrently.

Table 4 Music Spectra and Sound Pressure Levels, L_{Aeq}

	dBA	dBA levels at Octave Band Centre Frequencies (Hz)									
Spectra	**88**	**37**	**63**	**73**	**75**	**81**	**82**	**82**	**81**	**73**	**53**
Main Hall/ Small Hall 1	105										
Small Hall 2	88										
Activities Hall	80										
Players Hall	60										

5 OPERATIONAL NOISE AND TRAFFIC INTRUSION

Mechanical Plant

Noise levels from mechanical plant are predicted to comply with noise criteria as is indicted below in Table 5. The predicted noise levels for mechanical plant have been compared with night time noise criteria set between 10pm and 7am as these criteria are the most stringent. It is not anticipated that mechanical plant will remain on when the building is not in use.

The predicted noise levels assume the following noise treatments to plantrooms within the halls.

- Acoustically line plant rooms
- Acoustic louvres as required

Table 5 Night (10pm to 11pm) noise levels, $L_{Aeq\ (15\ minute)}$

Location	Criteria	Predicted Noise Level	Complies
Receivers A	42	<40	Yes
Receivers B	42	<40	Yes
Receivers C	39	<36	Yes

Amplified Music

Noise levels from amplified are predicted to comply with noise criteria as is indicted below in Table 6. The predicted noise levels for music have been compared with night time noise criteria set between 10pm and 11pm as these criteria are the most stringent. The noise from music includes a 5dBA penalty which is added to the predicted noise level. This penalty has been applied in accordance with the EPA's noise policy for industry where noise levels have low frequency energy which may be audible in residences.

Table 6 Night (10pm to 11pm) noise levels, $L_{Aeq\ (15\ minute)}$

Location	Criteria	Predicted Noise Level	Complies
Receivers A	45	40	Yes
Receivers B	45	45	Yes
Receivers C	41	41	Yes

Combined Noise Levels

Noise levels from amplified music and mechanical plant are predicted to comply with noise criteria as is indicted below in Table 7. A low frequency penalty has also been applied to these levels.

Table 7 Night (10pm to 11pm) noise levels, $L_{Aeq\ (15\ minute)}$

Location	Criteria	Predicted Noise Level	Complies
Receivers A	45	40	Yes
Receivers B	45	45	Yes
Receivers C	41	41	Yes

Traffic Noise Intrusion

Based on the estimated traffic noise levels, the design of the building roof, windows and cladding is controlled by the requirements to reduce noise from amplified music impacting residents and other buildings within the site.

Internal noise levels from road traffic are predicted to be less 40dBA with windows closed which meets the requirements of Australian Standard 2107 plus State guidelines and policy.

Recommended Building Design

The following indicative materials have been assumed to confirm the feasibility of the community centre based on the assumed internal noise levels. With these materials the noise criteria may be met subject to further review in detail design. Further review should include:

- Building usage scenarios and operational combinations to confirm internal noise levels within buildings and what combination of noise levels are likely at receivers at various times.
- Review of live band and speaker locations within the buildings plus internal building design which will influence the break out noise to residences and may affect compliance.
- Review of final materials selection and potential as-built performance.
- Review of building element junction details including box gutters and others.

Please see Figure 5 for buildings and material locations.

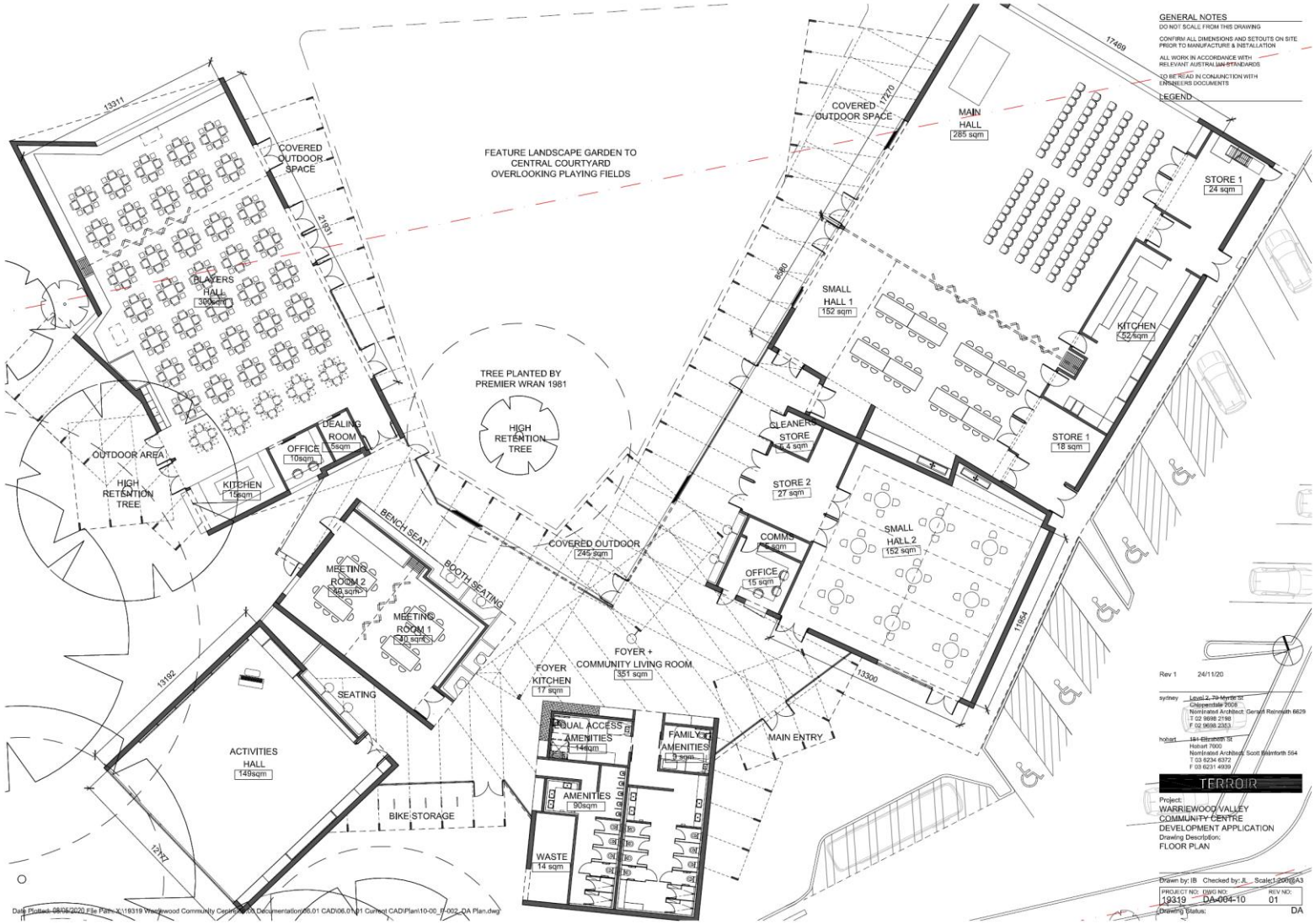
Table 8 Indicative building construction (to be reviewed in detail design)

Building Element	Noise Rating, R_{w+Ctr}	Description
Main Hall and Small Hall 1		
Roof	66	0.6mm BMT steel on 25mm cfc sheet, 700mm airgap to separate frames with 2 layers of 13mm fyrcheck gyprock.
Walls - South East external and plant room internal	44	145mm CLT against (no gap) 4 layers of 25mm cfc sheet, air cavity with absorption with gap size of 100mm or more to suit services, perforated

Building Element	Noise Rating, R_{w+Ctr}	Description
		plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Walls - North East and North West external	43	145mm CLT against (no gap) 3 layers of 25mm cfc sheet, air cavity with absorption with gap size of 100mm or more to suit services, perforated plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Glazing	38	10.38mm double glazed with 5mm air gap in frames to achieve the rating.
Small Hall 2		
Roof	53	0.6mm BMT steel, 1 times 24mm cfc sheet, 700mm airgap to 2 layers 13mm fyrecheck gyprock
Walls - South East and South West and plant room internal	43	145mm CLT against (no gap) 3 layers of 25mm cfc sheet, air cavity with absorption with gap size of 100mm or more to suit services, perforated plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Walls - North West	40	145mm CLT against (no gap) 2 layers of 25mm cfc sheet, air cavity with absorption with gap size of 100mm or more to suit services, perforated plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Glazing	38	10.38mm double glazed with 5mm air gap in frames to achieve the rating.
Players Hall		
Roof	36	CLT Wood Solutions, Roof Solution_01
External walls and plant room internal walls	40	9mm cfc, 25mm furring channel, 145mm CLT, air cavity with absorption with gap size of 100mm or more to suit services, perforated plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Glazing	30	Single 10.38mm laminated glass in frames to achieve the rating.
Activities Hall		
Roof	36	CLT Wood Solutions, Roof Solution_01
External walls and plant room internal walls	40	9mm cfc, 25mm furring channel, 145mm CLT, air cavity with absorption with gap size of 100mm or more to suit services, perforated plasterboard or timber (or no lining). It is important that the internal lining is perforated. Any external metal cladding must be lightweight with minimal air gap to drive resonance high in frequency.
Glazing	38	10.38mm double glazed with 5mm air gap in frames to achieve the rating.

All joins and junctions between the façade, window, eaves, fascia and roof elements must be acoustically sealed so they are airtight with a flexible mastic sealant or acoustically rated equivalent. Where lightweight cladding is used for the façade, junctions between cladding panels must form an airtight acoustic seal. This may be achieved by overlapping boards, a flexible mastic sealant or with an impermeable backing material.

Figure 5 Building layout on the site relative to north



6 CONCLUSIONS

Spoke Acoustics has reviewed the Warriewood Community Centre which has been proposed for Council approval. Spoke's review confirms the proposed building may be constructed so that the design manages potential noise impacts.

To minimise noise impact Spoke makes the following recommendations:

- Review of building usage scenarios and operational combinations to confirm internal noise levels and combined noise levels at receivers.
- Review of internal building design, band locations and speaker locations which will influence break out noise. Once confirmed the building façade, roof and window design should be reviewed to ensure compliance with noise criteria is met for music.
- Final plant selection is reviewed during detail design to ensure it complies with the noise criteria when combined with the noise emission from the buildings.
- Consideration of the indicative building materials in Table 8 or alternatives so that external noise criteria can be met. Note these indicative materials may be reviewed during detail design. The outcome of any review should ensure the noise criteria are met following specification of final internal finishes and materials.

GLOSSARY

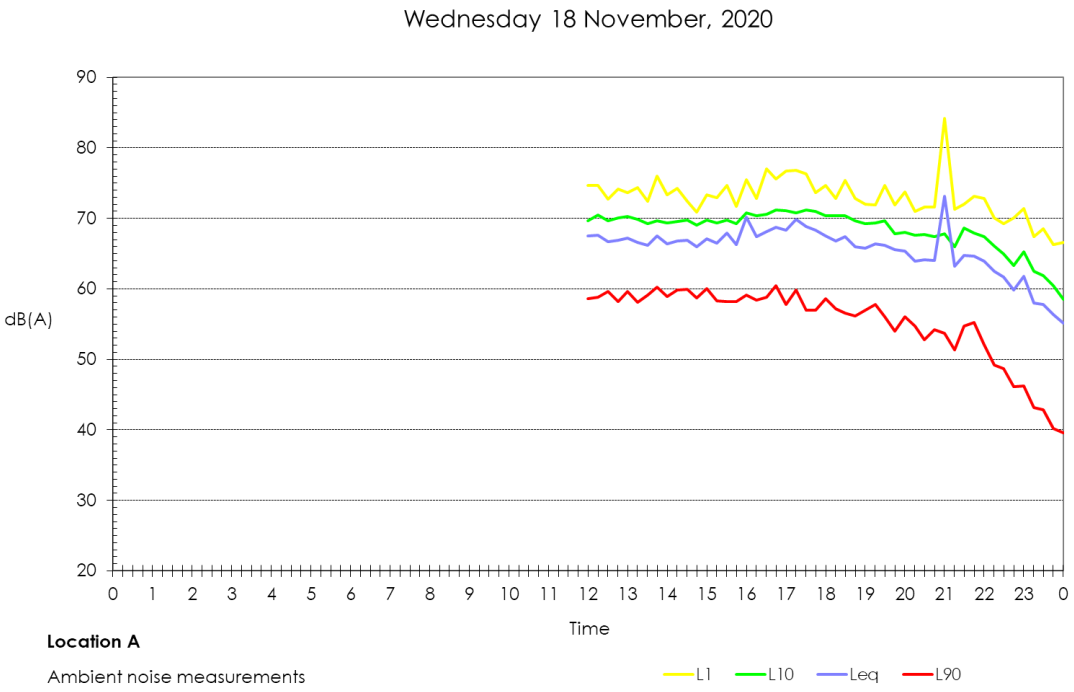
TERM	DESCRIPTION
dBA	The term dBA is an abbreviation which indicates the noise levels have been expressed in decibels (dB) using an A-weighting filter which approximates how the human ear perceives the loudness of complex noise sources with both low frequency (chugging of engines), medium (fans and engine exhaust flow) and higher frequency aspects.
L_{Aeq}, L_{A90}	In general, noise levels in any location vary continuously and any sound level meter will show this changing decibel level on the display. To make sense of the range in noise levels that may occur within a standard time period, various statistics are used in acoustics. The simplest are the L_{A90}, L_{A50} and L_{A10} descriptors. The number in each of these descriptors indicates the percentage of time that noise levels exceed the indicated value. For example, an L_{A90} is the noise level that was exceeded 90% of the time, and L_{A50} is the noise level that was exceeded 50% of the time (also the median) and L_{A10} is the noise level that was exceeded 10% of the time. The L_{Aeq} is more complex to derive from changing noise levels and is an averaging process. The averaging process results in a single equivalent number for the measurement period that has the same total sound energy as the changing noise levels over the time period.
Adverse wind and rain	Conditions are described as adverse when noise levels from wind or rain are high enough to influence noise measurement. Adverse noise may result from direct noise generation on the microphone or from wind and rain impacting other items such as the ground, pavements, structures, vegetation etc.
Noise logger	A noise logger is an automated sound level meter which repeatedly saves noise statistics for defined noise sampling periods. In NSW statistics are usually obtained for every 15 minute period each day starting at midnight.
Class 1	Sound level meters are available with different levels of accuracy. A class 1 instrument is a high precision instrument suitable for acoustic measurement of noise levels at the White Bay Cruise Terminal. To achieve a Class 1 rating the meter must comply with Standard IEC61672. Most meters that are available through retail electronics stores (including smartphone apps with claimed calibration curves) are not accurate or stable enough to achieve a class rating. Testing by Spoke Acoustics has found that noise levels measured using smartphone apps may commonly be wrong by 8dBA or more.
NATA calibration certificate	The sound level meter must have a current calibration certificate issued by a National Association of Testing Authorities (NATA) accredited laboratory for noise measurements to be valid in Australia. The certificate confirms that the meter is in good working order and complies with Standard IEC61672 and others as relevant.
Field calibration	A field calibration is conducted with a hand held acoustic calibrator and confirms the meter is working correctly and also permits minor adjustments to account for significant changes in temperature and atmospheric pressure.

GLOSSARY

TERM	DESCRIPTION
Acoustic calibrator	An acoustic calibrator is used to conduct a field calibration. For the calibration to be valid the calibrator must have a current calibration certificate issued by a National Association of Testing Authorities (NATA) accredited laboratory.

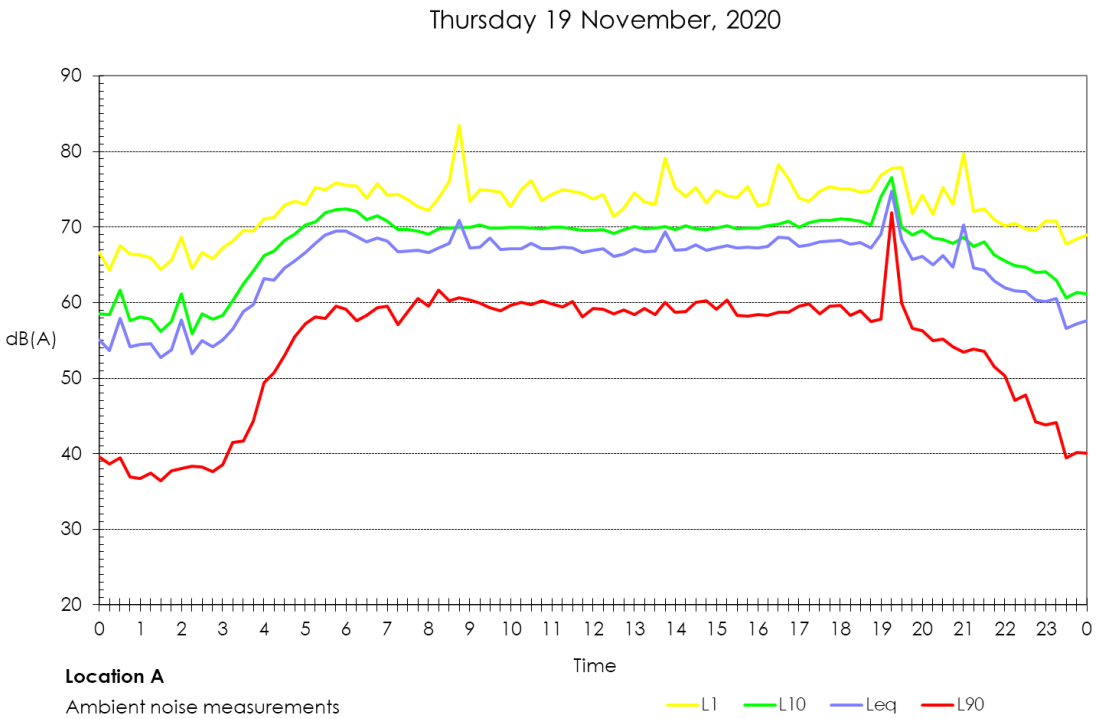
ATTACHMENT - LOGGER LOCATION A

The noise logging at Location A was completed with Svantek 977 logger with serial number 69721 with current NATA certification. The attended measurements were conducted using a Class 1 NTi XL2 (006316) sound level meter with current NATA calibration. Field calibration was completed before and after each noise measurement period with a Pulsar type 105 acoustic calibrator (81326) and not significant drift was detected. The calibrator also has a current NATA calibration certificate.



Location A

Ambient noise measurements

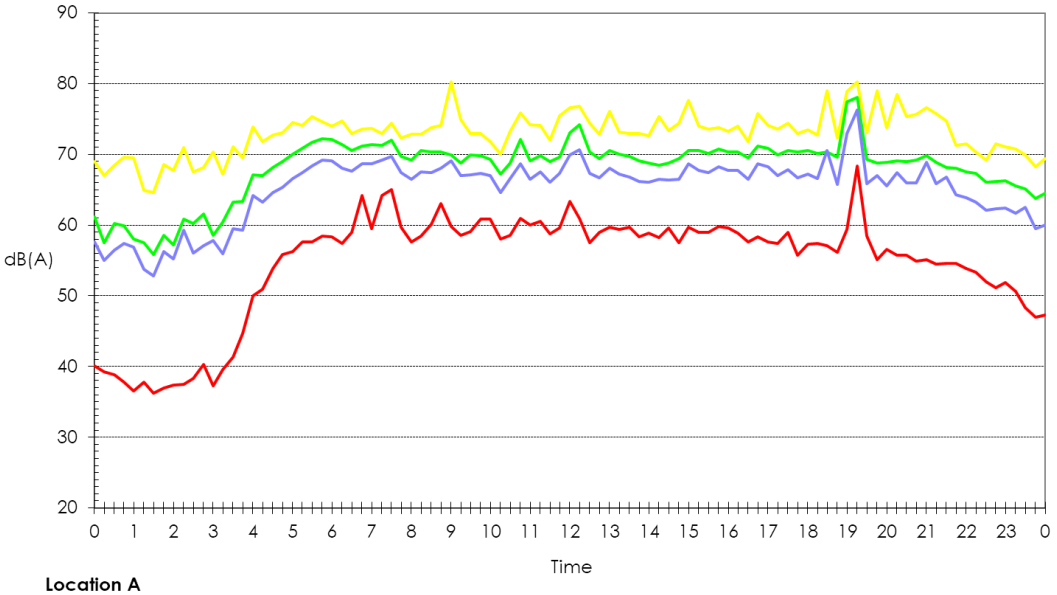


Location A

Ambient noise measurements

ATTACHMENT - LOGGER LOCATION A

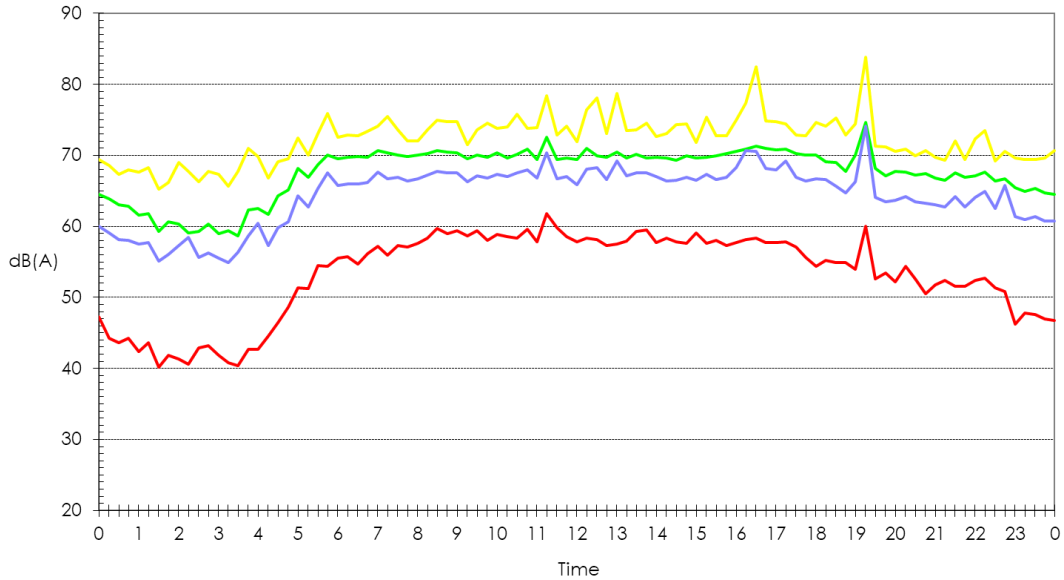
Friday 20 November, 2020



Location A

Ambient noise measurements

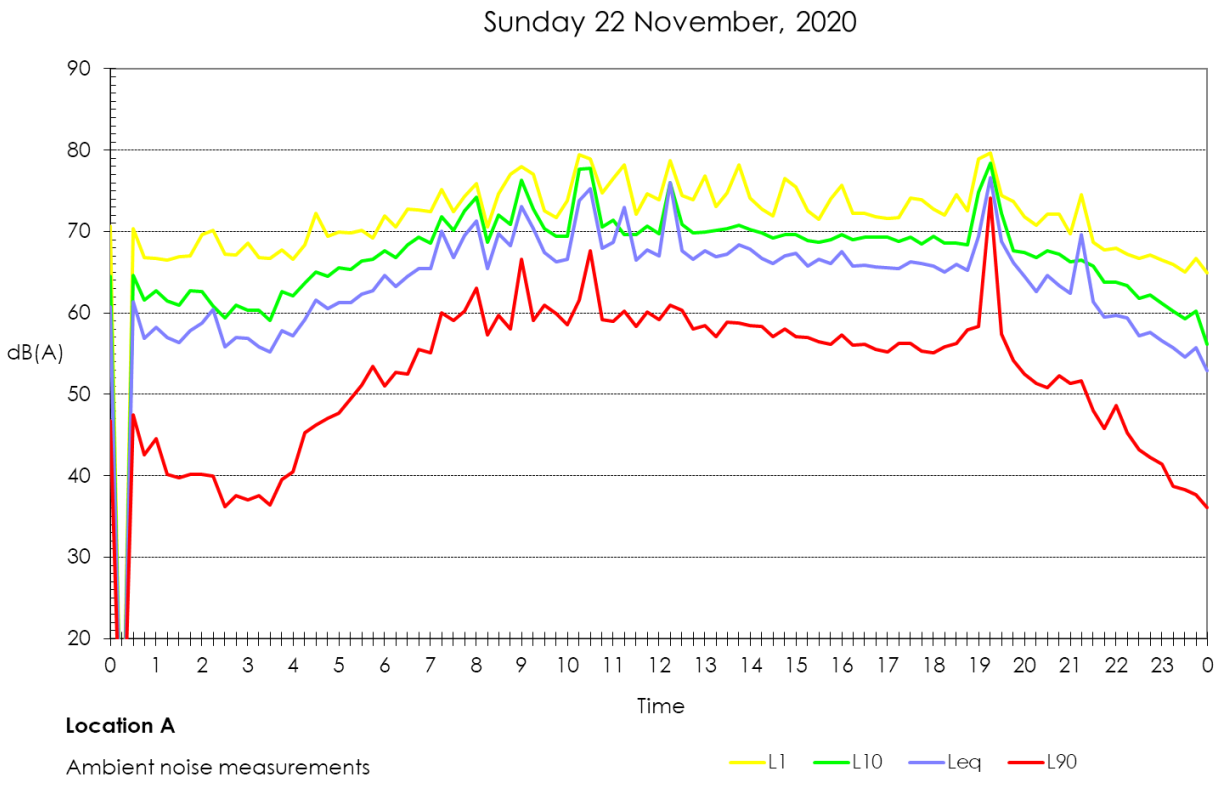
Saturday 21 November, 2020



Location A

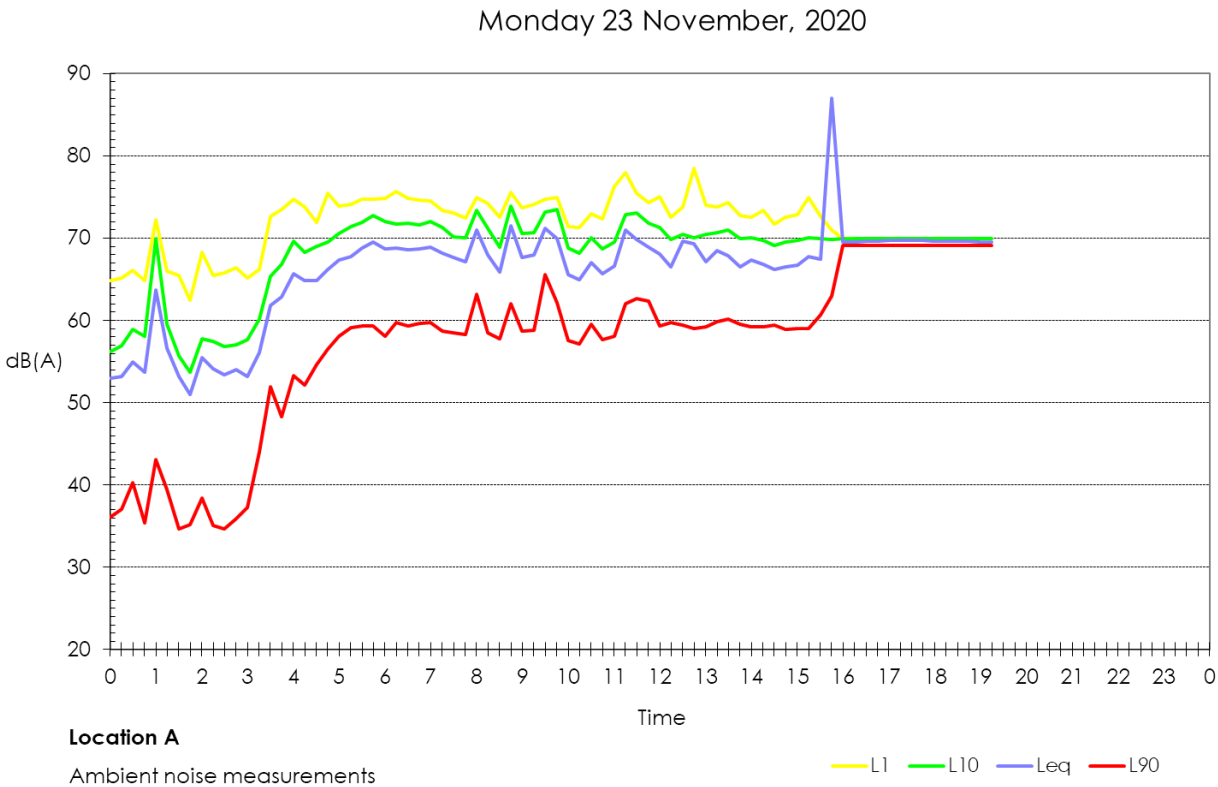
Ambient noise measurements

ATTACHMENT - LOGGER LOCATION A



Location A

Ambient noise measurements



Location A

Ambient noise measurements

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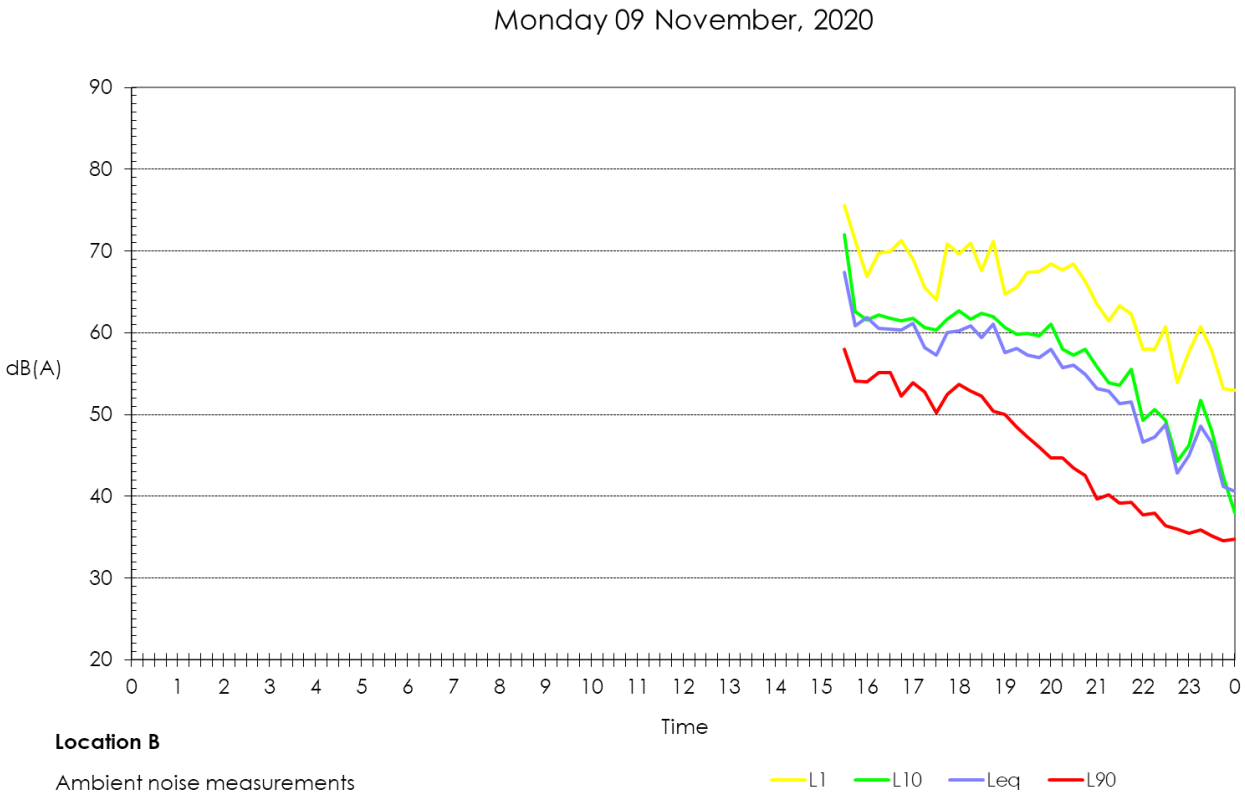
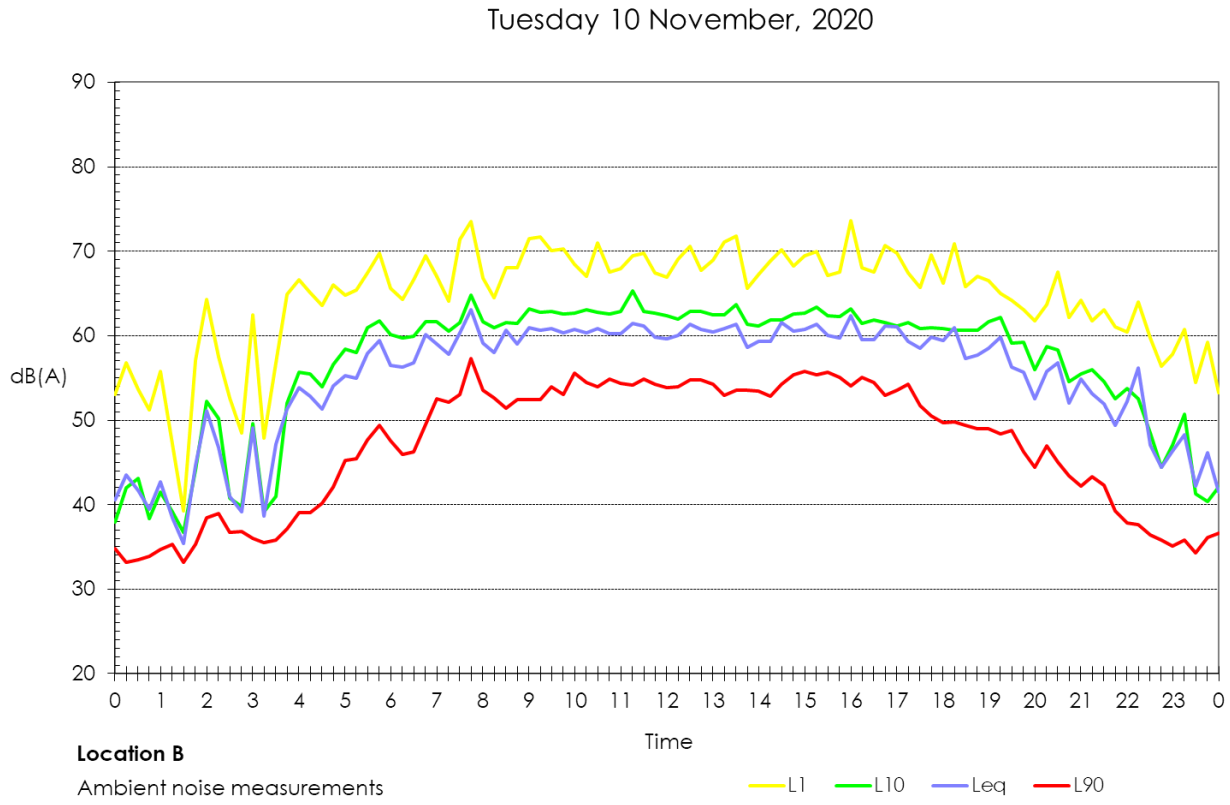
ATTACHMENT - LOGGER LOCATION B



Location B

Ambient noise measurements

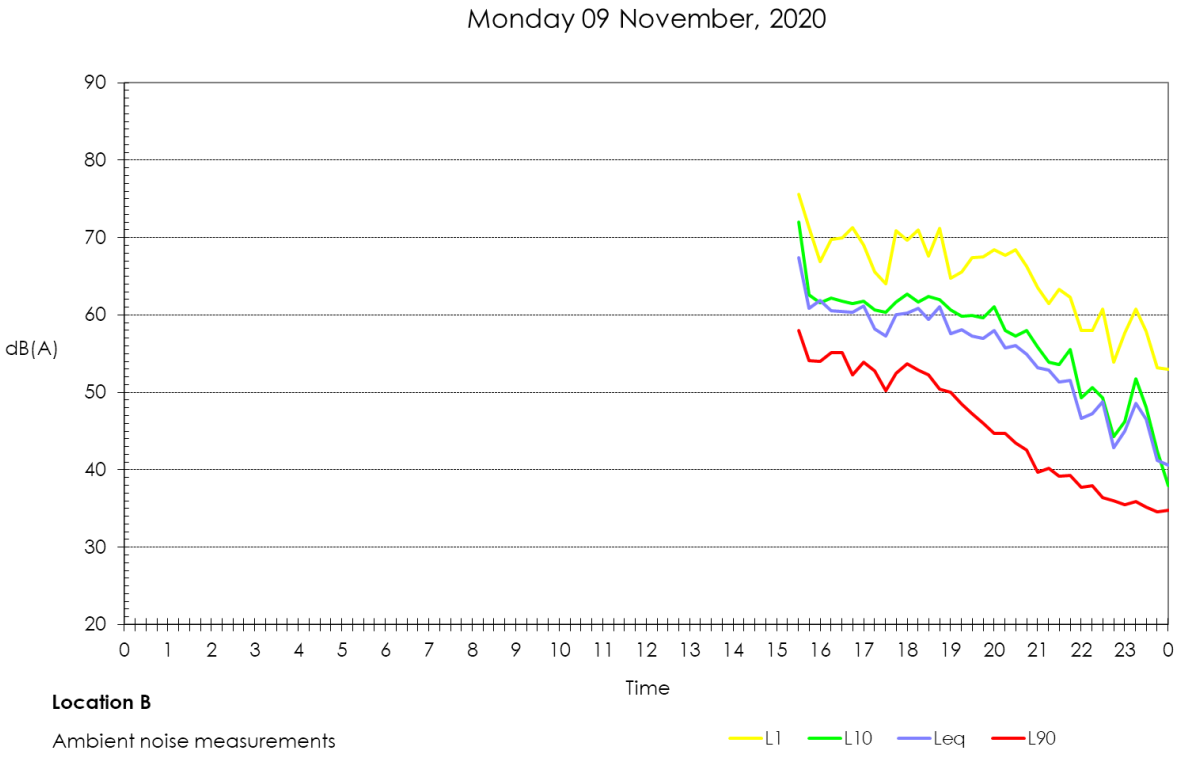


Location B

Ambient noise measurements

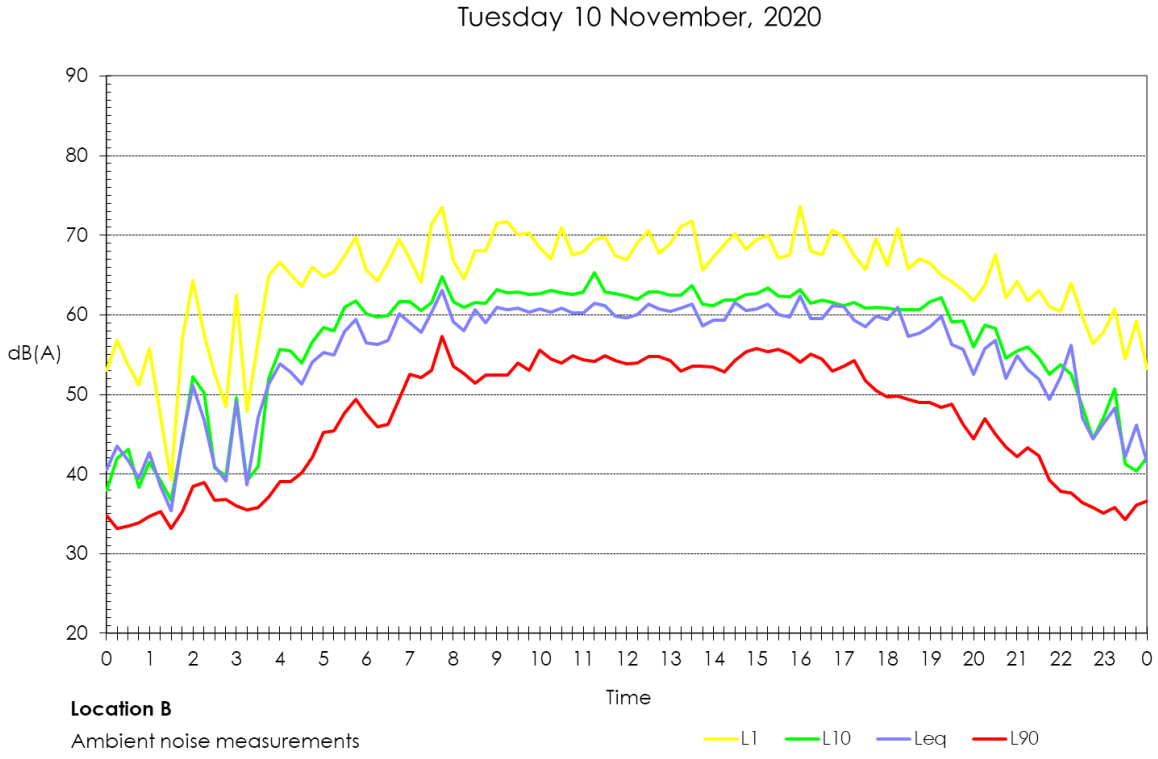
ATTACHMENT - LOGGER LOCATION B

The noise logging at Location A was completed with Svantek 977 logger with serial number 69203 with current NATA certification. The attended measurements were conducted using a Class 1 NTi XL2 (006316) sound level meter with current NATA calibration. Field calibration was completed before and after each noise measurement period with a Pulsar type 105 acoustic calibrator (81326) and not significant drift was detected. The calibrator also has a current NATA calibration certificate.



Location B

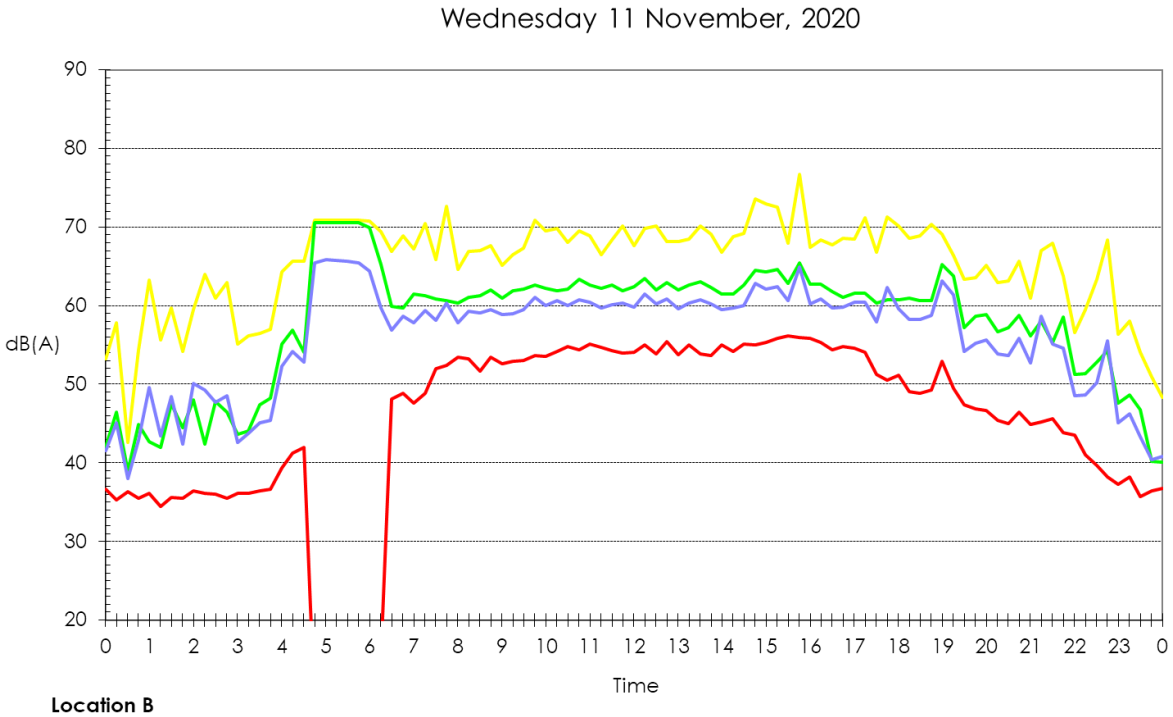
Ambient noise measurements



Location B

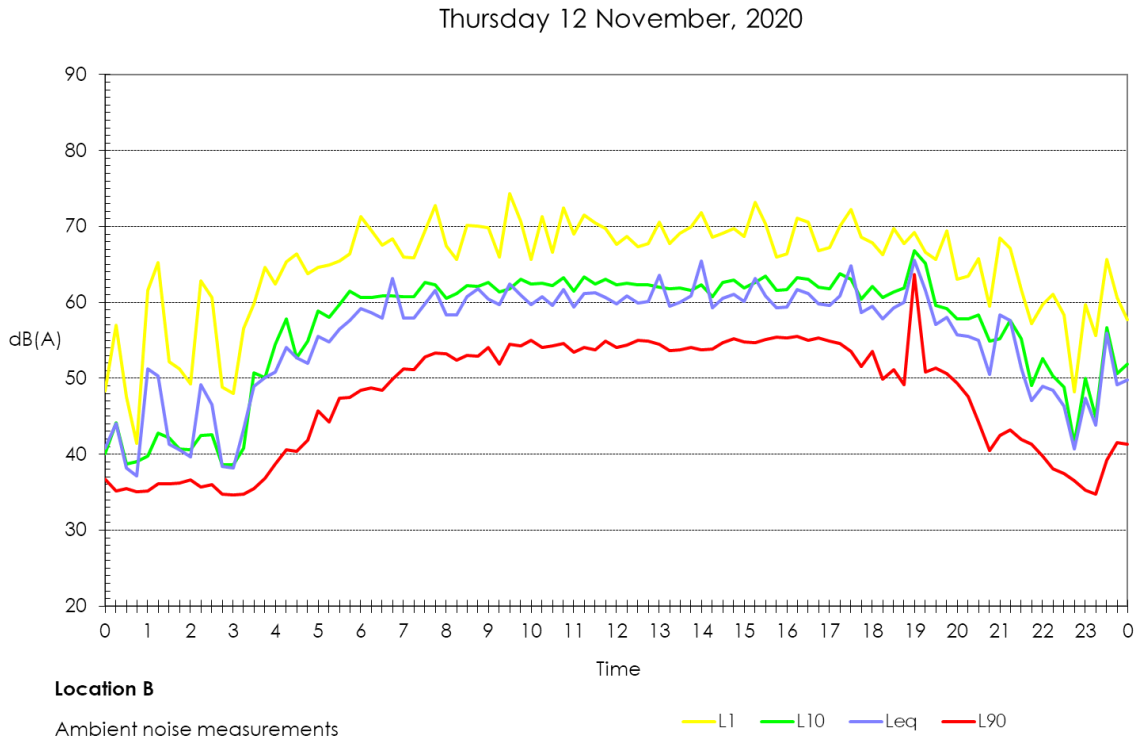
Ambient noise measurements

ATTACHMENT - LOGGER LOCATION B



Location B

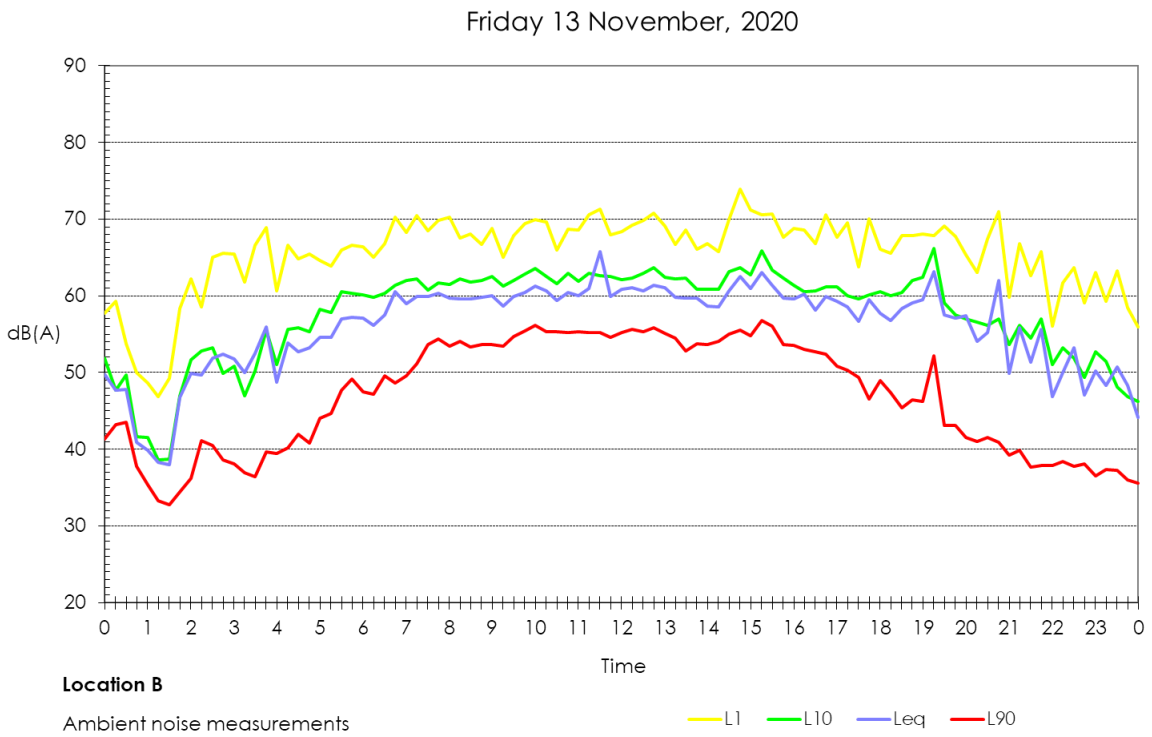
Ambient noise measurements



Location B

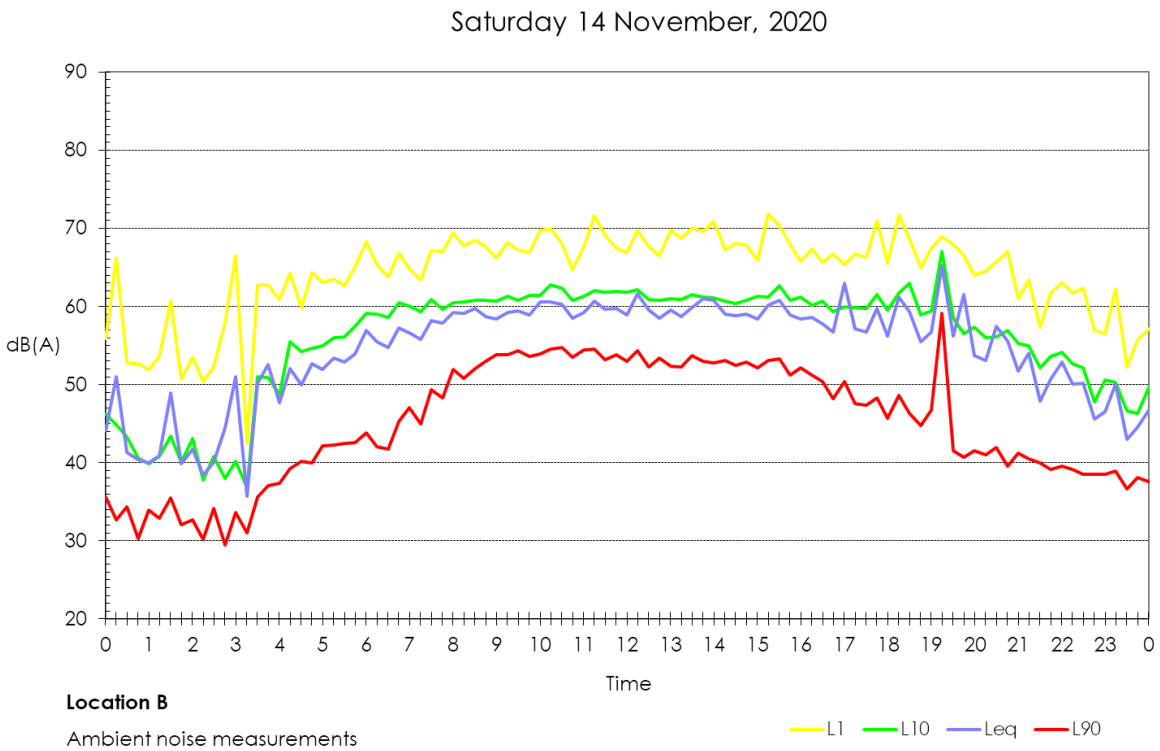
Ambient noise measurements

ATTACHMENT - LOGGER LOCATION B



Location B

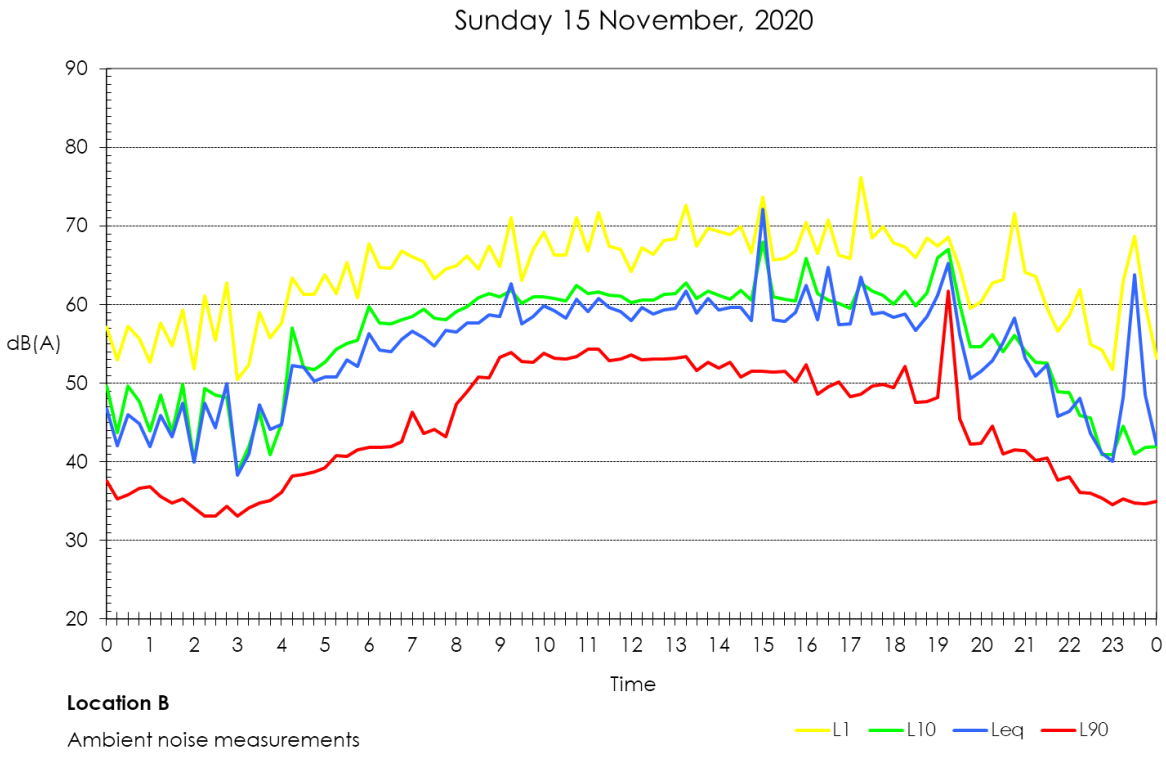
Ambient noise measurements



Location B

Ambient noise measurements

ATTACHMENT - LOGGER LOCATION B



Location B

Ambient noise measurements