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40-54 BAXTER ROAD, MASCOT

Acoustic Assessment for Development Application

28 June 2019

Manboom Pty Limited ATF Outdoor Signage Unit Trust

TK829-01F02 Acoustic Report for DA (r5)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

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1 Introduction

Renzo Tonin & Associates was engaged to undertake an assessment of noise impacts into and operational noise from the proposed hotel development at 40-54 Baxter Road, Mascot.

This study examines the effects of external noise intrusion on the proposed development from road traffic noise and noise emissions onto neighbouring properties. Noise surveys have been conducted by Renzo Tonin & Associates between Monday 26th April 2019 and Monday 6th May 2019 at the development site to determine the existing levels of ambient and background noise at the site.

As a result of our assessment, the following potential acoustic items were identified and assessed:

- Existing traffic noise impact from surrounding roads into the development;
- Existing rail noise impacts from Port Botany Rail line into the development;
- Aircraft noise associated with the operation of Sydney's Kingsford Smith Airport; and
- In principle noise emissions from proposed mechanical plant impacting onto neighbouring properties.

The assessment of the above acoustic items were undertaken in accordance with Botany Bay Development Control Plan 2013, State Environmental Planning Policy (Infrastructure) 2007, NSW Environment Protection Authority (EPA) Noise Policy for Industry and relevant Australian Standards.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Site description

The site is located on an existing carpark lot at 40-54 Baxter Road, Mascot and is bound by Baxter Road to the north. To the south, the site is bound by Port Botany Rail line which is a dedicated rail freight line. South of the rail line is Joyce Drive which is considered a busy road with an average annual traffic (AADT) volume of more than 40,000 vehicles based on the traffic volume data published on the RMS website. Sydney's Kingsford Smith Airport is located approximately 100m south of the site.

Figure 1 overleaf provides an aerial photograph showing the site location and surrounds.

The proposed development is a hotel building comprising of ground floor lobby/dining area, three levels for carparking, a gym for the use of guest and nine levels of hotel suites.

Figure 1: Aerial photograph (dated 27 December 2018) showing the Site location and surrounds

3 Ambient and background noise survey

One unattended long-term noise monitor was installed on site from Monday 29th April 2019 to 6th May 2019 to determine the existing level of ambient and background noise surrounding the site. The noise monitor was installed on the southern side of site, closest to the rail line, as indicated in Figure 1 above.

The noise monitor records noise levels on a continuous basis and stored data every fifteen minutes. The monitor was calibrated before and after measurements and no significant deviation in calibration was noted. The noise monitoring equipment used here complies with Australian Standard 1259.2-1990 "Acoustics – Sound Level Meters" and is designated as a Type 2 instrument suitable for field use.

The results of the background and ambient noise monitoring undertaken on site are presented in Appendix C.

3.1 Results of unattended noise monitoring

3.1.1 Rail and road traffic noise

The design rail and road traffic noise levels are taken from the representative L_{Aeq} for the week for both the day time (7am to 10pm) and night time (10pm to 7am) periods. The design external traffic noise levels are presented in Table 1 below.

Table 1: Representative day and night road/rail traffic noise levels

Monitoring Location	Survey Period	Measured Traffic Noise Level $L_{eq,\,T}$ [1,2]
Location L1 – southern side of site (refer to Figure 1)	Day time (7am to 10pm) 29 April 2019 to 6 May 2019	68 dB(A)
	Night time (10pm to 7am) 29 April 2019 to 6 May 2019	60 dB(A)

Notes:

1. Noise levels presented are facade corrected values.
2. Representative external noise levels in measured L_{Aeq} over 15 hour and 9 hour day and night period respectively.

3.1.2 Background noise

A summary of the background noise levels pertinent to the site are shown in Table 2 below.

Table 2: Background noise levels

Noise Monitoring		Representative Background Noise Levels in dB(A)	Day[1]	Evening[2]	Night[3]
Location	Duration				
Location L1 – southern side of site (refer to Figure 1)	29 April 2019 to 6 May 2019	L_{A90}	48	47	42
		L_{Aeq}	66	65	58

Noise Monitoring		Representative Background Noise Levels in dB(A)	Day[1]	Evening[2]	Night[3]
Location	**Duration**				

Notes:

Day, Evening & Night assessment periods are defined in accordance NSW EPA's Industrial Noise Policy as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

4 Noise intrusion assessment

4.1 Criteria

4.1.1 Rail and road noise guideline

The Standards and Council Development Control Plans (DCP) relevant to this development are as follows:

1. Botany Bay Development Control Plan 2013;
2. State Environment Planning Policy (Infrastructure) 2007 (ISEPP);
3. Department of Planning (DoP) publication "Development Near Rail Corridors & Busy Roads – Interim Guideline" 2008 (DoP Guideline 2008); and
4. Australian Standard AS/NZS 2107:2016 "Acoustics – Recommended design sound pressure levels and reverberation times for building interiors" (AS2107)

It is noted that the ISEPP only stipulates internal noise criteria for developments with the purpose of residential use. A hotel development is considered as a commercial property and does not trigger the requirements of the ISEPP. However, as the building use of a hotel development is relatable to that of a residential development (i.e. sleeping), guidance has been sought in accordance with the ISEPP. The internal noise criteria for occupancies that are not covered in the ISEPP are selected based on AS2107.

Table 3 below summarises the relevant acoustic criteria applicable to the assessment of rail and road noise intrusion.

Table 3: Recommended internal noise criteria for rail and road traffic noise

Occupancy	Period	Recommended Maximum Design Noise Level, $L_{Aeq,\ T}$
Hotel Rooms	Day Time (7am to 10pm)	40
	Night Time (10pm to 7am)	35
Bars and lounges	Day and Night (24 hours)	50
Kitchen, laundry and maintenance areas	Day and Night (24 hours)	55
Dining rooms	Day and Night (24 hours)	45

Notes:

1. Occupancies not covered in the ISEPP are based on Australian Standard AS2107

4.1.2 Aircraft noise criteria

The site is located within close proximity north of the Sydney's Kingsford Smith Airport and is most potentially affected by the operation of the parallel North-South runway 16L/34R. The most impacted movement has been predicted to be take-off on Runway 34R.

Australian Standard AS2021:2015 "Acoustics – Aircraft Noise Intrusion – Building Siting and Construction" provides internal design noise levels, zoning information and guideline for evaluating aircraft noise impacts on the proposed hotel development.

4.1.2.1 Building site acceptability

Table 2.1 of AS2021 sets building site acceptability zones for different building types and land uses. The table categorises building sites as either 'Acceptable', 'Conditionally Acceptable' or 'Unacceptable' relative to different ANEF levels. Table 4 below is an extract of AS2021 Table 2.1 relevant to the subject site.

Table 4: Building site acceptability based on ANEF zones (Table 2.1 of AS2021)

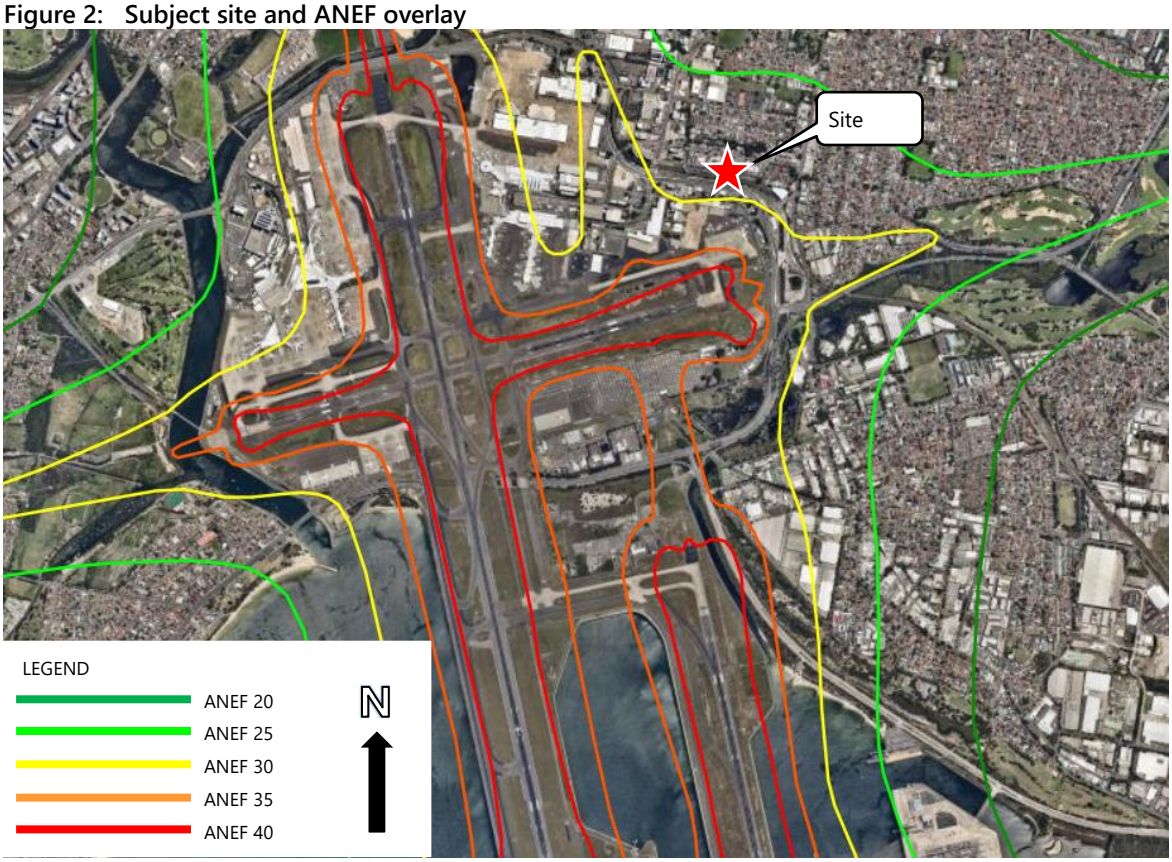
Building type	ANEF zone of site		
	Acceptable[1]	Conditionally Acceptable[2]	Unacceptable[3]
Hotel, motel, hostel	Less than ANEF 25	25 to 30 ANEF	Greater than 30 ANEF

NOTES:

1. If from Table 2.1, the building site is classified as 'acceptable', there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will be unnoticeable in areas outside the ANEF 20 contour. (See Notes 1, 2 and 3 of Table 2.1.)
2. If from Table 2.1, the building site is classified as 'conditionally acceptable', the maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedure of Clauses 3.1 and 3.2, and the aircraft noise attenuation to be expected from the proposed construction should be determined in accordance with Clause 3.3 (see Notes 1 and 3 of Table 2.1).
3. If, from Table 2.1 the building site is classified as 'unacceptable', construction of the proposed building should not normally be considered. Where in the community interest redevelopment is to occur in such areas, e.g. a hotel in the immediate vicinity of an aerodrome, refer to the notes to Table 2.1.

Figure 2 below shows the site location in respect to the ANEF and runway location.

Figure 2: Subject site and ANEF overlay



4.1.2.2 Indoor design noise levels for aircraft noise intrusion

The indoor design noise level for the activity or building type under consideration are outlined in AS2021 Table 3.3. Table 5 below is an extract of AS2021 Table 3.3 relevant to the subject site.

Table 5: Indoor design sound levels for determination of aircraft noise reduction (Table 3.3 from AS2021)

Building type and activity	Indoor design sound level, dB(A)
Hotels, motels, hostels	
Relaxing, sleeping	55
Social activities	70
Service activities	75

4.1.2.3 Aircraft noise levels

Aircraft noise exposure levels were calculated for the development site based on Australian Standard AS2021:2015. Buildings are required to be designed to meet the relevant internal noise levels presented in Table 5. The Aircraft Noise Reduction (ANR) for the building type construction is determined using the maximum external aircraft noise level and the indoor design sound level.

To determine resultant aircraft noise levels the following factors were considered as specified in the Standard:

- The site's position relative to each runway, including take-off and landing distances and runway centre line offsets;
- Elevation of the site compared with the elevation of the runways; and,
- Type of aircraft and associated maximum noise level during take-off and landing.

Using these factors, the resultant maximum noise levels were determined for each aircraft type. This calculation is not based on ANEF contours but on the location of the site relative to the runways.

The proposed development site is most impacted by the operation of the parallel North-South runway 16L/34R (take-off on Runway 34R) from Sydney's Kingsford Smith Airport.

In accordance with Clause 3.1.4 of the Standard, "where there is evidence that the particular aircraft type and movement which produced that noise level do not constitute a typical operation, then the noise level can be ignored and the next lowest noise level selected".

Aircraft noise movement statistics were obtained for the year 2018 to date from documents published by Air Services Australia in particular, the Sydney Airport Operational Statistics produced monthly and from the Sydney Airport Australian Noise Exposure Indexes produced quarterly.

In accordance with Clause 3.1.4, the upper 5% of movements are assumed to "not constitute a typical operation" and were excluded. The standard includes a comprehensive list of noise levels for all current aircraft including the popular Airbus A380, Boeing 737 aircraft and the Boeing 787 Dreamliner.

The maximum external noise level resulting from aircraft flyovers has been calculated in accordance with AS2021:2015.

The table below shows the maximum design noise level at the development site.

Table 6: Maximum Noise Levels at Assessment Location as per AS2021

Aircraft Type	Mode of Operation	Maximum Noise Level dB(A)
Boeing 737-800	Take-off on Runway 34R	89
Airbus A320-232	Take-off on Runway 34R	83

It should be noted that variations in flight paths and aircraft operational characteristics may generate external noise levels greater than calculated here.

The required ANR for areas in the proposed development are as follows:

Table 7: Required Aircraft Noise Reduction for the Proposed Development

Area	Required ANR
Hotels, motels, hostels	
Relaxing, sleeping	34
Social activities	19
Service activities	14

4.2 Calculated internal noise levels

Results from the long-term noise survey were used to calculate internal road traffic noise levels within the proposed development. Noise calculations and predications were conducted using the Outside-In Glazing Spreadsheet developed in this office which takes into account external ambient noise levels, facade transmission loss and room sound absorption characteristics. Noise levels were calculated for each building facade to account for any variation in the external noise levels affecting different parts of the building.

External facade and glazing constructions required to comply with the project noise criteria are outlined in Section 4.3 below.

4.3 Glazing design requirements

Table 8 below presents recommended glazing treatment for the building facades to achieve compliance with the noise levels nominated in Section 4.1 above for the control of rail, traffic and aircraft noise.

Table 8: Recommended glazing treatment

Level	Facade	Occupancy Type	Recommended Minimum Sound Insulation Rating of Glazing Assembly	Laboratory Test Reference
Ground	All facades	All	R_w 32	ESTIMATE
Level 4	South	Gym	R_w 32	ESTIMATE
All Levels	All facades	Hotel Rooms	R_w 43	ESTIMATE
		Lift Lobby and Corridor	R_w 32	ESTIMATE

By way of explanation, the Sound Insulation Rating Rw is a measure of the noise reduction property of the partition, a higher rating implying a higher sound reduction performance.

Note that the Rw rating of systems measured as built on site (R'w Field Test) may be up to 5 points lower than the laboratory result.

LEGEND where no appropriate test certificate exists:

1. ESTIMATE: The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.
2. ESTIMATE – APPROVED FOR CONSTRUCTION: Use of the form of construction is approved prior to laboratory certification. To complete the quality control of the design process and confirm the acoustical performance of the construction, we recommend testing in a laboratory to confirm the Rw rating as soon as practicable. In the case of impact rating for floor systems, no particular impact rating is guaranteed to comply with either the Building Code of Australia or Strata Scheme Management Act and hence carpet runners may still be required.
3. ESTIMATE – TEST NOT REQUIRED: Use of the form of construction is approved without laboratory certification. The STC/Rw of the form of construction exceeds the project requirements.
4. The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

Level	Facade	Occupancy Type	Recommended Minimum Sound Insulation Rating of Glazing Assembly	Laboratory Test Reference

NOTES FOR GLAZING CONSTRUCTIONS:

5. The information in this table is provided for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.
6. The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.
7. Before committing to any form of construction or committing to any builder, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the form of construction where only an "estimate" is available for the sound insulation properties of recommended materials.
8. The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site.
9. All openable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the Rw rating performance of the glazing to not be reduced.
10. The above glazing thicknesses should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading etc.

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11. The sealing of all gaps in partitions is critical in a sound rated construction. Use only sealer approved by the acoustic consultant.
12. Check design of all junction details with acoustic consultant prior to construction.
13. Check the necessity for HOLD POINTS with the acoustic consultant to ensure that all building details have been correctly interpreted and constructed.
14. The information provided in this table is subject to modification and review without notice.
15. The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

4.3.1 Glazing assembly requirements

The following acoustic measures should also be incorporated into the building design:

- All operable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the R_w rating performance of the glazing to not be reduced.
- The glazing supplier shall ensure that installation techniques will not diminish the R_w performance of the glazing when installed on site. Sliding door meeting stiles should form an airtight seal when closed and locked.
- The perimeter of all window and door frames are to be sealed airtight in the external facade using the following methods:
    - For gaps less than 10mm - Fill all gaps around the window perimeter with an acoustic mastic sealer (minimum specific gravity 1.6sg) equivalent to Promat Promaseal. The depth of sealer shall be at least equal to the width of the gap.
    - If the gap is greater than 10mm, fill the cavity with polyester insulation and a backing rod. Seal the gap airtight an acoustic mastic sealer (min specific gravity 1.6sg) equivalent to Promat Promaseal. The depth of sealer shall be at least equal to the width of the gap. The gaps between frames shall also be sealed using aluminium angle brackets (approximately 25 x 25 x 3mm).

4.4 Facade & roof sound insulation

In principle advice is provided below for the acoustic requirements of the roof and external walls for this proposed development.

4.4.1 External walls

The dominant path of external noise ingress into building interior is via window and doors. Assessment and recommendations regarding external noise intrusion has accordingly been made with respect to the windows and doors. It is therefore recommended that the external walls have a sound isolation rating (R_w) at least 15dB higher than that of the glazing specified in Table 8 above, to maintain the acoustic integrity of the overall facade system.

4.4.2 Roof and ceiling

Similar to the external wall design, the roof/ceiling construction can generally provide acoustic performances well in excess of glazing or doors. The roof construction should have a sound isolation rating (R_w) at least 10dB higher than that of the glazing on its facade.

5 Operational noise emission from development

5.1 EPA requirements

The NSW Environment Protection Authority (EPA) sets out noise criteria in its Noise Policy for Industry (NPfI) to control the noise emission from industrial sources.

The NPfI sets project noise trigger level to protect noise amenity for residential receivers. The project noise trigger level is set as the lower value of the following two assessment components:

- Controlling intrusive noise impacts in the short term for residences; and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

Noise intrusiveness ensures that industrial noise does not exceed the background noise level by an excessive margin, preventing significant changes in the noise characteristic pertinent to the development site and surrounds. This is commonly referred to as the 'background plus 5' criterion. That is, the noise level from new industrial development, assessed in periods of 15 minutes, should not exceed the existing background noise level (measured in the absence of that development) by more than 5dB(A).

Noise amenity ensures that industrial noise levels do not increase without limit, for if a number of industrial noise sources are permitted to increase the background noise level by 5dB(A), in turn there would be a point where the ultimate noise level is unacceptable. A limit on the ultimate acceptable noise level is therefore included in the NPfI as a way of ensuring that cumulative noise impact from industrial growth is curtailed. This limit is referred to as the project amenity noise level. Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess reasonable and feasible mitigation options, and subsequently determine achievable noise requirements.

The table below presents the recommended amenity noise level relevant to the receivers surrounding the proposed development site. The project amenity noise level is defined as the recommended amenity noise level minus 5dB(A).

Table 9: NPfI Amenity Noise Levels - Recommended L_{Aeq} Amenity Noise Levels from Industrial Noise Sources [EPA NPfI Table 2.1]

Receiver	Noise amenity area	Time of day	L_{Aeq}, dB(A)
			Recommended Amenity noise level
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40

Receiver	Noise amenity area	Time of day	L_{Aeq}, dB(A)
			Recommended Amenity noise level
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See Column 4	5dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom - internal	All	Noisiest 1-hour period when in use	35
Hospital ward - internal	All	Noisiest 1-hour	35
Hospital ward - external	All	Noisiest 1-hour	50
Place of worship - internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dB(A) to recommended noise amenity

Notes:

- Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
- On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
- The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

In accordance with Section 2.4 of the NPfI, the following **exceptions** to the above method to derive the project amenity noise level apply:

1. In areas with high traffic noise levels (see Section 2.4.1 of the NPfI).
2. In proposed developments in major industrial clusters (see Section 2.4.2 of the NPfI).
3. Where the resultant project amenity noise level is 10dB, or more, lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
4. Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

Table 10: Project noise trigger level for noise emission from mechanical plant (EPA NPfI)

Time of Day	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
	Rating Background Level (RBL) L_{A90}	Intrusiveness Trigger Level, $L_{Aeq, 15minute}$ (RBL+5)	Recommended Amenity Noise Level (RANL), $L_{Aeq, period}$	Project Amenity Noise Level (PANL), $L_{Aeq, period}$	Measured $L_{Aeq, period}$ existing noise levels	Traffic noise exceed the RANL by more than 10dB?	Existing noise level likely to decrease in future?	Exceptions to PANL?	Project Noise Trigger Level $L_{Aeq, 15minute}$ dB(A)
Day (7am to 6pm)	48	53	60	55	66	No	No	None	53
Evening (6pm to 10pm)	47	52	50	45	65	Yes	No	Existing $L_{Aeq, period}$ minus 15 dB(A) = 50dB(A)	52
Night (10pm to 7am)	42	47	45	40	58	Yes	No	Existing $L_{Aeq, period}$ minus 15 dB(A) = 43dB(A)	46

Explanatory notes:

Column 1 – RBL measured in accordance with the NPfI and outlined in the results of the long-term noise monitoring has been summarised in accordance with NPfI requirements and are presented in Table 2 above.

Column 4 – Project Amenity Noise Level determined based on 'Residential - urban' area in Table 2.2 (Amenity noise levels) of the EPA's NPfI minus 5dB

Column 5 – Measured in accordance with the NPfI

Column 8 - Determined in accordance with Section 2.4 of the NPfI.

Column 9 – Project Noise Trigger Level is the lower value of project intrusiveness noise level and project amenity noise level. In accordance with Section 2.2 of the NPfI, $L_{Aeq, 15minute}$ is calculated as $L_{Aeq, period}$ + 3dB(A)

5.2 Maximum noise level event assessment

The potential for sleep disturbance from maximum noise level events, from the proposed development, needs to be considered. Section 2.5 of the NPfI provides sleep disturbance trigger levels, summarised as follows:

Table 11: Sleep disturbance noise trigger levels

Receiver	Sleep Disturbance Trigger Levels, 10:00pm to 7:00am	
	$L_{Aeq,\ 15\ minute}$	L_{AFmax}
All residential	Greater than 40dB(A) or RBL plus 5dB, whichever is the greater	52dB(A) or RBL plus 15dB, whichever is the greater

Where noise from the proposed development is predicted to exceed the sleep disturbance trigger levels above in Table 11, during the night time, a detailed noise level assessment is required. The detailed assessment is required to cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the frequency of events occurring during the night time.

5.3 Recommended noise control measures for mechanical plant

Where necessary, noise amelioration treatment will be incorporated in the design to ensure that noise levels comply with the recommended EPA's NPfI noise emission criteria noted above.

At this stage details of mechanical plant have not been finalised, the following in-principal recommendations are provided:

- Acoustic assessment of mechanical services equipment will need to be undertaken during the detail design phase of the development to ensure that they shall not either singularly or in total emit noise levels which exceed the noise limits in EPA's NPfI or Council's requirements;
- As noise control treatment can affect the performance of the mechanical services system, it is recommended that consultation with an acoustic consultant be made during the initial phase of mechanical services system design in order to reduce the need for revision of mechanical plant and noise control treatment;
- Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following:
    - procurement of 'quiet' plant,
    - strategic positioning of plant away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises,
    - commercially available silencers or acoustic attenuators for air discharge and air intakes of plant;
    - acoustically lined and lagged ductwork;

- acoustic screens and barriers between plant and sensitive neighbouring premises; and/or
- Partially-enclosed or fully-enclosed acoustic enclosures over plant.

- Mechanical plant shall have their noise specifications and their proposed locations checked prior to their installation on site; and
- Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 "Rotating and Reciprocating Machinery – Mechanical Vibration".

We recommend a full and detailed assessment with fully documented acoustic treatments be undertaken at the detailed design phase of the development, followed by construction/installation supervision of mechanical plant and equipment acoustic treatment. Compliance testing following the installation of the plant should also be undertaken.

6 Internal sound insulation between tenancies

Internal walls and floors shall comply with the National Construction Code of Australia 2019 (formally Building Code of Australia). All services and doors shall comply with the requirements of the NCC 2019. Appendix C presents a summary of acoustic provisions outlined in Part F5 of the NCC 2019.

7 Conclusion

Renzo Tonin & Associates has completed an acoustic assessment of the proposed hotel development at 40-54 Baxter Road, Mascot including noise impacts on the site from road, rail and aircraft as well as potential noise impacts from mechanical plant and equipment serving the site.

The study of external noise intrusion into the subject development has found that appropriate controls can be incorporated into the building design to achieve a satisfactory accommodation environment, consistent with the intended quality of the building and relevant standards and regulatory guidelines.

Noise emission goals for the operation of mechanical plant and equipment have been set in accordance with the EPA's Noise Policy for Industry. It is feasible that noise emissions from the subject site can comply with these criteria, subject to detailed design for Construction Certificate.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 110dB Operating a chainsaw or jackhammer 120dB Deafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Criteria and design methodology

B.1 Bayside Council - Botany Bay Development Control Plan 2013

Botany Bay DCP 2013 contains guidelines in objectives and controls for control of aircraft noise intrusion. Relevant sections of the DCP are reproduced below.

Relevant sections from Botany Bay DCP 2013 are as follows:

3J.1.3 General Objectives

Objectives

O1 To provide a planning approach that is capable of variation in the event of differing circumstances arising from changed aircraft operating procedures and traffic volumes associated with Sydney (Kingsford-Smith) Airport; and

O2 To ensure, to the extent practicable when applying an endorsed ANEF noise metric, that developers, property owners and purchasers/occupiers are aware of the predicted level of aircraft noise, potential height limits due to prescribed airspace for Sydney (Kingsford Smith) Airport on properties, the subject of development, and the possibility that certain development in certain areas in the vicinity of Sydney Airport may cause mechanical wind shear.

3J.2 Aircraft Noise Exposure Forecast

Objective

O1 To provide a discretionary approach by Council in the assessment of proposed development within localities affected by aircraft noise.

Development Classified as "Conditional"

C2 Where the building site is classified as "conditional" under Table 2.1 of AS2021-2015, development may take place, subject to Council consent and compliance with the requirements of AS2021-2015.

Note:
Where the height of the proposed development is higher than the existing height of the localised building stock (and the proposed development has a direct line of sight to the seaport and/or the airport) and acoustical assessment by an accredited acoustical consultant is required which takes into account noise from the operations of Port Botany and Sydney Kingsford Smith Airport.

APPENDIX C Internal sound insulation

C.1 National Construction Code of Australia 2019

The National Construction Code of Australia (NCC) outlines minimum requirements for inter-tenancy (party) walls and ceiling/ floors to maintain privacy. This includes the incorporation of penetration of a service through a floor or through more than one sole-occupancy unit.

NCC nominates required Weighted Sound Reduction Indexes (R_w) and spectrum adaptation factor (C_{tr}) for partition constructions, of different space/ activity types in adjoining units. The R_w and $R_w + C_{tr}$ are single number descriptors for quantifying the attenuating performance of partitions for typical intrusive noises produced inside residences. The higher the rating, the greater the isolation provided by the partition.

Spectrum adaptation factors are commonly used to compensate for the fact that certain kinds of sounds are more readily transmitted through insulating materials than others insulate.

The adaptation factor C_{tr} has now been introduced for most building elements which require an airborne sound insulation rating. The only exception is a wall which separates a dwelling from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification. Therefore, both the C_{tr} factor and the R_w of the building element will need to be considered in most cases.

The C_{tr} factor takes into account lower frequency level sounds, and has been chosen in large part, in recognition of the problem of the high bass frequency outputs of modern home theatre systems and music reproduction equipment.

The Deemed-to-Satisfy Provisions also have impact sound insulation requirements for floors. The terms to describe the impact sound insulation of the floor is the weighted normalised impact sound pressure level ($L_{n,w}$). The lower the $L_{n,w}$ of the floor, the better the performance of the floor in terms of impact sound insulation.

The following section represents a summary of acoustic provisions outlined in the Part F5 of the NCC.

C.2 Sound Insultion Provision of NCC of Australia 2019

The acoustic provisions for inter-tenancy walls and floors in Class 2 and 3 buildings are outlined in the National Construction Code of Australia and the following is an extract from the NCC:

"F5.2 Determination of airborne sound insulation ratings

A form of construction required to have an airborne sound insulation rating must –

a. have the required value for weighted sound reduction index (R_w) or weighted sound reduction index with spectrum adaptation term ($R_w + C_{tr}$) determined in accordance with AS/NZS 1276.1 or ISO 717.1 using results from laboratory measurements; or

b. comply with Specification F5.2.

F5.3 Determination of impact sound insulation ratings

a. A floor in a building required to have an impact sound insulation rating must –

i. have the required value for weighted normalised impact sound pressure level with spectrum adaptation term ($L_{n,w}$) determined in accordance with AS/ISO 717.2 using results from laboratory measurements; or

ii. comply with Specification F5.2.

b. A wall in a building required to have an impact sound insulation rating must –

i. for a Class 2 or 3 building be of discontinuous construction;

c. For the purposes of this part, discontinuous construction means a wall having a minimum 20 mm cavity between 2 separate leaves, and

i. for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and

ii. for other than masonry, there is no mechanical linkage between leaves except at the periphery.

F5.4 Sound insulation rating of floors

a. A floor in a Class 2 or 3 building must have an $R_w + C_{tr}$ (airborne) not less than 50 and an $L_{n,w}$ (impact) not more than 62 if it separates –

i. sole-occupancy units; or

ii. a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.

F5.5 Sound insulation rating of walls

a. A wall in a Class 2 or 3 building must –

i. have an $R_w + C_{tr}$ (airborne) not less than 50, if it separates sole-occupancy units; and

ii. have an R_w (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and

iii. comply with F5.3(b) if it separates:

(A) a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or

(B) a sole-occupancy unit from a plant room or lift shaft.

b. A door may be incorporated in a wall in a Class 2 or 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an R_w not less than 30.

c. Where a wall required to have sound insulation has a floor above, the wall must continue to –

i. the underside of the floor above; or

ii. a ceiling that provides the sound insulation required for the wall.

F5.6 Sound insulation rating of services

a. If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an $R_w + C_{tr}$ (airborne) not less than –

i. 40 if the adjacent room is a habitable room (other than a kitchen); or

ii. 25 if the adjacent room is a kitchen or non-habitable room.

b. If a storm water pipe passes through a sole-occupancy unit it must be separated in accordance with (a)(i) and (ii).

F5.7 Sound insulation of pumps

A flexible coupling must be used at the point of connection between the services pipes in a building and any circulating or other pumps."

APPENDIX D Locations and results of noise surveys

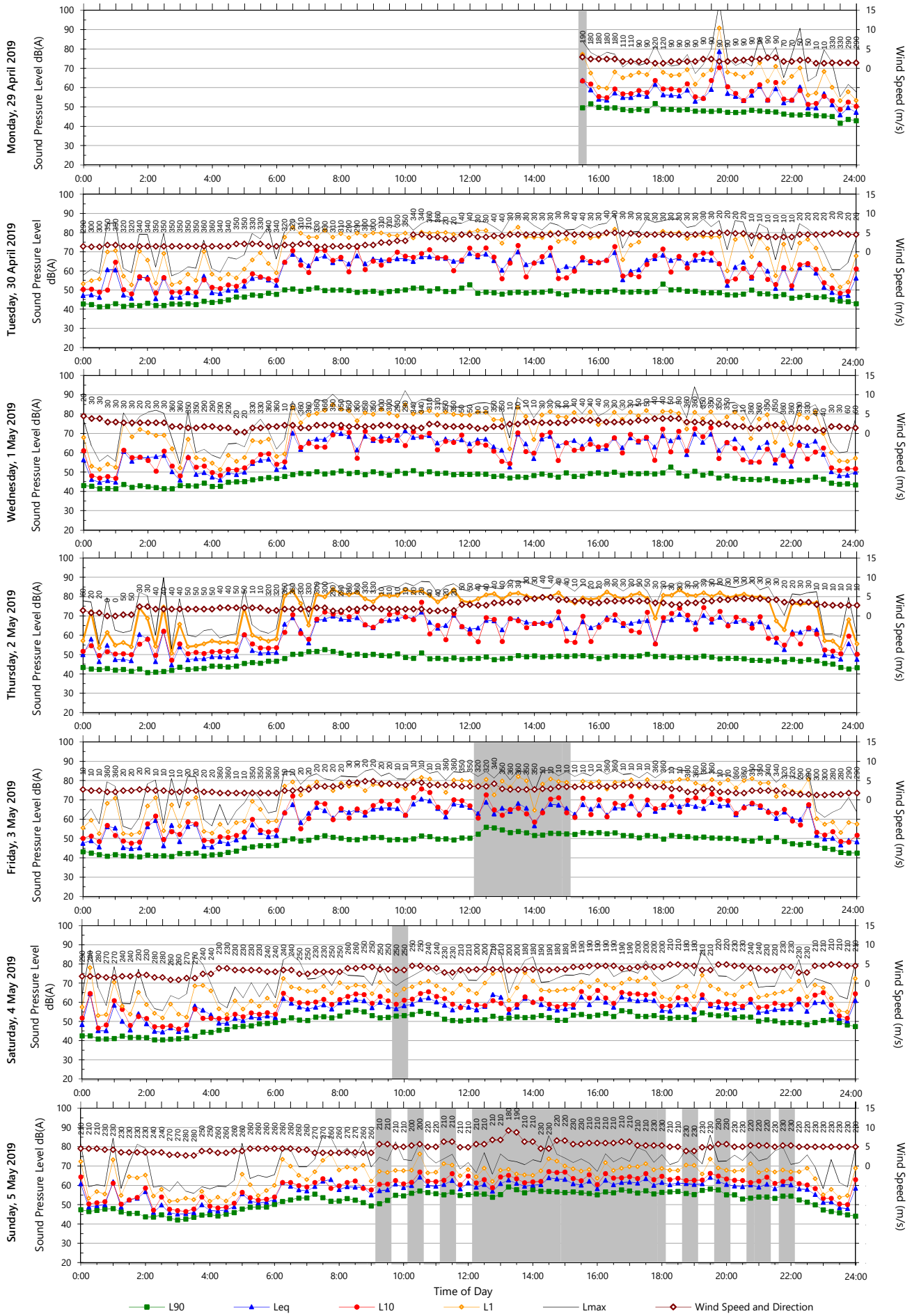
D.1 Noise monitoring location

Location L1: Unattended noise monitoring located on the southern side of site.

Survey Period: 26th April 2019 to 6th May 2019.

Unattended Monitoring Results

Location: Baxter Road, Mascot

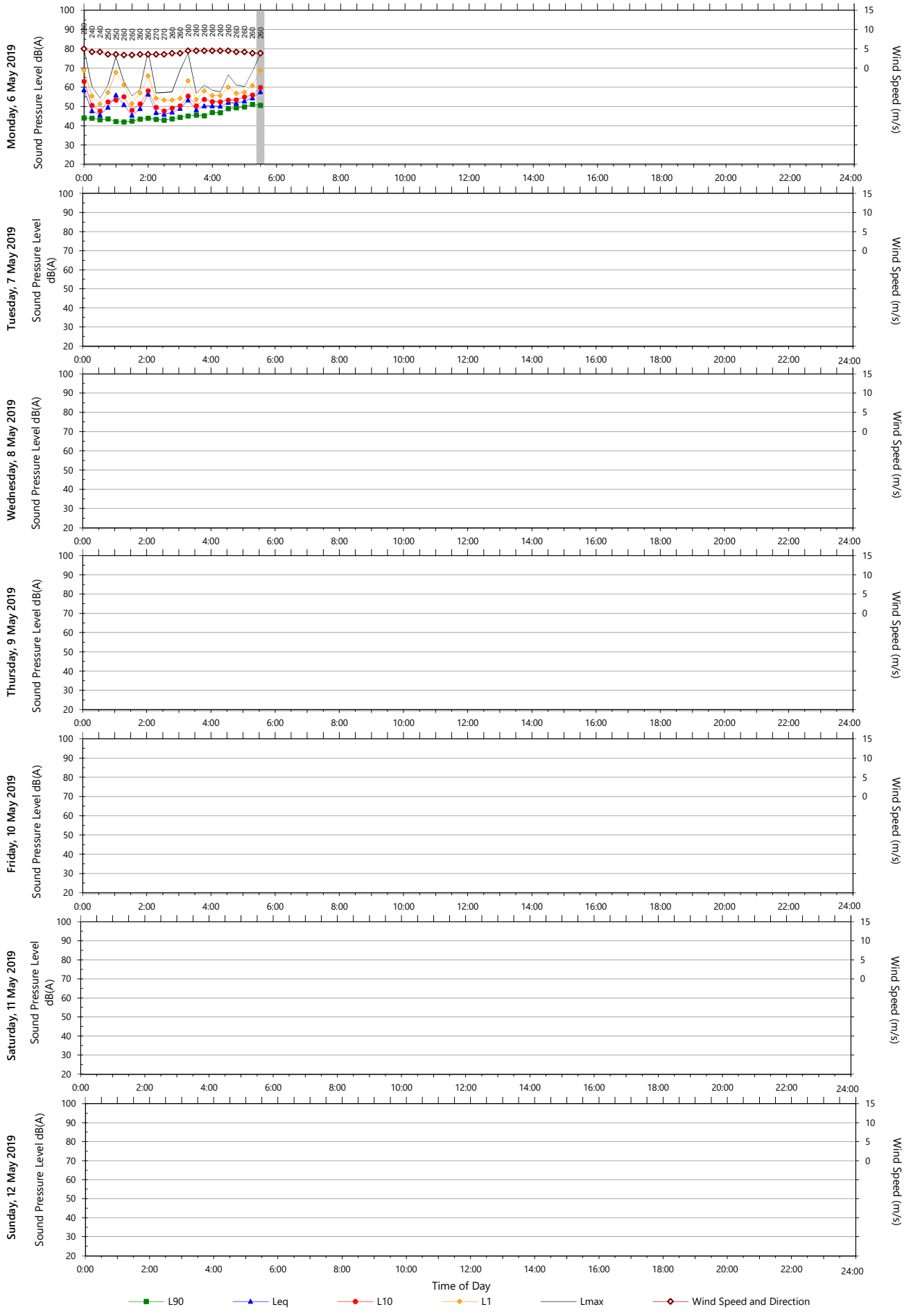


Data File: 2019-04-29_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r28)

Unattended Monitoring Results

Location: Baxter Road, Mascot



Data File: 2019-04-29_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r28)