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ASICS FACILITY, DARLING STREET, SYDNEY BUSINESS PARK, MARSDEN PARK

SSD Noise Assessment

21 March 2018

Sydney Business Park

TK239-01F02 Noise Assessment (r1)

30 1982 2012 ACOUSTIC EXCELLENCE
Sydney Melbourne Brisbane Gold Coast Kuwait
Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

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Attention:	Owen Walsh

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1 Introduction

Renzo Tonin & Associates was engaged to conduct an environmental noise impact assessment of operational noise for a new ASICS Facility located at 4 Darling Street, Sydney Business Park, Marsden Park. This report forms part of a State Significant Development Application.

The report quantifies the noise impacts from activities associated with the development at the nearest sensitive receivers in accordance with the Blacktown City Council and EPA requirements.

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 Project description

2.1 Site description and development overview

The site is located at 4 Darling Street, Sydney Business Park, Marsden Park. The site is currently a greenfield site located towards the centre of the Sydney Business Park.

This site is bounded by Darling Street to the east and south, an industrial development to the west and vacant land to the north. The nearest residential receivers are located approximately 300m to the northeast. A location map is presented in Figure 1 below.

2.2 Proposed development

The application relates to the construction of a ASICS Facility, which will encompass the following:

- A storage and distribution warehouse located along the northern boundary;
- An administration office located along the eastern boundary;
- A showroom/retail area located in the southeast corner of the site;
- Car and truck parking in the southeast corner of the site;
- Loading docks located along the southern façade of the warehouse; and
- A sports field, basketball court and tennis court located along the southern boundary of the site.

2.3 Hours of operation

The facility is proposed to operate 24 hours a day, 7 days a week.

Figure 1: Site location (Source – Nearmap_Jan_2018)

2.4 Assessment methodology

In order to assess the potential noise impact from the proposed development the following methodology was used:

- Identify nearest most potentially affected noise sensitive receiver location/s to the subject site;
- Determine existing background noise levels at the nearest most potentially affected residential receiver location;
- Use measured background levels to establish noise goals in accordance with the NSW Noise Policy for Industry ('NPfI') and local council;
- Use noise modelling to predict and determine the extent of noise impact from the proposed development at nearby receiver locations;
- Identify if noise emission from the site may exceed the relevant criteria, and
- Where noise emission from the site may exceed the relevant criteria, provide recommendations to reduce noise impacts from the site.

2.5 Reference material

The architectural drawing package prepared by REID CAMBELL titled '*Proposed Industrial Development, 4 Darling Street, Sydney Business Park, Marsden Park (File name 118101_SBP ASICS_A001 (C))*', dated 7 March 2018, was referenced for this noise assessment:

3 Existing noise environment

The existing noise environment at the nearest affected receivers is controlled by traffic noise from Richmond Road.

As the noise environment of an area usually varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum between 2am and 4am in the morning and at its maximum during the morning and afternoon traffic peak hours. The NSW EPA's relevant noise policies outline the following standard time periods over which the background and ambient noise levels are to be determined:

- Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
- Evening: 18:00-22:00 Monday to Sunday & Public Holidays
- Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

3.1.1 Noise measurement location

Noise measurements are ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

Long-term monitoring was undertaken by Renzo Tonin & Associates. This location (L1) is described in Table 1 and shown in Figure 2.

In addition, background noise monitoring has previously been undertaken for a nearby development as described within the Acoustic Logic report *Swire Cold Storage Facility, Marsden Park Noise Impact Assessment*, dated 22 July 2015. This monitoring data (l2) has also been referenced for this assessment and used to establish the existing acoustic environment at some of the sensitive receiver locations surrounding the site. This location is described in Table 1 and shown in Figure 2.

Table 1: Noise monitoring location

ID	Address	Description
Long-term noise monitoring		
L1	9 Habitat Place, Marsden Park	The noise monitor was located in the free field, in the backyard of the property. Results from this noise monitor represent the ambient and background noise environment for receiver A1.
L2[1]	140 Hollinsworth Rd, Marsden Park	Noise monitor was located in the free field, adjacent to the eastern boundary of the Over 55s Community, near the existing substation. Results from this noise monitor represent the ambient and background noise environment for receives A2, A3 and A4.

Note: 1. The long-term (unattended) noise monitoring was conducted at Location L2 from 5 May 2014 to 12 May 2014.

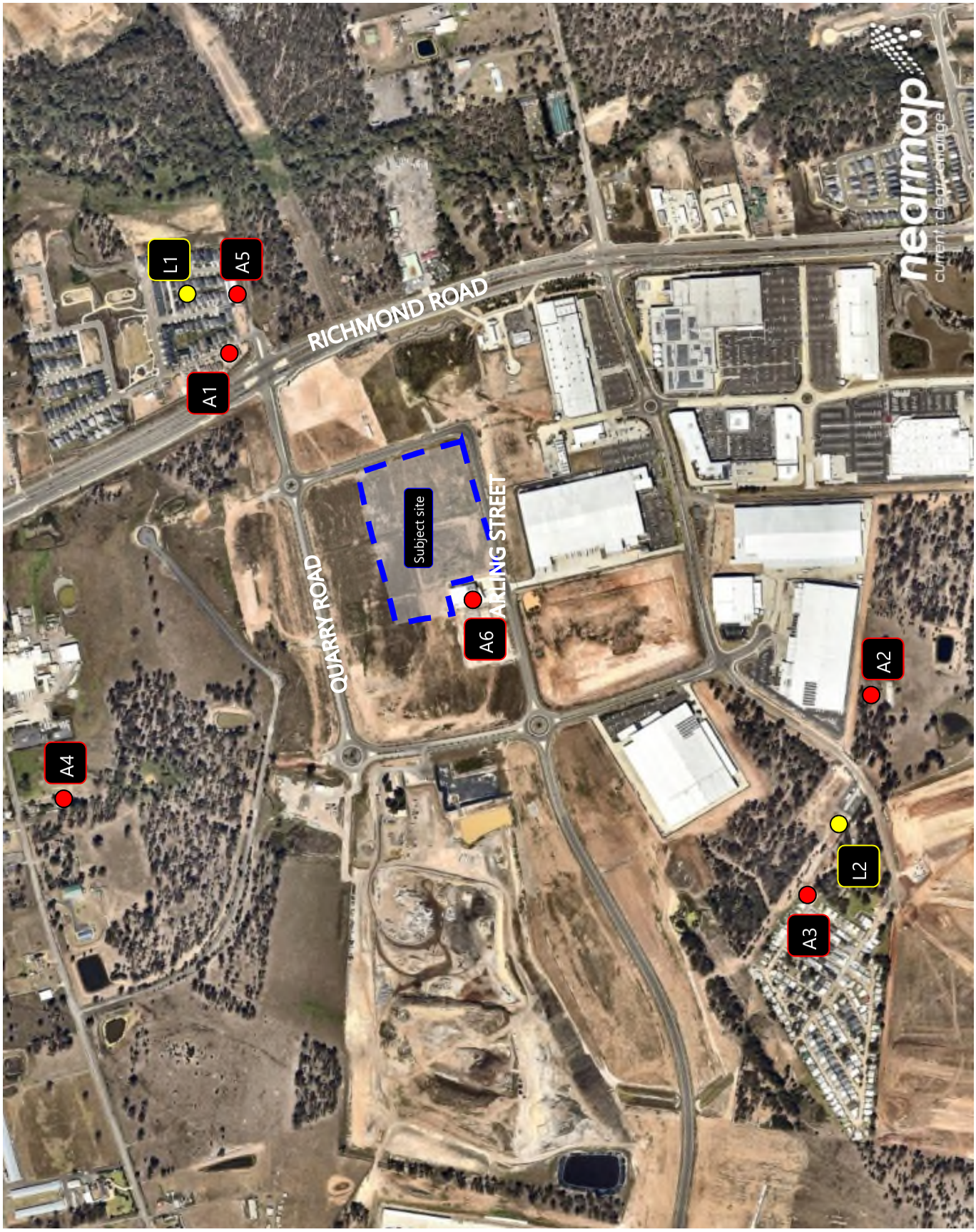


Figure 2: Assessment and noise monitoring locations (Source – Nearmap_Jan_2018)

3.1.2 Long-term noise measurement results

Long-term noise monitoring at L1 was carried out from Wednesday, 7 March 2018 to Friday, 16 March 2018. The long-term noise monitoring methodology is detailed in APPENDIX B and noise level-vs-time graphs of the data are included in APPENDIX C.

Monitoring at L2 was carried out by others from 5 May 2014 to 12 May 2014. Table 2 presents the results of both monitoring locations.

Table 2: Long-term noise monitoring results, dB(A)

Monitoring location	L_{A90} Rating Background Level (RBL)			L_{Aeq} Ambient noise levels		
	Day	Evening	Night	Day	Evening	Night
L1 – 9 Habitat Place, Marsden Park	35	39	37	48	50	52
L2 - 140 Hollinsworth Rd, Marsden Park	38	35	32	-	-	-

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays

Evening: 18:00-22:00 Monday to Sunday & Public Holidays

Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

As required by relevant NSW noise policies, the external ambient noise levels presented are free-field noise levels, ie. no facade reflection.

3.1.3 Assessment locations

The identified assessment locations are outlined in Table 3 below and shown in Figure 2.

Table 3: Assessment locations

ID	Address	Description	Distance from site (m)
A1	Residential Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	Detached residential dwelling located northeast of the site	300
A2	Residential 105 Hollinsworth Rd, Marsden Park	Detached single storey residential dwelling located south of the site	800
A3	Residential 140 Hollinsworth Rd, Marsden Park	Existing Over 55s Community, Ingenia Lifestyle Stoney Creek, located southwest of site	820
A4	Residential 235 South St, Marsden Park	Detached single storey residential dwelling located north of the site	730
A5	Childcare Centre 15 Harmony Avenue, Marsden Park	Childcare centre located northeast of the site	370
A6	Industrial Lot 306 DP 1213756	Industrial premises located along western boundary.	Adjacent

4 Project noise goals

4.1 NSW Noise Policy for Industry

Noise impact from the proposed development is assessed against the recently released NSW 'Noise Policy for Industry' (NPfI), dated 2017. The assessment procedure in terms of the NPfI has two components:

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

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels.

4.2.1 Intrusive noise criteria

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

$L_{Aeq,15minute}$ Intrusiveness noise level = Rating Background Level ('RBL') plus 5dB(A)

Based on the background noise monitoring carried out at the monitoring location and the proposed operating hours of the facility, the intrusiveness noise levels for the residential receivers are reproduced in Table 4 below.

Table 4: Project intrusiveness noise levels

Receiver	Intrusiveness noise level, $L_{Aeq,15min}$		
	Day	Evening	Night
A1	35 +5 = 40	35[1] +5 = 40	35[1] +5 = 40
A2, A3 and A4	38 +5 = 43	35 + 5 = 40	32 + 5 = 37

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 Sundays & Public Holidays

1. Where the Evening and Night RBL is greater than Day RBL, Evening and Night NML is based on Day NML, in accordance with the EPA guidelines

4.2.2 Amenity noise criteria

The project amenity noise levels for different time periods of day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aq,period}$) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for

total industrial noise experienced at receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

The recommended amenity noise levels applicable for the subject area are reproduced in Table 5 below, based on a 'residential - suburban' noise amenity area.

Table 5: Project amenity noise levels

Type of receiver	Noise amenity area	Time of day	Recommended amenity noise levels, dB(A) $L_{Aeq,period}$
Residence A1, A2, A3 and A4	Suburban	Day	55
		Evening	45
		Night	40
School Classroom – internal A5	All	Noisiest 1-hour period when in use	35
Industrial premises A6	All	When in use	70

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays

The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

In determining the project amenity criteria, Section 2.4.2 of the NPfI, which addresses areas near a proposed cluster of industry, has been referred to. Accordingly, the recommended amenity levels within Table 5 have been reduced by 10 dB to account for other future noise-generating premises within the Sydney Business Park. This amenity reduction effectively allows for 10 additional premises, which have the potential to create an equivalent noise level (equivalent to this project), at the nearest sensitive residential receivers.

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on much longer periods extending over an entire day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the $L_{Aeq,period}$ level to a representative $L_{Aeq,15min}$ level in order to standardise the time periods for the purpose of conducting a noise impact assessment. The adjustment or conversion from $L_{Aeq,period}$ to $L_{Aeq,15min}$ is:

$$\mathbf{L_{Aeq,15min} = L_{Aeq,period} + 3dB(A)}$$

Therefore, the 'project amenity noise levels' applicable for this project are presented in Table 6 below.

Table 6: Adopted project amenity noise levels

Type of receiver	Noise amenity area	Time of day	Recommended noise level, dB(A)	
			$L_{Aeq,period}$	$L_{Aeq,\ 15min}$
Residence A1, A2, A3 and A4	Suburban	Day	55 – 10 = 45	45 + 3 = **48**
		Evening	45 – 10 = 35	35 + 3 = **38**
		Night	40 – 10 = 30	30 + 3 = **33**

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays

The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

4.2.3 Project noise trigger levels

In accordance with the NPfI the project noise trigger levels, which are the lower (i.e. more stringent) value of the project intrusiveness noise levels and project amenity noise levels, have been determined as shown in Table 7 below.

Table 7: Project trigger noise levels

Receiver type	$L_{Aeq,15min}$ Project noise trigger levels, dB(A)		
	Day	Evening	Night
Residential A1	40	38	33
Residential A2, A3 and A4	43	38	33

4.2.4 Sleep disturbance noise levels

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

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

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 8.

Table 8: Sleep disturbance assessment levels

Receiver type	Assessment Level $L_{Aeq,15min}$	Assessment Level L_{AFmax}
Residential A1	40	52
Residential A2, A3 and A4	40	52

4.2 NSW Road Noise Policy (RNP)

Noise impact from the potential increase in traffic on the surrounding road network is assessed against the NSW Road Noise Policy (RNP, Department of Environment, Climate Change and Water NSW, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for developments that are potentially affected by road traffic noise, with the aim of preserving the amenity appropriate to the land use.

With regard to the surrounding road network, Richmond Road is classified as arterial road. The criteria for residential receivers are presented in the Table 9 below. These criteria are for noise levels assessed in front of a building facade.

Table 9: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment Criteria, dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Arterial/sub-arterial roads	Existing residences affected by additional traffic on existing arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for residences near busy roads (see RNP Appendix C10).

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

5 Noise assessment

The primary operational noise sources associated with the development are considered to be:

- Warehouse operations (see Section 5.1.1);
- On-site vehicle movement (see Section 5.1.1);
- Loading dock operations (see Section 5.1.3);
- Carpark (see Section 5.1.4);
- Mechanical plant and equipment (see Section 5.1.5).

This section of the report addresses noise emission associated with these sources at the nearest noise-sensitive receivers. Where necessary, noise mitigation and/or management measures will be identified

5.1 Noise predictions

5.1.1 Warehouse operations

Internal noise levels within the proposed warehouse will be typically associated with forklift operation and plant equipment. The following inputs have been utilised:

- A sound pressure level of 75 dB(A) L_{eq} adopted within the entire warehouse except for the offices and technical rooms.
- Doors to the loading dock are open.
- The walls and roof are constructed from 0.48mm BMT sheet metal.

Noise predictions at the identified assessment locations are presented in Table 10 below. The predicted noise levels comply with the established project trigger noise levels at all receivers for all periods.

Table 10: Warehouse assessment

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	24	24	24	40	38	33
A2 - 105 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A3 -140 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A4 - 235 South St, Marsden Park	<20	<20	<20	43	38	33
A5 - 15 Harmony Avenue, Marsden Park	22			45[1]		
A6 - Lot 306 DP 1213756	<20			70		

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays

1. Outside noise level approximated based on 10 dB(A) insertion loss through an open window [NSW Environmental Criteria for Road Traffic Noise, Environmental Protection Authority 1999 p14]

5.1.2 On-site vehicular movements

The site's heavy vehicle entrance and exit is located along Darling Street at the south-west corner of the site. A truck movement corresponds to a truck entering the site, unloading at the loading dock and leaving via the Darling Street exit.

The site's light vehicle entrance and exit is located along Darling Street towards the south-east corner of the site. Light vehicles will directly enter a carpark. Carpark operations are assessed in Section 5.1.4.

For the noise assessment it has conservatively been assumed that all of 10 loading docks will be utilised during a 15 minute period. These equates to 10 vehicle movements and has conservatively been adopted for the day, evening and night periods. Table 11 show the number of movements utilised and the adopted source noise level.

Table 11: Heavy vehicle noise level and number of movements

Noise source	Sound Power Level, dB(A) re: 1pW[1]	Number of movements[2]		
	$L_{Aeq\ 15\ minute}$	Day	Evening	Night
Semi-trailer/ B-Double	106	10	10	10

Notes 1. Noise levels taken from Renzo Tonin & Associate's database

2. Movement corresponds to a truck entering the site, unloading at the loading dock and leaving via the Darling Street exit.

Noise predictions at the identified assessment locations are presented in Table 12 below. The predicted noise levels comply with the established project trigger noise levels at all receivers for all periods.

Table 12: On-site vehicular noise assessment

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	<20	<20	<20	40	38	33
A2 - 105 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A3 -140 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A4 - 235 South St, Marsden Park	<20	<20	<20	43	38	33
A5 - 15 Harmony Avenue, Marsden Park	<20			45[1]		
A6 - Lot 306 DP 1213756	59			70		

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays
Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays
Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays
1. Outside noise level approximated based on 10 dB(A) insertion loss through an open window [NSW Environmental Criteria for Road Traffic Noise, Environmental Protection Authority 1999 p14]

5.1.3 Loading dock activity

The loading docks are located along the southern façade of the warehouse. The following noise levels from Renzo Tonin & Associate's database have been used for the assessment and are shown in Table 13. The number of trucks being loaded/unloaded at any one time has conservatively been adopted to be 10 per 15 minute period during the day, evening and night periods.

Table 13: Loading dock activity – Sound power levels

Activity	Sound Power Level, dB(A) re: 1pW
	$L_{Aeq\ 15\ minute}$
Semi-trailer/ B-Double idling	95
Forklift	90

Noise predictions at the identified assessment locations are presented in Table 14 below. The predicted noise levels comply with the established project trigger noise levels at all receivers for all periods.

Table 14: Loading dock assessment

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	<20	<20	<20	40	38	33
A2 - 105 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A3 -140 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A4 - 235 South St, Marsden Park	<20	<20	<20	43	38	33
A5 - 15 Harmony Avenue, Marsden Park	<20			45[1]		
A6 - Lot 306 DP 1213756	59			70		

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays
Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays
Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays
1. Outside noise level approximated based on 10 dB(A) insertion loss through an open window [NSW Environmental Criteria for Road Traffic Noise, Environmental Protection Authority 1999 p14]

5.1.4 Carpark

The proposed carpark is located in the south-east corner of the site and has a capacity of 243 spaces. The carpark entry and exit is located along Darling Street.

According to the ARUP Traffic Report, the number of peak hour vehicle movements is 170. This has conservatively been adopted for the day, evening and night periods.

The noise sources generated by carparks include, vehicle doors closing, vehicle engines starting, vehicles accelerating and vehicles moving. Noise level measurements from our database and library files were used for the purpose of this assessment.

Noise predictions at the identified assessment locations are presented in Table 15 below. The predicted noise levels comply with the established project trigger noise levels at all receivers for all periods.

Table 15: Car park noise assessment

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	<20	<20	<20	40	38	33
A2 - 105 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A3 -140 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A4 - 235 South St, Marsden Park	<20	<20	<20	43	38	33
A5 - 15 Harmony Avenue, Marsden Park	<20			45[1]		
A6 - Lot 306 DP 1213756	25			70		

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays

1. Outside noise level approximated based on 10 dB(A) insertion loss through an open window [NSW Environmental Criteria for Road Traffic Noise, Environmental Protection Authority 1999 p14]

5.1.5 Mechanical plant

Detailed specifications of mechanical services equipment that would otherwise allow a quantitative acoustic assessment of noise emission from the site are not available at this stage. This is common for a development of this size, as detailed design of the mechanical services system would not typically be undertaken until after approval.

Notwithstanding the above, a qualitative review of the proposed development has been carried out and indicative noise management measures are provided for mechanical plant servicing the proposed development.

The proposed development may include the following primary mechanical plant and equipment:

- Air-conditioning;
- Exhaust fans;
- Condensing units
- Refrigeration equipment

Given the large separation distance to the nearest residential receivers and the relatively high criterion of adjacent commercial receivers, mechanical plant noise emission will be able to be readily controlled by appropriate mechanical system design and implementation of common engineering methods, which is to be determined at the detailed design stage. Indicative acoustic mitigation may include:

- Procurement of 'quiet' plant.
- Air-conditioners and condensers should include day/night modes to further reduce noise emission.
- Strategic positioning of plant away from sensitive neighbouring premises to maximise intervening acoustic shielding between the plant and sensitive neighbouring premises.
- Commercially available acoustic attenuators for air discharge and air intakes of plant.
- Acoustically lined and lagged ductwork.
- Acoustic barriers between plant and sensitive neighbouring premises.
- Partial or complete acoustic enclosures over plant.
- Acoustic louvres.
- Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 'Rotating and Reciprocating Machinery – Mechanical Vibration'.

5.1.6 Sleep Disturbance

Sleep disturbance would most potentially be caused by a single event of a vehicle door closing, engine starting in the carpark area, and/or truck air break release in the loading dock where there is a limited degree of acoustic shielding (compared with internal activities) and due to the relatively high L_1 noise levels that can be generated. The following noise levels from Renzo Tonin & Associate's database have been used for the assessment and are shown in Table 16.

Table 16: Sleep disturbance - Sound power levels

Activity	Sound power level, dB(A) re: 1pW
	$L_{1\ (1\text{-minute})}$
Truck Air break release	115
Vehicle door closing	100
Vehicle engine starting	100

Noise predictions at the identified assessment locations are presented in Table 17 below. The predicted noise levels comply with the established sleep disturbance criteria at all residential receivers for all periods.

Table 17: Sleep disturbance noise assessment

Assessment Location	Predicted Noise Level dB(A)		Sleep disturbance criteria, $L_{A1,1minute}$ or L_{Amax}	
	$L_{Aeq,15min}$	$L_{1\ (1\text{-}minute)}$ dB(A)	Assessment Level $L_{Aeq,15min}$	Assessment Level L_{AFmax}
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	26	39	40	52
A2 - 105 Hollinsworth Rd, Marsden Park	<20	30	40	52
A3 -140 Hollinsworth Rd, Marsden Park	20	32	40	52
A4 - 235 South St, Marsden Park	20	34	40	52

Notes: Night is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

5.1.7 Cumulative noise impact

Based on the predicted noise level for the relevant on-site activities, as well as the relevant times periods for each activity, a cumulative noise impact assessment has been carried out and is presented in Table 18 below. The predicted noise levels comply with the established project trigger noise levels at all receivers for all periods.

Table 18: Cumulative noise assessment

Assessment Location	Predicted Noise Level $L_{Aeq,15min}$			Project Specific Noise Goal $L_{Aeq,15min}$		
	Day	Evening	Night	Day	Evening	Night
A1 -Hazelwood Ave (Cnr of Hazelwood Ave & Harmony Avenue), Marsden Park	26	26	26	40	38	33
A2 - 105 Hollinsworth Rd, Marsden Park	<20	<20	<20	43	38	33
A3 -140 Hollinsworth Rd, Marsden Park	20	20	20	43	38	33
A4 - 235 South St, Marsden Park	20	20	20	43	38	33
A5 - 15 Harmony Avenue, Marsden Park	25			45[1]		
A6 - Lot 306 DP 1213756	62			70		

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays

Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays

Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 on Sundays and Public Holidays

1. Outside noise level approximated based on 10 dB(A) insertion loss through an open window [NSW Environmental Criteria for Road Traffic Noise, Environmental Protection Authority 1999 p14]

Mechanical plant noise will be able to be readily controlled by the measures outlined in 5.1.5 during the detailed design phase.

6 Road traffic generated by development

6.1 Road traffic generated by development

Additional noise from traffic generated by a development on the surrounding road network is assessed against the EPA Road Noise Policy. The assessment involves consideration of the existing traffic noise levels and the potential change in noise as a result of the development.

Except for movements along Richmond Road, traffic associated with the site will not travel past any residential properties. On this basis, the traffic noise generated by the development is insignificant and complies with the requirements of the RNP.

Richmond Road has an existing daily traffic volume in excess of 30,000 vehicles (RMS Traffic Volume Viewer). The additional traffic noise generated by the development is predicted to be less than 2dB(A) and is therefore acceptable.

7 Conclusion

Renzo Tonin & Associates has carried out an acoustic assessment to support a State Significant Development Application, for a new ASICS Facility located at 4 Darling Street, Sydney Business Park, Marsden Park.

The report has quantified operational noise emission from the proposed development and has assessed noise at the nearest sensitive receivers. The report has been prepared in accordance with Blacktown Council and NSW Environmental Protection Authority (EPA). It has been established that noise from the operation of the proposed facility has been predicted to comply at all surrounding receivers for all periods.

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 115dB Limit of sound permitted in industry 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 Long-term noise monitoring methodology

B.1 Noise monitoring equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave band data	Logger location
RTA05 (NTi XL2)	Type 1	1/1	L1

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4230 calibrator. No significant drift in calibration was observed.

B.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW INP. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 '*Wind actions on structures*'.

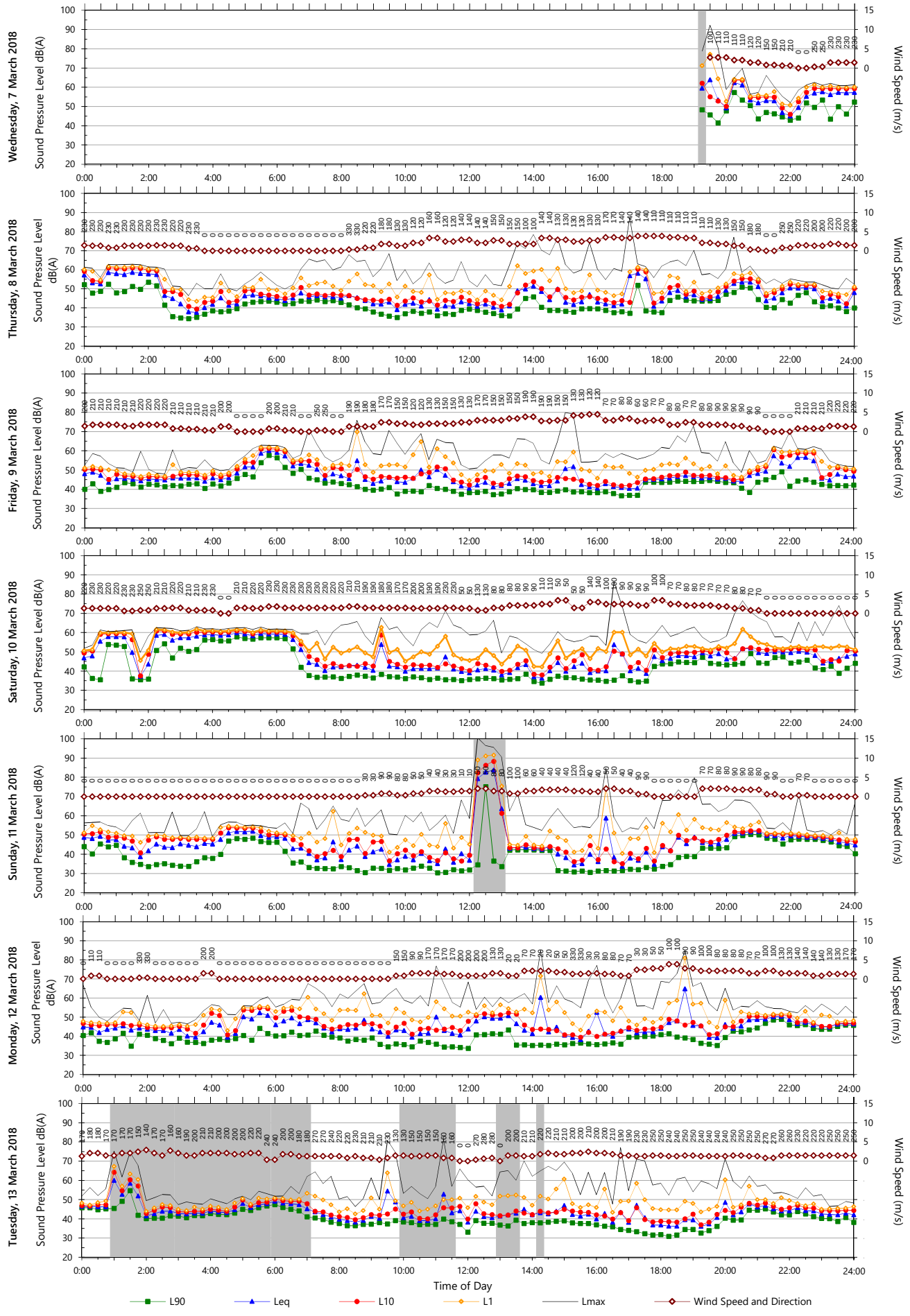
B.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10}, L_{90}, and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

APPENDIX C Long-term noise monitoring results

Unattended Monitoring Results

Location: 9 Habitat Place, Marsden Park

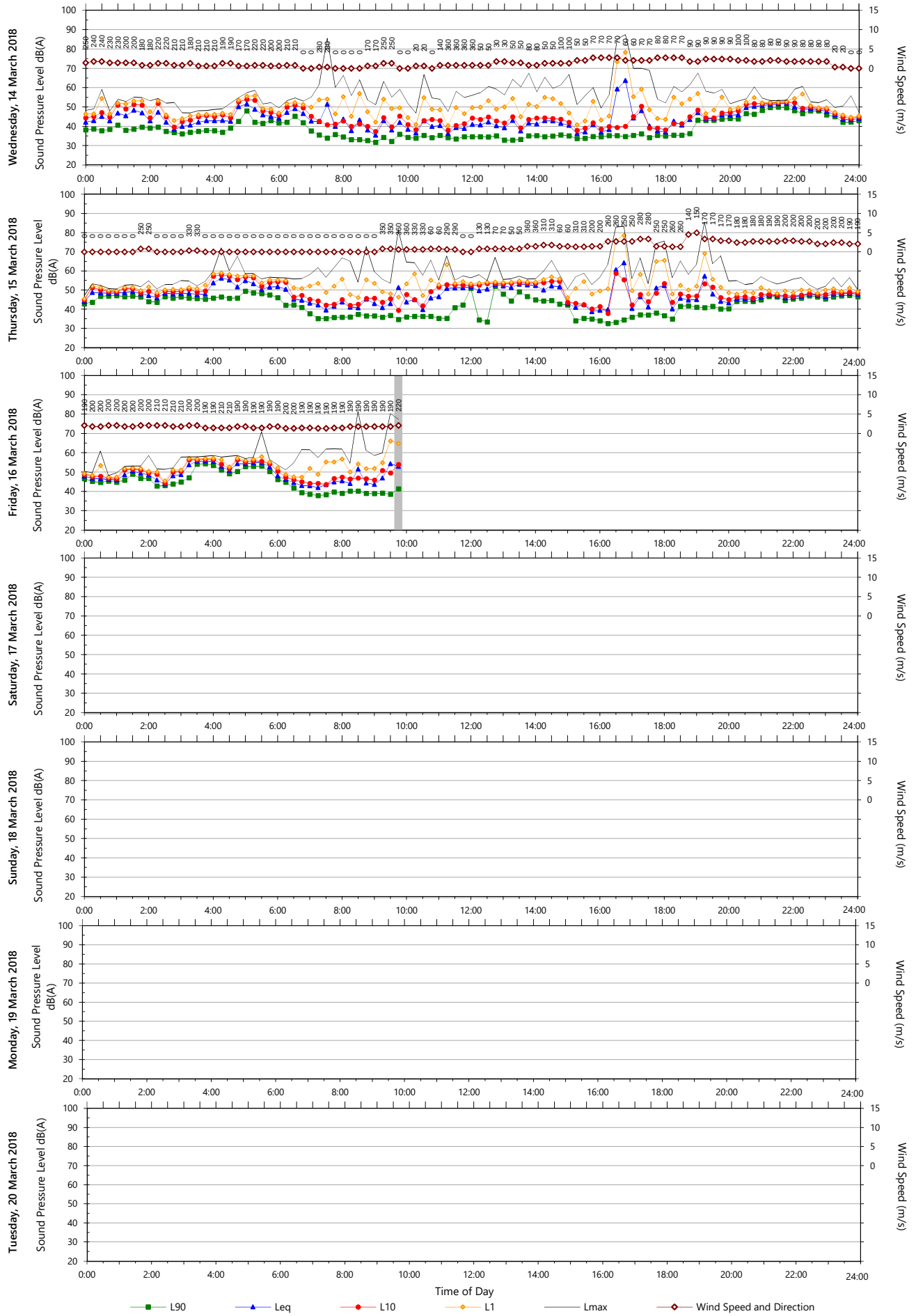


Data File: 2018-03-07_SLM_000_123_Rpt_Report.txt

Template: QTE-26 (rev 17) Logger Graphs Program

Unattended Monitoring Results

Location: 9 Habitat Place, Marsden Park



Data File: 2018-03-07_SLM_000_123_Rpt_Report.txt

Template: QTE-26 (rev 17) Logger Graphs Program