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143A STONEY CREEK ROAD, BEVERLY HILLS

DA Noise Assessment for Proposed Health Services Facilities

21 May 2020

Cambridge Unit Developments Pty Ltd

TL394-01F02 Acoustic assessment for DA (r1)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

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1 Introduction

Renzo Tonin & Associates was engaged to undertake a noise impact assessment of a proposed 3 storey health services facility at 143A Stoney Creek Road, Beverly Hills. This assessment addresses both external noise emissions from operations for potential impacts on neighbouring sensitive receivers and environmental noise intrusion for indoor amenity.

This study examines the effects of external noise intrusion on the proposed development from road traffic noise from Stoney Creek Road. An unattended noise survey was conducted by Renzo Tonin & Associates between the 16th and 23rd of March 2020 at the development site to determine the existing traffic noise affecting the site. These levels were used to predict noise levels within the proposed development, and then assessed against the recommended internal noise criteria for the project.

Recommendations have been made in the body of this report so that noise levels inside the building will comply with the nominated criteria with windows and external doors closed.

Construction noise shall be managed in accordance with the EPA's Interim Construction Noise Guideline 2009.

This assessment is based on the project DA drawings summarised below.

Table 1: Drawing summary

Drawing No.	Date	Title
TP00.01	15/05/2020	Proposed Site Plan
TP01.01	18/05/2020	Basement 3
TP01.02	18/05/2020	Basement 2
TP01.03	18/05/2020	Basement 1
TP01.04	18/05/2020	Ground Floor
TP01.05	18/05/2020	Level 1
TP01.06	18/05/2020	Level 2
TP01.07	18/05/2020	Roof Plan
TP03.01	18/05/2020	Section 01
TP03.02	18/05/2020	Section 02
TP03.03	18/05/2020	Section 03

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

The proposed development at 143A Stoney Creek Road, Beverly Hills is to consist of:

- 3 floors of basement car parking located underground;
- Loading dock, located on the ground level at the rear of the site, used for deliveries and waste disposal; and
- 3 storey development broken down into separate health services tenancies.

The Site faces both Stoney Creek Road and Cambridge Street and is surrounded by neighbouring residential receivers. The Site will be accessed through a proposed driveway located along the southern boundary of the site.

2.1 Noise issues

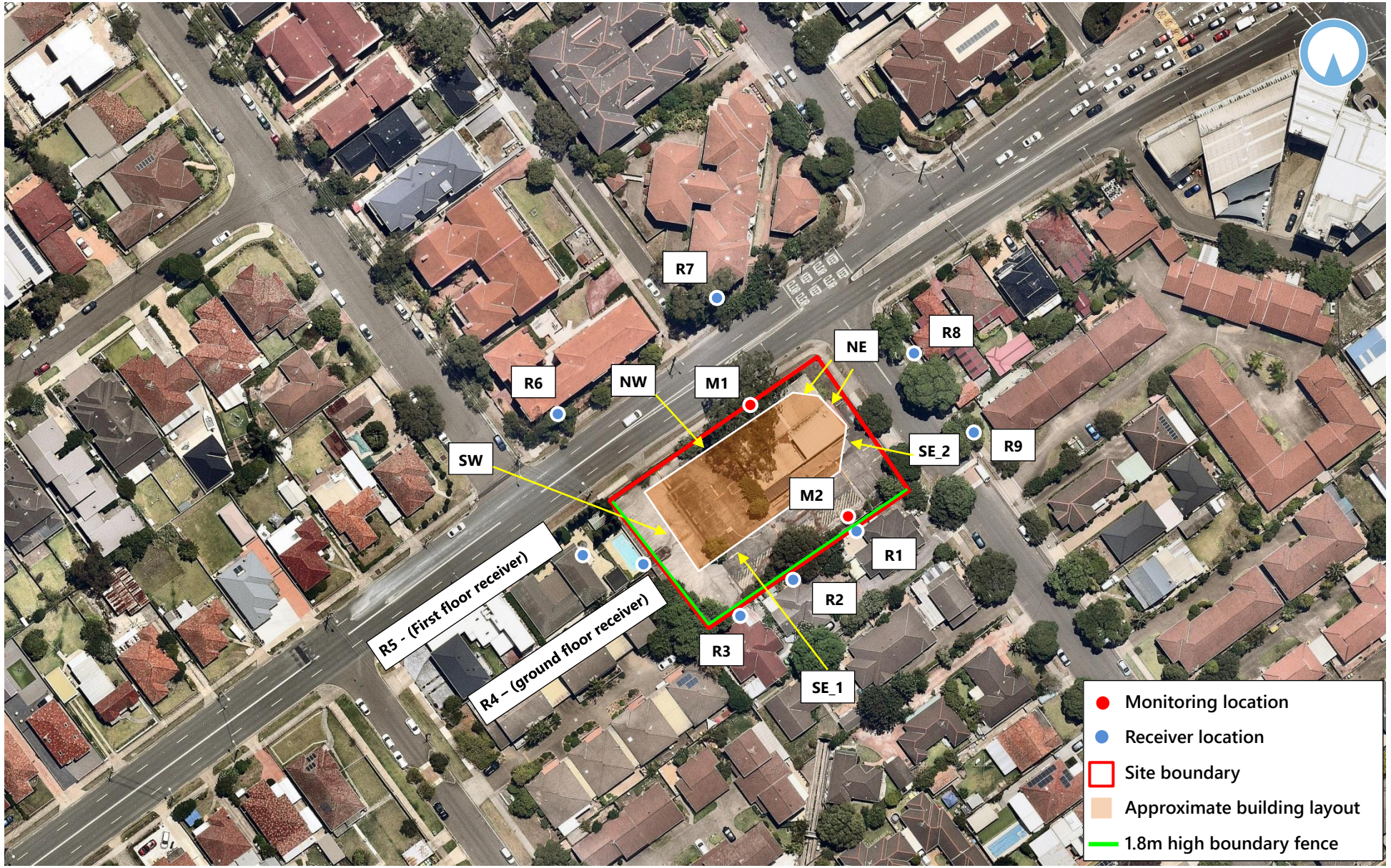
It is anticipated that noise from the health services facilities will essentially emanate from the following sources:

- Operational noise from the use of the health services facilities including:
  - Noise generated during the hours of operation by mechanical plant; and
  - Noise generated by vehicle movements within the premises.
- Road traffic noise on public roads generated by additional vehicles associated with the health services facility.
- Road traffic noise from Stoney Creek Road impacting upon the proposed health services facility.

2.2 Hours of operation

The development is proposed to operate between 7am – 10pm Monday to Saturday and 8am – 10pm on Sundays and public holidays.

Figure 1: Site, surrounds and monitoring locations



3 Existing acoustic environment

3.1 Long-term and short-term noise survey

Two RTA Technology Environmental Noise Loggers were set up for the ambient noise survey from Monday 16th of March to Monday 23rd of March 2020. The noise monitoring locations are summarised below.

Location M1 – 143A Stoney Creek Road (front yard)

The noise monitor was installed north-west of the site facing Stoney Creek Road at a height of 1.5m above the ground level. The noise environment was dominated by traffic noise from Stoney Creek Road.

Location M2 – 143A Stoney Creek Road (rear yard)

The noise monitor was installed south-west of the site behind the existing building at a height of 1.5m above the ground level. The noise environment was dominated by traffic noise from Stoney Creek Road.

The noise logger records noise levels on a continuous basis and stores data every fifteen minutes. The noise logger 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 Type 2 instruments suitable for field use.

The dates of measurement and the results obtained from the logger survey are shown in APPENDIX B.

3.2 Measured traffic noise level

The measured traffic noise levels for the day time (7am to 10pm) and night time (10pm-7am) periods during the monitoring period are summarised in Table 2 below.

Table 2: Representative day and night traffic noise levels, $L_{Aeq, period}$ (ground level)

Address	Logger location	Measured traffic noise level $L_{Aeq, period}$, dB(A) at 1m from a facade[2]	
		Day[1]	Night[1]
143A Stoney Creek Road	M1 - Front of the site	74	69
	M2 - Rear of the site	61	57

Notes: 1. Day is defined as 7am to 10pm; Night is defined as 10pm to 7am
2. Free field monitoring location corrected for facade reflections (i.e. +2.5dB correction added)

3.3 Existing noise environment at development site

The results of the long-term noise monitoring have been summarised in accordance with Noise Policy for Industry (NPfI) requirements published by NSW Environmental Protection Authority (EPA) and are presented in Table 3 below.

Table 3: Measure background and ambient noise levels, dB(A)

Location	L_{A90} Background noise levels			L_{Aeq} Ambient noise levels		
	Day[1]	Evening[2]	Night[3]	Day[1]	Evening[2]	Night[3]
M1 - Front of the site	53	50	39	71	71	67
M2 - Rear of the site	48	46	39	59	58	54

Notes: 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

Receivers R1-R4 would not have a line of sight to Stoney Creek Road and therefore the noise monitor located at M2 would be more representative of the background noise levels at these receiver locations. Alternatively, Receivers R5-R9 would have higher background levels as they would have a line of sight to Stoney Creek Road and therefore the background noise levels measured at M1 would be more applicable.

3.4 Calculated noise levels

Based on the monitoring conducted at M1 and M2, the traffic noise levels were calculated for the separate facades identified in Figure 1. The table below summarises the external noise levels used for the calculation of internal noise levels within the proposed development. Noise calculations were performed using glazing design software developed in this office which take into account external noise levels, facade transmission loss and room sound absorption characteristics.

Table 4: Traffic noise level $L_{Aeq,\ period}$ at each facade, dB(A)

Facade location	Traffic noise level $L_{Aeq,\ period}$, dB(A)[2]	
	Day[1]	Night[1]
SE_1	62	58
SE_2	66	62
NE	71	66
NW	74	69
SW	71	66

Notes: 1. Day is defined as 7am to 10pm; Night is defined as 10pm to 7am
2. Free field monitoring location corrected for facade reflections (i.e. +2.5dB correction added)

4 Internal noise criteria

The following policies and guidelines were assessed in order to determine suitable environmental noise intrusion criteria for the proposed development site:

- Hurstville Development Control Plan 2012;
- State Environment Planning Policy (Infrastructure) 2007 ('ISEPP');
- Department of Planning (DoP) publication "Development Near Rail Corridors & Busy Roads – Interim Guideline" 2008 ('DoP Guideline'); and
- AS NZS 2107-2016 Recommended design sound levels and RT for building interiors.

The Hurstville DCP does not specify any particular internal noise criteria for this development. However, Stoney Creek Road is identified as a road where an assessment is recommended (between 20,000 AADT and 40,000 AADT) on The Roads and Maritime Services (RMS) Traffic Volume Maps for ISEPP. The acoustic criteria as determined in the ISEPP Clause (and quantified in the DoP Guideline) relate specifically to hospital developments but it is noted that health services facilities would have similar spaces to a hospital. Consequently, the criteria given in the DoP Guideline and the recommended internal noise criteria stipulated by AS NZS 2107 (2016) has been adopted for this assessment and reproduced below.

Table 5: Recommended internal noise criteria for road traffic noise

Occupancy	Period	Design Internal Noise Level	
		2107	ISEPP
Consulting rooms	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Dental clinics	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Laboratories	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
MRI/ CT Scan/X-Ray areas/ Ultra sound	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Office areas	7am – 10pm	35 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Patient lounge	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Pharmacies	7am – 10pm	45 to 50 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Staff rooms	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Operating theatres	7am – 10pm	40 to 50 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Post-Op, Pre-Op, recovery	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Utility rooms	7am – 10pm	50 to 60 dB(A) $L_{eq,\ 15hr}$	NA
Waiting rooms, reception	7am – 10pm	40 to 50 dB(A) $L_{eq,\ 15hr}$	NA
Small meeting rooms	7am – 10pm	40 to 45 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Executive offices	7am – 10pm	35 to 40 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Board/Conference Rooms	7am – 10pm	30 to 40 dB(A) $L_{eq,\ 15hr}$	45 $L_{eq,\ 15hr}$
Audiological test rooms	7am – 10pm	See AS/NZS 1269.4 and AS ISO 8253	Seek particular advice

Occupancy	Period	Design Internal Noise Level	
		2107	ISEPP
Ward rooms	7am – 10pm	35 to 40 dB(A) $L_{eq,\ 15hr}$	35 $L_{eq,\ 15hr}$

5 Control of external noise – window glazing

5.1 Glazing

The particular use and layout for each tenancy is yet to be finalised, therefore the room size and glazing size was approximated to the following:

- Consultation room: 5m x 5m x 2.7m (L x W x H)
- Glazing dimensions: 5m x 2.7m (L x H)

For the purpose of this assessment a design noise level of 45 dB(A) has been adopted for all general tenancy spaces. If private offices, board/conference rooms, wards or other spaces with an internal design goal under AS2107:2016/ ISEPP of less than 45dB(A) were located on the façade, then the façade would need to be upgraded to allow for that use. Depending on the extent, this could be done locally (possibly with a jockey sash) or may require upgrade of the whole façade. This can be refined during the detailed design phase for CC.

Furthermore, it is proposed that the building will be mechanically ventilated and therefore it is assumed that the windows will be closed. The following table represents the recommended glazing selections for facades of the proposed development at 143A Stoney Creek Road, Beverly Hills.

Table 6: Minimum acoustic performance of glazing assembly - preliminary

Facade	Level	Occupancy	Required acoustic rating of glazing assembly, Rw	Indicative construction
SE_1	All	See applicable occupancies in Table 5 – design internal noise goal of 45dB(A) or louder	23	4mm standard glazing
SE_2	All		26	4mm monolithic glass with full perimeter acoustic seals
NE	All		32	6.38mm laminated glass with full perimeter acoustic seals
NW	All		36	10.5mm VLam Hush laminated glass with full perimeter acoustic seals
SW	All		32	6.38mm laminated glass with full perimeter acoustic seals

Notes:

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.

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.

The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.

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.

The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site.

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.

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.

5.1.1 Doors and window seals

All occupied space must also include special acoustic grade seals installed on windows and perimeter doors exposed to road traffic noise to meet Renzo Tonin's calculated minimum standard.

5.2 External wall requirement

The acoustic performance of the external walls (Rw) shall exceed the required glazing performance by at least +15 points.

5.3 Roof/ceiling requirement

The acoustic performance of the external roof/ceiling construction (Rw) shall exceed the required glazing performance for that room by at least +10 points.

6 Operational noise assessment

6.1 Operational noise criteria

The operational noise generate by the site is assessed against the EPA's Noise Policy for industry.

The NSW EPA Noise Policy for Industry assessment has two components:

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

6.1.1 Project intrusive noise levels

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)

6.1.2 Amenity noise trigger levels

The NPfI amenity trigger levels are designed to maintain noise level amenity for particular land uses, including residential and other land uses. The NPfI recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and other sensitive receivers in Table 2.2 of the NPfI. Uses pertinent to the site are outlined in Table 7 To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = recommended amenity noise level (NPfI Table 2.2) minus 5 dB(A)

Table 7: NPfI Amenity Criteria - Recommended L_{Aeq} noise levels from industrial noise sources [NSW NPfI Table 2.2]

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended amenity noise level $L_{Aeq(Period)}$
Residence	Suburban	Day	55
		Evening	45
		Night	40

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended amenity noise level $L_{Aeq(Period)}$

Note:

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.

6.1.3 Project amenity noise levels

The project amenity noise levels for different time periods of a day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aeq, period}$) 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 a receiver location. However, when assessing a **single** industrial development and its impact on an area, "project amenity noise levels" apply.

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

$L_{Aeq,period}$ Project amenity noise level = $L_{Aeq,period}$ Recommended amenity noise level – 5dB(A)

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the $L_{Aeq,period}$ level to a representative $L_{Aeq,15minute}$ level in order to standardise the time periods.

$L_{Aeq,15minute}$ = $L_{Aeq,period}$ + 3dB(A)

As discussed in Section 3.3, the background noise levels measured at M1 would be representative for Receivers R5-R9 and M2 background noise levels would be representative for Receivers R1-R4. Table 8 presents the site-specific noise trigger levels from industrial noise sources from the development for Receivers R1-R4, while Table 9 presents the site-specific noise trigger levels for Receivers R5-R9.

Table 8: Project noise trigger level for Receivers R1-R4 (EPA NPfI)

Time of Day	Column 1 Rating Background Level (RBL) L_{A90}	Column 2 Intrusiveness Trigger Level, $L_{Aeq,\ 15minute}$ (RBL+5)	Column 3 Recommended Amenity Noise Level (RANL), $L_{Aeq,\ period}$	Column 4 Project Amenity Noise Level (PANL), $L_{Aeq,\ period}$	Column 5 Measured $L_{Aeq,\ period}$ existing noise levels	Column 6 Traffic noise exceed the RANL by more than 10dB?	Column 7 Existing noise level likely to decrease in future?	Column 8 Exceptions to PANL?	Column 9 Project Noise Trigger Level $L_{Aeq,\ 15minute}$ dB(A)
Day (7am to 6pm)	48	53	55	50	59	No	No	None	53
Evening (6pm to 10pm)	46	51	45	40	58	Yes	No	Existing LAeq, period minus 15 = 43 dB(A)	46
Night (10pm to 7am)	39	44	40	35	54	Yes	No	Existing LAeq, period minus 15 = 39 dB(A)	42

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 Table 3 above.

Column 4 – Project Amenity Noise Level determined based on 'Residential - suburban' 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)

Table 9: Project noise trigger level for Receivers R5-R9 (EPA NPfI)

Time of Day	Column 1 Rating Background Level (RBL) L_{A90}	Column 2 Intrusiveness Trigger Level, $L_{Aeq,\ 15minute}$ (RBL+5)	Column 3 Recommended Amenity Noise Level (RANL), $L_{Aeq,\ period}$	Column 4 Project Amenity Noise Level (PANL), $L_{Aeq,\ period}$	Column 5 Measured $L_{Aeq,\ period}$ existing noise levels	Column 6 Traffic noise exceed the RANL by more than 10dB?	Column 7 Existing noise level likely to decrease in future?	Column 8 Exceptions to PANL?	Column 9 Project Noise Trigger Level $L_{Aeq,\ 15minute}$ dB(A)
Day (7am to 6pm)	53	58	55	50	71	Yes	No	Existing LAeq, period minus 15 = 56 dB(A)	58
Evening (6pm to 10pm)	50	55	45	40	71	Yes	No	Existing LAeq, period minus 15 = 56 dB(A)	55
Night (10pm to 7am)	39	44	40	35	67	Yes	No	Existing LAeq, period minus 15 = 52 dB(A)	44

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 Table 3 above.

Column 4 – Project Amenity Noise Level determined based on 'Residential - suburban' 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)

6.2 Operational noise sources

6.2.1 On site vehicle movements

The car park area of the proposed health services facilities is to be located in a purpose-built underground car park, with access to and from Cambridge Street via a driveway ramp. The car park is to accommodate staff vehicles as well as patrons. It is proposed that the heavy vehicles used for deliveries and waste disposal will utilise the loading dock area located on the ground level (access to which is via the Southern driveway).

Noise generated by car park activities that typically contribute to the overall L_{Aeq} noise level emission from a site includes doors closing, vehicle engines starting and vehicles moving. In this instance, the only vehicular noise likely to affect receivers in the area is engine noise as vehicles enter and exit the premises via the access ramp, due to the car park area being underground. To assess the impact of these noises, the L_{Aeq} noise levels were determined for the relevant period based on the number of vehicle activities expected to occur during that period at the nearest affected residential premises. Sound power level measurements from our database and library files have been used for the purpose of this assessment.

The sound power level of the car park activity which is anticipated to impact the nearest affected receivers is shown in Table 10 below.

Table 10: Sound power levels of car park activities

Activity	Sound Power Level, dB(A) re. 1pW
Light vehicle moving (10km/h) per metre	79
Heavy vehicle moving (10km/h) per metre	103

Notes: 1. Only activity expected to impact nearest affected receivers

It is noted that for the car park ramp, a +5dB(A) penalty has been added to the noise level for a vehicle traveling up the ramp when exiting the underground car park.

The number of light vehicle movements for the proposed development was based on the traffic and parking statement prepared by Ason Group (ref. P0780r01v01). The report predicts the peak number of light vehicle movements from the development to be 110 trips (55 in / 55 out). Therefore, the light vehicle movements during the peak one hour period have been assumed to be 110 trips (55 in / 55 out).

Based on advice given by Ason Group, it is assumed that no more than two heavy vehicle movements will occur during any 15 minute period (ie. one heavy vehicle enters and exits the site within 15minutes). Furthermore, it is assumed that the heavy vehicle engine will be turned off during loading/ unloading procedures.

Additionally, the peak number of vehicle movements (light and heavy vehicles) are proposed to occur during the day time period only (ie. between 7am-6pm Monday to Saturday and 8am-6pm on Sundays and Public Holidays). Consequently, the day time assessment is based on the peak number of vehicle movements on site.

For a conservative assessment of the evening period, it is assumed that the peak number of light vehicle movements occur during the evening period (ie. between 6pm-10pm). No heavy vehicle movements are predicted for the evening period.

6.2.2 Mechanical plant

The details and noise emission levels of mechanical plant items to be installed are yet to be finalised at this early DA stage of the project. An assessment of external noise emissions from mechanical plant and equipment shall be undertaken for Construction Certificate for compliance with the project noise emission goals outlined in Section 6 (considering cumulative impacts with use of carpark and loading dock).

6.3 Predicted noise levels

Noise emissions were predicted by modelling the noise sources, receiver locations and topographical features of the intervening area using Cadna-A (version 2020) noise modelling computer program. Noise predictions include losses due to shielding provided by the 1.8m boundary fence illustrated in Figure 1. The modelling program calculates the contribution of each noise source at each specified receiver point and allows for the prediction of the total noise from a site. Noise levels were predicted at the worst affected receivers R1 (single story) and R5 (first floor receiver) as shown in Figure 1.

Table 11: Predicted $L_{Aeq,15min}$ noise levels from vehicle movements, dB(A)

Receiver Location	Time of Day	Noise Criteria	Predicted Noise Levels	Comply?
R1 – 147 Cambridge Street, Penshurst	Day (7am to 6pm)	*53*	**52**	Yes
	Evening (6pm to 10pm)	*46*	**40**	Yes
R5 – 141 Stoney Creek Road, Penshurst (first floor receiver)	Day (7am to 6pm)	*58*	**42**	Yes
	Evening (6pm to 10pm)	*55*	**38**	Yes

Based on the results presented above the predicted noise levels comply at the worst affected receiver during the day and evening period and therefore no additional noise mitigation is required.

6.4 Recommended noise control measures for mechanical plant

Although at this stage details of mechanical plant have not been finalised, the following in-principle advice is 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 NPfI and 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.

Based on the extent of mechanical plant and equipment typically required for a development of this type, compliance with the project noise emission goals is achievable, subject to detailed design.

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".

7 Road traffic noise assessment

Noise impact from the potential increase in traffic on public roads due to the proposed development is assessed against the Road Noise Policy (RNP, 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 associated with the Site, with the aim of preserving the amenity appropriate to the land use.

It is proposed that traffic associated with the development will access the site through Cambridge Street. It is noted that the intersection between Cambridge Street and Stoney Creek Road, is dominated by traffic noise from Stoney Creek Road. Due to the high existing noise levels along Stoney Creek Road, the traffic associated with the development are not anticipated to significantly increase the noise levels for residential receivers located near the intersection and is not addressed any further in this report.

For a conservative assessment, Cambridge Street is classified as a local road. Therefore, for *"existing residences affected by additional traffic on existing local roads generated by land use development"* the following road traffic noise criteria applies to residential receivers located along the section of Cambridge Street that is south east of the Site:

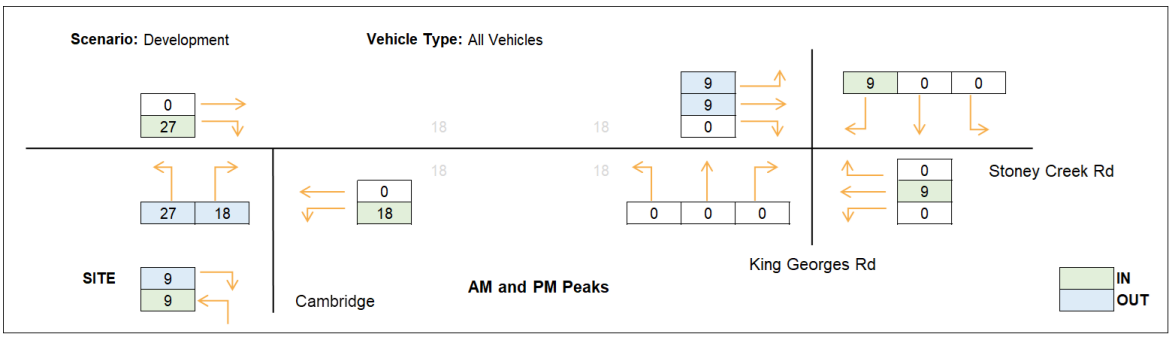
- Day (7am to 10pm) $L_{Aeq(1\ hour)}$ **55dB(A)**

As discussed previously, traffic generation due to the proposed health services facilities was estimated to be up to 110 trips (55 in / 55 out) during the peak period. The existing traffic volumes during the peak periods were detailed in the traffic report prepared by Ason Group. Details of the existing traffic survey have been reproduced in Table 12 and the predicted traffic volumes are presented in Figure 2.

Table 12: Existing traffic volumes along Cambridge Street

Direction of traffic flow	AM Peak Hour 7:15am – 8:15am	PM Peak Hour 5:00pm – 6:00pm
Southbound	27	44
Northbound	126	68
Combined Total	**153**	**112**

Figure 2: Predicted traffic volumes generated by the proposed development



Ason group predict the same traffic volumes for the AM and PM peak periods. Currently, there is less traffic during the PM peak period when compared to the AM peak period, as shown in Table 12. Therefore, the change in traffic volumes along Cambridge Street would be more prominent during the PM peak period and therefore only the PM peak period is assessed herein. Based on the existing PM peak period and predicted traffic due to the proposed health services facilities, road traffic noise levels were predicted for residences located along Cambridge Street and presented in Table 13.

Table 13: Predicted $L_{Aeq(1\ hour)}$ road traffic noise levels along Cambridge Street, dB(A)

Receiver	Criteria	PM Peak Hour Movements	Distance to Road	Predicted Noise Level	Comply
Residences along Cambridge Street	*55*	(112 + 18[2])	12m[1]	55	Yes

Notes: 1. Based on typical distance from facade of dwelling to road
2. Traffic associated with the development that travel along the section of Cambridge Street that is south east of the site.

Results presented in the table above indicate that traffic noise impacts from vehicle movements on public roads, namely Cambridge Street, due to the proposed health services facility will comply with the RNP noise criteria at affected residences.

8 Conclusion

Renzo Tonin & Associates have completed an assessment of the potential noise impacts to and from the proposed health services facility at 143A Stoney Creek Road, Beverly Hills.

In order to control airborne traffic noise intrusion and comply with the nominated criteria, glazing recommendations have been made in Section 5 above.

Noise emissions from on-site vehicle movements have been assessed and are predicted to comply with the noise emission criteria. Furthermore, the traffic on public roads generated by the proposed development is predicted to comply with the criteria stipulated in the RNP.

An assessment of noise emissions from mechanical plant and equipment shall be conducted for CC, by which time the plant selections and associated noise data will be available. Compliance with the project noise emission goals is achievable subject to detailed design.

In conclusion, the proposed site is capable of complying with all relevant acoustic criteria through means of standard acoustic treatment and management.

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 common sounds in our daytime environment:

threshold of hearing	0 dB	The faintest sound we can hear
	10 dB	Human breathing
almost silent	20 dB	
	30 dB	Quiet bedroom or in a quiet national park location
generally quiet	40 dB	Library
	50 dB	Typical office space or ambience in the city at night
moderately loud	60 dB	CBD mall at lunch time
	70 dB	The sound of a car passing on the street
loud	80 dB	Loud music played at home
	90 dB	The sound of a truck passing on the street
very loud	100 dB	Indoor rock band concert
	110 dB	Operating a chainsaw or jackhammer
extremely loud	120 dB	Jet plane take-off at 100m away
threshold of pain	130 dB	
	140 dB	Military jet take-off at 25m away

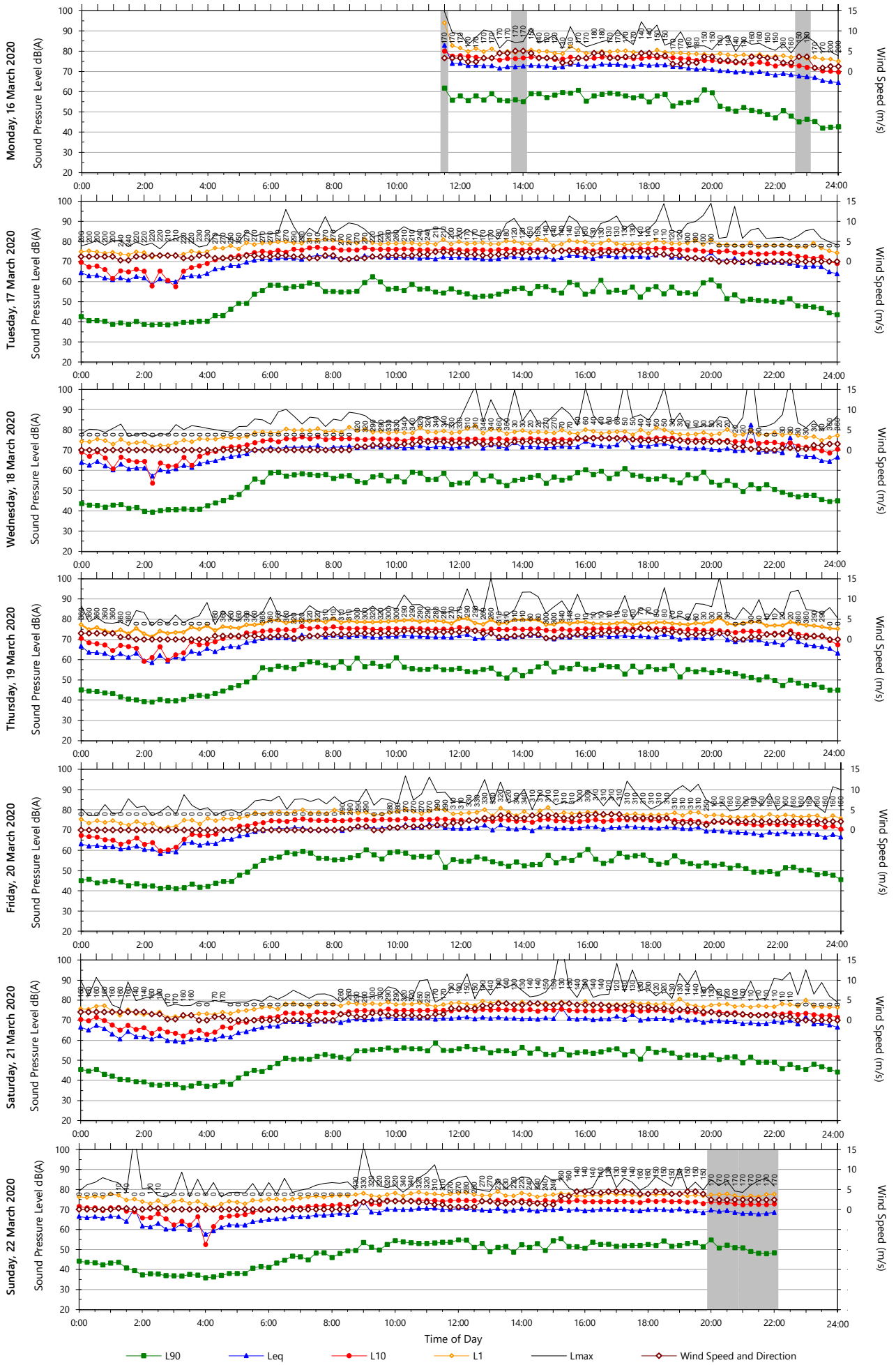
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud 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 Noise monitoring locations and results

Figure 3: M1 long term monitoring location (front of the site)

Figure 4: M2 long term monitoring location (rear of the site)



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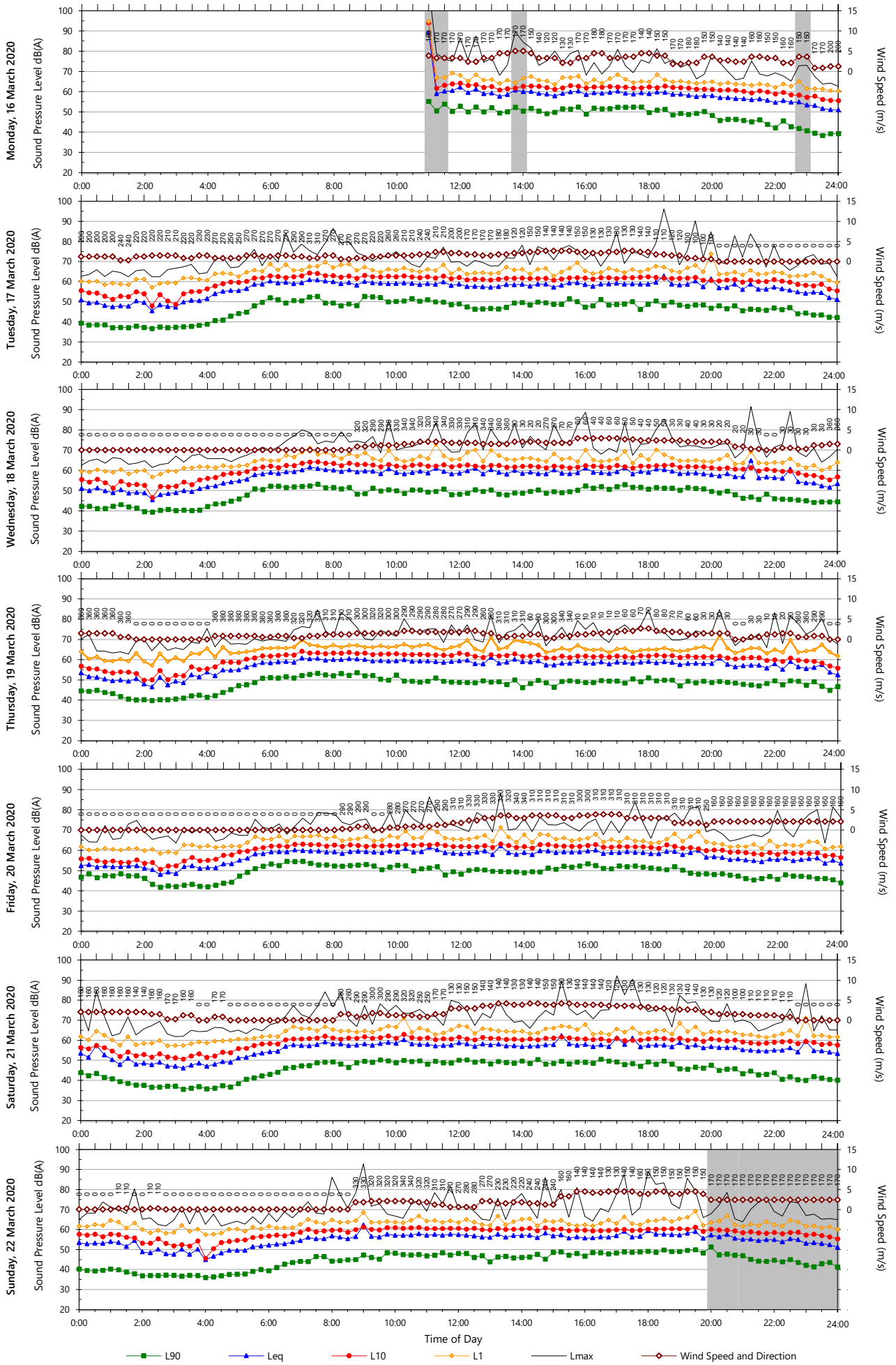

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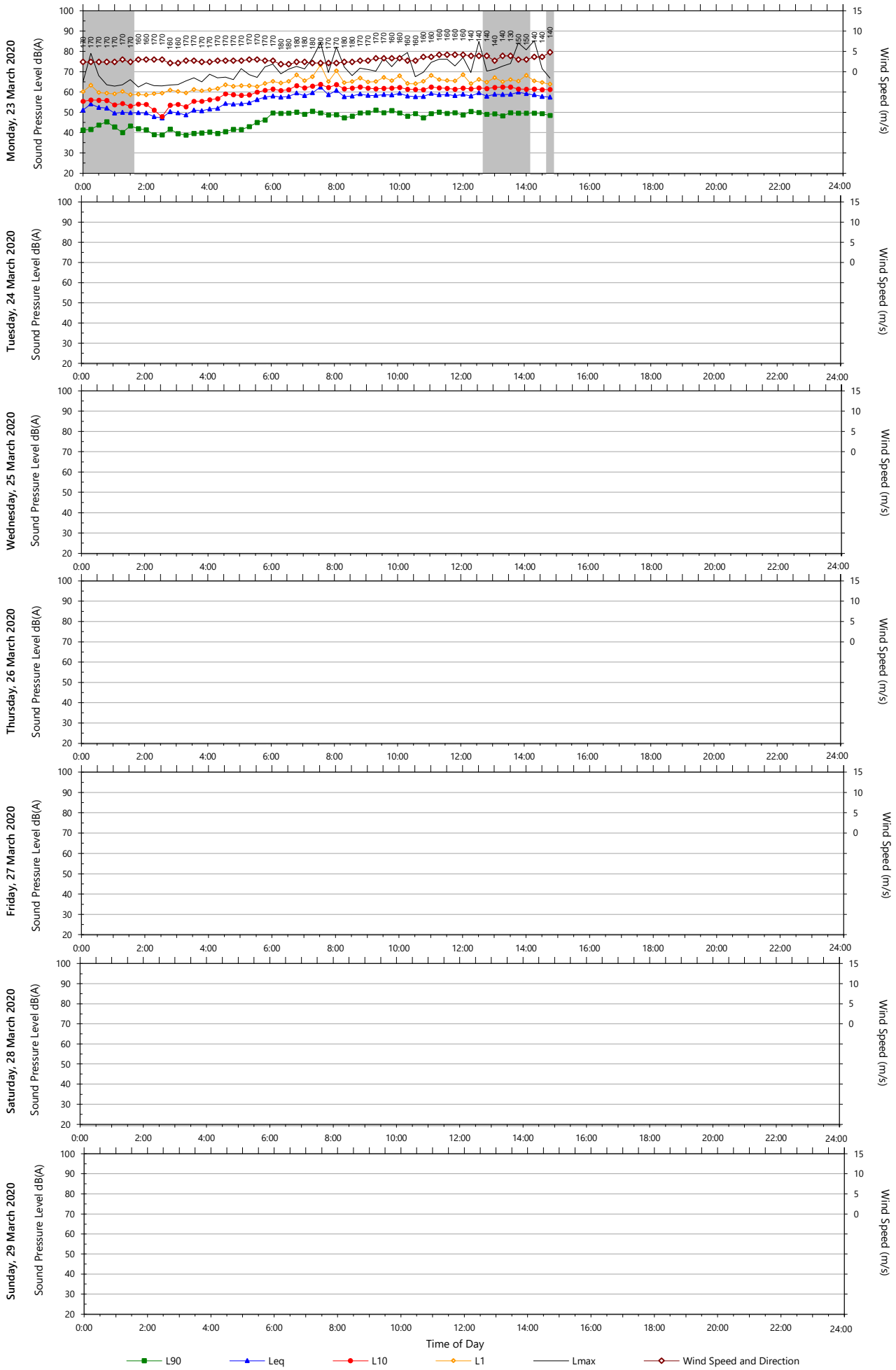

Data File: 2020-03-16_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r31)