REPORT

339-349 HORSLEY ROAD

MILPERRRA, NSW

NOISE AND VIBRATION IMPACT ASSESSMENT
RWDI # 2205494
19 August 2022

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (LAmax) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

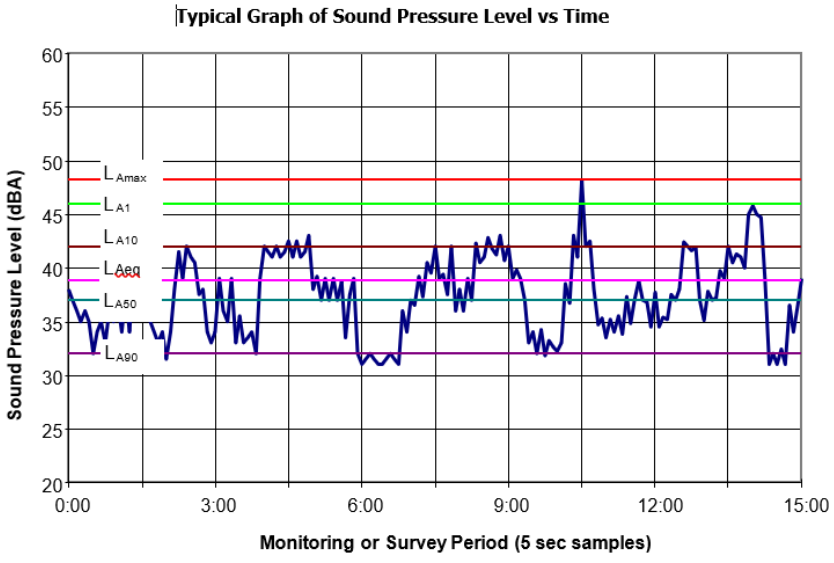
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.



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1 INTRODUCTION

RWDI has been engaged by Tactical Group on behalf of ITP Australia TS Mid Pty Ltd to provide a noise and vibration impact assessment of a proposed warehouse and distribution facility located at 339-349 Horsely Road Milperra (the Project).

This noise and vibration impact assessment report provides the following details:

- the existing environment
- the land zoning of the site and neighbouring area
- the closest existing residential and industrial receivers
- relevant noise criteria
- operational, construction, and traffic noise predictions for the warehouse and distribution facility and assumptions used in the assessment
- recommendations to minimise the noise impact on the affected receivers, if required

This noise impact assessment has been completed with reference to relevant guidelines and policies, namely:

- EPA *Noise Policy for Industry* 2017 (*NPfI*)
- *NSW Road Noise Policy* 2011 (*RNP*)
- *Interim Construction Noise Guideline* 2009 (*ICNG*)

This report forms part of the State Significant Development Application and addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the development (SSD 45998963) issued in July 2022. **Table 1-1** states the SEARs and identifies the sections in the report where the requirements are addressed.

Table 1-1 SEARs

SEARs	Section
Provide a noise and vibration assessment prepared in accordance with the relevant EPA guidelines	Section 4, 5, 6, and 7 presents the noise and vibration goals
The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures	Sections 8 and 9 addresses construction and operational noise impacts
Outline the proposed management and mitigation measures that would be implemented.	No significant operational noise impacts are expected. Section 8.9 and 9.4 outlines recommended operational and construction noise management and mitigation measures for consideration.

2 PROJECT DESCRIPTION

2.1 Project Location

The Project is located at 339-349 Horsley Road, Milperra within the Canterbury-Bankstown Local Government Area and is legally described as Lot 140 and 141 in DP 550194. It is zoned IN1 – General Industrial and is bounded on all sides by other industrial premises, zoned IN1.

The site has been developed and currently accommodates a large double height warehouse building comprising of warehouses, loading docks, and office spaces within its building. Trees and vegetation are planted along the site boundary. The closest residential receivers are located to south west of theProject with the closest being approximately 400 m.

Figure 2-1 presents the project location and surrounding land zoning.

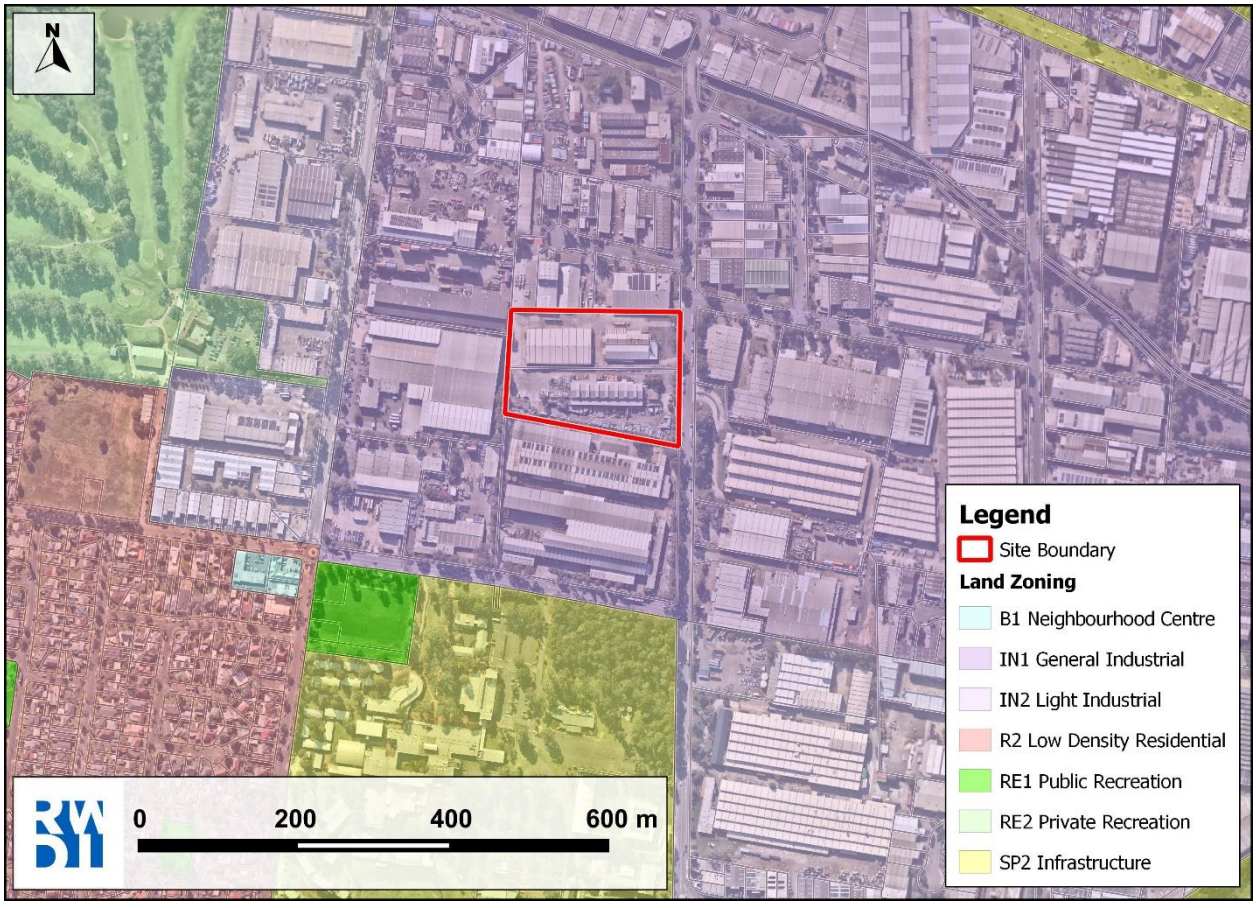


Figure 2-1 Site Location and Surrounding Land Use

2.2 Proposed Development

The proposal involves the construction and operation of a multi-unit warehouse and distribution facility at 339-349 Horsley Road, Milperra, which includes:

- Demolition of all existing buildings and structures
- Site preparation works, including tree clearing
- Earthworks (to achieve an FFL of RL 11.05)
- Infrastructure comprising civil works and utilities servicing
- Three (3) vehicular crossovers to Horsley Road
- Construction of two (2) warehouse buildings, split over two (2) storeys
- On-site car parking
- Complementary landscaping and offset planting

The layout of the proposal is shown in **Figure 2-2** and a 3D render of the Project is presented in **Figure 2-3**.

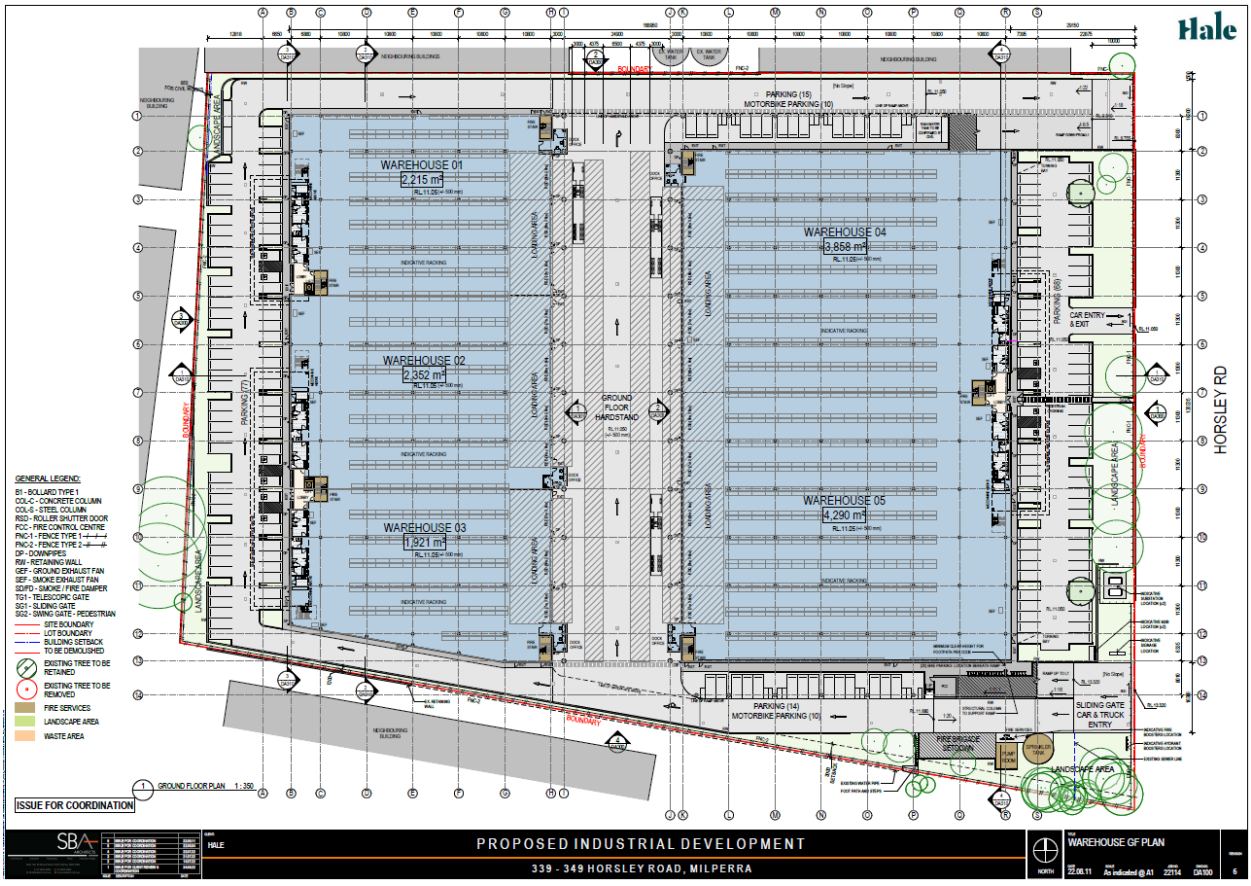


Figure 2-2 Site Layout

Figure 2-3 Proposed Site Render

2.3 Site Description

The proposal applies to land at 339 – 349 Horsley Road, Milperra, more formally described as Lot 140 & 141 DP550194 (subject site).

The subject site comprises two (2) allotments located on the western side of Horsley Road, within the Canterbury Bankstown Local Government Area (LGA), and is zoned IN1 General Industrial, pursuant to the Bankstown Local Environmental Plan 2015 (BLEP2015).

Existing attributes of the subject site are noted as follows:

- The subject site exhibits an area of 3.377ha and is located in the suburb of Milperra
- The subject site affords a primary frontage of 172m to Horsley Road to the east
- Vehicular access to the subject site is currently facilitated via existing access points on Horsley Road
- In its existing state, the subject site comprises a one-storey factory building and a brick office building at 339 Horsley Road and two (2) one-storey warehouse buildings and a one-storey rendered office with at-grade parking and concrete driveway
- The subject site is within the existing Milperra industrial precinct, predominantly characterised by established industrial development of similar scale
- The subject site is serviced by road infrastructure including Horsley Road, Milperra Road and the M5 South Western Motorway

3 EXISTING NOISE ENVIRONMENT

3.1 Representative Receivers

Representative receivers have been selected for this assessment. The receivers are presented in **Figure 3-1** and **Table 3-1** summarises the receivers and their land use.

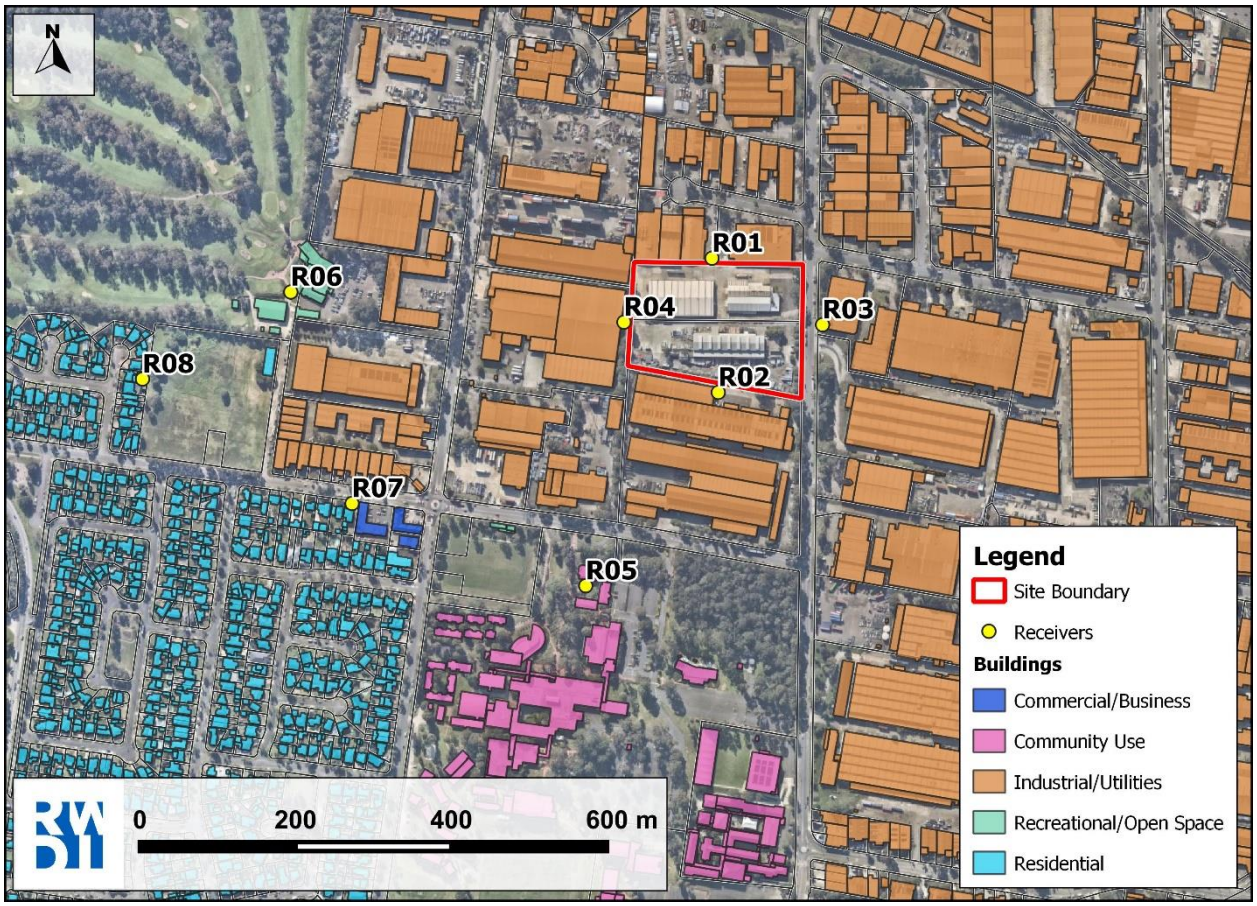


Figure 3-1 Location of Represetantive Receivers

Table 3-1 Summary of Representative Receivers

Receiver ID	Address	Receiver Type
R01	5 Works Place, Milperra	Industrial
R02	319 Horsley Road, Milperra	Industrial
R03	1 Amour Street, Milperra	Industrial
R04	75 Ashford Avenue, Milperra	Industrial
R05	Western Sydney University Bankstown	Educational
R06	Bankstown Golf Club	Active Recreational
R07	10 Bullecourt Avenue, Milperra	Residential

Receiver ID	Address	Receiver Type
R08	12 Keysor Place, Milperra	Residential

3.2 Noise Monitoring

Attended and unattended noise monitoring was conducted to quantity the existing noise environment surrounding the Project. The location if the noise monitor is indicated in **Figure 3-2**.

Noise monitoring was completed in accordance with Australian Standard AS 1055-2018 "*Acoustics - Description and measurement of environmental noise*". All acoustic instrumentation utilised complies with AS IEC 61672.1-2004 *"Electroacoustics - Sound level meters – Specifications".*

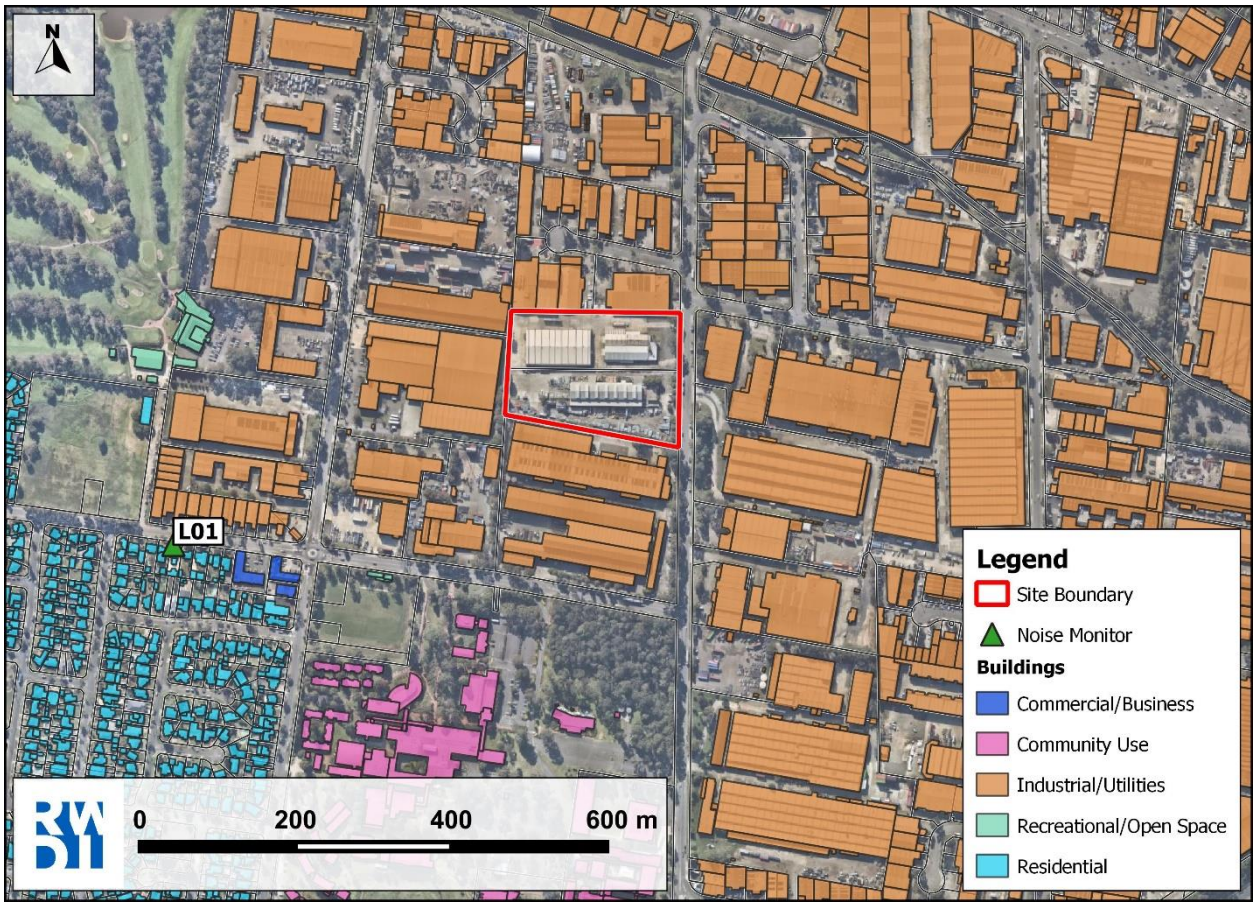


Figure 3-2 Unattended Noise Monitoring Locations

3.2.1 Existing Background Noise Levels

Unattended noise monitoring was conducted between 21 June and 30 June 2022 by RWDI. The measured data was processed according to the *NPfI* requirements. The noise monitor was installed at the rear of 18 Bullecourt Avenue, Milperra.

Table 3-2 details the L_{A90} presented as Rating Background Level (RBL) logged during the daytime, evening, and night periods. RBL data affected by adverse meteorological conditions or extraneous noise was removed from the data prior to processing. Full noise monitoring plots are provided in Appendix A.

Details of the monitoring equipmented used can be provided on request.

Table 3-2 Unattended Noise Monitoring Results – Ambient Noise Levels, dBA

Location	Time Period[1]	RBL
L01	Day	45
	Evening	45
	Night	39

Note 1: Daytime (6am – 7pm), Evening (7pm – 10pm), and Night time (10pm – 6am).

3.2.2 Existing Road Traffic Noise Levels

Attended noise monitoring was completed at the front of 18 Bullecourt Avenue, approximately 5 m from the nearest lane, to determine the existing road traffic noise levels. Monitoring was completed at 3.00pm on 21 June 2022. **Table 3-3** below presents the measured road traffic noise levels at this location.

Table 3-3 Attended Noise Monitoring Results, dBA

Date Time	L_{Amax}	L_{Aeq}	L_{A90}	Comments
20 June 2022 3.00pm-3.15pm	91	73	58	Truck drive bys approximately 79-85 dBA Car drive bys approximately 70-80 dBA Lulls in traffic, SPL between 52-60

The measured noise levels at the unattended noise monitor was compared to estimate the $L_{Aeq,15hr}$ and $L_{Aeq,9hr}$ for traffic noise assessment. **Table 3-4** presents the measured levels and assumed $L_{Aeq,15hr}$ and $L_{Aeq,9hr}$ levels.

Table 3-4 Existing Traffic Noise Levels – Bullecourt Avenue, dBA

Location	Noise Level	
Attended 21 June 2022, 3.00pm-3.15pm	L_{Aeq} 73 dBA	
Unattended 21 June 2022, 3.00pm-3.15pm	L_{Aeq} 56 dBA	
Measured at rear 21 June to 30 June 2022	$L_{Aeq,15hr}$ 54 dBA	$L_{Aeq,9hr}$ 50 dBA
Assumed 5 m from nearest lane	$L_{Aeq,15hr}$ 71 dBA	$L_{Aeq,9hr}$ 67 dBA
Assumed at façade 15 m from nearest lane	$L_{Aeq,15hr}$ 66 dBA	$L_{Aeq,9hr}$ 62 dBA

4 OPERATIONAL NOISE CRITERIA

The *Noise Policy for Industry (NPfI)* guideline is considered appropriate to develop noise criteria to assess the impact from the noise emissions associated with the proposal that may impact the surrounding receivers.

The emission of noise and potential noise impact from the operation of the proposed development is to be assessed with respect to the site-specific noise trigger levels based on the *NPfI*. The assessment procedure has two components: intrusiveness and amenity.

4.1 Intrusiveness noise level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the RBL is determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5 dBA.

The intrusiveness noise levels for the surrounding residential receivers are presented in **Table 4-1**.

Table 4-1 Project Intrusiveness Noise Level

Receiver	Time of Day	Intrusiveness Noise Level $L_{Aeq,15min}$ dBA
R07 and R08	Day	50
	Evening	50
	Night	44

4.2 Amenity noise level

The project amenity trigger level sets limits on the total noise level from all industrial noise sources affecting a receiver. Different amenity noise levels apply for different types of receivers (e.g. residential, commercial, industrial – or for areas specifically reserved for passive recreation) and different areas (e.g. urban, suburban, rural). The amenity noise level applies to the $L_{Aeq,period}$ during the full day (or evening or night). To ensure that industrial noise levels remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise. This is calculated as the recommended amenity noise level for the receiver type minus 5 dBA. Where noise sources are not continuous for the whole period it is allowable to add 3 dB to convert from a period level to a 15-minute level.

Table 4-2 below presents the relevant project amenity noise levels, determined in accordance with the *NPfI*. The residential receivers have been classified as suburban receivers.

Table 4-2 Project Amenity Noise Level

Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,period}$ dBA	Project Amenity Trigger Level $L_{Aeq,15min}$ dBA
Residence (Urban)	Day	55	53
	Evening	45	43
	Night	40	38

4.3 Sleep Disturbance Screening Level

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night time need to be considered.

The approach recommended by the *NPfI* is to apply the following initial screening noise levels:

- $L_{Aeq,15min}$ 40 dBA or the prevailing RBL + 5 dB, whichever is the greater; and/or
- L_{AFmax} 52 dBA or the prevailing RBL + 15 dB, whichever is the greater.

The sleep disturbance screening noise levels apply outside bedroom windows during the night period. It should be noted, the sleep disturbance criteria do not apply to receivers within an industrial zone.

Where the screening noise levels cannot be met, a detailed maximum noise level event assessment should be undertaken. It may also be appropriate to consider other guidelines including the NSW *Road Noise Policy* (RNP) which contains additional guidance relating to potential sleep disturbance impacts.

4.4 Project Noise Trigger Levels

The resulting project noise trigger levels (PNTL) are shown in **Table 4-3** and include the sleep disturbance (screening) levels.

Table 4-3 Project Noise Trigger Level, dBA

Noise Amenity Area	Time of Day	PNTL	Noise Descriptor
Residenital	Day	50	$L_{Aeq,15min}$
	Evening	43	$L_{Aeq,15min}$
	Night	38	$L_{Aeq,15min}$
	Night	54	L_{AFmax}
Industrial	When in use	68	$L_{Aeq,15min}$
Education	Noisest 1-hour period when in use	45[1]	$L_{Aeq,1hr}$
Active Recreational	When in use	53	$L_{Aeq,15min}$

Note 1: The NPfI provides an internal noise limit of 35 dBA. It has been conservatively assumed that a 10 dBA reduction would be expected from a partially open window thus resulting in an external limit of 45 dBA.

5 CONSTRUCTION NOISE CRITERIA

The *Interim Construction Noise Guideline* (ICNG) provides the noise goals for construction noise to be achieved for the Project.

All construction works will be carried out during the daytime period only and it is expected that the approval will typically condition standard construction hours. Standard construction hours per the *ICNG* are typically Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm.

On this basis and specifically for residences, the construction Noise Management Level (NML) is that the noise should not exceed the RBL by more than 10 dBA.

It should be noted, the NML are considered as guidelines and not necessarily numeric noise levels to be complied with. The *ICNG* also prescribes a noise limit of 75 dBA. This limit represents the likelihood of a strong reaction from surrounding receivers. **Table 5-1** presents the application of the NML.

Table 5-1 Noise at Residences using Quantitative Assessment

Time	NML	How to Apply
Recommended Standard Hours: Mon to Fri: 7am-6pm Sat: 8am-1pm Sun/Public Holidays: No Work	Noise Affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measure L_{AEQ} is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours the very noisy activities can occur, taking into account: 1. Times identified by community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning, mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Based on the recommended NML, **Table 5-2** presents the applicable NML for construction activities.

Table 5-2 Construction NML for Residential Receivers, $L_{Aeq,15min}$ dBA

Receiver ID	Day RBL	Day NML
R07 and R08	45	55

Table 5-3 presents the applicable noise management levels for non-residential receivers.

Table 5-3 Construction NML for Non-Residential Receivers, $L_{Aeq,15min}$ dBA

Land Use	Period	NML
Industrial Premises	When in use	External 75 dBA
Education	When in use	External 55 dBA[1]
Active Recreation	When in use	External 65 dBA

Note 1: The ICNG provides an internal noise limit of 45 dBA. It has been conservatively assumed that a 10 dBA reduction would be expected from a partially open window thus resulting in an external limit of 55 dBA.

6 ROAD TRAFFIC NOISE CRITERIA

Additional traffic movements will result from both the construction and the operational phases of the Project.

The *RNP* is considered by RWDI to be the most suitable guideline to assess potential impacts at residences from both construction and operational traffic noise.

It is noted that the *RNP* is normally applied to developments which result in indefinite increases in road traffic noise rather than temporary increases associated with construction projects, however the *ICNG* does not include criteria to assess off-site construction traffic noise.

It has been assumed that during construction and operation the majority of traffic from the Project will be via Horsley Road before connecting onto M5 or Milperra Road. Based on this approach, the impact of the traffic generated by this proposal will potentially impact residential receivers located along some sections of Bullecourt Avenue.

Considering all the variety of development categories within the *RNP*, the relevant criteria are summarised in **Table 6-1** and apply to all traffic along Bullecourt Avenue.

Table 6-1 Road Traffic Noise Criteria – Residences

Type of Development	Assessment Criteria	
	Day (7am–10pm)	Night (10pm–7am)
Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)

In addition, for existing residences and other sensitive land uses affected by additional traffic on existing roads and where the criterion is exceeded, any increase in the total traffic noise level should preferably be limited to 2 dB. The *RNP* considers that a 2 dB increase is typically not noticeable.

It is worthy to note that the EPA defines periods for on-site noise differently to that defined for road traffic (along the road network). For road traffic noise along the road network, the daytime period is defined as the time between 7.00am and 10.00pm and night time is between 10.00pm and 7.00am.

7 CONSTRUCTION VIBRATION CRITERIA

The warehouse operation of the Project is not expected cause any vibration impacts as it primarily includes vehicles manoeuvring on the site. Therefore, vibration impacts have only been considered for construction activities.

The relevant standards and guidelines for the assessment of construction vibration are summarised in **Table 7-1**.

Table 7-1 Construction and Vibration Standards and Guidelines

Item	Standard/Guideline
Structural Damage	British Standard BS 7385 – Part 2-1993 – Evaluation and measurement for vibration in buildings Part 2
Human Comfort (Tactile Vibration)[1]	Assessing Vibration – A technical Guideline (AVATG)

Note 1: This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard *was* superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings - Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive, or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities.
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities.
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

7.1 Cosmetic Damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 "*Explosives – Storage and Use – Part 2: Use of Explosives*" recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 "*Evaluation and measurement for vibration in buildings Part 2*", as they "*are applicable to Australian conditions*".

The British Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 7-2**.

Table 7-2 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	N/A
Un-reinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

The Standard states that the guide values in **Table 7-2** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

The British Standard goes on to state that "Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity". In addition, a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

7.2 Human Comfort

The assessment of intermittent vibration outlined in the NSW EPA guideline *Assessing Vibration: A Technical Guideline* (AVTG) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in **Table 7-3**. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 7-3 Preferred and Maximum Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime [1] Preferred	Daytime Max	Night time Preferred	Night time Max
Critical Areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, Schools, Educational Institutions and Places of Worship	0.4	0.8	0.4	0.8
Workshops	0.8	1.6	0.8	1.6

Table C1.1 of the *AVTG* (reproduced below in Table 7-4) also provides the criteria in alternative units.

Table 7-4 Preferred and Maximum Peak Velocity Values for Impulsive Vibration (mm/s)

Location	Time of Day	Preferred	Maximum
Critical Areas	Day or Night	0.14	0.28
Residences	Day	8.6	17.0
	Night	2.8	5.6
Offices, Schools, Educational Institutions and Places of Worship	Day or Night	18.0	36.0
Workshops	Day or Night	18.0	36.0

No peak velocity values are provided for intermittent vibration in Table C1.1 of the AVTG. As such, the value for impulsive vibration have been considered most applicable and has been presented.

8 OPERATIONAL NOISE ASSESSMENT

8.1 Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithm in the CadnaA modelling software. CONCAWE and CadnaA have both been accepted by the NSW EPA for use in previous environmental noise assessments and has been widely used in Australia. CONCAWE is explicitly recommended in the SA EPA and VIC EPA technical guidelines for noise assessments.

Noise modelling was conducted for day, evening, and night time as the warehouses would be operating 24 hours per day.

The noise model was constructed from a combination of aerial photography, existing ground topography, and design ground topography for the development. The local terrain, design of the development, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the operations of the development and surrounding environment. **Table 8-1** summarises the noise modelling parameters.

Table 8-1: Noise Modelling Parameters

Parameter	Comment
Noise Model	CadnaA 2022 MR1 applying CONCAWE noise prediction algorithm
Terrain	5m Contours Lines derived from Geoscience Australia LiDAR 5m Grid
Ground Absorption	0.5

8.2 Meteorological Effects

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly temperature inversions and gradient winds. Where these factors are a feature of an area their effect on resultant noise levels should be considered.

The *NPfI* defines standard meteorological conditions and noise-enhancing meteorological conditions to be considered for the assessment. The definition of those conditions is provided in Table D1 of Fact Sheet D, which is reproduced in **Table 8-2** below.

Table 8-2 Standard and Noise-Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard	Day/evening/night: stability categories A-D with wind speed up to 0.5 m/s at 10 m AGL.
Adverse	Daytime/evening: stability categories A-D with light winds (up to 3 m/s at 10 m AGL). Night time: stability categories A-D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Notes: m/s = metres per second; m = metres; AGL = above ground level; where a range of conditions is nominated, the meteorological condition delivering the highest predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise-enhancing conditions as relevant. All wind speeds are referenced to 10 m AGL. Stability categories are based on the Pasquill-Gifford stability classification scheme.

The *NPfI* provides two options when considering meteorological effects. The first option has been adopted for this assessment:

1. Conservatively adopt noise-enhancing meteorological conditions without processing meteorological data local to the site; or
2. Determine the significance of noise-enhancing meteorological conditions based on meteorological data local to the site and adopt significant noise-enhancing conditions for the assessment. Where noise-enhancing meteorological conditions are deemed non-significant, standard meteorological conditions may be adopted.

8.3 Modelled Noise Sources

Noise sources including onsite vehicle movements, forklift operation and internal warehouse activity have been modelled throughout the development. As details of specific items and exact usage of warehouse facilities are not yet known, a conservative approach to modelling has been conducted.

The following noise level data for vehicle-related noise sources has been used for the assessment. These noise levels are taken from RWDI's internal database and external assessments of similar subject sites.

Table 8-3 Operational Noise Sound Power Levels

Noise Source	Noise Characteristic	Sound Power Level
Forklift operational on hardstand	Quasi-steady	93 L_{Aeq}
Light Vehicles on site, up to speed of 40 km/h	Quasi-steady	90 L_{Aeq}
Heavy Vehicle[1] @ 25 km/h	Quasi-steady	106 L_{Aeq}
Heavy Vehicle[1], reversing @ 5 km/h	Quasi-steady	111 L_{Aeq}

Note 1: Heavy vehicle defined as any cargo vehicle with three or more axles with gross vehicle weight > 12,000 kg.

8.4 Modelled Onsite Vehicle Movements

Worst case hour onsite vehicle movements were provided by the client on behalf of the traffic consultants CBRK Pty Ltd. It has been assumed that this worst case hour could occur at any period of the day (day, evening, or night).

The vehicle movements have been modelled to reflect realistic operations, with heavy vehicles accessing and manoeuvring hardstand areas to load and unload items via forklift and light vehicles utilising carparking facilities.

Summary of worst-case hourly vehicle movements for each assessment period is presented below in **Table 8-4**.

Table 8-4 Worst-case Hourly Vehicle Movements

Level	Light Vehicle	Heavy Vehicle	Total
Ground Floor	48	6	54
Level 1	0	6	6

8.5 Modelled Line Sources

Light vehicles are represented as line sources travelling 40 km/hr with a sound power level (L_w) of 90 dBA and a height of 0.5 m.

Heavy vehicle traffic movements on the access handle are represented as line sources travelling 25 km/hr with a L_w of 106 dBA.

Heavy vehicle movements over hardstand and loading areas have been modelled travelling at 5 km/hr with a L_w of 106 dBA, respectively. Locations where vehicles require greater engine capacity, such as accelerating from a stationary position, cornering, or accessing entry/exit ramps have been modelled as line sources travelling 5 km/hr with a L_w of 111 dBA for heavy vehicles.

Heavy vehicles reversing into delivery docks, including reversing alarm and airbrake release have been modelled as a single line source with L_w of 115 dBA, respectively. Duration of heavy vehicle reversing is assumed to be not greater than 30 seconds and includes reversing alarm and air-break release events.

Source height for medium and heavy vehicles is 1.5 m with the exception of the reversing alarm and air-brake release modelled at 1 m.

A figure showing the locations of the onsite traffic movements is provided in Appendix B.

8.6 Modelled Fixed Sources

Fixed noise sources such as mechanical plant and forklifts have been modelled throughout the development.

External gas-powered forklifts have been modelled as point sources with a L_w of 93 dBA at 1 m in height. It has been assumed that forklifts would operate continuously during any one 15-minute period. One forklift has been modelled operating externally on the hardstand areas for each of the warehouses.

Fixed noise sources with a reference sound power level (80 dBA) have been modelled at rooftop locations around the development to provide a worst-case prediction of noise impacts on the surrounding sensitive receivers. By predicting the noise levels at the sensitive receivers using this method, we are able to determine the maximum sound power level of plant items required to meet the noise criteria.

Mechanical plant serving the proposed development will require review to determine potential noise impacts prior to issue of a construction certificate. Upon final selection, noise emissions from plant to be installed should be compared with the project noise trigger levels listed in **Table 4-3**. Considerations must be made such that the cumulative noise emissions from mechanical plant and other operational noise sources do not exceed the project noise trigger level.

8.7 Predicted Operational Noise Levels

Table 8-5 presents the predicted noise levels for the proposed operations. **Figure 8-1** to **Figure 8-3** presents operational noise contours. **Table 8-5** indicates that noise levels from the operation of the Project will comply with all relevant PNTLs.

Table 8-5 Predicted Operational Noise Levels at Representative Receivers, $L_{Aeq,15min}$ dBA

Receiver	Predicted Noise Level			PNTL		
	Standard Met	Adverse Day/Evening	Adverse Night	Day	Evening	Night
R01	68	68	68	68		
R02	67	67	67	68		
R03	54	54	54	68		
R04	40	40	40	68		
R05	27	28	28	45		
R06	25	26	26	53		
R07	28	29	29	50	43	38
R08	24	25	25	50	43	38

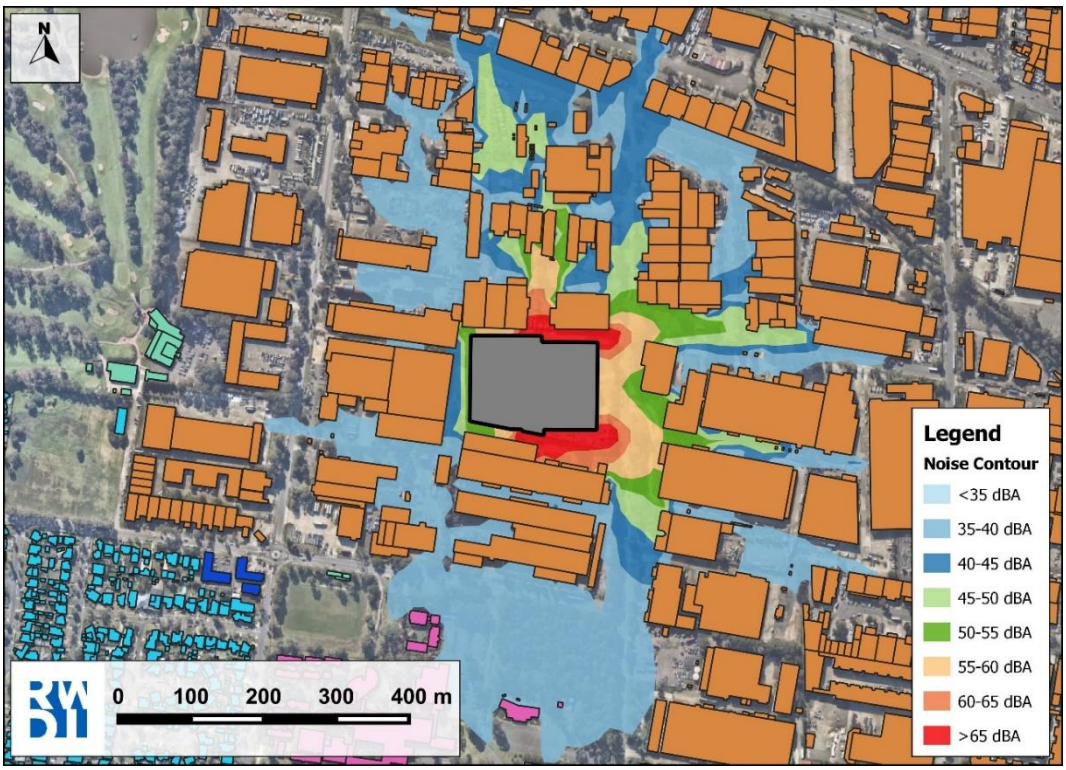


Figure 8-1 Noise Contour – Standard Met Day and Evening

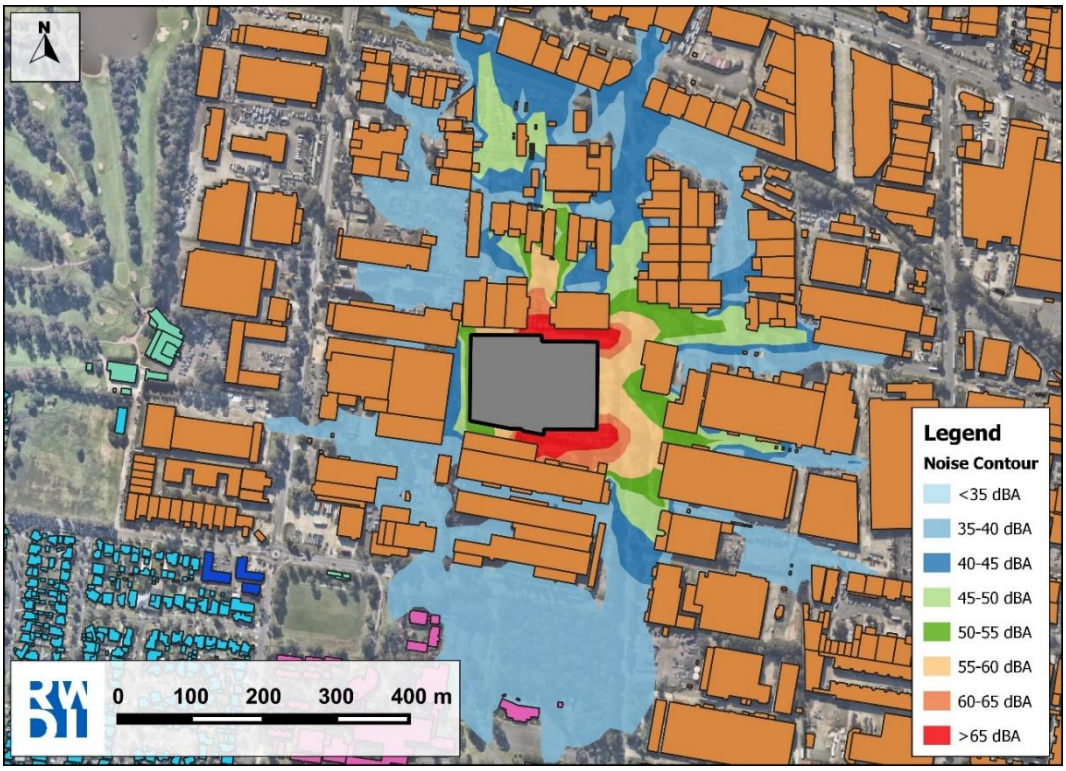


Figure 8-2 Noise Contour – Adverse Met Day and Evening

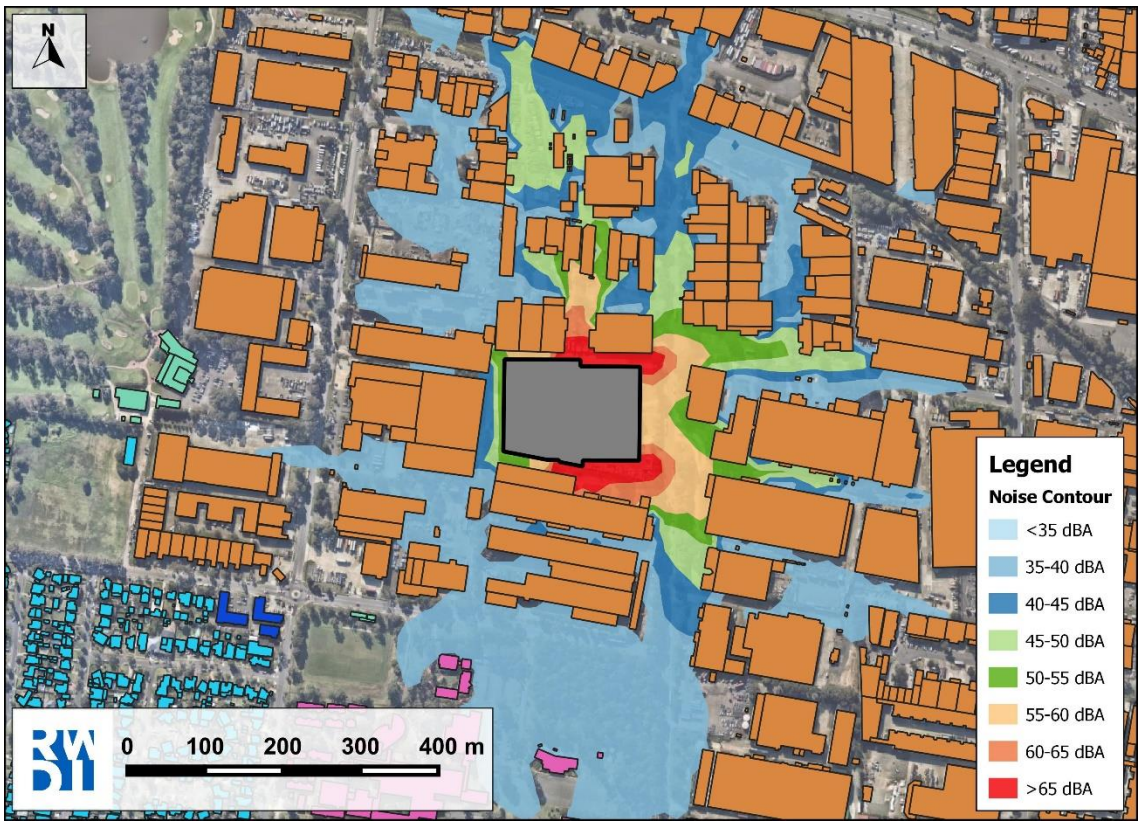


Figure 8-3 Noise Contour – Adverse Met Night

8.8 Sleep Disturbance

As the Project proposes to operate 24 hours per day, noise emissions during the night time period require an assessment for potential sleep disturbance at the nearest noise sensitive receivers. A summary of the L_{Amax} sound power levels of typical activities that may occur at the facility with the potential to cause sleep disturbance is presented in **Table 8-6**.

Table 8-6 Sleep Disturbance Noise Events

Noise Source	L_w L_{AMax}	Source Height
Truck Engine Starting	100	2 m
Reversing Alarm	111	1 m
Roller Door	94	4 m
Forklift loading / unloading	100	2 m
Air Brake Release	115	1 m

Review of **Table 8-6** indicates that air brake release could have the greatest impact on sleep disturbance at surrounding residential receivers. The predicted night time L_{Amax} noise levels at the nearest receivers is presented in **Table 8-7** and complies with the screening level of the *NPfI*. L_{Amax} calculations include noise enhancing metrological conditions as described in Section 8.1.

Table 8-7 Predicted Night Time L_{Amax} Levels

Receiver	Screening Level	Predicted Level	Exceedance
R07	54	38	0
R08	54	29	0

8.9 Recommended Mitigation and Management

Although noise predictions have indicated compliance with the noise trigger levels, appropriate noise mitigation and management measures should be implemented to ensure noise impacts from the Project is minimal. These could include:

- Turning off all engines when not required
- Where possible, schedule heavy vehicle movements to day and/or evening periods
- Minimise use of reversing alarms or alternatively installing “squawkers” for forklifts
- Training of staff and employers should include noise awareness component, community consultation and response to complaints
- Keeping roller shutter doors closed when not in use

9 CONSTRUCTION NOISE ASSESSMENT

9.1 Noise Modelling

Noise modelling methodology is consistent with what was applied for operational noise assessment, see Section 8.1.

Construction is proposed to only occur during the standard hours and so only daytime predictions have been completed.

9.2 Construction Equipment Noise Source Levels

At this stage, a detailed list of equipment likely to be used during the construction project was not provided. Therefore, based on experience from similar projects, the construction project is divided into three separate work stages. The typical equipment expected to be used is also assumed in each construction stage. The stages and assumptions include:

- Stage 1: Site Clearing, Demolition, and Earthworks
  - Typical plant will be dozer/front end loader, haul trucks, and excavators
  - It has been assumed that no rock-breaking would be required.
  - Total sound power level for such works is typically 112 dBA to 118dBA
- Stage 2: Concrete Works
  - Bored piling/auger expected in this stage initially
  - Concrete trucks and pumps will largely dominate the main works in this stage
  - Total sound power level for such works is typically 105dBA to 109dBA for bored piling but during the concreting part of this stage, typically 108dBA to 115dA is expected depending on the number of teams of trucks and pumps.
- Stage 3: Building Construction
  - This stage is largely expected to include truck deliveries, cranes, and the use of elevated platforms and powered hand tools.
  - There will be up to several teams on each warehouse with expected sound power levels of 108dBA to 114dBA expected with some of the work elevated to greater than 10m when roofing works are being conducted.

Given the early stage of the Project, preliminary assumptions to provide noise predictions are provided in **Table 9-1**. These assumptions can be revisited at detailed design stage and once a construction contractor has been appointed.

Table 9-1 Indicative Construction Noise Source Levels, $L_{Aeq,15min}$ dBA

Stage	Total Sound Power Level
Stage 1 – Site Clearing, Demolition, and Earthworks	118
Stage 2 – Concrete Works	115
Stage 3 – Building Construction	114

9.3 Predicted Construction Noise Levels

Predictions assume a "typical worst-case" scenario whereby all the plant is running continuously. As such, the impact predictions represent the likely noise levels that would occur during intensive periods of construction. The presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction stages occur.

Based on the above, resultant noise levels at receivers have been predicted, as shown in **Table 9-2**. **Table 9-2** indicates that construction noise levels are expected to comply with the relevant NMLs at all representative receivers.

Table 9-2 Construction Noise Predictions, $L_{Aeq,15min}$ dBA

Receiver ID	Predicted Noise Level			NML Daytime
	Stage 1	Stage 2	Stage 3	
R01	70	67	66	75
R02	69	65	64	75
R03	68	63	62	75
R04	70	66	65	75
R05	31	28	27	55
R06	34	32	31	65
R07	35	33	32	55
R08	33	31	30	55

9.4 Construction Noise Management

9.4.1 Noise Management Control

The predicted noise levels comply with the NMLs for all receivers. However, noise management control measures should be implemented in order to minimise and prevent impacts on the surrounding receivers.

Prior to commencement of works, it is recommended that a Construction Noise and Vibration Management Plan (CNVMP) should be prepared and implemented in accordance with the requirements of the *ICNG*, and the recommendations documented herein. The CNVMP should take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable. Reasonable and feasible noise mitigation measures should be outlined to reduce the noise impact from construction activities. The following preliminary controls are recommended:

- *Site Induction Training* – Training should include noise awareness component, community consultation and response to complaints as provided in the CNVMP.
- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Site Noise Planning* – Where practical, the layout and positioning of fixed noise-producing plant and activities away from the nearby receivers.
- *Scheduling* – Where practical, minimise the number of tools and machines operating simultaneously.
- *Plant Equipment* – Where possible, plant and equipment with a low sound power level should be selected while still maintaining efficiency of function.

9.4.2 Community consultation

Consultation with and the provision of information to the surrounding community is regarded as a major factor in controlling the negative reaction to the inevitable impacts associated with construction works. Contact details should be prominently displayed on the site boundary fence.

9.4.3 Response to complaints

Should ongoing complaints of excessive noise and vibration impacts occur, measures shall be undertaken to investigate the complaint, the cause of the complaint identified and changes to work practices implemented by the contractor.

Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated. If a noise and vibration complaint is received the complaint should be recorded. The complaint form should list:

- The name and location of the complainant (if provided) as well as the time, date and nature of the complaint received.
- The name of the employee who received the complaint, actions taken to investigate the complaint, and a summary of the results of the investigation.
- Required remedial action, if required.
- Validation of the remedial action by a site manager.
- Summary of feedback to the complainant.

A permanent Register of Complaints should be held. All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable:

- measurements at the affected receiver;
- an investigation of the activities occurring at the time of the incident;
- inspection of the activity; and
- whether work practices were being carried out either within established guidelines or outside these guidelines.

10 CONSTRUCTION VIBRATION ASSESSMENT

Vibration intensive works that may occur during the proposed works would be limited to the use of pile boring during the concrete works stage.

The Transport for NSW *Construction Noise and Vibration Strategy* suggests safe working distances between items of plant used for construction and vibration sensitive receivers. If these safe working distances are maintained, no adverse impacts from vibration intensive works are likely to occur at receivers in terms of human response or cosmetic damage.

The safe working distances shown in Table 10-1 are recommended to be adopted as criteria for the proposed works. Figure 10-1 presents these setback distances against the proposed site location. As details of the construction activities were not available at this stage, it has been conservatively assumed that vibration intensive activity would occur at across the proposed building envelope.

Table 10-1 Safe Working Distances of Vibration Intensive Equipment

Plant	Rating/Description	Cosmetic Damage	Human Response
Pile Boring	≤ 800 mm	2 m	7 m

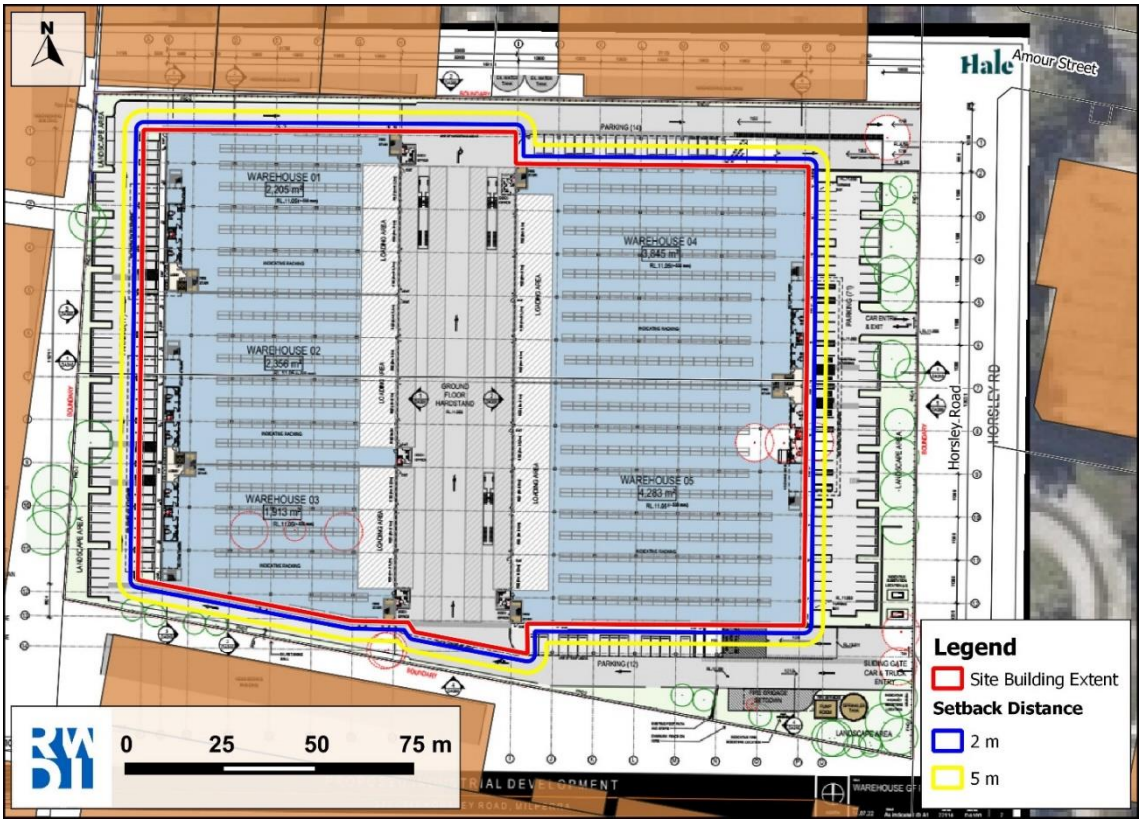


Figure 10-1 Vibration Setback Distances – Medium Hydraulic Hammer

Review of Figure 10-1 indicates that proposed vibration intensive activities are outside of the recommended safe working distances.

Nonetheless, it is recommended that within the Construction Noise and Vibration Management Plan (CNVMP), a review of proposed vibration intensive activities be completed. Vibration propagation is dependent on the local geological makeup. Attended vibration testing should be conducted at the commencement of any vibration intensive activity to confirm the dominant frequency of the vibration and the corresponding upper limit "component" peak particle velocity for nearby structures to revise the safe working distance accordingly.

The CNVMP should also employ the follow standard mitigation measures where practicable:

- Maximising the offset distance between high vibration plant items and nearby buildings.
- Substitution by alternative equipment, plant, and processes.
- Reduction vibration settings levels when operating the vibratory roller nearby buildings.
- Consultation with affected residences and business owners.

11 ROAD TRAFFIC NOISE ASSESSMENT

Additional road traffic due to the Project will have the most impact on the residential receivers on Bullecourt Avenue. RWDI has reviewed surveyed existing traffic flow information for the local road network. Flows were counted by CBRK and discussed in the *Transport and Accessibility Impact Assessment* (TAIP) prepared July 2022.

Table 11-1 presents the existing traffic volumes on the surrounding road network.

Table 11-1 Existing Two Way Peak Hour Traffic Flows

Road	Location	AM Peak Hour	PM Peak Hour
Ashford Avenue	North of Bullecourt Avenue	560	795
	South of Bullecourt Avenue	220	305
Bullecourt Avenue	West of Ashford Avenue	920	960
	West of Horsley Road	935	1040
Horsley Road	North of Amour Street	230	280
	North of Bullecourt Avenue	320	360
	South of Bullecourt Avenue	785	910
Amour Street	East of Horsley	295	315

The TAIP identified that the proposed development could generate a total of 60 vehicles per hour two-way during peak weekday morning and afternoon peak hours. This includes approximately 10-15 movements from the existing development operating at the site.

Table 11-2 presents the expected distribution of additional traffic to the surrounding road network

Table 11-2 Existing Two Way Peak Hour Traffic Flows Plus Site Generated Traffic

Road	Location	AM Peak Hour		PM Peak Hour	
		Existing	Additional	Existing	Additional
Ashford Avenue	North of Bullecourt Avenue	560	10	795	10
	South of Bullecourt Avenue	220	-	305	-
Bullecourt Avenue	West of Ashford Avenue	920	20	960	20
	West of Horsley Road	935	30	1040	30
Horsley Road	North of Amour Street	230	-	280	-
	North of Bullecourt Avenue	320	30	360	30
	South of Bullecourt Avenue	785	-	910	-
Amour Street	East of Horsley	295	20	315	20

RWDI has reviewed traffic data from RMS Station number 44043 located at Henray Lawson Drive to estimate the daily distribution of road traffic. This station was decommissioned in 2018 however is the closest to the Project.

Based on data from 2013 to 2018, an AM peak hour is expected to carry approximately 6% of the daily traffic, and the PM peak hour is expected to carry approximateý 7% of the daily traffic. 85% of the daily traffic will occur during the day period of 7am to 10pm.

Residential receivers are only located on Bullecourt Avenue, west of Ashford Avenue. **Table 11-3** presents the predicted traffic noise level increase from site generated traffic. It is assumed that the existing PM peak hour represents 7% of the daily traffic.

Table 11-3 Relative Increase in Road Traffic Noise Levels, dBA

Period	Measured Noise Level	Existing Traffic Volume	Site Generated Volume	Noise Level Increase
Day	$L_{Aeq,15hr}$ 66 dBA	11,657	450	0.2 dBA
Night	$L_{Aeq,9hr}$ 62 dBA	2,057	270	0.5 dBA

Table 11-3 indicates that the relative increase in road traffic noise levels from the operation of the Project is 0.2 dBA during the day period and 0.5 dBA during the night period. This increase will be imperceptible to receivers and will have no impact.

The TAIP estimates that construction of the development would generate up to 40 vehilcles per day during peak times. This impact is negligible and no further assessment is required.

12 CONCLUSION

RWDI has completed a noise and vibration impact assessment (NVIA) of a proposed warehouse and distribution facility located at 339-349 Horsley Road Milperra.

The NVIA has confirmed that noise emissions from operation and construction of the Project will comply with relevant regulatory guidelines. It is expected that vibration generated from the operation and construction of the Project will meet relevant standards. Additional road traffic noise generated from the Project will be minimal and meet relevant noise goals.

As such, it is expected that the noise and vibration impacts from the development of the Project is low.

12.1 Statement of Limitations

This report entitled '339-349 Horsley Road Warehouse and Distribution Centre Noise and Vibration Impact Assessment', dated 19 August 2022, was prepared by RWDI Australia Pty Ltd ("RWDI") for Tactical Group on behalf of ITP Australia TS Mid Pty Ltd ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

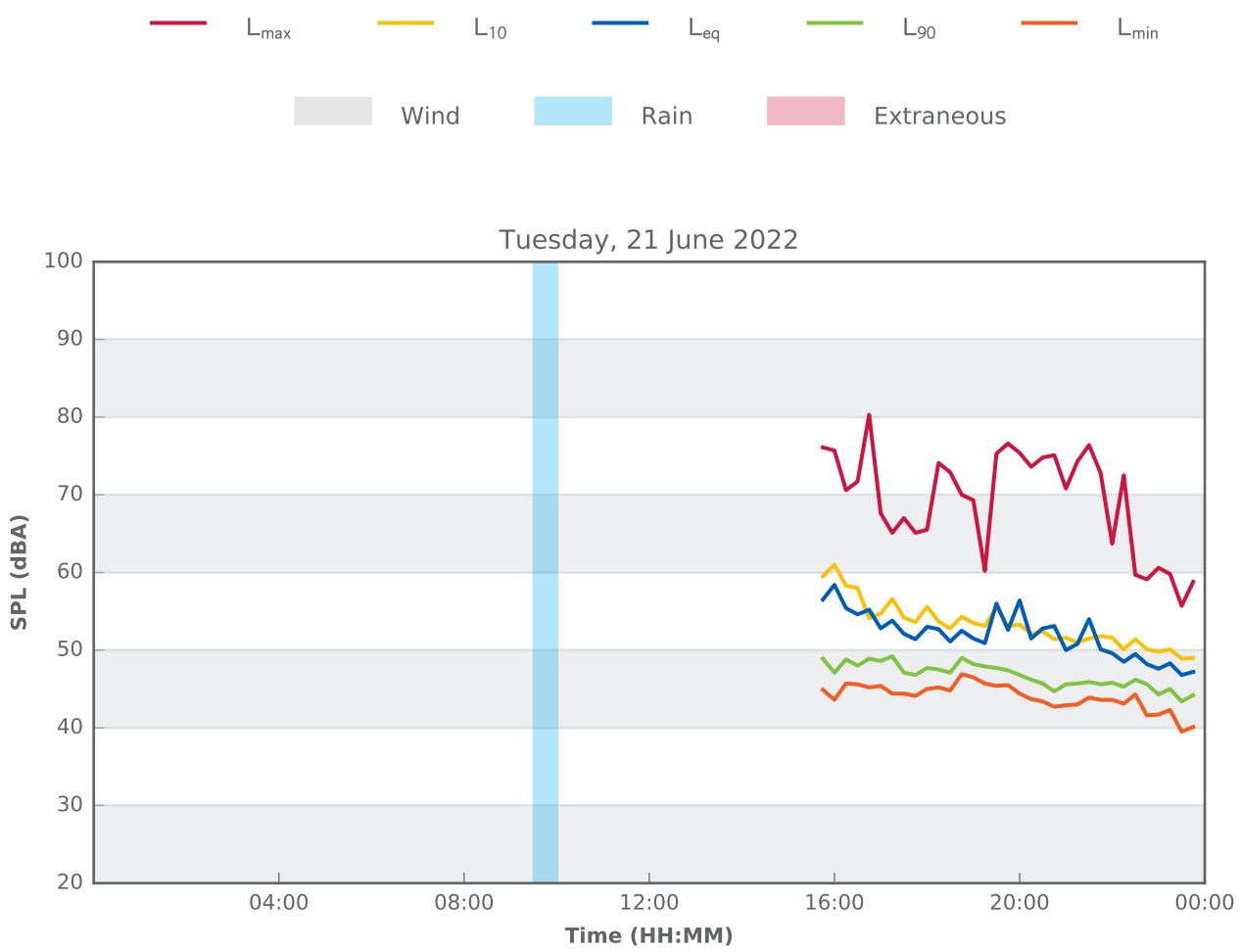
Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

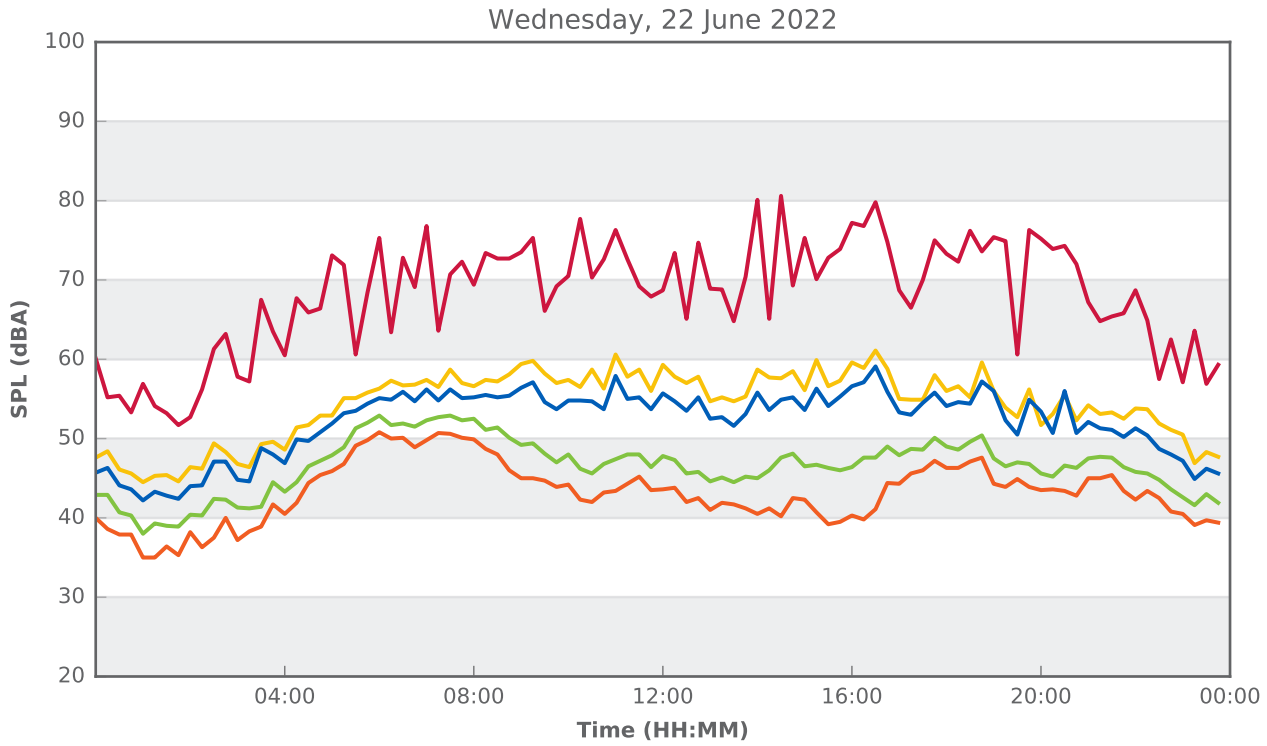
APPENDIX A

UNATTENDED NOISE MONITORING RESULTS

Noise Monitor L01 – 18 Bullecourt Avenue, Milperra

18 Bullecourt Avenue Milperra Nsw





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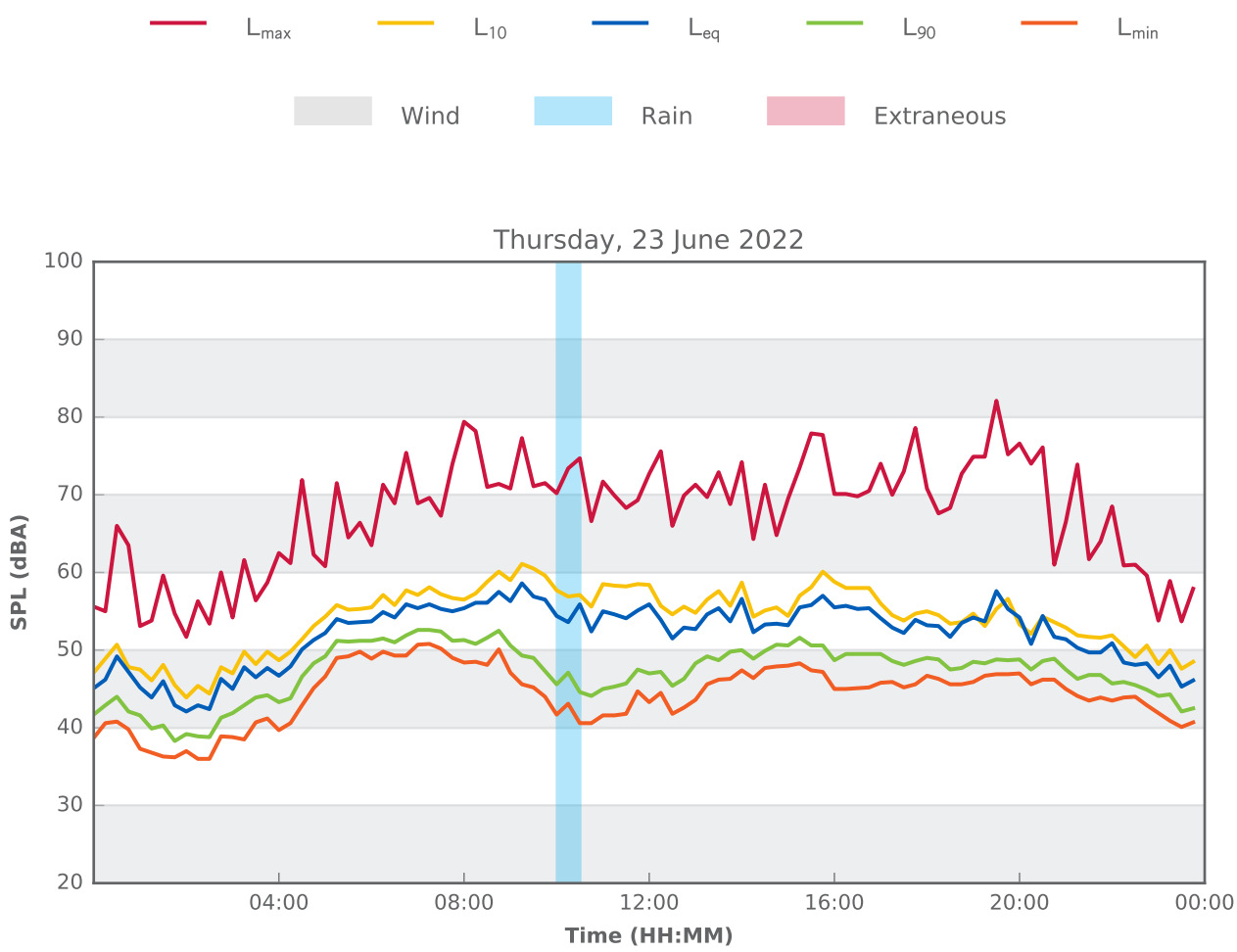

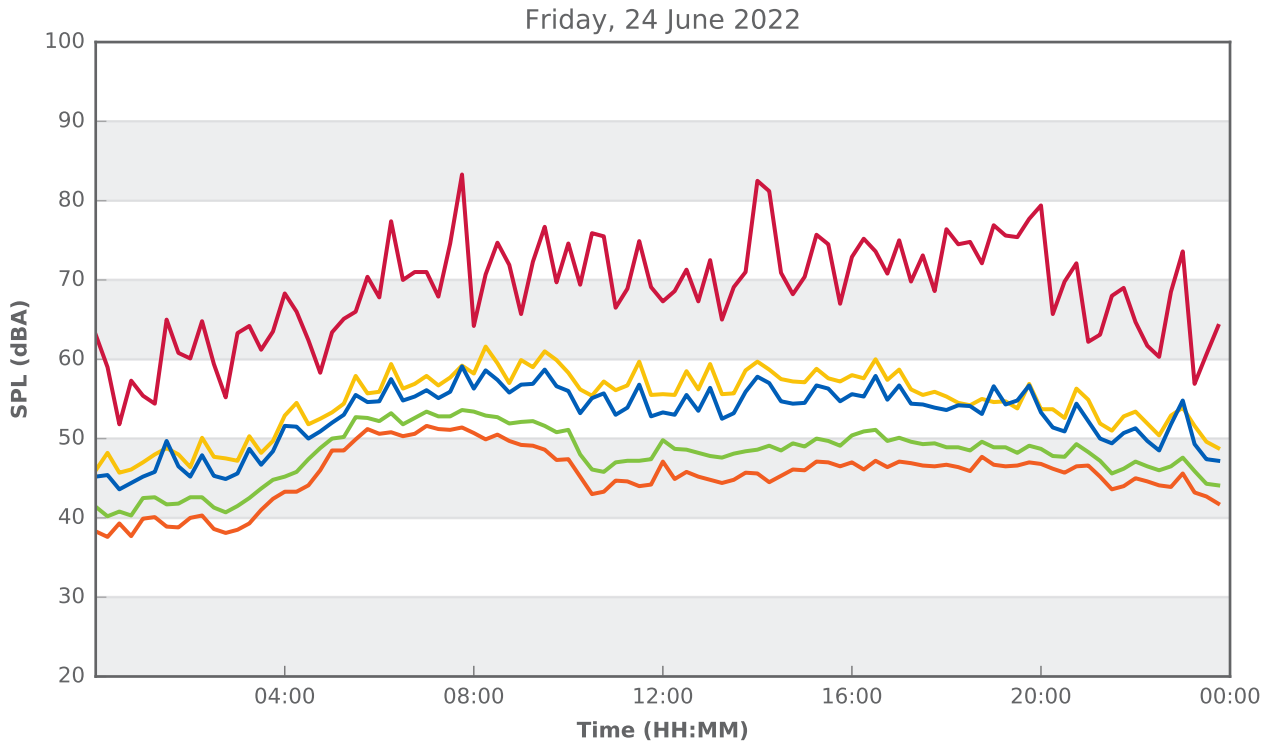

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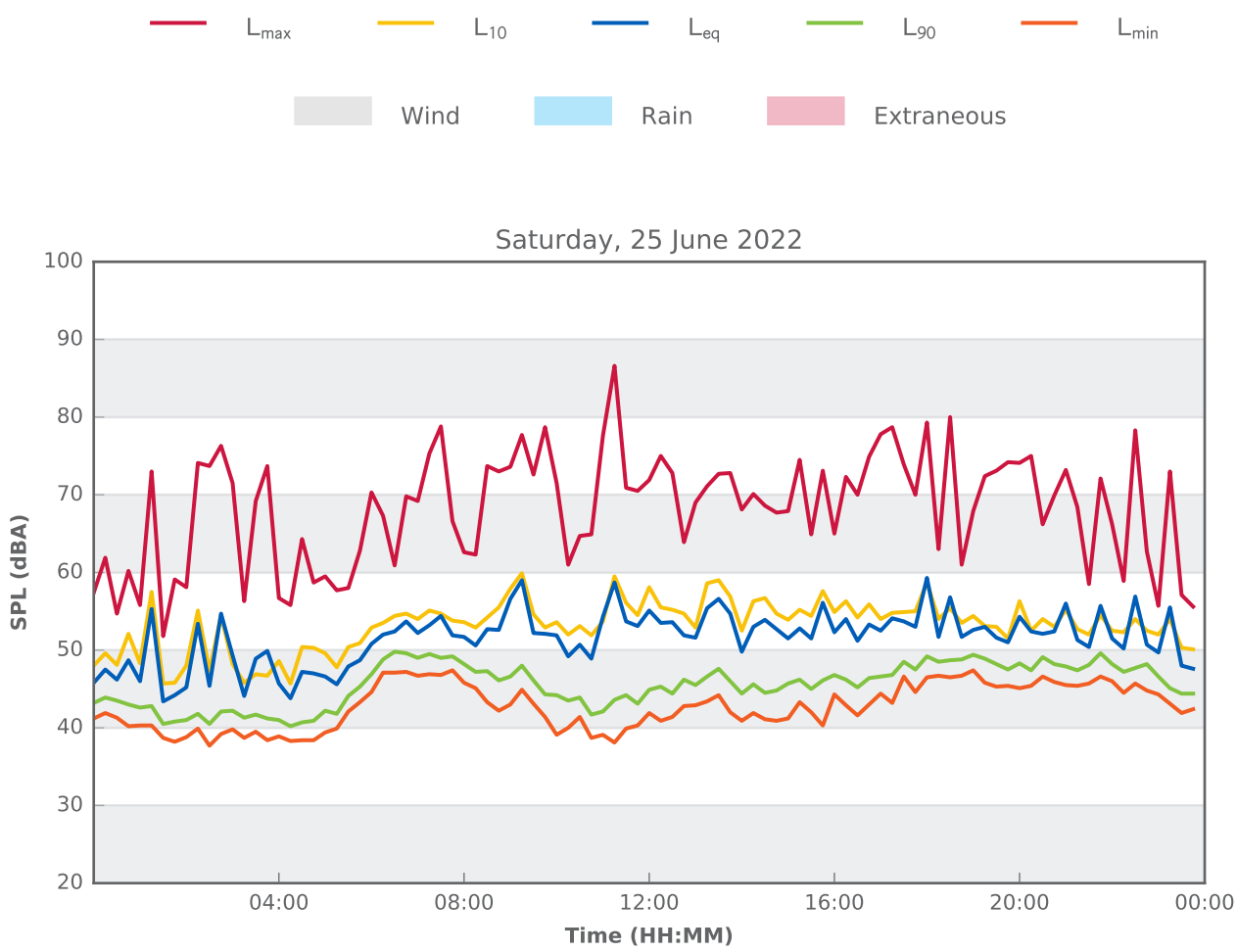

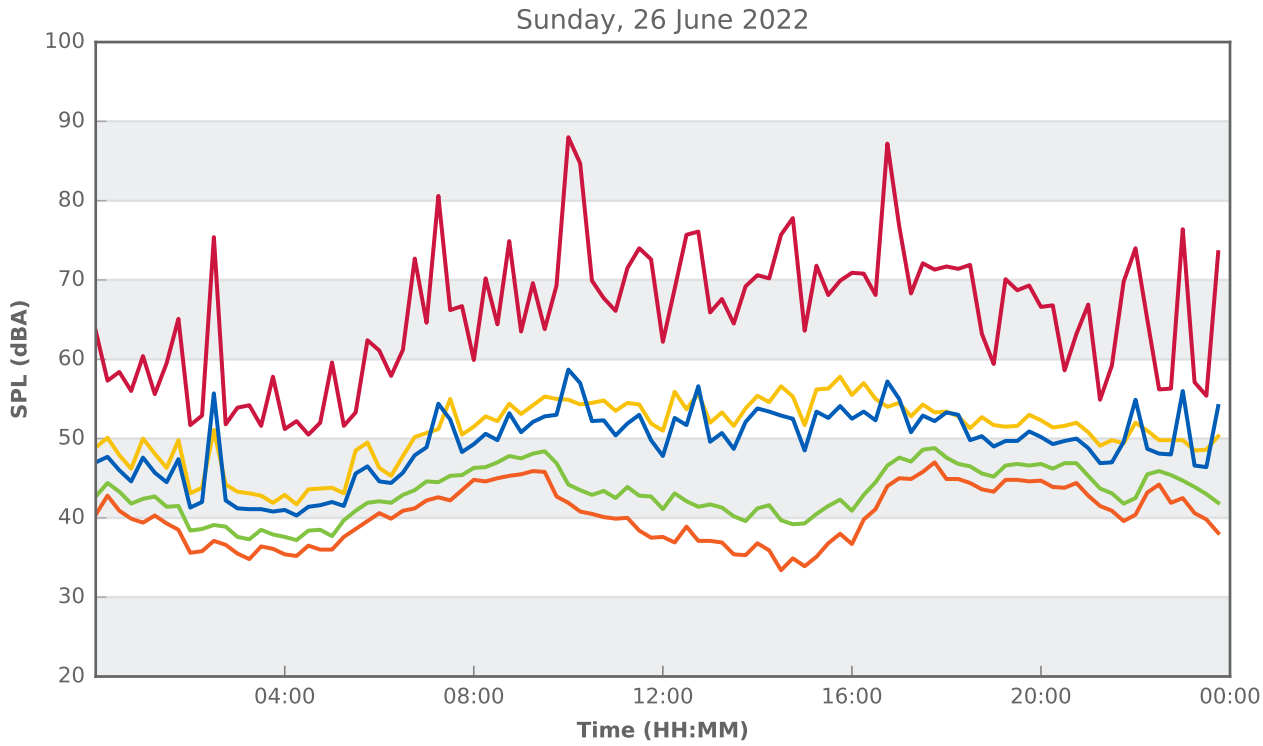

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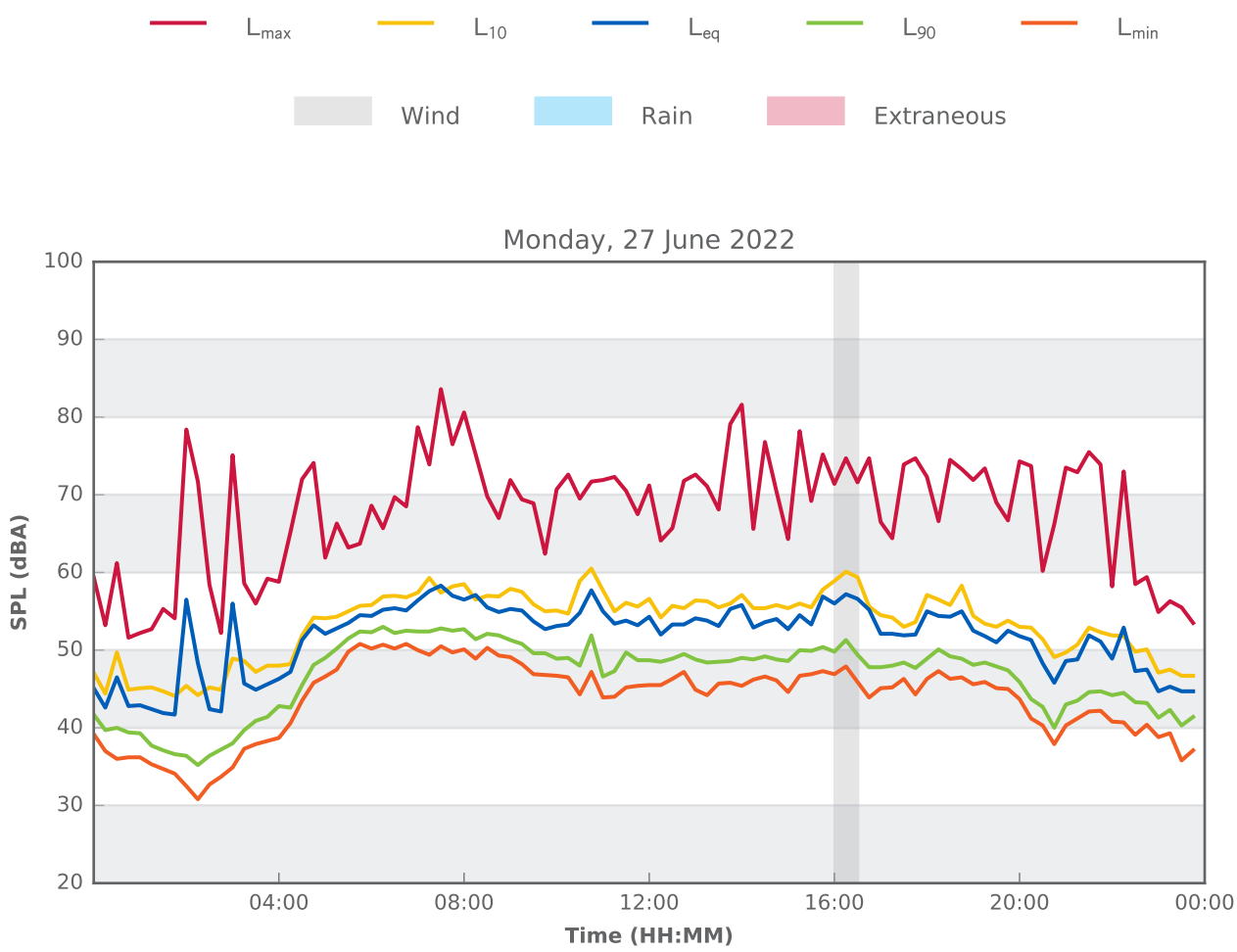

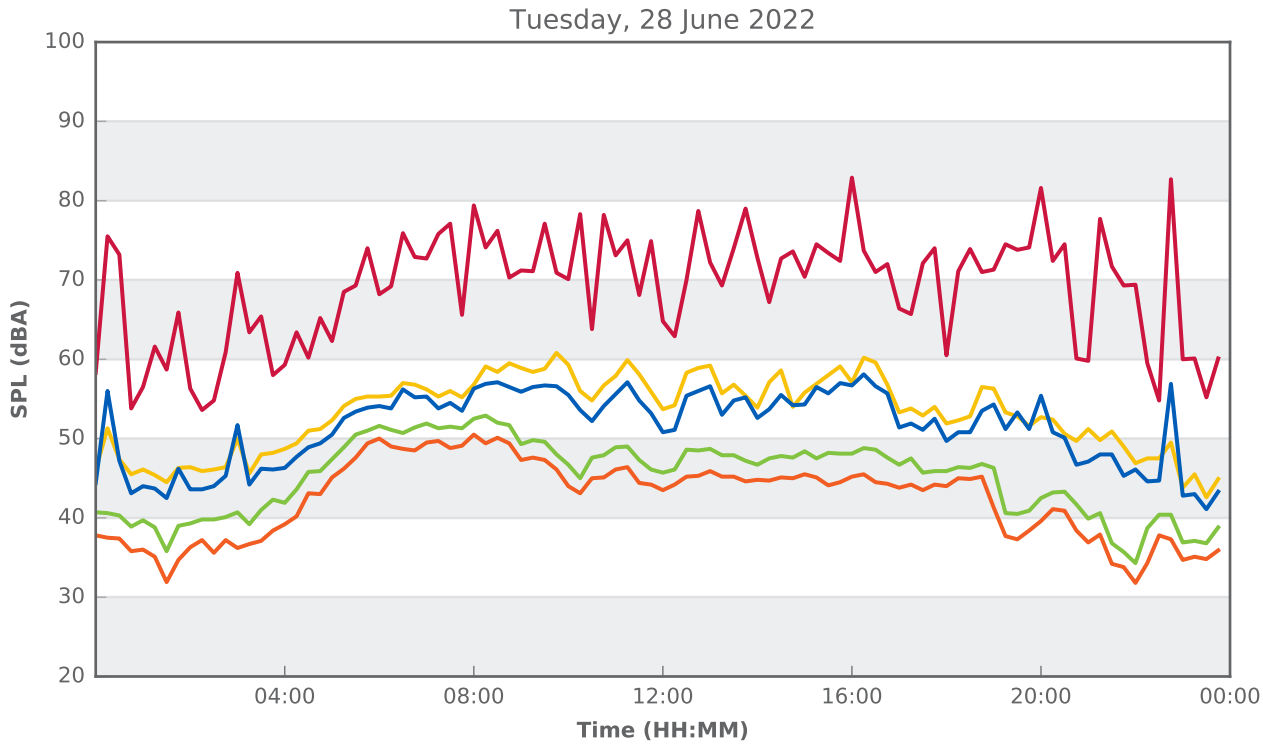

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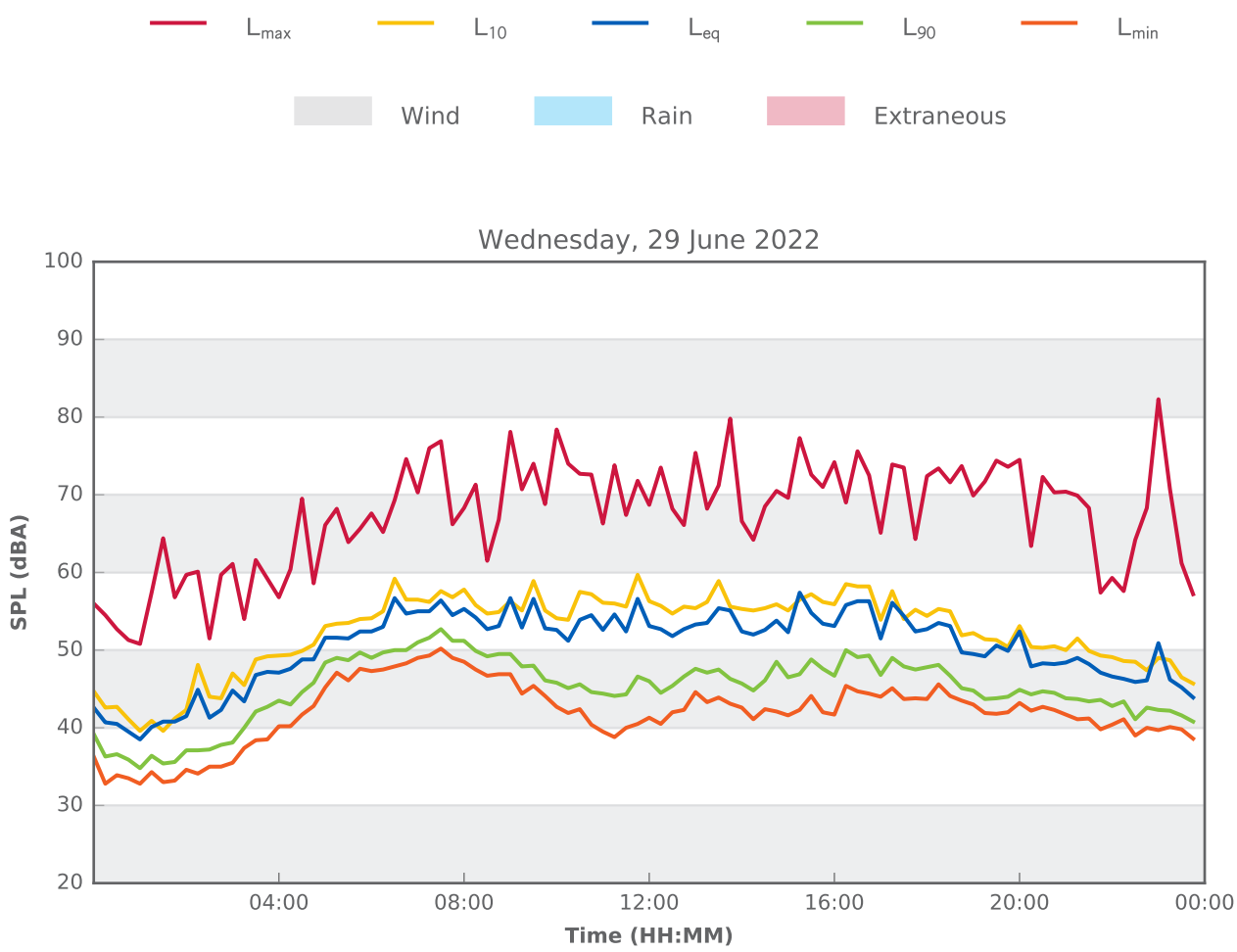

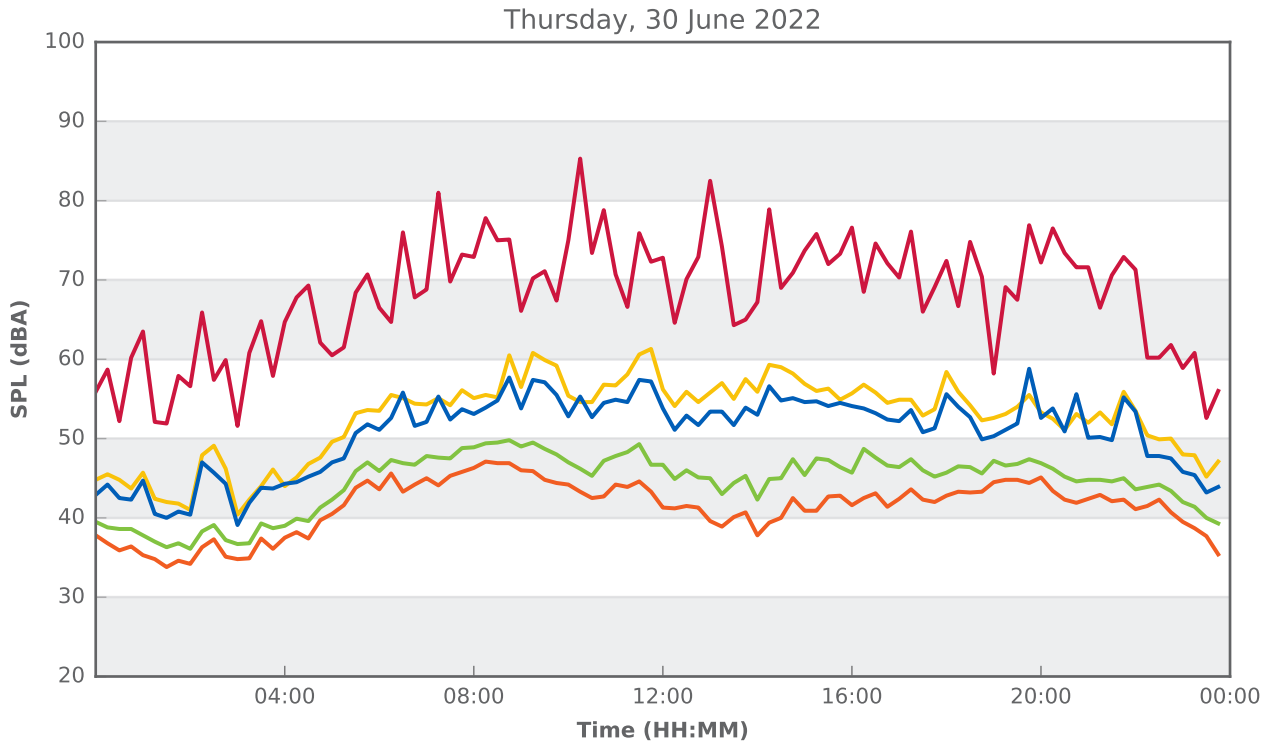

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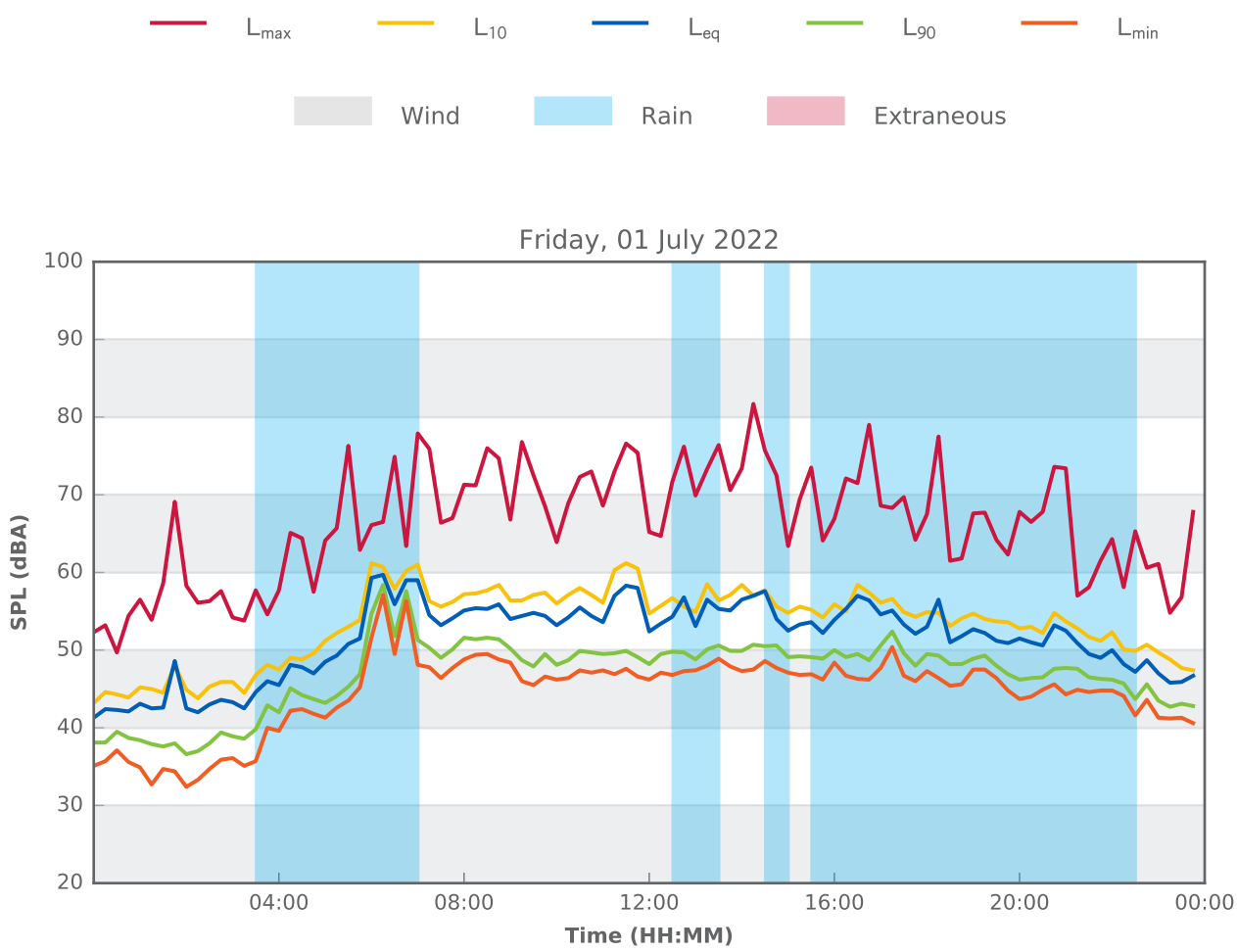

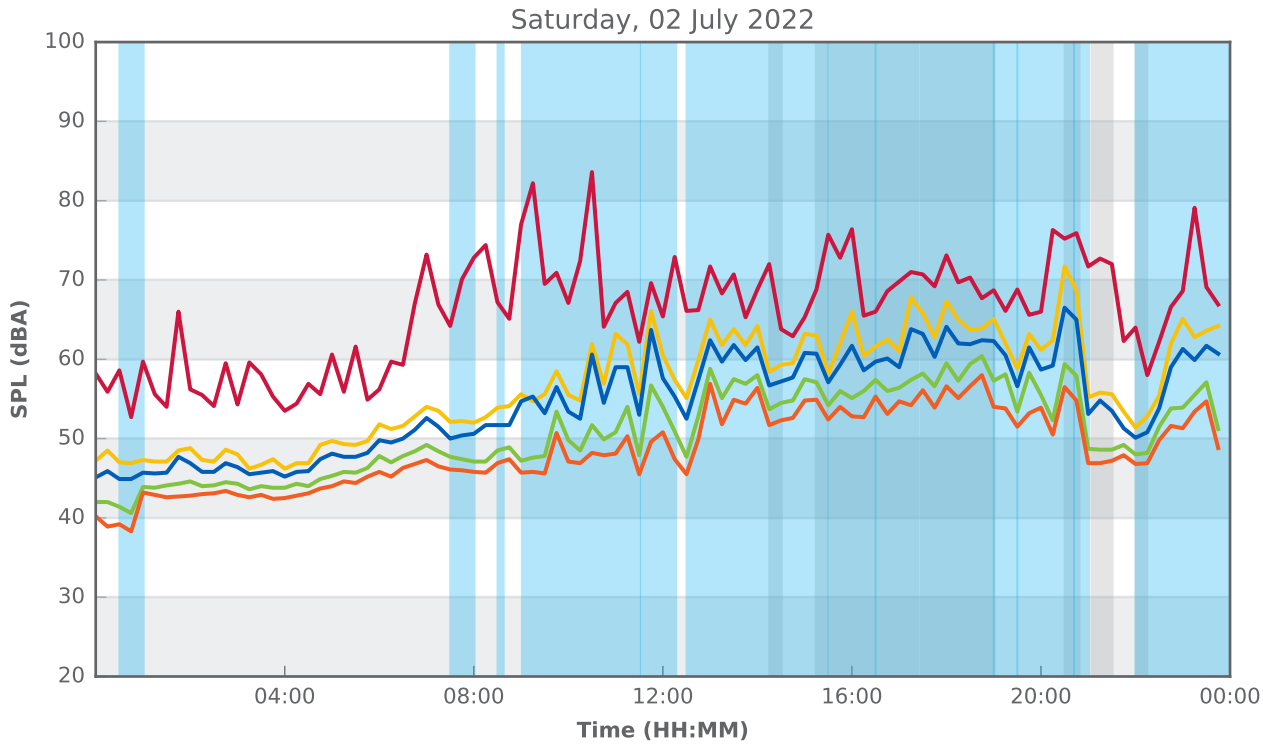

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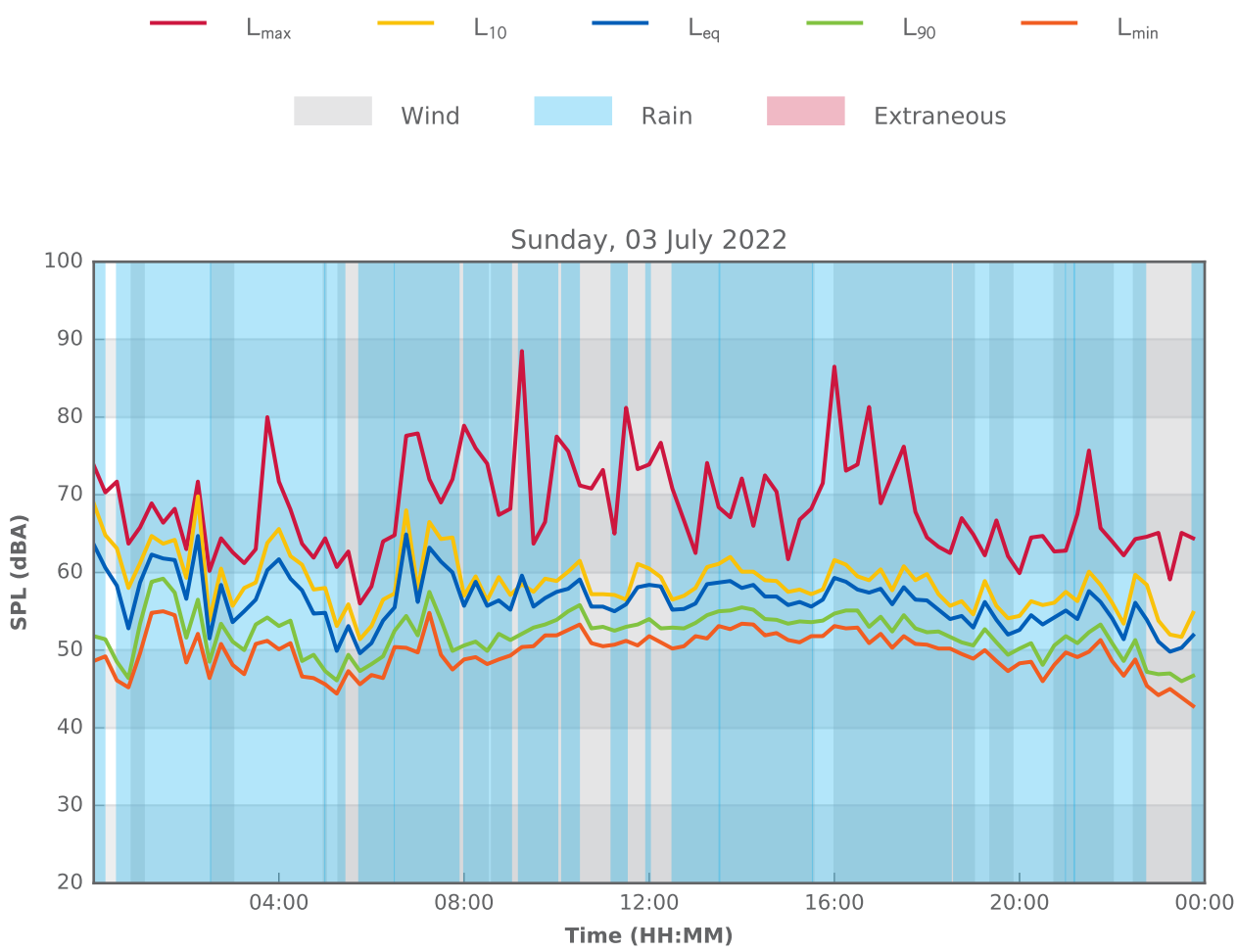

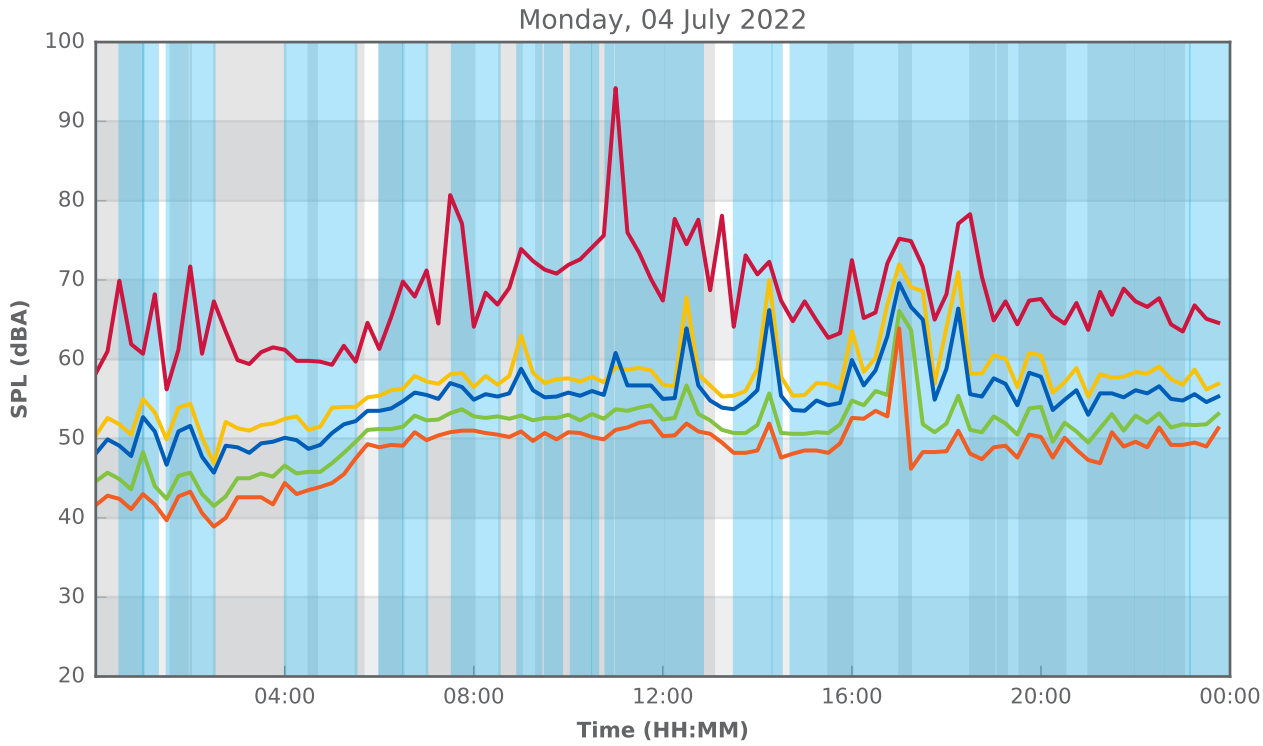

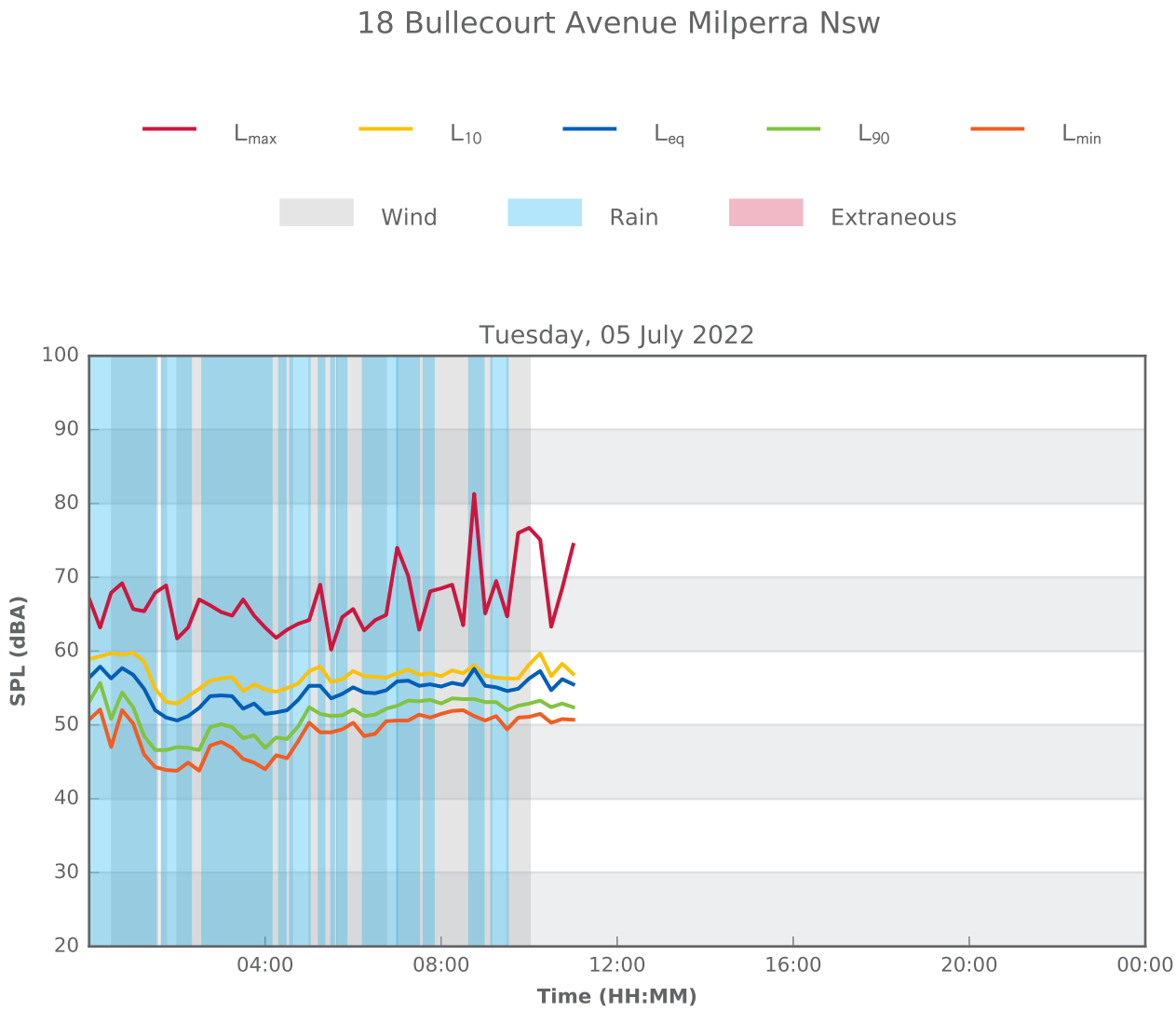
18 Bullecourt Avenue Milperra Nsw
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L_{10}
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Wind
Rain
Extraneous
Tuesday, 05 July 2022
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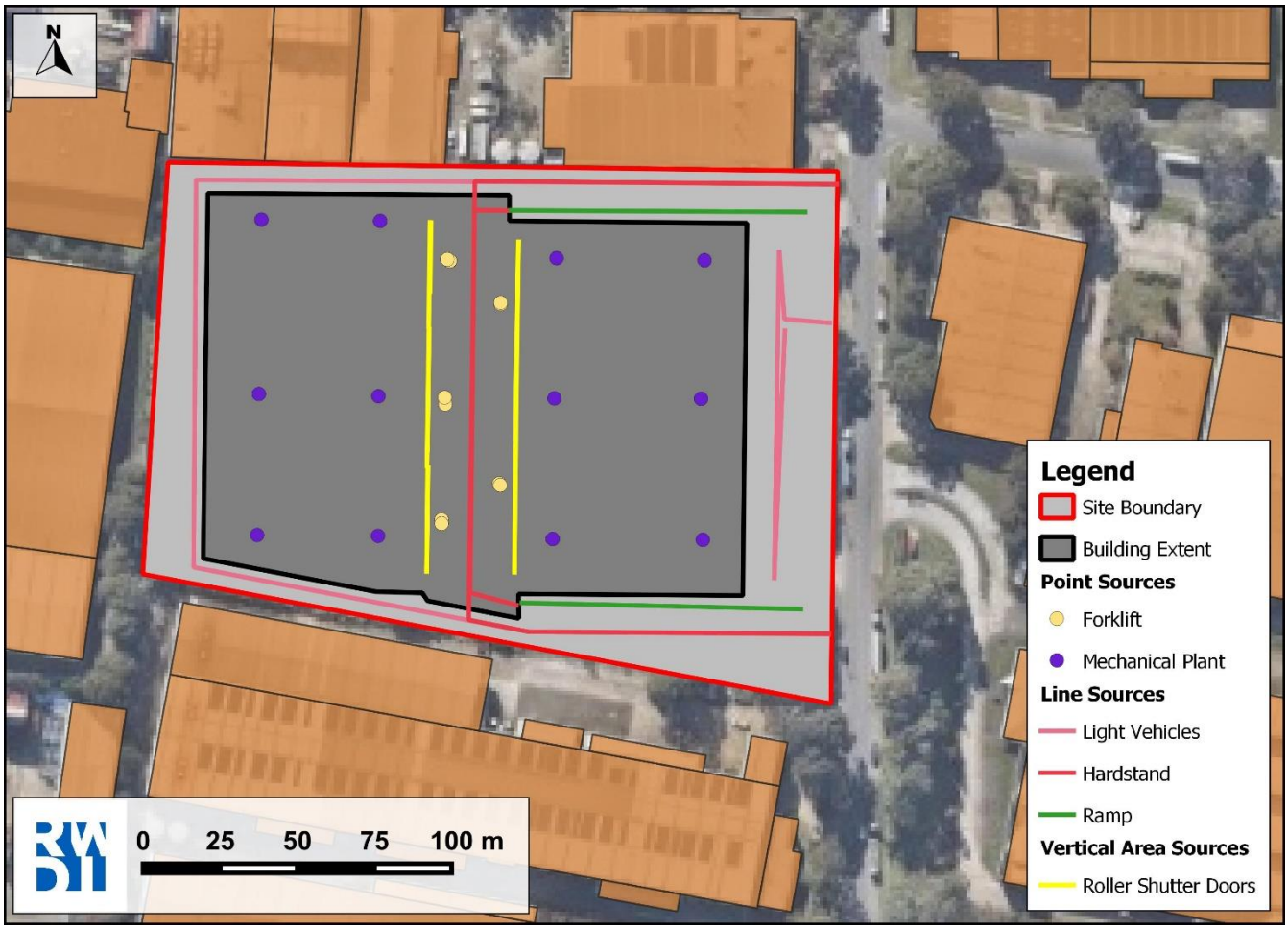
APPENDIX B

MODELLED NOISE SOURCES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Legend
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Forklift
Mechanical Plant
Line Sources
Light Vehicles
Hardstand
Ramp
Vertical Area Sources
Roller Shutter Doors
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25
50
75
100 m