FINAL REPORT

INDUSTRIAL SUBDIVISION AND GENERAL INDUSTRY DEVELOPMENT

2-10 BOWMAN ROAD, MOSS VALE

NOISE AND VIBRATION IMPACT ASSESSMENT
RWDI # 2402788
4 April 2024

SUBMITTED TO

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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.

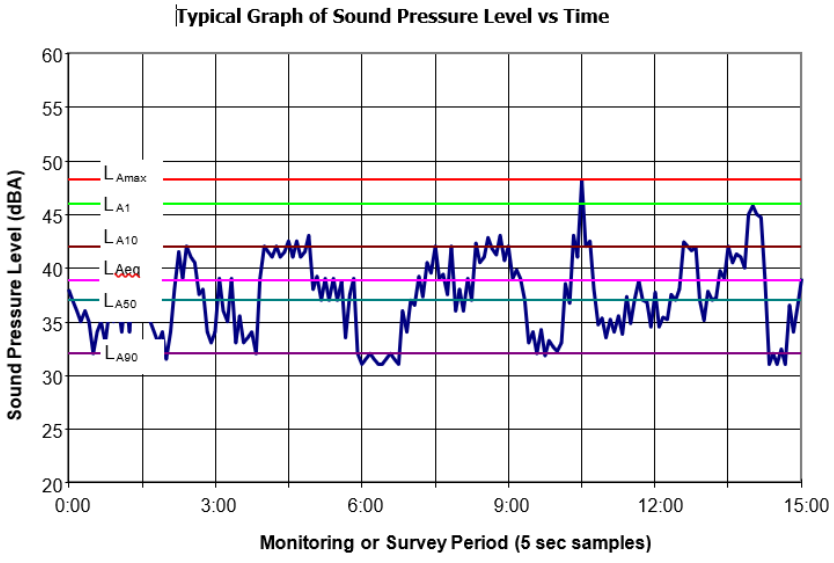
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

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 Australia (RWDI) has been engaged by Jackson Environment and Planning Pty Ltd to conduct a Noise and Vibration Impact Assessment (NVIA) supporting the Statement of Environmental Effects for the creation of an industrial subdivision and general industry development on the properties at 2 Bowman Road (Lot 1, DP103123 and Lot 2, DP1070888) and 10 Bowman Road, Moss Vale (Lot 51, DP130176) (the Project).

The noise & vibration assessment has the following components:

- Identification of the sensitive receivers for the noise and vibration assessment;
- Establishment of relevant noise and vibration criteria for surrounding receivers;
- Preparation of a predictive noise model representative of the proposed operations and construction activities;
- Determination of the potential impacts of operational noise and vibration emissions associated with site noise/vibration sources such as mechanical plant, on-site movements of vehicles upon nearby residential receivers;
- Determination of the potential impacts of construction noise and vibration emissions associated with construction noise/vibration sources upon nearby residential receivers;
- Based on projected traffic generation, prediction and assessment of road traffic noise levels generated as a result of the subdivision; and
- Providing recommendations to ensure operations and construction activities do not result in any adverse noise impacts upon the surrounding community.

The following guidelines and standards have been referenced in this NVIA:

- *Noise Policy for Industry* (NSW EPA, 2017) *(NPfI);*
- *Interim Construction Noise Guideline* (DECC, 2009), *(ICNG)*;
- *Road Noise Policy* (EPA, 2011) *(RNP);*
- *Assessing Vibration: A Technical Guideline* (DEC, 2006) *(AVATG)*; and,
- *British Standard BS 7385-2 – 1993 Evaluation and Measurement for Vibration in Buildings*;

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at 2-10 Bowman Road, Moss Vale within Lot 1, DP103123, Lot 2, DP1070888 and Lot 51, DP130176 in the Wingecarribee Shire Council Local Government Area (LGA). Under the Wingecarribee Local Environmental Plan 2010, the site is on land zoned for General Industrial and Rural uses.

The site is located within an industrial area and will be relabelled with the lot identifications shown in **Figure 2-1** (noting Lot 4 of the subdivision would be located directly west of Lots 2 and 3). Existing industrial facilities are located to the north, east, and south of the site. To the west of the site is non-residential rural landscape and to the east is Berrima Road. There is a vacant residential dwelling situated within Lot 4 which will be used as a site office during the construction of the site, following which it will be demolished, subject to a separate approval.

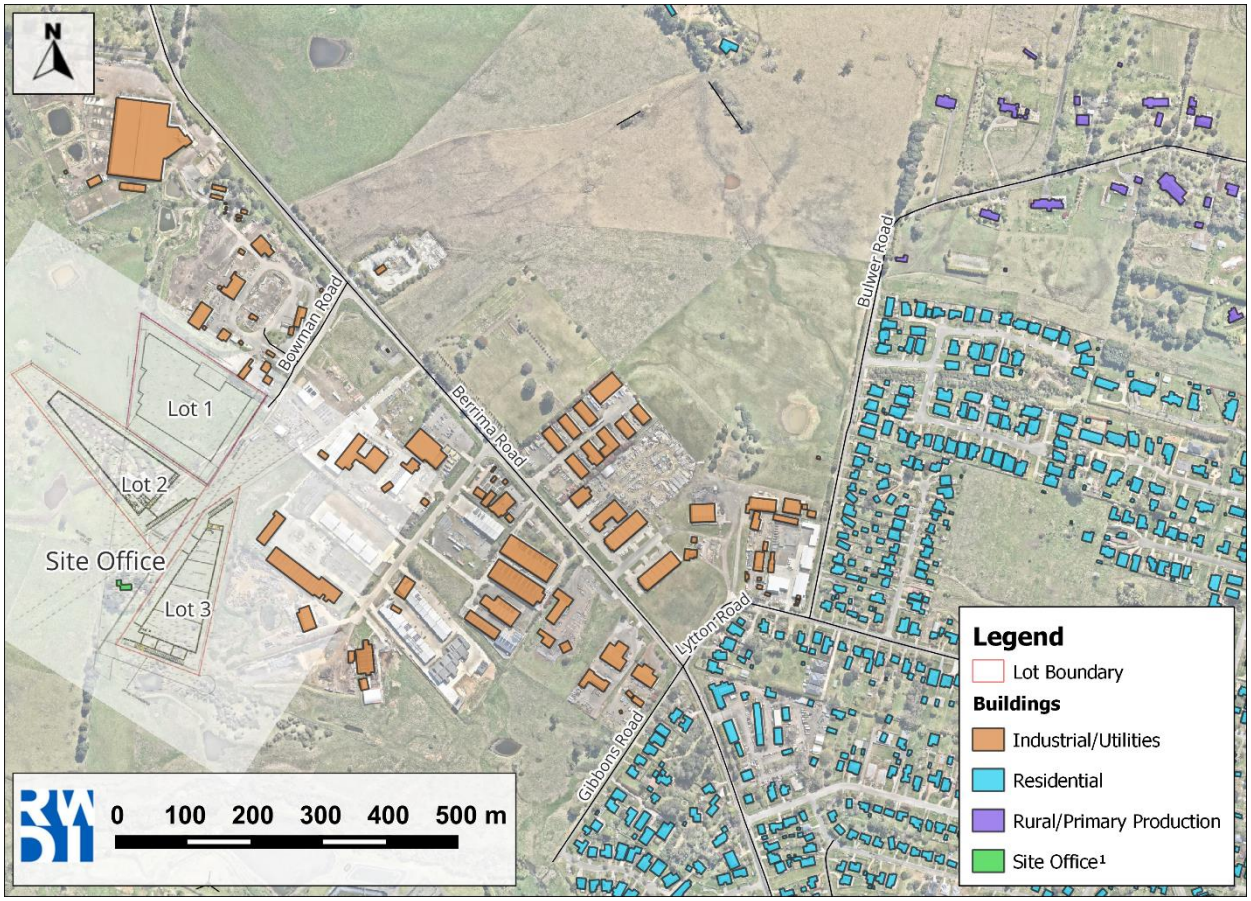


Figure 2-1: Site Location

Note 1: Existing residential property to be used as site office during construction period, and subsequently demolished.

2.2 Proposed Development

Industrial buildings with ancillary office space are proposed to be constructed on each of the three lots. They will be used for the storage, assembly, maintenance, transport, and hire of scaffolding equipment for three scaffolding businesses currently based in Sydney, NSW. The site will operate between the hours of 5am and 8pm.

The proposed building development will include the following:

- Extension of the existing Bowman Road, and creation of part of Hutchinson Road to provide access to the proposed industrial buildings, including;
  - Construction of an industrial cul-de-sac at the termination of Hutchinson Road to accommodate turning of up to 26m B-Double vehicles;
  - Creation of an easement within the RU2 portion of land on the southern side of Hutchinson Road to facilitate construction of the cul-de-sac;
  - Stormwater management system with an outfall on the southern side of Hutchinson Road within the RU2 portion of land; and
  - Street lighting and landscaping in accordance with Wingecarribee Shire Council and Australian Standard requirements;
- Construction of three buildings for the purposes of scaffolding material storage, assembly, maintenance, transport, and hire. Each building will include:
  - Internal office space, staff amenities and training rooms;
  - On-site parking;
  - Haul road and hardstand surrounding each building;
  - Stormwater management system including stormwater treatment devices, on-site detention basin, and rainwater storage;
  - Internal fire sprinkler system and 200kL static water supply; and
  - Outdoor lighting and perimeter landscaping in accordance with Wingecarribee Shire Council and Australian Standard requirements.

3 SENSITIVE RECEIVERS

The sensitive receivers considered in the assessment include distant residential properties located to the southeast, east, and northeast. Also considered are industrial receivers located to the northeast and east of the site. These representative receiver locations are present in **Table 3-1** and **Figure 3-1**. The monitoring locations referred to in **Table 3-1** are discussed in Section 4.

Table 3-1: Noise Sensitive Receiver Locations

Receiver ID	Representative Monitoring Location	Address	Receiver category
R1	L1	1 Morrice Ct, Moss Vale	Residential
R2		1 Gibbons Rd, Moss Vale	Residential
R3		80 Lytton Rd, Moss Vale	Residential
R4	L2	71 Lytton Rd, Moss Vale	Residential
R5		23 Bulwer Rd, Moss Vale	Residential
R6		35 Bulwer Rd, Moss Vale	Residential
R7	L3	194 Berrima Rd, Moss Vale	Residential
I01	-	205 Berrima Rd, Moss Vale	Industrial
I02	-	8-10 Old Dairy Cls, Moss Vale	Industrial

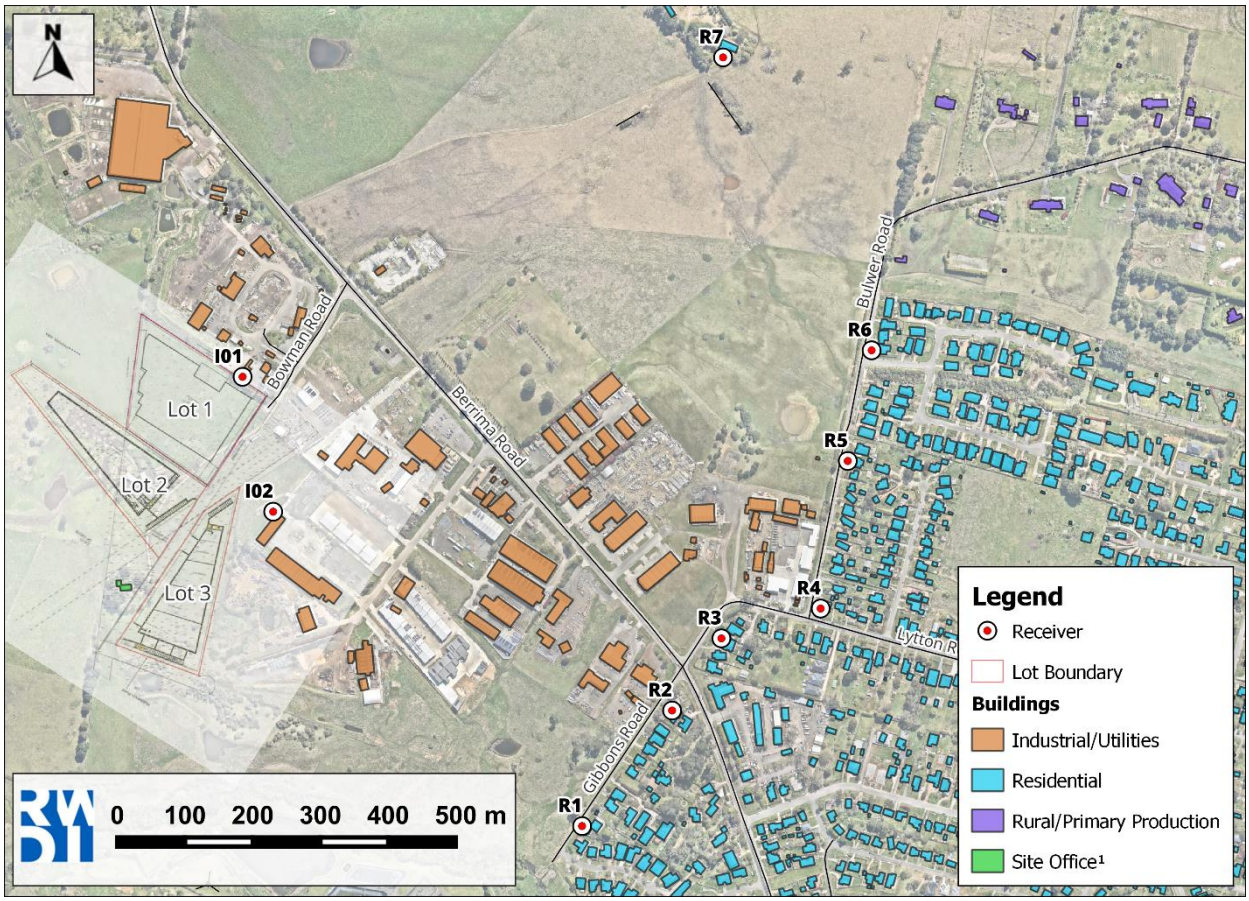


Figure 3-1: Sensitive Receiver Locations

Note 1: Existing residential property to be used as site office during construction period, and subsequently demolished.

4 EXISTING NOISE ENVIRONMENT

Unattended monitoring to quantify the existing noise environment was conducted by RWDI for a previous development application for a resource recovery facility on the same site in late 2022 (*2 and 10 Bowman Road, Moss Vale – Noise and Vibration Impact Assessment*, RWDI, January 2023). The local acoustic environment is not believed to have changed since 2022 and as such RWDI considers the noise results from the survey suitable for establishing noise criteria for this assessment. Monitoring was conducted at three locations surrounding the site. The locations of the unattended noise monitors are depicted in **Figure 4-1.**

Figure 4-1: Unattended Noise Monitoring Locations

Note 1: Residential property to be used as site office during construction period, with the use subsequent to construction stage yet to be determined.

4.1 Existing Background Noise Levels

Measured background noise levels were used to establish the background noise criteria for this project. Background monitoring was conducted at three locations as presented in **Table 4-1**.

Monitoring was conducted using three ARL NGARA Environmental noise loggers set to A-weighted, fast response continuously monitoring over 15-minute sampling periods. These noise loggers conform to Australian Standard *AS/NZS IEC 61672.2-2019 Electroacoustics – Sound level meters Pattern evaluation tests* and also *AS/NZS 61672.3:2019 Electroacoustics – Sound level meters Periods tests* as class 1 precision sound level meters which have an accuracy suitable for field and laboratory use.

The loggers determine L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the existing noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level. The L_{Aeq} level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels. Whilst the L_{A10} has in the past been used as a descriptor for traffic noise, the L_{Aeq} is now the standard descriptor for traffic noise.

Serial numbers of all noise monitors are presented in **Table 4-1.** All loggers were calibrated at the start and end of the monitoring period and no significant drift was noted. All loggers have been NATA calibrated within the previous two years in accordance with RWDI's Quality Assurance procedures. Detailed measurement results can be found in the noise and vibration assessment prepared for the resource recovery facility on the same site (RWDI, January 2023).

Table 4-1: Noise Logger Details

ID	Address	Monitoring Period	Logger Make	Logger SN
L1[1]	25 Gibbons Road, Moss Vale	21/09/2022 – 03/10/2022	ARL NGARA	878007
		28/10/2022- 09/11/2022		8780F9
L2	23 Bulwer Road, Moss Vale[2, 3]	28/10/2022- 09/11/2022	ARL NGARA	878092
L3	194 Berrima Road, Moss Vale[3]	21/09/2022 – 03/10/2022	ARL NGARA	878092

Notes:

1. Monitoring data for this location is the combined data of two separate monitoring blocks as neither block provided sufficient data alone due to inclement weather during the monitoring period.
2. Access to this resident was unavailable so the logger was placed across the road rather than inside the front yard.
3. Weather data at the nearest weather station indicated wind speeds higher than 5 m/s during 8 days of the monitoring period. Review of the collected data showed the background noise levels were not affected by the wind during these periods.

The measured data was analysed in accordance with the *NPfI* to establish the Rating Background Levels (RBLs) for each location. These are summarised below in **Table 4-2**.

Table 4-2: Background Noise Levels

Logger ID	Applicable Receiver	RBL dBA		
		Day[1]	Evening[2]	Night[3]
L1	R1, R2, R3	36	34	34
L2	R4, R5, R6	34	34	34
L3	R7	36	36	34

Notes:

1. 7.00am – 6.00pm
2. 6.00pm - 10.00pm
3. 10.00pm - 7.00am

4.2 Existing Road Traffic Noise Levels

The noise data at location L3 was reviewed to determine the existing road traffic noise levels on Berrima Road. It is assumed that traffic noise on Taylor Avenue (joining Berrima Road and the Old Hume Highway) will be similar to the traffic noise on Berrima Road. This data is presented in **Table 4-3**.

Table 4-3: Existing Road Traffic Noise Levels

Monitoring Period	Existing Road Noise Levels (dBA)
Day[1] $L_{Aeq,15hr}$	63
Night[2] $L_{Aeq,\ 9hr}$	56

Notes:

1. 7.00am - 10.00pm
2. 10.00pm - 7.00am

5 OPERATIONAL NOISE CRITERIA

The *NPfI* (EPA, 2017) provides a framework for assessing environmental noise impacts from industrial premises and industrial development proposals in NSW.

The *NPfI* recommends the development of project noise trigger levels, which provide a benchmark for assessing a proposal or site. The project noise trigger levels should not be interpreted as mandatory noise criteria but, rather, as noise levels that, if exceeded, would indicate a potential noise impact on the community.

The project noise trigger level is the lower value of the project intrusiveness noise level and the project amenity noise level; each explained further below. The project intrusiveness noise level assesses the likelihood of noise being intrusive above the ambient noise level and is applied to residential receivers only. The project amenity noise level ensures the total industrial noise from all sources in the area does not rise above a maximum acceptable level.

5.1 Intrusiveness Noise Level

For assessing intrusiveness, 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 RBL by more than 5 dB.

The intrusiveness noise levels for the surrounding residential receivers are presented in **Table 5-1**.

Table 5-1: Project Intrusiveness Noise Level

Receiver	Time of Day[1]	Intrusiveness Noise Level $L_{Aeq,15min}$ dBA
R1, R2, R3	Day	41
	Evening	39
	Night	39
R4, R5, R6	Day	39
	Evening	39
	Night	39
R7	Day	41
	Evening	41
	Night	39

Note:

1. Daytime (7.00am – 6.00pm)
   Evening time (6.00pm – 10.00pm)
   Night-time (10.00pm – 7.00am)

5.2 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, evening or night period. 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 dB. 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 5-2 below presents the relevant project amenity noise levels, determined in accordance with the *NPfI*. Residential receivers R1-R6 have been classified as suburban receivers, whilst R7 is considered a rural receiver.

Table 5-2: Project Amenity Noise Level

Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,period}$ dBA	Project Amenity Noise Level[1] $L_{Aeq,15min}$ dBA
Residential (Suburban) R1-R6	Day	55	53
	Evening	45	43
	Night	40	38
Residential (Rural) R7	Day	50	48
	Evening	45	43
	Night	40	38
Industrial	When in use	70	68

Note: Recommended Amenity Noise Level minus 5 dBA plus 3 dBA to adjust from a $L_{Aeq,period}$ to a $L_{Aeq,15min}$ level.

5.3 Sleep Disturbance Screening Level

Noise events 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 only to residential receivers and are measured outside bedroom windows during the night period.

Where the sleep disturbance screening noise level is predicted to be exceeded then a detailed maximum noise level event assessment should be undertaken. The detailed assessment should discuss the predicted level of the events, the exceedance of the screening level, existing maximum noise levels, and consider guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*.

5.4 Project Noise Trigger Levels

The resulting Project Noise Trigger Levels (PNTLs) are shown in **Table 5-3** and include the sleep disturbance screening levels.

Table 5-3 Project Noise Trigger Level, dBA

Receivers	Time of Day[1]	PNTL	Noise Descriptor
R1, R2, R3	Day	41	$L_{Aeq,15min}$
	Evening	39	$L_{Aeq,15min}$
	Night	38	$L_{Aeq,15min}$
	Night	52	L_{Afmax}
R4, R5, R6	Day	39	$L_{Aeq,15min}$
	Evening	39	$L_{Aeq,15min}$
	Night	38	$L_{Aeq,15min}$
	Night	52	L_{Afmax}
R7	Day	41	$L_{Aeq,15min}$
	Evening	41	$L_{Aeq,15min}$
	Night	38	$L_{Aeq,15min}$
	Night	52	L_{Afmax}
I01, I02	When in use	68	$L_{Aeq,15min}$

Note:

1. Daytime (7.00am – 6.00pm)
   Evening time (6.00pm – 10.00pm)
   Night-time (10.00pm – 7.00am)

6 ROAD TRAFFIC NOISE CRITERIA

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

The *RNP* (EPA, 2011) 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* (DECC, 2009) does not include criteria to assess off-site construction traffic noise and for this reason the *RNP* was used for assessing impacts at residences from both construction and operational traffic noise.

The relevant road traffic noise criteria are summarised in **Table 6-1.** Berrima Road to the east of the site and Taylor Avenue to the north of the site have been classified as arterial roads.

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 represents a minor impact that is considered barely perceptible to the average person.

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 NOISE CRITERIA

The *ICNG* (DECC, 2009) 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 dB.

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 7-1** presents the application of the NML.

Table 7-1: Construction Noise Management Levels for Residences

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 **Table 7-1**, **Table 7-2** presents the applicable NMLs for residences for construction activities.

Table 7-3 presents the applicable noise management levels for non-residential receivers based on the *ICNG*.

Table 7-2: Construction NML for Residential Receivers, $L_{Aeq,15min}$ dBA

Receiver ID	Day RBL	Day NML
R1, R2, R3	36	46
R4, R5, R6	34	44
R7	36	46

Table 7-3: Construction NML for Non-residential Receivers, $L_{Aeq,15min}$ dBA

Land Use	Period	NML
Industrial Premises	When in use	External 75 dBA
Offices, retail	When in use	External 70 dBA

8 CONSTRUCTION VIBRATION CRITERIA

None of the operational activities conducted on the site are expected to cause any significant vibration. 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 8-1**.

Table 8-1: Construction and Vibration Standards and Guidelines

Item	Standard/Guideline
Structural Damage	*British Standard BS 7385-2-1993 – Evaluation and measurement for vibration in buildings*
Human Comfort (Tactile Vibration)[1]	*Assessing Vibration – A technical Guideline* (DEC, 2006) *(AVATG)*

Note : 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.

8.1 Cosmetic Damage

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 BS 7385-2 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 8-2**.

Table 8-2: 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	
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 8-2** 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".

8.2 Human Comfort

The *Assessing Vibration: A Technical Guideline (AVTG)* sets non-mandatory criteria: "they are goals that should be sought to be achieved through the application of all feasible and reasonable mitigation measures. Where all feasible and reasonable measures have been applied and vibration values are still beyond the maximum value, the operator would need to negotiate directly with the affected community".

Construction vibration can be continuous, intermittent or impulsive and the NSW vibration guideline provides different goals for each category. The continuous vibration goals are most stringent and higher vibration levels are acceptable for intermittent and impulsive vibration on the basis of the shorter exposure times. Examples of typical vibration sources are provided in **Table 8-3**.

Table 8-3 Types of Vibration (NSW Vibration Guideline)

Continuous Vibration	Impulsive Vibration	Intermittent Vibration
Machinery, steady road traffic, continuous construction activity.	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g., occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990).	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria.

Vibration emitting equipment anticipated in the proposed works are considered either intermittent or continuous. The continuous vibration criteria (as shown in Appendix C - Assessing Vibration: A Technical Guideline) are presented in **Table 8-4**.

Table 8-4 Preferred and Maximum Vibration Levels for Continuous Vibration (Human Comfort)

Building Type	Peak Particle Velocity, PPV (mm/s)	
	Preferred	Maximum
Child Care (sleeping areas)	0.28	0.56
Commercial	0.56	1.1

The assessment of intermittent vibration outlined in the *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 8-5**. 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 8-5: 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

No peak velocity values are provided for intermittent vibration in the *AVTG*. As such, the values for continuous vibration have conservatively been considered most applicable for the Project.

9 OPERATIONAL NOISE ASSESSMENT

9.1 Operational Noise Modelling

Operational and construction noise emissions associated with the Proposal were modelled using the CadnaA acoustic noise prediction software and the CONCAWE noise prediction algorithm. The CONCAWE noise propagation model is used around the world and is widely accepted as an appropriate model for predicting noise over significant distances. Factors addressed in the noise modelling are:

- equipment sound level emissions (in octave bands) and locations
- screening effects from buildings and barriers
- receiver locations
- ground topography
- noise attenuation due to geometric spreading
- ground absorption and atmospheric absorption
- meteorological effects

The following assumptions have been made:

- Site layout based on architectural plans dated September 2023
- A ground absorption factor of 0.5 was conservatively adopted for all areas.
- Operational noise sources as discussed in section 9.2
- Meteorological conditions as discussed section 9.3

9.2 Source Noise Levels

Operational noise emissions have been predicted to the most sensitive receivers around the site. The mechanical services of the site have been assumed based on typical operations of a warehousing facility, and vehicle travel routes as indicated in the architectural plans. Additional assumptions adopted for assessment purposes are summarised as follows:

- Heavy Vehicles include light rigid vehicles and semi-trailers up to B-doubles;
- Due to the internal nature of loading docks trucks will not idle for extended periods of time outside of buildings
- All heavy vehicles travel at 10 km/h;
- All light vehicles travel at 20 km/h;
- All rigid trucks accessing Building 2 enter/exit from the front roller door;
- All articulated trucks (semi-trailers and B-doubles) accessing Building 2 enter/exit from the rear roller door, and travel along the outside of Building 2 for access;
- Up to four forklifts working outside of each building (for whole subdivision); and,
- No motorised extraction fans will be used for the buildings, only passive 'whirley-bird' ventilation devices.

Vehicle movements were modelled based on the hourly schedule outlined in the provided traffic impact assessment (reproduced in full in section 10). The arrival rates of light and heavy vehicles vary throughout the day depending on type of vehicle and building, beginning at 5am and ending at 9pm. The worst-case hour for each assessment period was determined as shown in **Table 9-1** and assumed for assessment purposes.

Table 9-1: Vehicle Movements during Worst-Case Hours

Time of Day	Worst Case Hour[2]	Total Number of Vehicles Movements Per Hour (In or Out)		
		Building 1	**Building 2**	**Building 3**
Day	3pm-4pm	Cars: 4 Trucks[1]: 10	Cars: 2 Trucks[1]: 10	Cars: 0 Trucks[1]: 4
Evening	6pm-7pm	Cars: 0 Trucks[1]: 0	Cars: 20 Trucks[1]: 3	Cars: 0 Trucks[1]: 3
Night	6am-7am	Cars: 4 Trucks[1]: 10	Cars: 4 Trucks[1]: 10	Cars: 3 Trucks[1]: 4

Note 1: Includes light rigids and semi-trailers

Note 2: Determined based on the period with the greatest number of heavy vehicle arrivals

The noise level data used for the assessment is presented in **Table 9-2**. These noise levels are taken from RWDI's internal database.

An L_{Amax} noise impact associated with truck airbrake brake release valves is modelled to assess potential sleep disturbance impacts.

Table 9-2 Operational Source Sound Power Levels

Equipment	Noise Characteristic	Sound Power Level, dBA
Light Vehicles on site, up to speed of 40km/h	Quasi-steady L_{Aeq}	85
Heavy Vehicle[1], unloaded @ 10 km/h	Quasi-steady L_{Aeq}	106
Heavy Vehicle[1], loaded @ 10 km/h	Quasi-steady L_{Aeq}	107
Forklift operational on hardstand	Quasi-steady L_{Aeq}	93
Heavy vehicle[1] airbrake release	Instantaneous L_{Amax}	115
Air Conditioner Condenser Unit	Steady L_{Aeq}	80

Note 1: Includes light rigids and semi-trailers up to B-doubles

It should be noted that the described operations are not anticipated to generate tonal, intermittent or low frequency dominant noise as defined by the *NPfI* and hence would not be subject to the penalties for annoying characteristics.

9.3 Meteorological Conditions

The meteorological effects on noise propagation such as temperature inversion and wind are considered in the noise prediction model. Two meteorological scenarios are considered, one under neutral conditions where temperature inversion and wind have minimal effect on the noise. The second is a worst-case scenario, where

temperature inversion and wind affect the noise emissions. Both conditions conservatively assume an ambient temperature of 10 degrees and relative humidity 70%.

The standardised neutral and worst-case weather conditions outlined in Section D of the NSW *NPfI* are used in the noise prediction model. A summary of the meteorological conditions is outlined in **Table 9-3**.

Table 9-3 Meteorological Conditions adopted for the Noise Modelling

Assessment period	Meteorological condition	Wind speed (m/s)	Wind direction (°)	Stability category (A to G)
Day/Evening	Standard	0	N/A	D Class
	Noise Enhancing (wind)	3	Source-to-receiver	D Class
Night	Standard	0	N/A	D Class
	Noise Enhancing (wind)	3	Source-to-receiver	D Class
	Noise Enhancing (temperature inversion with wind)	2	Source-to-receiver	F Class

9.4 Predicted Operational Noise Levels

The noise levels at surrounding receivers are presented in **Table 9-4** through **Table 9-6** for all receivers shown in **Table 3-1**. Noise levels have been presented at the most exposed location within the property boundary. The predicted noise levels are compliant at all receivers. Noise contours under noise enhancing meteorological conditions are shown in Appendix B.

Table 9-4 Predicted $L_{Aeq,15min}$ Operational Noise Levels at Receivers (Daytime)

Location	Predicted worst case noise level during period		Project Noise Trigger Criteria[1] $L_{Aeq,15min}$ dBA	Compliance (Y/N)
	$L_{Aeq,15min}$ dBA			
	Standard MET[1]	Adverse MET[2]		
R1	<20	20	41	Y
R2	<20	<20	41	Y
R3	<20	<20	41	Y
R4	<20	<20	39	Y
R5	<20	<20	39	Y
R6	<20	<20	39	Y
R7	<20	<20	41	Y
I1	54	54	68	Y

Location	Predicted worst case noise level during period		Project Noise Trigger Criteria[1]	Compliance (Y/N)
I2	45	46	68	Y

Table 9-5 Predicted $L_{Aeq,15min}$ Operational Noise Levels at Receivers (Evening)

Location	Predicted worst case noise level during period		Project Noise Trigger Criteria[1] $L_{Aeq,15min}$ dBA	Compliance (Y/N)
	$L_{Aeq,15min}$ dBA			
	Standard MET[1]	Adverse MET[2]		
R1	<20	<20	39	Y
R2	<20	<20	39	Y
R3	<20	<20	39	Y
R4	<20	<20	39	Y
R5	<20	<20	39	Y
R6	<20	<20	39	Y
R7	<20	<20	41	Y
I1	37	37	68	Y
I2	41	42	68	Y

Table 9-6 Predicted $L_{Aeq,15min}$ Operational Noise Levels at Receivers (Night)

Location	Predicted worst case noise level during period		Project Noise Trigger Criteria[1] $L_{Aeq,15min}$ dBA	Compliance (Y/N)
	$L_{Aeq,15min}$ dBA			
	Standard MET[1]	Adverse MET[2]		
R1	<20	<20	38	Y
R2	<20	<20	38	Y
R3	<20	<20	38	Y
R4	<20	<20	38	Y
R5	<20	<20	38	Y
R6	<20	<20	38	Y
R7	<20	<20	38	Y
I1	54	54	68	Y
I2	44	45	68	Y

9.5 Sleep Disturbance

A sleep disturbance assessment has been conducted considering a truck airbrake release (sound power level as per **Table 9-2**) occurring outdoors at the nearest point on the expected truck routes to a given receiver. The predicted night time L_{Amax} noise levels at the nearest receivers due to the airbrake releases is presented in **Table 9-7**. The predicted noise levels are compliant at all receivers.

Table 9-7 Maximum Noise Level Assessment

Location	Predicted worst case noise level L_{Amax} dBA		Project Noise Trigger Criteria[1] L_{AMax} dBA	Compliance (Y/N)
	Standard MET	NE MET		
R1	27	28	52	Y
R2	24	24	52	Y
R3	25	25	52	Y
R4	20	20	52	Y
R5	21	22	52	Y
R6	<20	<20	52	Y
R7	25	26	52	Y

10 ROAD TRAFFIC NOISE ASSESSMENT

The nearest residential properties are located along Berrima Road in Moss Vale to the east of the site, and along Taylor Avenue to the North of the site. Results of unattended traffic noise monitoring are presented in **Table 4-3.** This data reveals that the noise generated by existing traffic is already in exceedance of the criteria set out in section 6 without the Project, and hence any further increase in the total traffic noise level should be limited to 2 dB.

Traffic noise levels from site generated traffic have been predicted using the Calculation of Road Traffic Noise (CoRTN) model developed by the Welsh Office of the UK Department of Transport, 1988. The CoRTN model is a commonly accepted method for noise assessments in NSW.

The following has been assumed regarding access routes:

- 40% of light rigid trucks and light vehicles access the site via Taylor Avenue; and
- 60% of light rigid trucks and light vehicles access the site via Berrima road through the town of Mossvale;
- All articulated heavy vehicles access the site via Taylor Avenue.

The total traffic generation due to the site, predicted in the traffic report, is presented in **Table 10-1** through **Table 10-3** for the three buildings. Time periods not shown indicate no vehicle movements are predicted at these times.

Table 10-1 Site Traffic Generation Building 1

Time	Light Vehicles		Light Rigid Trucks		Articulated Trucks	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
5am-6am	13					
6am-7am	4			8		2
7am-8am			8	7	2	2
8am-9am			7		2	2
9am-10am	3				2	
10am-11am						
11am-12pm	10					
12pm-1pm						
1pm-2pm		13				
2pm-3pm				7		2
3pm-4pm		4	7	8	2	2
4pm-5pm			8		2	

Time	Light Vehicles		Light Rigid Trucks		Articulated Trucks	
5pm-6pm		3				
6pm-7pm						
7pm-8pm						
8pm-9pm		10				
Total Day	43		52		18	
Total Night	17		8		2	

Table 10-2 Site Traffic Generation Building 2

Time	Light Vehicles		Light Rigid Trucks		Articulated Trucks	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
5am-6am	13					
6am-7am	4			8		2
7am-8am	20			7		2
8am-9am	20		5		2	2
9am-10am	23		6	2	2	
10am-11am	2		8	2	1	
11am-12pm	2	2	2	2	1	
12pm-1pm	12	2	2	2		
1pm-2pm	2	15	2	2		
2pm-3pm	2	6		7		2
3pm-4pm		2	1	8		2
4pm-5pm		20	5		2	
5pm-6pm		23	6		2	
6pm-7pm		20	2		1	
7pm-8pm			1			
8pm-9pm		10				
Total Day	183		72		19	
Total Night	17		8		2	

Table 10-3 Site Traffic Generation Building 3

Time	Light Vehicles		Light Rigid Trucks		Articulated Trucks	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
5am-6am	7					
6am-7am	3			3		1
7am-8am				3		1
8am-9am			1			1
9am-10am	3		2		1	
10am-11am	1		2	1	1	
11am-12pm	8	1	1			
12pm-1pm	1	1	1	1	1	
1pm-2pm	1	8				
2pm-3pm	1	1	1	1		1
3pm-4pm		4		3		1
4pm-5pm			1	3		
5pm-6pm		3	2		1	
6pm-7pm			2		1	
7pm-8pm			2			
8pm-9pm		7				
Total Day	40		27		9	
Total Night	10		3		1	

Change in traffic noise levels due to additional traffic associated with the Project (i.e., including all three buildings combined), is presented in **Table 10-4** for the typically most exposed receivers along Taylor Avenue and Berrima Road.

Table 10-4 Traffic Noise from Site Generated Traffic

Location	Day $L_{Aeq15hour}$ (7am–10pm)	Night $L_{Aeq9hour}$ (10pm–7am)
Taylor Avenue		
Existing Traffic Noise[1]	61.0	53.5
Existing + Project Traffic Noise[1]	62.5	55.4
Predicted Increase	**1.5**	**1.9**

Location	Day $L_{Aeq15hour}$ (7am–10pm)	Night $L_{Aeq9hour}$ (10pm–7am)
Berrima Road		
Existing Traffic Noise[2]	62.9	55.4
Existing + Project Traffic Noise[2]	64.0	56.9
Predicted Increase	**1.2**	**1.5**

Note 1: Includes façade and distance correction appropriate for nearest facades on Taylor Avenue

Note 2: Includes façade and distance correction appropriate for nearest facades on Berrima Road

From the difference in the predicted noise levels and the measured existing traffic noise levels, it can be seen that the increase in noise relative to the existing traffic flows will be less than 2 dB, and subsequently meet the criterion discussed in section 6.

11 CONSTRUCTION NOISE ASSESSMENT

11.1 Construction Noise Modelling

Noise modelling methodology is consistent with what was applied for operational noise assessment, see **Section 9.1**.

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

11.2 Construction Equipment Noise Source Levels

The potential construction noise impacts at sensitive receivers were predicted using a noise model representative of the construction stages for the proposed development.

At this stage, a detailed list of equipment to be used during the construction phase of the project was not provided. Therefore, the construction equipment and processes have been adapted from previous similar reports and are depicted below.

Table 11-1 Construction Equipment and Sound Power Levels

Construction Equipment	Sound Power Level (dBA)
Excavator (approx. 20t)	105
Backhoe/FE Loader	111
Dump Truck (approx. 15t)	108
Truck delivery	107
Concrete Truck	112
Concrete Pump	109
Concrete Vibrator	105
Vibratory Roller (approx. 10t)	114
Generator	104
Cherry Picker	102
Mobile Crane	110
Hand Tools	102
Grader	110
Sum	120

The majority of the construction work will take place at a large distance from the worst affected receivers which are located along Gibbons Road, Moss Vale. A worst-case construction noise scenario was developed based on the following assumptions:

- No shielding from barriers;
- Hand tools used at a height;
- All sources operating simultaneously; and
- As conservative measure, predictions assumed all construction equipment to be concentrated in the lot closest to each receiver.

Predicted noise from this worst-case construction scenario per receiver was calculated using CadnaA and is presented in **Table 11-2.** Based on these predictions, it can be concluded that construction noise is unlikely to cause any impacts to nearby receivers and is highly likely to be within the NML at all receiver locations.

Table 11-2 Predicted Construction Noise Levels

Receiver	Period	$L_{Aeq,15min}$ Noise Level (dBA)			Meets NML
		NML	Highly Affected NML	Construction Activities	
R1	Day	46	75	41	Y
R2	Day	46	75	41	Y
R3	Day	46	75	40	Y
R4	Day	44	75	35	Y
R5	Day	44	75	35	Y
R6	Day	44	75	34	Y
R7	Day	46	75	40	Y
I01	Day	75	-	69	Y
I02	Day	75	-	70	Y

11.3 Construction Noise Management

11.3.1 Noise Management Control

The predicted noise levels comply with the NMLs for all receivers; however noise management control measures should still 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.

11.3.2 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.

11.3.3 Response to Complaints

Should ongoing complaints of excessive noise 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; and
- whether work practices were being carried out either within established guidelines or outside these guidelines.

12 CONSTRUCTION VIBRATION ASSESSMENT

The following equipment may be used during construction and could typically be expected to induce minor vibration:

- Trucks
- Excavators
- Piling rig
- Vibratory roller

The nearest potentially affected industrial receivers are 15 m away (I01). The nearest residential receivers are 720 m away and are conservatively classified as typical lightweight construction.

Vibration goals have been provided in Section 8 of this report. As a guide, indicative working distances for typical items of vibration intensive plant are listed in **Table 12-1**. The indicative working distances are quoted for both "structural" damage and human comfort. If you are working within the indicative working distances there is potential to exceed "structural" damage and human comfort criteria.

Table 12-1: Typical Vibration Emission Levels from Construction Plant

Plant Item	Rating/Description	Indicative Working Distance	
		Structural Damage (BS 7385)	Human Response[1]
Small Hydraulic Hammer	300 kg (5-12t Excavator)	2 m	7 m
Vibratory Roller	1-2 tonnes	5 m	20 m
	2-4 tonnes	6 m	20 m
	4-6 tonnes	12 m	40 m
	7-13 tonnes	15 m	100 m
Medium Hydraulic Hammer	900 kg (12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34t excavator)	22m	73 m
Excavator	≤ 30 t	10 m	15 m
Piling Rig – Vibratory	Sheet piles	2 m to 20 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (Nominally)	N/A
Piling Rig – Hammer	12 t down force	15 m	50 m
Dozer	-	2 m	10 m
Jackhammer	Hand held	1 m (Nominal)	2 m

Note 1: The working distances for Human Response assume that the source of the vibration is continuous throughout the 16-hour daytime period. Higher levels of vibration are acceptable when the vibration levels are intermittent or impulsive. The safe working distances are therefore considered to be conservative, and it is likely that the safe working distances corresponding to a "low probability of adverse comment" would be less than indicated.

12.1 Human Comfort

The distance separating the closest residential receiver and the proposed construction works exceeds the minimum distance required to achieve the human comfort criteria . Vibration levels at industrial neighbours may possibly be felt as the work area is within the indicative working distances, particularly for vibratory rollers.

12.2 Building Damage

The distances to residential receivers (and to surrounding industrial premises) exceed those applicable indicative working distances for building damage. As such, vibration levels due to construction works are not expected to result in cosmetic damage to nearby buildings unless large vibratory rollers, large rock hammers and or sheet piling is conducted within 20 m of the industrial buildings.

12.3 Construction Vibration Management

Although predicted impacts from construction vibration are low, mitigation and management measures are still recommended, similar to the measures outlined for management of noise in section 11.3. In particular the following is recommended:

- Community consultation to notify of vibration intensive works at nearby receivers (including industrial).
- Prior to commencement of works a Construction Noise and Vibration Management Plan (CNVMP) should be prepared.
- The CNVMP should discuss mitigation measures to address possible vibration intensive works in close proximity to nearby structures and offices.

12.4 Construction Vibration Monitoring

Although vibration monitoring is not proposed for the impact on buildings around the site, vibration monitoring is proposed to be undertaken to monitor potential impacts to the gas pipelines that traverse the site. The pipeline owner/operator, APA Group, have stringent requirements for vibration from construction works near the project. All works will be conducted to the APA Group standards and the Construction Management Plan will be prepared in consultation with APA Group.

This monitoring is beyond the scope of this assessment, but should be considered in the CNVMP developed for the site.

13 CONCLUSION

RWDI has completed a Noise and Vibration Impact Assessment of a proposed industrial subdivision and general industry development located at 2-10 Bowman Road, Moss Vale.

The NVIA has confirmed that noise emissions from operation and construction of the Project will comply with relevant regulatory guidelines, at all receivers.

Existing residential receivers along Taylor Avenue and Berrima Avenue are already experiencing equal or greater noise levels than the criteria recommended in the *Road Noise Policy*. No increases in traffic noise levels greater than 2 dB and anticipated, meaning that a change in traffic noise is not likely to be perceptible to the typical person.

During construction, worst case noise levels are not predicted to exceed Noise Management Levels at any receiver.

It is expected that vibration generated from the operation and construction of the Project will meet relevant standards.

STATEMENT OF LIMITATIONS

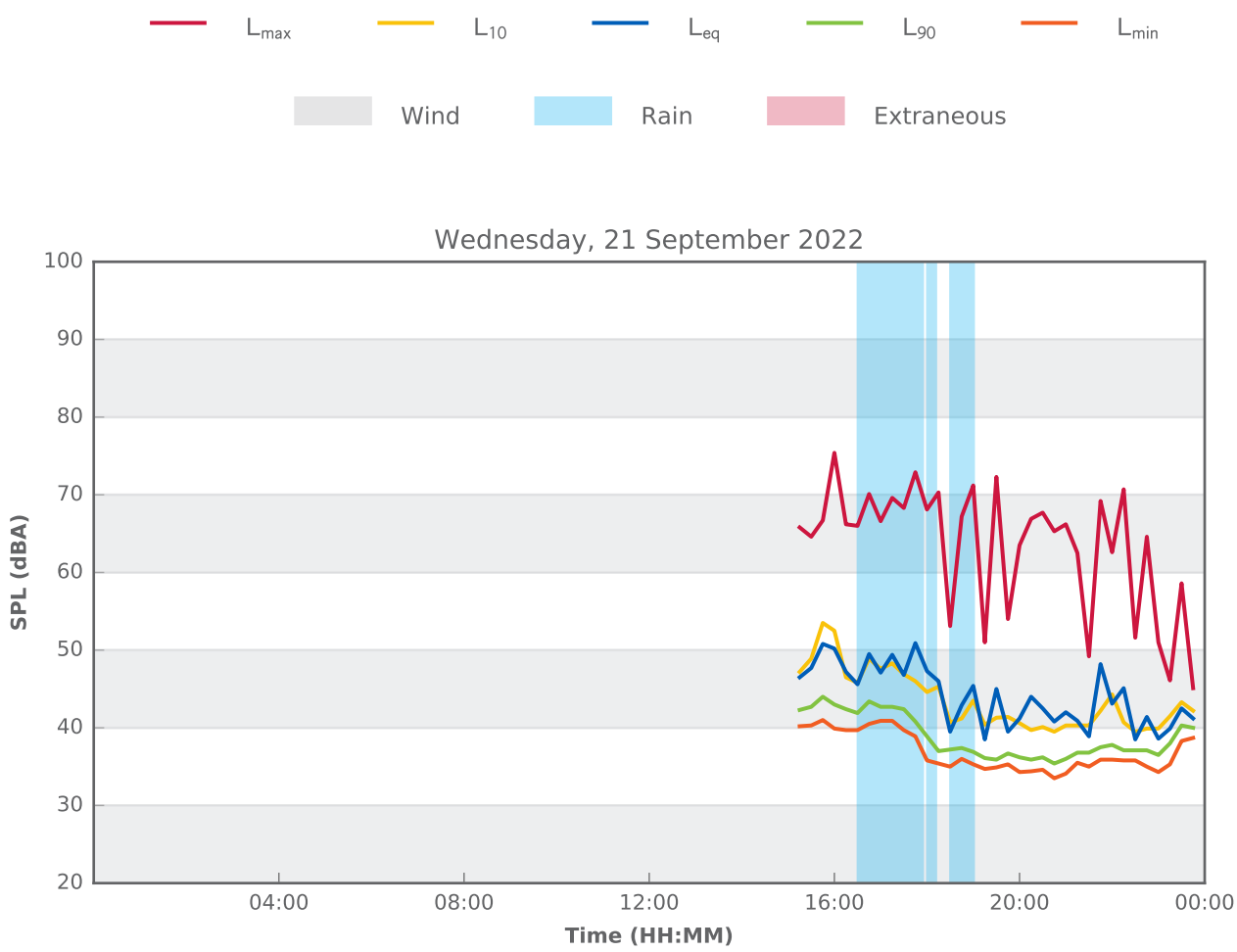
This report entitled *Industrial Subdivision and General Industry Development – Noise and Vibration Impact Assessment*, dated 4 April 2024, was prepared by RWDI Australia Pty Ltd ("RWDI") for Jackson Environment and Planning Pty Ltd ("Client"). The findings and conclusions presented in this report have 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.

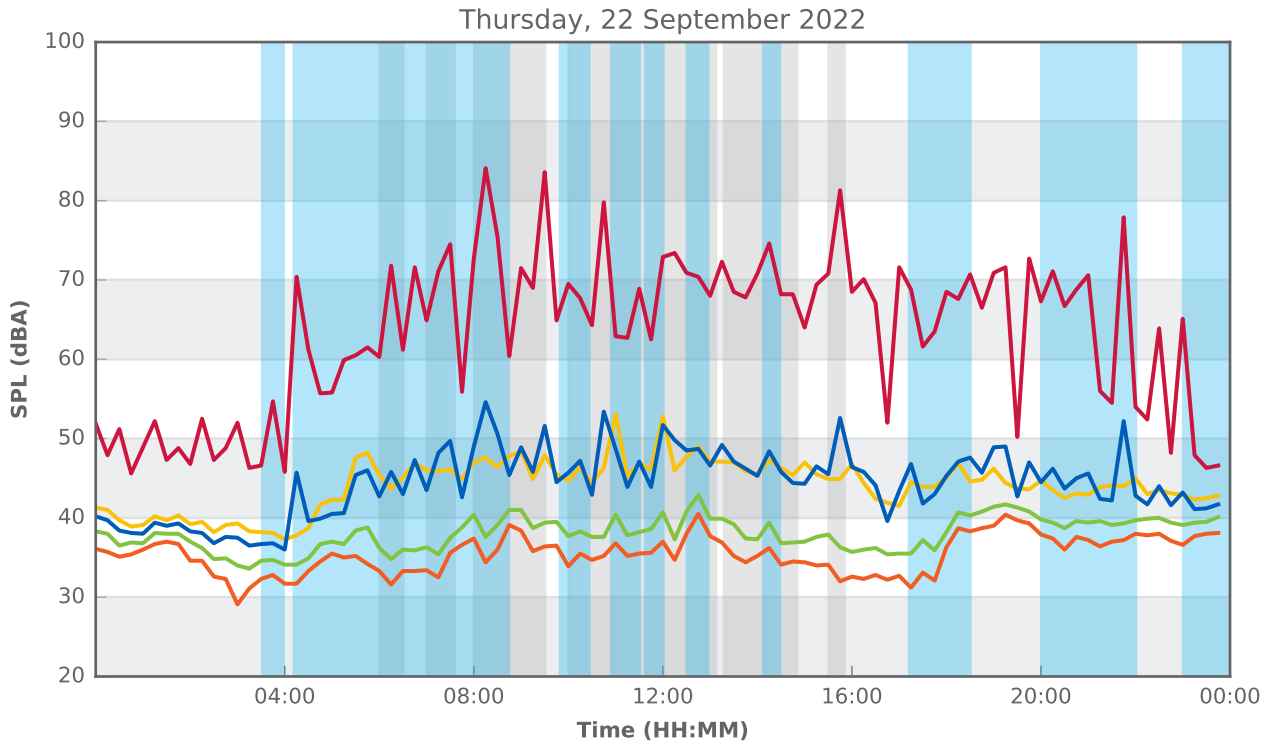
The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the 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

25 Gibbons Rd, Moss Vale





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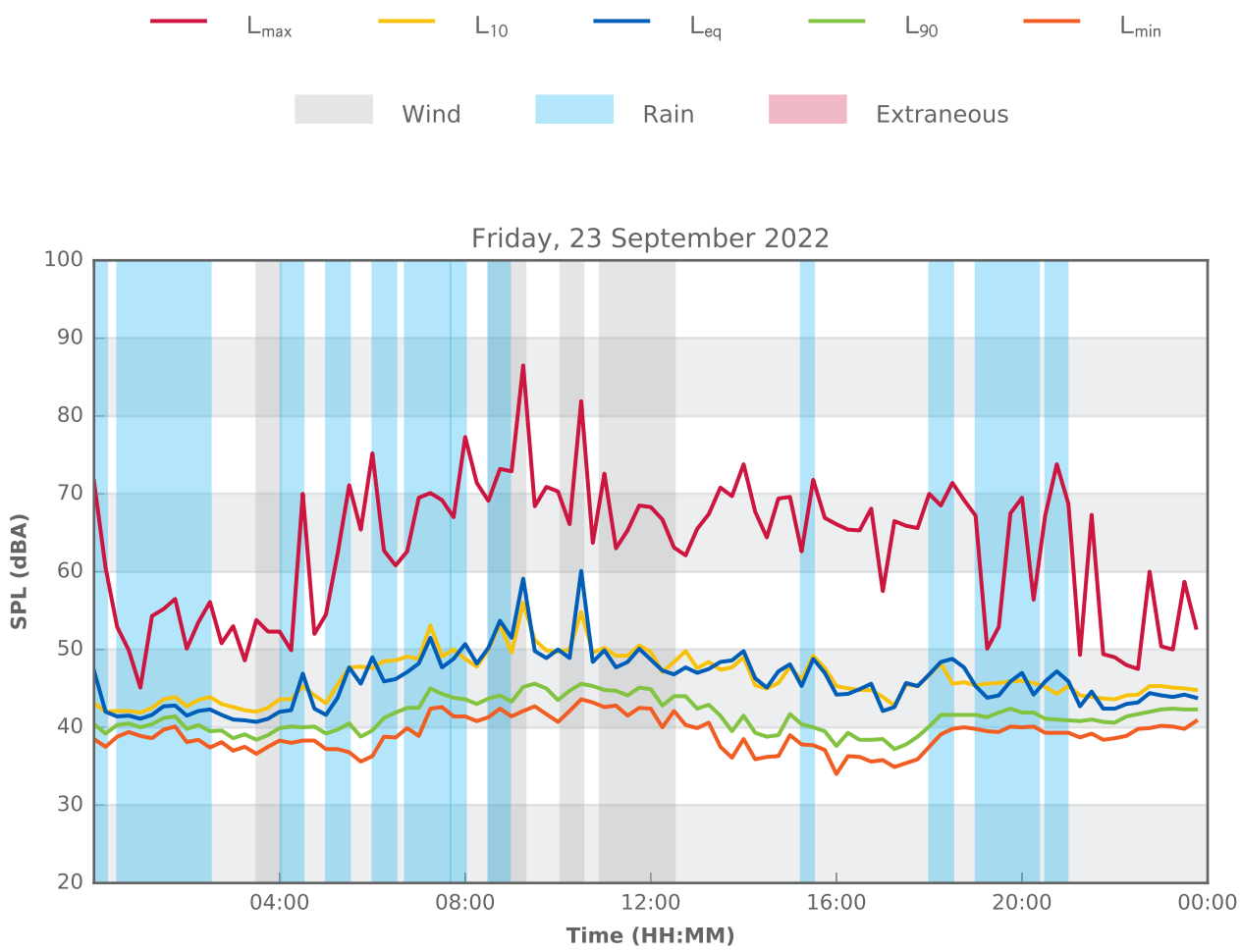

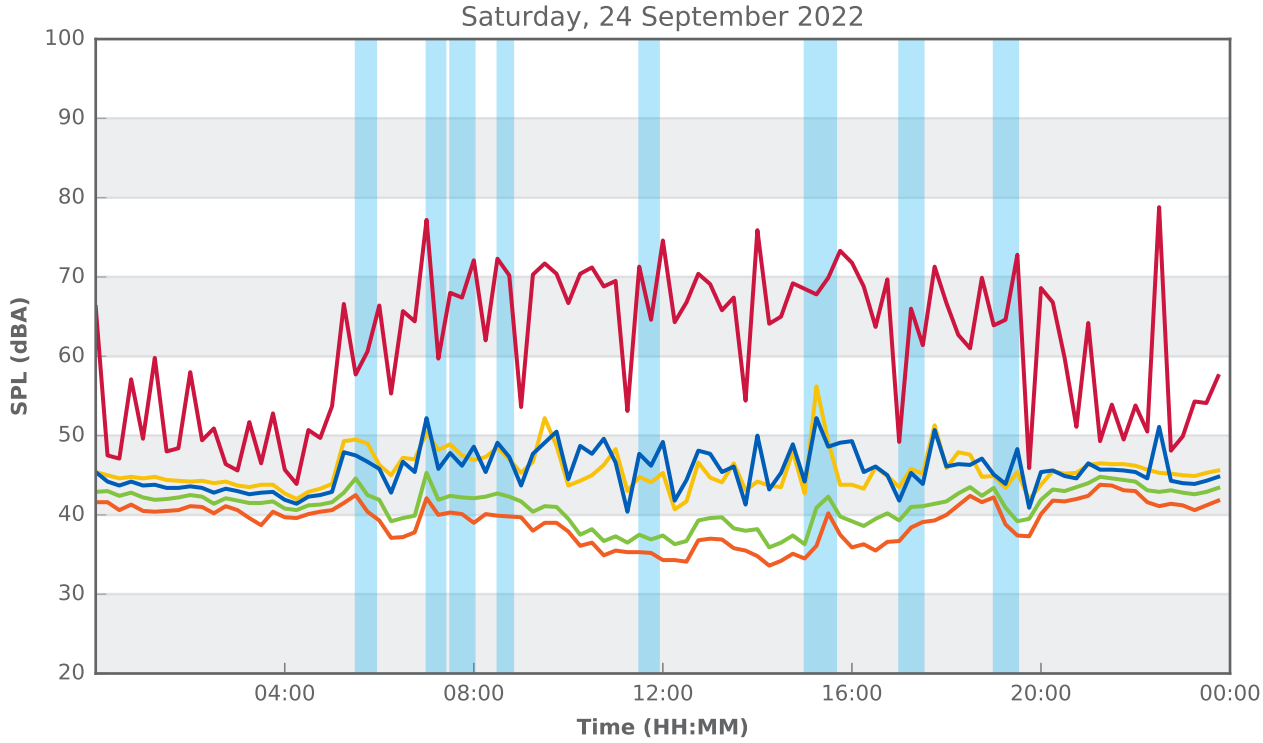

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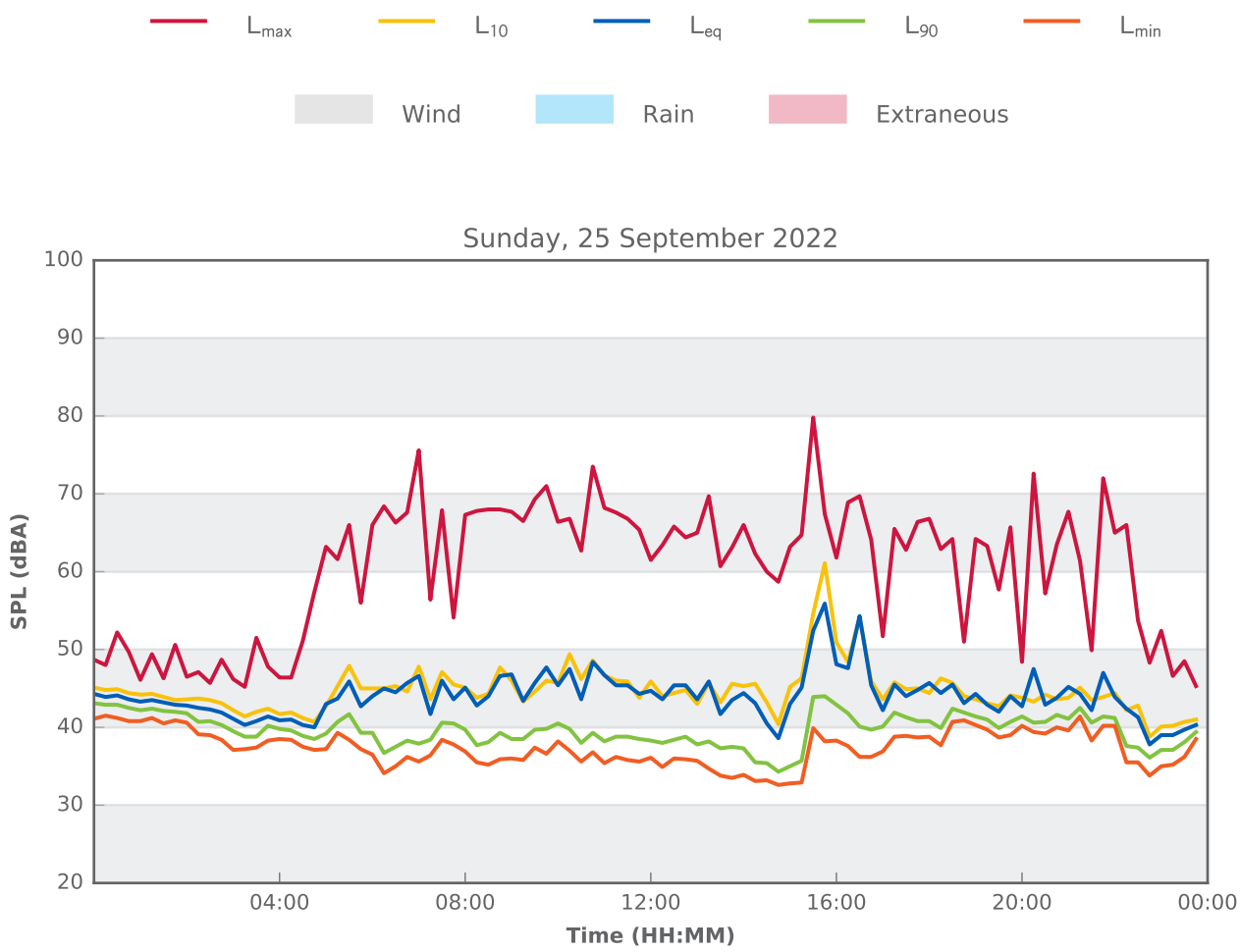

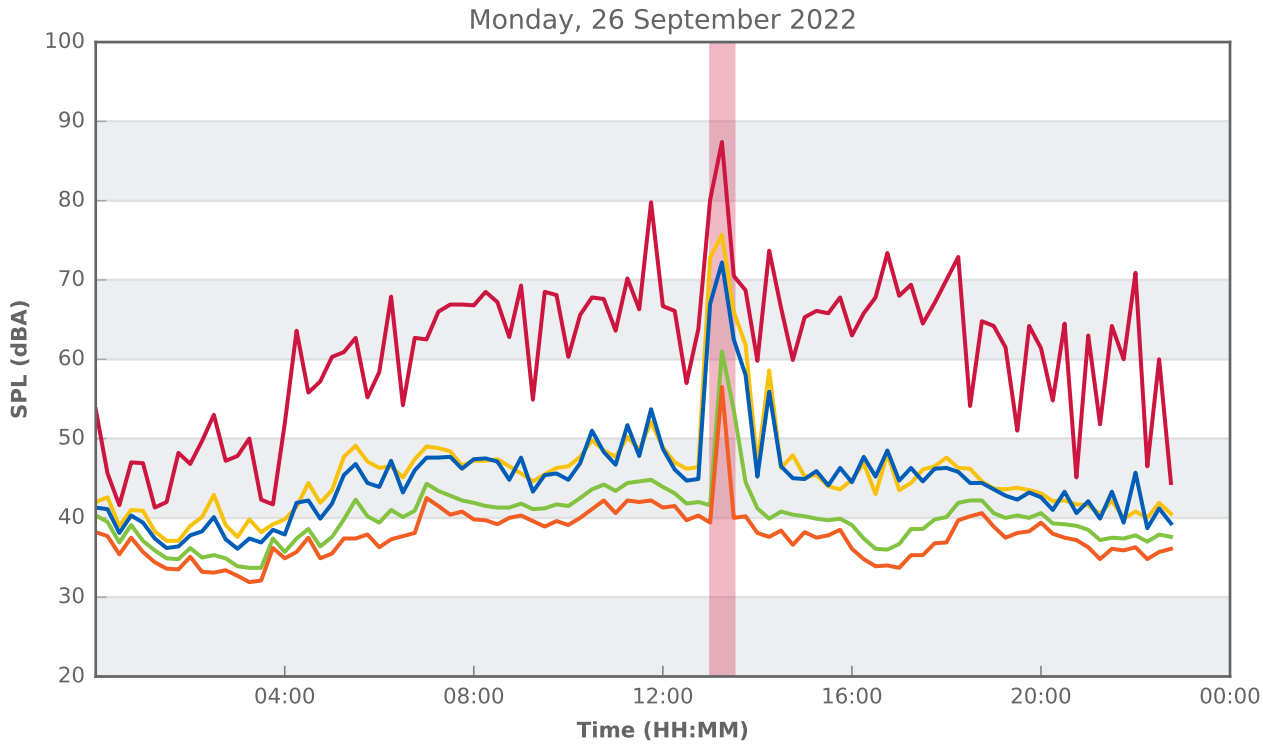

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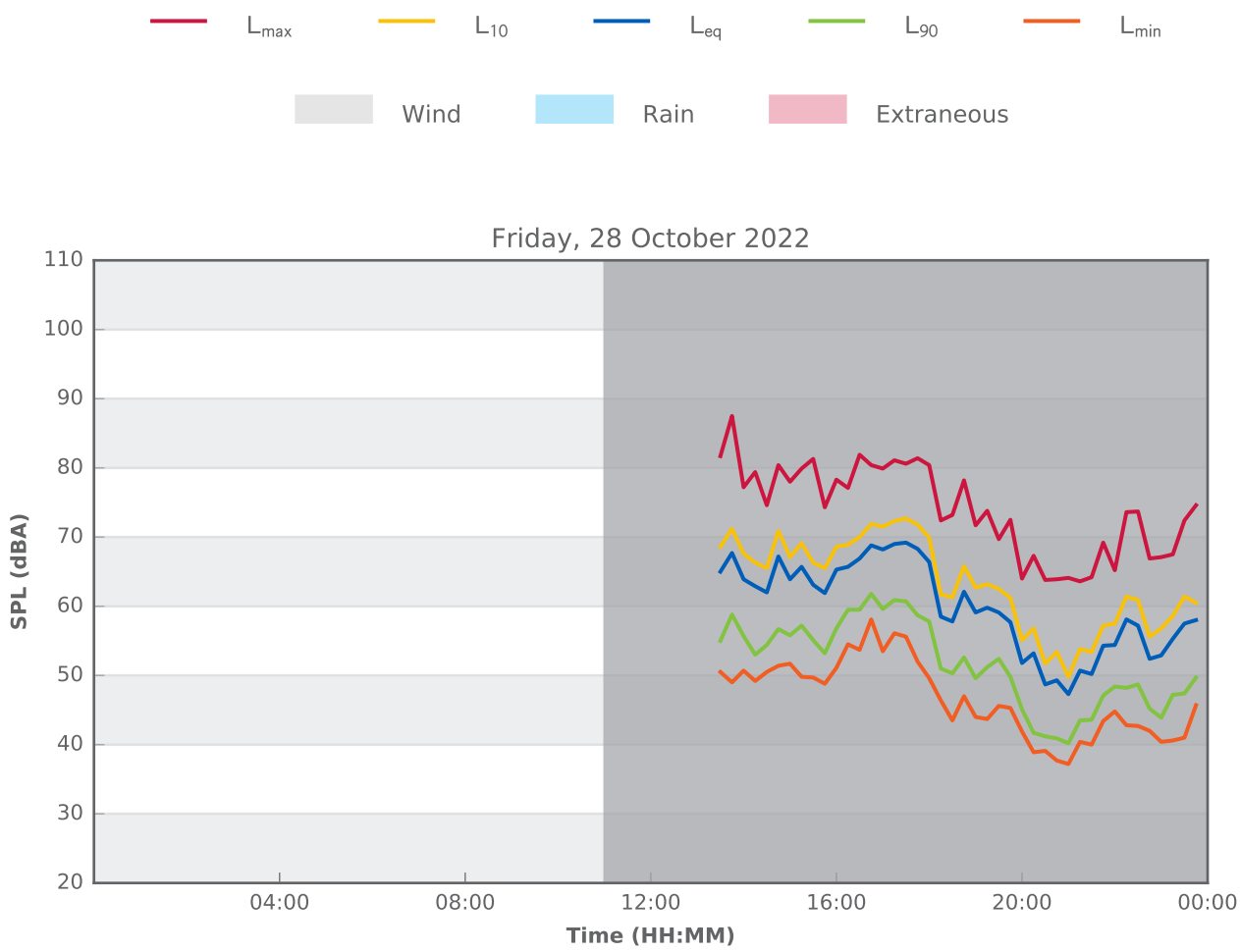

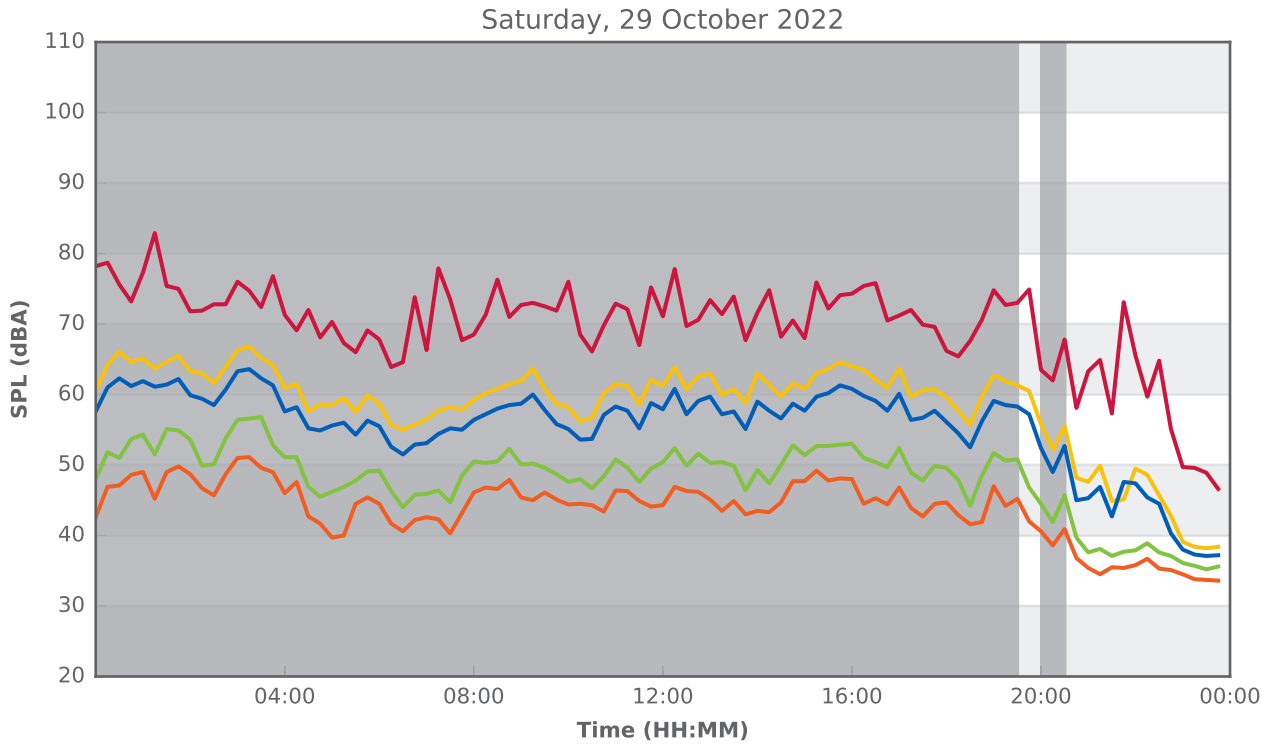

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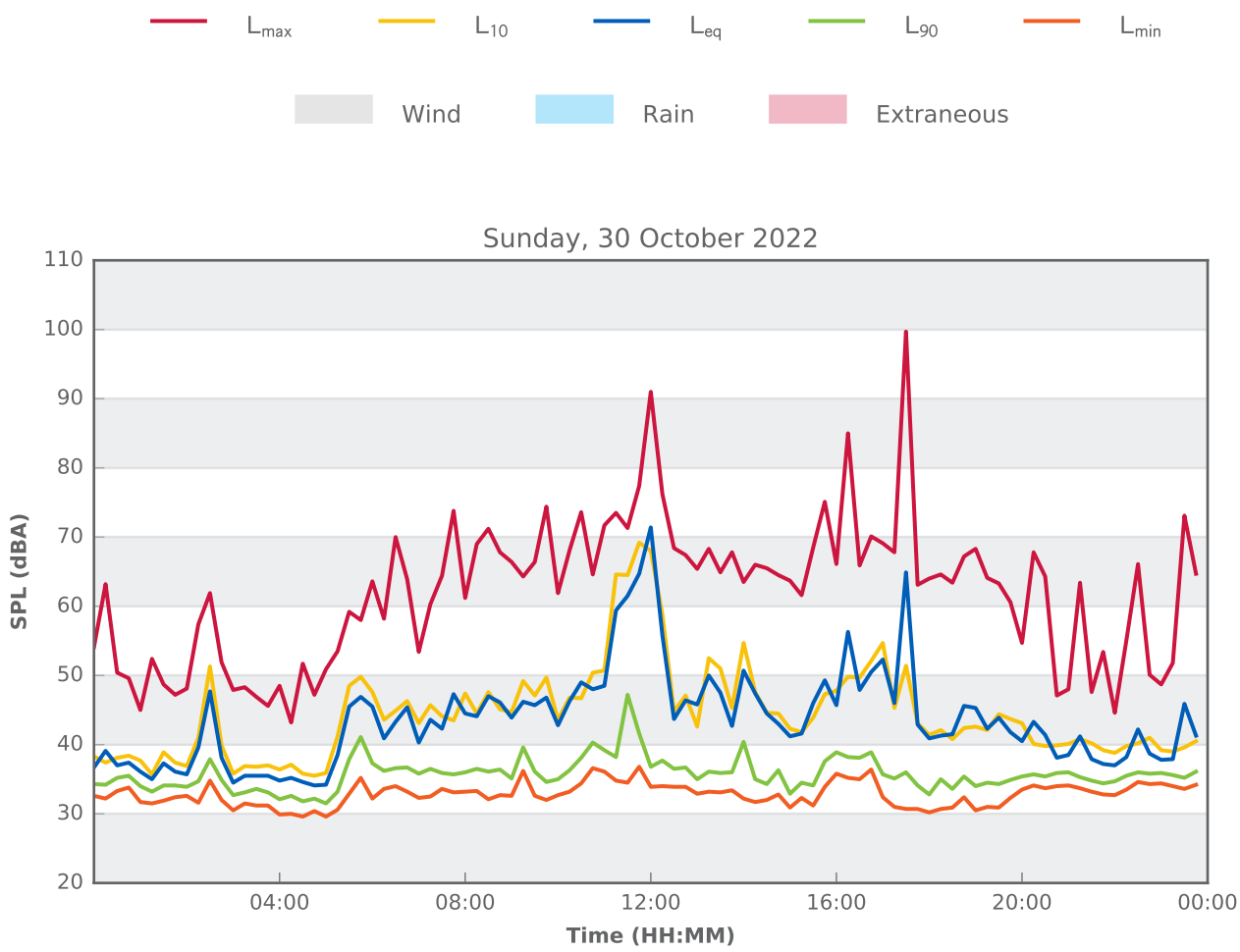
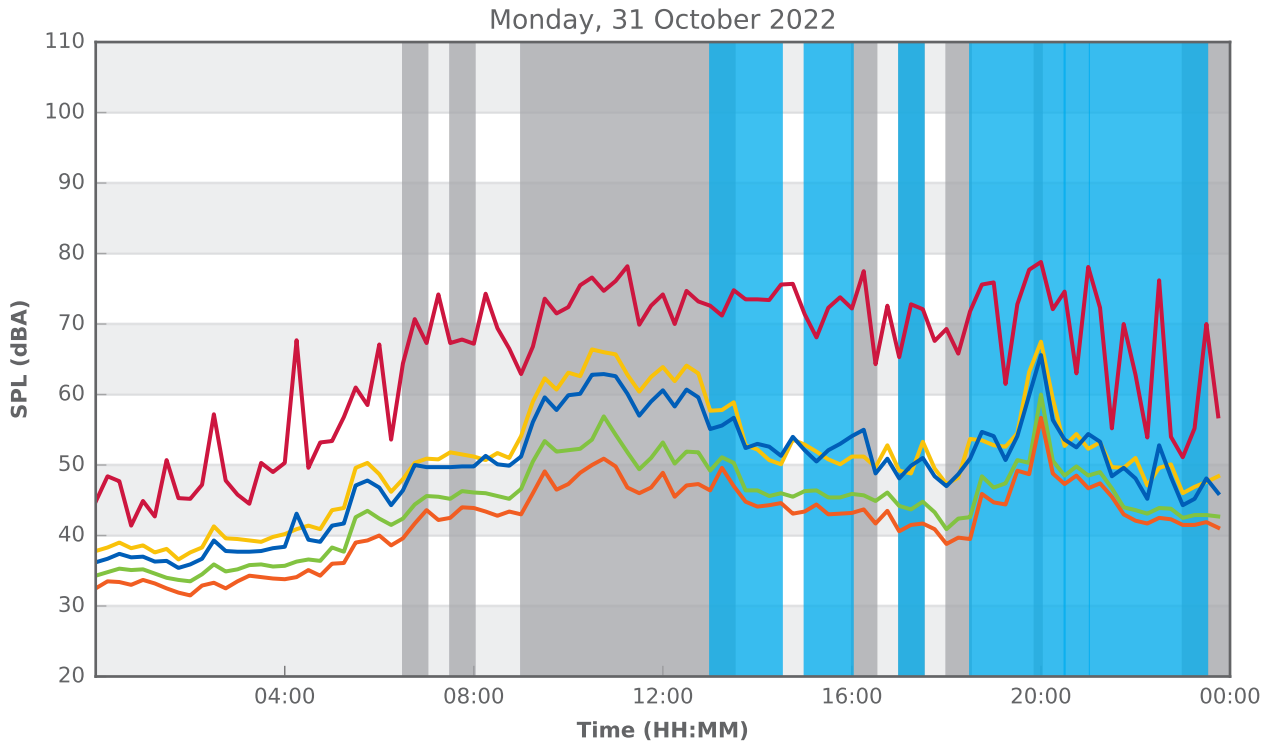
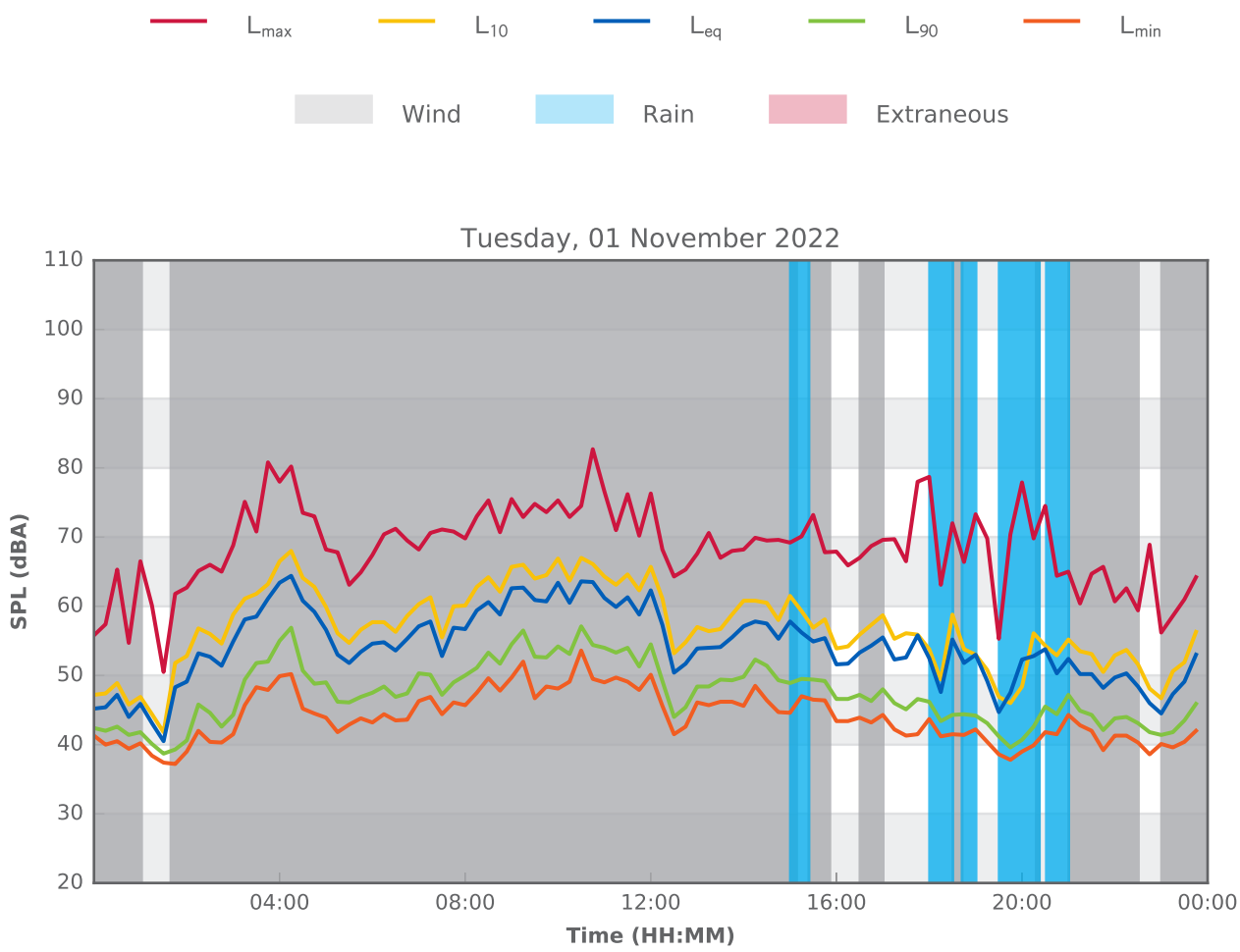
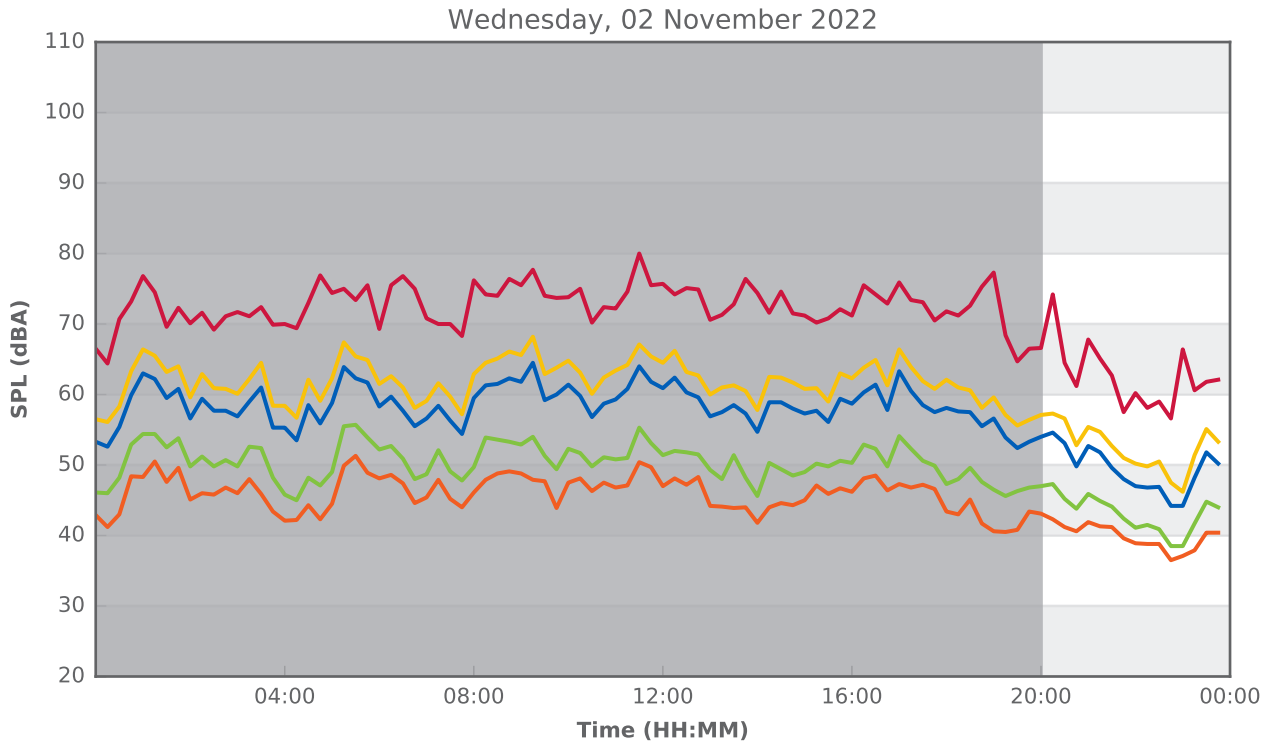


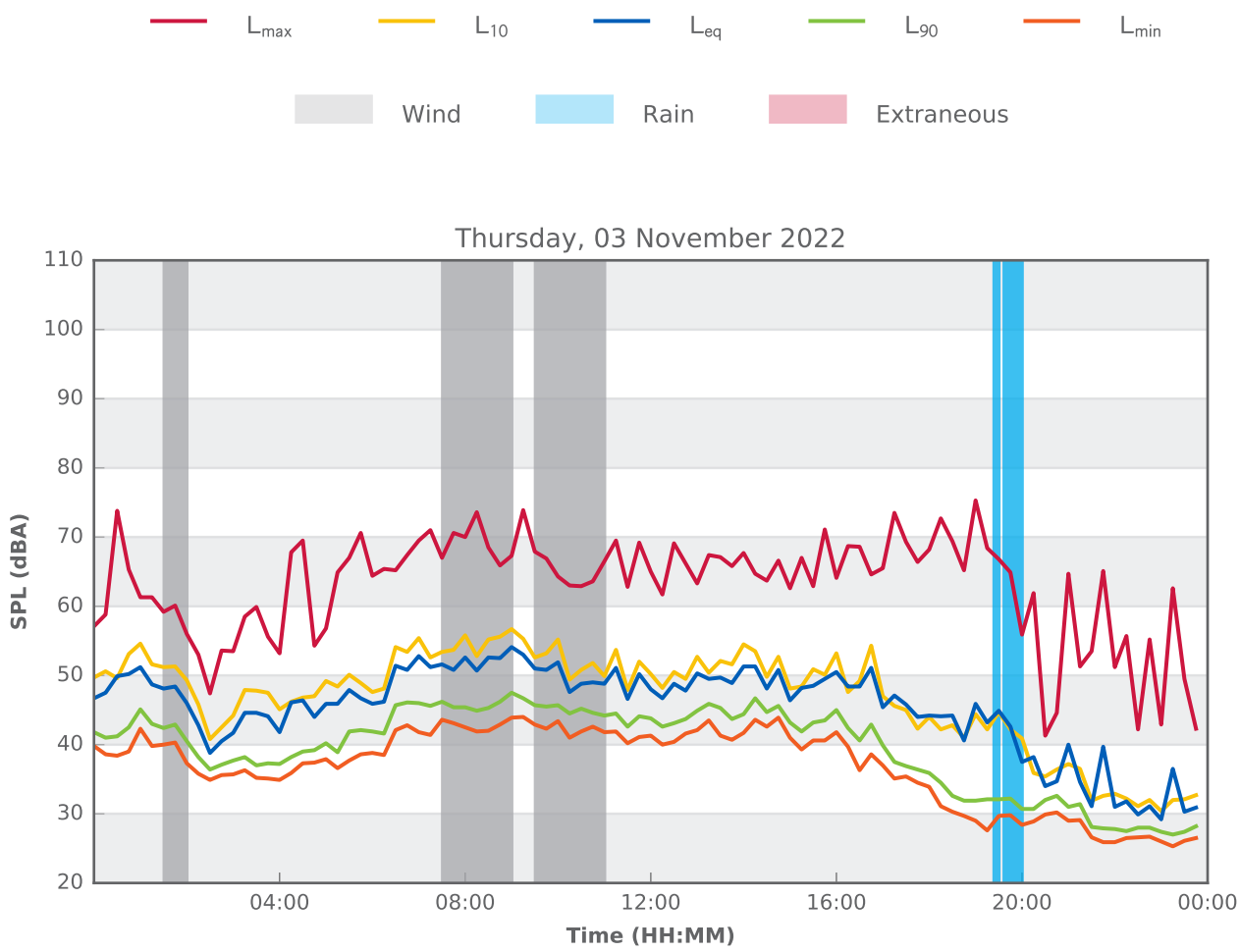


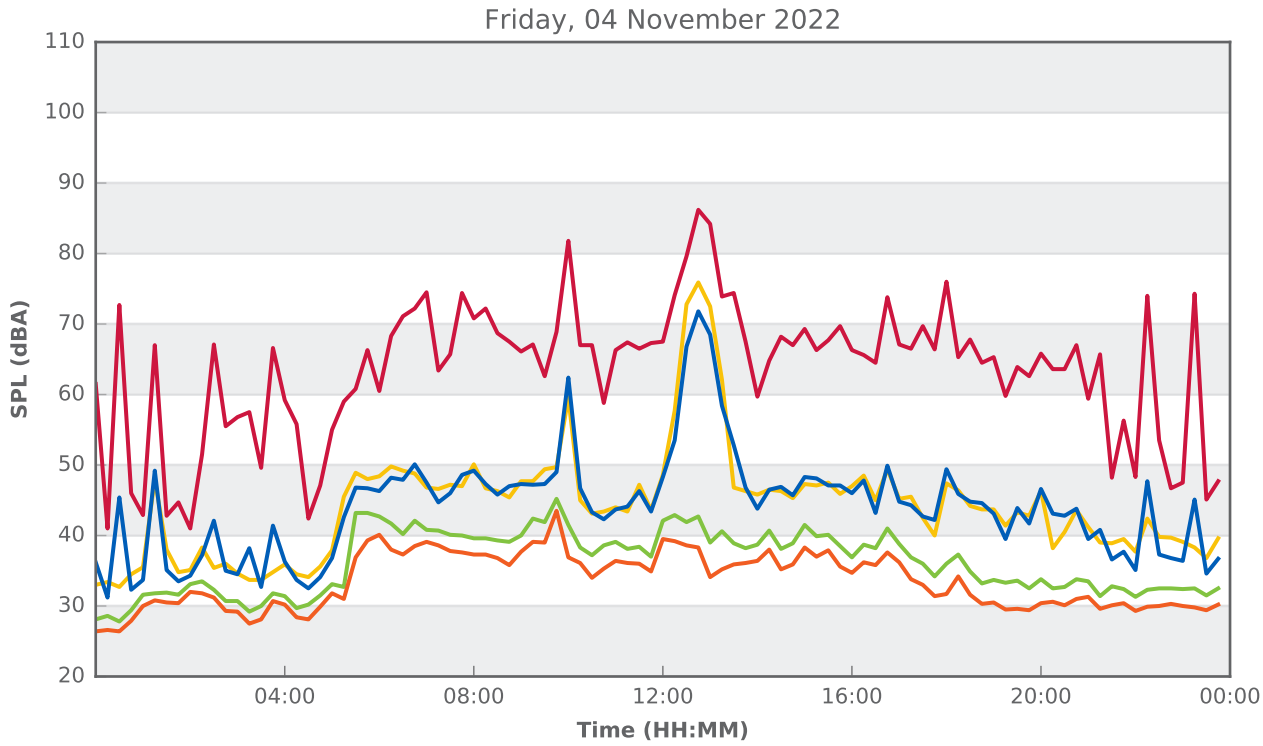
25 Gibbons Rd, Moss Vale



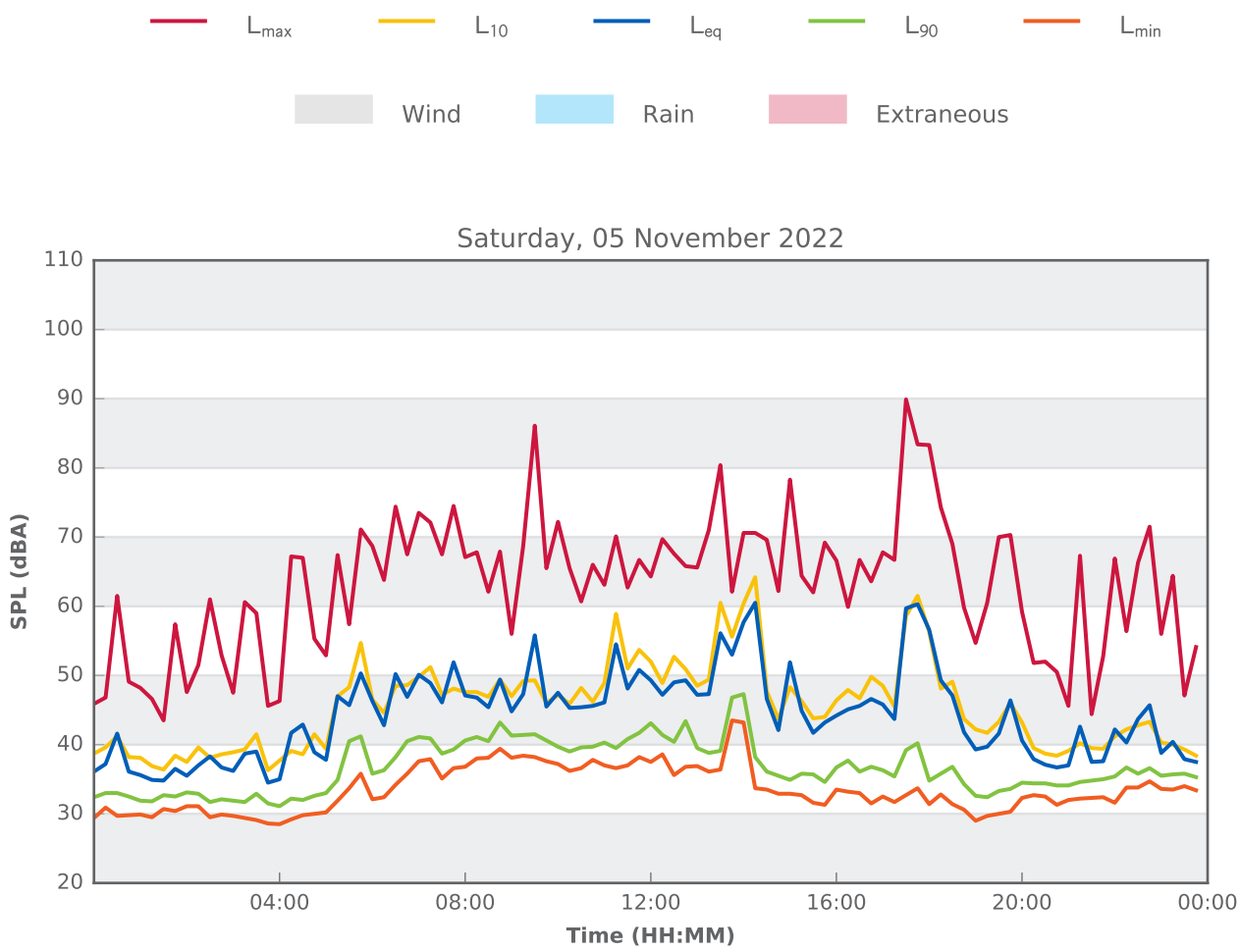


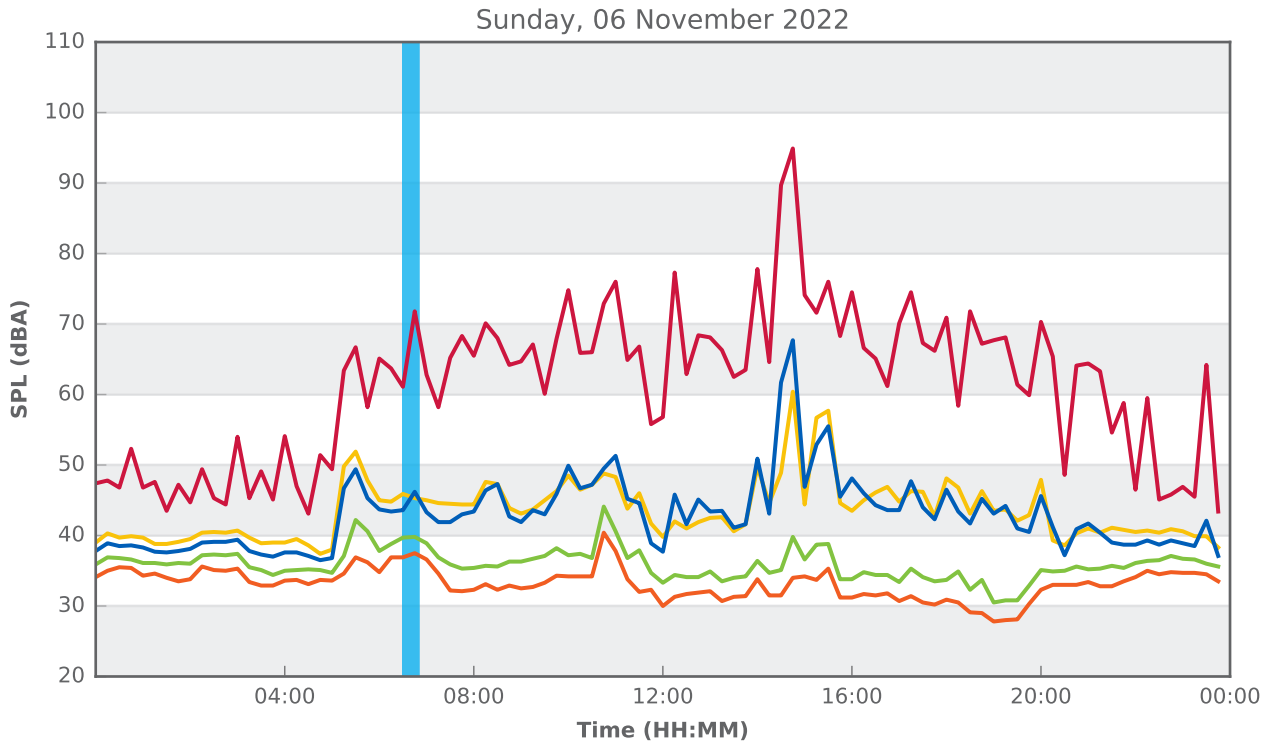
25 Gibbons Rd, Moss Vale



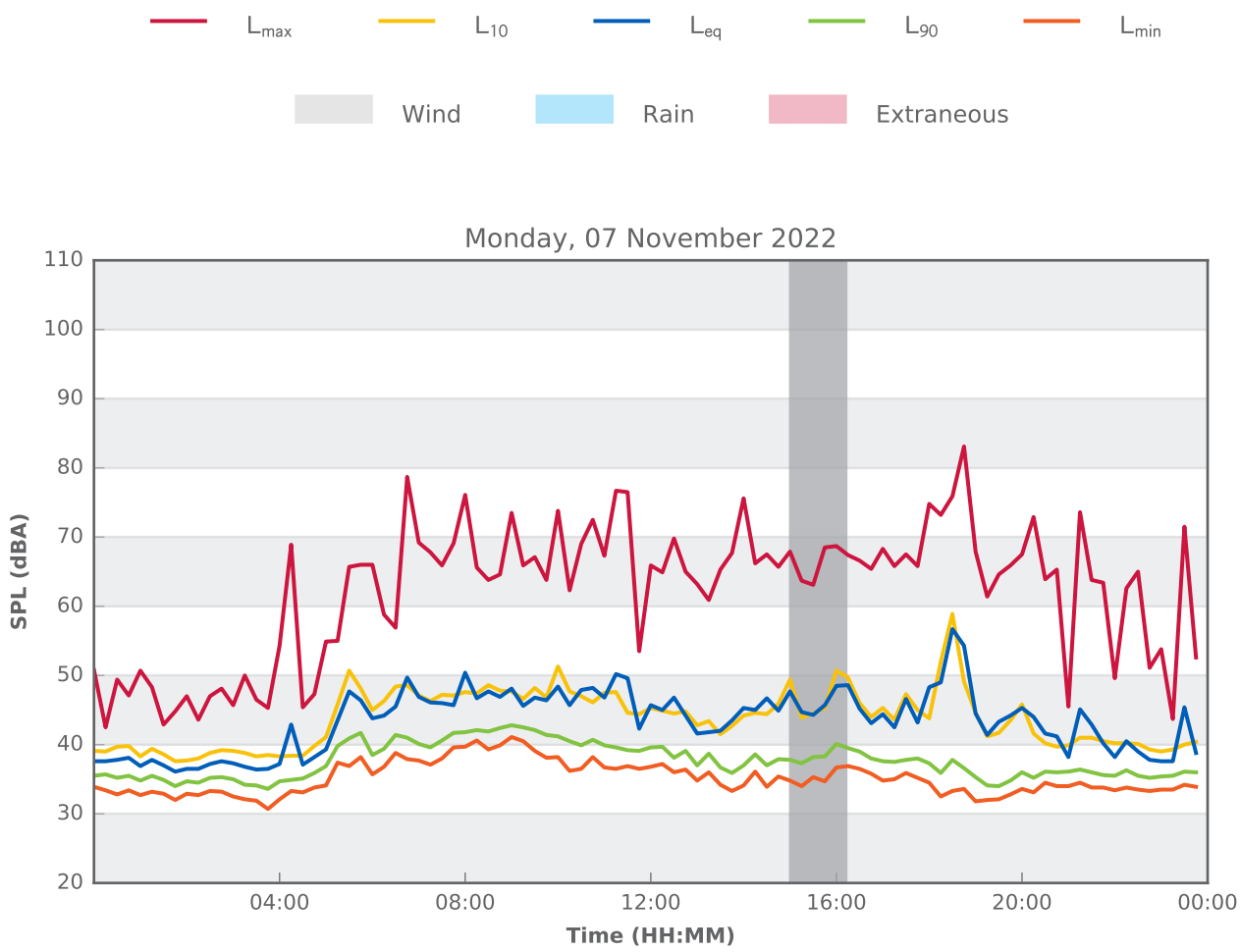


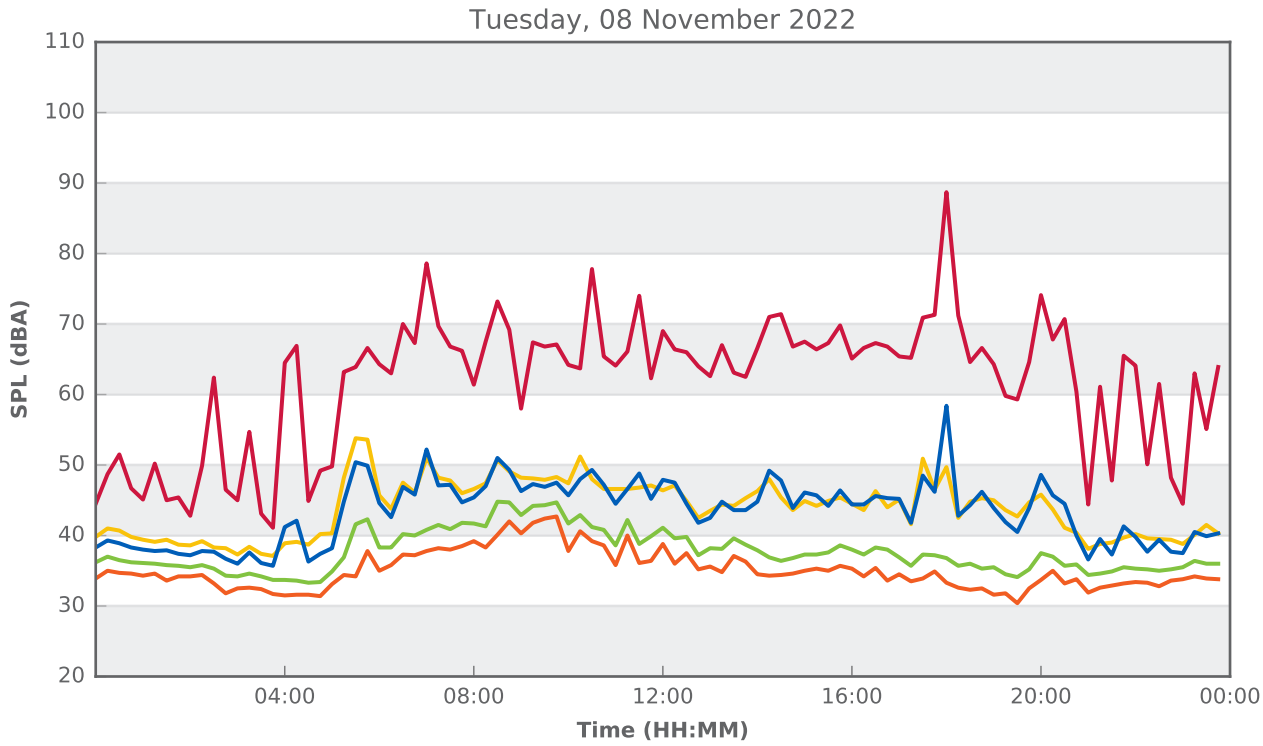
25 Gibbons Rd, Moss Vale

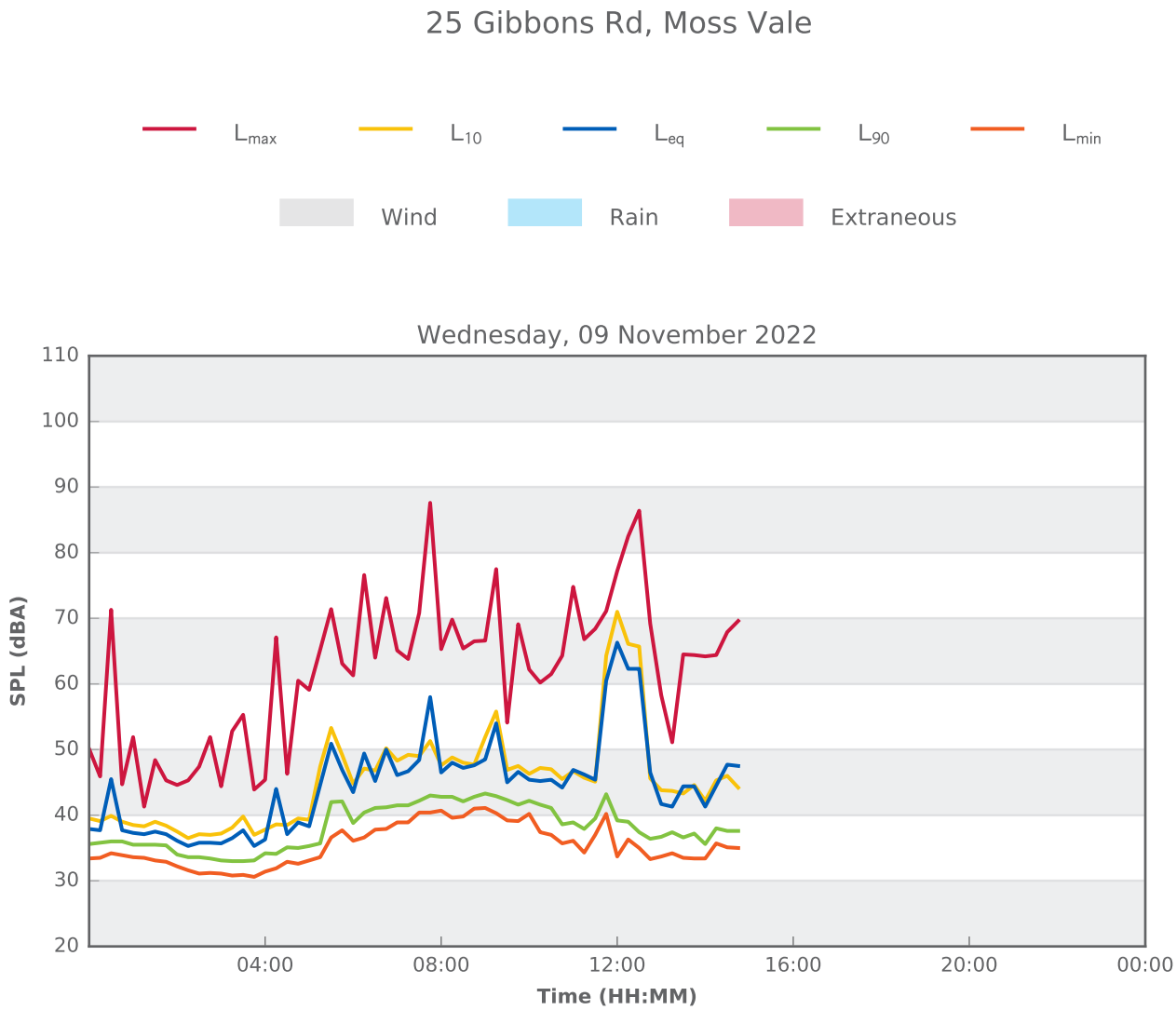




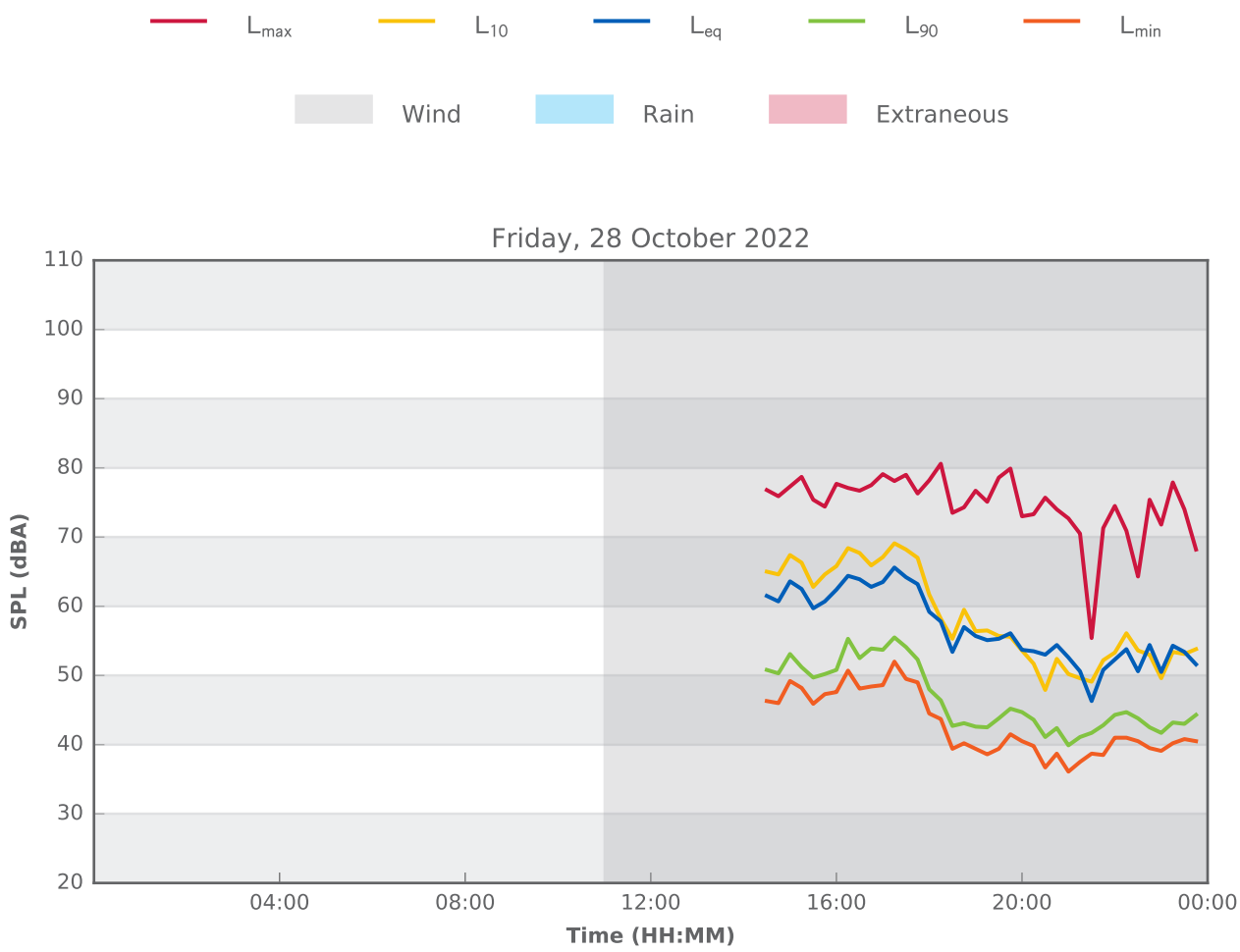
25 Gibbons Rd, Moss Vale

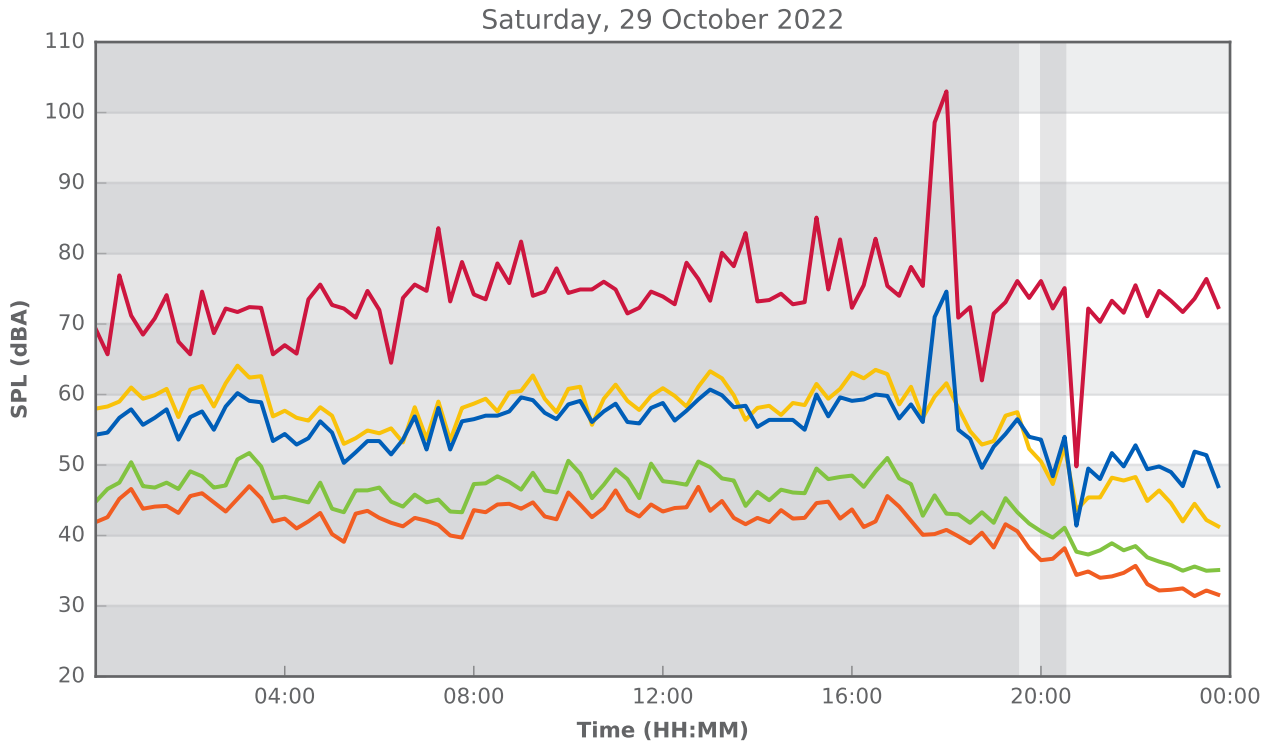




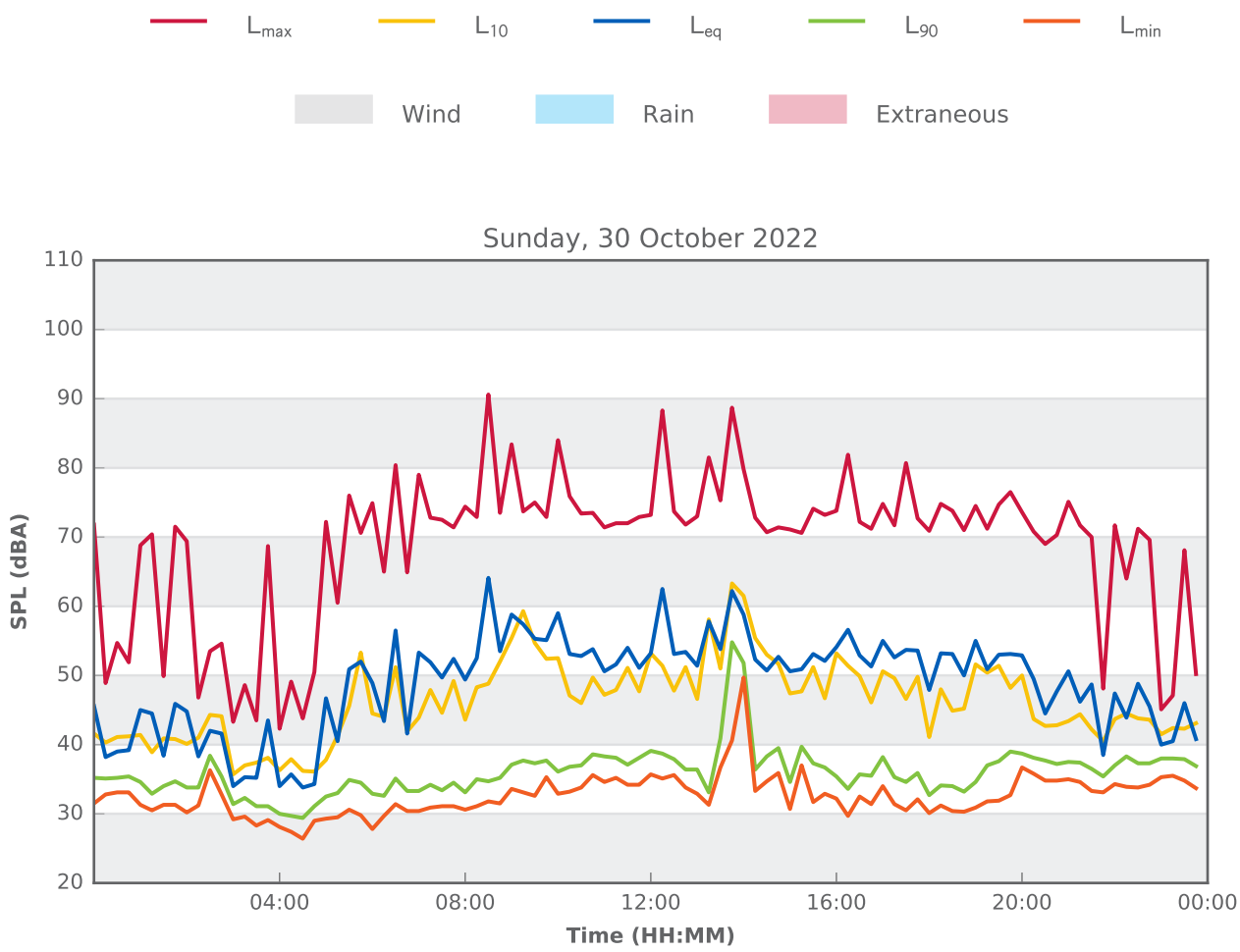

25 Gibbons Rd, Moss Vale
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Wednesday, 09 November 2022
110
100
90
80
70
60
50
40
30
20
SPL (dBA)
04:00
08:00
12:00
16:00
20:00
00:00
Time (HH:MM)

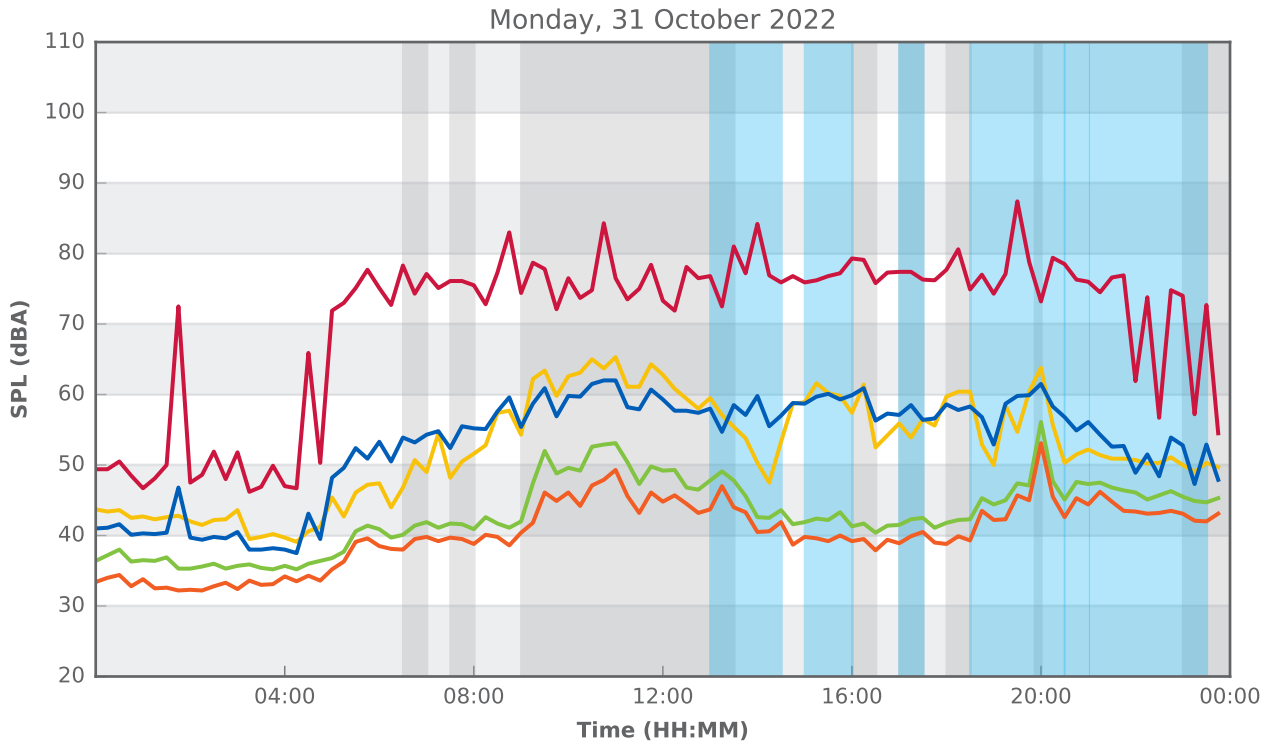
23 Bulwer Rd, Moss Vale



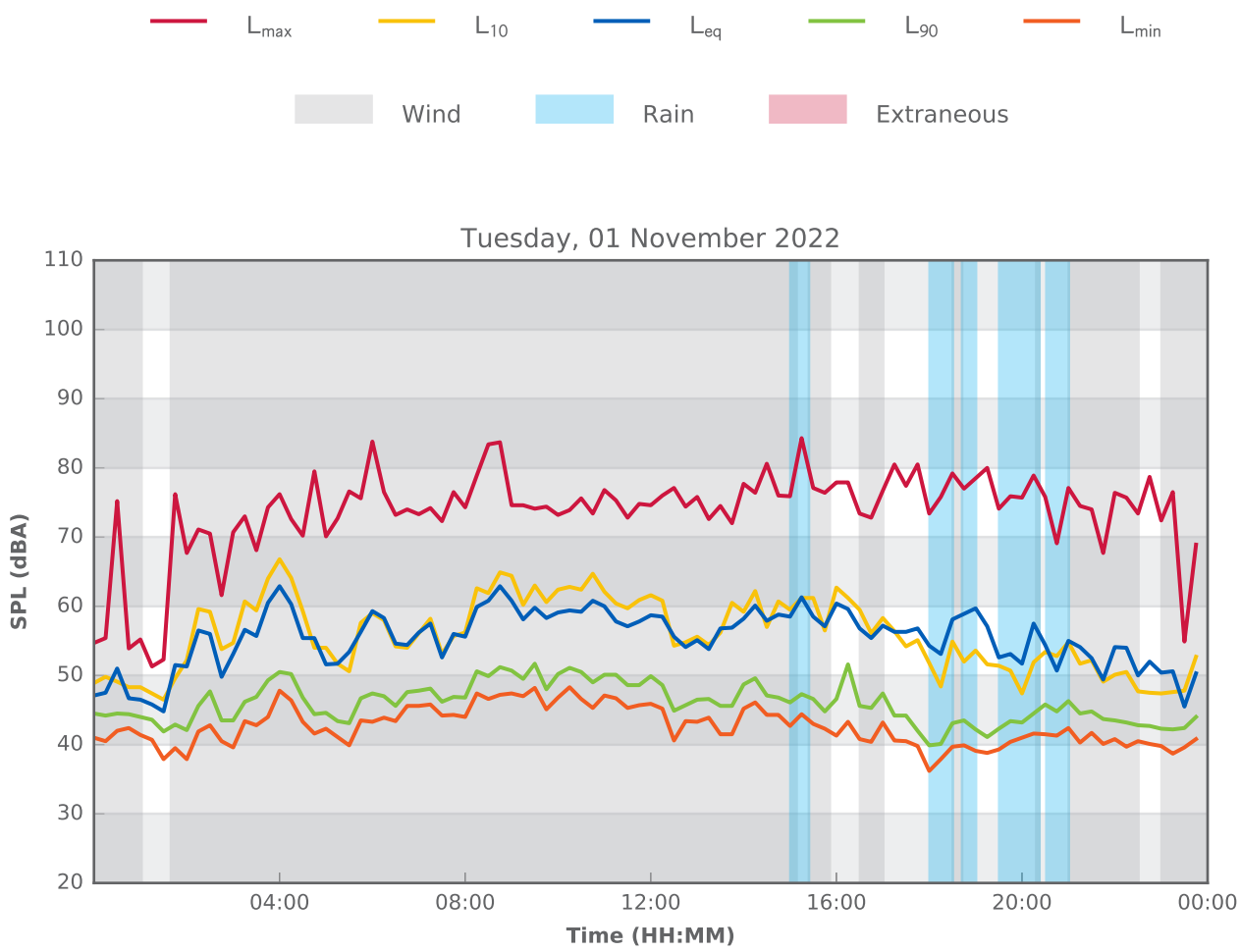


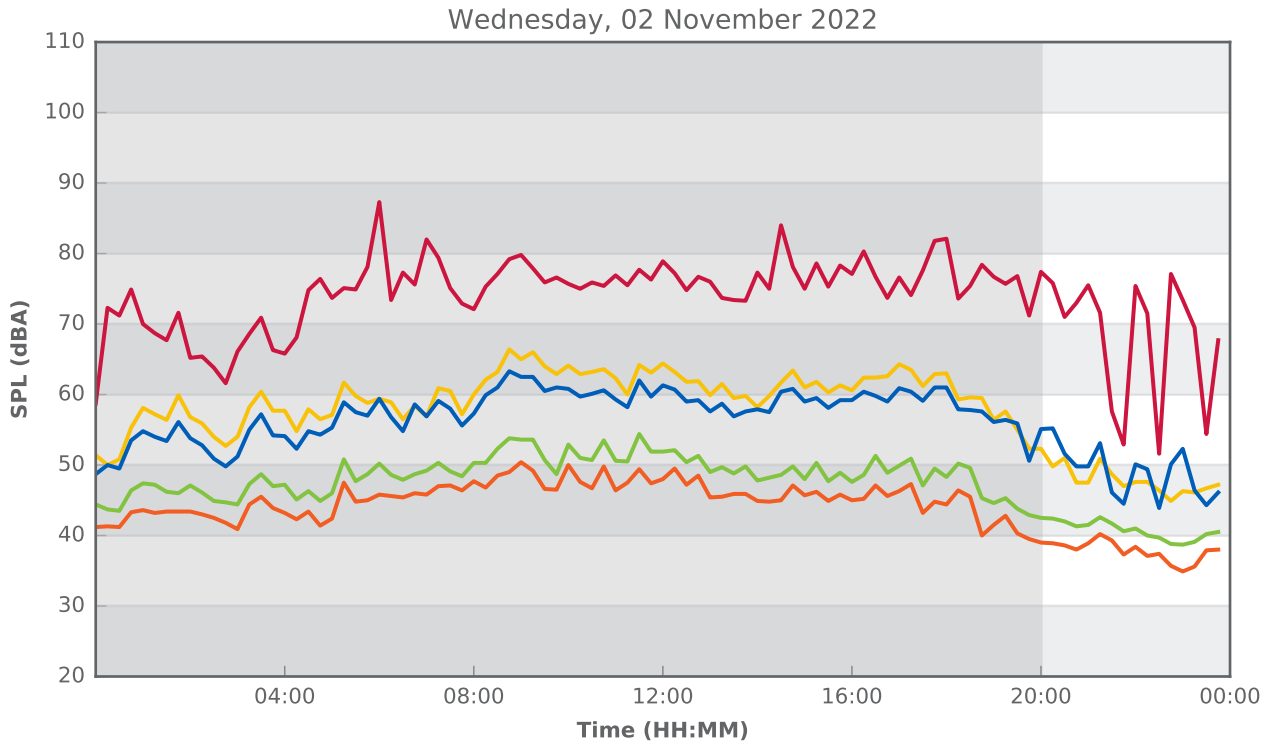
23 Bulwer Rd, Moss Vale



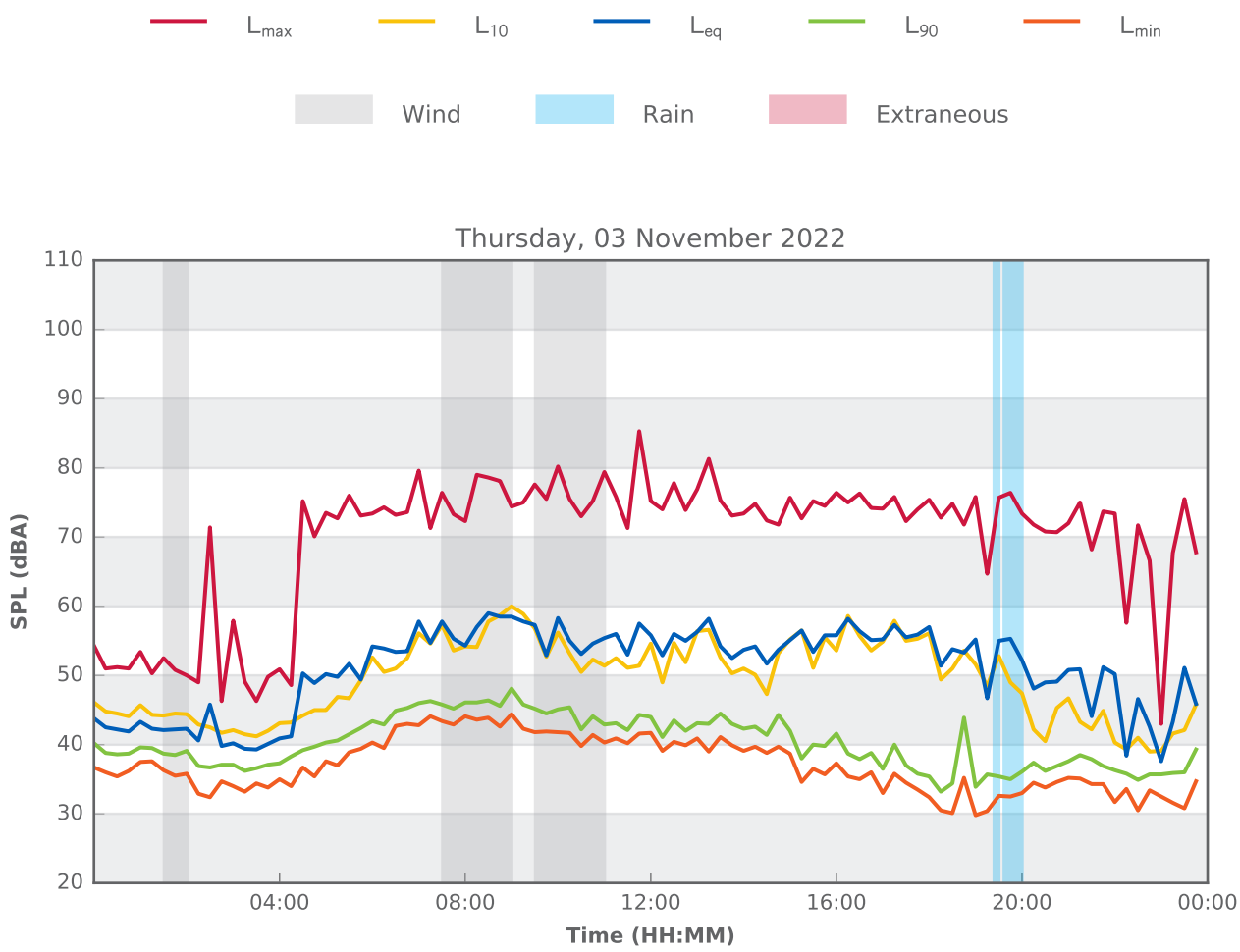


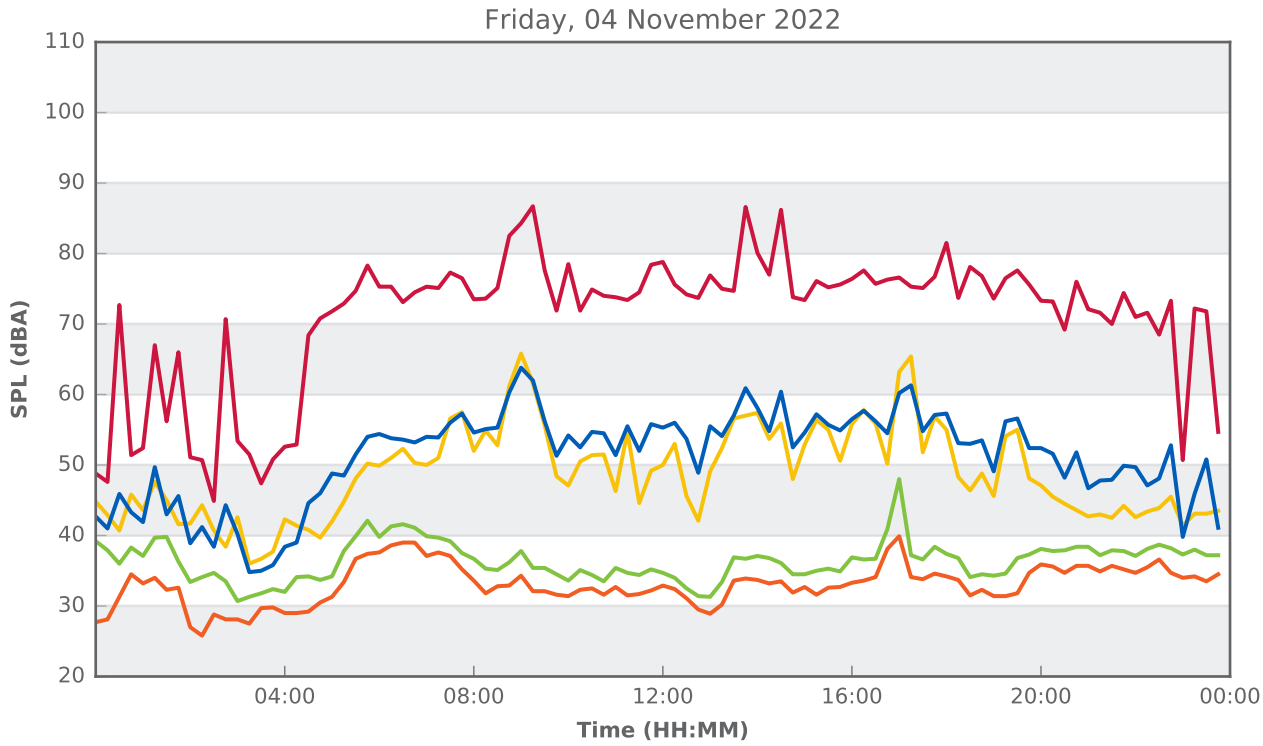
23 Bulwer Rd, Moss Vale





23 Bulwer Rd, Moss Vale





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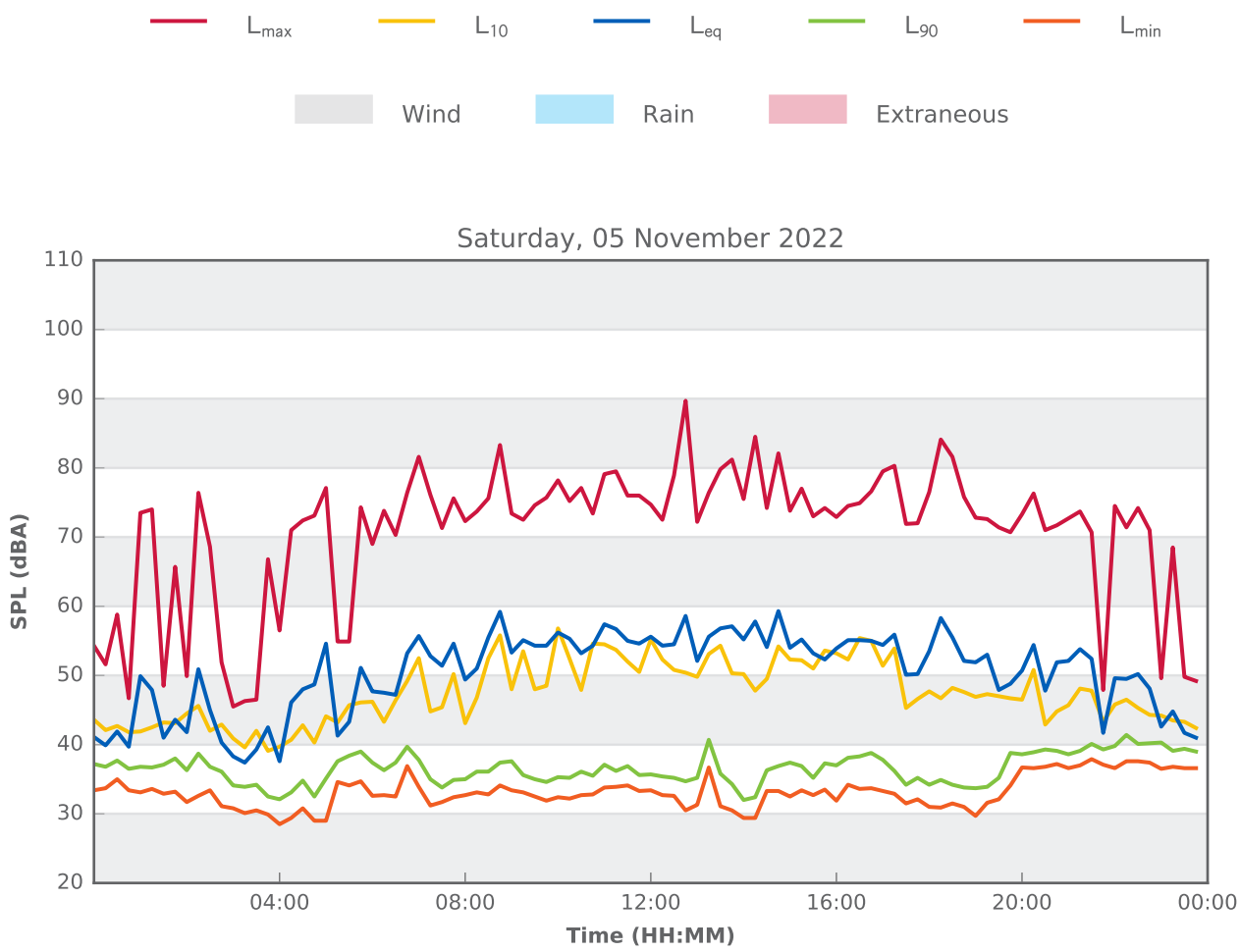
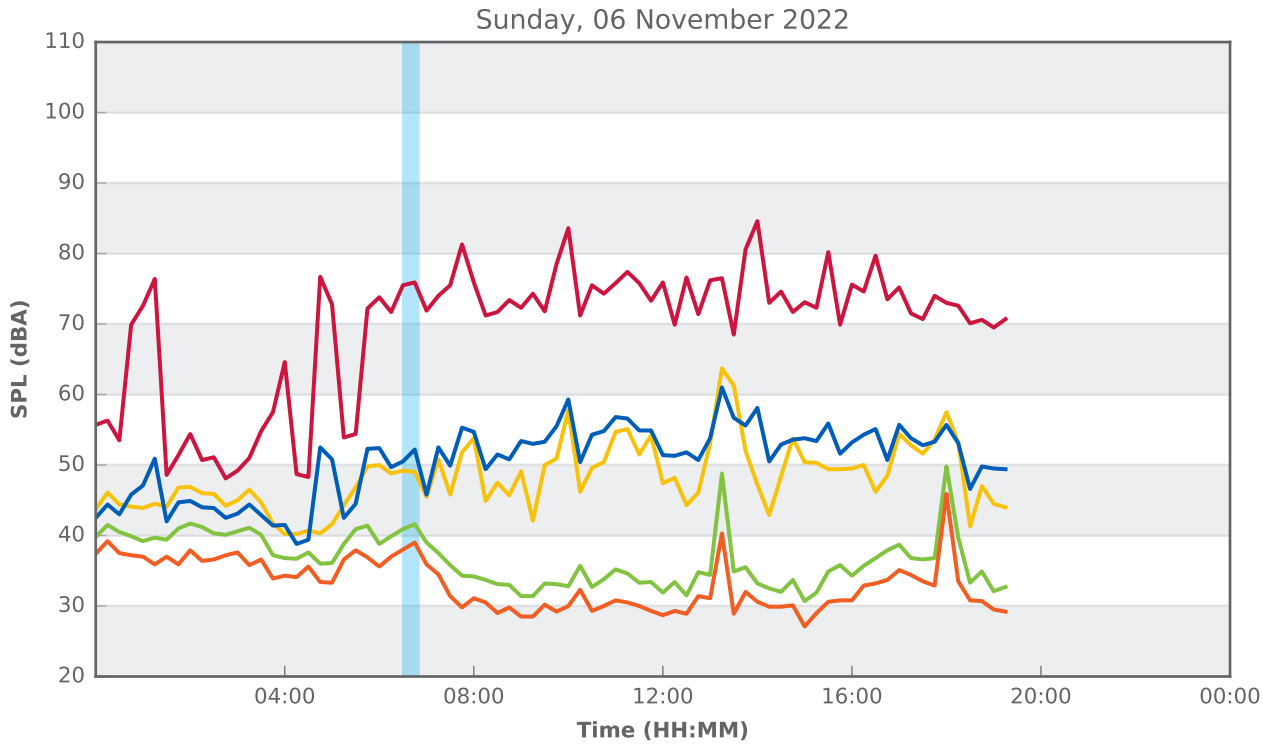
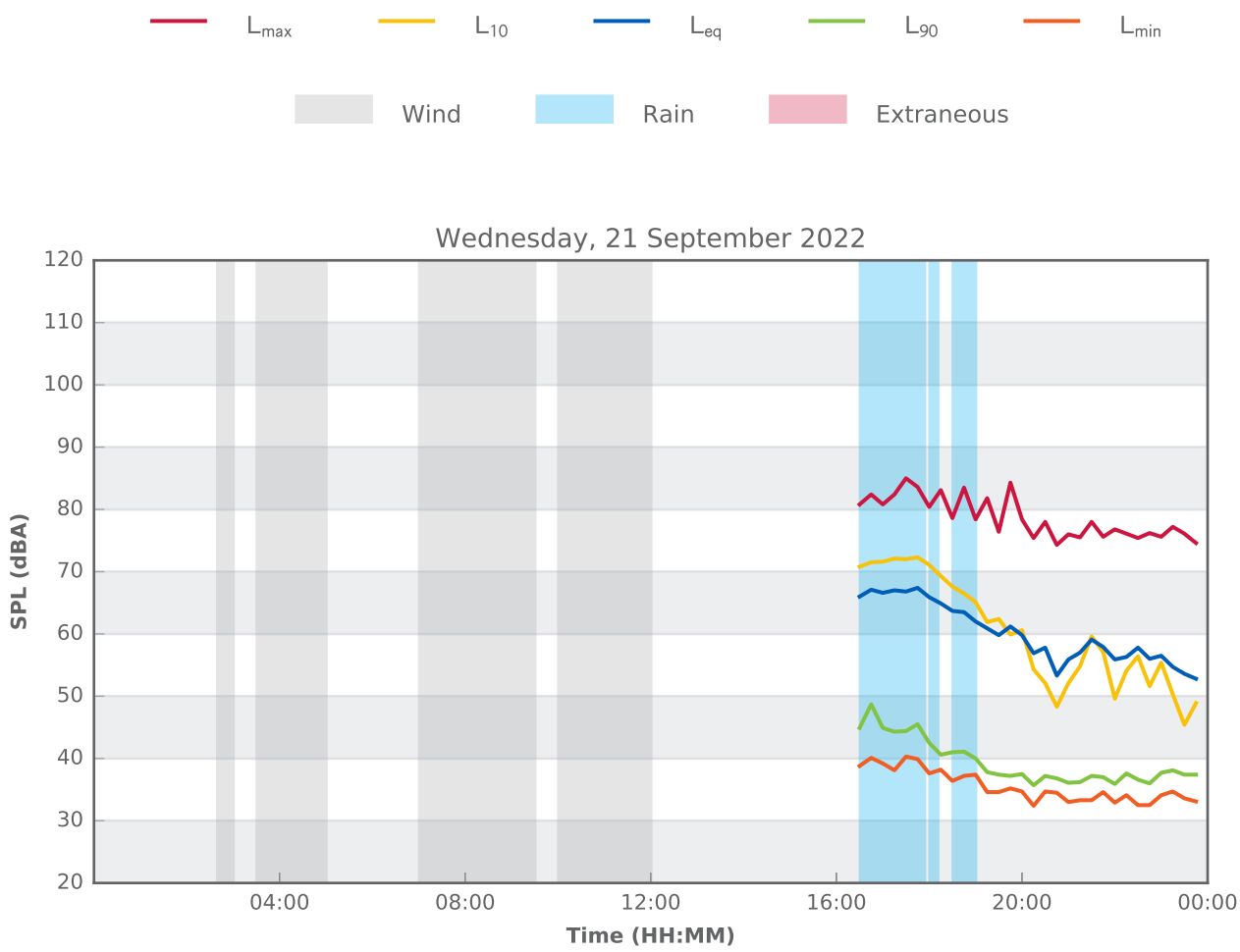
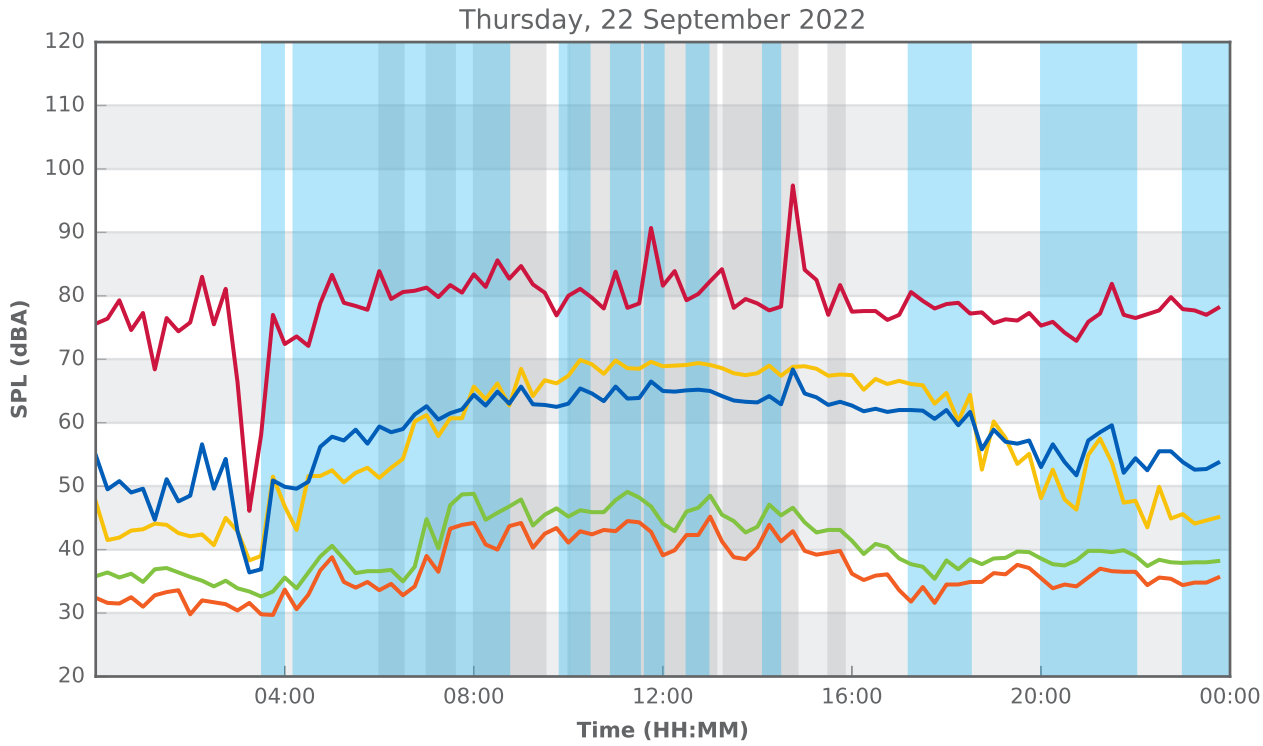


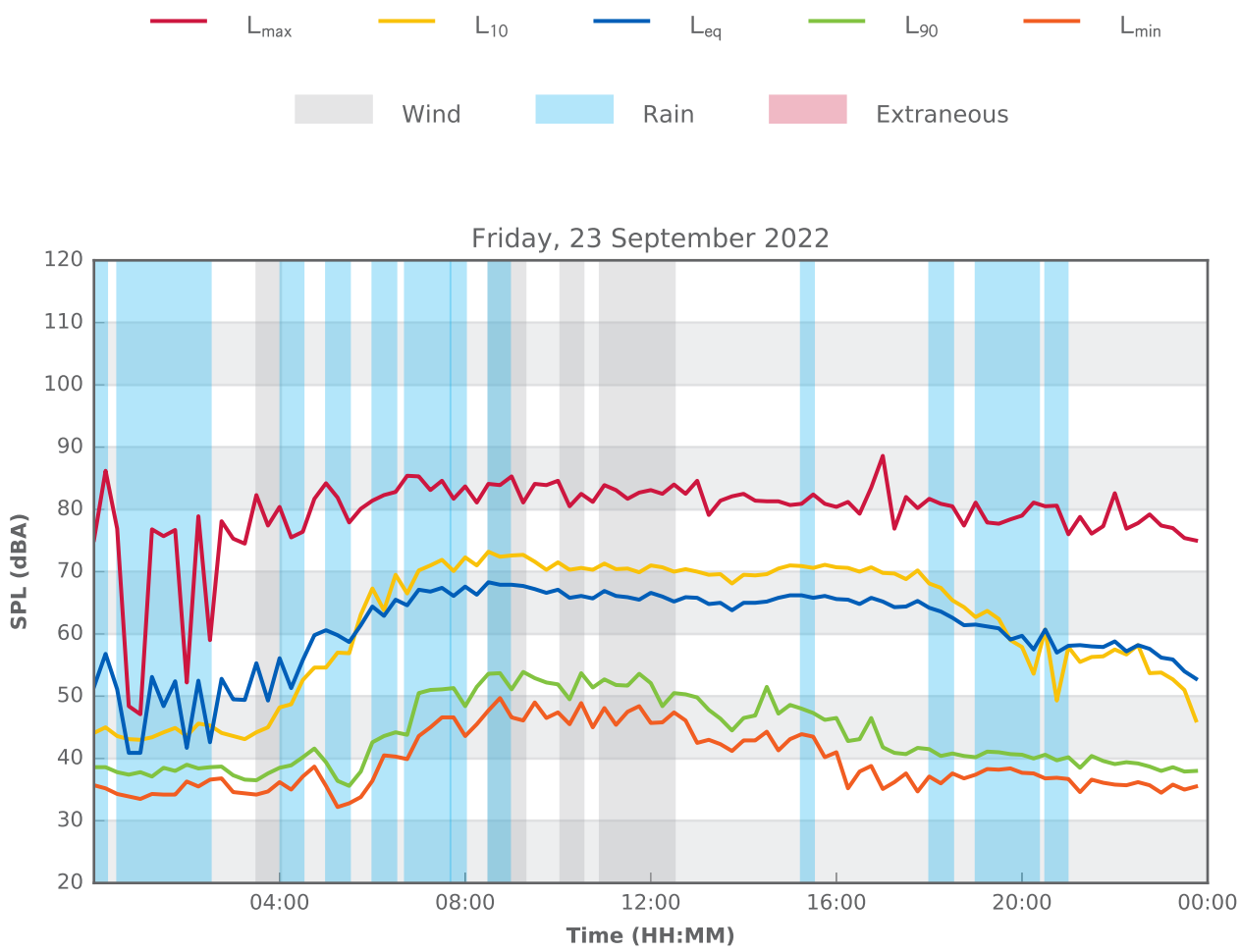


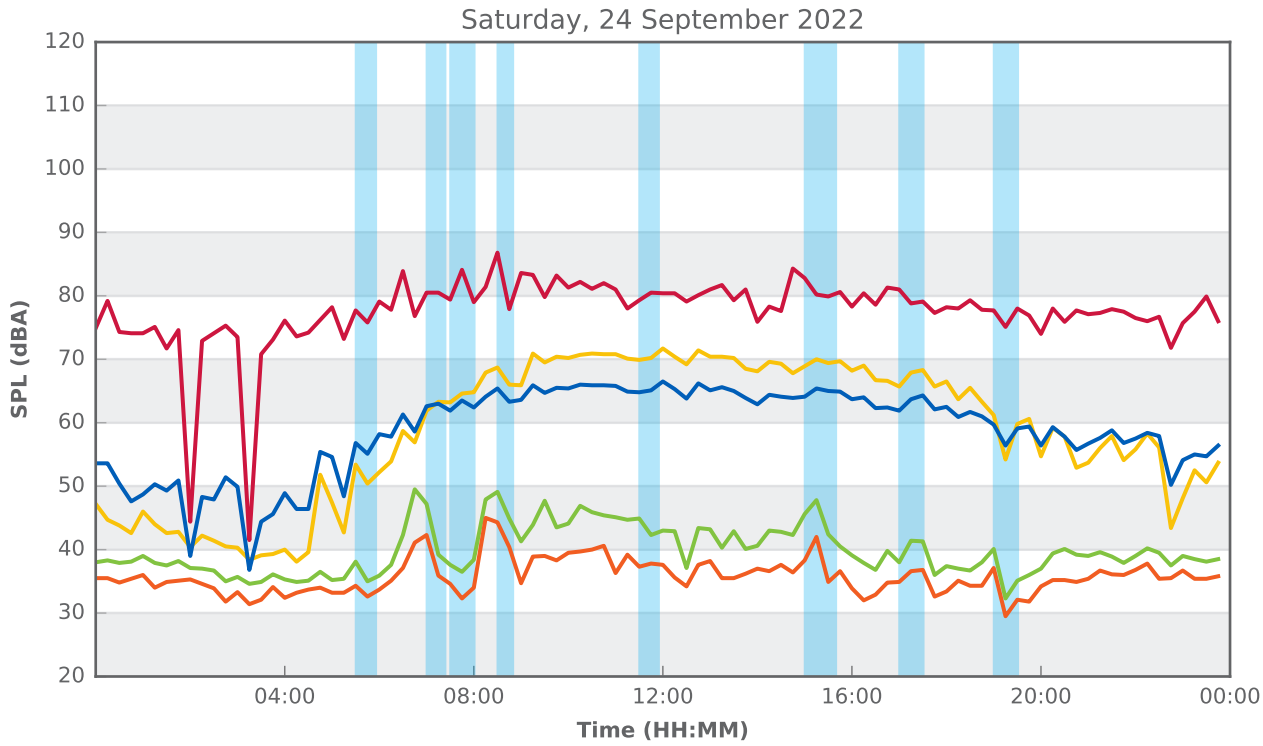
194 Berrima Rd, Moss Vale



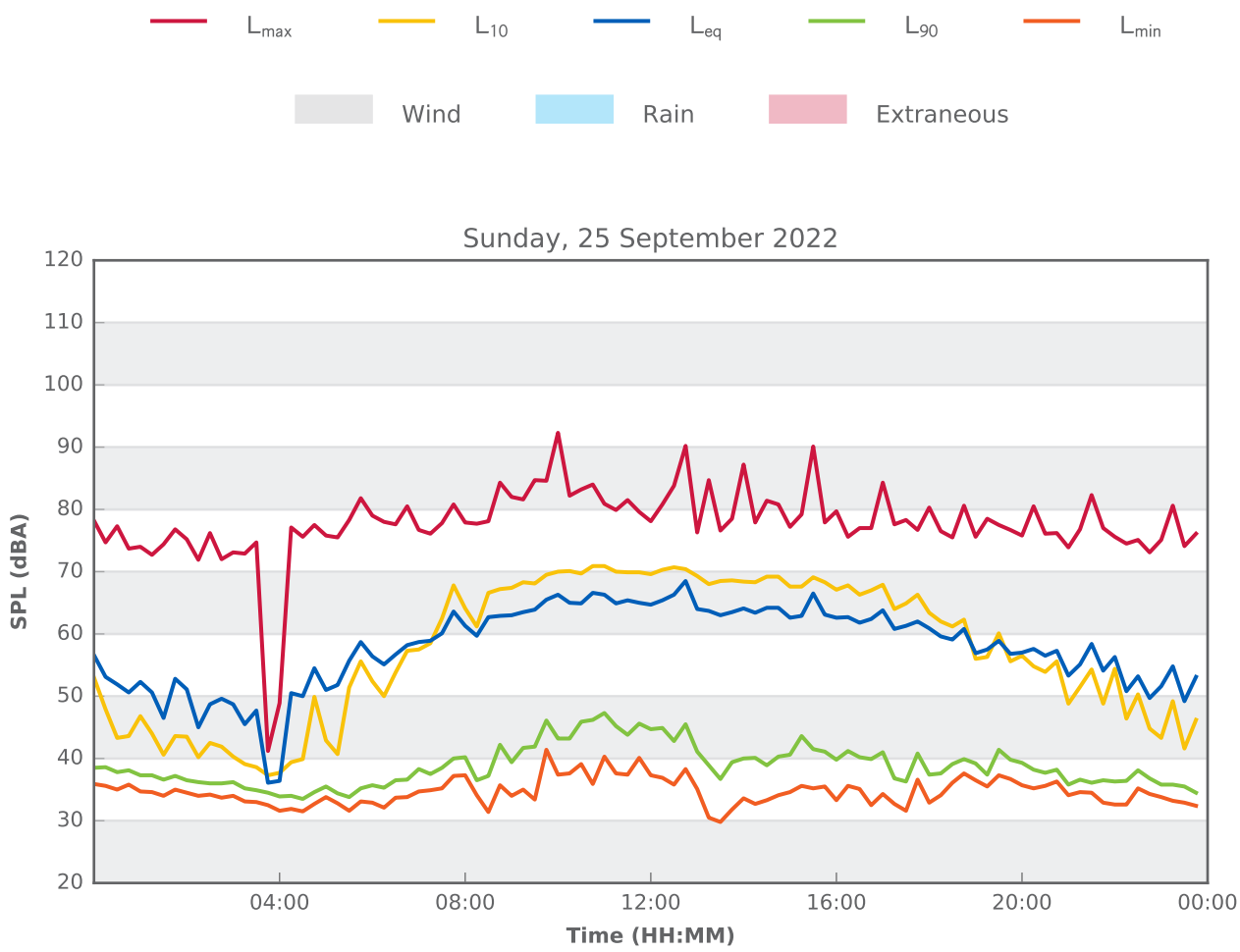


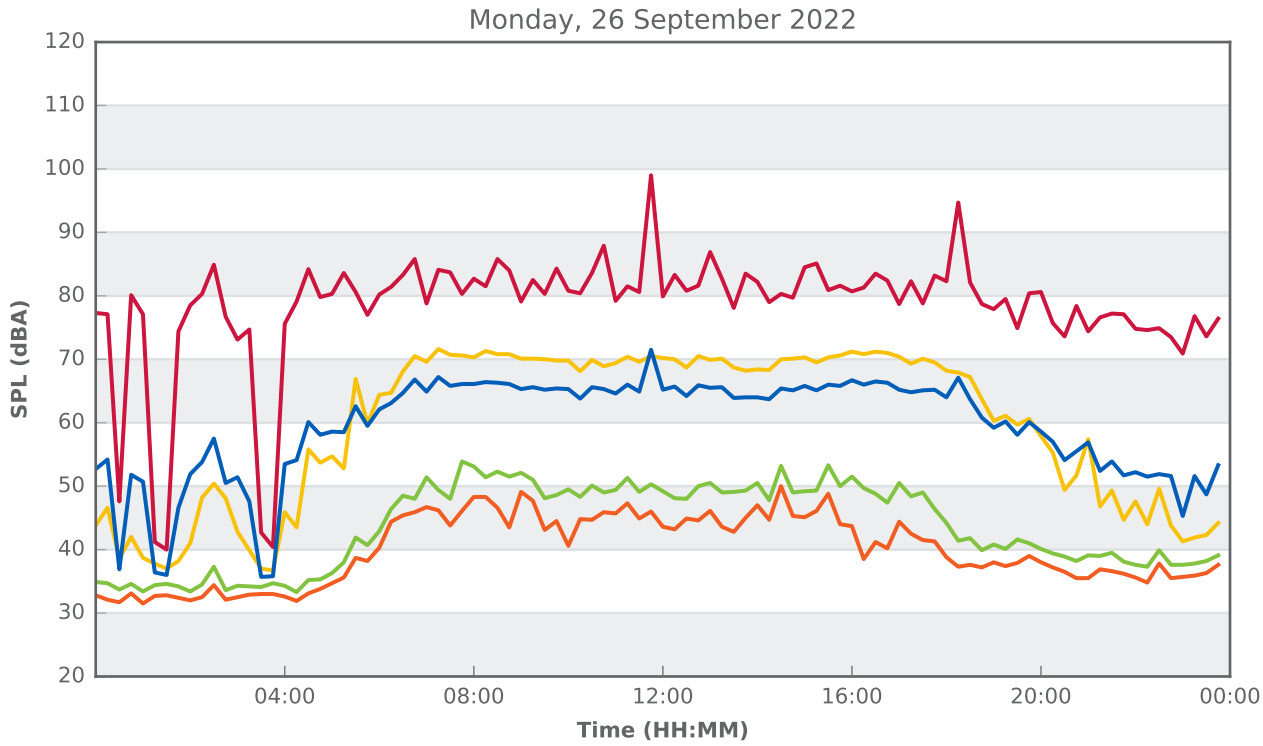
194 Berrima Rd, Moss Vale



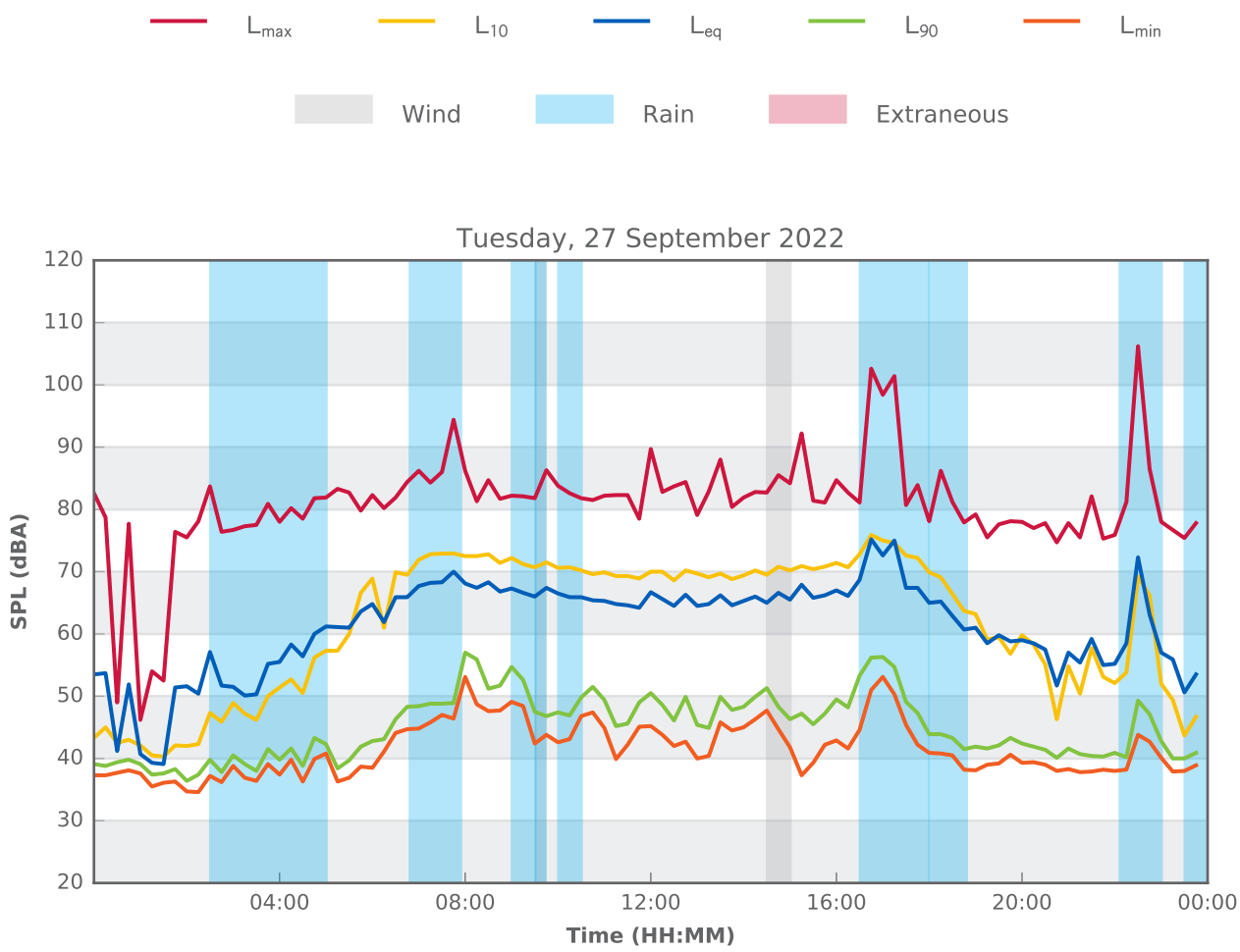


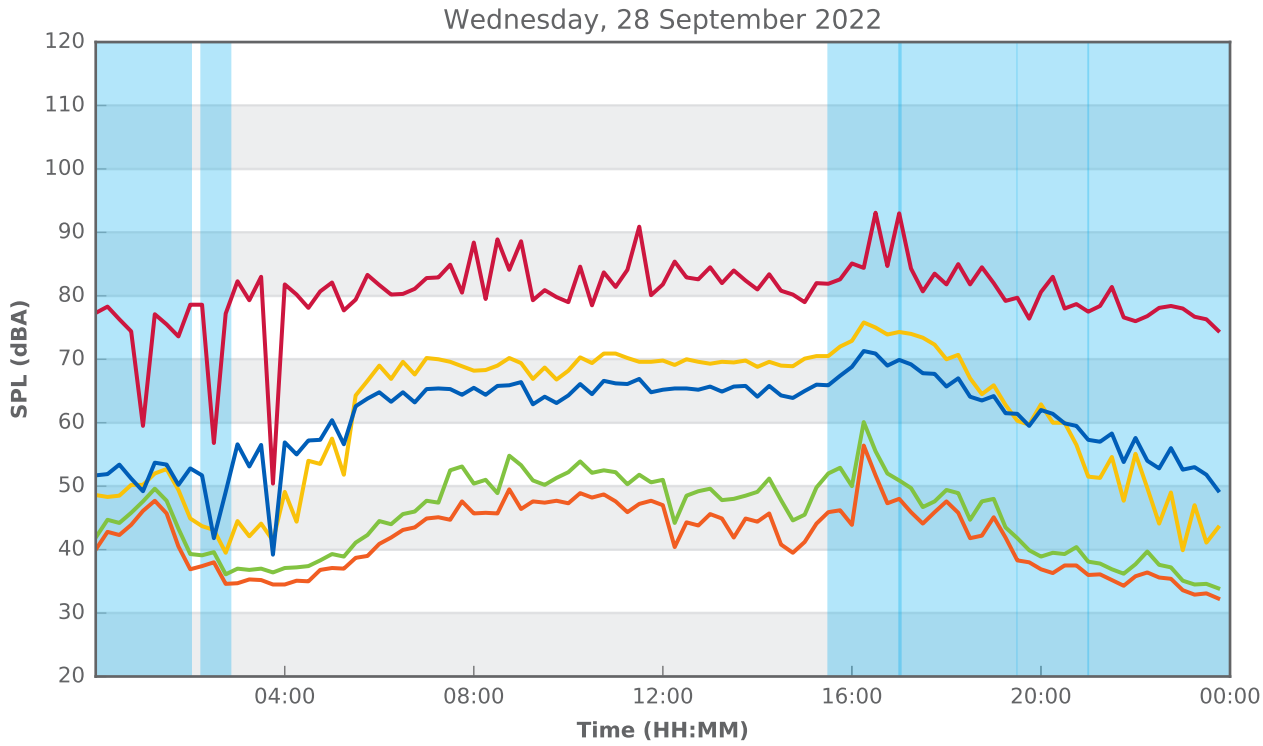
194 Berrima Rd, Moss Vale



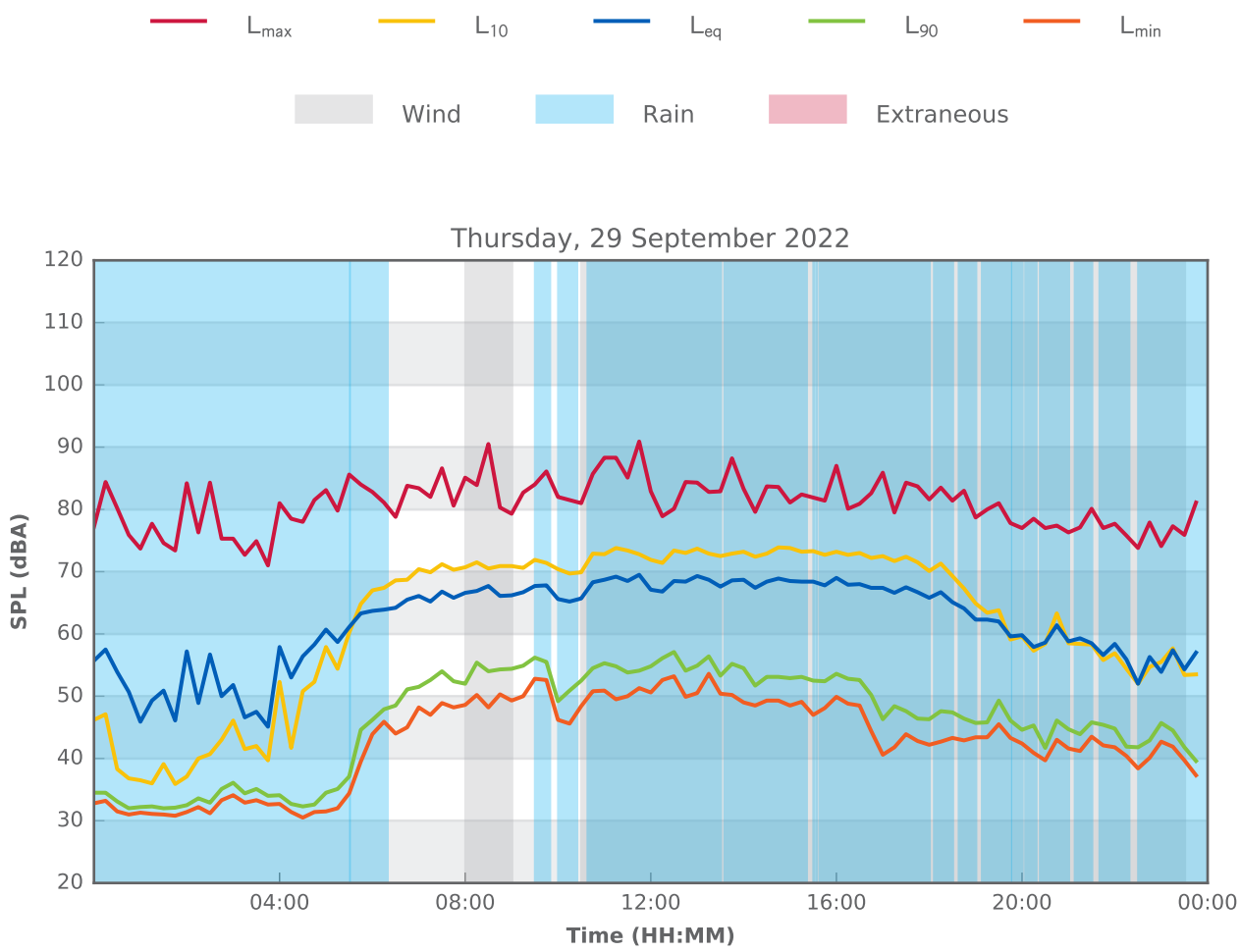


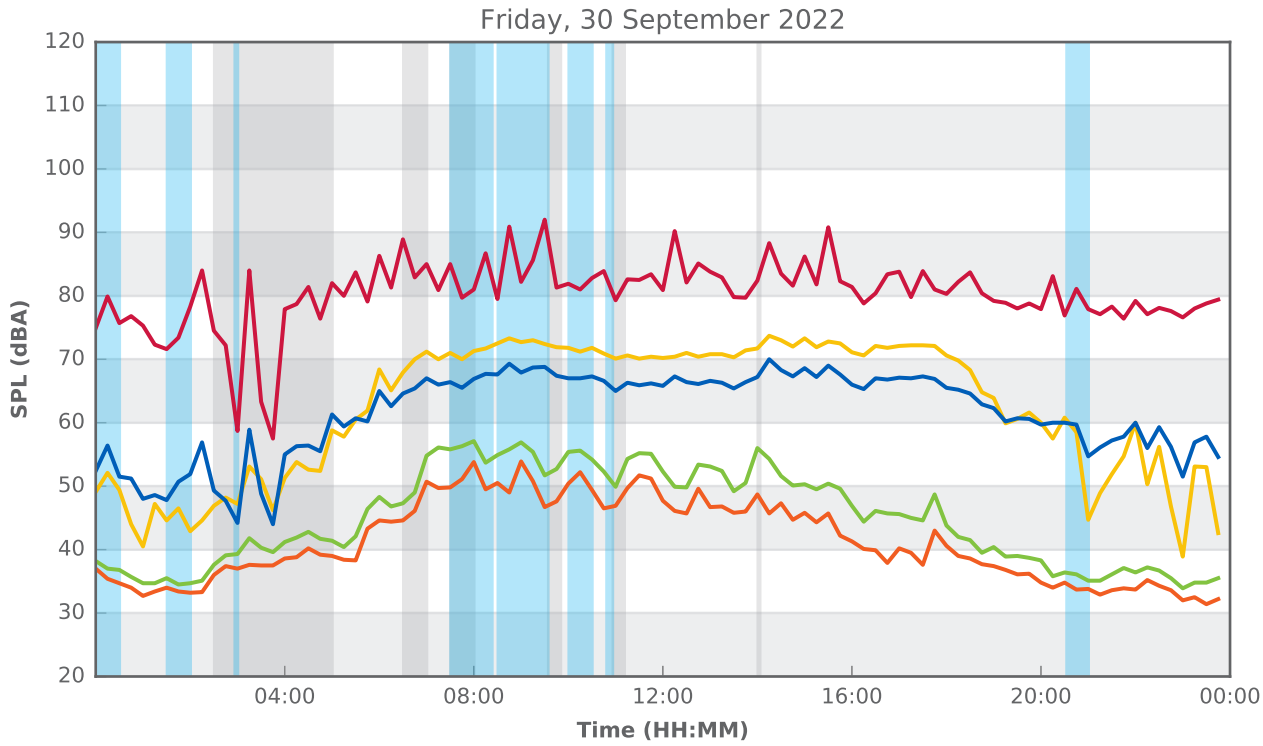
194 Berrima Rd, Moss Vale



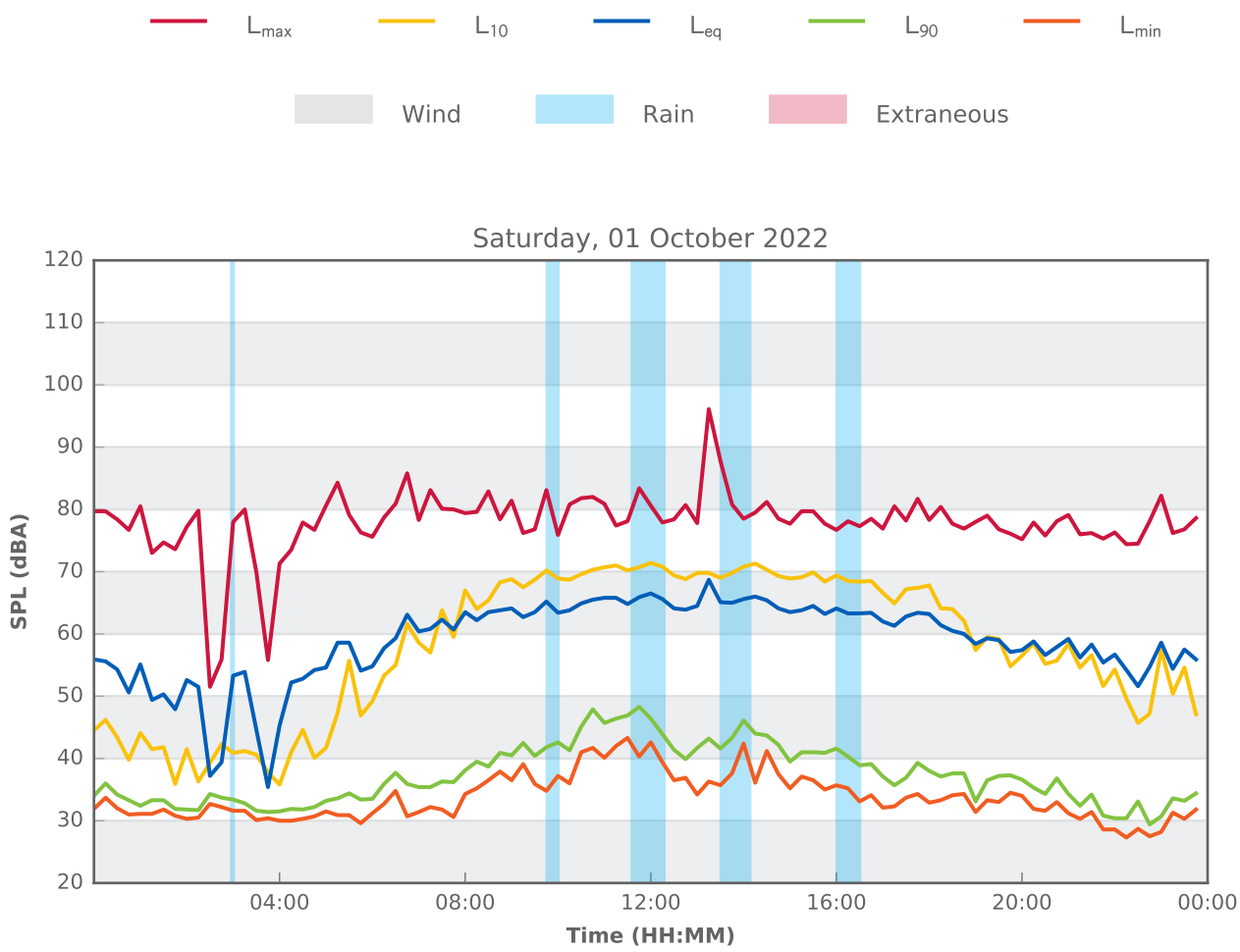


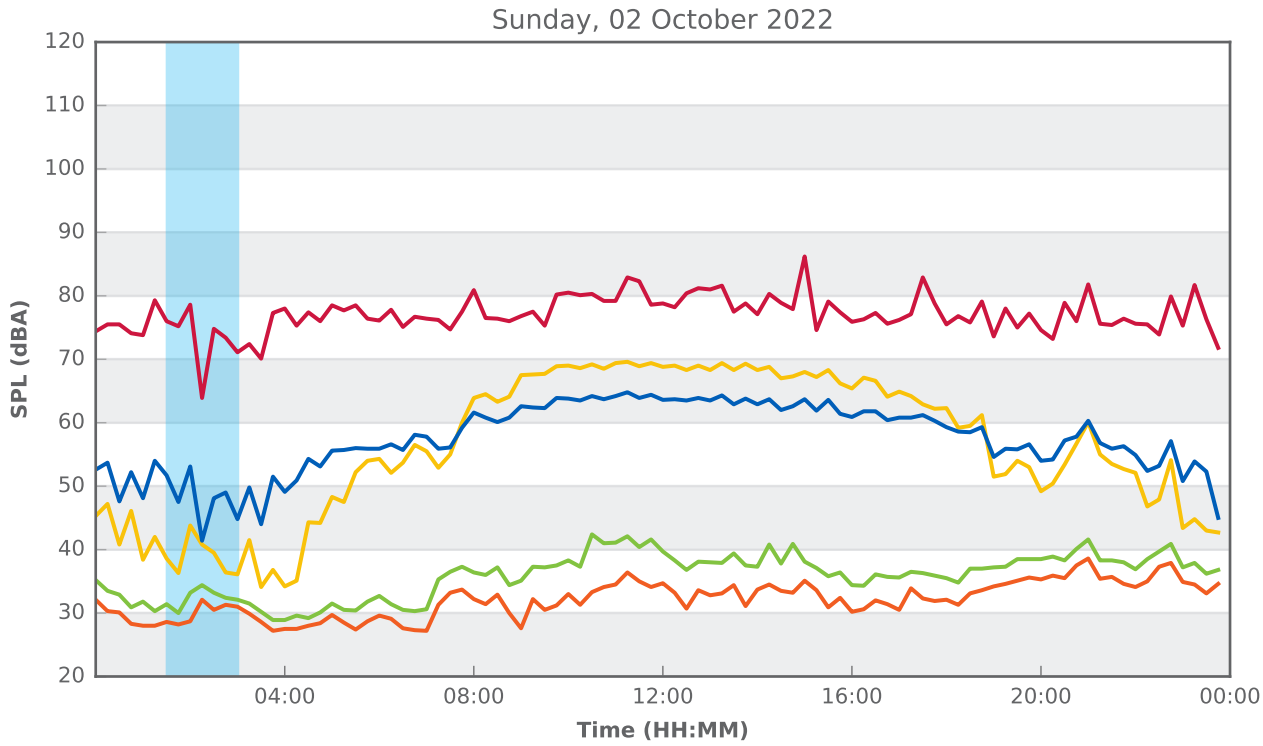
194 Berrima Rd, Moss Vale

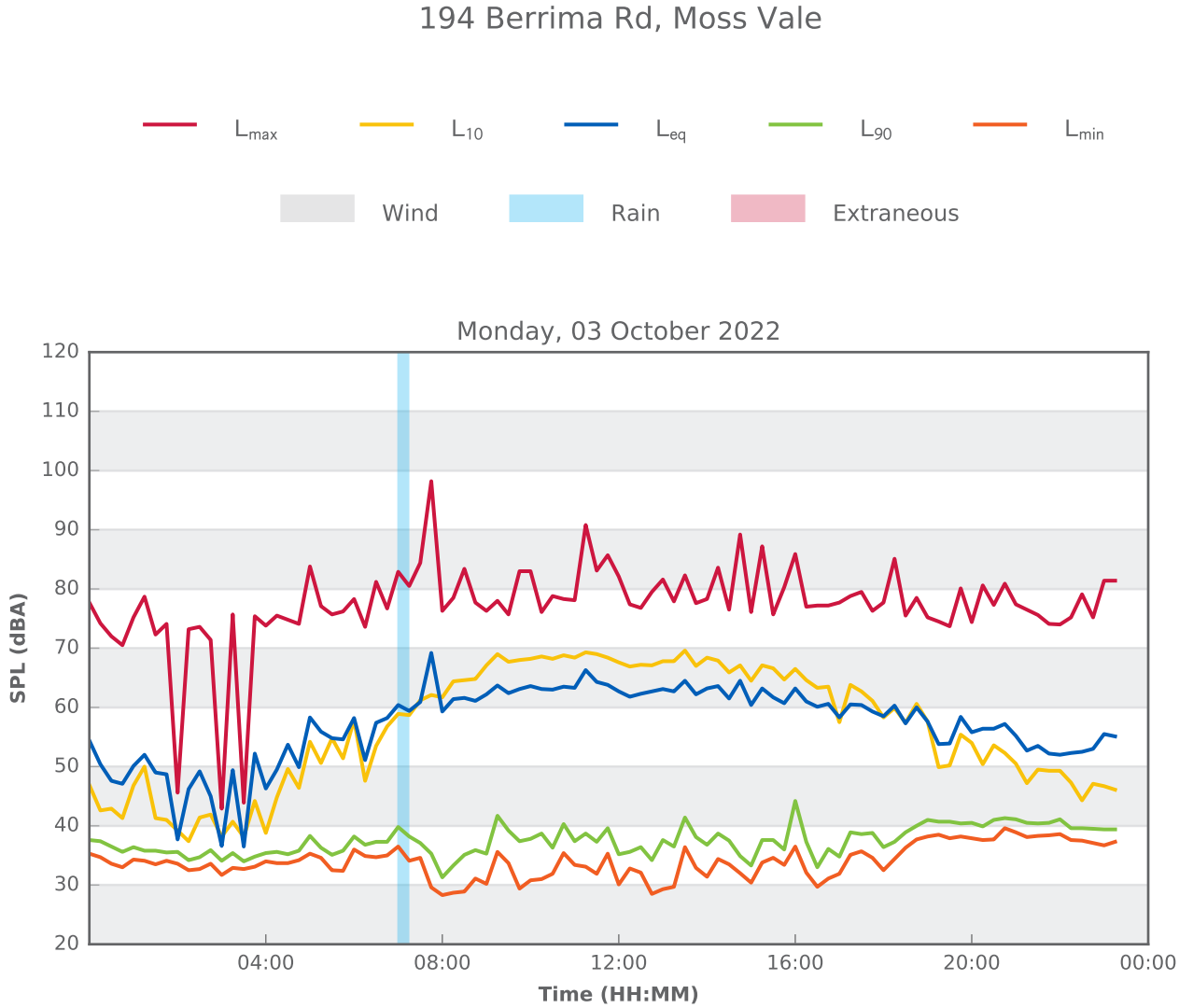




194 Berrima Rd, Moss Vale






194 Berrima Rd, Moss Vale
L_{max}
L_{10}
L_{eq}
L_{90}
L_{min}
Wind
Rain
Extraneous
Monday, 03 October 2022
SPL (dBA)
120
110
100
90
80
70
60
50
40
30
20
04:00
08:00
12:00
16:00
20:00
00:00
Time (HH:MM)

APPENDIX A – UNATTENDED NOISE MONITORING

APPENDIX B – NOISE CONTOUR PLOTS

Figure B-1 Predicted $L_{Aeq,15min}$ Operational Noise Contours (Day, Adverse MET Conditions)

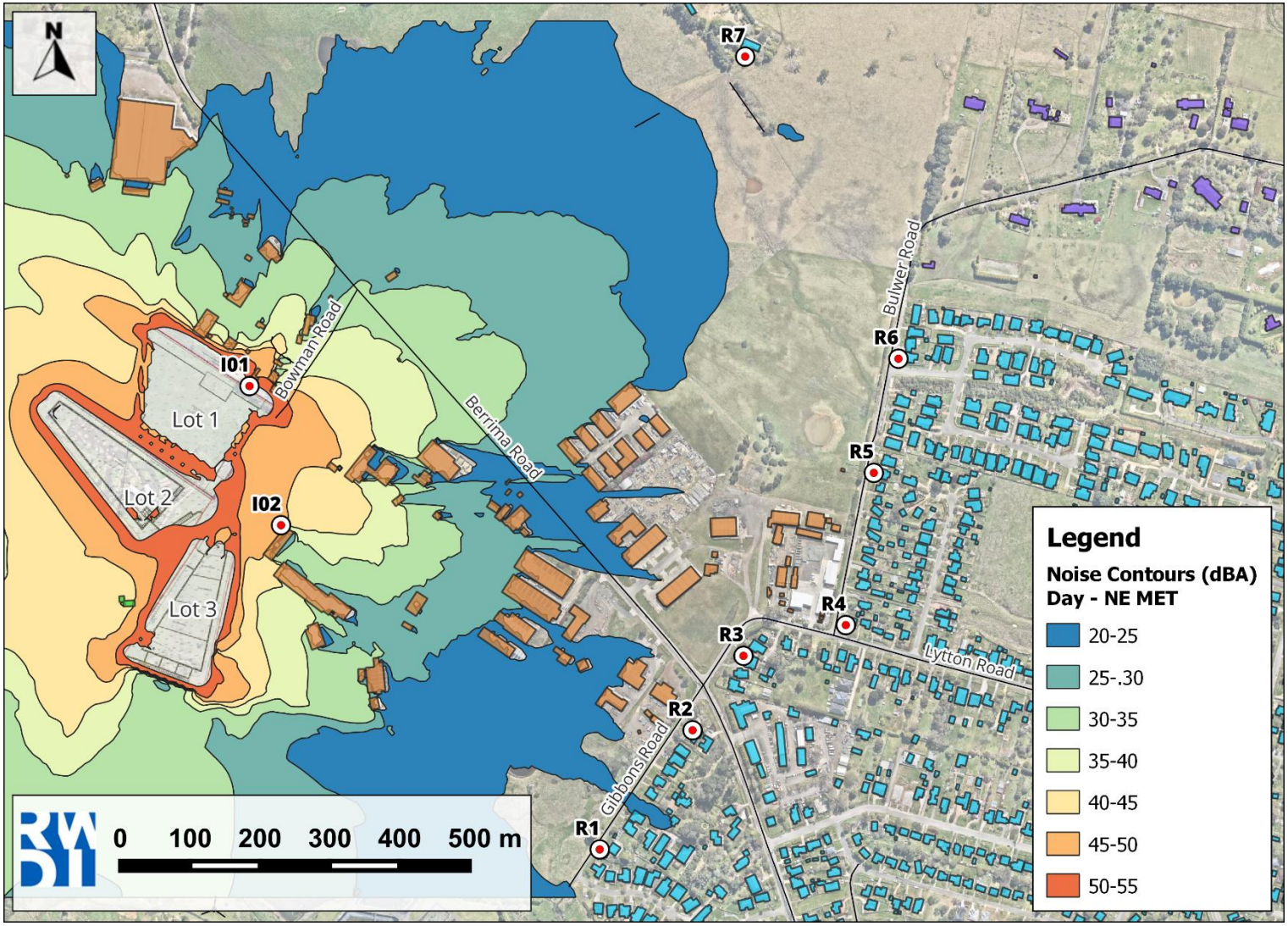


Figure B-2 Predicted $L_{Aeq,15min}$ Operational Noise Contours (Evening, Adverse MET Conditions)

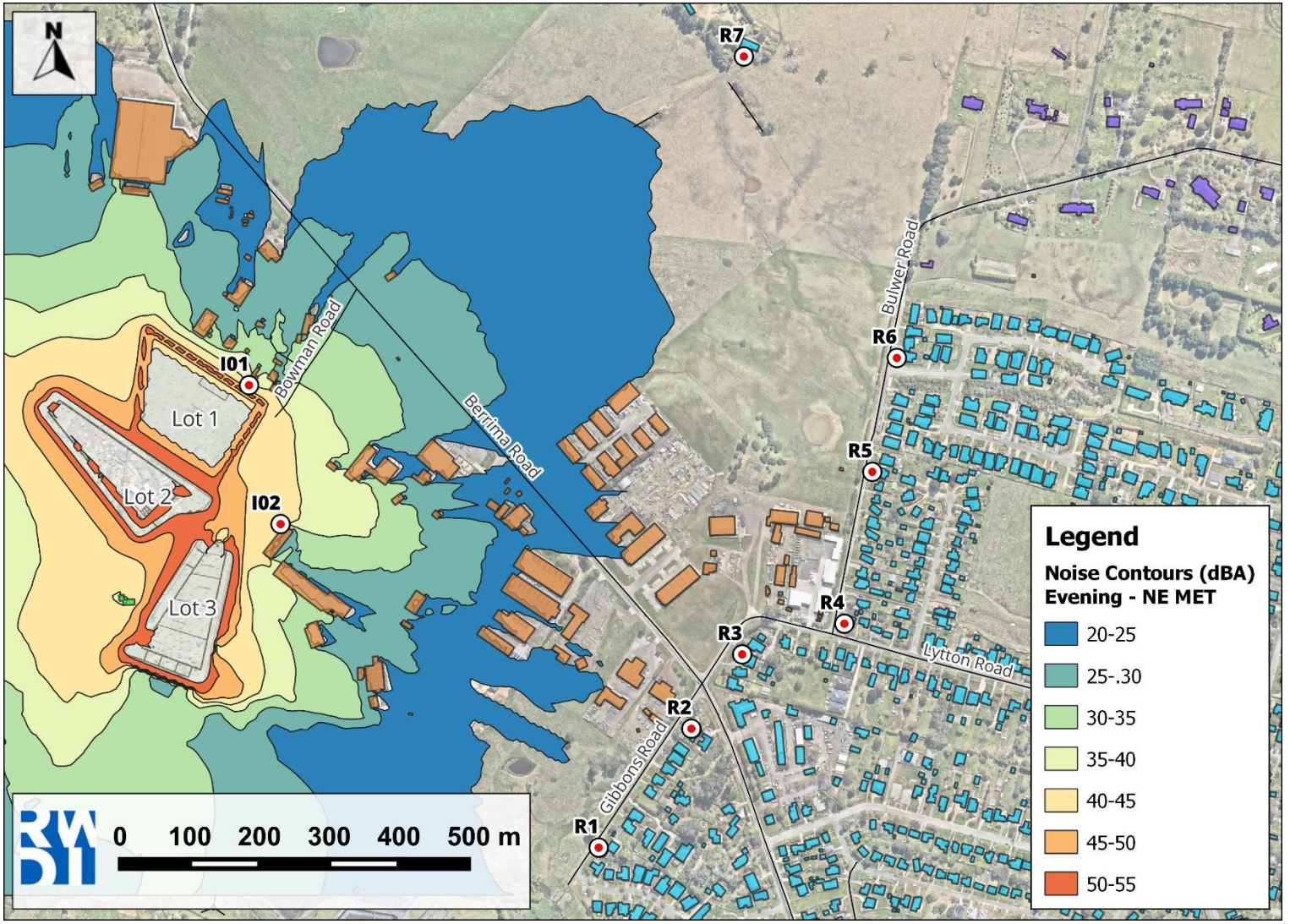


Figure B-3 Predicted $L_{Aeq,15min}$ Operational Noise Contours (Night, Adverse MET Conditions)