FINAL REPORT

NEW PUBLIC SCHOOL IN EPPING

EPPING, NSW

NOISE IMPACT ASSESSMENT
RWDI # 2190042
April 21, 2021

SUBMITTED TO

Department of Education
C/- SINSW
GPO Box 33
Sydney NSW 2001
John.buckley@johnstaff.com.au

SUBMITTED BY

Dave Perry, MArchSci, BATvnPrd, MAAS
Project Engineer
dave.perry@rwdi.com

Lee Hudson, BAppSc, MAAS
Senior Acoustical Consultant | Associate
lee.hudson@rwdi.com
T: +61 2 8116 6108

Michael Pieterse, M.A.Sc., CPEng., P.Eng.
Senior Project Manager | Associate
michael.pieterse@rwdi.com
T: +61 2 8103 4020 x2324

RWDI Australia Pty Ltd
272 Pacific Highway – Level 4
Crows Nest, NSW, Australia, 2065

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Acoustic Terminology

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 are here defined.

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

dB(A) – A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.

Frequency – Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.

Impulsive Noise – Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

Intermittent Noise – The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.

L_{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.

Sound Absorption – The ability of a material to absorb sound energy through its conversion into thermal energy.

Sound Level Meter – An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure level.

Sound Pressure Level – The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.

Tonal Noise – Containing a prominent frequency and characterised by a definite pitch.

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1 INTRODUCTION

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for a new primary school at 86 Chelmsford Avenue, Epping (the site).

The proposal meets the criteria for State Significant Development (SSD) as the development proposed is for the purpose of a new school (regardless of the capital investment value) pursuant to Clause 15(1) of Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD). This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project by DPIE, ref no SSD-8873898 issued on 14 September 2020.

Table 1-1 : SEARS – Key issues

Key Issues	Report Reference
Concept Proposal	
5. Environmental Amenity	
Assess amenity impacts on the surrounding locality, including solar access, visual privacy, visual amenity, overshadowing, wind impacts and acoustic impacts.	Comments specific to the Concept Proposal noise amenity impacts are contained in **Sections 6 and 7**
11. Noise and Vibration	
Provide a noise impact assessment that: • Outlines measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers • Considers sources of external noise intrusion in proximity to the site (including road, rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards • Demonstrates that the assessment has been prepared in accordance with policies and guidelines relevant to the context of the site and the nature of the proposed development.	Assessed within Section 5.1.2 Assessed within Section 5 Assessment prepared in accordance with the policies and guidelines detailed within **Section 1.1**

Key Issues	Report Reference
Stage 1 Works	
22. Environmental Amenity	
• Assess amenity impacts on the surrounding locality, including solar access, visual privacy, visual amenity, overshadowing, wind impacts and acoustic impacts.	Assessed within **Section 5.2**
28. Noise and Vibration	
• Provide a noise and vibration impact assessment that:	
○ Includes a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation and construction	Assessed within Section 4.3
○ Details the proposed construction hours and provide details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours	Assessed within Section 4.1.2
○ Outlines measures to minimise and mitigate the potential noise impacts on nearby sensitive receivers	Assessed within Section 4.3.5
○ Demonstrate that the assessment has been prepared in accordance with policies and guidelines relevant to the context of the site and the nature of the proposed development.	Assessment prepared in accordance with the policies and guidelines detailed within **Section 1.1**

This assessment considers noise (and vibration) emissions associated with the proposed development, and their potential impact on nearby residential receivers, including:

- Noise and vibration generated during construction works;
- Noise from mechanical plant associated with the new buildings;
- Noise from activities and operations associated with the new buildings and facilities at the school including vehicular movements; and
- Road traffic noise generation.

1.1 References

The acoustic assessment was conducted generally in accordance with the following environmental planning instruments, policies and guidelines:

- SEPP *(Infrastructure)* 2007 (iSEPP);
- SEPP (Educational Establishments and Child Care Facilities) 2017;
- NSW Noise Policy for Industry (EPA 2017);
- Interim Construction Noise Guideline (DECC 2009);
- Assessing Vibration: A Technical Guideline (DECC 2006);
- Development near Rail Corridors and Busy Roads – Interim Guideline (DP&E 2008);
- NSW *Road Noise Policy* (DECCW 2011).

The application is lodged as a concept development application. The application also seeks approval for the Stage 1 works. The Stage 1 works will provide a total of 25 home bases and associated facilities together with a hall and canteen, administration facilities and play spaces. Car parking for the Stage 1 development will also be provided.

2 PROPOSED DEVELOPMENT

Significant growth in the Epping area has led to increased demand for schools. To reduce the possible overcrowding of teaching spaces, provision of additional facilities is proposed. The strategy includes the development of a new public school in Epping.

The proposed new public school will be developed at 86 Chelmsford Avenue, Epping, on the site of the former Northern Sydney Institute of TAFE – Epping Annex. The site is located at the western end of Chelmsford Avenue, directly north of the residential apartment development on the former Channel 7 site. The surrounding area is predominantly residential with single dwelling houses to the north, east and west and an apartment development to the south.

The site location is shown in **Figure 2-1**.

Figure 2-1: Site Location

Source: Google Earth

2.1 Concept Proposal

The scope of the development is to build a new K-6 primary school, master planned to cater for up to 1,000 students and 5 staff at 86 Chelmsford Avenue, Epping. The facilities will include home bases (classrooms); administration and staff areas, hall and canteen, library, Covered Outdoor Learning Areas (COLA), special educational areas, play spaces and car parking.

The New Public School in Epping would accommodate 575 students and 38 staff in the year of commencement (2023). This would increase to 760 students and 48 staff by 2028 at the completion of Stage 2 and 1,000 students and 54 staff by the completion of Stage 3.

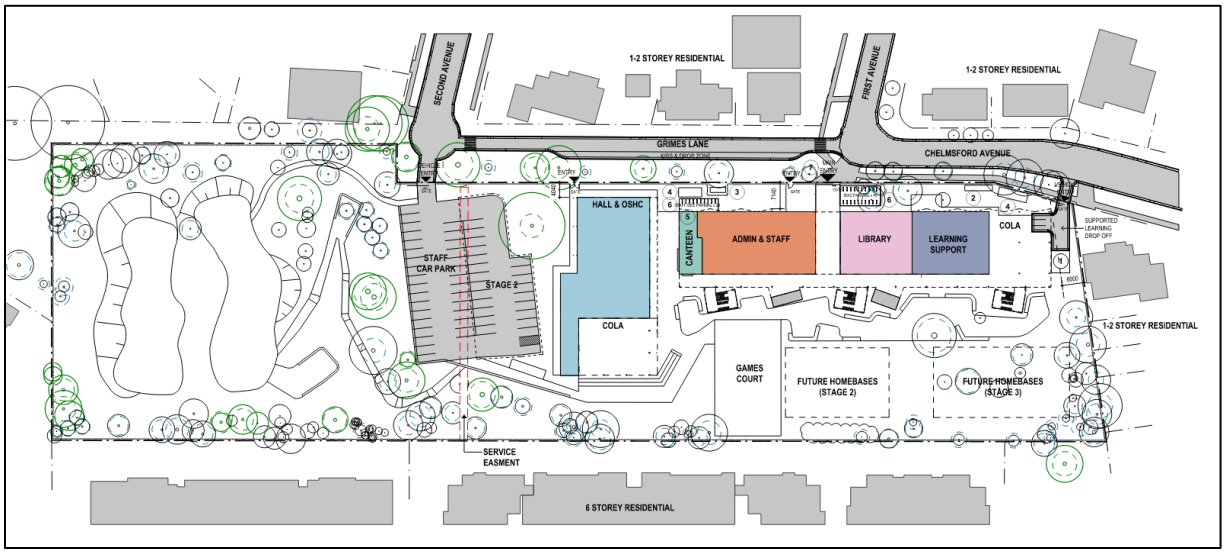
The architectural documentation for the new school has been produced by BVN and is included separately within the design package. The following design documentation presented in **Table 2-1** has been reviewed for assessment.

Table 2-1: Document Register

Drawing	Issue	Date	Drawing Name
EPPS – SSDA – 001	A	13 April 2021	Site Plan
EPPS – SSDA – 003	A	13 April 2021	Demolition Plan
EPPS – SSDA – 011	A	13 April 2021	Composite Plan – Ground Floor
EPPS – SSDA – 012	A	13 April 2021	Composite Plan – First Floor
EPPS – SSDA – 013	A	13 April 2021	Composite Plan – Second Floor
EPPS – SSDA – 201	A	13 April 2021	Sections 1
EPPS – SSDA – 202	A	13 April 2021	Sections 2

The proposed site layout for the new educational development is shown for reference in **Figure 2-2**.

Figure 2-2: Proposed Site Layout



Source: BVN

The proposed works include the following:

- Demolition of existing structures associated with the former use of the site as a TAFE campus;
- Construction of new buildings on the eastern and central portions of the site. The works are proposed to be undertaken in stages. Facilities which will generally include:
    - Home bases (classrooms) suitable for a school population of 1000 students;
    - Administration and staff areas:
    - Hall and canteen;
    - Library;
    - COLA;
    - Special education unit; and
    - Special programs area.
- Play spaces in various locations;
- Accessible paths linking the school facilities; and
- A staff carpark accessed from Second Avenue.

The proposal will also require potential remediation of the land and tree/vegetation removal. The works are proposed to be undertaken in stages.

2.2 Stage 1

In addition to the lodgment of a concept development application, the application also seeks approval for the Stage 1 works. The Stage 1 works will provide a total of 25 home bases and associated facilities together with a hall and canteen, administration facilities and play spaces. Car parking for the Stage 1 development will also be provided.

3 EXISTING NOISE ENVIRONMENT

3.1 Ambient Noise Survey

In order to quantify and characterise the existing noise environment in the area, long-term ambient noise levels were monitored between 25 November 2020 and 3 December 2020, at two (2) locations, selected to cover the range of ambient noise conditions surrounding the site.

Long-term noise monitoring locations are documented in **Table 3-1** and illustrated in **Figure 2-1.**

Table 3-1 Noise Monitoring Locations

Location	Address	Instrumentation
M1	Frontage - 2 Grimes Lane, Epping	ARL Ngara 8780F9
M2	Rear boundary - 30 Ferntree Place, Epping	ARL Ngara 8780F1

Instrumentation for the survey comprised (2 off) Acoustic Research Laboratories (ARL) Ngara Environmental Noise Loggers (refer **Table 3-1**) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The loggers continuously sampled noise levels over the entire survey period and calculated relevant statistical indices for each 15-minute interval. Data measured during periods of adverse weather, established through consultation with historical weather reports provided by the Bureau of Meteorology (BOM), has been excluded. The survey results are included in Appendix A.

3.2 Noise Monitoring Results

Future assessment of operational noise emissions will be based on project specific criteria determined from the results of the measured weekday data, processed according to the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry (NPfI)* assessment time periods. **Table 3-2** details the RBL (background) noise levels and the L_{Aeq} noise levels recorded during the daytime, evening and night time periods.

Table 3-2 Measured Ambient Noise Levels

Location	Noise Level – dBA re 20 µPa					
	Daytime 7.00am – 6.00pm		Evening 6.00pm – 10.00pm		Night Time 10.00pm – 7.00am	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
M1	38	48	38	55[1]	35	47
M2	37	49	40	54[1]	36	46

Note 1: Evening levels elevated due to bird/insect activity. For conservative assessment, the night time levels should be adopted during the evening period.

4 CONSTRUCTION NOISE & VIBRATION

This section of the assessment relates to typical construction activities expected to occur during development works on the site, and their impact on the surrounding residential receivers.

4.1 Construction Noise Criteria – Residential Receivers

The following sections detail the applicable site-specific noise and vibration criteria based on the EPA's Interim Construction Noise Guideline.

4.1.1 Construction Noise Management Levels

The EPA released the *Interim Construction Noise Guideline (ICNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the $L_{Aeq,15min}$ noise management level (NML) should not exceed the background noise by more than 10dBA. This applies to construction works conducted during standard hours which are defined as Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours, where construction is justified, the noise management level applicable is background + 5dBA. **Table 4-1** details the *ICNG* noise management levels.

Table 4-1: Construction Noise Management Levels at Residences Using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended standard hours: **Monday to Friday** **7am to 6pm** **Saturday** **8am to 1pm** **No work on Sundays or Public Holidays**	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
		there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the guideline.

Noise Catchment Areas (NCAs) for assessment of construction noise are presented in **Figure 4-1**.

NCA 1 residential receivers to the north of the site located east of Second Avenue.

NCA 2 residential receivers to the east of the site.

NCA 3 residential receivers to the south (residential apartment development on the old Channel 7 site).

NCA 4 residential receivers to the north of the site located west of Second Avenue.

Figure 4-1: Noise Catchment Areas and Surrounding Receiver Locations

On the basis of the ambient noise level data presented in **Table 3-2,** the noise management levels adopted for construction activities during standard hours at residential receivers are presented in **Table 4-2.**

Table 4-2: Standard Hours Construction Noise Management Level

Construction Noise Management Level $L_{Aeq,15\ min}$ – (dBA)		Highly Noise-Affected Noise Level $L_{Aeq,15min}$ – (dBA)
NCA 1	48	75
NCA 2	48	
NCA 3	47	
NCA 4	47	

4.1.3 Hours of Operation

Construction hours are to be confirmed; however, it has been assumed that construction will be undertaken during standard hours as follows:

- Monday to Friday 7.00am to 6.00pm
- Saturdays 8.00am to 1.00pm
- Sundays and Public Holidays No work

4.1.4 Vibration Criteria

4.1.4.1 Human Comfort

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document *Assessing Vibration: A Technical Guideline* (2006) produced by the NSW DECCW.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in **Table 4-3**.

Table 4-3: Criteria for Exposure to Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	*Maximum*
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

In the case of intermittent vibration, which is caused by plant such as rock breakers, the criteria are expressed as a Vibration Dose Value (VDV) and are presented in **Table 4-4.**

Table 4-4: Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$)

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events and their duration in the relevant time period.

4.1.4.2 Building 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 BS 7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 4-5.**

Table 4-5: 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 40Hz and above

The Standard states that the guide values in **Table 4-5** 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.

4.2 Construction Equipment & Noise Source Levels

Sound Power Levels (L_W) for typical construction plant are identified in **Table 4-6.** These L_W are based upon archival data from measurements at other construction sites.

Table 4-6: Typical Construction Plant Sound Levels

Plant	Sound Power Level L_W dBA	Source
Backhoe	97	DEFRA
Bored Piling Rig	108	WM /DEFRA/SLR
Concrete Truck	103	DEFRA
Concrete Pump	103	DEFRA
Compressor	103	WM
Dump Truck	107	WM
Front End Loader	107	DEFRA
Excavator (40t)	102	DEFRA/SLR
Hand Tools	101	WM/DEFRA
Mobile Crane	98	DEFRA

4.3 Construction Noise Assessment

4.3.1 Noise Modelling

Assessment of potential noise generation at surrounding receivers has been undertaken for the construction works likely to be involved in the proposed new school development.

Site-related noise emissions were calculated addressing the following factors:

- Equipment sound level emissions and location;
- Receiver locations;
- Ground topography;
- Distance between source and receiver;
- Ground absorption;
- Atmospheric absorption.

Modelling of the noise levels potentially generated during the major works stages as summarised in **Table 4-7** has been conducted using the computer program, SoundPLAN v.8. This noise modelling software enables calculations to be performed using various recognised algorithms taking into account noise generated at the source, attenuation with distance and any shielding provided by intervening topography or structures. Modelling of construction noise was carried out in accordance with ISO 9613.1 procedures.

Table 4-7: Construction Works Scenarios

Stage	Description	Works
1	Demolition, Bulk Excavation & Earthworks	Demolition of existing structures onsite (disused TAFE buildings and agricultural plots). Site preparation and excavation works – mainly using excavators with front end loaders to load trucks. Tree removal conducted during site preparation including use of chainsaws.
2	Piling, Drainage works, Slabs	Bored piling, concreting, and lifting. Bored piling rig, concrete pumps & boom, crane assumed to operate continuously over 15 minutes. Also, concrete trucks and normal delivery trucks.
3	General Building Works Facade / Fitout	General construction works including facade and internal fitout. Mobile crane and power tools assumed.

Noise modelling has been conducted for each of the above scenarios, with plant positioned in locations representative of typical operation during the works across the construction site.

The modelling assumes a “typical worst-case” scenario whereby it has been assumed plant operates continuously and simultaneously. As such, predictions represent the noise levels that can be expected to occur during intensive periods of construction. The resultant noise levels can be considered in the upper range anticipated at surrounding receivers throughout the course of construction works.

The results of construction noise modelling are shown in **Table 4-8.** The location of the surrounding residential receivers adopted for prediction of construction noise are shown in **Figure 4-1**. Exceedances of the construction noise management levels (NMLs) and highly noise affected level (HNL) are listed applicable to works during recommended standard hours.

Table 4-8 Predicted Construction Noise Levels – $L_{Aeq(15\ min)}$ – dBA

NCA	Scenario	Activities	Total L_w dBA	Maximum Noise Level		Exceedances NML	
				Closest	Typical	Closest	Typical
NCA01	1	Demolition, Bulk Excavation & Earthworks (including tree removal)	118	75	66	27	18
	2	Piling, Drainage works, Slabs	112	72	60	24	12
	3	General Building Works Facade / Fitout	109	69	58	21	10
NCA02	1	Demolition, Bulk Excavation & Earthworks	118	72	58	24	10
	2	Piling, Drainage works, Slabs	112	71	62	23	14
	3	General Building Works Facade / Fitout	109	63	56	15	8
NCA03	1	Demolition, Bulk Excavation & Earthworks	118	74	65	27	18
	2	Piling, Drainage works, Slabs	112	72	65	25	18
	3	General Building Works Facade / Fitout	109	62	67	16	9
NCA04	1	Demolition, Bulk Excavation & Earthworks	118	66	59	19	12
	2	Piling, Drainage works, Slabs	112	65	56	18	9
	3	General Building Works Facade / Fitout	109	67	56	20	9

4.3.2 Discussion of Results

A review of the predicted noise level range indicates exceedances of up to 27dBA $L_{Aeq,15min}$ may occur during the demolition and bulk excavation works, and up to 25dBA $L_{Aeq,15min}$ may occur during the piling works. The worst exceedances are predicted for residential receivers to the north and south of the project located in NCA01 and NCA03. These exceedances are not unusual for construction works in a relatively quiet residential area and can be mitigated by the construction noise management procedures detailed in the following sections.

No noise sensitive receivers are considered to be within the Highly Noise Affected noise category i.e., with predicted noise levels exceeding 75dB $L_{Aeq,15min}$.

During the demolition and excavation stages, mobile equipment such as excavators with rock breaking attachments are the most significant noise source. Bored piling rigs have been modelled and provide the greatest noise contributions during Scenario 2.

Throughout all stages of construction careful management will be required to minimise impact at residences. Work practices and mitigation measures that are reasonable and feasible noise will be applied. These measures shall be determined in detail when a contractor, with defined construction techniques, has been engaged on the project. However, "in-principle" mitigation measures are detailed in the following sections.

4.3.3 Construction Vibration Assessment

Given the likely construction methodology involved and the distance between works and the closest surrounding residential and associated structures, ground vibration is not considered to be a potential issue.

Table 4-9 sets out the typical safe working distances applicable for structural damage and human comfort for vibration caused by construction plant. On review of the site layout and surrounding receivers, the minimum distance between any potentially vibration generating activities and surrounding residences will be a minimum of 50 metres. Safe working distances will be achieved, and vibration levels received are likely to be significantly lower than levels of ambient vibration. No further assessment of vibration is warranted.

Table 4-9 Recommended Safe Working Distances for Vibration-Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300kg – 5 to 12t Excavator)	2m	7m
Medium Hydraulic Hammer	(900kg – 12 to 18t Excavator)	7m	23m
Large Hydraulic Hammer	(1600kg – 18 to 34t Excavator)	22m	73m
Pile Boring	≤ 800mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

4.3.4 Construction Traffic Assessment

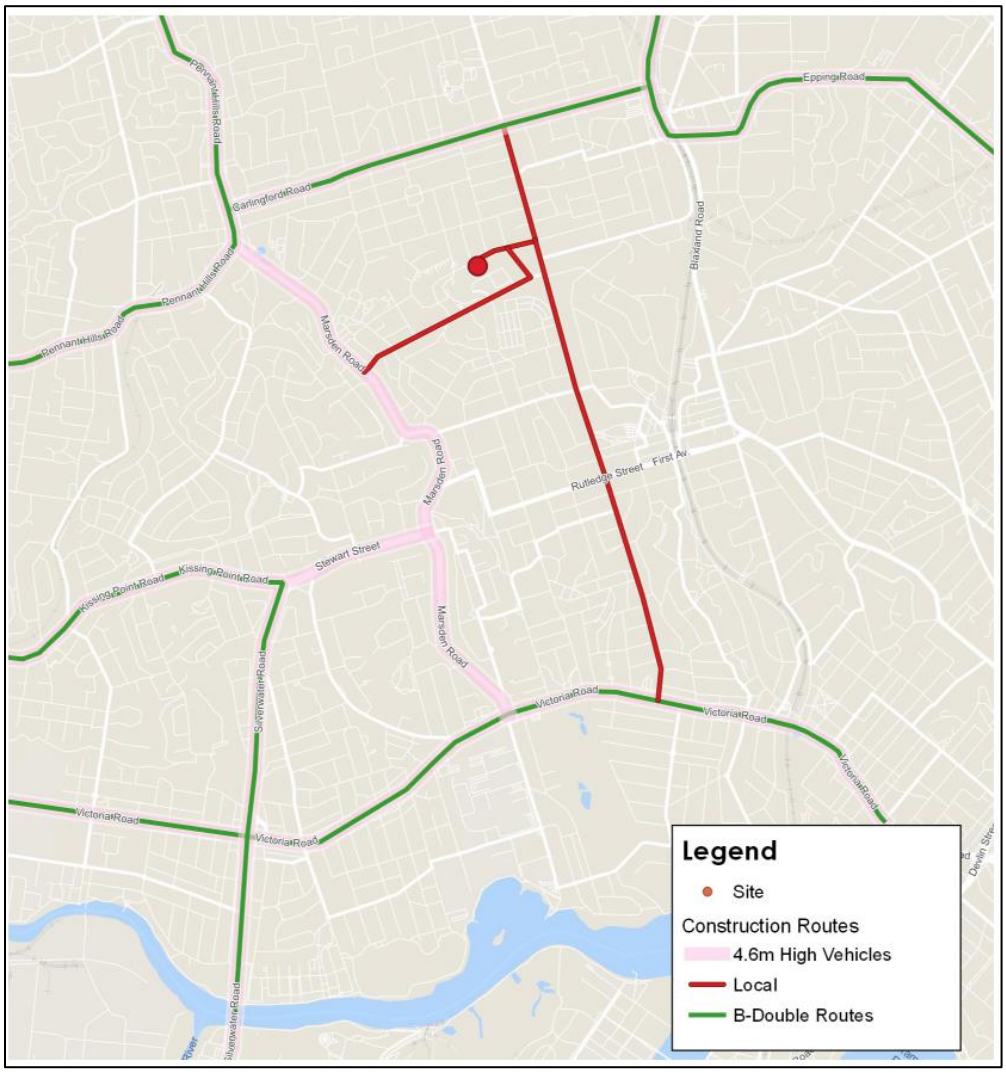
Construction techniques to assist in the delivery of the school upgrade program include the use of Design for Manufacture and Assembly (DfMA). DfMA is a design and construction process that combines the manufacture of building components with on-site construction assembly, limiting traffic impact on the site and surrounding road network.

In accordance with the *Transport Assessment and Accessibility Impact Assessment* prepared by SCT Transport, a detailed Construction Traffic Management Plan (CTMP) will be prepared prior to construction.

Final construction vehicle numbers are still being confirmed. A preliminary estimate of 20 heavy vehicle truck movements is anticipated on a typical day.

Proposed truck routes are presented in **Figure 4-2**.

Figure 4-2: Construction Vehicle Routes



Mitigation measures would be adopted during the construction phase to ensure traffic movements have minimal impact on surrounding land uses and the community in general. These would include the following:

- Neighbouring properties would be notified of construction works and timing.
- Avoidance of idling trucks alongside sensitive receivers.
- Deliveries would be planned to ensure a consistent and minimal number of trucks arriving at the site at any one time.
- Vehicles are to enter and exit the site in a forward direction.

These arrangements will be further examined as part of the detailed CTMP.

4.3.5 Construction Noise & Vibration Mitigation Measures

When operating in closest proximity to the surrounding residential properties, noise levels from construction works are likely, at times, to exceed the applicable noise management levels. Noise control measures are recommended to ensure that noise is minimised where feasible and reasonable.

The following project-specific mitigation measures should be adopted where practicable:

- Selection of quietest feasible construction equipment;
- Use of ripping where rock removal is required;
- Localised treatment, such as barriers, shrouds and the like around fixed plant, such as pumps and generators; and
- Provision of respite periods, particularly on Saturdays.

In addition, the following measures should be included in a Construction Noise and Vibration Management Plan.

- Plant Noise Audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into service. To this end, testing should be established with the Contractor.
- Operator Instruction – Operators should be trained to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- Equipment Selection – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with attenuators, acoustical enclosures and other noise attenuation measures to ensure that the total noise emission from each work site complies with EPA guidelines.
- Site Noise Planning – Where practical, the layout and positioning of noise-producing plant and activities should be optimised to minimise noise emission levels.

Adoption of these measures is aimed at working towards achieving the noise management levels established at surrounding receivers.

4.3.6 Construction Noise and Vibration Management Plan

A Construction Noise and Vibration Management Plan should be prepared and implemented by the Contractor. The plan should reference the findings of this assessment. Areas to be addressed in plan include:

- Noise and vibration mitigation measures;
- Noise and vibration monitoring;
- Response to complaints;
- Responsibilities;
- Monitoring of noise emissions from plant items;
- Reporting and record keeping;
- Non-compliance and corrective action; and
- Community consultation and complaint handling.

5 OPERATIONAL NOISE CRITERA

This section of the assessment relates to activities that may generate noise to surrounding residential receivers.

The proposed school development will be undertaken in stages. In addition to the lodgement of the concept development application, the application also seeks approval for the Stage 1 works, the extent of which have been documented in Section 2.

5.1 Assessment Criteria

5.1.1 Operational Noise Emissions

Operational noise from the proposed new school facilities may be generated by the following activities:

- Mechanical services plant;
- Teaching and practical activities;
- School announcements and bells;
- Sporting activities and events in the halls; and
- Sports-related classes held in the outdoor play area.

Although the *NPfI* is not intended to be applicable to schools, and there are no criteria specifically relating to noise emissions from primary schools some noise emissions may be considered consistent with those from industrial or commercial premises, in terms of their continuous or near-continuous nature. These include external mechanical plant and activity-related noise generated during the use of spaces such as the classrooms, halls and performing arts areas. It is therefore reasonable and appropriate to consider these sources of noise in the context of the *NPfI*.

The *NPfI* documents a procedure for assessment and management of industrial noise which involves determining the project noise trigger levels for a development. The project noise trigger level is a benchmark level above which noise management measures are required to be considered. They are derived by considering short-term intrusiveness due to changes in the existing noise environment (applicable to residential receivers only) and maintaining noise level amenity for particular land uses for residents and other sensitive receivers.

Intrusiveness Noise Level

For assessing intrusiveness, the background noise level (L_{A90}) is measured, and the Rating Background Level (RBL) 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 5dBA.

Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive developments within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To prevent increases in industrial noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity noise level.

The following exceptions are applicable to determining the project amenity noise level:

- For high traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dBA.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.
- Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements.

An extract from the NSW *NPfI* that relates to the amenity noise levels for surrounding receivers is given in **Table 5-1**.

Table 5-1: Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level L_{Aeq} (dBA)
Residential	Suburban	Day	55
		Evening	45
		Night	40

Note 1: Daytime 7.00am–6.00pm; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am.

Project Noise Trigger Levels

The amenity and intrusiveness noise levels and resulting project trigger levels (shown in bold) applicable to sources of continuous operational noise associated with the new school facilities are shown in **Table 5-2.**

The area surrounding the project site is residential and does not contain industrial noise sources. Under the procedures documented in the *NPfI*, the amenity criterion recommended for residences in a suburban area is the most appropriate classification and, in the absence of "industrial" noise sources, the amenity criterion becomes equal to the recommended Acceptable Noise Level (ANL) for this receiver type.

These trigger levels are only applicable for the assessment of sources of continuous noise. They do not apply to sources such as outdoor sporting and play activities.

Table 5-2 Project Noise Trigger Levels for Continuous Operational Noise Emissions

Receiver	NCA	Area Classification	Period [1]	Project Noise Trigger Levels		
				RBL [2] $L_{A90,(15min)}$	Intrusiveness $L_{Aeq,(15min)}$	Amenity [3] $L_{Aeq,(15\ min)}$
North / East residences	NCA01 NCA02	Suburban	Day	38	43	58[4]
			Evening	38	43	48[4]
			Night	35	40	43[4]
South / North-Western residences	NCA03 NCA04	Suburban	Day	37	42	58[4]
			Evening	40[5]	41	48[4]
			Night	36	41	43[4]

Note 1: EPA Governing Periods are Day: 7.00am to 6.00pm Evening: 6.00pm to 10.00pm Night: 10.00pm to 7.00am
Note 2: RBL Rating Background Level.
Note 3: Assuming existing noise levels unlikely to decrease in the future.
Note 4: Project amenity noise level (ANL) is suburban ANL plus 3dBA to convert from a period level to a 15-minute level.
Note 5: Night time RBL of 36dBA to be adopted for the evening period due to bird/insect activity influencing measured result.

5.1.2 Noise Intrusion

The site is not exposed to any environmental noise sources of potentially significance. No further assessment of noise intrusion is warranted.

5.1.3 Road Traffic Noise

The NSW *Road Noise Policy* (2011) was released by the EPA to replace the *Environmental Criteria for Road Traffic Noise* (1999) from 1 July 2011. The key provisions of the policy are an emphasis on the use of land use planning, better road design and vehicle noise emission control to avoid or minimise road traffic noise impacts. The assessment criteria for residences potentially affected by additional traffic generated by land use developments on arterial, sub-arterial and local roads are summarised in **Table 5-3.**

Table 5-3: Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Development	Assessment Criteria – dBA	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hr}$, 60 (external)	$L_{Aeq,9hr}$ 55 (external)
	Relative Increase Criteria	Existing traffic $L_{Aeq,15hr}$ + 12dB (external)	Existing traffic $L_{Aeq,9hr}$ + 12dB (external)
Local roads	Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,(1hour)}$ 55 (external)	$L_{Aeq,(1hour)}$ 50 (external)

Where predicted noise levels exceed the project-specific noise criteria, an assessment of all feasible and reasonable mitigation options should be considered. The *RNP* states that an increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

6 OPERATIONAL NOISE - STAGE 1

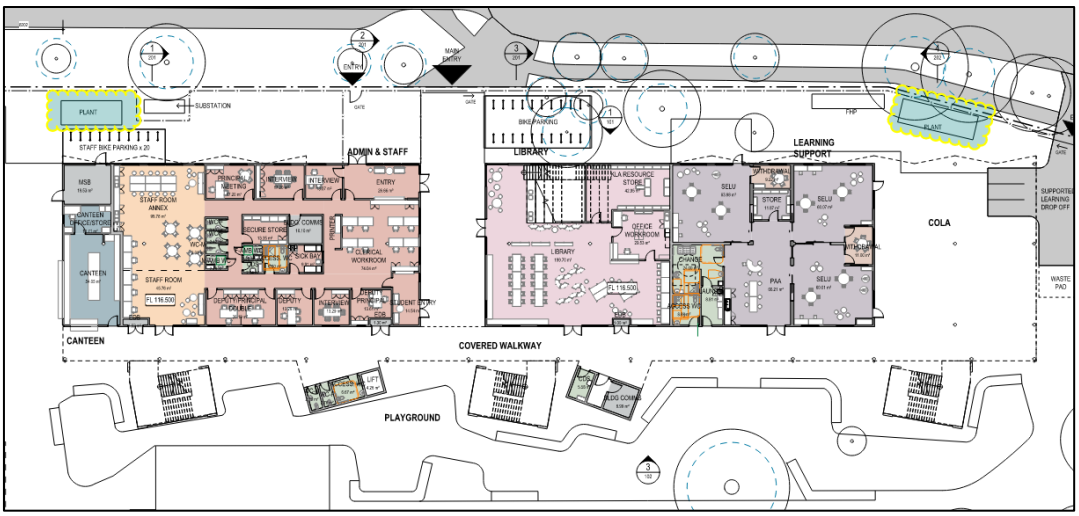
6.1 Future Capacity

The proposed development is intended to meet future community needs. The projected student capacity is 600 students and 38 staff by 2023 and 1000 students and 48 staff by 2028.

6.2 Mechanical Services

The noise emissions from mechanical plant associated with the new school development should be controlled so that the operation of such plant does not adversely impact upon surrounding residential properties. Air-conditioning will be provided with outdoor units and roof-mounted plant as required. Proposed locations for mechanical plant are presented in **Figure 6-1**.

Figure 6-1: Plant Locations



Mechanical plant selection and location will be finalised during the detailed design phase. It is recommended that during detailed design stage, potentially noise generating equipment be examined to ensure compliance with the project noise trigger levels for mechanical noise emissions to surrounding residential properties.

6.3 Use of Built Spaces

Generally, it is anticipated that the noise levels throughout the administration spaces and special and general learning areas will be relatively low and consistent with typical school usage.

The classrooms have operable glazing on the northern and southern facades. Generally, it is anticipated that the noise levels in the classrooms will be relatively low. However, for the purpose of assessment it is assumed that from time to time there could be activities during which the teacher or several pupils may be talking loudly.

Assuming a reverberant sound pressure level of 75dBA within a learning space with open windows, the predicted $L_{Aeq,15min}$ noise level at the nearest potentially sensitive receivers to the northern boundary (Grimes Lane) is 43dBA. Accordingly, the predicted noise level complies with the relevant environmental criterion of 43dBA for noise emissions during the daytime period.

6.4 School Hall

Use of the School Hall for assemblies, concerts and other functions has the potential to impact surrounding noise sensitive receivers. Noise emissions from such events are typically related to use of amplified speech or music through the use of public address systems. The public address (PA) system should be designed to ensure noise emissions are minimised.

Noise transfer paths may exist while the eastern facade doors are opened during periods of high noise generating activity.

During a worst-case operational scenario with amplified music playing within the hall, an internal reverberant level of 85 $L_{Aeq,15min}$ has been assumed. With doors open for a period of 15 minutes, the predicted noise emissions to the closest residential receivers (Grimes Lane) is 45 $L_{Aeq,15min}$.

The predicted level marginally exceeds the relevant environmental criterion of 43dBA during the daytime and evening period. This residual impact is negligible in terms of significance based upon *NPfI* procedures. The following measures are recommended to minimise noise emissions:

- The Hall PA system shall be designed to ensure speakers are oriented to direct sound inwards towards the audience.
- The L_{Amax} noise level from the PA system operation should not exceed the ambient noise levels by more than 5dBA at the nearest residential receiver.
- It is recommended that management of noise be included in any site management plan.

6.5 Carparking

Stage 1 includes development of a 32-space carpark for staff located near the western facade of the School Hall. Nearest noise sensitive receivers are located to the north of the carpark on Second Avenue and Grimes Lane with all vehicle access via Second Avenue.

Assuming all staff arrive within a 1-hour period, 'worst case' peak use would result in at least 8 vehicles arriving and parking within a period of 15-minutes. An $L_{Aeq,15min}$ sound power level per vehicle movement of 70dBA has been adopted for noise calculation purposes, based on the BayLfU method (Bavarian State Agency for the Environment 2007) and the carpark noise results published by Ron Rumble Renzo Tonin (Acoustics 2011) which established sound power levels of 63dBA per hour and 64dBA per hour (70dBA per 15-minutes) respectively. Using this information, the highest predicted $L_{Aeq,15min}$ noise levels during the morning peak activity is 41dBA at the closest residential receiver. Noise emissions associated with the carpark operation will comply with the relevant environmental criterion of 43dB $L_{Aeq,15min.}$

6.6 School Announcements and Bells

Announcements and school bells are typical activities associated with the existing school operations. Typically, these are produced by the school PA system and can vary significantly depending on the volume setting of the system.

At this stage, PA system design has not been finalised. However, the following measures should be adopted to ensure that impact at all surrounding residences is minimised:

- Speakers should be located and orientated to provide good coverage of the school areas whilst being directed away from residences. System coverage should be reviewed during the detailed design stage.
- The volume of the system should be adjusted on site so that announcements and bells are clearly audible on the school site without being excessive. The system should initially be set so that maximum noise levels at surrounding residences do not exceed the ambient noise levels by more than 5dBA.
- Once the appropriate level has been determined on site, the system should be limited to the acceptable level so that staff cannot increase noise levels.
- The system bell should be set so that it only occurs on school days.

6.7 Outdoor Noise

Noise will be generated by students engaged in outdoor play and recreational activities at various times throughout the day. The maximum duration and intensity of these periods is likely to occur during recess (typically 20 minutes) and lunch (typically up to 60 minutes).

Noise from school students engaged in outdoor play and recreational activities cannot be assessed in the same manner as noise generated by the use of learning facilities such as performing arts and technology rooms, gymnasiums and halls. The EPA's *NPfI* has previously been referred to for the assessment of such classroom and activity noise emissions (and noise from mechanical plant) however, the policy does not present appropriate criteria for the assessment of noise from outdoor areas and sporting fields.

Schools traditionally form an essential part of all residential communities. Noise emissions from students engaged in active outdoor games are unlikely to achieve a "background + 5dBA" criterion adjacent to the site boundary. This is common across all educational facilities, particularly if the students are located near the boundary, and is often the case, in close proximity to residences.

In general, the impact of outdoor activity noise from schools is considered to be sufficiently mitigated by the site zoning and the limited periods of outdoor recreational and physical activities, during the school year, and, as such, does not typically warrant quantitative assessment.

A "background + 10dBA" criterion, based upon the guideline for the assessment of noise from child care centres prepared by the Association of Australasian Acoustical Consultants (AAAC), has been applied to schools in other local government areas within the Sydney Metropolitan area.

In the case of Al-Faisal College Limited v Canterbury Bankstown Council (2018), which involved the development of a new primary school, whilst the Court accepted that the "background + 10dBA" approach may, be considered a 'datum' of acceptability when considering whether acoustical impacts arising from an educational establishment are reasonable in a merit assessment of the application, Commissioner Dixon found that this guideline was not intended to be directly applied to the assessment of noise from outdoor play at a school.

In the absence of any quantitative criterion for assessment of noise emissions from outdoor play, the "background + 10dBA" criterion will be applied as a 'yardstick' or 'datum' for determining the acceptability of noise emissions from the outdoor sporting fields and recreational spaces, in addition to the Amenity criteria as documented in **Table 5-1.**

Applying this guideline for the assessment of noise emissions from outdoor activities, the relevant 'limits' are presented in **Table 6-1.**

Table 6-1: Adopted Limits for Assessment of Outdoor Play

Receiver Location	Daytime RBL $L_{A90,\ 15min}$	Project Noise Trigger Levels	
		Intrusiveness $L_{Aeq,15min}$	Amenity[1] $L_{Aeq,15min}$
NCA01	38	48	58
NCA02	38	48	
NCA03	37	47	
NCA04	37	47	

Note 1: Recommended Amenity Noise Level (ANL) for Daytime period, plus 3dB for 15-minute assessment as per *NPfI*.

Based upon the results of previous measurements of children engaged in outdoor play, a L_{Aeq} sound power level of 79dBA per student has been adopted.

For prediction of noise emissions from outdoor play and recreation, students are assumed to be evenly distributed across the playgrounds and outdoor areas evenly. The number of students playing outside in high noise generating activity has been conservativity estimated as 90% (540 students), with every third student creating noise by yelling/shouting at any given time.

The noise levels generated during outdoor play periods will vary according to the following factors:

- The number of students in the area – students will be spread around the outdoor areas;
- The level of noise made by each student – this is obviously different from individual to individual, and various factors such as age, personality, mood, activity and countless other factors will play a part. The louder events are not capable of being sustained over an extended period; and
- The location of the students relevant to the residences – as the distance between the source and the receiver increases, the noise level at the receiver will decrease.

The noise levels ($L_{Aeq,15min}$) generated during outdoor play and recreational activities have been predicted at the surrounding residential receivers. The results at the surrounding residential receiver locations, are shown, together with the relevant emissions guideline, in **Table 6-2.**

Table 6-2: Predicted $L_{Aeq15min}$ Noise Levels from Outdoor Play

Receiver Location	Project Noise Trigger Levels		Predicted Noise Levels	
	Intrusiveness $L_{Aeq,15min}$	Amenity[1] $L_{Aeq,15min}$	Maximum $L_{Aeq,15min}$	Typical $L_{Aeq,15min}$
NCA01	48	58	43	49
NCA02	48		57	47
NCA03	47		57	36
NCA04	47		53	43

The noise emissions associated with outdoor activities, as documented in **Table 6-2,** are expected to be generally within the range of background L_{A90} + 10dBA and less than the recommended Acceptable Noise Level (ANL) for 'Suburban' acoustic amenity noise level.

The greatest noise impacts are predicted for the residential towers overlooking the project site. At the two residential towers (32-34 Ferntree Place and 26 Ferntree Place) noise levels of up to 57dB $L_{Aeq,15min}$ are predicted for receivers with north-west orientation. Within residential tower (18-20 Epping Park Drive) noise levels of up to 54dB $L_{Aeq,15min}$ are predicted for receivers with eastern orientation.

Noise levels of up to 57dB $L_{Aeq,15min}$ are also predicted at one residential receiver (84b Chelmsford Avenue) due to the close proximity (14m) to the project boundary. Installation of a 1800mm solid screen constructed along the eastern project boundary would limit noise impacts at this receiver location.

The levels of noise generated during outdoor play do not exceed the amenity criterion at any of the surrounding residential receivers.

6.8 Outside Hours Use

Outside of regular school hours any 'high noise generating activities' conducted on the school grounds or within the facilities are required to limit noise emissions to comply with the criterion determined in **Section 5.1.**

It is recommended that no outside hours or community use take place prior to 7.00 am or after 10.00 pm. This also includes operation of maintenance equipment such as leaf blowers, lawn mowers and any other high noise power tools.

6.9 Deliveries, Loading Bays and Waste Collection

Schools, particularly primary schools, do not typically generate significant numbers of truck or service vehicle movements. Garbage and recycling collection will be undertaken by a Contractor typically using a small capacity waste removal truck. Occasional deliveries involving courier or small commercial vehicles could be expected to occur generally during school hours.

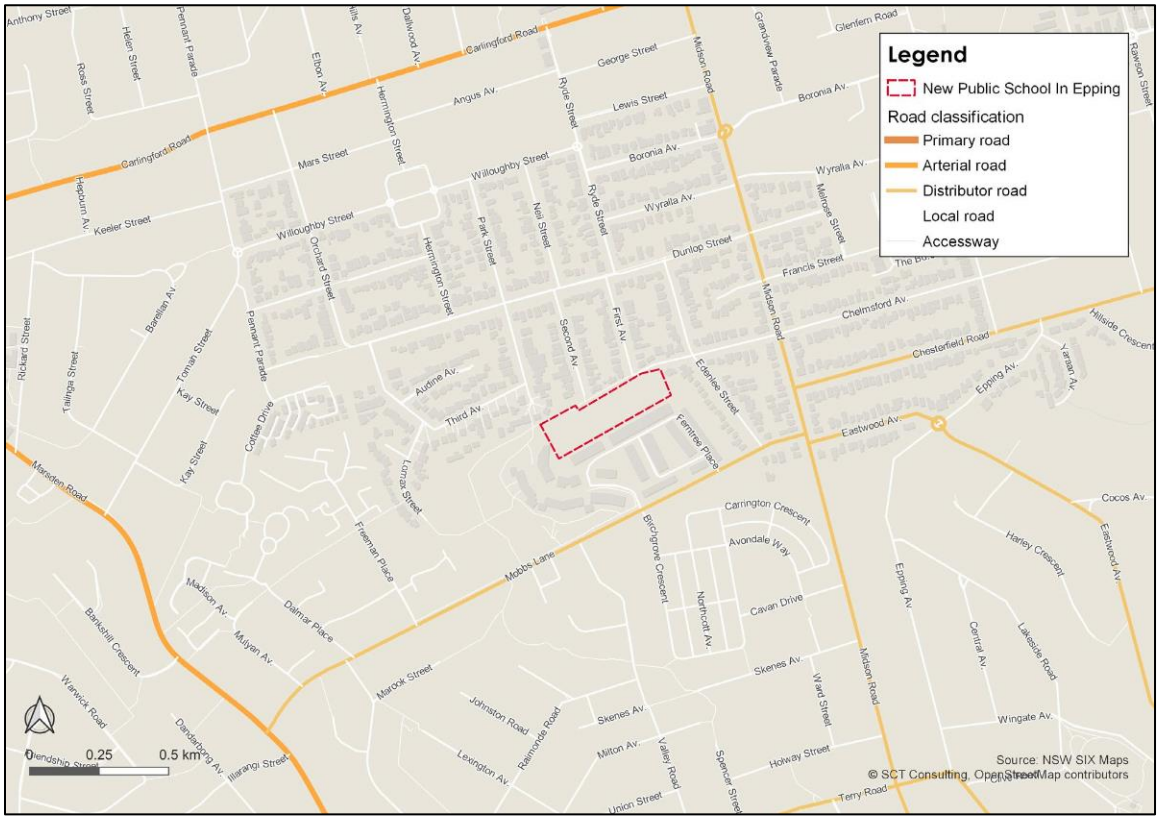
Given the limited number of service vehicles likely to be associated with the proposed school operations, and the times at which such events will occur, noise emissions are not considered to be acoustically significant.

7 ROAD TRAFFIC NOISE

7.1 Existing and Proposed Road Network

Road traffic noise emissions have been assessed with reference to the *Transport Assessment and Accessibility Impact Assessment* prepared by SCT Transport, dated April 2021. The surrounding road network is shown **Figure 7-1**: below.

Figure 7-1: Surrounding Road Network

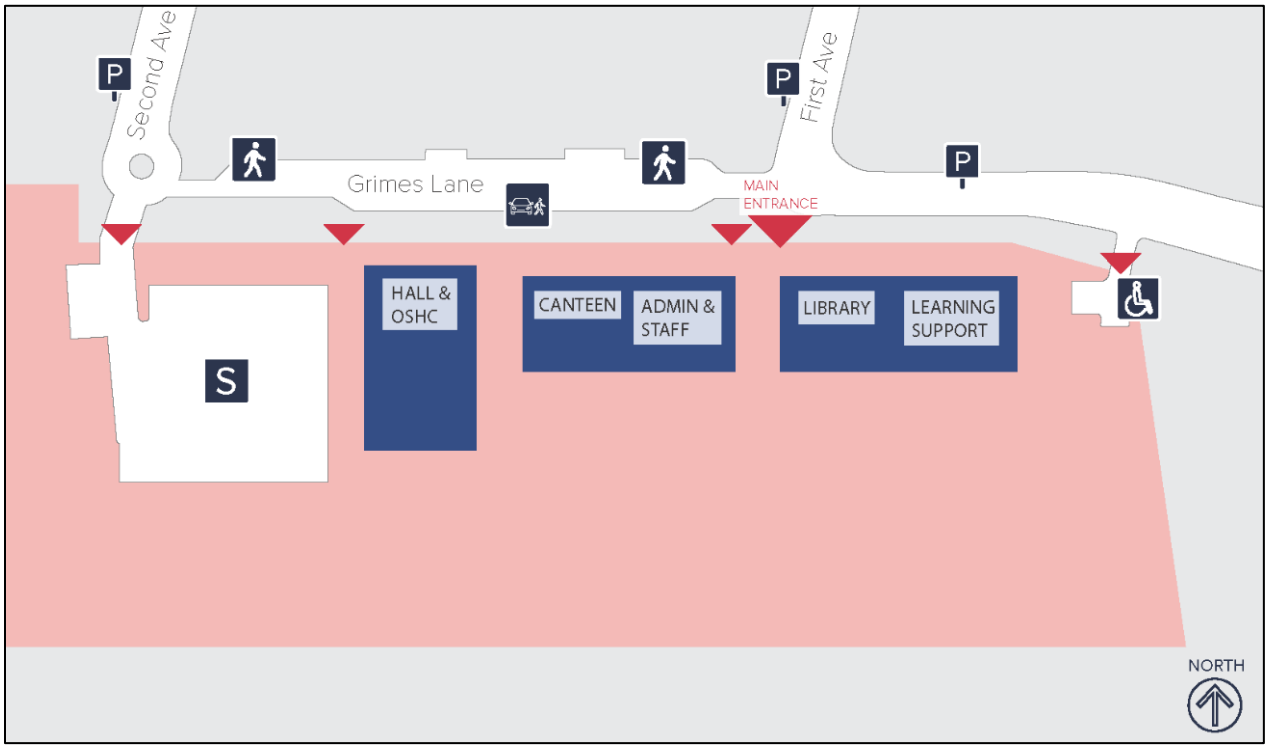


Traffic increases on surrounding roads will typically result from students and staff arriving to school in the morning and leaving in the afternoon. The location of the pickup and drop off (Kiss n' Drop) areas can contribute to potential noise generation at surrounding receivers.

Grimes Lane will be converted from a single lane two-way road to a one-way road for vehicles travelling in the westbound direction once the New Public School is in operation. Students and parents accessing the site would generally use First Avenue and Chelmsford Avenue to access Grimes Lane, which would be extended to connect with Second Avenue as a one-way westbound connection. A kiss 'n drop facility with 10 spaces is proposed along Grimes Lane and an additional kiss 'n drop area with 3 spaces is provided for supported learning students at the eastern end of the school via Chelmsford Avenue.

Layout of the proposed extension to Grimes Lane and kiss 'n drop facilities are presented in **Figure 7-2**:.

Figure 7-2: Transport Layout



The projected trip generation associated with the proposal is presented in **Table 7-1**.

Table 7-1: Projected Trip Generation

Scenario	2023	2033
Student population	600	1,010
AM peak vehicle trips	330 vehicles	550 vehicles
PM peak vehicle trips	240 vehicles	400 vehicles

The traffic assessment indicates that 65% of the kiss 'n drop demand would be serviced by Grimes Lane and Chelmsford Avenue, with the remaining kiss 'n drop activity occurring on the surrounding streets.

7.2 Assessment Criteria – Road Traffic

Following the proposed future modifications, Chelmsford Avenue, First/Second Avenue and Grimes Lane would no longer be considered as "Local" roads and would fall into the "Collector" road classification. From an acoustic consideration, the assessment criteria applicable to "Sub-arterial" roads would apply and is presented in **Table 7-2.**

Table 7-2: Road Traffic Noise Assessment Criteria

Road	Road Classification	Assessment Criteria – dBA	
		Day (7am-10pm)	Night (10pm-7am)
Chelmsford Avenue – Grimes Lane – First Avenue – Second Avenue	"Collector"	$L_{Aeq,15hr}$, 60 (external)	$L_{Aeq,9hr}$ 55 (external)

7.3 Traffic Noise Prediction and Assessment

To determine noise levels at potentially affected receivers near the Kiss n' Drop locations, noise modelling has been conducted using SoundPLAN v8 noise prediction software. The levels of road traffic noise generated by project traffic have been predicted using the UK Department of Environment *Calculation of Road Traffic Noise (CoRTN)* 1988 method.

Based on the information supplied by SCT Transport, the following daytime (7am–10pm) traffic volumes presented in **Table 7-3** have been assigned to First/Second Avenue, Chelmsford Avenue and Grimes Lane.

Table 7-3: Noise Model Traffic Inputs (Average Weekday 15-hour Volume)

Road Name	2023	2033
First Avenue	185	309
Chelmsford Avenue	185	309
Grimes Lane – Second Avenue	371	618

Results of the noise modelling are presented in **Table 7-4**, with the highest levels from NCA 01 and NCA 04 reported.

Table 7-4: Predicted Road Traffic Noise Levels

Scenario Year	NCA	*RNP* Criteria	Highest Predicted Level
2023	NCA01	$L_{Aeq,15hr}$, 60 (external)	47 $L_{Aeq,15hr}$
	NCA04		46 $L_{Aeq,15hr}$
2033	NCA01		50 $L_{Aeq,15hr}$
	NCA04		49 $L_{Aeq,15hr}$

As shown in **Table 7-4** the predicted levels of noise associated with traffic generated by the proposed new school comply with the recommended assessment criteria.

8 CONCLUSION

Assessment of noise impacts associated with the new primary school at 86 Chelmsford Avenue, Epping has been conducted. The assessment supports a State Significant Development Application (SSDA) submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The scope of the assessment involved a survey of the existing noise environment; derivation and establishment of assessment criteria for noise emissions; a noise impact assessment relative to appropriate criteria; and recommendations for measures to minimise the potential for disturbance to surrounding residents. The findings are as follows:

Construction Noise & Vibration

Noise objectives for construction have been established based on EPA guidelines. The noise management levels should be adopted as objectives to work towards minimising noise emissions to surrounding residences.

Construction activities associated with Stage 1 works are expected to generated noise levels that will potentially exceed established construction noise management levels, during standard hours. Planning and management of construction activities shall be undertaken to minimise noise impact at surrounding receivers. The control of construction noise and vibration should be addressed in a detailed Noise & Vibration Management Plan developed when the successful contractor has been appointed for the project.

Operational Noise

Details of mechanical plant are unavailable at this stage. Acceptable noise levels due to plant operation are likely to be achieved with consideration given to low-noise plant selection, sensible plant location and implementation of engineering noise control measures where required. Further assessment will be required when detailed mechanical services design becomes available.

The noise level emissions from assumed worst-case operational scenarios of the future potentially noise-generating activity / teaching spaces and the school hall have been predicted to the nearest surrounding residential receivers.

The results of calculations of continuous operational noise sources, including the carpark, were compared with the project specific trigger limits, determined in accordance with regulatory requirements. All relevant criteria can generally be achieved by the development.

The noise emissions associated with outdoor activities are expected to be generally within the range of background L_{A90} + 10dBA and less than the recommended Acceptable Noise Level (ANL) for 'Suburban' acoustic amenity. Significant exceedances are predicted at residential apartment buildings overlooking the school site and at the neighboring residence to the northeast. Installation of an 1800 mm solid screen constructed along the eastern project boundary (where practicable) would minimise noise impacts at this receiver location.

The levels of noise generated during outdoor play do not exceed the amenity criterion at any of the surrounding residential receivers.

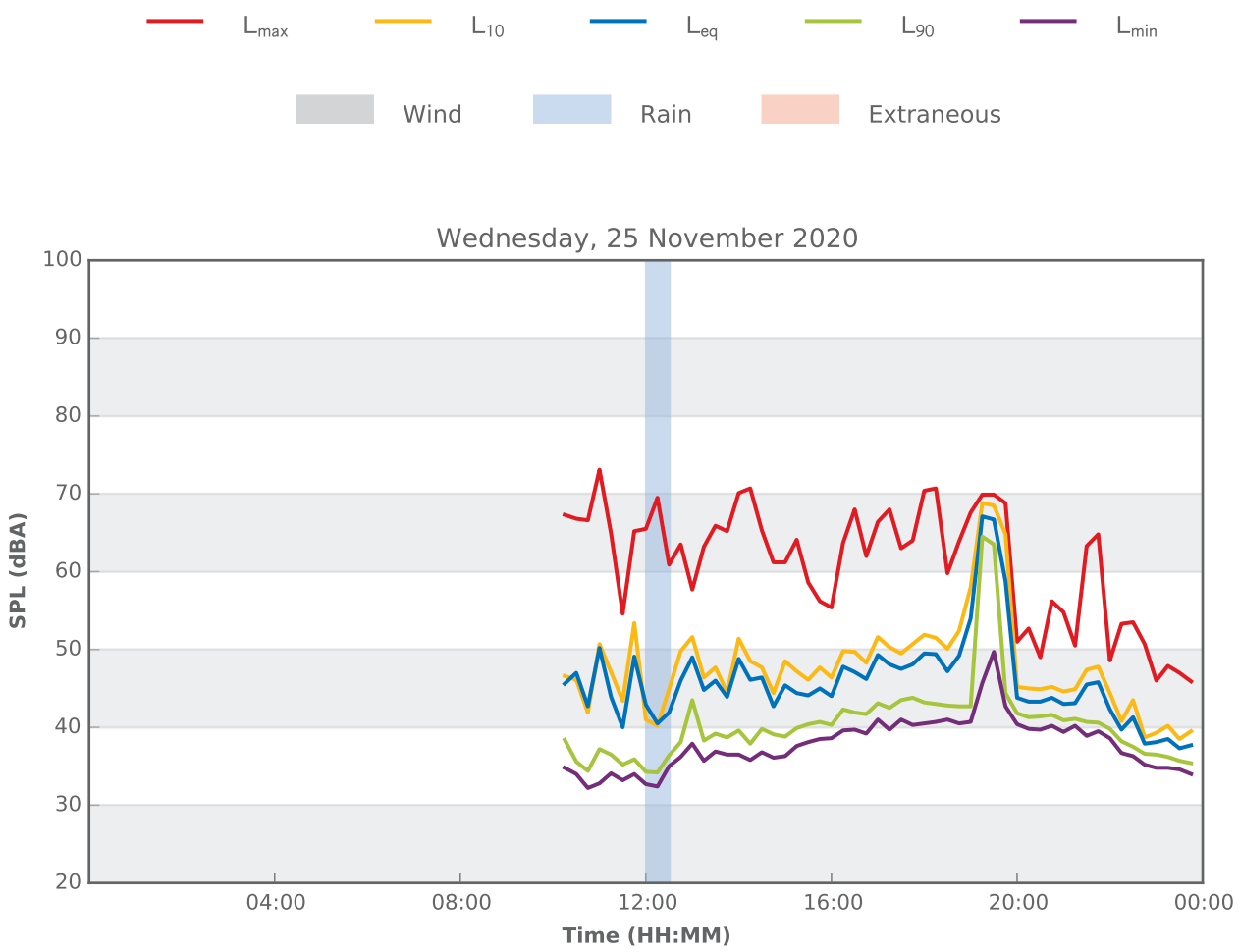
Road Traffic

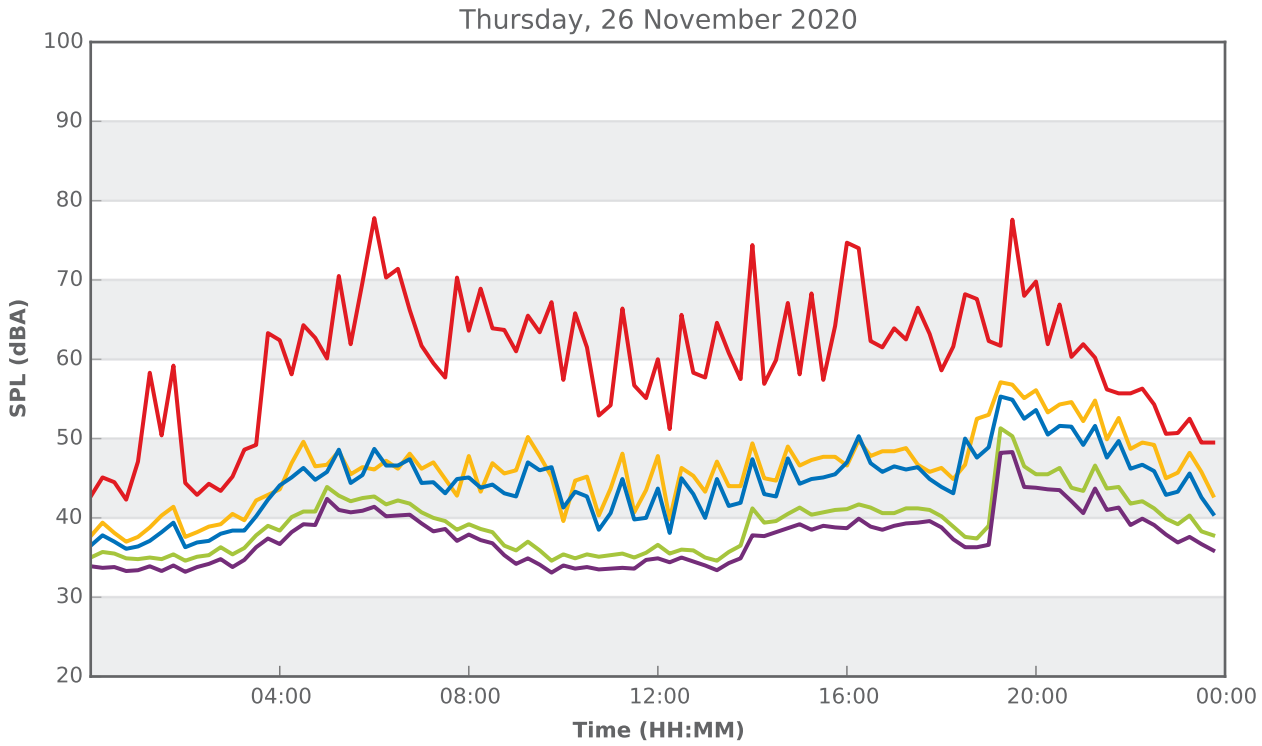
Road traffic noise emissions have been assessed with reference to the *Transport Assessment and Accessibility Impact Assessment* prepared by SCT Transport. Predicted levels of noise associated with traffic generated by the proposed new school comply with the recommended assessment criteria.

APPENDIX A:

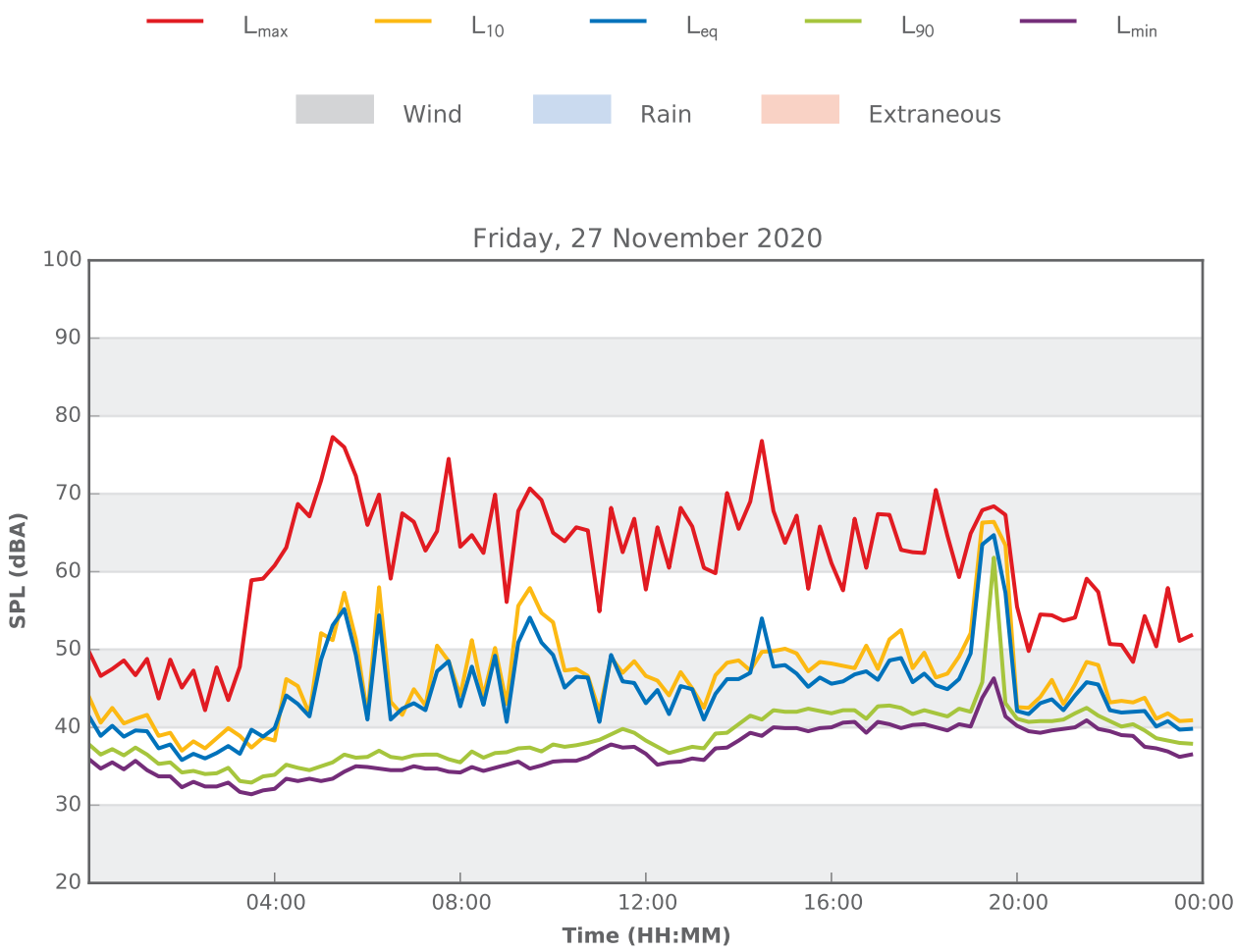
Ambient Noise Survey Results

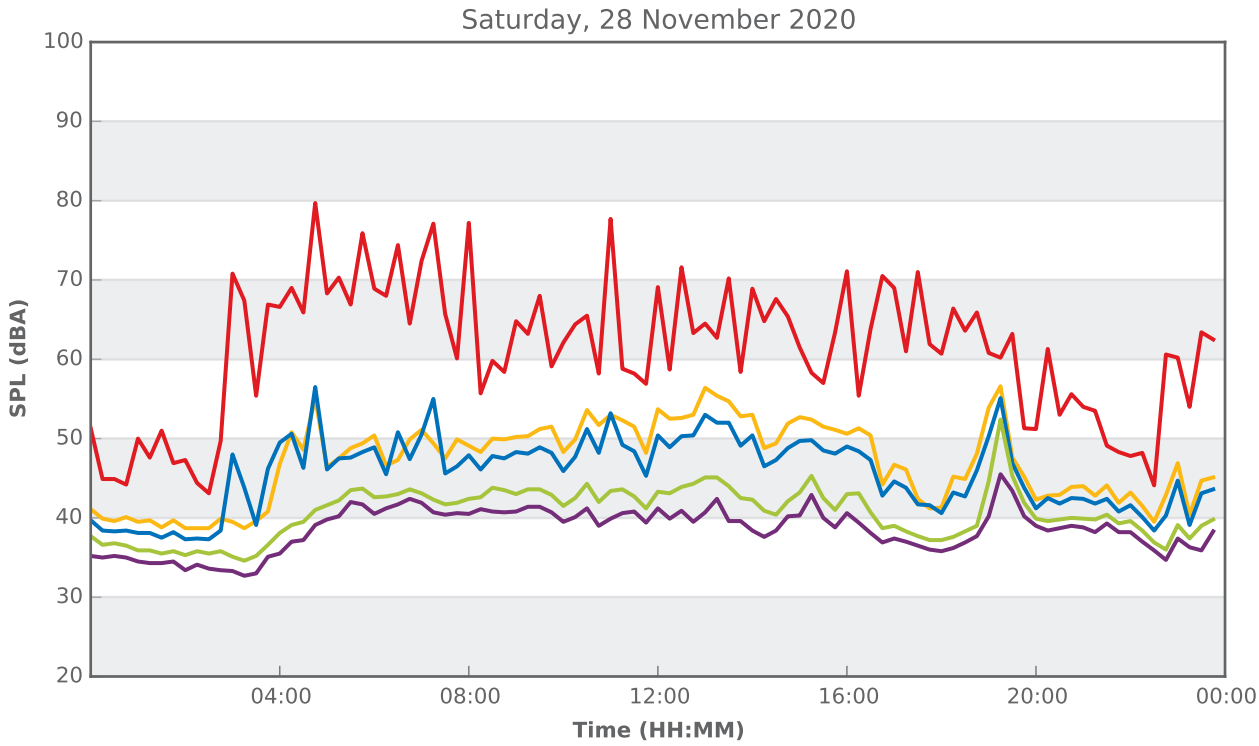
2 Grimes Lane, Epping



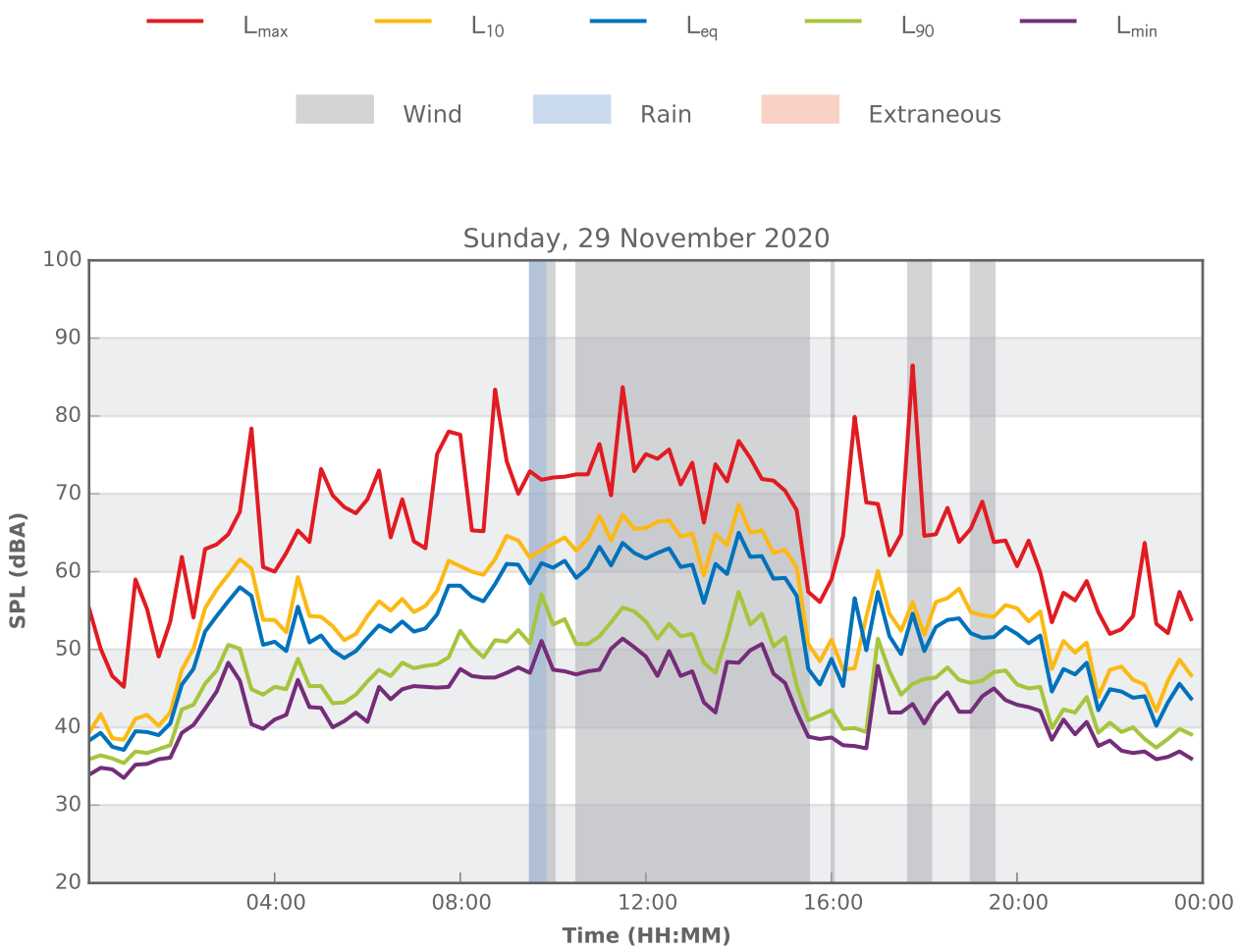


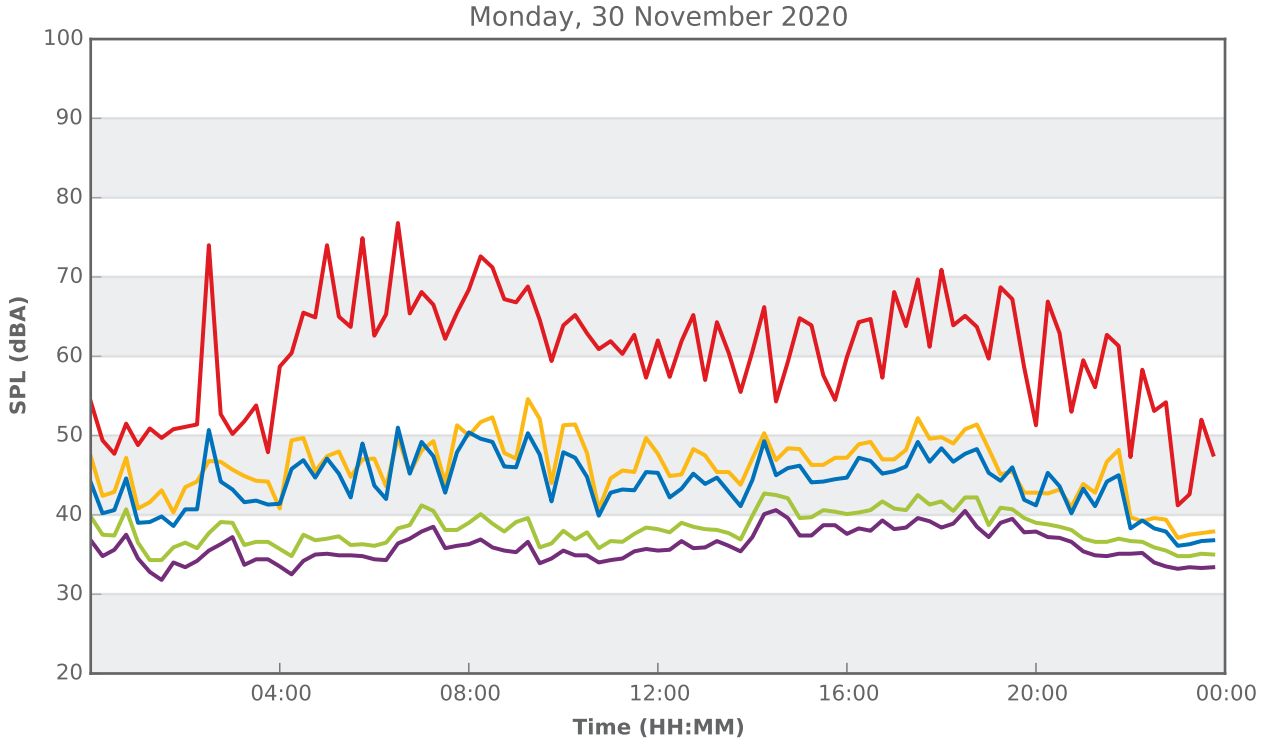
2 Grimes Lane, Epping



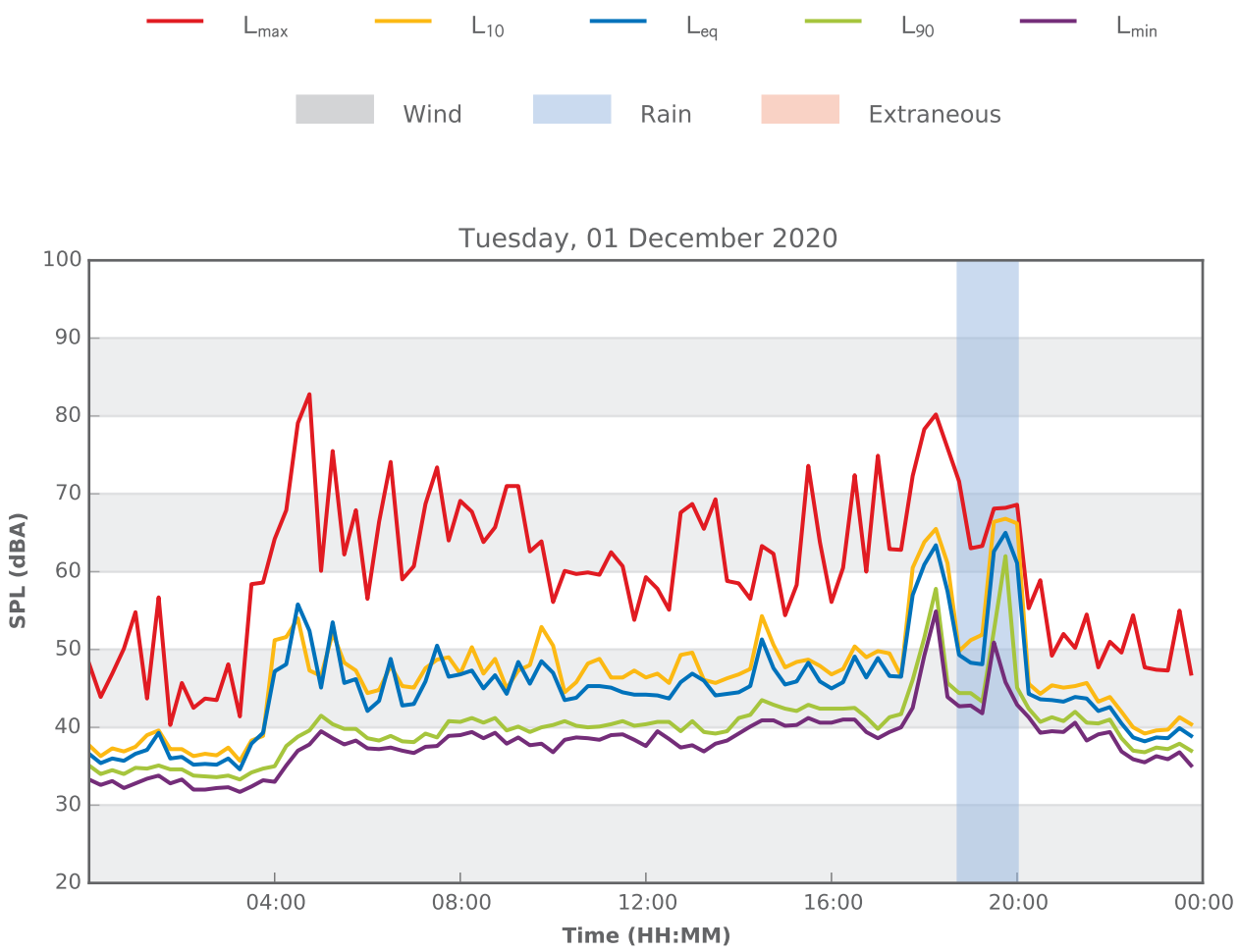


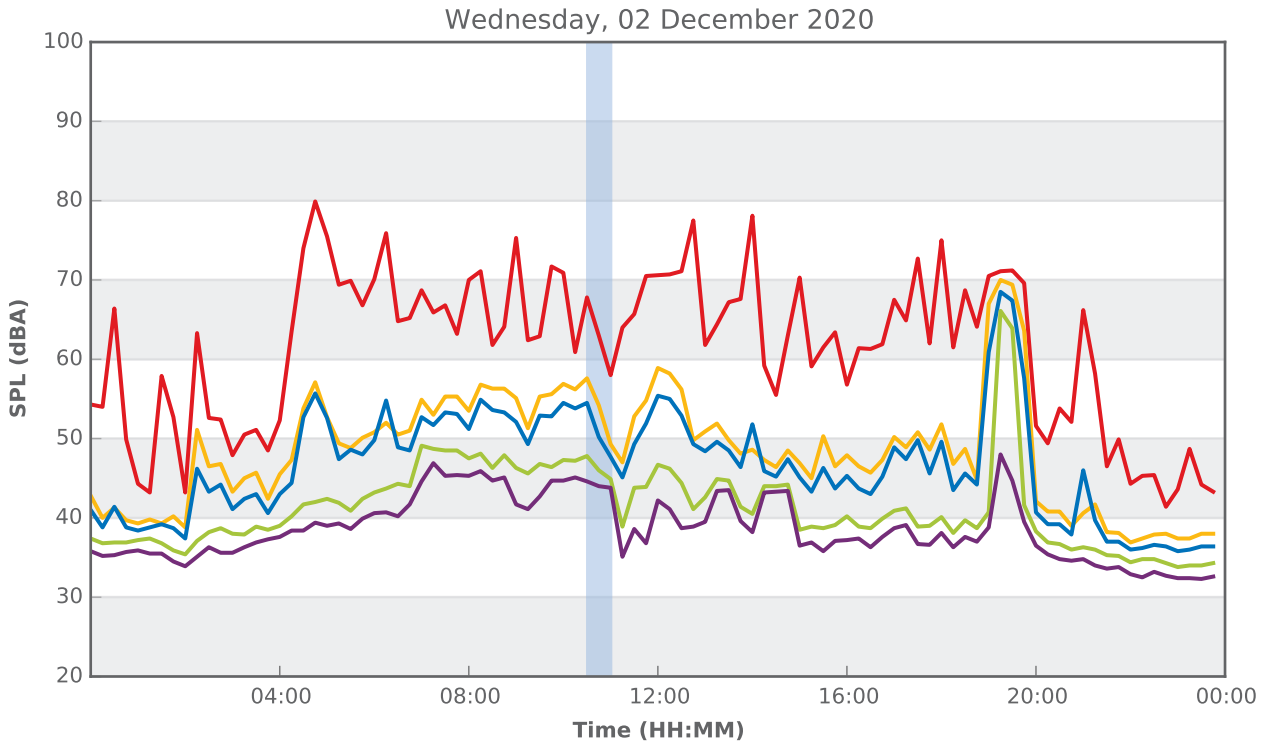
2 Grimes Lane, Epping



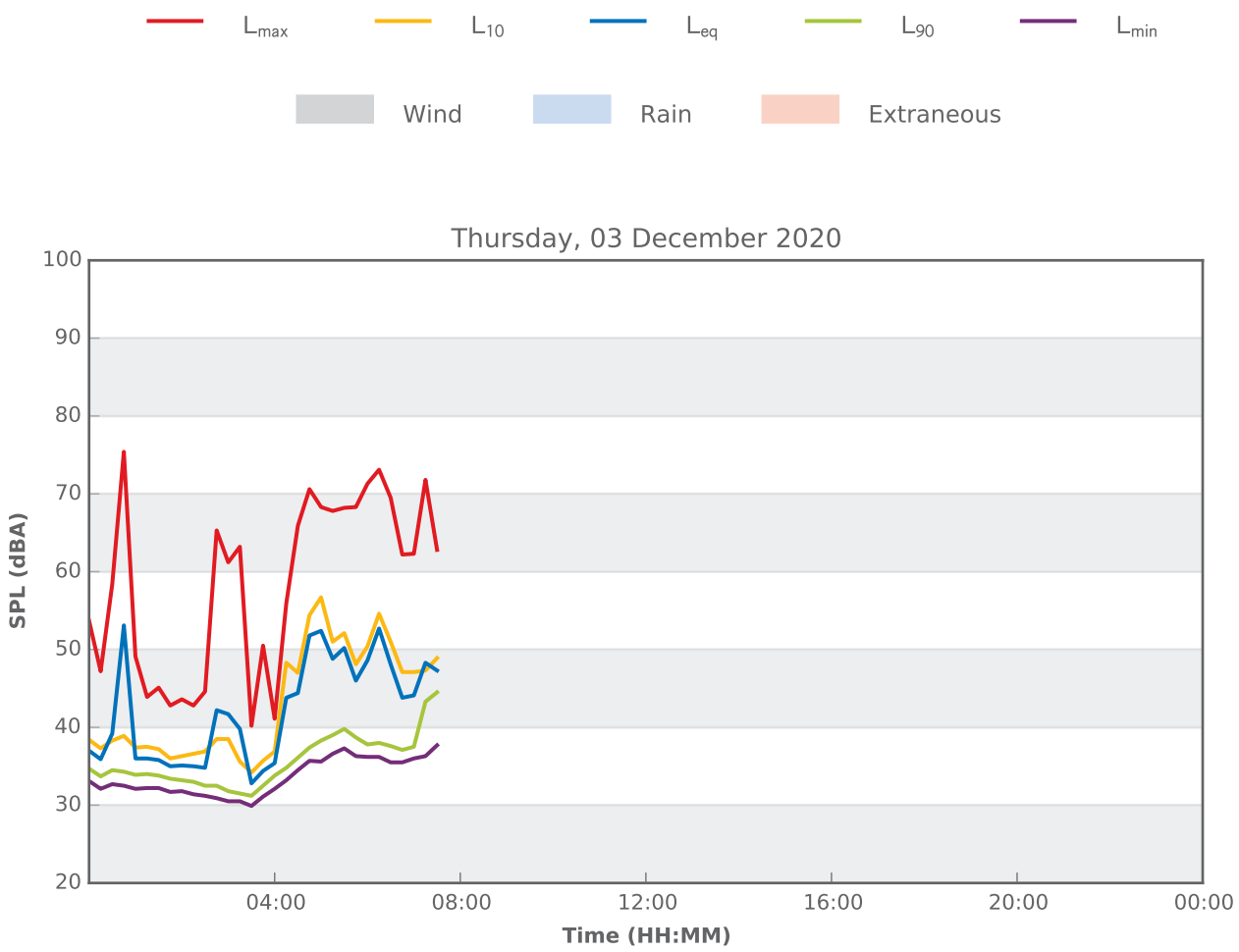


2 Grimes Lane, Epping

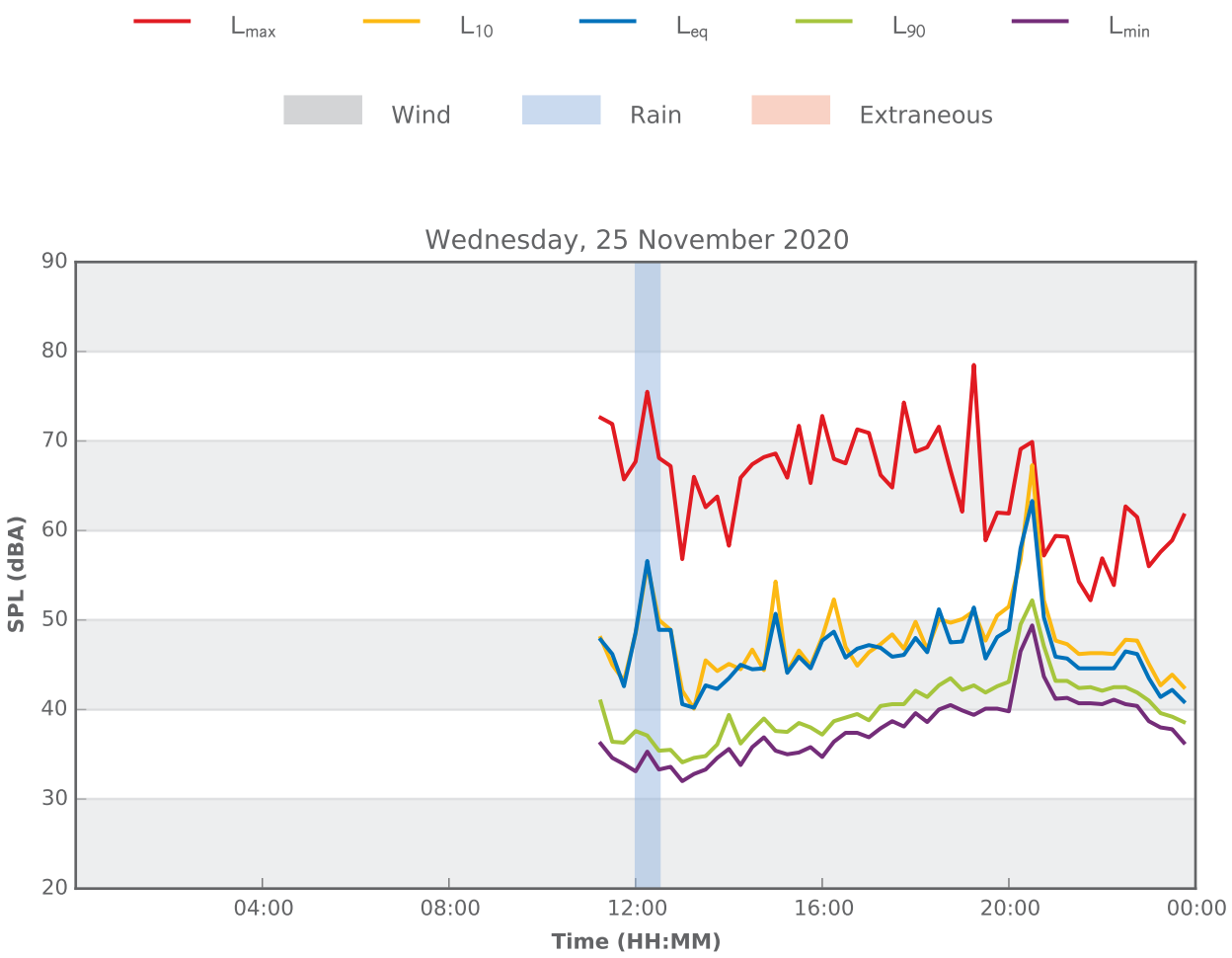


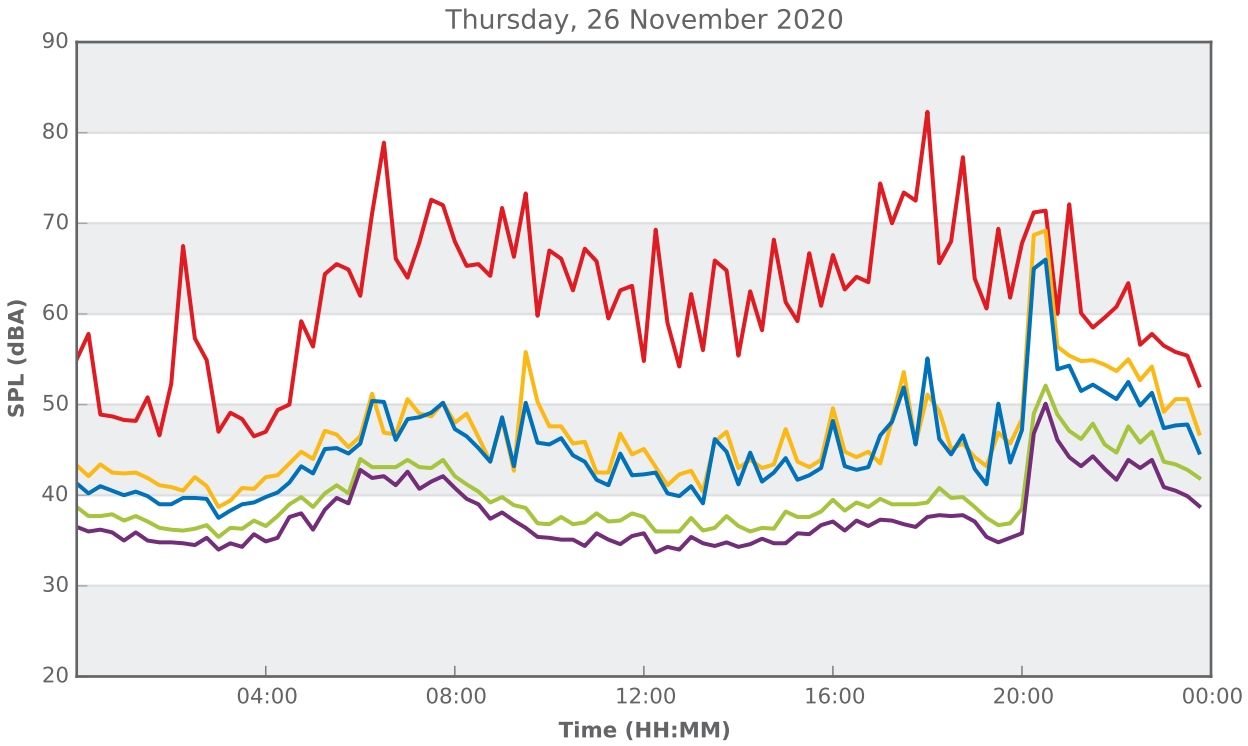


2 Grimes Lane, Epping

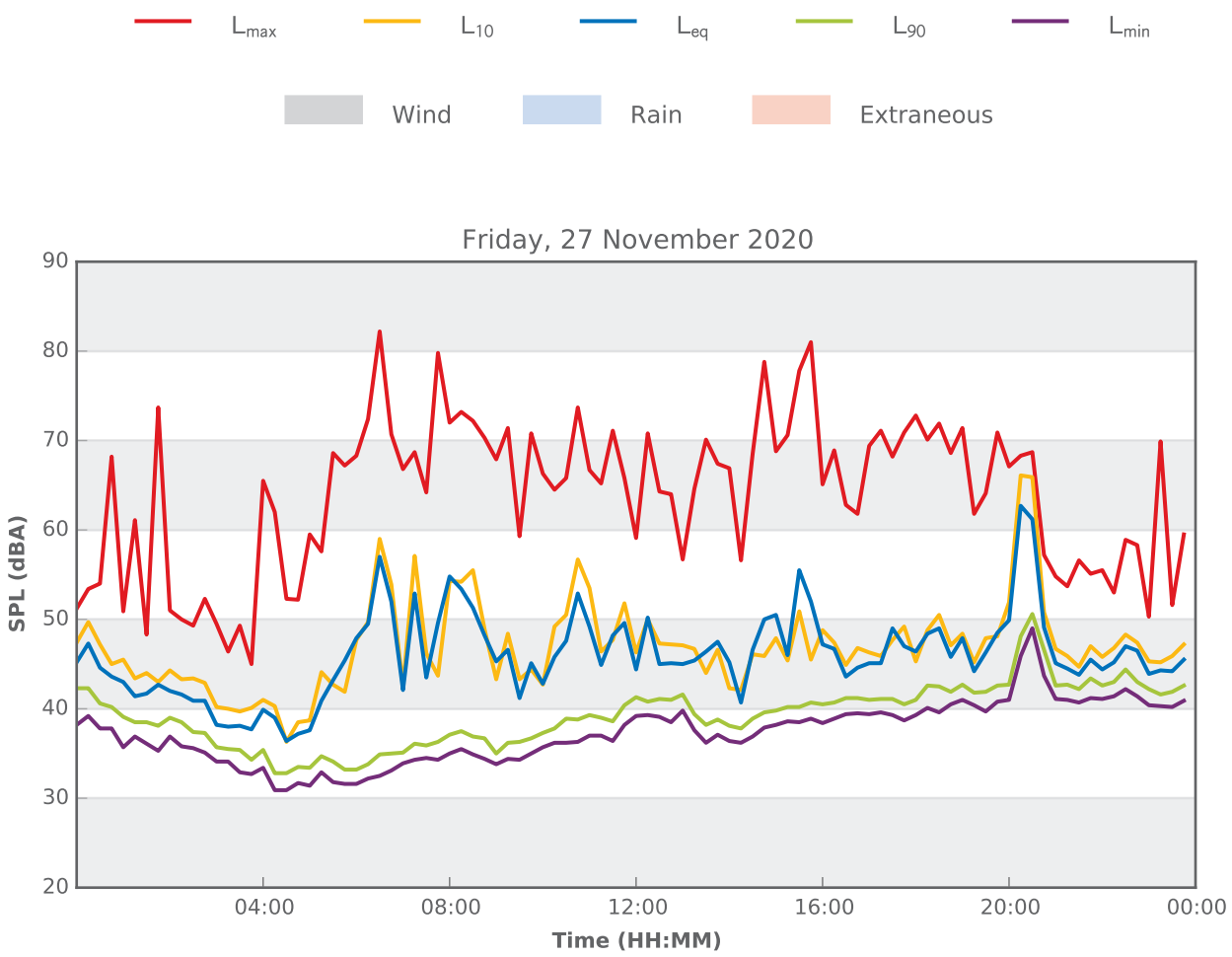


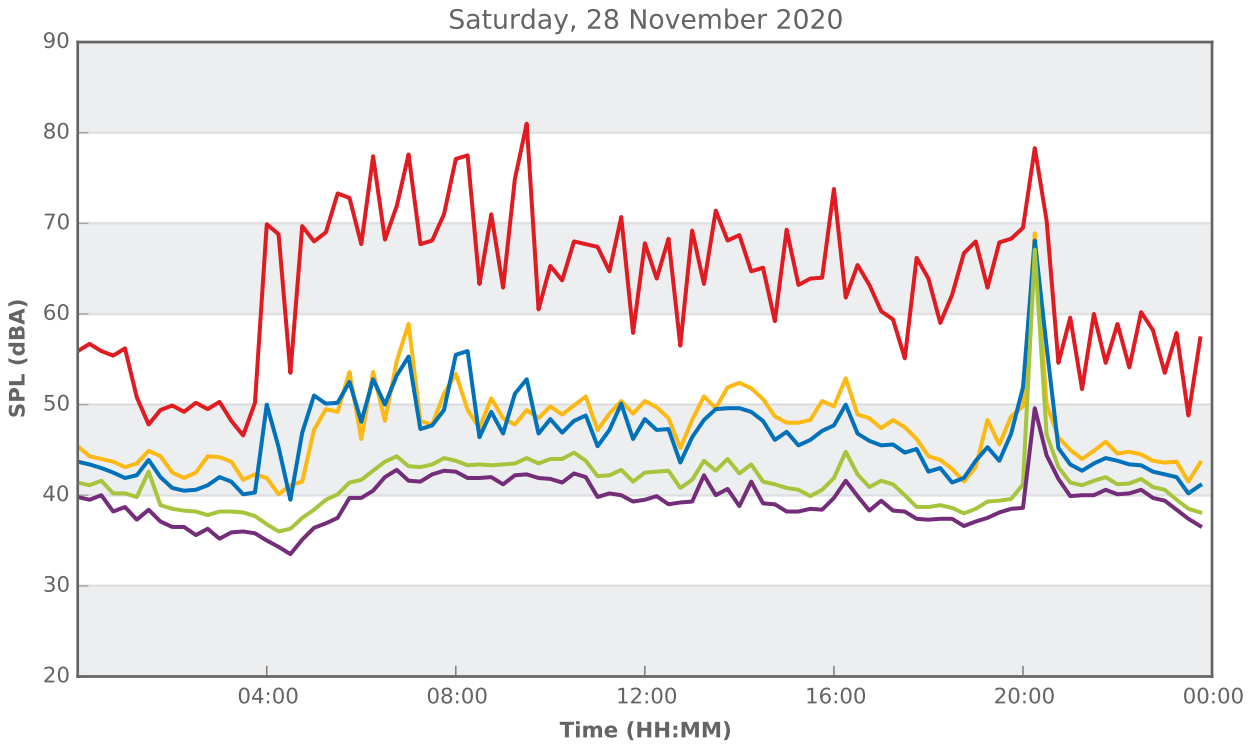
30 Ferntree Place, Epping



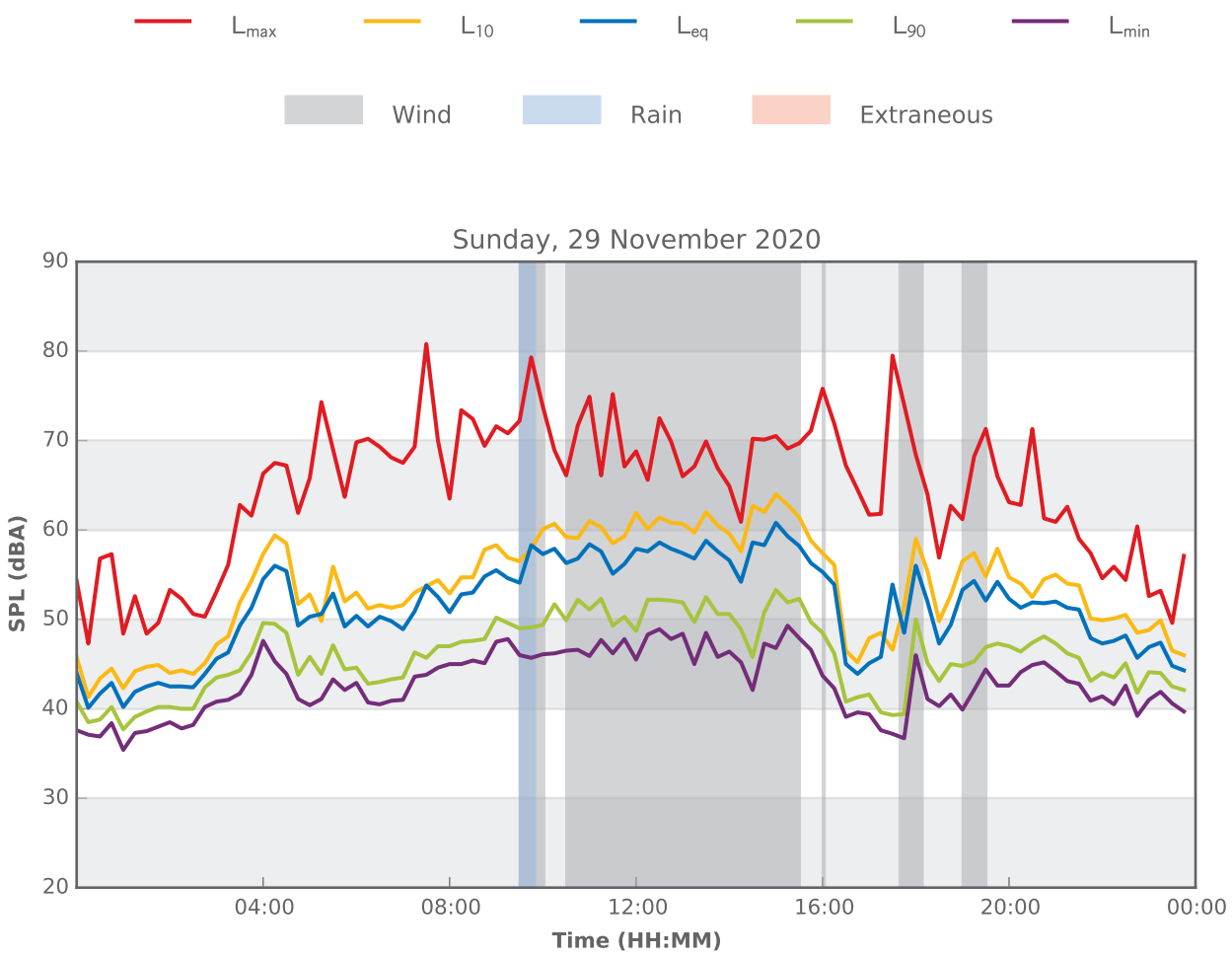


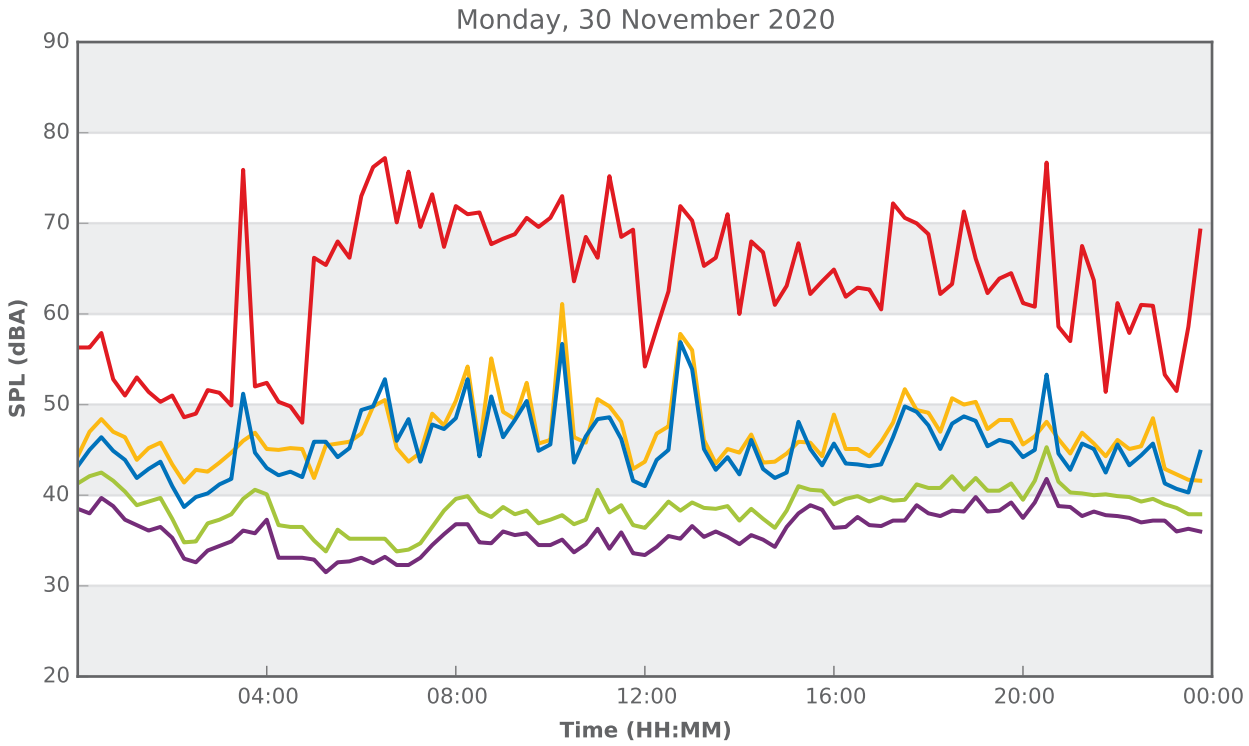
30 Ferntree Place, Epping



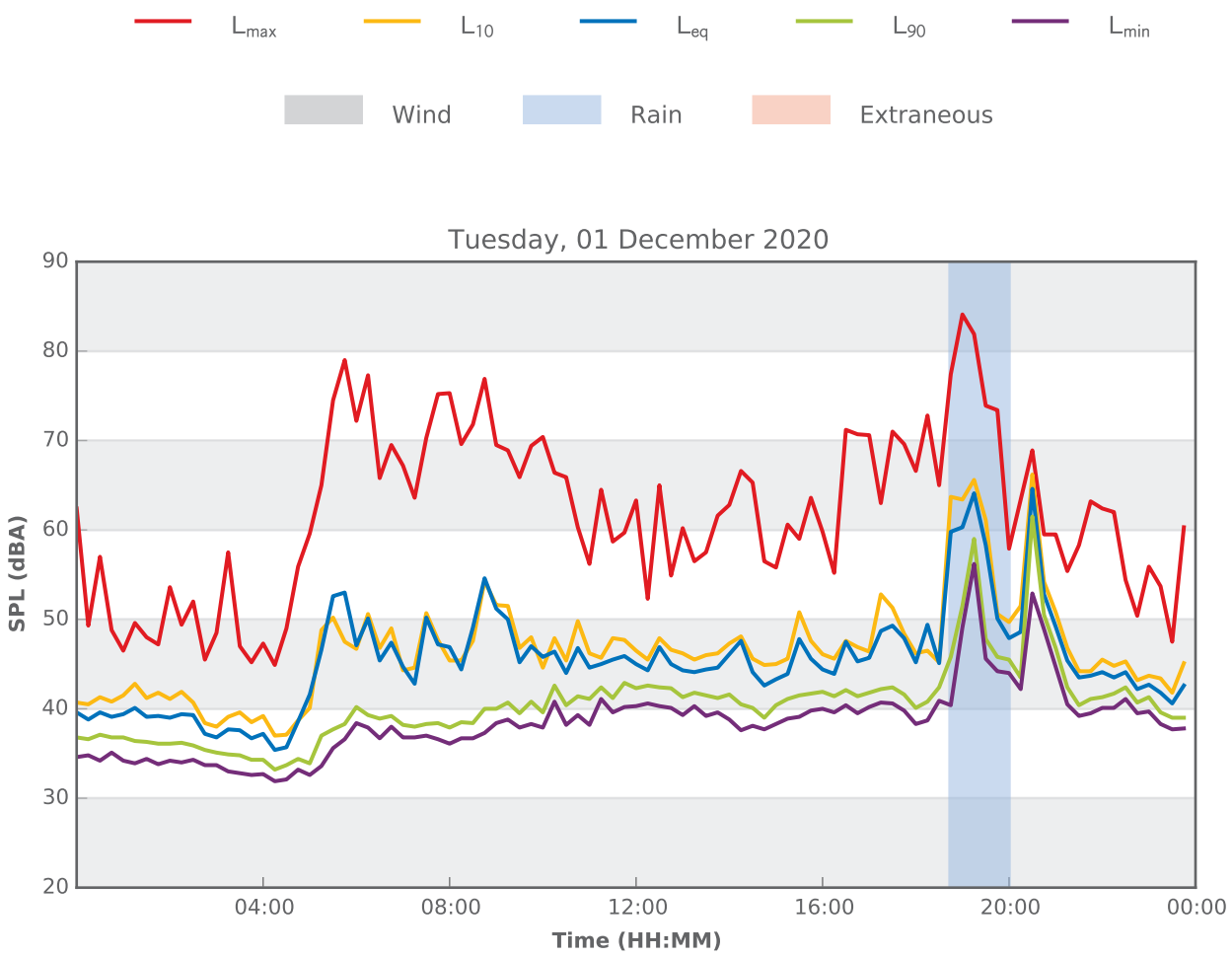


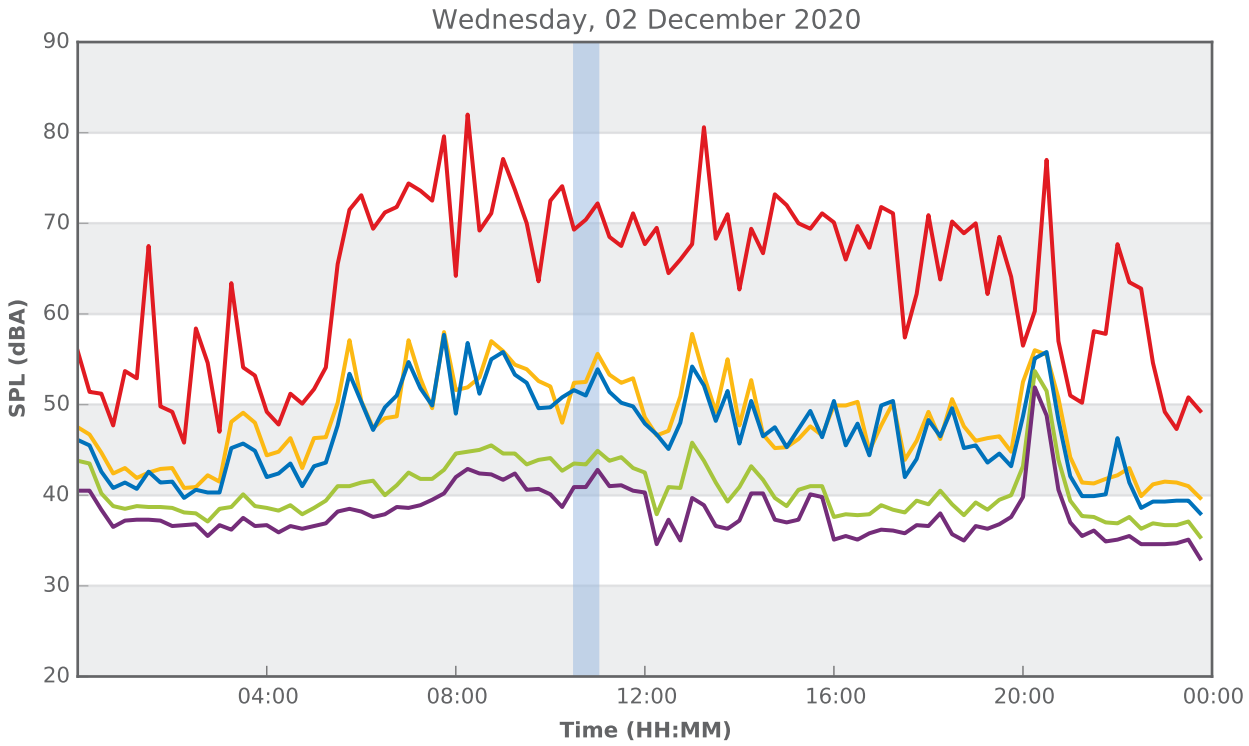
30 Ferntree Place, Epping





30 Ferntree Place, Epping





30 Ferntree Place, Epping