RODNEY STEVENS ACOUSTICS
Acoustic Consultants

REPORT R220974R1

Revision 0

Traffic Noise and Vibration Assessment
Proposed Residential Development
47 Raymond Terrace Road, East Maitland

PREPARED FOR:
Aozid Trust

12 January 2023

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Traffic Noise and Vibration Assessment

Proposed Residential Development

47 Raymond Terrace Road, East Maitland

PREPARED BY:

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
R220974R1	Revision 0	12 January 2023	Dani Awad	Rodney Stevens	Rodney Stevens

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (here forth referred to as RSA) has been engaged by Aozid Trust to conduct a road and rail noise and vibration impact assessment for development application (DA) lodgement of the proposed residential development at 47 Raymond Terrace Road, East Maitland.

This report addresses road traffic noise impacts from Raymond Terrace Road on the amenity of the proposed residential development.

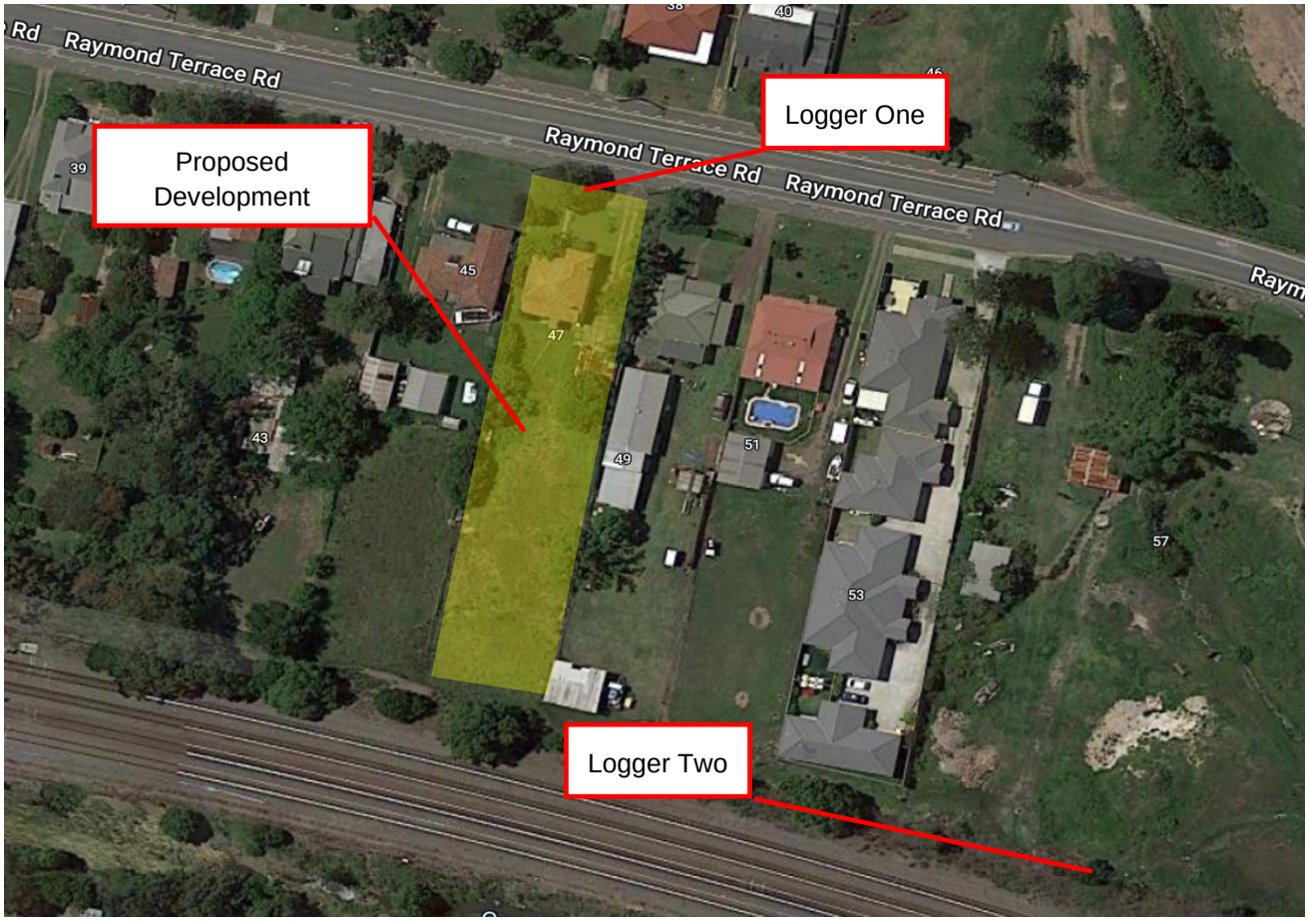
This assessment is to form part of the supporting documentation for the DA submission to Maitland City Council. Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROJECT DESCRIPTION

2.1 Site Location

The proposed development site is located at 47 Raymond Terrace Road, East Maitland. The site is bounded by residential developments to the east and west with the Hunter railway line to the south. The site and its surroundings are shown in Figure 2-1.

Figure 2-1 Site Location



Aerial image courtesy of Google Maps © 2023

2.2 Proposed Development

The proposal is to construct 7 new townhouse dwellings on-site. There is an existing dwelling on site that will be retained. Floor plans of the development are presented in Appendix D.

3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between Tuesday 13th December and Tuesday 20th December 2022 at the logging locations shown in Figure 2-1. Two noise loggers were set up on site. The first logger was located in the front yard of the site overlooking Raymond Terrace Road this location is representative of the traffic noise levels that the site will be exposed to.

The second logger was located in line with the rear boundary, noise monitoring at this location is representative of the typical acoustic environment of the site in addition to overlooking the Hunter railway line.

Logger locations were selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from residents and landowners.

Instrumentation for the survey comprised of two RION NL-42 environmental noise loggers (serial numbers 00410151 and 1000322) fitted with microphone windshields. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A). Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of L_{A1}, L_{A10}, L_{A90} and L_{Aeq} for each 15-minute monitoring period.

3.2 Ambient Noise Results

In order to establish the ambient noise criteria of the area, the data obtained from the noise logger has been processed in accordance with the procedures contained in the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPfI, 2017) to establish representative noise levels that can be expected in the residential vicinity of the site.

The monitored ambient noise levels are detailed in Table 3-1

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined NPfI Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Daytime 7 am - 6 pm	Evening 6 pm – 10 pm	Night-time 10 pm – 7 am
Rear Boundary	L_{Aeq}	66	67	65
	RBL (Background)	45	43	34

Notes: All values expressed as dB(A) and rounded to nearest 1 dB(A);

LAeq Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

LA90 Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

3.3 Noise Intrusion (State Environmental Planning Policy (Infrastructure) 2007)

To assess noise intrusion into the proposed dwelling, the data obtained from the first logger location has been processed to establish representative ambient noise levels at the facades most exposed to Raymond Terrace Road.

The time periods used for this assessment are as defined in the State Environmental Planning Policy (Infrastructure) 2007 and the Development near Rail Corridors and Busy Roads Interim Guideline. Results are presented below in Table 3-2.

Table 3-2 Traffic Noise Levels Corresponding to Defined SEPP 2007 Periods

Location	Period	External Noise Levels dB(A)
Logger 1 Raymond Terrace Road	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 65
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 62
Logger 2 Rail Corridor	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 66
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 65

4 NOISE GUIDELINES AND CRITERIA

4.1 Road Noise Criteria

The determination of an acceptable level of traffic noise impacting the internal residential spaces requires consideration of the activities carried out within the space and the degree to which noise will interfere with those activities.

As sleep is the activity most affected by traffic noise, bedrooms are considered to be the most sensitive internal living areas. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to the television etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries etc. can be higher.

4.2 State Environmental Planning Policy (Infrastructure) 2007

The NSW Government's State Environmental Planning Policy (Infrastructure) 2007 (SEPP (Infrastructure) 2007) was introduced to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. In accordance with the SEPP, Table 3.1 of the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* (the DP&I Guideline) of December 2008 provides noise criteria for residential and non-residential buildings. These criteria are summarised in Table 4-1.

Table 4-1 DP&I Interim Guideline Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

Note 1: Airborne noise is calculated as $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ night-time

The following guidance is also provided in the DP&I Guideline:

> *"These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities. For some residential buildings, the applicants may wish to apply more stringent design goals in response to market demand for a higher quality living environment.*
>
> *The night-time "sleeping areas" criterion is 5 dB(A) more stringent than the "living areas" criteria to promote passive acoustic design principles. For example, designing the building such that sleeping areas are less exposed to road or rail noise than living areas may result in less onerous requirements for glazing, wall construction and acoustic seals. If internal noise levels with windows or doors open exceed the criteria by more than 10 dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

The noise criteria presented in Section 4.2 and in Table 4-1 apply to a 'windows closed condition'. Standard window glazing of a building will typically attenuate noise ingress by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). Accordingly, the external noise threshold above which a dwelling will require mechanical ventilation is an $L_{Aeq(9hour)}$ 55 dB(A) for bedrooms and $L_{Aeq(15hour)}$ 60 dB(A) for other areas.

Where windows must be kept closed, the adopted ventilation systems must meet the requirements of the Building Code of Australia and Australian Standard 1668 – The use of ventilation and air conditioning in buildings.

4.2.1 Rail Vibration Criteria

Section 3.6.3 of the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* requires that intermittent vibration emitted by trains should comply with the criteria in the EPA's document Assessing Vibration: a technical guideline.

Table 2.4 of the "*Assessing Vibration guidelines"* sets out the following acceptable vibration dose values for residences affected by intermittent vibration:

Table 4-2 Acceptable vibration dose values for intermittent vibration in residences ($m/s^{1.75}$)

Location	Period	Preferred VDV	Maximum VDV
Residences	Day (7am-10pm)	0.20	0.40
	Night (10pm-7am)	0.13	0.26

4.3 Operational Noise Project Trigger Noise Levels

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA. The EPA oversees the Noise Policy for Industry (NPfI) October 2017 which provides a framework and process for deriving project trigger noise level. The NPfI project noise levels for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

4.3.1 Intrusiveness Noise Levels

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness noise level essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15-minute period.

4.3.2 Amenity Noise Levels

The amenity noise level is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The noise levels relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured.

If it approaches the project trigger noise level value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the project trigger noise level.

4.3.3 Area Classification

The NPfI characterises the “Urban” noise environment as an area with an acoustical environment that:

- is dominated by ‘urban hum’ or industrial source noise,
- where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources
- has through-traffic with characteristically heavy and continuous traffic flows during peak periods
- is near commercial districts or industrial districts
- combination of the above.

The area surrounding the proposed development falls under the “Urban” area classification.

4.3.4 Project Specific Trigger Noise Levels

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project specific project trigger noise levels. The intrusive and amenity project trigger noise levels for nearby residential premises are presented in Table 4-3. These project trigger noise levels are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the project amenity noise levels are assigned as per Table 2.2 of the NPfI (Recommended Amenity Noise Levels) and standardised as per Section 2.2 of the NPfI. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive project trigger noise level are adopted. These are shown in bold text in Table 4-3.

Table 4-3 Operational Project Trigger Noise Levels

Receiver	Time of Day	ANL [1] L_{Aeq}	Measured		Project Trigger Noise Levels	
			RBL [2] $L_{A90(15min)}$	Existing $L_{Aeq(Period)}$	Intrusive $L_{Aeq(15min)}$	Amenity $L_{Aeq(15min)}$
Residential	Day	60	45	66	**50**	63
	Evening	50	43	67	**48**	53
	Night	45	34	65	**39**	48

Note 1: ANL = "Amenity Noise Level" for residences in Urban Areas.
Note 2: RBL = "Rating Background Level".

5 NOISE IMPACT ASSESMENT

5.1 Road and Rail Traffic Noise Assessment

In order to ascertain the existing traffic noise levels from Raymond Terrace Road and the Hunter railway line, the measured noise logger data was processed in accordance with the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* assessment time periods as shown in Table 3-2.

The final façade noise levels were predicted for each time period considering the distance attenuation from each respective source, virtual source, façade's orientation and any barrier effects.

The required noise reduction via the building façade for each respective room for each time period will be compared to determine the appropriate design criteria levels.

It is typically accepted that an open window (fractionally open to meet ventilation requirements) results in an attenuation of external noise by 10 dB. This reduction has been used to predict the room noise level in the window open condition.

5.2 Recommended Noise Control Treatment

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of traffic noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

All recommendations must be checked by others to ensure compliance with other non-acoustic requirements that Council or other authority may impose (e.g. Thermal requirements for BASIX compliance).

5.3 Glazing

The R_w rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements in Table 5-1

The window systems must be tested in accordance with both of the following:

- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Table 5-1 presents the minimum recommended R_w (weighted noise reduction) for glazing elements.

Table 5-1 Minimum Acoustic Rating (R_w) Required for Glazing Elements

Location	Glazing Type	Minimum Glazing Rw Rating	Indicative Glazing System
Town Houses U1, U2 and U3			
Bedrooms	Windows	Rw 36	10.38mm laminated glass in acoustically sealed frame*
Living/Kitchen/Dining	Sliding Doors	Rw 34	8.38mm laminated glass in acoustically sealed frame*
	Windows	Rw 32	6.38mm laminated glass in acoustically sealed frame*
Rumpus	Windows	Rw 34	8.38mm laminated glass in acoustically sealed frame**
Stairs/Landing	Windows	Rw 32	6.38mm laminated glass in acoustically sealed frame*
Town Houses U4, U5, U6 and U7			
Bedrooms	Windows	Rw 38	12.38mm laminated glass in acoustically sealed frame*
Living/Kitchen/Dining	Sliding Doors	Rw 36	10.38mm laminated glass in acoustically sealed frame*
	Windows	Rw 36	10.38mm laminated glass in acoustically sealed frame*

Rumpus	Windows	Rw 36	10.38mm laminated glass in acoustically sealed frame*
Stairs/Landing	Windows	Rw 32	6.38mm laminated glass in acoustically sealed frame*

Note *: Glazing systems are for reference only. Any glazing system to be installed for the development is to achieve the minimum Rw rating indicated above.

The above recommended glazing systems are indicative only. Care should be taken when selecting the system to ensure the acoustic rating (Rw) is verified through laboratory tested data. As a guide, the following table presents the Rw ratings of different glass thicknesses, please note that these are shown as a guide only, all final glazing system selections must comply with the requirements in Section 5.3.

Table 5-2 Glass Thickness Guideline

Glass Thickness	Rw Rating (Glass Pane Only)
5mm	26
6mm	28
6.38mm Laminated	32
8.38 Laminated	34
10.38 Laminated	36
12.38 Laminated	37
4mm – 50mm Airgap – 6mm Double Glazed	41

5.4 Roof/Ceiling

The roof/ceiling structure must have a minimum Rw +Ctr 40 rating. This can be met by the following minimum construction:

- A steel Colorbond roof
- Bradford Anticon on 150mm timber or steel purlins
- Rondo furring channel at 600mm maximum centres;
- 165 Gold Batts R 3.0;
- 2 x 13mm Fyrchek Plasterboard (minimum density 12.5 kg/m^2 per sheet).

If ventilators, heat extraction units or other openings into the ceiling cavity for lighting, ventilation, decoration or other purposes are to be provided, then care should be taken to ensure that such units are properly attenuated and all penetrations are properly sealed off so as not to degrade the rating of the roof/ceiling construction system. Care should also be taken to avoid any noise paths into the ceiling cavity via the eaves.

5.5 External Walls

The following wall construction recommendations are given as guidance only. The client is responsible for selecting adequate systems in order to achieve the recommended acoustic ratings.

5.5.1 Masonry Walls

Any proposed masonry/brick veneer external walls will be required to achieve a rating of R_w 50. This Rw rating is generally achieved with a standard construction with insulation. No further acoustic requirements are needed

5.5.2 Light Weight Walls

Any proposed lightweight cladded external walls must have a minimum Rw + Ctr 41 rating. This can be met by the following minimum construction:

- Cemintel Weatherboard with a direct fixed timber frame
- Timber studs at 600mm maximum centres
- 90 Gold Batts R2.5
- 1 x 6mm Ceminseal Wallboard (against frame)
- 1 x 16mm Gyprock Fyrcheck MR Plasterboard (minimum density 12.5 kg/m2 per sheet)
- 2 x 13mm Gyprock Fyrcheck Plasterboard (minimum density 12.5 kg/m2 per sheet)
- 148mm Minimum Wall Thickness

5.6 Detailing

Note that well-detailed construction and careful installation is needed to achieve the required Rw acoustic ratings. All gaps are to be minimised and fully sealed with an acoustic rated sealant, such as FireBan One by Bostik or Sikaflex Pro 2HP by Sika.

5.7 Railway Vibration

The average railway vibration dosage measured adjacent to the railway line at rear of Raymond Terrace Road was VDV 0.000591 $m/s^{1.75}$ which complies with the relevant criteria in Table 4-2.

5.8 Mechanical Plant Noise Assessment

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

It is likely that the criteria set out in Table 4-3 will be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made.

6 CONCLUSION

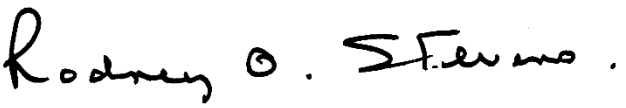
Rodney Stevens Acoustics has conducted a noise impact assessment of the proposed residential development at 47 Raymond Terrace Road, East Maitland. The noise impact assessment has assessed the noise generation and intrusion of the site and compared it with the noise criteria required by in Maitland City Council and other relevant standards.

Noise and vibration surveys have been conducted and the processed data has been used to determine noise from Raymond Terrace Road in addition to noise and vibration from the Hunter railway line at the project site.

Based on the noise impact study conducted, the proposed development is assessed to comply with the SEPP (Infrastructure) 2007 noise criteria with recommendations from this report. It is therefore recommended that planning approval be granted for the proposed development on the basis of acoustics.

Noise emissions criteria for mechanical plant have been established, a future noise survey may be required once the mechanical plant schedules are available.

Approved: -



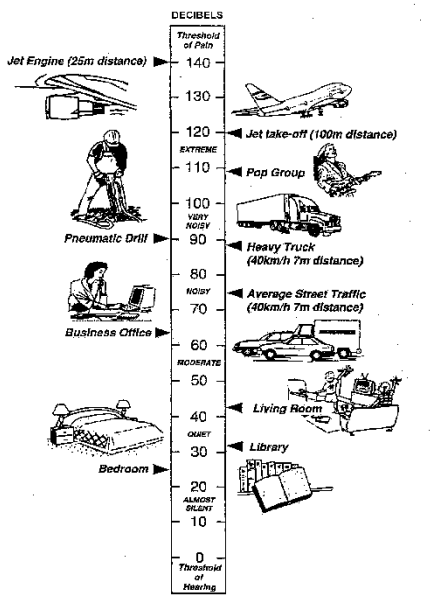
Rodney Stevens

Manager/Principal

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) character of the environment (e.g. very quiet suburban, suburban, urban, near industry) miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: Noise mitigation benefits (amount of noise reduction provided, number of people protected). Cost of mitigation (cost of mitigation versus benefit provided). Community views (aesthetic impacts and community wishes). Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

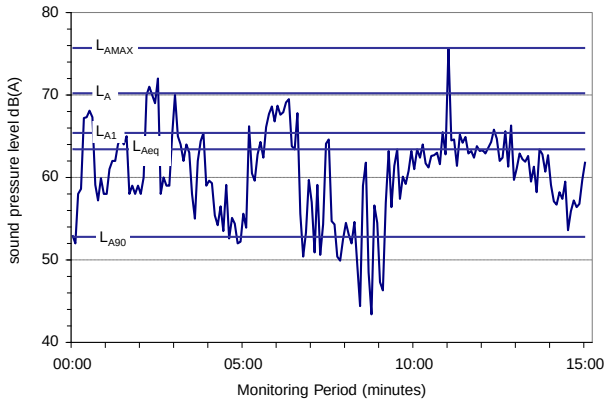
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

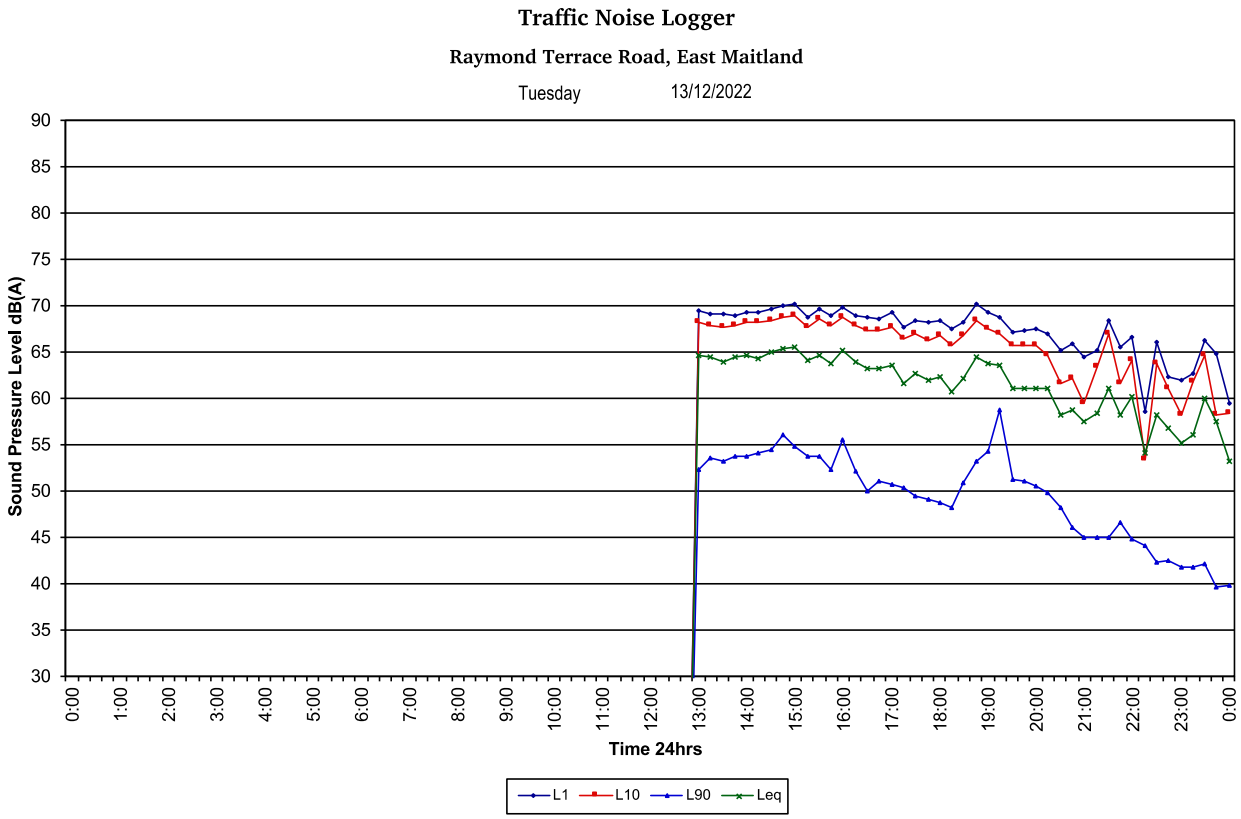
A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:

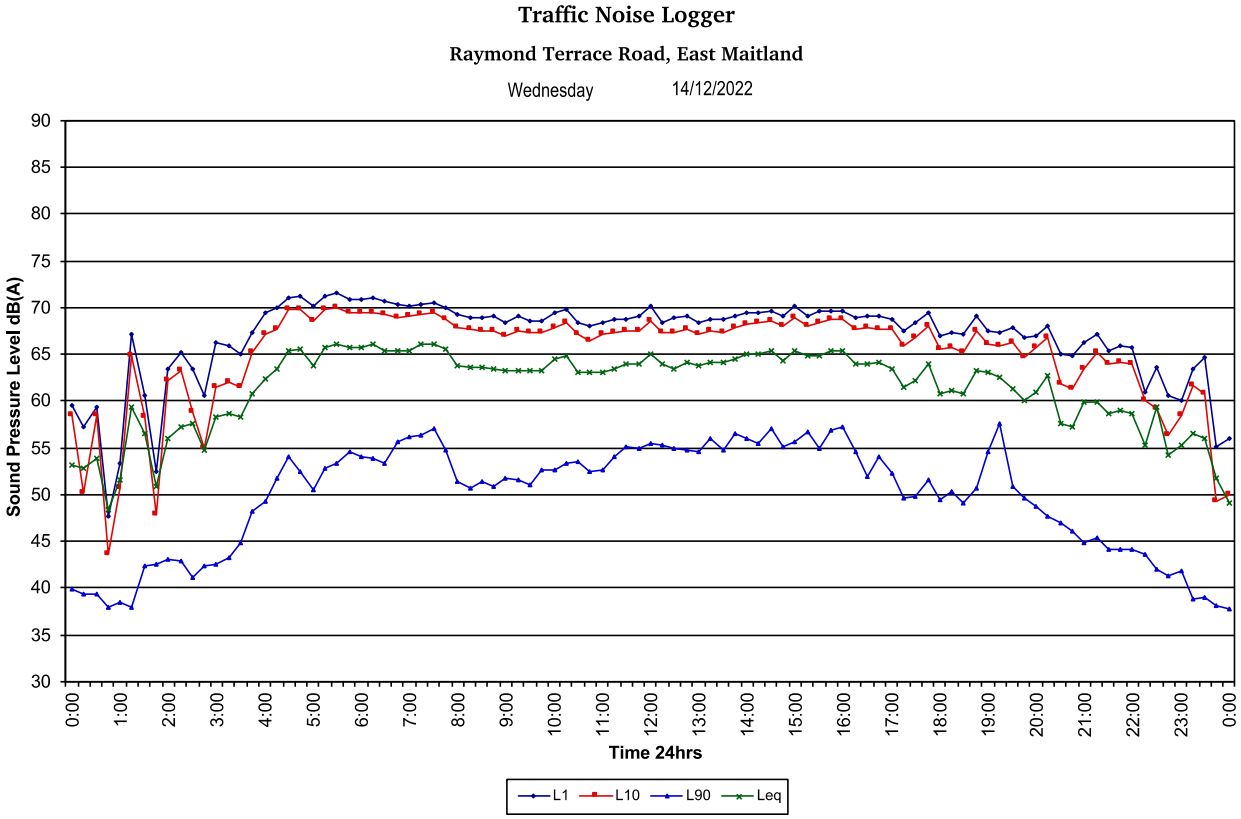


Key descriptors:

	L_{Amax} Maximum recorded noise level.
	L_{A1} The noise level exceeded for 1% of the 15 minute interval.
	L_{A10} Noise level present for 10% of the 15-minute interval. Commonly referred to the average maximum noise level.
	L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.
	L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Logger Graphs

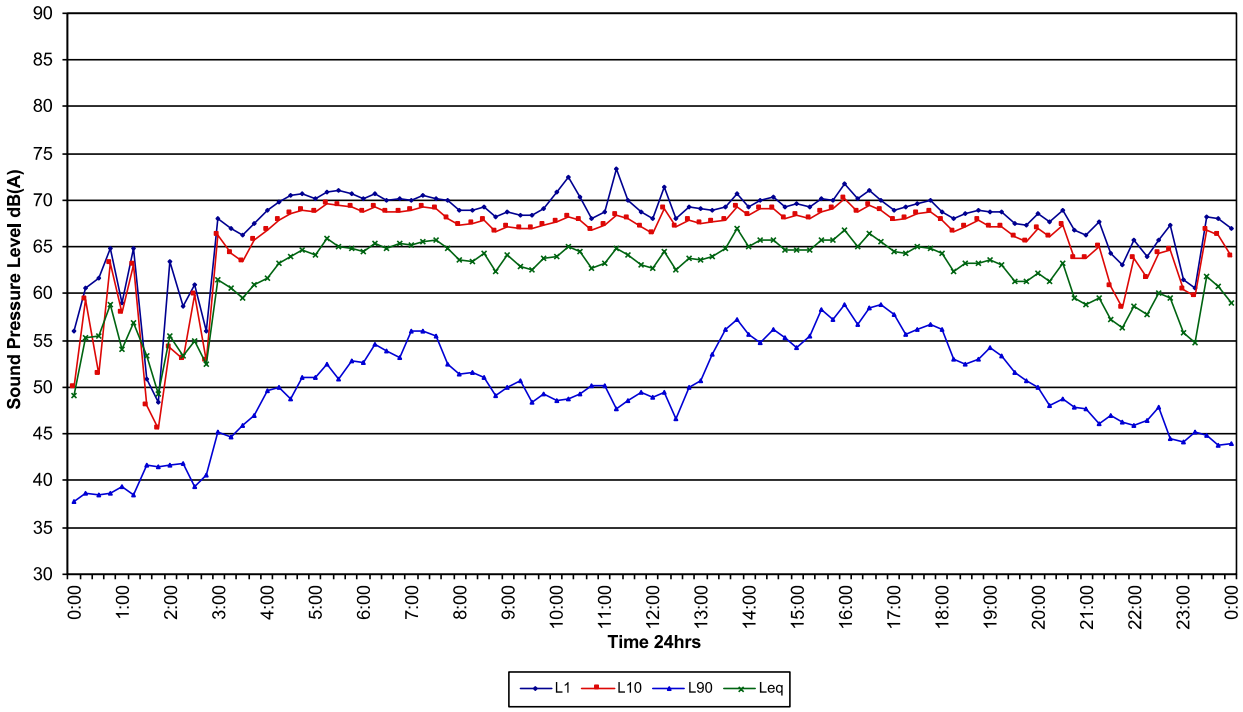




Traffic Noise Logger

Raymond Terrace Road, East Maitland

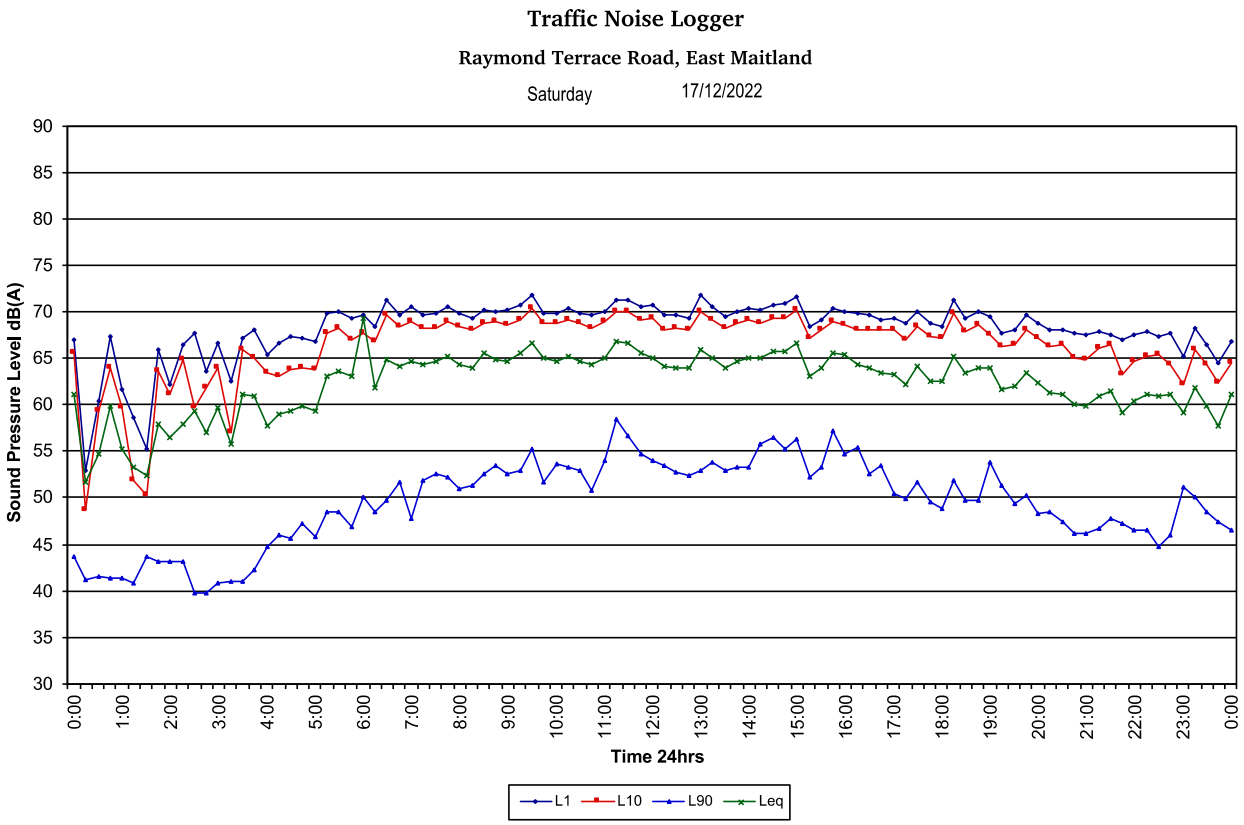
Thursday 15/12/2022



Traffic Noise Logger

Raymond Terrace Road, East Maitland

Friday 16/12/2022


Traffic Noise Logger
Raymond Terrace Road, East Maitland
Saturday 17/12/2022
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
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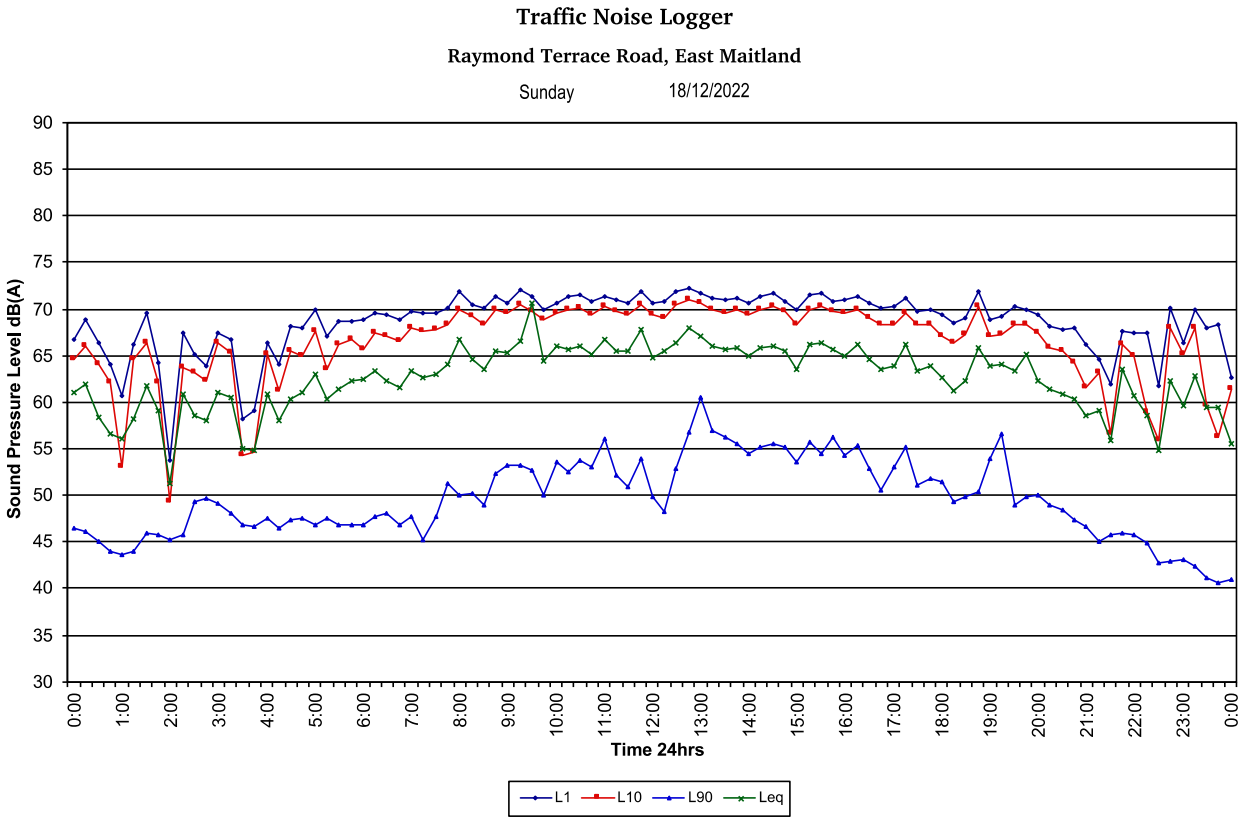
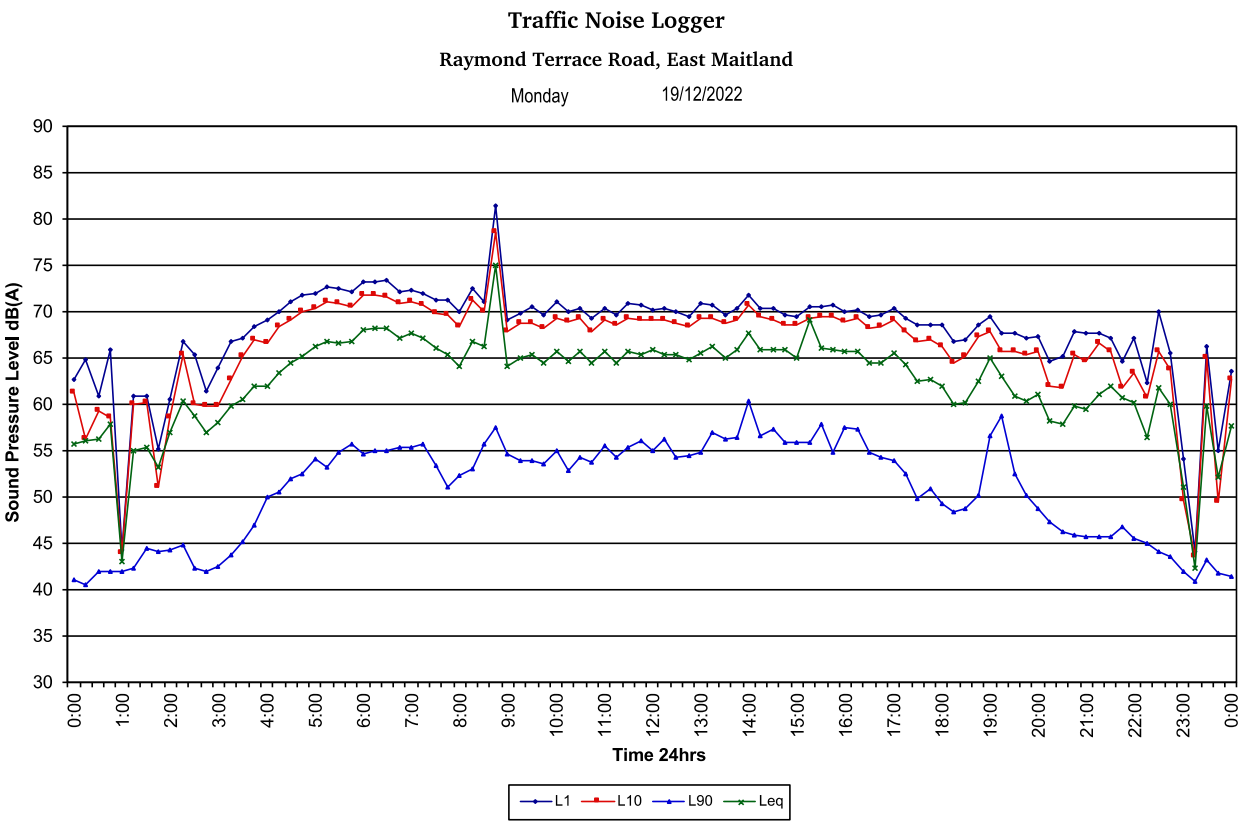
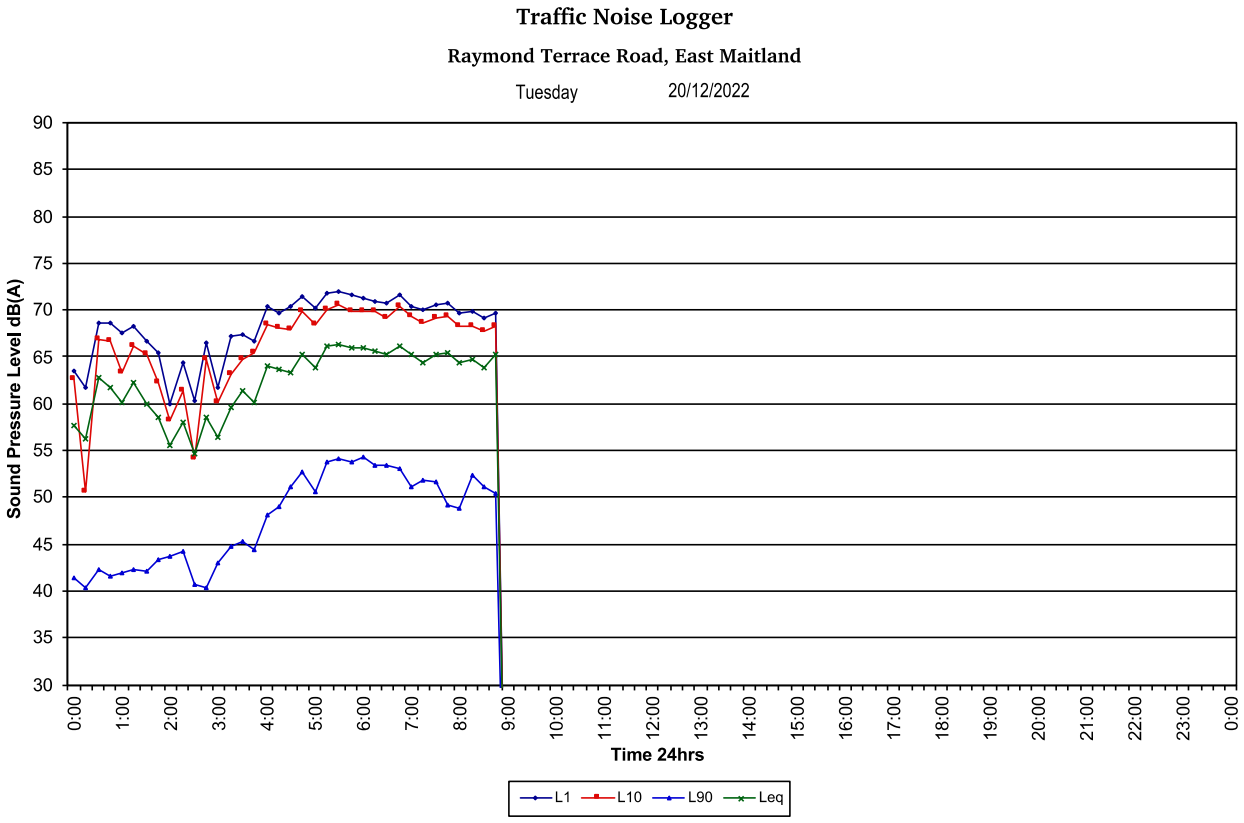
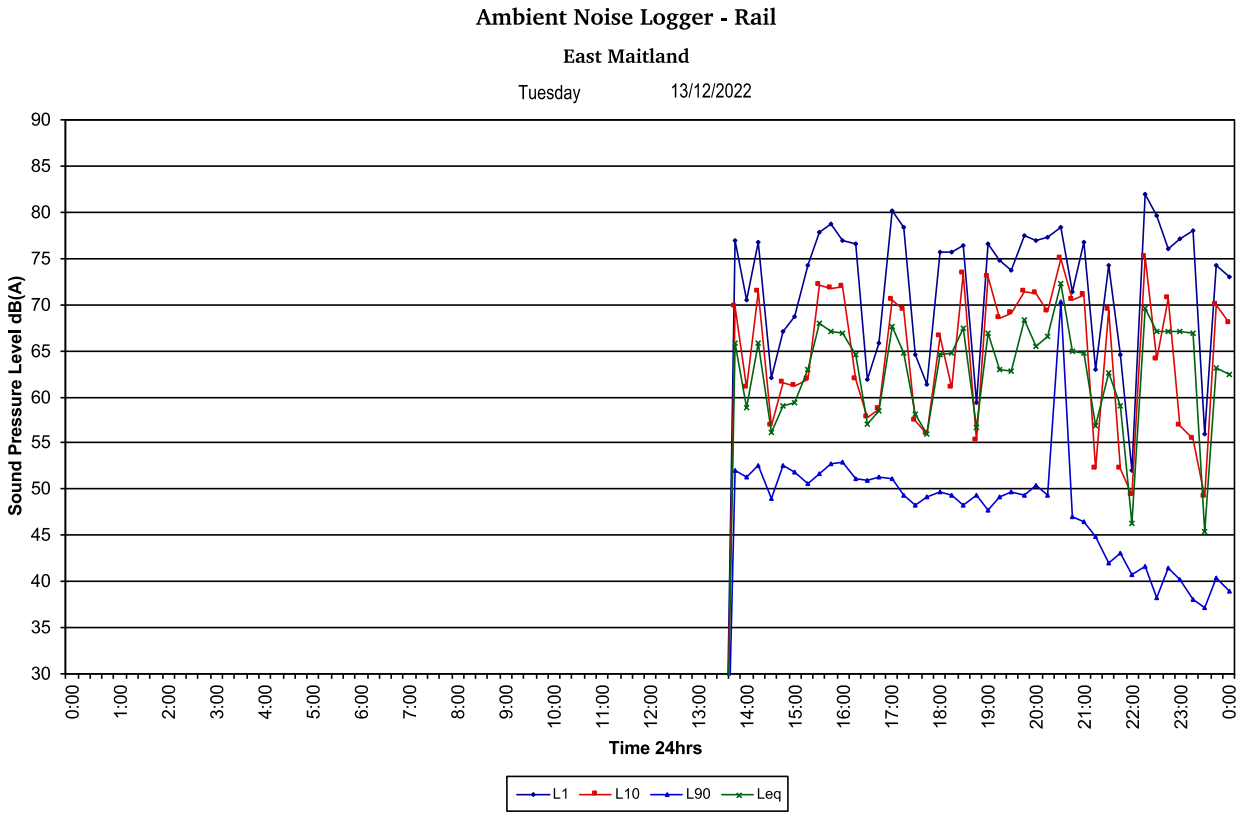
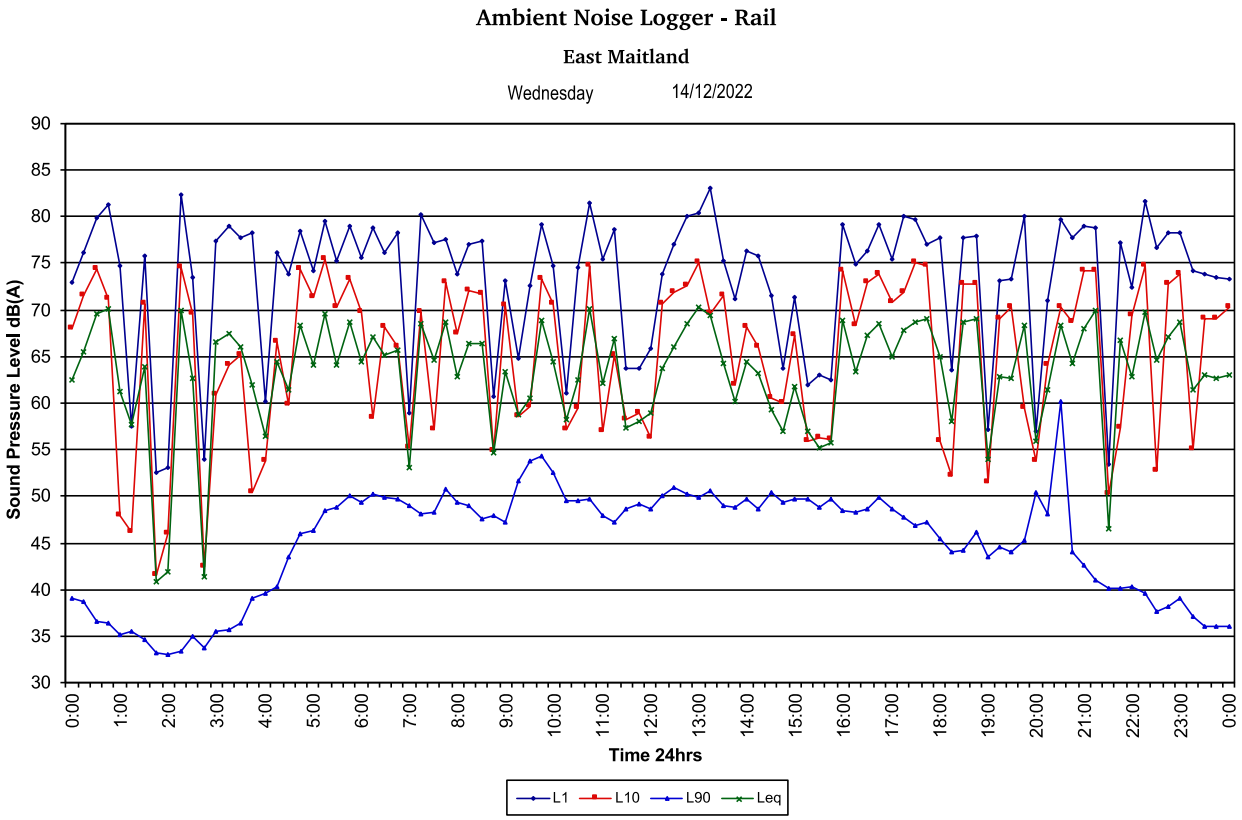
0:00
Time 24hrs
L1
L10
L90
Leq


Traffic Noise Logger
Raymond Terrace Road, East Maitland
Sunday 18/12/2022
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Traffic Noise Logger
Raymond Terrace Road, East Maitland
Monday 19/12/2022
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Traffic Noise Logger
Raymond Terrace Road, East Maitland
Tuesday 20/12/2022
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient Noise Logger - Rail
East Maitland
Tuesday 13/12/2022
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient Noise Logger - Rail
East Maitland
Wednesday 14/12/2022
Sound Pressure Level dB(A)
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85
80
75
70
65
60
55
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40
35
30
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2:00
3:00
4:00
5:00
6:00
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15:00
16:00
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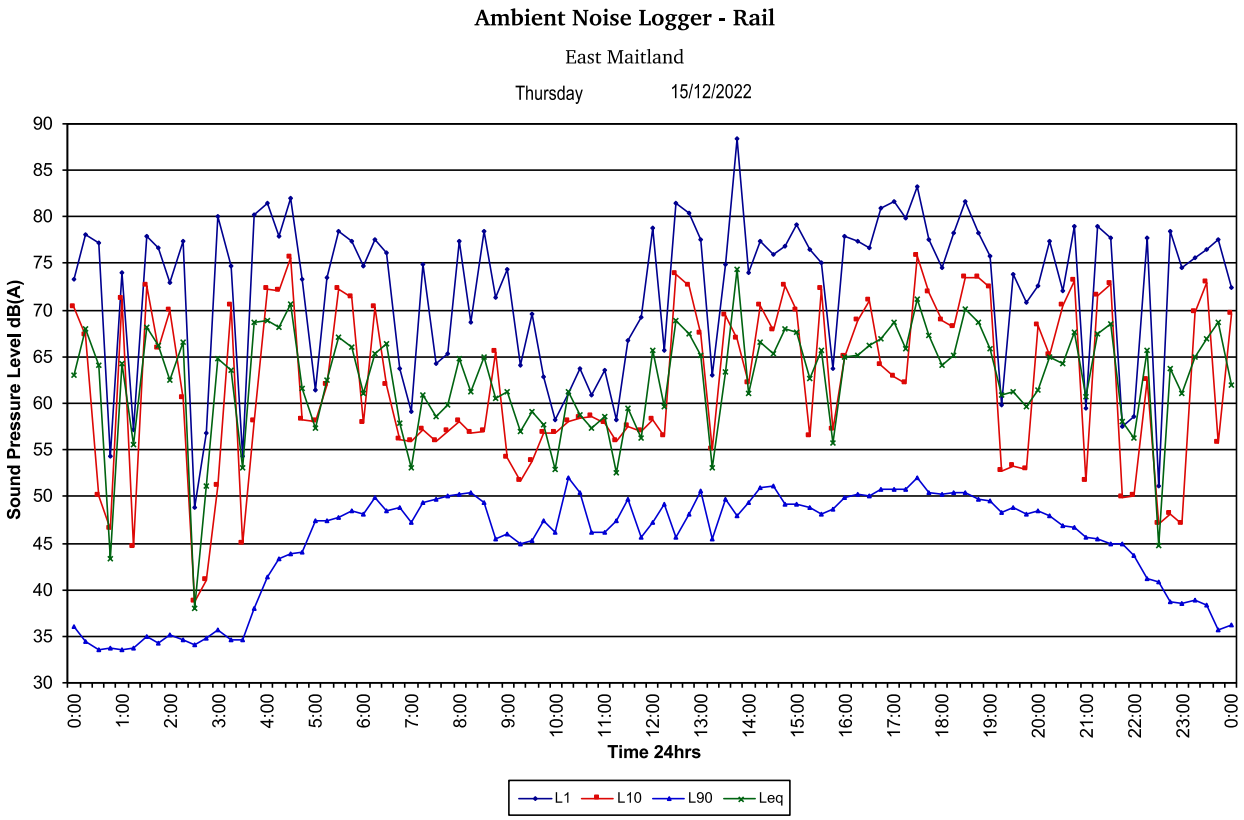
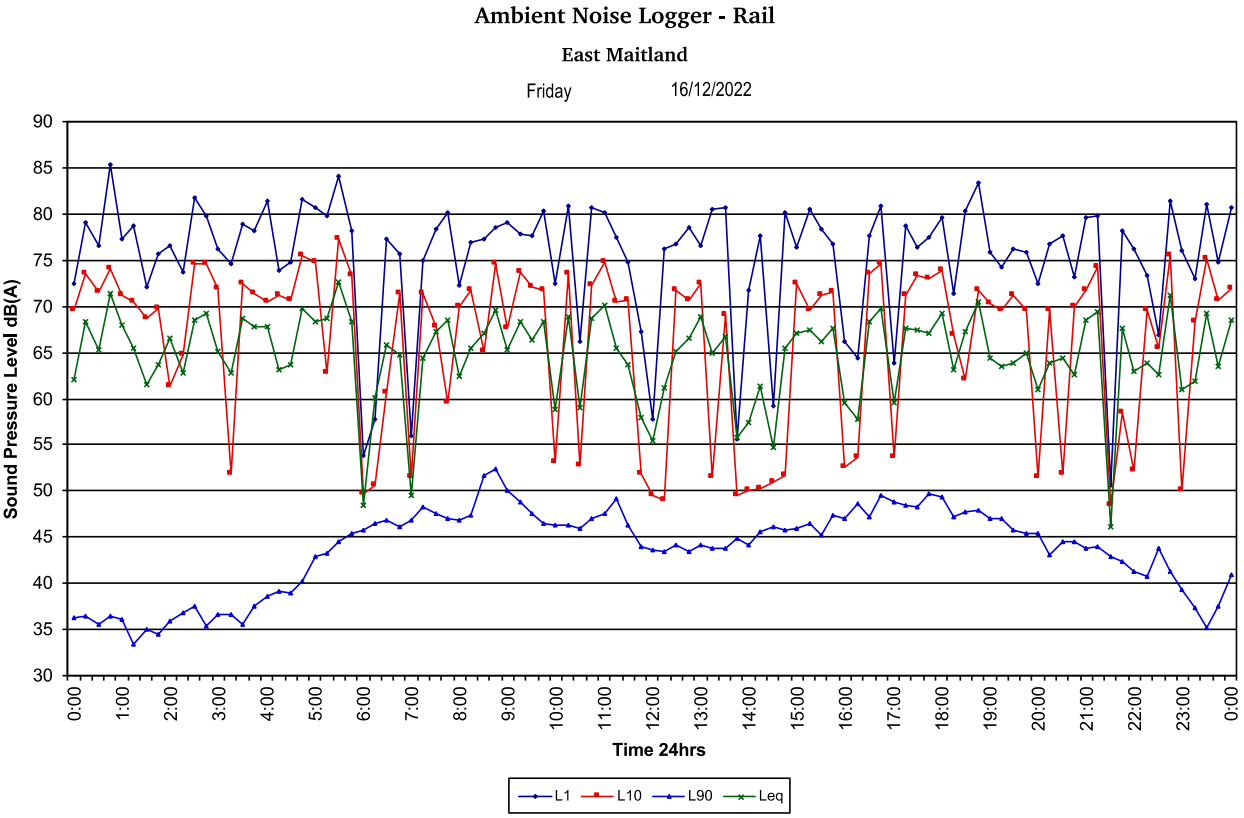
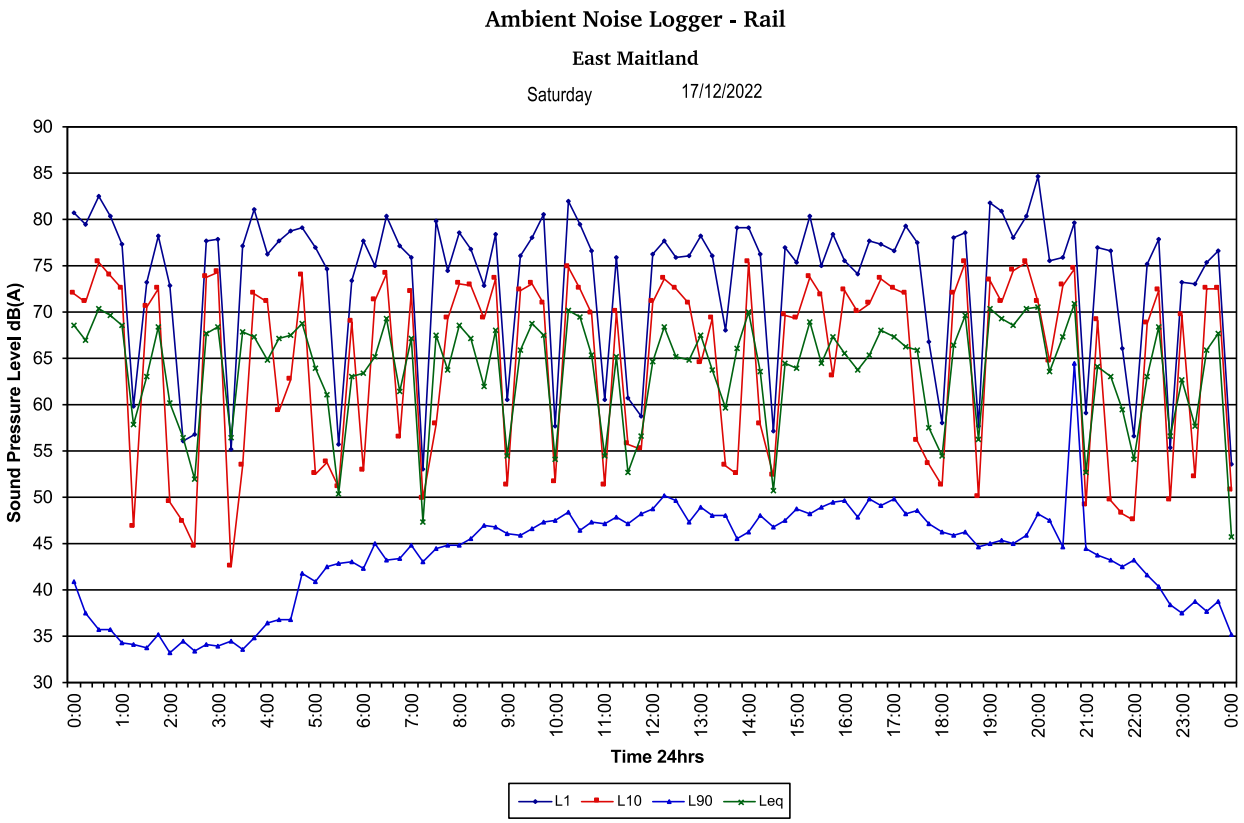
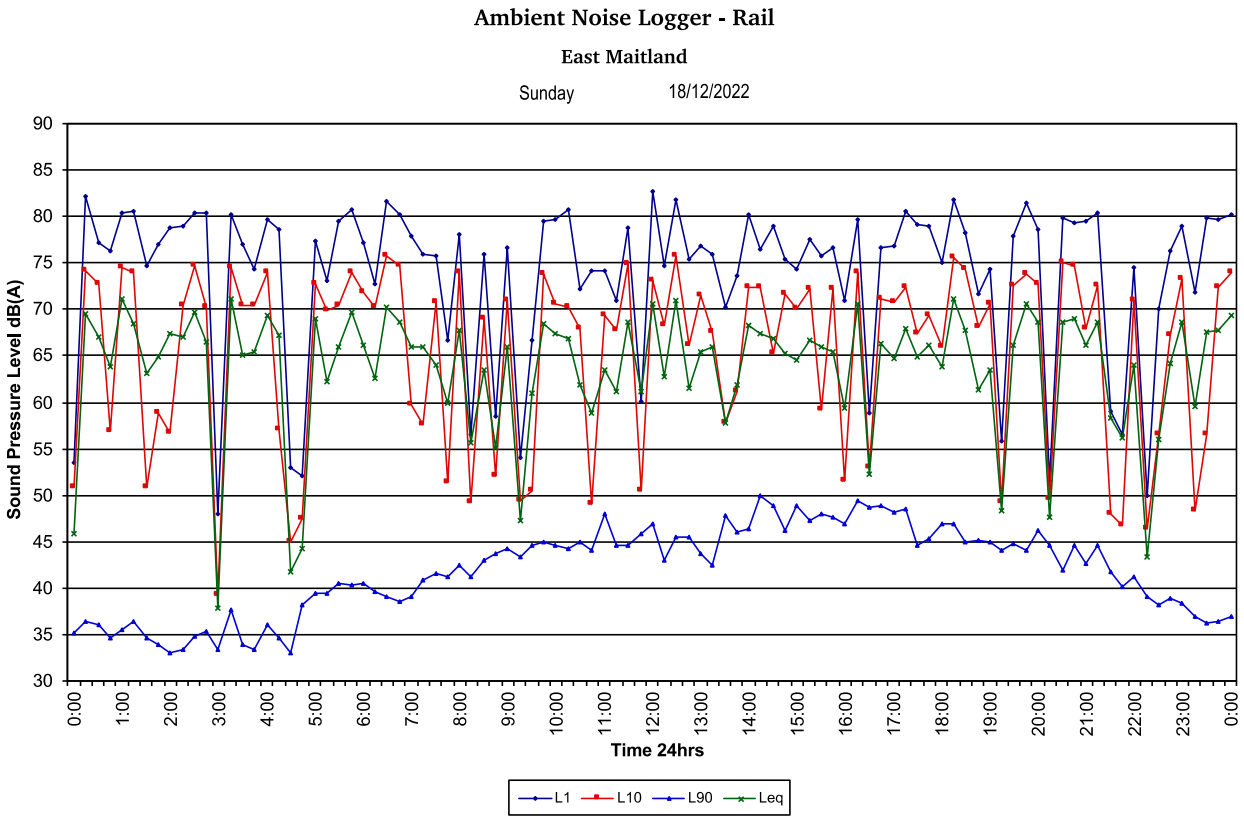
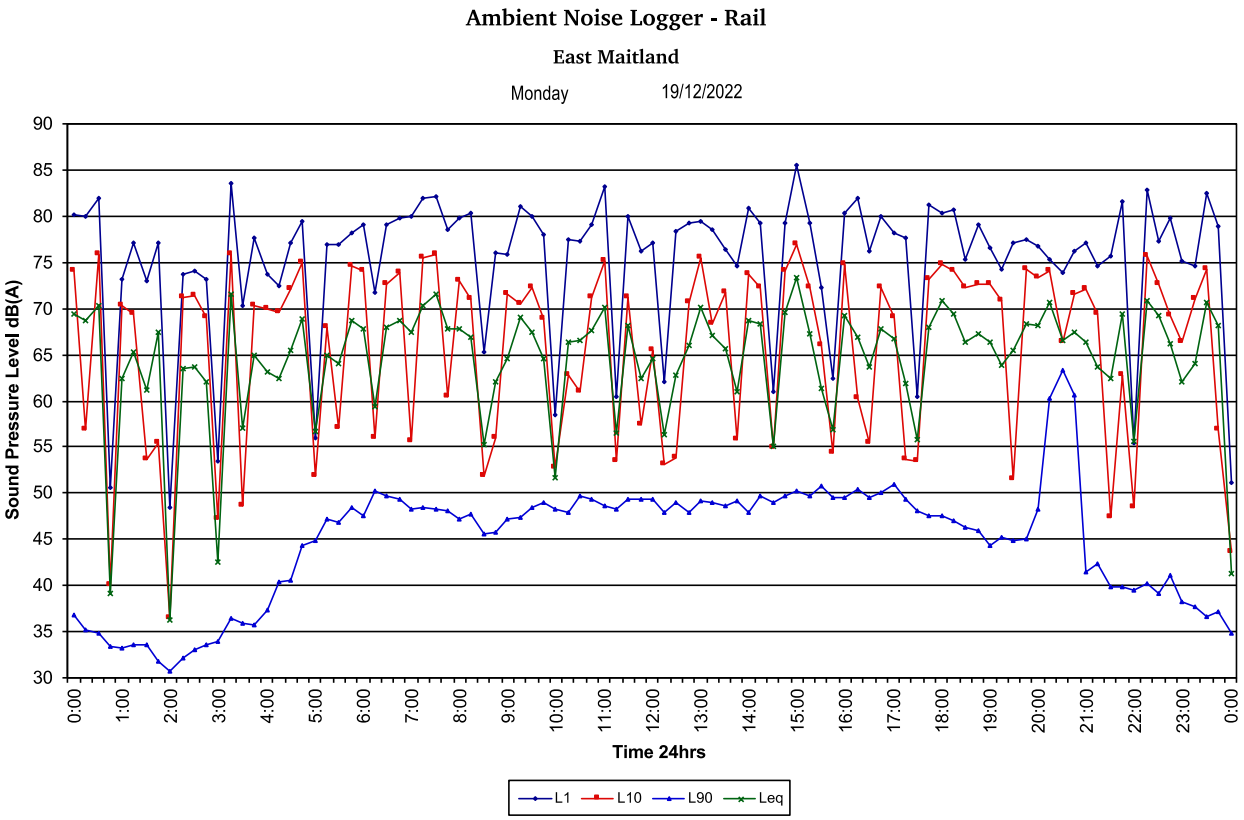
0:00
Time 24hrs
L1
L10
L90
Leq

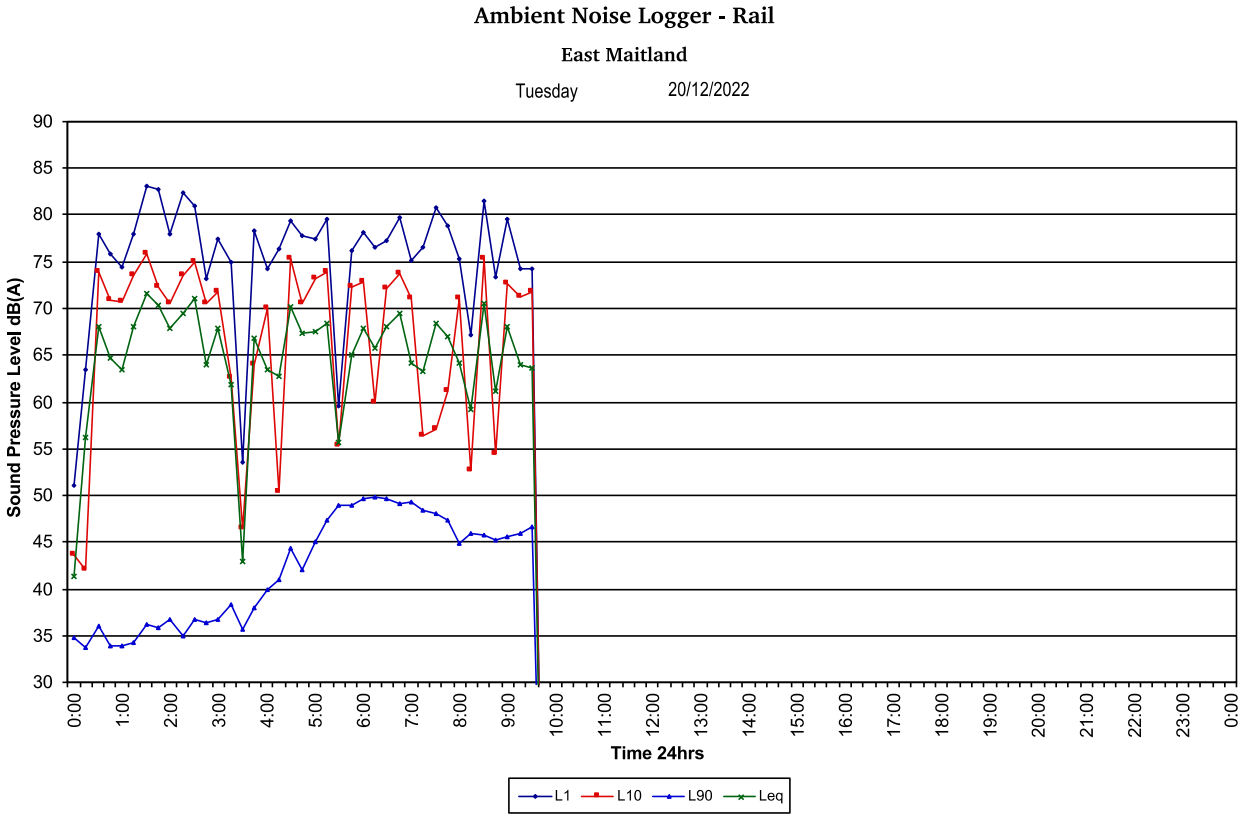

Ambient Noise Logger - Rail
East Maitland
Thursday 15/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Logger - Rail
East Maitland
Friday 16/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Logger - Rail
East Maitland
Saturday 17/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Logger - Rail
East Maitland
Sunday 18/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Logger - Rail
East Maitland
Monday 19/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Logger - Rail
East Maitland
Tuesday 20/12/2022
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

Appendix C – Calibration Certificates

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate
Calibration Number C21294

Client Details	Acoustic Research Labs Pty Ltd Unit 36/14 Loyalty Rd North Rocks NSW 2151
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00410151
Microphone Serial Number :	101448
Pre-amplifier Serial Number :	10145

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22.9°C	**Ambient Temperature :**	22.9°C
Relative Humidity :	57.6%	**Relative Humidity :**	57.3%
Barometric Pressure :	100.47kPa	**Barometric Pressure :**	100.46kPa

Calibration Technician : Jeff Yu
Calibration Date : 4 May 2021
Secondary Check: Harrison Kim
Report Issue Date : 4 May 2021
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C21335

Client Details	Rodney Stevens Acoustics Pty Ltd PO Box 522 Wahroonga NSW 2076
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	01000322
Microphone Serial Number :	188625
Pre-amplifier Serial Number :	01985

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.6°C	**Ambient Temperature :**	22.9°C
Relative Humidity :	44.6%	**Relative Humidity :**	44.6%
Barometric Pressure :	101.82kPa	**Barometric Pressure :**	101.81kPa

Calibration Technician :	Jeff Yu	**Secondary Check:**	Harrison Kim
Calibration Date :	21 May 2021	**Report Issue Date :**	25 May 2021

Approved Signatory :  **Ken Williams**

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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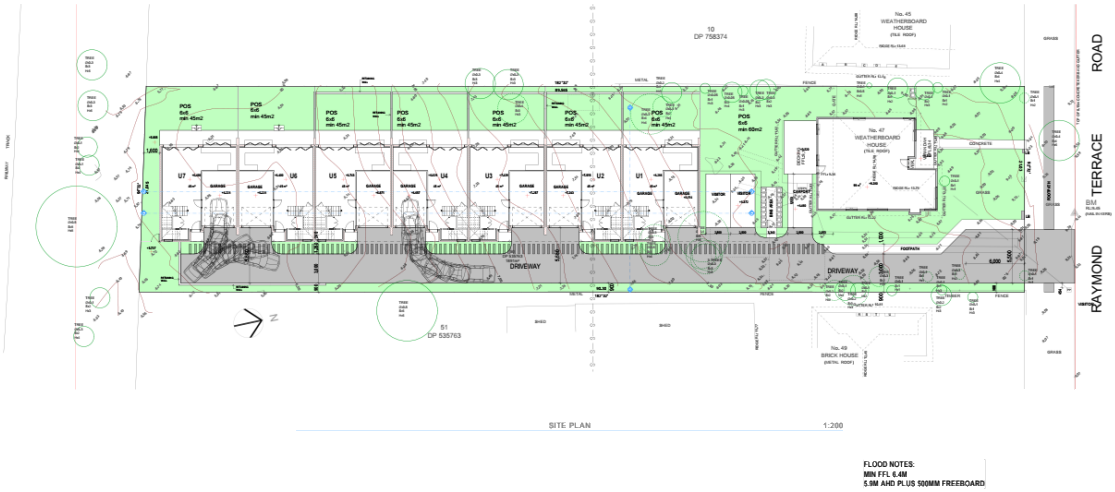
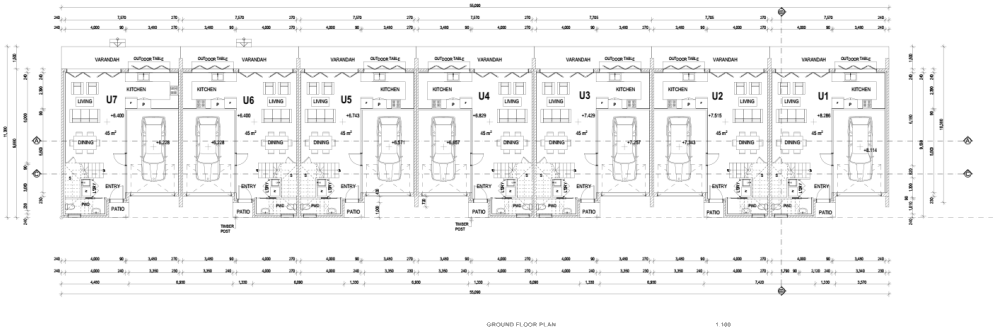
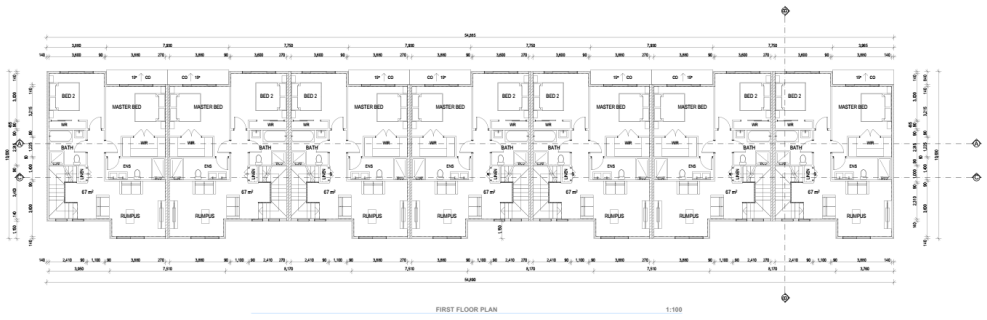
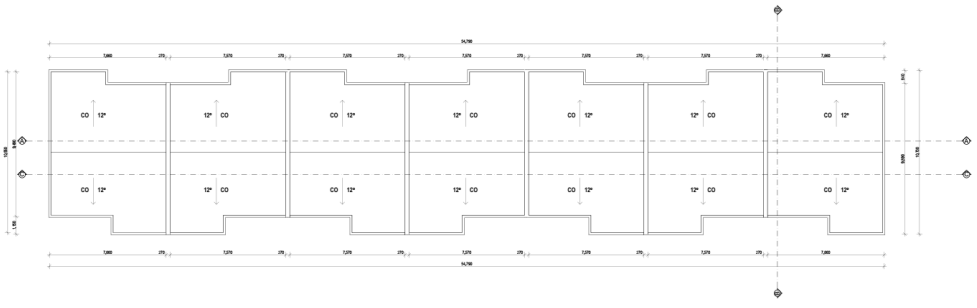
Appendix D – Architectural Plans







FIRST FLOOR PLAN 1:100



ROOF PLAN 1:100