94-100 Explorers Way, St Clair

DA Acoustic Assessment

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1 INTRODUCTION

This report presents an acoustic assessment to accompany the development application for the proposed residential subdivision development at 94-100 Explorers Way, St Clair.

In this report we have:

- Conducted an external noise intrusion assessment from traffic to determine the acoustic treatments required to achieve a reasonable level of amenity for future occupants.

- Conducted background noise monitoring to determine noise emission goals for future use of the development to meet the requirements of NSW EPA Industrial Noise Policy.

This noise assessment is based on the following preliminary architectural drawings which have been provided to ALC from Diversi Consulting, for the purpose of this assessment;

Table 1 – Architectural Drawing Information

Drawing Number	Drawing Title	Revision	Date
SK04	Concept Development Layout Plan	A	10/03/2015

2 SITE DESCRIPTION / PROPOSED REDEVELOPMENT

The site is located at 94-100 Explorers Way, St Clair. The proposed development will comprise of fourteen sub divisions off the existing site.

The site is surrounded by the M4 Motorway to the immediate north, it carries a high volume of traffic. To the east and west of the proposed site is existing residential properties. South of the proposed site is Explorers Way which carries a low volume of traffic, mostly used by local residents.

Receivers in the vicinity of the site are typically categorised as all suburban housing. The nearest residential receivers are to the east and west of the project site.

A site description is presented in Figure 1 below.

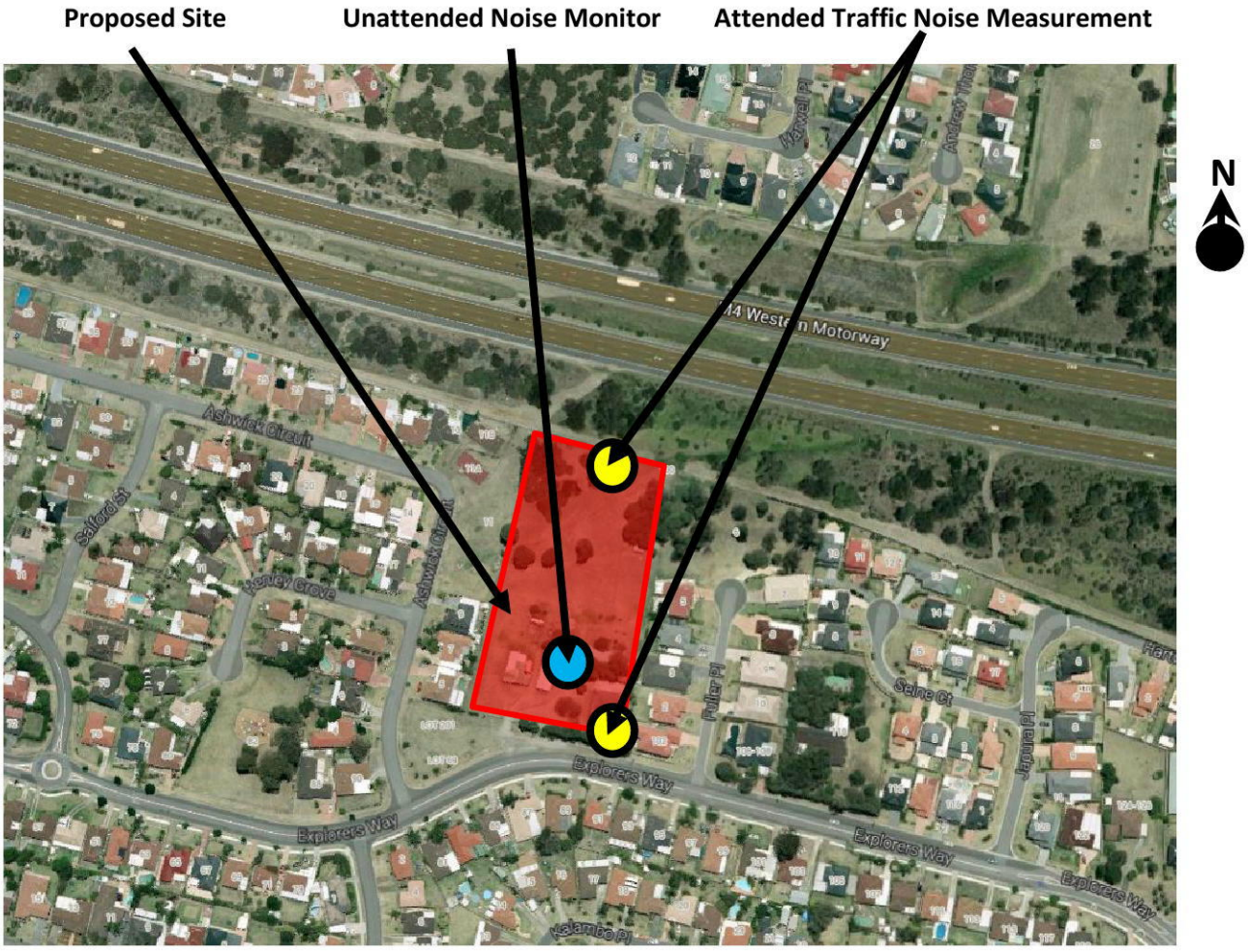

Figure 1 – Site Map – 94-100 Explorers Way, St Clair
Sourced from www.google.com.au

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise, three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 TRAFFIC NOISE INTRUSION ASSESSMENT

The nearest major road to impact the amenity of the future occupants of the proposed development is M4 Motorway to the immediate north of the project site.

4.1 ASSESSMENT OBJECTIVES

The determination of an acceptable level of noise within the 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 environmental noise, bedrooms are the most sensitive rooms. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to television, etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries, etc can be higher.

This development will be assessed against the requirements of the Penrith City Council Development Control Plan (DCP), Australian Standard AS2107-2000, NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline) and the State Environmental Planning Policy (Infrastructure) 2007.

4.1.1 Penrith City Council DCP

The Penrith City Council DCP does not set out any specific criteria for road traffic noise intrusion, however it mentions the requirement to achieve compliance with relevant Australian Standards.

4.1.2 Australian Standard - AS2107 "Acoustics – Recommended Design Sound Levels & Reverberation Times for Building Interiors"

AS2107-2000: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in section 5 of AS2107-2000, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads;

Table 2 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A)Leq
Living Areas	45 dB(A) $L_{eq,\ day}$
Sleeping Areas	40 dB(A) $L_{eq,\ night}$

4.1.3 NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)'

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*

  - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*

anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."

4.1.4 SEPP (Infrastructure) 2007

Map No. 10 of the traffic volume maps for the Infrastructure SEPP on the RTA website (see below), classifies the section of M4 Western Highway where the development is located as a road where a noise intrusion assessment is recommended under clause 102 of the SEPP Infrastructure 2007. See SEPP map No. 10 and the approximate location of the site below.

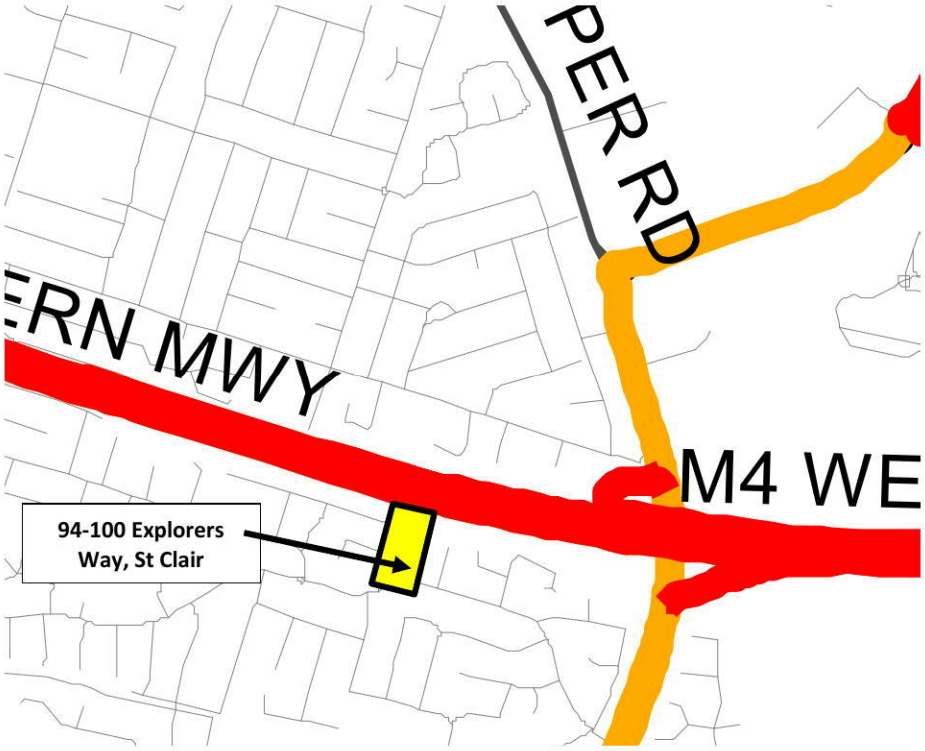

Figure 2 – SEPP Map No. 10 and Approximate Location of Proposed Development

Clause 102 of the NSW SEPP for rod traffic noise stipulates,

(a) a building for residential use,

If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."

RMS (formerly the RTA) Traffic Volume Maps indicate that Francis Road carries Recommended (> 20,000 and < 40,000 AADT), and as such, compliance with the SEPP Infrastructure Acoustic Criteria is recommended.

4.1.5 Internal Noise Criteria Summary

The acoustic criteria which will be used for internal noise goals for this project have been outlined below;

Table 3 – Project Internal Noise Goals Summary

Space	Criteria
Bedroom	35dB(A)$L_{eq(10pm-7am)}$
Living Space	40dB(A)$L_{eq(7am-10pm)}$

4.2 EXTERNAL NOISE MONITORING

As part of this assessment, unattended noise monitoring and attended measurements were conducted in the vicinity of the project site to determine traffic noise levels from the nearest roadways. The results of these measurements will be used to determine the treatments required to reduce noise levels to the internal spaces of the project site.

External noise levels in the area have been recorded by this office using long term unattended noise monitoring equipment and attended short-term attended measurements.

4.2.1 Attended Traffic Noise Measurements

Attended measurements of peak hour traffic noise were conducted around the site between 8:00am to 8:30am on 16th April 2015. Attended noise measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Rion NC-73 calibrator. No significant drift was noted.

The traffic noise levels listed in the Table 4 below, were determined based on attended measurements. In determination of acoustic treatments, the measured level is adjusted for distance and orientation.

Table 4 - Attended Traffic Noise Measurements

Location	Time of Day	Measured Noise Level
Explorers Way (Proposed Site) (Refer to Figure 1) @ 8m distance from carriage way	8:00am – 8:30am	60 dB(A) $L_{eq(15mins)}$
M4 Motorway (Proposed Site) (Refer to Figure 1) @ 44m distance from carriage way	8:30am – 9:00am	71 dB(A) $L_{eq(15mins)}$

4.2.2 Unattended Traffic Noise Measurements

Unattended traffic noise measurements have been carried out by setting up a noise logger on the project site from the 10th April 2015 until 16th April 2015. Detailed location refer to Figure 1.

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period.

Detailed measurement results have been summarised in Table 5 below.

Table 5 - Unattended Traffic Noise Measurements

Location	Time of Day	Traffic Noise Measured
94-100 Explorers Way, St Clair	Day	59dB(A) $L_{eq(7am-10pm)}$
	Night	57dB(A) $L_{eq(10pm-7am)}$

4.3 RECOMMENDATIONS

Internal noise levels will primarily be as a result of noise transfer through the windows, doors and roof, as these are relatively light building elements that offer less resistance to the transmission of sound.

The predicted noise levels through the windows, doors and roof are discussed below. The predicted noise levels have been based on the measured level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

As the project is for a subdivision no current building concepts plans are available in order to calculate the orientation of windows, barrier effects (where applicable), the total area of glazing,

facade transmission loss and the likely room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing type (refer to Table 5) reduces internal noise levels to within the nominated criteria for the various space types.

4.4 RECOMMENDED GLAZING

Please refer to Table 6 for recommended glazing assemblies for this project to achieve the internal traffic noise requirements. All external windows and doors listed are required to be fitted with Q-Lon type acoustic seals. (**Mohair Seals are unacceptable**).

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 6 – Glazing Requirements

Lot	Room	Requirement	Acoustic Seals
1,2, 13 and 14	Bedroom	6.38mm Laminate	Yes
	Living Spaces	6mm Float	Yes
	Bathrooms/Ensuites/Laundry	4mm Float	Yes
3, 4, 5, 10, 11 and 12	Bedroom	10mm Float	Yes
	Living Spaces	6.38mm Laminate	Yes
	Bathrooms/Ensuites/Laundry	4mm Float	Yes
6, 7, 8 and 9	Bedroom	12.38mm Laminate	Yes
	Living Spaces	12.38mm Laminate	Yes
	Bathrooms/Ensuites/Laundry	6mm Float	Yes

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table above. **Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.**

Please note: All calculations have been done on the assumption that living spaces have a hard floor finish and bedrooms have carpet.

Table 7 – Minimum STC of Glazing (with Acoustic Seals)

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
4mm Float	Yes	27

6mm Float	Yes	29
6.38mm Laminate	Yes	31
10mm Float	Yes	33
12.35mm Laminate	Yes	37

4.5 EXTERNAL DOORS

Any glass door should be constructed using glazing thickness set out in Table 6. Full perimeter acoustic seals around the doors are required. It will be acoustically acceptable if thicker glazing is required for structural or comfort purposes, the glazing recommended in Table 6 is a minimum requirement.

4.6 ROOF / CEILING CONSTRUCTION

Roof and ceiling structure has had been assessed two different options in terms of the roof system, light weight sheet metal and concrete roof tiles. Both of these options will require acoustic upgrading is recommended, please see table below. If penetrations through the roof are needed for building services please ensure that the gaps are acoustically sealed.

Table 8 – Sheet Metal Roof Construction

Unit	Space	External Material	Stud System	Internal Material
1,2, 13 and 14	Bedroom	0.5mm Sheet Metal	Large airgap with 11kg/m^3 glasswool insulation	1 x 13mm Plasterboard
	Living Space			
3, 4, 5, 10, 11 and 12	Bedroom	0.5mm Sheet Metal	Large airgap with 11kg/m^3 glasswool insulation	1 x 13mm Plasterboard
	Living Space			
6, 7, 8 and 9	Bedroom	0.5mm Sheet Metal	Large airgap with 11kg/m^3 glasswool insulation	2 x 13mm Plasterboard
	Living Space			

Table 9 – Concrete Roof Tile Construction

Unit	Space	External Material	Stud System	Internal Material
1,2, 13 and 14	Bedroom	Concrete Roof Tiles	Large airgap with 11kg/m^3 glasswool insulation	1 x 13mm Plasterboard
	Living Space			
3, 4, 5, 10, 11 and 12	Bedroom	Concrete Roof Tiles	Large airgap with 11kg/m^3 glasswool insulation	1 x 13mm Plasterboard
	Living Space			
6, 7, 8 and 9	Bedroom	Concrete Roof Tiles	Large airgap with 11kg/m^3 glasswool insulation	2 x 13mm Plasterboard
	Living Space			

4.7 EXTERNAL WALLS

External walls composed of either masonry elements or light weight cladding systems. Proposed masonry elements will not require further acoustic upgrading. Proposed alternate cladding system will require the following acoustic upgrading.

Table 10 – External Light Weight Wall System

Unit	Space	External Material	Stud System	Internal Material
1,2, 13 and 14	Bedroom	External Cladding + 1 x 9mm Fibre Cement Sheeting	92mm Steel Stud with 75mm thick 11kg/m^3 Glasswool Insultation	1 x 13mm Plasterboard
	Living Space			
3, 4, 5, 10, 11 and 12	Bedroom			2 x 13mm Plasterboard
	Living Space			1 x 13mm Plasterboard
6, 7, 8 and 9	Bedroom			2 x 13mm Plasterboard
	Living Space			1 x 13mm Plasterboard

4.8 MECHANICAL VENTILATION

With respect to natural ventilation of the dwelling, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(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."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

Habitable rooms on the **Southern facades of Unit 1 and Unit 2** of the development will be able to achieve the internal noise goals with windows open.

All habitable spaces along the **Northern, Eastern and Western façades of Unit 1 and 2** will require to have their windows closed in order to meet acoustic requirements. A mechanical engineer is to confirm if supplementary ventilation (to meet Australian Standard AS1668.2 requirements) will be required to these rooms.

5 NOISE EMISSION ASSESSMENT

Noise emissions from the site should be assessed to ensure that the amenity of nearby land users are not adversely affected.

Potential noise sources which should be assessed are:

- Noise generated by mechanical plant (typically air-conditioning).

The nearest potentially affected noise receivers are:

- Residential receivers to the west and east of the project site.

Noise emission criteria will be determined based on the following documents:

- NSW EPA Industrial Noise Policy

5.1 BACKGROUND NOISE MONITORING

Background noise levels for the site were obtained using an unattended noise logger around the project site.

The unattended monitoring was conducted using an Acoustic Research Laboratory's noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

The unattended measurement was conducted from the 10th May 2015 to the 16th April 2015. Refer to the aerial photo in Figure 1 for the noise monitor location.

The measured background noise levels are summarised in the table below.

Table 11 - Measured Background Noise Levels

Location	Measured Background Noise Level dB(A)L_{90} (15min)		
	Day Noise Level 7am to 6pm (dB(A))	Evening Noise Level 6pm to 10pm (dB(A))	Night Noise Level 10pm to 7am (dB(A))
94-100 Explorers Way, St Clair (Project site, See Figure 1)	54	51	40

5.2 NOISE EMISSION OBJECTIVES

Noise emissions from the development will have to achieve the following requirements.

5.2.1 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant to a level that is consistent with the general environment.

The EPA's Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 5.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 12 – Intrusiveness Noise Emission Goals

Location	Period/Time	Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$
Great Western Highway Façade	Day (7am-6pm)	59
	Evening (6pm-10pm)	56
	Night (10pm-7am)	45

5.2.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The NSW EPA Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by suburban receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

Table 13 - Amenity Noise Emission Goals

Location	Period/Time	Amenity Noise Emission Goal dB(A) $L_{eq(Period)}$
Nearby Residences – Suburban Receiver	Day (7am-6pm)	55
	Evening(6pm-10pm)	45
	Night(10pm-7am)	40

5.2.2 Protection of the Environmental Operation Act Regulation 2000

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or
(b) before 7 am or after 10 pm on any other day.

5.3 RESULTANT PROJECT NOISE EMISSION CRITERIA

Based on the requirements stated in the sections above, Table 14 provides a summary of the assessment criteria applicable to the future residential development at the proposed site. The assessment criteria are also based on the background noise monitoring data conducted at the proposed development location.

Table 14 - Environmental Noise Emission Criteria

Time Period	Assessment Background Noise Level dB(A)L_{90}	Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria Background + 5 dB(A) L_{eq}(15min)	EPA Criteria for Residential Condensers
Day	54	55	59	N/A
Evening	51	45	56	N/A
Night	40	40	45	55

5.4 MECHANICAL PLANT

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services plant to the closest residential receiver should comply with the noise emission criteria in Section 5.2.

6 CONCLUSION

This report presents our acoustic assessment of the proposed residential subdivision at 94-100 Explorers Way, St Clair.

Noise intrusion from traffic onto the future occupants of the development have been assessed in accordance with the Penrith City Council DCP, Australian Standard AS2107-2000, NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)'and SEPP (Infrastructure) 2007. Provided the acoustic treatments in Section 4 are adhered to, the internal noise levels will satisfy the requirements of the criteria.

Noise emission criteria for the development site have been determined based on background noise logging data, the NSW EPA Industrial Noise Policy and the Protection of the Environment Operations Act Regulation 2000. The resultant criteria are presented in Section 5.2. Noise from mechanical plant items associated with the proposed development should comply with these criteria. Detailed design of mechanical plant items should be carried out during the CC stage.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

APPENDIX A: UNATTENDED NOISE MONITOR DATA