Prestons Warehouse and Industrial Estate - Bernera Road and Yarrunga Street

Acoustic Environmental Impact Assessment

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8339 8000
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20151316.1
Project Name	Prestons Warehouse and Industrial Estate - Bernera Road and Yarrunga Street
Document Title	Acoustic Environmental Impact Assessment
Document Reference	20151316.1/2202A/R5/JD
Issue Type	Email
Attention To	Logos Australian Logistics Venture Prestons Trust Brendan Seage

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	21/10/2015	20151316.1/2110A/R0/JD	JD		
1	21/10/2015	20151316.1/2110A/R1/JD	JD		
2	21/10/2015	20151316.1/2110A/R2/JD	JD		
3	22/02/2016	20151316.1/2202A/R3/JD	JD		
4	22/02/2016	20151316.1/2202A/R4/JD	JD		
5	22/02/2016	20151316.1/2202A/R5/JD	JD		

TABLE OF CONTENTS

1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to undertake an acoustic environmental impact assessment of the industrial lot, located on the corner of Yarrunga Street and Bernera Road, Prestons. This assessment is to satisfy the acoustic requirements the of *Secretary's Environmental Assessment Requirements,* Application Number 7155.

This report will:

- Identify nearby noise sensitive receivers and operational noise sources with the potential to adversely impact nearby developments.
- Identify relevant Liverpool Council and EPA acoustic criteria applicable to the development (as required by Secretary Environmental Assessment Requirements).
- Predict typical operational noise emissions and assess them against acoustic criteria to determine if the site is capable of meeting typical noise emission requirements.
- Identify potential building and/or management controls necessary to ensure ongoing compliance with noise emission goals.

This assessment has been based on the architectural drawings supplied by Axis Architectural, Project Number 140604, Sheets DA-A101 – DA-A102, Issue B, dated February 2016.

2 SITE DESCRIPTION AND PROPOSED WORKS

The site is located at the corner of Yarrunga Street and Bernera Road, Prestons. The site is currently used for rural/residential purposes. The project site and its adjoining properties are currently zoned as industrial areas. Five industrial warehouses are proposed on the site.

Vehicular access to the site is via driveways along the northern and eastern boundaries, from Yarrunga Street and Bernera Road. As part of the development of the site, construction of a number of internal roadways is proposed.

The site is proposed to operate twenty four hours per day.

This site is bounded as follows:

- Receiver 1: To the north of the site along Yarrunga Street is a rural development.
- Receiver 2: Further to the north of the site along Bernera Road is a rural development.
- Receiver 3: To the south of the site across from Kurrajong Road, are residential developments.
- Receiver 4: To the west of the development is a rural development.
- Receiver 5: To the east of the site across from Bernera Road are industrial and commercial developments.

The primary noise source in the vicinity of the site is road traffic along Kurrajong Road, Yarrunga Street and Bernera Road. To a lesser extent, road traffic noise is also contributed by the M7 Motorway, which is located approximately 500m to the north from the site.

See aerial photograph below

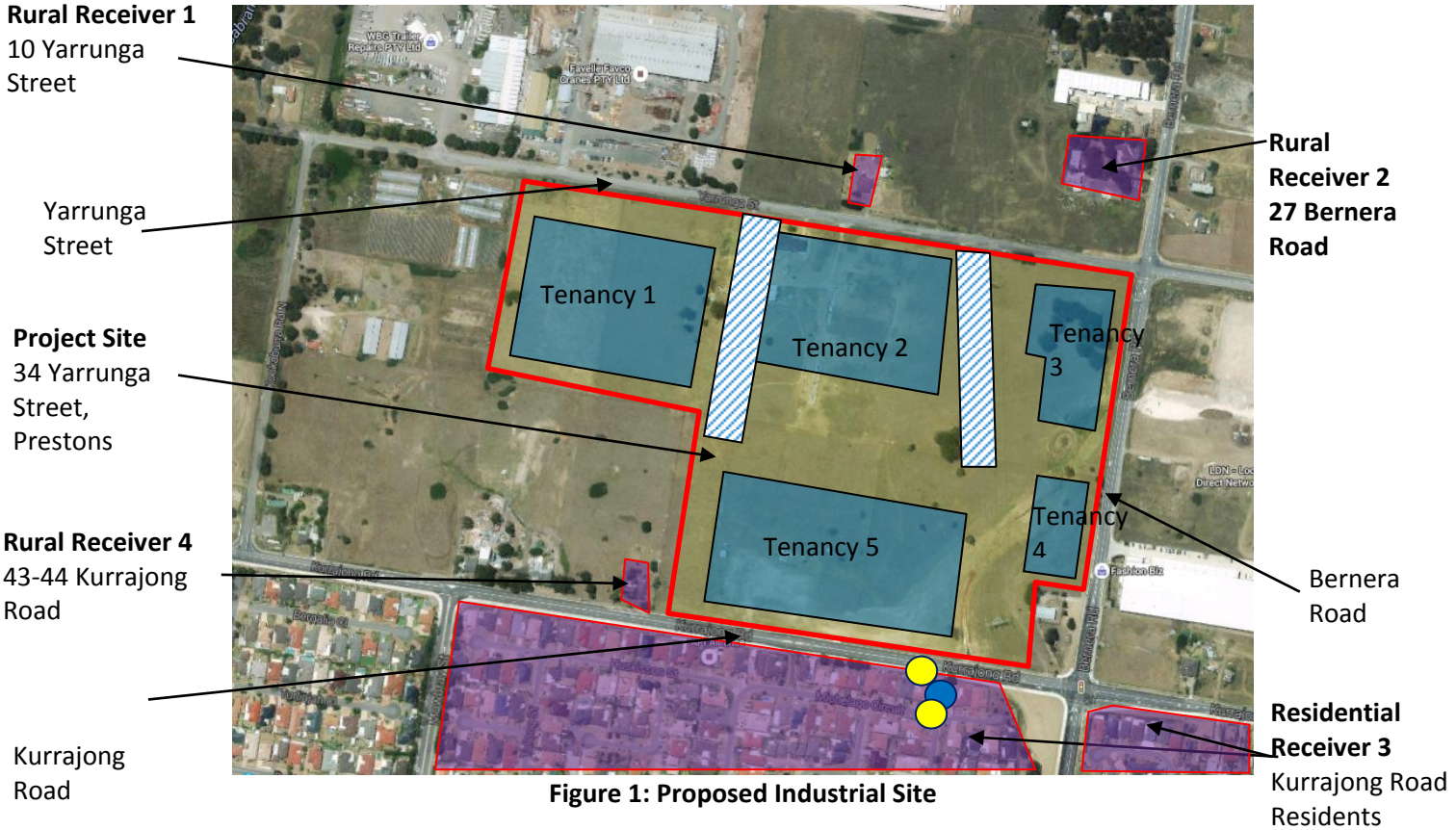


Figure 1: Proposed Industrial Site

Receivers 1 2 and 4 are currently used as rural properties, within an industrial zoned area. Progressive industrial development in accordance with the current zoning may see that these properties are removed. Accordingly these residences may or may not exist at the time of construction. Nevertheless, this assessment will assess these sites as rural receivers as such is the current use.

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental 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.

In analysing 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 intervals.

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 15 minute 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 environmental noise.

L_1 levels represent is the loudest 1% noise event during a measurement period.

4 SURVEY OF AMBIENT NOISE

Both long term unattended noise monitoring, and attended noise measurements were conducted to quantify the existing acoustic environment at the site.

Unattended noise monitoring was conducted between the 13th and 20th October 2015. Monitoring was conducted using an Acoustic Research Laboratories monitors set on A-weighted fast response mode. The monitors were calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded. The monitor was placed in the walkway between Kurrajong Road and Michelago Circuit. The monitoring location is shown in Figure 1.

In addition, an attended measurement was made on 13th October 2015 to both compliment unattended background noise levels and measure existing noise levels generated by traffic on Kurrajong Road. This measurement was made using a Norsonic 140 Type 1 Sound Analyser set on A-weighted, fast response mode.

All measurement locations are marked in the aerial photograph in Figure 1.

Periods of adverse weather have been eliminated when determining the rating background noise level at the site, which is presented below.

Measured noise levels (both the average/L_{eq} and rating background noise level) are presented below. Average/L_{eq} noise levels at the site are dominated by road traffic noise.

Table 1 - Long Term Noise Logging Data

Location	Time of Day		
	Daytime (7am-6pm)	**Evening (6pm-10pm)**	**Night (10pm-7am)**
Kurrajong Road Residents	54dB(A)$L_{eq(Period)}$ 43dB(A)L_{90}	55dB(A)$L_{eq(Period)}$ 43dB(A)L_{90}	49dB(A)$L_{eq(Period)}$ 37dB(A)L_{90}

*See aerial photo above in Figure 2.

Table 2 -Attended Noise Measurement (Road Traffic Noise)

Location	Measured Noise Level - Daytime
Attended Measurement – 3m from Kurrajong Road	64dB(A)L_{eq}

5 NOISE EMISSION CRITERIA

The Secretary Environmental Assessment Requirements, reference SSD7155 (dated 11 September 2015) require (with respect to acoustics):

- *A quantitative noise and vibration assessment for construction and operation, including impacts on nearby sensitive receivers*
- *Cumulative Impacts of other developments and*
- *Details of the proposed noise management/mitigation and monitoring measures.*

To address the issues raised, the following noise controls and guidelines will be used in the acoustic assessment of the site:

- Liverpool City Council DCP
- The EPA Industrial Noise Policy
- The EPA Road Noise Policy
- EPA guidelines for sleep arousal (Application Notes to the Industrial Noise Policy).
- The EPA document –Assessing Vibration, A Technical Guideline.
- The EPA Interim Construction Noise Guidelines.

5.1 THE LIVERPOOL CITY COUNCIL DCP 2014

Section 7 of the Liverpool DCP 2014 has no specific noise emission criteria set within the DCP, but has reference to the *Protection of the Environment Operations Act 2008*.

In our opinion, compliance with the Industrial Noise Policy will also meet the intended criteria of the *Protection of the Environment Operations Act*.

5.2 EPA INDUSTRIAL NOISE POLICY

Noise sources covered by this code will include vehicle noise (generated on the site) and mechanical services noise. Both the Intrusiveness and the Amenity criteria (as set out below) must be complied with.

5.2.1 INP - Intrusiveness Assessment

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels. The criteria are as follows:

Table 3 -EPA Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)L_{90}	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
All Potentially Affected Residential Properties	Day Time (7am - 6pm)	43	48
	Evening (6pm - 10pm)	43	48
	Night (10pm - 7am)	37	42

5.2.2 INP - Amenity Assessment

The Amenity criteria set additional criteria based on the land use of the noise sensitive receivers.

Amenity criteria are as follows:

Table 4 - EPA Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A)$L_{eq(Period)}$
All Potentially Affected Residential Properties	Rural Residential	Day Time (7am – 6pm)	50
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40
Commercial	All	When in use	65
Industrial	All	When in use	70

5.2.3 Meteorological Consideration

Section 5.2 of the Industrial Noise Policy states the following with regard to meteorological conditions that may have an adverse effect on noise levels due to temperature inversions;

To assess the level by which noise is increased as a result of inversion effects, it is generally necessary to analyse meteorological data from the area in question. However, before doing any detailed analyses, the potential for temperature inversions to increase noise impact should be determined. Detailed analyses of meteorological data are not required where there is little or no potential for impact, as in the following cases:

- *Where the development in question does not operate during the night-time hours. As temperature inversions are usually prominent during night-time hours, there is no need to consider their effects for a development that does not operate at night (10 pm to 7 am)*

- *Where, by using the default values, (see Appendix C Table C1 for screening test default values), it can be shown that there would be no significant additional noise impacts during inversion conditions (for example, less than a 3-dB increase). In this situation, no further analysis of inversion effects is required.*

The above states that an increase of less than 3dB due to meteorological conditions is considered not significant, and no further analysis of inversion effects will be required.

We note:

- Table C1 of Appendix C of the INP states that a noise source 300m from a receiver in a non-arid area may incur a noise increase by up to 3dB.

- Therefore it can be deduced that temperature inversion effects must be analysed only if the distance between source and receiver is greater than 300m.

- For distances less than 300m between source and receiver, analysis of inversion effects is not significant and so is not required. As the receivers to the proposed industrial site are less than 300m, consideration of meteorological conditions is not required, as per the INP.

5.3 SLEEP AROUSAL ASSESSMENT CRITERIA

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (typically trucks starting and the noise from the pneumatic break release valve, which engages when a truck leaves a stationary position) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the Application Notes to the EPA Industrial Noise Policy. As recommended in the Application Notes, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An "emergence" test is first carried out. That is, the L_1 noise level of any specific noise source should not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 5 - Sleep Arousal (Emergence Criteria)

Location	Background Noise Level (10pm-7am) dB(A)$_{L90}$	Emergence Level dB(A) $L_{1(1min)}$
Residential Receivers	37	52

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

The sleep arousal assessment is conducted in Section 6.3 below.

5.4 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS - CRITERIA

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA Road Noise Policy.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby building facade.

Table 6– Criteria for Traffic Noise Generated By New Developments

Road Type	Time of day	Permissible Noise Generation
Sub-Arterial Bernera Road	Day (7am to 10pm)	60 dB(A)$L_{eq(15hr)}$
	Night (10pm to 7am)	55 dB(A)$L_{eq(9hr)}$
Local Road Kurrajong Road	Day (7am to 10pm)	55dB(A)$L_{eq(1hr)}$
	Night (10pm to 7am)	50 dB(A)$L_{eq(1hr)}$
Local Road Yarrunga Street	Day (7am to 10pm)	55dB(A)$L_{eq(1hr)}$
	Night (10pm to 7am)	50 dB(A)$L_{eq(1hr)}$

However, if existing noise levels exceed those in the table above, Section 3.4 of the Road Noise Policy is applicable, which requires noise impacts are reduced through feasible and reasonable measures. However, in determining what is feasible/reasonable, the Policy notes that an increase of less than 2dB(A) is a minor impact and would be barely perceptible.

The assessment of noise increase from road noise traffic is conducted in Section 6.2 below.

5.5 CONSTRUCTION NOISE AND VIBRATION CRITERIA

5.5.1 EPA Interim Construction Noise Guidelines

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than:
    - 10dB(A)$L_{eq(15min)}$for work during standard construction hours (7am-6pm Monday to Friday and 8am to 1pm on Saturdays) and
    - 5dB(A)$L_{eq(15min)}$for work outside of standard construction hours.
- "*Highly noise affected level".* Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

A summary of noise emission goals for both standard hours of construction and outside standard hours are presented.

Table 7 – Construction Noise Emission Goals

Location	**"Noise Affected" Level - dB(A)$L_{eq(15min)}$**	**"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$**
Residences	53 (Standard Construction Hours)	75
Commercial	70	N/A
Industrial	75	N/A

The construction noise assessment is conducted below in Section 6.6.

5.5.2 Construction Vibration Criteria

Vibration goals for the amenity of nearby land users are those recommended by the EPA document *Assessing Vibration: A technical guideline.* These levels are presented below:

Table 8– Construction Vibration Goals

Location	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Continuous Vibration			
Residences	Daytime	0.28	0.56
Commercial/Industrial	When in use	0.56	1.12
Impulsive Vibration			
Residences	Daytime	8.6	17
Commercial/Industrial	When in use	18	36

6 NOISE EMISSION ASSESSMENT

This section of the report presents the expected noise emission levels associated with the use of the development for warehousing and distribution.

Therefore, an assessment of typical operational and construction noise is presented below in order to demonstrate that the industrial warehouse and distribution use of the site is capable of meeting noise emission requirements.

The following noise sources are assessed:

- Vehicular noise on site (trucks driving on internal roadways, noise from use of forklifts, and use of the car-park facilities).
- Noise created on public roads as a result of traffic generated by the site.
- Sleep disturbance from night time use of the premises.
- A preliminary assessment of noise from mechanical plant.
- A preliminary assessment of construction noise and vibration.

6.1 ON SITE VEHICLE NOISE (TRUCKS DRIVING ON INTERNAL ACCESS ROADS AND ON SITE, NOISE FROM FORKLIFTS)

Noise generated by vehicles manoeuvring on the site is assessed with reference to the EPA Industrial Noise Policy.

In predicting operational noise emissions, the following worst case scenario assumptions have been made:

- A total of three trucks enter the site within a 15 minute period
- Articulated trucks are assumed to have a sound power level of 105dB(A)L_{eq}, inclusive of a 5dB(A) penalty for a tonal reversing beacon when driving on the site or on internal roadways within the development.
- That there is a total of 5 forklifts operating continuously at each of the five hardstands. Forklifts are assumed to have a sound power level of 90dB(A)L_{eq}.
- A total of 10 cars enter/exit the premises in a 15 minutes period.
- It is assumed that these manoeuvres (truck movements, car movements and forklift movements) occur every 15 minutes during the entire night time period. This provides for a conservative assessment, as it is unlikely that all these movements will occur every 15 minutes during the night time period.

Predicted noise levels are set out below.

All predictions take into account the treatments nominated within Section 7 of this report, the relative position of noise source and noise receiver, distance attenuation, air absorption, adverse weather and noise screening (where appropriate).

As is consistent with EPA guidelines when assessing rural developments (Receivers 1, 2 and 4), the noise emissions are assessed at point on the residential properties which is 30m from the location of the house.

Note:

- A separate assessment of both the Intrusiveness and the Amenity Criteria is presented below.
- In assessing noise emissions against these criteria, it is not simply a matter of selecting the criteria with the lower number to determine the noise emission goal. This is because the two criteria use different time descriptors (the Intrusiveness Criteria us the short duration $L_{eq(15min)}$ descriptor, while the Amenity Criteria looks at long term average noise levels over an entire day/evening/night period (using the $L_{eq(Period)}$ descriptor).
- However, as an abundant precaution, noise emission predictions have been made assuming that the activities during a peak 15 minute period (3 truck movements, 5 forklifts in use) occur continuously for the entire night time period, when assessing against the Amenity criteria. In reality, this is very unlikely to occur, and so the noise levels predicted in Table 10 are likely to be quieter in reality.

Table 9– Vehicle Noise Impact Assessment – Intrusiveness

Noise Source	Noise Receiver Location	Predicted Noise Level	Criteria	Compliance
Articulated trucks driving to/from site, forklift operating on site	Rural Receiver 1 (Yarrunga Street)	40dB(A) $L_{eq(15min)}$	Night time 42dB(A) $L_{eq(15min)}$	Yes
	Rural Receiver 2 (Bernera Road)	38dB(A) $L_{eq(15min)}$	Night time 42dB(A) $L_{eq(15min)}$	Yes
	Residential Receiver 3 (Kurrajong Street Residential Developments)	35dB(A) $L_{eq(15min)}$	Night time 42dB(A) $L_{eq(15min)}$	Yes
	Rural Receiver 4 (43-44Kurrajong Street)	35dB(A) $L_{eq(15min)}$	Night time 42dB(A) $L_{eq(15min)}$	Yes

Given that the attenuation measures in Section 7 of this report are adopted, the predicted noise emissions levels will be as per this table.

Table 10– Vehicle Noise Impact Assessment – Amenity

Noise Source	Noise Receiver Location	Predicted Noise Level	Criteria	Compliance
Articulated trucks driving to/from site, forklift operating on site	Rural Receiver 1 (Yarrunga Street)	40dB(A) $L_{eq(Period}$	Night time 40dB(A) $L_{eq(Period)}$	Yes
	Rural Receiver 2 (Bernera Road)	38dB(A) $L_{eq(Period}$	Night time 40dB(A) $L_{eq(Period)}$	Yes
	Residential Receiver 3 (Kurrajong Street Residential Developments)	35dB(A) $L_{eq(Period}$	Night time 40dB(A) $L_{eq(Period)}$	Yes
	Rural Receiver 4 (43-44Kurrajong Street)	35dB(A) $L_{eq(Period}$	Night time 40dB(A) $L_{eq(Period)}$	Yes

Given that the attenuation measures in Section 7 of this report are adopted, the predicted noise emissions levels will be as per this table.

Please refer to appendix 2 for modelling and sample calculations of noise emissions to Receiver 1.

Noise emissions from the site indicates that 24-hour use of the site can be conducted and compliance with EPA guidelines will be achieved, given the recommendations in Section 7 of this report are adopted.

In addition, we note:

- Analysis of noise generation from vehicles shows that even at night time, there can be a moderate level of use of large vehicles on the site (three truck per fifteen minutes). Daytime periods could accommodate at least twice as many vehicles (given the higher ambient noise levels).

This analysis indicates that the site is capable of complying with EPA guidelines, while accommodating for trucks, cars and forklifts operating during the night time period.

6.2 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS ASSESSMENT

Noise created as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy.

As trucks enter/leave the premises, it is assumed that they will exit along Yarrunga Street towards Bernera Road. From the traffic report provided by Transport and Traffic Planning Associates, Reference 15168, it is assumed there will be a 60%-40% split onto Bernera Road. 60% of traffic will go north along Bernera Road, while 40% of traffic will go south along Bernera Road. It is the noise associated with these movements which is assessed below.

Given that noise levels from increase of traffic from the use of the proposed industrial site are compliant along Yarrunga Street and Bernera Road, noise levels on remaining surrounding roadways, including Kurrajong Road will also indicate compliance.

Noise emission predictions of noise generation are based on the following:

- A daily traffic generation of articulated/b-double trucks of:
    - Up to 13 truck movements per hour during the night time (10pm-7am), distributed evenly through the two site driveways; and
    - Up to 26 truck movements per hour during the day time (7am-10pm), distributed through the two site driveways.
- Noise emissions are predicted at the building façade of the effected residences on Yarrunga Street and Bernera Road.

Predicted noise levels are as follows:

Table 11– Noise Generated by Additional Road Traffic Assessment

Time of Day	Receiver Location	Predicted Noise Level – dB(A)L_{eq}	Compliance
Daytime (7am-10pm)	Receiver 1 Fronting Yarrunga Street (Local Road)	52 dB(A)$L_{eq(1hr)}$	Complies with 55dB(A)$L_{eq(1hr)}$ criteria.
Night (10pm-7am)		49 dB(A)$L_{eq(1Hr)}$	Complies with 50dB(A)$L_{eq(1hr)}$ criteria.
Daytime (7am-10pm)	Receiver 2 Fronting Bernera Road (Sub-Arterial Road)	52 dB(A)$L_{eq(Day)}$	Complies with 60dB(A)$L_{eq(15hr)}$ criteria.
Night (10pm-7am)		49 dB(A)$L_{eq(Night)}$	Complies with 55dB(A)$L_{eq(9hr)}$ criteria.
Daytime (7am-10pm)	Receiver 3 Fronting Bernera Road (Sub-Arterial Road)	51 dB(A)$L_{eq(Day)}$	Complies with 60dB(A)$L_{eq(15hr)}$ criteria.
Night (10pm-7am)		48 dB(A)$L_{eq(Night)}$	Complies with 55dB(A)$L_{eq(9hr)}$ criteria.

Although specific numbers of vehicles cannot be determined at this stage, this indicates that the proposed use of the site is capable of meeting EPA Road Noise Policy guidelines.

6.3 TRANSIENT NOISE EVENTS (SLEEP AROUSAL) ASSESSMENT

Noise events occurring between 10pm and 7am should be assessed for potential sleep disturbance impacts on nearby residents.

The primary potential noise source will be the use of the pneumatic valve which engages when a truck moves from a stationary position. Based on measurements conducted by this office, the sound power of this noise event is 110dB(A)$L_{1(1min)}$.

The nearest affected residential receiver is the resident along Yarrunga Street, as this receiver is nearest to the driveway of the project site. Compliance at this receiver will indicate compliance at all remaining residential receivers.

The noise emissions at the window of the nearest residences are presented below. Predictions take into account distance correction and air absorption.

As detailed in Section 5.3 of this report, the sleep disturbance test is a two stage process, and presented below;

1. The first step is to check if the emergence noise level meets the "background + 15" externally at the bedroom façade. As this step is non-compliant, as shown in the table below, we moved onto step two.

Table 12– Sleep Arousal Assessment – Background+15dB(A) Test Externally

Receiver Location	Noise Source	Predicted Noise Level	Emergence Test Level	Compliance
Rural Receiver 1 (Yarrunga Street)	Truck Brake	57dB(A)$L_{1(1min)}$	52dB(A)$L_{1(1min)}$	Non-Compliance with BG+15 test externally – See below

2. In the event of a non-compliance with the "emergence test", the second step predicts the noise level internally (assuming the bedroom window is left open) for compliance with EPA guidelines. This is presented in the table below.

Table 13 – Sleep Arousal Assessment – Internal Noise Level Test

Receiver Location	Noise Source	Predicted Noise Level	Acoustic Criteria	Compliance
Nearest Bedroom (Bedroom Window Open)	Truck Brake	47dB(A)$L_{1(1min)}$	50-55dB(A)$L_{1(1min)}$	Yes

The level predicted internally within the bedroom is below the recommended 50-55dB(A)$L_{1(1min)}$ noise range that is unlikely to cause sleep disturbance. On this basis, use of the site during the

night time period between 10pm and 7am (to allow for vehicles to enter/leave the site) is compliant with EPA sleep disturbance guidelines.

6.4 MECHANICAL PLANT ASSESSMENT

Detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the required levels set out in section 5 of this report.

Compliance with noise emission requirements will be achievable with appropriate acoustic measures such as appropriately positioning of external mechanical plant, use of screening if required and re-selection of a quieter unit if necessary. Generally, if the external mechanical plant is not along the property boundary and does not have line of site to the receiver, then noise emissions should be compliant with the requirements of the INP.

A detailed analysis of noise treatments to potential external mechanical plant is not feasible at this stage, as selection and location of plant has not been determined. As such specific acoustic treatments cannot be determined. However, a basic sample noise emission calculation is presented below to provide indicative acoustic treatments that may be required to control noise emissions. It is recommended that a detailed analysis is undertaken once plant selection is finalised.

In a typical scenario below, the following assumptions are taken;

- A rooftop refrigeration condenser unit with a sound power level of 85dB(A), and there are a total of 3 units on the rooftop located together.
- The units are located a minimum of 40 metres from a receiver property boundary
- The units are located a minimum of 5 metres from the edge of the warehouse rooftop.
- The plant will be in operation continuously.

Table 14 – Sample Calculation of Mechanical Plant to Receiver

Noise Source / Correction	**Noise Level db(A) L_{eq} (Period)**
Refrigeration Condenser Unit	85
Distance Correction (40m)	-40
Barrier (rooftop/building shell breaking line of sight)	-13
% of sound (assuming 3 plant units total)	+4.8
TOTAL	**36.8dB(A)**
Night Time Amenity Goal	40dB(A)L_{eq} Period

The sample calculation above indicates that through appropriate location of plant, noise level can be successfully attenuated through minimal acoustic treatment to meet the night time amenity criteria. Given that this criteria is met, it will be compliant at all other times of the day.

In short, for large external equipment items such as cooling towers, refrigeration plant or similar:

- If the building shell breaks the line of site between the equipment item and the resident, it is unlikely that acoustic treatment will be required to the equipment item.

- However, if the equipment item is located such that there is a line of sight between the resident and the equipment item, it is very likely that a screen will be required to be constructed around the equipment items.

Once mechanical plans are finalised, a detailed and specific mechanical plant assessment can be undertaken if required at construction certification stage.

6.5 FUTURE DEVELOPMENTS NOISE CONTRIBUTION

There are currently no other industrial developments in the same block (between Yarrunga Street, Bernera Road, Kurrajong Road and Kookaburra Road North) as the proposed site at 34 Yarrunga Road, Prestons. The remaining land within this block may be used in the future for industrial developments, where each proposed development will require its own development application to address specific noise concerns.

If future industrial developments are constructed nearby on the same block, the most sensitive noise receivers from our projects site, Receivers 1 and 2, will be screened from the proposed warehouses on site. This barrier effect, in addition to the large distance between Receivers 1 and 2 and potential future developments, will significantly reduce potential cumulative noise increases from the use of surrounding sites for industrial purposes.

The development application of new future proposed industrial sites should assess noise emissions in conjunction with the EPA industrial Noise Policy, and take into account the cumulative noise emission from the use of the surrounding industrial sites.

6.6 CONSTRUCTION IMPACT ASSESSMENT

Below is a summary of the construction noise goals as presented in Section 5.5.1;

Table 15 – Construction Noise Emission Goals

Location	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residences	53 (Standard Construction Hours)	75
Commercial	70	N/A
Industrial	75	N/A

6.6.1 Construction Noise

With respect to construction noise, the impact on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. Excavation and piling works tend to be the loudest typical construction activity. Work close to the northern and southern boundaries will have greatest potential impact on residential dwellings. However, a highly detailed acoustic assessment of individual activities cannot be undertaken prior to knowing the activities/construction methods proposed, and their duration and location.

Primary noise emissions will occur during excavation/site levelling. Equipment items will typically have sound power levels of approximately 110dB(A)$L_{eq(15min)}$. Predicted noise levels at nearby development are:

- We note that during construction of the industrial along the northern site boundary will be as close as 25m away to residents along Kurrajong Road. When working at the boundary line along Kurrajong Road noise emissions are predicted to be between 69-74dB(A) L_{eq}, but will be closer to 58-63dB(A) when working throughout the industrial site:
    - Although this is technically an exceedance of EPA "background+10dB(A)" Noise Affected Level guidelines, we note that at 53-58dB(A), the construction noise will still be quieter than the daytime traffic noise level from Kurrajong Road.
    - The construction noise will also be generally below the EPA "Highly Noise Affected" level of 75dB(A).
- Noise levels at all other residences (to the north along Yarrunga Street and Bernera) will also be generally compliant with EPA guidelines.

Provided that construction works are limited to standard construction hours (7am-6pm), and use of very noisy equipment such as pneumatic hammers of driven/vibrated piling is suitably managed, especially when working close to the boundary of the industrial site, excessive construction noise impact will be avoided.

In light of the above, we recommend:

- On completion of a construction program for any given warehouse, acoustic review of proposed construction activities and plant/methods should be undertaken to identify the extent and duration of potential exceedances of EPA Noise Affected levels (ie – “background+10dB(A)”).

- Identify feasible acoustic controls or management techniques (for example, selection of plant, use of screens around static plant, scheduling of noisy works, notification of adjoining land users) when exceedance of Noise Affected levels may occur.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent unreasonable impact.

6.6.2 Construction Vibration

Excavation, earth retention and civil works are the primary vibration generating activities.

Given the distance between the site and the nearest residential buildings, it is unlikely that construction vibration will exceed EPA guidelines (for amenity) and *highly* unlikely to approach vibration levels with the potential to cause building damage.

7 RECOMMENDATIONS

Acoustic analysis indicates that the site is capable of meeting EPA noise emission guidelines.

7.1 FENCING RECOMMENDATIONS

To reduce noise emission to be in compliance with the EPA Guidelines to the current rural properties to the north of the site (Receivers 1 and 2), the following acoustic treatments will be required to be implemented for the use of the development.

- Construct a 2.4 metre solid fence in the area marked in Figure 2 below.
- The fence along the boundary of the project site, of height specified above, may be constructed of lapped and capped timber, flexi-glass, 4mm Perspex, Colorbond, 9mm fibrous cement sheet or equivalent, installed with no gaps between the panels.

The length of barrier has been marked and presented below.

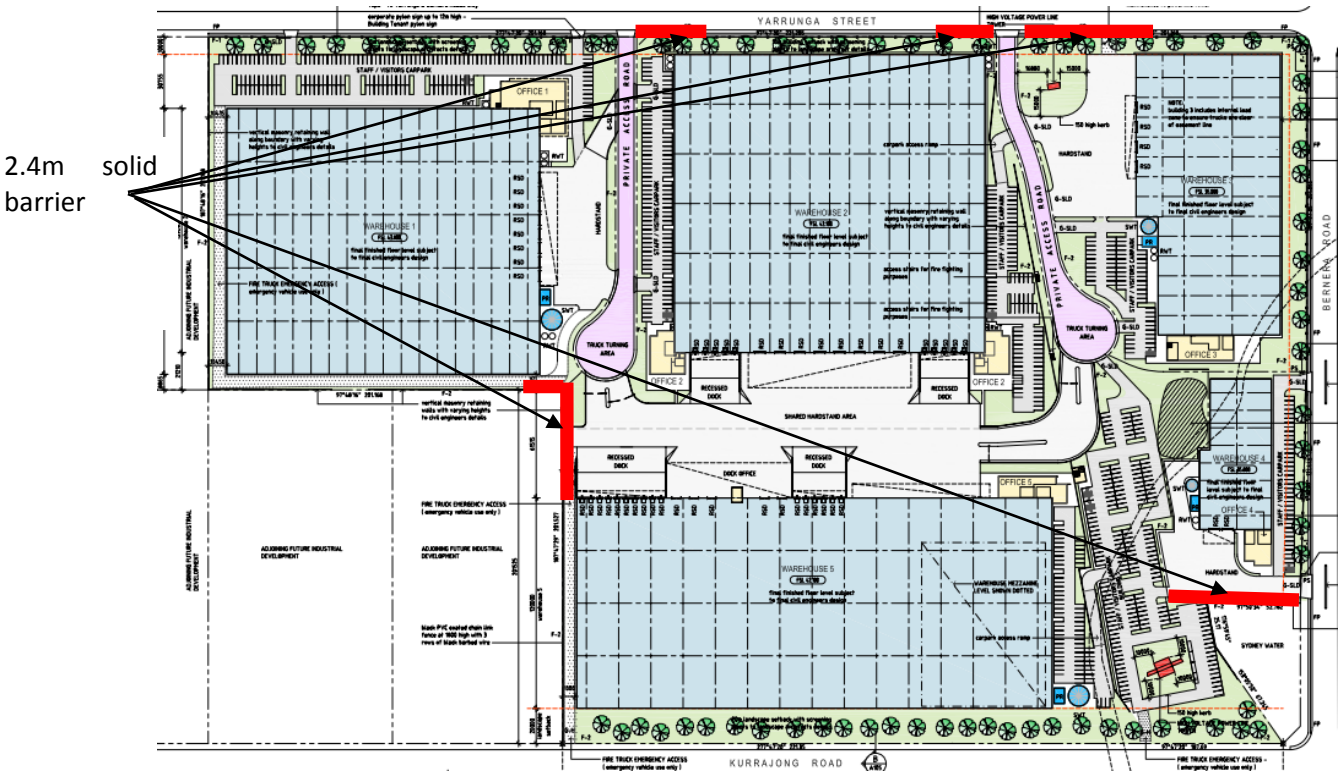


Figure 2: Barrier Requirements

It has advised that Receivers 1 and 2 have been sold for future industrial use. If at the time of construction, these tenancies are no longer used as rural/residential developments, the barrier requirements specified on the northern boundary above will not be required.

Barrier requirements to the southern and western boundary will be required regardless of the use of Receivers 1 and 2.

7.2 MECHANICAL PLANT RECOMMENDATIONS

A sample noise emission calculation of potential mechanical plant is presented in Section 6.4 of this report. It is determined that appropriately locating mechanical plant can successfully attenuate noise emissions to surrounding receivers and achieve compliance with the night time noise goals.

The sample calculation indicates that if plant is located a minimum of 40m from a receiver boundary, with the plant completely screened from view, no further attenuation measures will be required.

In the event that further acoustic measures are required, re-location of plant, re-selection of plant and additional use screening are plausible options.

Specific acoustic treatments to mechanical plant cannot be given at this stage, as selection and location of plant is yet to be determined. It is recommended to conduct a detailed mechanical assessment at construction stage once location and plant selection is known.

8 CONCLUSION

Operational noise emissions associated with the proposed industrial Warehouse and Industrial Distribution Centre at Yarrunga Street and Bernera Road, Prestons have been assessed with reference to relevant EPA and Liverpool Council acoustic guidelines in order to address Secretary Environmental Assessment Requirements.

An analysis of typical operational noise (vehicle, mechanical equipment equipment) indicates that the site is capable of complying with relevant noise emission criteria.

Acoustic treatments for control of noise emissions have been presented in Section 7 of this report. Provided that these recommendations are followed, compliant noise levels will be achieved at surrounding receivers, satisfying the requirements of the EPA Guidelines.

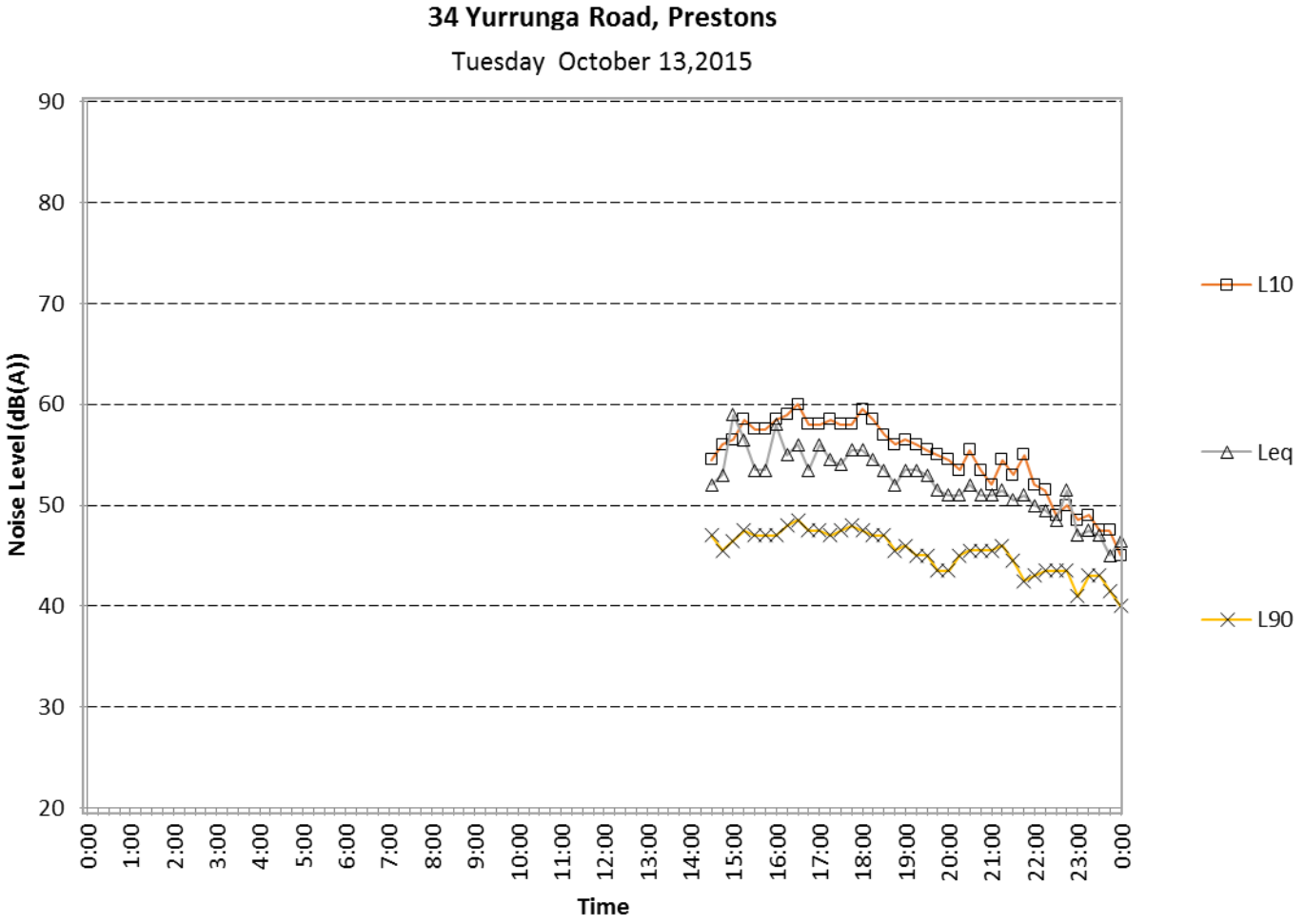
Please contact us if you have any queries.

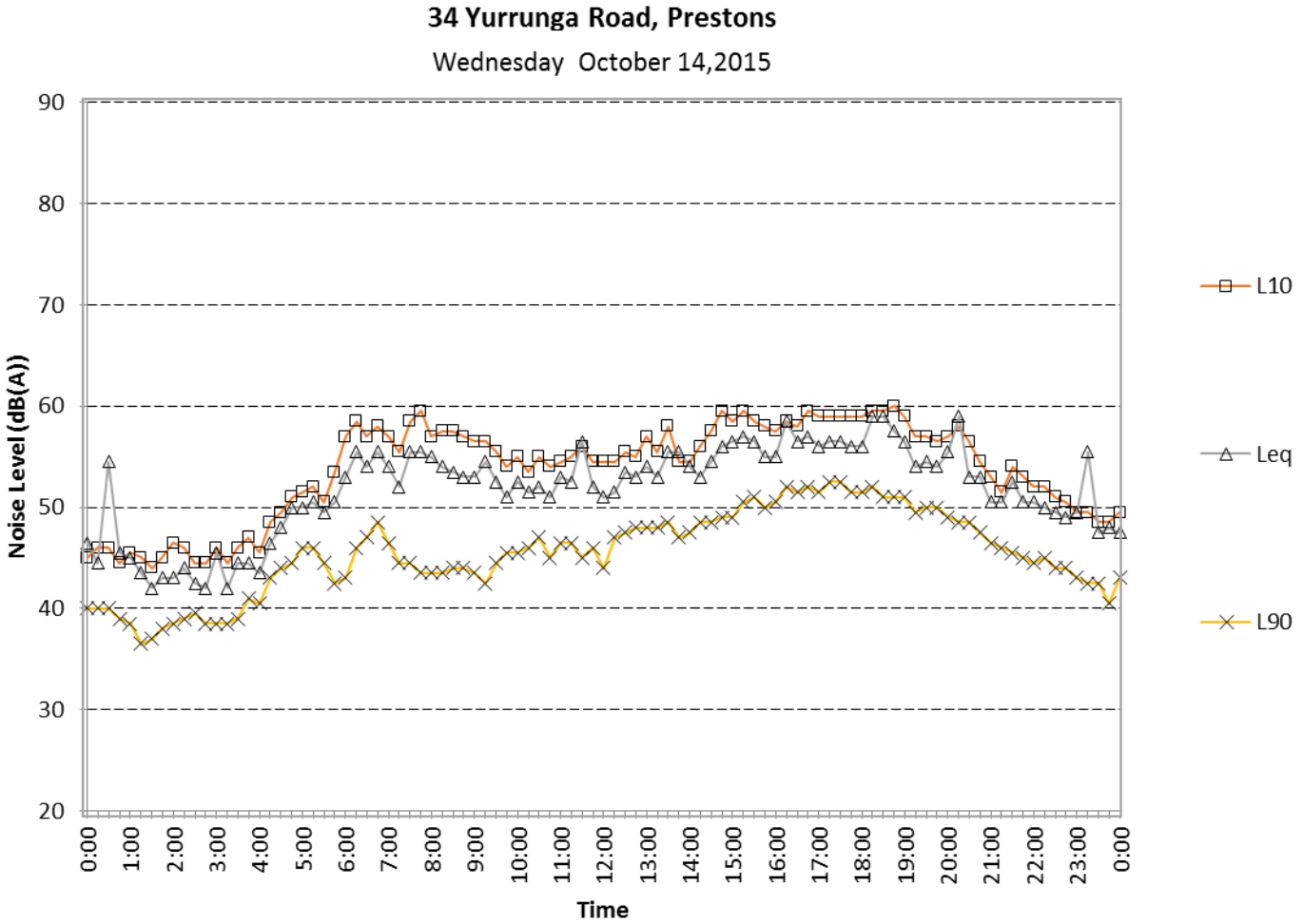
Yours faithfully,

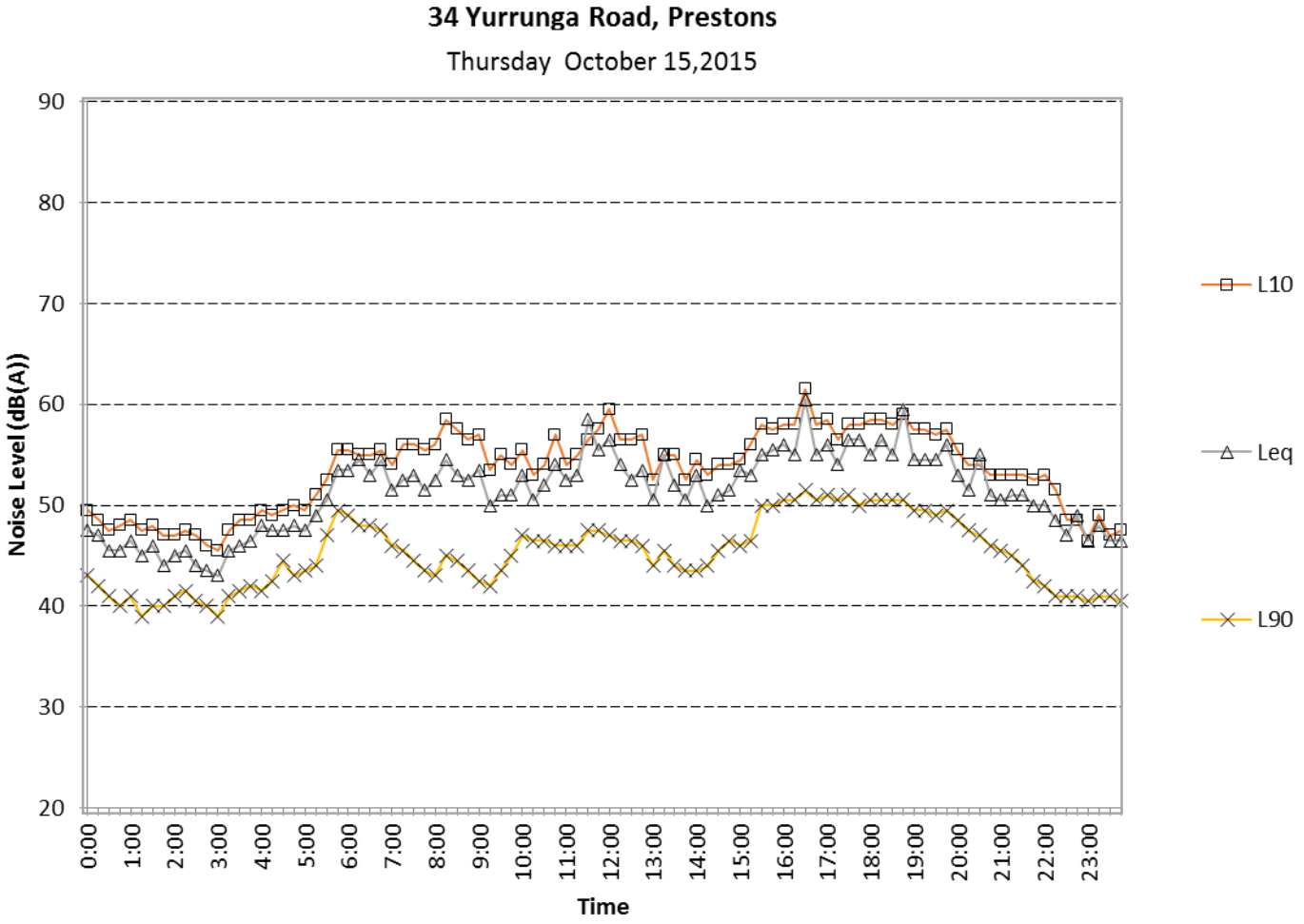
Acoustic Logic Consultancy Pty Ltd
Johan Davydov

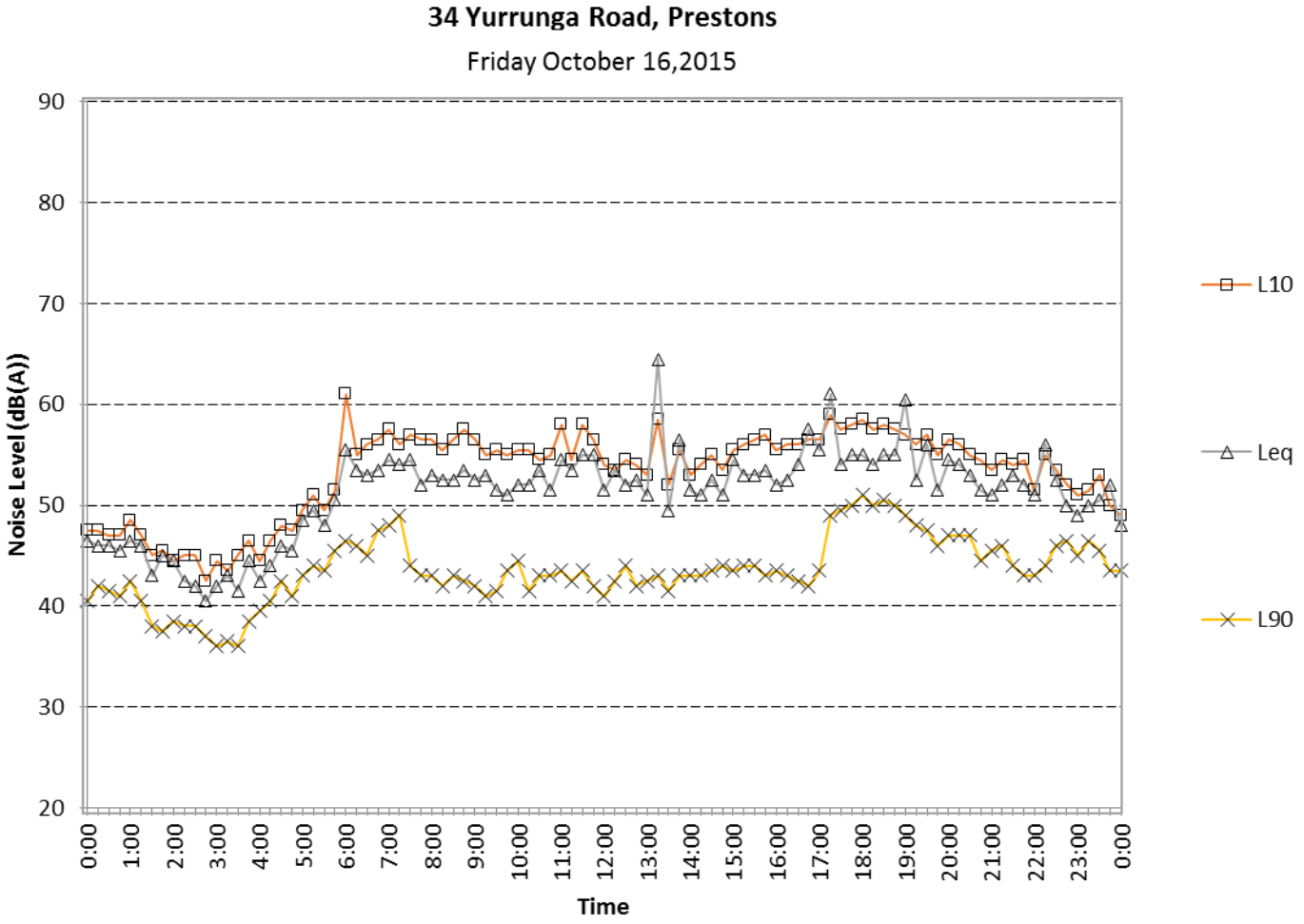
Appendix 1

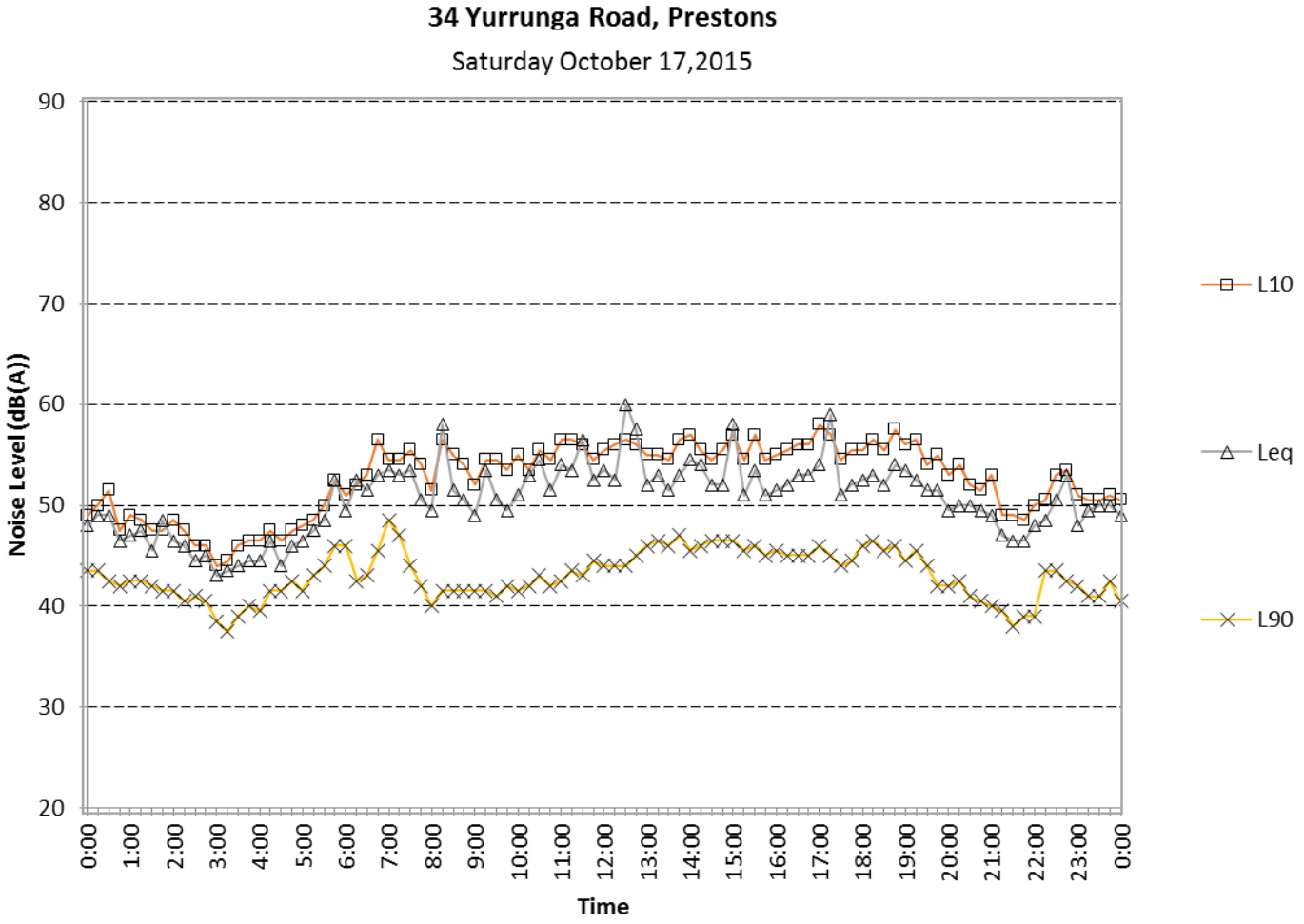
Unattended Noise Monitoring

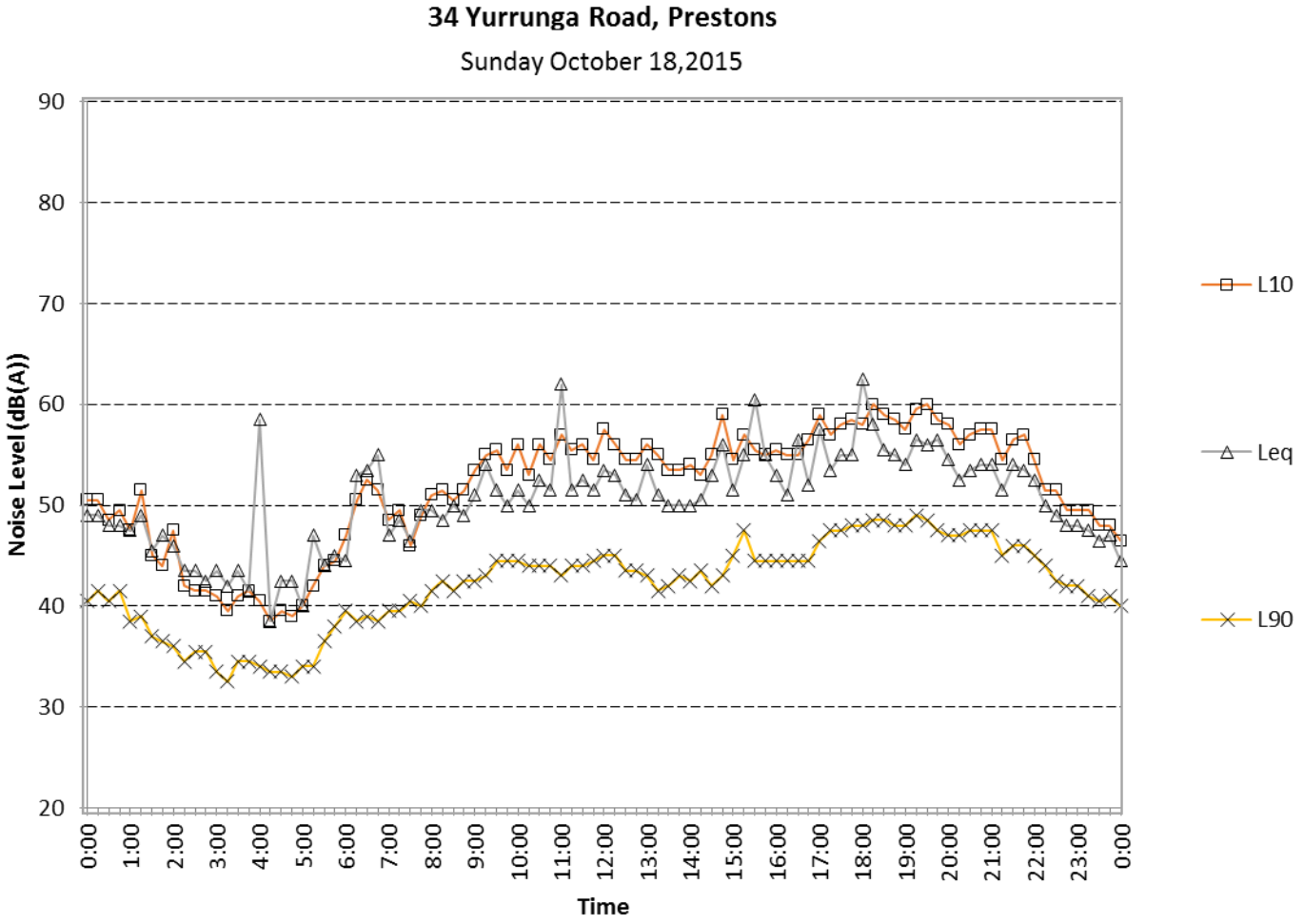

34 Yurrunga Road, Prestons
Tuesday October 13,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90

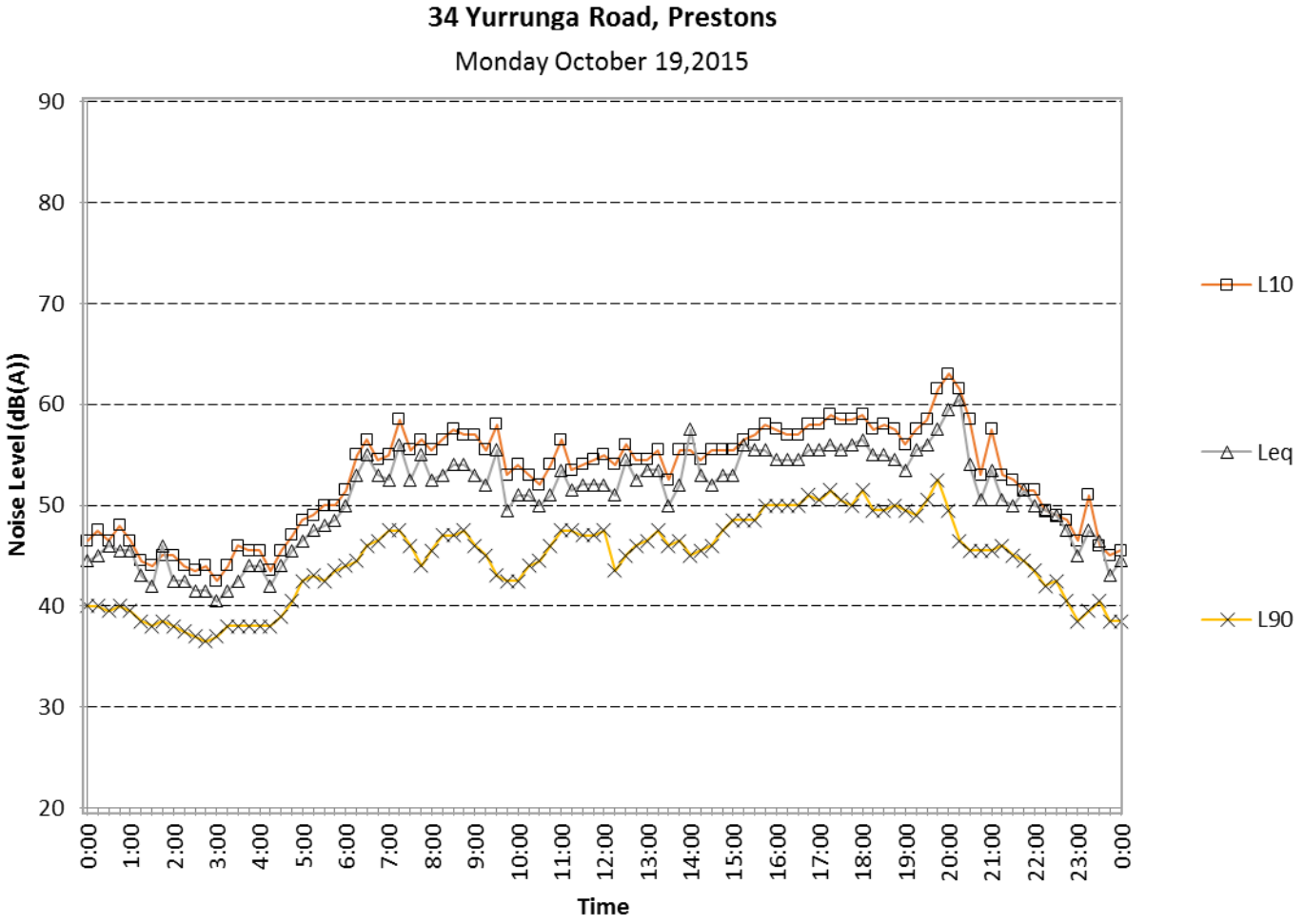

34 Yurrunga Road, Prestons
Wednesday October 14,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90

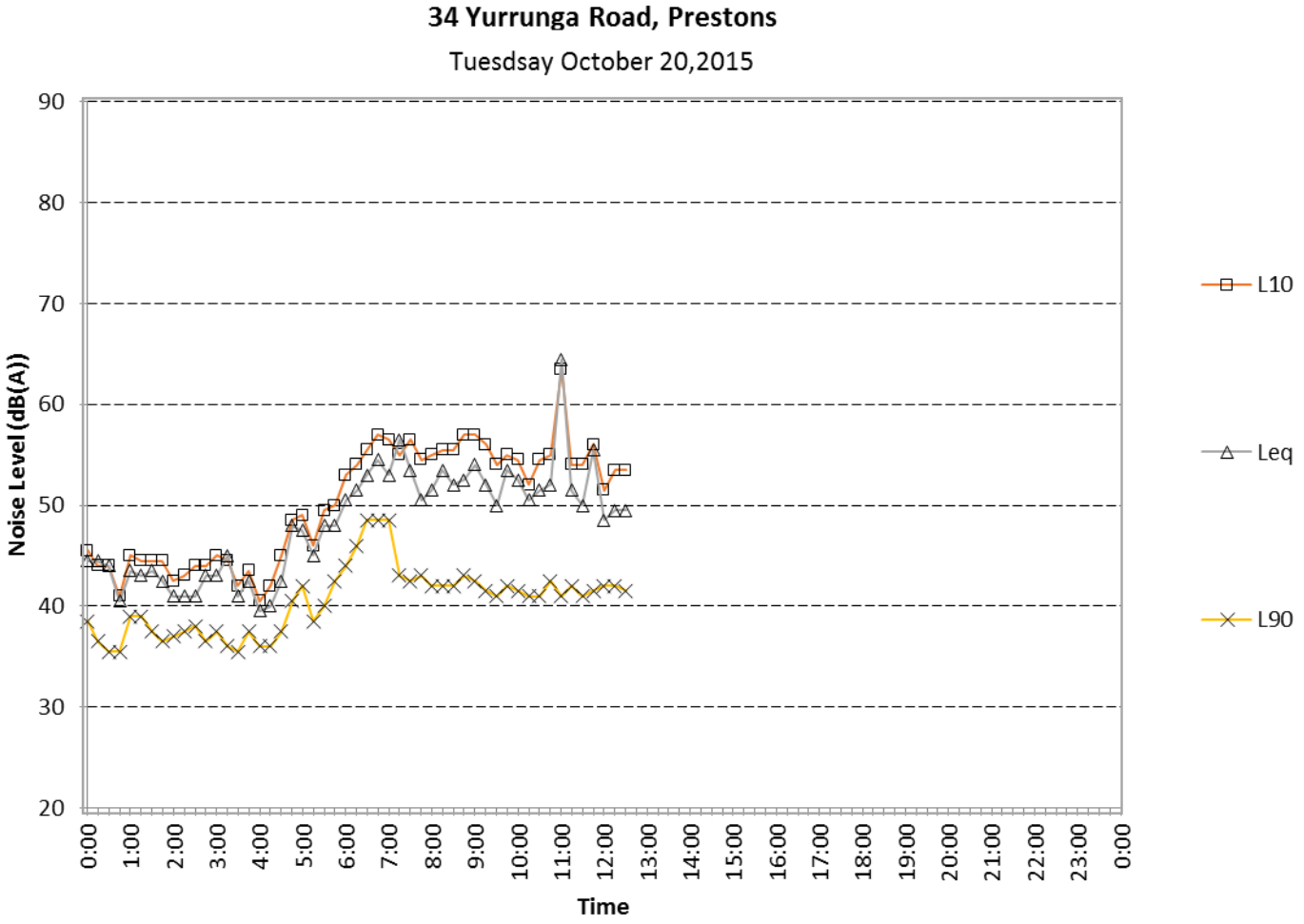

34 Yurrunga Road, Prestons
Thursday October 15,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time
L10
Leq
L90


34 Yurrunga Road, Prestons
Friday October 16,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
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
L10
Leq
L90


34 Yurrunga Road, Prestons
Saturday October 17,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
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
L10
Leq
L90


34 Yurrunga Road, Prestons
Sunday October 18,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
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
L10
Leq
L90


34 Yurrunga Road, Prestons
Monday October 19,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
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
L10
Leq
L90


34 Yurrunga Road, Prestons
Tuesdsay October 20,2015
Noise Level (dB(A))
90
80
70
60
50
40
30
20
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
L10
Leq
L90

Appendix 2

Sample Noise Emission Calculation

Sample Noise Calculations

This sample calculation shows modelling of on-site vehicular movement to Receiver 1, located to the north of the site.

Noise calculations include noise emissions from the following on site manoeuvres;

- Manoeuvre 1: Articulated trucks entering and exiting the site
- Manoeuvre 2: Use of forklifts within the hardstand areas
- Manoeuvre 3: cars entering and exiting the western carpark
- Manoeuvre 4: cars entering and exiting the eastern carpark

Predictions below shown the calculation for each of the points above, and combines all the noise levels together to provide a cumulative noise level at Receiver 1. Our calculation are as follows:

On Site Vehicle Noise

Manoeuvre 1: Noise from Trucks entering/exit the site to Receiver 1.

It is assumed that 3 trucks will enter and exit the site in this 15 minute period.

Noise Source/Correction	Noise level $dBL_{eq(15min)}$ – Frequency (Hz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A-wt**
Noise Source from Truck	111	100	104	99	99	100	93	89	**105**
Distance Correction (distance to receiver)	-49	-49	-49	-49	-49	-49	-49	-49	**-49**
Time Correction (truck activity within 15 minute period)	-15	-15	-15	-15	-15	-15	-15	-15	**-15**
% of Sound (3 trucks)	+4.8	+4.8	+4.8	+4.8	+4.8	+4.8	+4.8	+4.8	**+4.8**
Barrier Effect	-5	-5	-6	-6	-7	-8	-9	-10	**-7**
Noise Level to Receiver 1	**47**	**36**	**39**	**34**	**33**	**33**	**25**	**20**	**39**

Manoeuvre 2: Forklifts operating in Hardstand Area to Receiver 1

It is noted that 3 of the 5 forklifts will be fully screened by Warehouse 2 and will contribute minimal to the overall noise level. Noise level predictions from the remaining forklifts is as follows;

Noise Source/Correction	Noise level $dBL_{eq(15min)}$ – Frequency (Hz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A-wt**
Noise Source from Forklifts	96	85	89	84	84	85	78	74	**90**
Distance Correction (distance to receiver)	-52	-52	-52	-52	-52	-52	-52	-52	-52
Field of View (Partial Screening by Warehouse)	-3	-3	-3	-3	-3	-3	-3	-3	**-3**
% of Sound (2 forklifts)	+3	+3	+3	+3	+3	+3	+3	+3	**+3**
Barrier Effect	-5	-5	-6	-6	-7	-8	-9	-10	**-7**
Noise Level to Receiver 1	**39**	**28**	**31**	**26**	**25**	**25**	**17**	**12**	**31**

Manoeuvre 3: Vehicles entering/exiting within the Western Carpark

It is assumed 5 vehicles enter/exit from this carpark within a 15 minute period.

Noise Source/Correction	Noise level $dBL_{eq(15min)}$ – Frequency (Hz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A-wt**
Noise Source from Forklifts	94	89	83	82	79	75	68	60	**84**
Distance Correction (distance to receiver)	-53	-53	-53	-53	-53	-53	-53	-53	-53
Time Correction (car activity within 15 minute period)	-12	-12	-12	-12	-12	-12	-12	-12	-12
% of Sound (5 cars)	+7	+7	+7	+7	+7	+7	+7	+7	**+7**
Noise Level to Receiver 1	**35**	**30**	**25**	**23**	**21**	**17**	**9**	**1**	**26**

Manoeuvre 4: Vehicles entering/exiting within the Eastern Carpark

It is assumed 5 vehicles enter/exit from this carpark within a 15 minute period.

Noise Source/Correction	Noise level $dBL_{eq(15min)}$ – Frequency (Hz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**A-wt**
Noise Source from Forklifts	94	89	83	82	79	75	68	60	**84**
Distance Correction (distance to receiver)	-48	-48	-48	-48	-48	-48	-48	-48	**-48**
Time Correction (car activity within 15 minute period)	-18	-18	-18	-18	-18	-18	-18	-18	**-18**
% of Sound (5 cars)	+7	+7	+7	+7	+7	+7	+7	+7	**+7**
Noise Level to Receiver 1	**35**	**29**	**24**	**22**	**20**	**16**	**8**	**1**	**25**

Below is a sum of the above mentioned manoeuvres, indicating that the overall noise level is compliant with the night time criteria at Receiver 1.

Sum of all Manoeuvres

	Noise Level dB(A) $L_{eq\ (Period)}$
Manoeuvre 1	39
Manoeuvre 2	31
Manoeuvre 3	26
Manoeuvre 4	25
Cumulative Noise Level to Receiver 1	39.8
Criteria (Amenity)	**40**
Complies	Yes