Proposed Carwash Development
1-21 Cranebrook Road, Cranebrook

Environmental Noise Assessment

29 November 2020

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Executive Summary

EcoAcoustics Pty Ltd assessed a proposed car wash site located at 1-21 Cranebrook Road, Cranebrook. This noise impact assessment report has been completed to support the proposal, as part of the development application. The purpose of this report is to assess the noise emissions from the site in accordance with the prescribed standards contained in the *New South Wales Environmental Protection Authority Noise Policy for Industry.*

To ensure compliance with the Policy, the following recommendations are required to be incorporated into the proposed development:

- The proposed automatic car wash will be fitted with an automatic roller door on the exit, providing performance of a minimum R_w 23 (clear 3mm thick PVC);
- The Plant Room roof and the covered entry to the Automatic Wash Bays are both to be lined with 50mm 32kg/m^3 sound absorbing insulation or similar.

With the above inclusions, the site complies with the prescribed criteria contained in the Policy at all nearby residential receivers.

1 Introduction

EcoAcoustics Pty Ltd assessed a proposed car wash site located at 1-21 Cranebrook Road, Cranebrook. This noise impact assessment report has been completed to support the proposal, as part of the development application. The purpose of this report is to assess the noise emissions from the site in accordance with the prescribed standards contained in the *New South Wales Environmental Protection Authority Noise Policy for Industry.*

Appendix A contains a description of some of the terminology used throughout this report.

1.1 Site Locality & Surroundings

The site and surroundings are shown in an aerial photo in *Figure 1.1.* The site is located at 1-21 Cranebrook Road in Cranebrook within the Penrith City Council. The proposed site is located on the corner of Cranebrook Road and Londonderry Road adjacent to an existing service station. The surrounding land uses are predominately rural in nature, with a transport depot located across Londonderry Road to the east and a market garden across Cranebrook Road to the south The nearest noise sensitive receivers are located along Cranebrook Road and are shown on *Figure 1.1* as R1 to R3.

Figure 1.1: Site and Surroundings (Source: Near Maps)

1.2 Site Layout

It is proposed to construct a car wash on the proposed site. *Figures 1.3 and 1.4* show the site plan and elevations for the car wash.

The proposed carwash will comprise

- Two automatic wash bays and associated mechanical plant;
- Three manual wash bays;
- Fully enclosed mechanical plant room; and
- Four vacuum bays.

It is understood that the hours of operation for the car wash site will be 24 hours per day 7 days per week.

The potential noise impacts associated with the site include:

- The automatic wash bays;
- The mechanical plant room;
- The vacuum bays;
- Vehicles; and
- Manual wash bays.

To determine the impact of the carwash during different time periods, *Table 1.1* provides the assumed operational usage percentages used for the proposed site. These percentages have been based on assessments of carwash usages around Australia.

Table 1.1: Assumed Operational Usage Percentages

Equipment	Day Period	Evening Period	Night Period
Automatic Carwash Bays	75%	40%	20%
Manual Wash Bays	75%	40%	20%
Vacuum (per vacuum)	75%	40%	20%

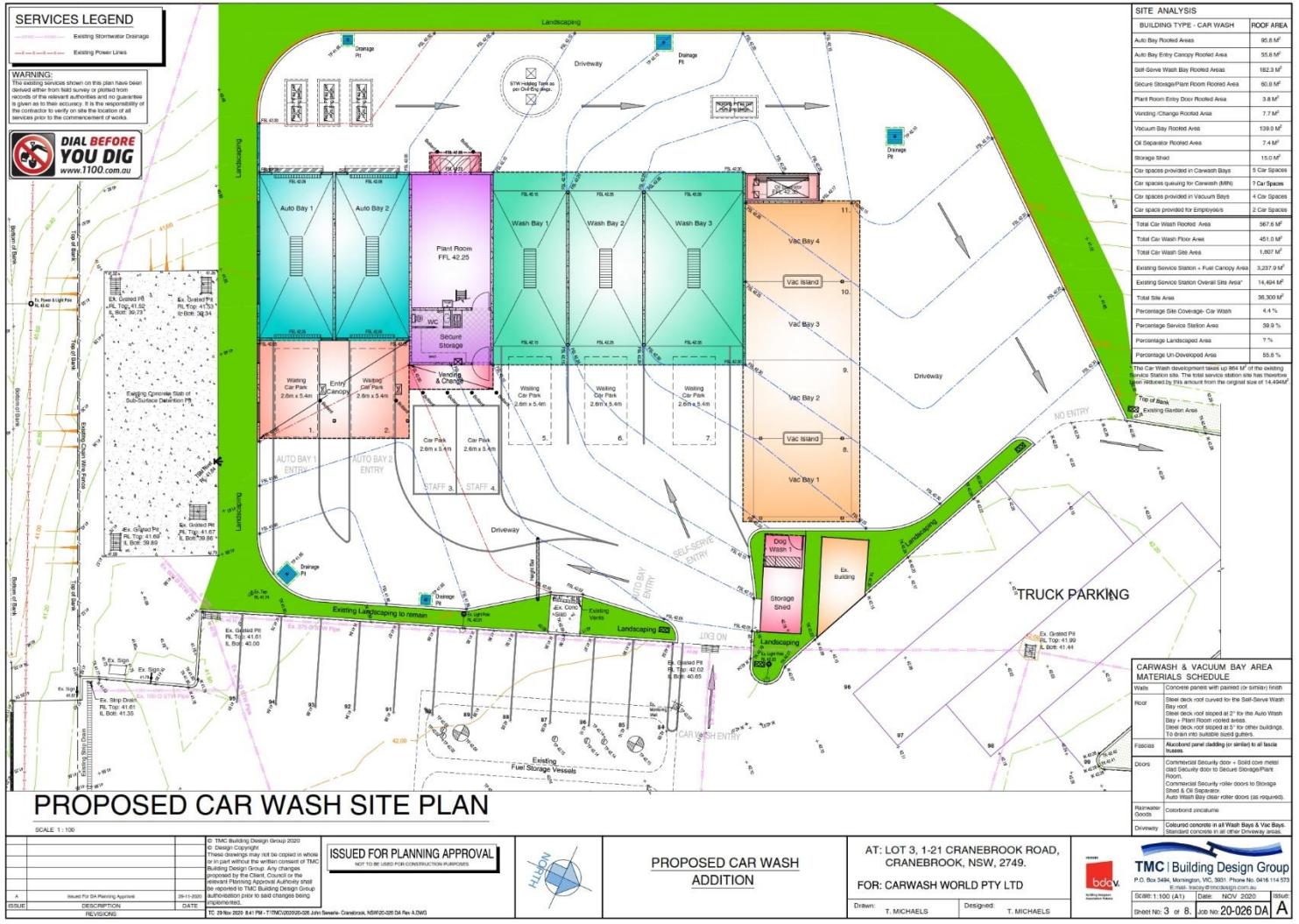


Figure 1.3 proposed Site Layout (source TMC Design)

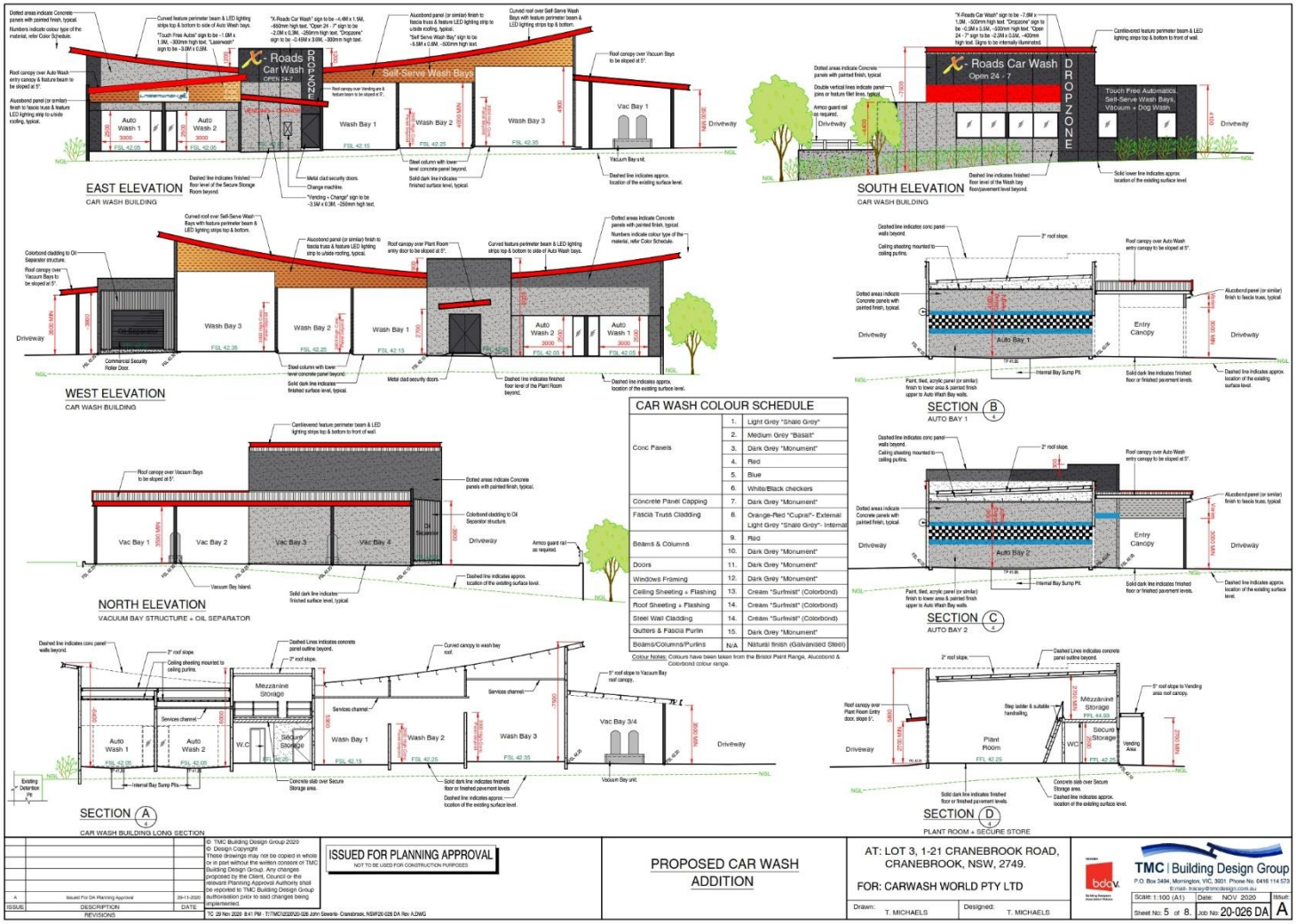


Figure 1.4: Elevations (source: TMC Design)

2 Noise Monitoring

2.1 Noise Measurement Methodology

Noise measurements were taken continuously over a three-day period commencing Tuesday 17th November 2020. The following information was detailed:

- Measurements were completed at a location representative of the nearest noise sensitive premises (shown on *Figure 1.1*) using a Rion NL42 Noise logger (s/n 00885459).
- The sound level meter holds current laboratory certificate of calibration, available upon request;
- The meter was calibrated before and after the measurements and was found to be within 0.2dB of the reference signal;
- The meter records both slow and fast time weighted sound levels, allowing relevant data to be collected;
- The microphone was fitted with a standard wind screen;
- During the measurements, the microphone was located at a height of 1.5 metres above the ground level and at least 3 metres from reflecting facades (other than the ground plane); as such no adjustments have been applied for reflected noise.

Average meteorological conditions at the time, recorded at the Bureau of Meteorology's Penrith site were:

- Temperature: 14 to 40°C
- Relative Humidity (avg): approximately 70%
- Periods of heavy rainfall were recorded on Wednesday 18th November, data recorded during this period has been disregarded.

2.2 Ambient Noise Monitoring

The results of the measured noise levels are summarised in *Table 2.1*. *Figure 2.1* presents a chart of the measured noise levels throughout the entire noise logging period.

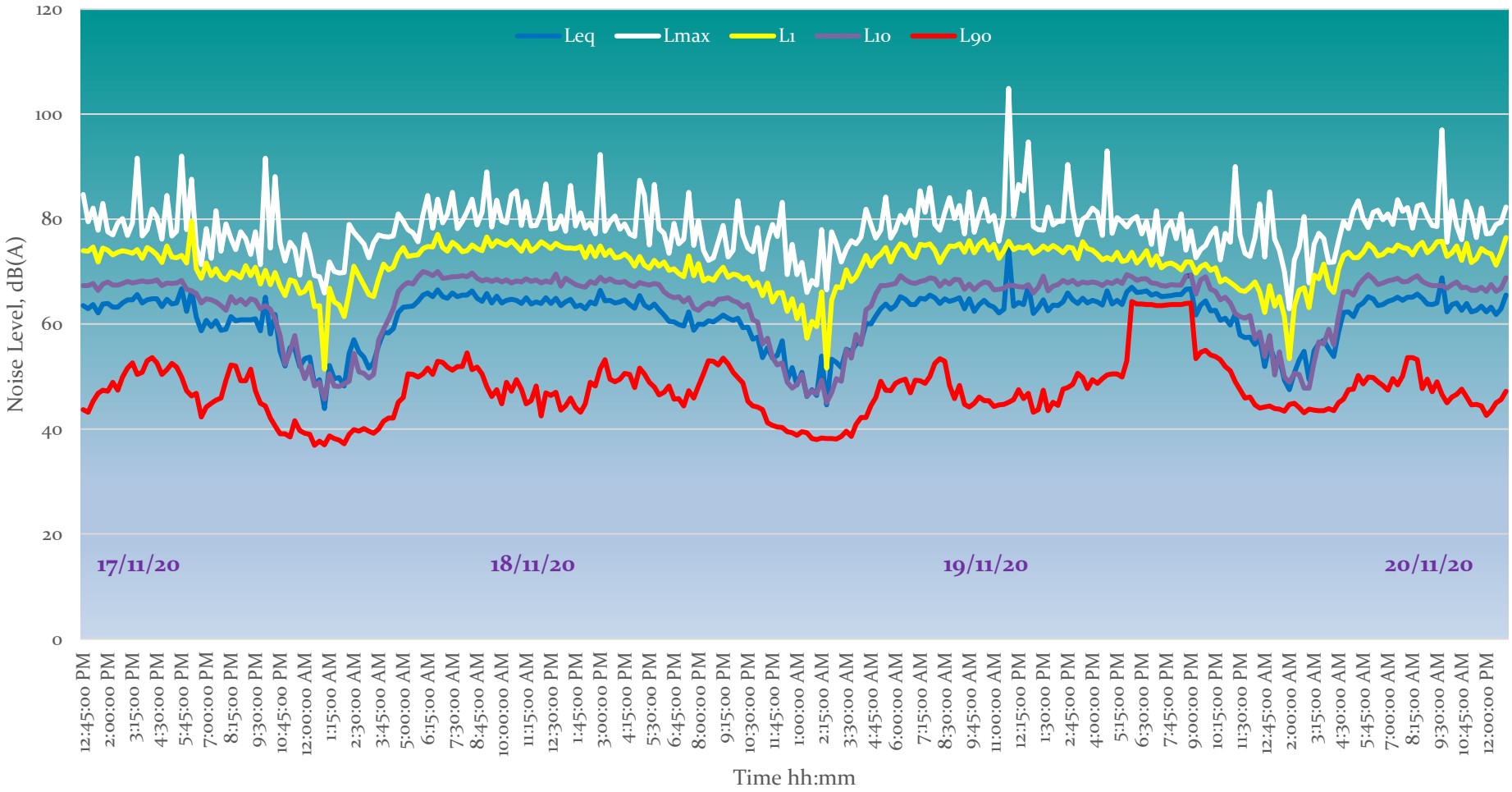
Table 2.1: Measured Average Noise Levels Noise Logging

Date	Time Period	Measured Noise Level, dB (A)		
		L_{Amax}	L_{Aeq}	ABL L_{A90}
Tuesday 17th November	Day	80	64	44
	Evening	76	60	45
	Night	76	57	38

Date	Time Period	Measured Noise Level, dB (A)		
		L_{Amax}	L_{Aeq}	ABL L_{A90}
Wednesday 18th November	Day	81	64	45
	Evening	76	61	46
	Night	57	56	38
Thursday 19th November	Day	82	65	44
	Evening	77	65	55
	Night	68	58	44
Friday 20th November	Day	80	64	45

The noise logging includes noise from the nearby rural premises, along with road traffic noise and noise from the existing service station.

Figure 2.1: Chart Showing Noise Logging Results 1-21 Cranebrook Road Cranebrook 17th November to 20th November 2020



3 Criteria

Within NSW, the noise emissions from commercial premises are governed by the NSW EPA *Noise Policy for Industry 2017* (the Policy). The policy provides a framework for the determination of suitable noise level limits for new commercial premises, by examining the intrusiveness and the project amenity noise level. It allows for the determination of a Project Noise Trigger Level derived from the lower of the intrusiveness noise level and the amenity noise level. The Policy states:

> *The project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. Applying the most stringent requirement as the project noise trigger level ensures that both intrusive noise is limited and amenity is protected and that no single industry can unacceptably change the noise level of an area.*

The intrusiveness of a commercial site is considered to be acceptable if the noise level from the source (L_{Aeq} descriptor) measured over a 15-minute period, does not exceed the background noise by more than 5dB.

For this site, the Intrusiveness Noise Levels have been calculated based on the background noise levels in *Table 2.1*. In addition to the intrusiveness noise levels, the Policy requires the project amenity noise levels to be determined. The project amenity noise levels are determined based on the following formula:

> *Project amenity noise level for industrial/commercial developments = recommended amenity noise level (Table 2.2 in the Policy) minus 5dB(A)*

Table 2.3 in the Policy provides guidance as to the determination of the appropriate residential receiver category. For this site, it is considered that the appropriate residential category is *Rural Residential.*

The Policy requires maximum noise level events to be assessed during the nighttime, to limit any potential for sleep disturbance at nearby noise sensitive premises. The appropriate maximum noise level limit is considered to be the RBL +15dB(A). There are a number of factors that may be of importance when assessing sleep disturbance, including:

- The frequency of high noise events;
- The time of day (generally between 10pm and 7am); and
- Periods of time where there is a clear change in the noise environment.

For this site, the derived project amenity noise levels are shown in *Table 3.1*. Also shown in *Table 3.1* is the Rated Background Level (RBL) and the derived project specific limit for the relevant time periods. *Table 3.2* shows a summary of the measured RBL and the derived project amenity noise level, the measured L_{Aeq} along with the Project Trigger level limit and the maximum noise level limit (sleep disturbance).

Table 3.1: Summary of Noise Level Limits

Time of Day	Existing Noise Levels, dB(A)		NSW Industrial Noise Policy, dB(A)		
	L_{Aeq} (period)	RBL	Amenity Criteria Recommended Noise Level (Acceptable), L_{Aeq}	Project Specific Trigger Limit, L_{Aeq}	Maximum Noise Level, L_{AFmax}
Day (07:00-18:00)	64	45	50	50	n/a
Evening (18:00-22:00)	62	45	45	45	n/a
Night (22:00-07:00)	57	38	40	40	53

4 Noise Modelling

4.1 Methodology

Computer modelling using SoundPlan 8.2 has been used to calculate the noise levels at nearby residences. Noise modelling is used as it is not affected by background noise sources and can provide the noise level for various weather conditions.

The software incorporates algorithms enabling the modelling to include the influence of wind and atmospheric stability. Input data required in the model are:

- Topographical data;
- Ground Absorption; and
- Source sound power levels.

4.1.1 Topographical Data

Topographical data was based on information provided by the client and obtained from Google Maps.

4.1.2 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. grass). In this instance value of 0.6 has been used for the surrounding area, and 0 has been used for the site.

4.1.3 Source Sound Levels

Table 3.2 shows the sound power levels used in the modelling. The sound power levels have been determined based on file data and manufacturer's data provided by the client, along with the measurements from similar sites.

Table 3.2: Source Sound Power Levels

Description	Parameter	Octave Band Centre Frequency, dB (Hz)							Overall dB(A)
		63	125	250	500	1k	2k	4k	
Automated carwash entry or exit	L_{Aeq}	82	83	84	85	87	86	85	**92**
Manual wash bay	L_{Aeq}	79	80	80	82	83	83	80	**88**
Vacuum (unattenuated)	L_{Aeq}	85	80	82	80	81	82	85	**92**
Car doors shutting	L_{Amax}	97	90	86	84	80	77	71	**86**

5 Noise Impact Assessment

5.1 Project Trigger Noise Level Assessment

The prediction of noise associated with the proposed site has been based on three scenarios, representing the day, evening, and night periods in accordance with the Policy requirements. Each scenario has been derived based on the percentage usage as defined in *Section 1, Table 1.1*. The noise level predictions for the site assume the following:

- The proposed automatic car wash will be fitted with an automatic roller door on the exit, providing performance of a minimum R_w 23 (clear 3mm thick PVC);
- The entry to the automatic wash bays will have an acoustically absorptive roof with the location as shown in *Figure 1.2*;
- Based on the sound power data provided, the noise associated with the automatic car wash has no tonal, impulsive, or modulating characteristics therefore no penalty adjustment is applicable.

Figure 4.1 presents the predicted site noise level contours for daytime period at the ground floor of the nearby residential premises. *Figure 4.2* presents the predicted site noise level contours for the evening period. Similarly, *Figures 4.3* presents the predicted site noise level contours for the night-time period.

On each plot, the red colour contour represents relevant noise criterion for the corresponding time, day, evening and night.

Figure 4.1: Noise Contour Plot 1-21 Cranebrook Road Cranebrook

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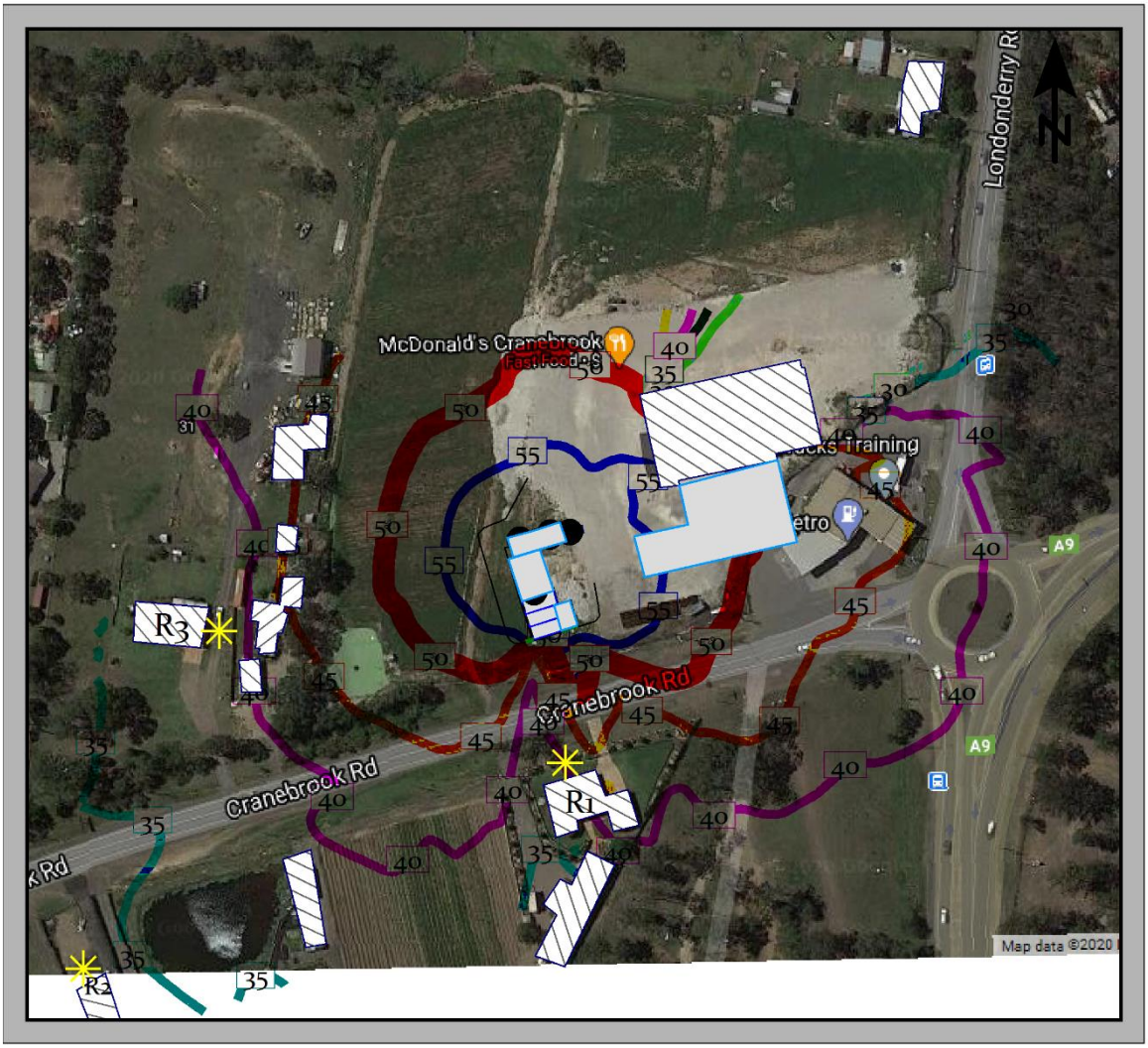
Day Time Period at 75%



Signs and symbols
- Main building
- Point receiver
- Industrial building; Roon
- Wall
- Floating screen
- Roof area

Levels L_{Aeq} in dB(A)
- = 30
- = 35
- = 40
- = 45
- = 50
- = 55

Customer:
X Roads Cranebrook Pty Ltd

EcoAcoustics

Length scale 1:2000

0 20 40 80 120 160 m

Date: 29/11/2020
Project engineer: Rebecca Ireland

Figure 4.2: Noise Contour Plot 1-21 Cranebrook Road Cranebrook

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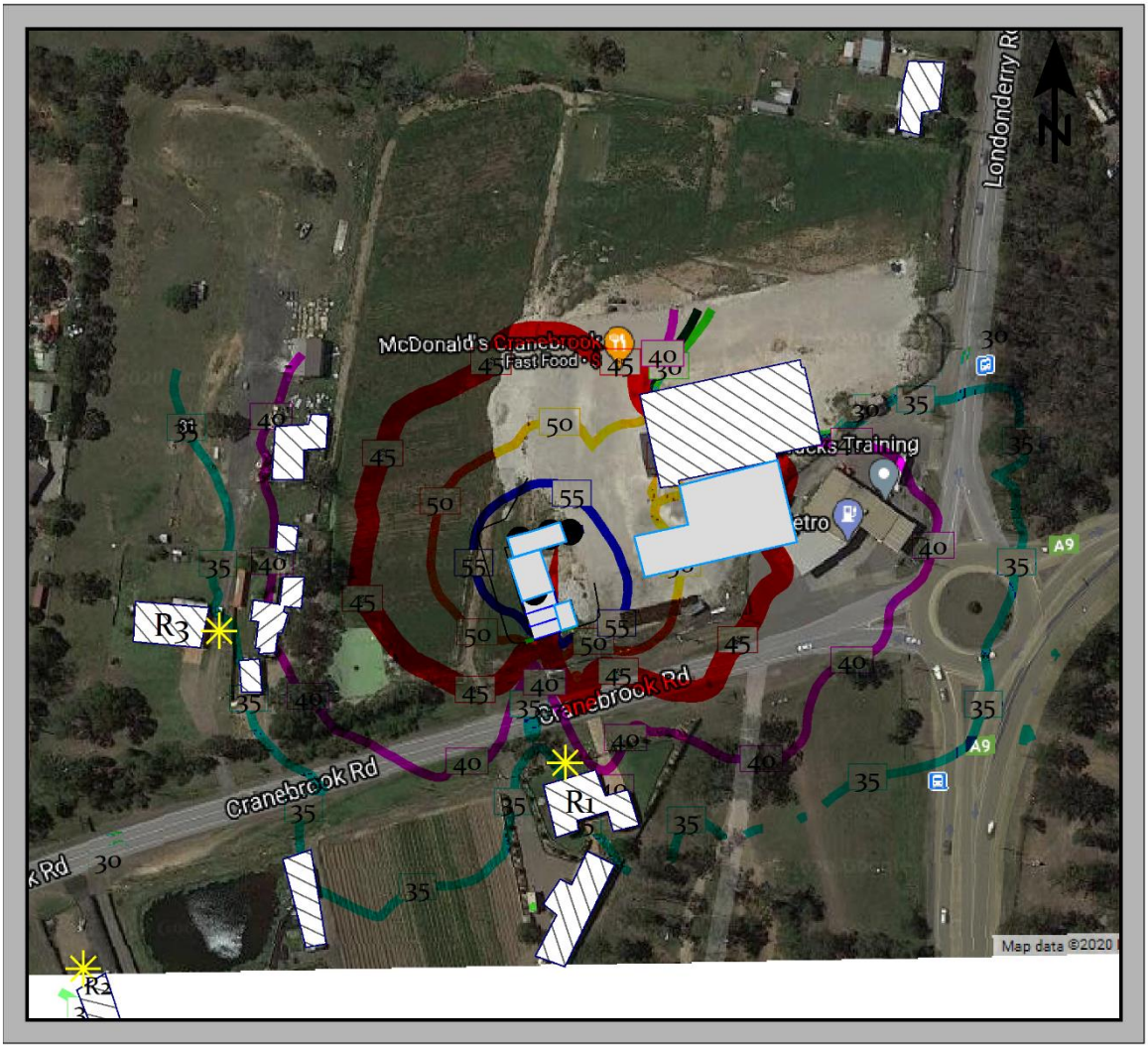
Evening Period at 40%



Signs and symbols
- Main building
- Point receiver
- Industrial building; Roon
- Wall
- Floating screen
- Roof area

Levels L_{Aeq} in dB(A)
- = 30
- = 35
- = 40
- = 45
- = 50
- = 55

Customer:
X Roads Cranebrook Pty Ltd

EcoAcoustics

Length scale 1:2000

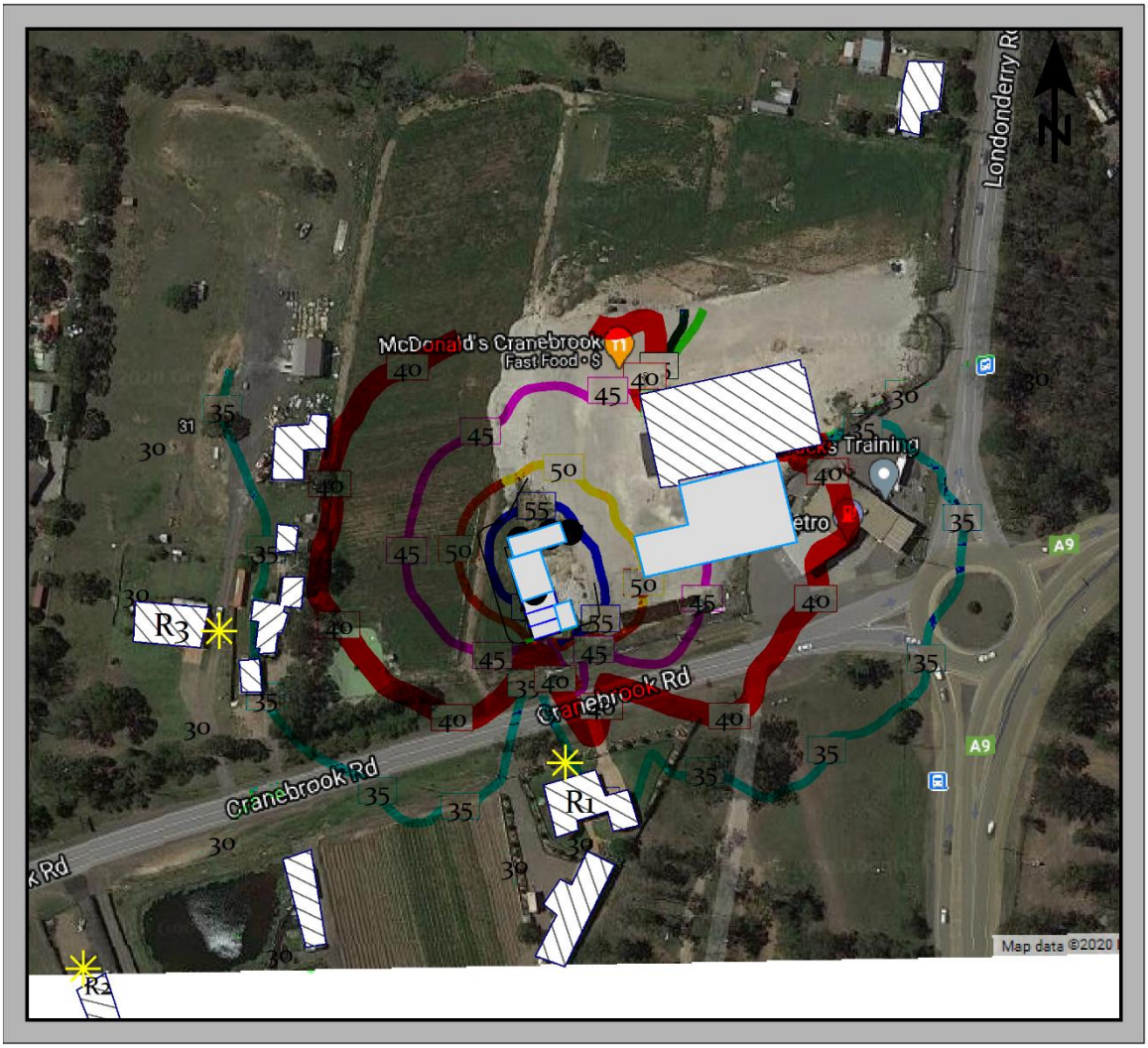
0 20 40 80 120 160 m

Date: 29/11/2020
Project engineer: Rebecca Ireland

Figure 4.3: Noise Contour Plot 1-21 Cranebrook Road Cranebrook

20100899

Night Time Period at 20%



Signs and symbols
- Main building
- Point receiver
- Industrial building; Roon
- Wall
- Floating screen
- Roof area

Levels L_{Aeq} in dB(A)
- = 30
- = 35
- = 40
- = 45
- = 50
- = 55

Customer:
X Roads Cranebrook Pty Ltd

EcoAcoustics

Length scale 1:2000

0 20 40 80 120 160 m

Date: 29/11/2020
Project engineer: Rebecca Ireland

5.2 Assessment of Sleep Disturbance

Table 5.1 presents the predicted noise levels associated with car doors shutting on the site and compares this to the L_{Amax} noise limit for sleep disturbance. To represent the worst-case scenario, the predictions have been made at a series of locations around the site, with the noisiest being shown.

Table 5.1: Assessment of Sleep Disturbance

Location (ref *Figure 1.1*)	Predicted Noise Level Car Doors Closing L_{Amax}, dB(A)	Noise Limit L_{Amax}, dB(A)	Complies with Assigned Noise Level
R1	24	53	Complies
R2	28	53	Complies
R3	35	53	Complies

The results presented in *Table 5.1* show that the predicted L_{Amax} noise levels comply with the Policy for sleep disturbance at nearby residential premises.

6 Recommendations and Discussion

To ensure compliance with the Policy throughout the 24-hour period, the following recommendations are required to be incorporated into the proposed development:

- The proposed automatic car wash will be fitted with an automatic roller door on the exit, providing performance of a minimum R_w 23 (clear 3mm thick PVC);
- The Plant Room roof and the covered entry to the Automatic Wash Bays are both to be lined with 50mm thick 32kg/m³ sound absorbing insulation or similar.

7 Conclusion

The results of the noise predictions show that the proposed site complies with the noise criteria set out in the Policy for all time periods at all nearby residential receivers.

Appendix A

Terminology

Terminology

Ambient Noise

Ambient noise refers to the level of noise from all sources, including background noise as well as the source of interest.

A-Weighting

An A-weighted noise level is a noise level that has been filtered as to represent the way in which the human ear distinguishes sound. This weighting indicates the human ear is more sensitive to higher frequencies than lower frequencies. The A-weighted sound level is described as L_A dB.

Background Noise

Background noise is the noise level from sources other than the source of interest. Background may originate from such things as traffic noise, wind induced noise, industrial noise etc.

Decibel (dB)

The decibel is the unit that characterises the sound power levels and sound pressure of a noise source. It is a logarithmic scale with regard to the threshold of hearing.

Impulsive Noise

An impulsive noise source is a short-term impact noise which may originate from such things as banging, clunking or explosive sound.

L_{A1}

An L_{A1} level is the A-weighted noise level which is overreached for one percent of a measurement period. It represents the average of the maximum noise levels measured.

L_{A10}

An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}

The L_{Aeq} descriptor is used for both the intrusiveness noise level and the amenity noise level. This descriptor represents the level of average noise energy over the relevant period of measurement and takes account of peak noise levels as well as the degree of noise fluctuation. This descriptor is most widely correlated with the subjective effect of noise (Miedema and Vos, 2004). The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods .To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the $L_{Aeq,15min}$ will be taken to be equal to the L_{Aeq}, period+ 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered. Amenity noise level Intrusiveness noise level Monitor and determine RBL (see Section 2.3 and Fact Sheets A and B) Determine applicable noise amenity area (see Tables2.2 & 2.3andtablenotes) Derive project intrusiveness noise level (see Section 2.3) Derive project amenity noise level (see Section 2.4)

Project noise trigger level is lowest value of intrusiveness or project amenity noise level after conversion to $L_{Aeq,15minute}$, dB(A) equivalent level Noise Policy for Industry.

All project noise trigger levels and limits derived in this policy will be expressed as $L_{Aeq,15min}$ values, except as otherwise expressed in Section 2.8.

L_{AF90}

The L_{AF90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90% of the time over a relevant period of measurement using 'A' frequency weighting and fast time weighting. This policy describes a process to derive a rating background noise level (RBL) that provides a single figure that represents the background noise level for assessment purposes.

L_{AFmax}

The L_{AFmax} descriptor is used to measure and quantify maximum noise level events. The L_{AFmax} is the maximum sound pressure level of an event measured with a sound level meter satisfying *AS IEC 61672.1-2004se*t to 'A' frequency weighting and fast time weighting.

L_{AFast}

The noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. L_{AFast} is used when examining the presence of modulation.

L_{APeak}

The L_{APeak} level is the maximum reading (measured in decibels) during a measurement period, using the A frequency weighting and P time weighting AS1259.1-1990.

L_{ASlow}

A L_{ASlow} level is the noise level (measured in decibels) obtained using the A frequency weighting and S time weighting as specified in AS1259.1-1990

Maximum Design Sound Level

Maximum Design Sound Level is the level of noise beyond hearing range of most people occupying the space start, become dissatisfied with the level of noise.

Modulating Noise

A modulating source is an audible, cyclic, and regular source. It is present for at least 10% of a measurement period. The quantitative definition of tonality is:

a fluctuation in the discharge of noise which;

a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;

b) is present for at least 10% of the representative

One-Third-Octave Band

One-Third Octave-Band are frequencies that span one-third of an octave which have a centre frequency between 25 Hz and 20 000 Hz inclusive.

Representative Assessment Period

Representative Assessment Period describes a period of time not less than 15 minutes, and not surpassing four hours. It is determined by an inspector or authorised person to be suitable for the assessment of noise emissions.

Reverberation Time

Reverberation time refers to an enclosure for a sound of a specified frequency or frequency band as well as the time that would be necessary for the reverberantly decaying sound pressure level in the enclosure to decrease by 60 decibels.

RMS

The root mean square level is used to represent the average level of a wave form such as vibration.

Satisfactory Design Sound Level

Satisfactory Design Sound Level refers to the level of noise that has been found to be acceptable for the environment in question, which is also to be non-intrusive.

Sound Pressure Level (L_p)

Sound Pressure Level refers to a noise source which is dependent upon surroundings, and is influenced by meteorological conditions, topography, ground absorption, distance etc. Sound Pressure Level is what the human ear actually hears. Noise modelling predicts the sound pressure level from the sound power levels whilst taking into account the effect of relevant factors (meteorological conditions, topography, ground absorption; distance etc).

Sound Power Level (L_w)

A sound power level of a noise source cannot be directly measured using a sound level meter. It is calculated based on measured sound pressure levels at recognised distances. Noise modelling includes source sound power levels as part of the input data.

Specific Noise

Specific Noise relates to the component of the ambient noise of interest. It can be specified as the noise of interest or the noise of concern.

Tonal Noise

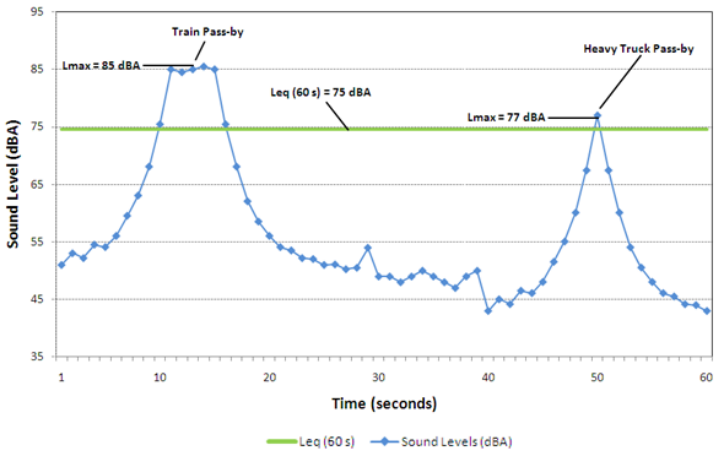
A tonal noise source can be designated as a source that has a specific noise emission over one or several frequencies, such as droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between —

a) the A-weighted sound pressure level in any one-third octave band; and

b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands, is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Chart of Noise Level Descriptors



Typical Noise Levels