

APPENDIX

F

NOISE AND VIBRATION ASSESSMENT

Noise Impact Assessment

Tripoli Way Upgrade – Albion Park, NSW

E140_8201612601

Prepared for
Shellharbour City Council

August 2021



Document Information

Prepared for Shellharbour City Council
Project Name Tripoli Way Upgrade – Albion Park, NSW
File Reference pr_E140_8201612601_02KM.docm
Job Reference E140_8201612601
Date August 2021

Contact Information

Cardno QLD Pty Ltd
Trading as Cardno
ABN 57 051 074 992

L11 Green Square North Tower
515 St Pauls Terrace
Fortitude Valley QLD 4006

Telephone: 07 3369 822
Facsimile: 07 3369 9722
International: +61 7 3369 9822

Julie.mcdonagh@cardno.com.au
www.cardno.com

Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
Draft 01	29 June 2020		PL		JM
02	12 August 2021		KM		PL

© Cardno 2021. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Executive Summary

Shellharbour City Council (Council) propose to develop the Tripoli Way Extension, which would traverse and extend the existing Tripoli Way alignment running parallel to the north of Tongarra Road/Illawarra Highway. The intent of the new bypass road is to help alleviate traffic impacts through Albion Park, as a result of predicted traffic growth along Tongarra Road, both from background traffic and land development in the local area including Calderwood, Tullimbar and Albion Park. The Project would involve construction of new roadways, upgrades to existing roadways (including road widening) and pedestrian walkways.

This noise impact assessment was conducted on the behalf of Shellharbour City Council, for inclusion in the REF prepared for the proposed Tripoli Way Bypass. The assessment has been carried out to determine the predicted noise impacts associated with provision of both the new and upgraded roads associated with the project.

Noise modelling has been carried out to determine whether the proposed upgrade works for the Tripoli Way Upgrade project are likely to result in appropriate noise criteria adopted in accordance with the NSW Department of Roads & Maritime Services (RMS) requirements as defined by the RMS Noise Criteria Guideline. This assessment considers the following impacts on nearby noise sensitive receivers:

- Potential impacts from road traffic noise as a result of the upgrade in accordance with the NSW Road Noise Policy 2011, and associated RMS Noise Criteria, Noise Modelling Validation and Noise Mitigation Guidelines.
- Noise impacts from construction of the project in accordance with NSW Department of Environment, Climate Change & Water (now Department of Environment, Energy and Science) and the RMS guidelines for the control of construction noise impacts.
- Potential construction vibration impacts from the project in accordance with NSW Department of Environment & Conservation, and RMS guidelines for assessing vibration.

This assessment considers the following policies and guidelines:

Construction Noise & Vibration:

- NSW Interim Construction Noise Guideline (DECC 2009) (ICNG)
- RMS Construction Noise & Vibration Guideline (Roads and Maritime 2016) (CNVG)
- NSW Assessing Vibration – A Technical Guideline (DEC 2006) (AV:ATG)

Operational Road Traffic Noise:

- NSW Road Noise Policy (DECCW July 2011) (RNP)
- RMS Noise Criteria Guideline (Roads and Maritime 2015) (NCG)
- RMS Noise Mitigation Guideline (Roads and Maritime 2015) (NMG)
- RMS Noise Model Validation Guideline (Roads and Maritime 2016) (NMVG)
- NSW Environmental Noise Management Manual (RTA 2001) (ENMM)

The prediction of future road traffic noise levels has been based on projected future traffic volumes. Modelling assumptions have been outlined in Section 6.2 of this report.

Assessment Conclusions

Road Traffic Noise

The assessment of road traffic noise was conducted in accordance with the NSW RNP, NCG and NMG. The assessment of current and future traffic conditions has resulted in the following conclusions:

- Traffic noise levels for the year 2041, following completion of the project, are predicted to exceed the criteria at 147 residential receiver locations. This is due to the new road traversing a built-up location in close proximity to residents.
- Options for mitigation include road surface treatments, acoustic barriers/earth mounds, and at-property treatments. The proposed road surface is Dense Graded Asphalt (DGA - AC14), therefore there are limited options for quieter pavement options. Barriers and earth mounds are not a feasible treatment option as driveway access to Tripoli Way will be needed.
- In accordance with the NMG, properties where the noise criteria are predicted to be exceeded are eligible for the consideration of at-property acoustic treatments to mitigate traffic noise intrusion. Therefore, at-property treatments have been recommended for the properties where predicted road traffic noise levels exceed the project criteria.
- The specific mitigation measures should be determined with an operational noise impact assessment during the detail design phase or once the project is complete. The operational noise impact assessment should include additional traffic noise monitoring to verify the results of this assessment, and specify acoustic treatment to affected dwellings, if required.

Construction Noise Impacts

- In accordance with the criteria stipulated in Section 5.2, dwellings exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the daytime RBL +10 dB(A) considered noise affected.
- It is expected that construction of the project would take in the order of 12 months to complete. Standard hours (Monday to Friday 7.00am to 6.00pm, Saturday 8.00am to 1.00pm) would be adopted for the majority of the project, with some out of hours works occasionally required, where works during standard hours would result in unacceptable delays to traffic.
- Construction noise levels are predicted to exceed the NSW ICNG management levels for “standard” hours at a number of residents due to their proximity to the proposed works.
- Construction noise levels are predicted to exceed management levels for “non-standard” hours of operation for all construction phases at the nearby residential receivers. This is due to the proximity of receivers to the construction works.
- Predicted levels were noted to impact receivers below 75 dB(A); therefore no receiver locations are predicted to be highly noise affected. However, if any receivers are located within 15 metres of the works at any stage of the project, it is likely that the highly noise affected criteria may be exceeded.
- It should be noted that this assessment has endeavoured to carry out “worst case” noise modelling, and noise levels are predicted based on a moving line source representative of the total construction noise level moving along the length of the project. Should the work sites or plant and equipment be relocated so that other receivers are located closer to the works, these receivers are likely to be affected more significantly than predicted in this report.
- The predicted exceedances are generally a result of works being located in close proximity to the adjacent receivers. This modelling has been carried out to provide a worst case scenario and it may be possible to

reduce the number of plant operating simultaneously, particularly at night, once detailed construction schedules are known.

- Best practice mitigation measures are recommended in Section 9.2 of this report.
- A detailed assessment of L_{Amax} impact has not been carried out for this assessment as it is difficult to predict L_{Amax} for construction noise sources and it is expected that if the night-time noise management levels are complied with then sleep disturbance is not likely to occur unless high impact noise sources such as piling or jack hammering are proposed for night-time, which should not be carried out for this project.

Construction Vibration Impacts

- Based on the above results human discomfort may be caused should vibratory rolling be carried out within 100 metres of nearby receivers during standard construction hours. For this reason, nearby residential receivers are also likely to be affected. Therefore, vibratory rolling should not be carried out at night due to the increased required separation distance and high potential for sleep disturbance.
- Based on the above results building damage may occur should vibratory rolling be carried out within 10 metres of residential dwellings. Where works are proposed to be close to existing receivers it is recommended that a construction vibration management plan be produced to determine a management methodology to monitor and prevent building damage. This may include provision of pre-construction dilapidation surveys and vibration monitoring during construction.

Table of Contents

Executive Summary	iii
Assessment Conclusions	iv
Technical Terms	10
1 Introduction	12
1.1 Assessment Objectives	12
2 Project Description	13
2.1 Existing Site Description	13
2.2 Surrounding Land Uses	14
2.3 Proposed Project	14
2.4 Determination of the Assessment Footprint	15
3 Existing Noise Environment	17
3.1 Unattended Noise Monitoring Methodology	17
3.2 Equipment Calibration	18
3.3 Metrological Monitoring Conditions	18
3.4 Measurement Parameters	18
3.5 Measured Noise Levels	19
3.5.2 Rating Background Noise Level	19
3.5.3 Road Traffic Noise Levels	20
4 Statutory Noise & Vibration Criteria	24
4.1 Roads & Maritime Noise Criteria Guideline	24
4.1.1 Target Criteria	24
4.1.2 Relative Increase Criteria	24
4.2 Roads & Maritime Noise Mitigation Guideline	25
4.2.1 Minor Works	25
4.3 Roads and Maritime Construction Noise and Vibration Guideline	26
4.4 Interim Construction Noise Guideline	26
4.4.1 Airborne Construction Noise	26
4.4.2 Sleep Disturbance	28
4.5 Vibration Criteria	28
4.5.1 Assessing Vibration: A Technical Guideline (Human Comfort)	28
4.5.2 German Standard DIN 4150 (Building Damage)	29
4.6 Australian Standards	29
5 Design Benchmarks	30
5.1 Road Traffic Noise	30
5.2 Construction Noise	30
5.3.1 Human Comfort Criteria	31
5.3.2 Building Damage Criteria	32
6.1.1 Determination of Assessment Footprint	33
6.1.2 Modelled Source Heights	33
6.1.3 Transition Zones	34
6.1.4 Modelled Scenarios	34
6.2 Noise Modelling Inputs & Assumptions	34
6.2.1 General Modelling Input Data	34
6.2.2 Surveyed Traffic Volumes	35
6.3 Predicted Future Traffic Volumes	35

6.4	Modelled Receivers	38
6.5	Modelling Validation	38
6.6	Predicted Noise Levels	39
6.7	Results Overview	62
7	Construction Noise Impact Assessment	63
7.1	Construction Noise Assessment Methodology	63
7.2	Modelled Construction Phases	63
7.3	Noise Catchment Areas	63
7.4	Construction Timing	64
7.5	Construction Plant & Equipment	64
7.6	Predicted Construction Noise Levels	65
7.7	Construction Noise Results Summary	73
7.7.1	Sleep Disturbance	73
8	Construction Vibration Assessment	74
8.1	Vibration limits	74
8.1.1	Vibration assessment	74
9.1	Operational Road Traffic Noise	76
10	Conclusions	82
10.1	Operational Road Traffic Noise Impacts	82
10.2	Construction Noise Impacts	82
10.3	Construction Vibration Impacts	83

Appendices

Appendix A	PROJECT ASSESSMENT AREA
Appendix B	NOISE MONITORING CHARTS
Appendix C	WEATHER DATA NOISE MONITORING PERIOD
Appendix D	NOISE CONTOUR MAPS – ROAD TRAFFIC NOISE IMPACT
Appendix E	NOISE CONTOUR MAPS – PREDICTED CONSTRUCTION NOISE IMPACT

Tables

Table 2-1	Key Features of the Project	15
Table 3-1	Noise Monitoring Equipment	17
Table 3-2	Observed Existing Noise Environment	19
Table 3-3	Rating Background Noise Level	20
Table 3-4	Measured Road Traffic Noise Levels	20
Table 4-1	NCG Road Traffic Noise Assessment Criteria for Residential Land Uses	24
Table 4-2	Relative Increase Criteria for Residential Land Uses	25
Table 4-3	Noise at Residences Using Quantitative Assessment (Source: DECC, 2009)	26
Table 4-4	Types of Vibration	29
Table 5-2	Construction Noise Management Levels	30

Table 5-4	DIN 4150-3 Structural Damage Criteria	32
Table 6-1	Modelled Scenarios	34
Table 6-2	Modelling Assumptions	34
Table 6-3	Surveyed traffic volumes	35
Table 6-4	Future Traffic Volumes	36
Table 6-5	Measured versus Modelled Existing Road Traffic Noise Levels	38
Table 6-6	Predicted Noise Levels (Daytime) – Residential Receivers	40
Table 6-7	Predicted Noise Levels(Night-time) – Residential Receivers	50
Table 7-1	Modelled construction phases	63
Table 7-2	Construction Plant Sound Power Levels	64
Table 7-3	Predicted Construction Noise Levels	66
Table 8-1	Recommended minimum working distance from sensitive receivers	74
Table 9-1	Summary of Proposed Properties Requiring Treatment	77
Table C1	Recorded Weather Data during the Monitoring Period – Shellharbour Airport	96

Figures

Figure 2-1	Project area	14
Figure 2-2	Project Assessment Extents (Operational Noise)	16
Figure 3-1	Noise Logger Locations	18
Figure 3-2	Averaged Measured Noise Levels – Logger 1	21
Figure 3-3	Averaged Measured Noise Levels – Logger 2	21
Figure 3-4	Averaged Measured Noise Levels – Logger 3	22
Figure 3-5	Averaged Measured Noise Levels – Logger 4	22
Figure 3-6	Averaged Measured Noise Levels – Logger 5	23
Figure 6-1	Modelled road segments	36
Figure 7-1	Noise Catchment Areas	64
Figure A1	Project Assessment Area – Daytime $L_{Aeq,15hr}$. Predicted Increase in Noise Levels as a Result of the Project	85
Figure A2	Project Assessment Area – Night-time $L_{Aeq, 9hr}$ Predicted Increase in Noise Levels as a Result of the Project	86
Figure A3	Target Criteria Transition Zones – Day-time $L_{Aeq, 15hr}$	87
Figure A4	Target Criteria Transition Zones – Night-time $L_{Aeq, 9hr}$	88
Figure B1	Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 1	90
Figure B2	Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 2	91
Figure B3	Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 3	92
Figure B4	Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 4	93
Figure B5	Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 5	94
Figure E1	Predicted 2026 Road Traffic Noise Levels – With Build - Daytime Residential ($L_{Aeq,15hr}$)	104
Figure E2	Predicted 2026 Road Traffic Noise Levels – With Build – Night time Residential ($L_{Aeq,9hr}$)	105
Figure E3	Predicted 2026 Road Traffic Noise Levels – No Build – Daytime Residential ($L_{Aeq,15hr}$)	106
Figure E4	Predicted 2026 Road Traffic Noise Levels – No Build – Night time Residential ($L_{Aeq,9hr}$)	107
Figure E5	Predicted 2041 Road Traffic Noise Levels – With Build - Daytime Residential ($L_{Aeq,15hr}$)	108
Figure E6	Predicted 2041 Road Traffic Noise Levels – With Build - Night-time Residential ($L_{Aeq,9hr}$)	109

Figure E7	Predicted 2041 Road Traffic Noise Levels – No Build – Daytime Residential ($L_{Aeq,15hr}$)	110
Figure E8	Predicted 2041 Road Traffic Noise Levels – No Build – Night time Residential ($L_{Aeq,9hr}$)	111
Figure F1	Predicted Construction Noise Impact Worst Case – Site Establishment	113
Figure F2	Predicted Construction Noise Impact Worst Case – Bulk Earthworks	114
Figure F3	Predicted Construction Noise Impact Worst Case – Bridge Works	115
Figure F4	Predicted Construction Noise Impact Worst Case – Surface Works	116

Technical Terms

Term	Definition
Adverse Weather	Weather effects that enhance noise (that is, wind and rain) that occur at a site for a significant period of time (that is, wind exceeding 5 m/s and rain exceeding 0.5 mm per hour during any measurement period.)
A-weighted Level	As per dB(A) defined below.
Ambient Sound	Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.
AV:ATG	New South Wales Office of Environment and Heritage Assessing Vibration: A Technical Guide (DEC 2006)
Background Sound Level	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources.
CNVG	NSW Roads and Maritime Construction Noise & Vibration Guideline (RMS 2016)
CoRTN	Calculation of Road Traffic Noise, HMSO 1988
dB(A)	Unit of acoustic measurement electronically weighted to approximate the sensitivity of human hearing to sound frequency.
DEC	NSW Department of Environment and Conservation, now known as the NSW Office of Environment and Heritage
DECC	NSW Department of Environment and Climate Change, now known as the NSW Office of Environment and Heritage
DECCW	NSW Department of Environment and Climate Change and Water, now known as the NSW Office of Environment and Heritage
Decibel, dB	Unit of acoustic measurement. Measurements of power, pressure and intensity may be expressed in dB relative to standard reference levels.
ECRTN	New South Wales superseded Office of Environment and Heritage Environmental Criteria for Road Traffic Noise (EPA 1999).
ENMM	The New South Wales Department of Roads and Maritime Safety Environmental Noise Management Manual (RTA 2001).
EPA	New South Wales Environmental Protection Authority
ICNG	New South Wales Office of Environment and Heritage Interim Construction Noise Guideline (DECCW 1999).
INP	New South Wales Office of Environment and Heritage Industrial Noise Policy (EPA 2000).
L90, L10 etc.	A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, i.e. L90 is the level which is exceeded for 90 percent of an observation period. L90 is commonly referred to as a basis for measuring the background sound level.
LA _{bg} , T	The A-weighted background sound level measured over a time interval T.

Term	Definition
LAeq, T	Equivalent continuous A-weighted sound pressure level. This is the value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.
NCG	The New South Wales Department of Roads and Maritime Noise Criteria Guideline (RMS 2015)
NMG	The New South Wales Department of Roads and Maritime Noise Mitigation Guideline (RMS 2015)
NMVG	The New South Wales Department of Roads and Maritime Noise Model Validation Guideline (RMS 2016)
NSW	New South Wales
RBL	Rating Background Level
RNP	New South Wales Office of Environment and Heritage Road Noise Policy (DECCW 2011).
RTA	NSW Roads and Traffic Authority, now known as the NSW Department of Transport, Roads and Maritime Services
RMS	NSW Roads and Maritime Services
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Pressure Level, Lp, dB, of a sound	A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 microPascals.
Sound Power Level, Lw, dB of a source	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power level is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt.
TfNSW	Transport for New South Wales, formerly Roads and Maritime Services

1 Introduction

Shellharbour City Council (Council) propose to develop the Tripoli Way Extension, which would traverse and extend the existing Tripoli Way alignment running parallel to the north of Tongarra Road/Illawarra Highway. The intent of the new bypass road is to help alleviate traffic impacts through Albion Park, as a result of predicted traffic growth along Tongarra Road, both from background traffic and various land developments in the local area including Calderwood, Tullimbar and Albion Park. The Project would involve construction of new roadways, upgrades to existing roadways (including road widening) and pedestrian walkways.

This noise impact assessment was conducted on the behalf of Shellharbour City Council, for inclusion in the REF prepared for the proposed Tripoli Way Bypass. The assessment has been carried out to determine the predicted noise impacts associated with provision of both the new and upgraded roads associated with the project.

The noise impact assessment has been carried out to determine the level of predicted impacts from the proposed upgrade works for the Tripoli Way Upgrade project and appropriate forms and levels of mitigation in accordance with the requirements of RMS where applicable.

Computer noise modelling has been carried out to determine whether the proposed road and intersection upgrade works for the project will comply with the new road, redeveloped road and transition zone noise criteria as defined by the RMS Noise Criteria Guideline, and to identify any potential impacts on nearby sensitive receivers as a result of the project.

This assessment considers the following policies and guidelines:

- NSW Interim Construction Noise Guideline (DECC 2009) (ICNG)
- RMS Construction Noise & Vibration Guideline (Roads and Maritime 2016) (CNVG)
- NSW Assessing Vibration – A Technical Guideline (DEC 2006) (AV:ATG)
- NSW Road Noise Policy (DECCW July 2011) (RNP)
- RMS Noise Criteria Guideline (Roads and Maritime 2015) (NCG)
- RMS Noise Mitigation Guideline (Roads and Maritime 2015) (NMG)
- RMS Noise Model Validation Guideline (Roads and Maritime 2016) (NMVG)
- NSW Environmental Noise Management Manual (RTA 2001) (ENMM)

In undertaking the assessment, unattended noise monitoring was conducted to measure noise from the existing road network concurrently with traffic counts. 3D noise modelling software (SoundPLAN 8.2) was used to create a noise model of the existing scenario which was verified against the measured levels.

The verified model was then used to predict road traffic noise levels for the upgraded road design impacting on the noise sensitive receptors by adopting the appropriate traffic scenarios, and updating the model with predicted future road traffic volumes, and the proposed design alignment.

1.1 Assessment Objectives

The assessment objectives are to determine the predicted levels of noise and vibration impact on sensitive receivers located near to the project, and determine the levels of mitigation that are likely to be required, if applicable, to enable compliance with the current NSW legislation.

2 Project Description

2.1 Existing Site Description

Tripoli Way is a 550 metre long local road that currently runs between Hamilton Road to the east and Calderwood Road to the west. The roadway is split into two segments, separated by trees and grass on undeveloped land. The road currently extends approximately 430 metres east of Hamilton and 45 metres west of Calderwood Road, with the two sections separated by mostly undeveloped land and a few driveways leading into residential lots.

Tripoli Way runs in a generally east/west direction and provides access to a number of low density residential dwellings. The proposed Tripoli Way Extension encompasses the full length and surrounding area of Tripoli Way and continues east and may link into the future Albion Park Rail Bypass through existing rural properties and west to link into Tongarra Road (Illawarra Highway) at the intersection with Broughton Avenue.

The existing acoustic environment throughout the project area is typical of a suburban area, with ambient noise primarily consisting of traffic noise at varying levels. Residents in the area are generally not impacted by noise from industrial or commercial sources to any significant degree. The investigation study area is proximate to the Shellharbour Airport and may be moderately impacted by occasional overflights from aircraft. The project area is situated in a semi-rural low density residential area to the north and adjacent to some higher density existing residential areas to the south.

The sensitive receptors located immediate adjacent to the proposed upgrade / extension of Tripoli Way are mainly situated on the southern side of the street, with a few receptors situated on the northern side generally at greater distances from the road. The majority of the noise sensitive receptors are residential in nature with a few commercial shops, Albion Park Bowling & Recreation Club, Albion Park RSL, Albion Park-Shellharbour Presbyterian Church and Albion Park Public School situated south of Tripoli Way but north of Tongarra Road. Further commercial shops as well as Albion Park Anglican Church, St Paul's Catholic Church and St Paul's Catholic Primary School are situated immediate south of Tongarra Road and as such more than 250 metres south of the proposed Tripoli Way Extension. It should be noted that the majority of the commercial shops are located at the eastern end of the project area.

Figure 2-1 shows the project area.

Figure 2-1 Project area



The proposed road length of the project is approximately 1,575 metres, with a variable road reserve width ranging between 15 and 37 metres.

2.2 Surrounding Land Uses

The surrounding land uses include:

- Residential dwellings on large lots are generally situated immediately north of the proposal. Further north is the Macquarie Rivulet, classified as “Environmentally Sensitive Land” under the Shellharbour Local Environmental Plan 2013 (SLEP), and land used for agricultural purposes. At the eastern most extent of the Proposal, a commercial premises, Albion Park Landscaping Supplies, is situated north of the Site.
- A water body and its foreshore are situated immediately east of the most eastern extent of the Site. The water body and its foreshore are classified as “Environmentally Sensitive Land” under the SLEP. May Harris Park, including Keith Gray Oval and the Albion Park Showground, are located further east. May Harris Park is listed as a heritage item under the SLEP.
- Urban residential dwellings comprising the Town of Albion Park are generally situated immediately south of the Proposal.
- Land used for agricultural purposes is situated west of the site.

2.3 Proposed Project

The upgrade and extension of Tripoli Way within Albion Park, New South Wales is required to service future development and land use changes in the Calderwood area, west and north-west of Albion Park. The Tripoli Way Extension would provide improved access to and from this proposed future development. In addition, it is expected that as these areas develop the role of the Albion Park Town Centre as a commercial and retail hub would increase in

importance. The new Tripoli Way Extension bypass road would also provide improved access for traffic movements to and from the Town Centre.

Shellharbour City Council (Council) propose to develop the Tripoli Way Extension, which would traverse and extend the existing Tripoli Way alignment running parallel to the north of Tongarra Road/Illawarra Highway. The intent of the new bypass road is to help alleviate traffic impacts through Albion Park, as a result of predicted traffic growth along Tongarra Road, both from background traffic and land development in the local area including Calderwood, Tullimbar and Albion Park. The Project would involve construction of new roadways, upgrades to existing roadways (including road widening and intersection upgrades) and pedestrian walkways.

The key objectives of the project are to:

- Upgrade and extend Tripoli Way to provide efficient and functional access for future development and land use changes in the area
- Reduce potential congestion along Tongarra Road, Illawarra Highway and the surrounding road network caused by future development and land use changes in the Calderwood area
- Improve safety for local motorists, pedestrians and cyclists
- Ensure consistency in the Project design against the relevant NSW strategies and current design standards

Table 2-1 Key Features of the Project

Item	Proposed Works
Lanes	Single 4m wide lane in both directions with 3.5m wide verges on both sides
Route	A 60km/hr section of sub-arterial road linking the Illawarra Highway with the proposed new Albion Park Rail Bypass
Interchanges	Roundabout controlled intersections at the intersections with Illawarra Highway (new fourth leg proposed to the existing roundabout), Calderwood Road and Hamilton Road
Pavement Surface	Dense Graded Asphalt (AC14)

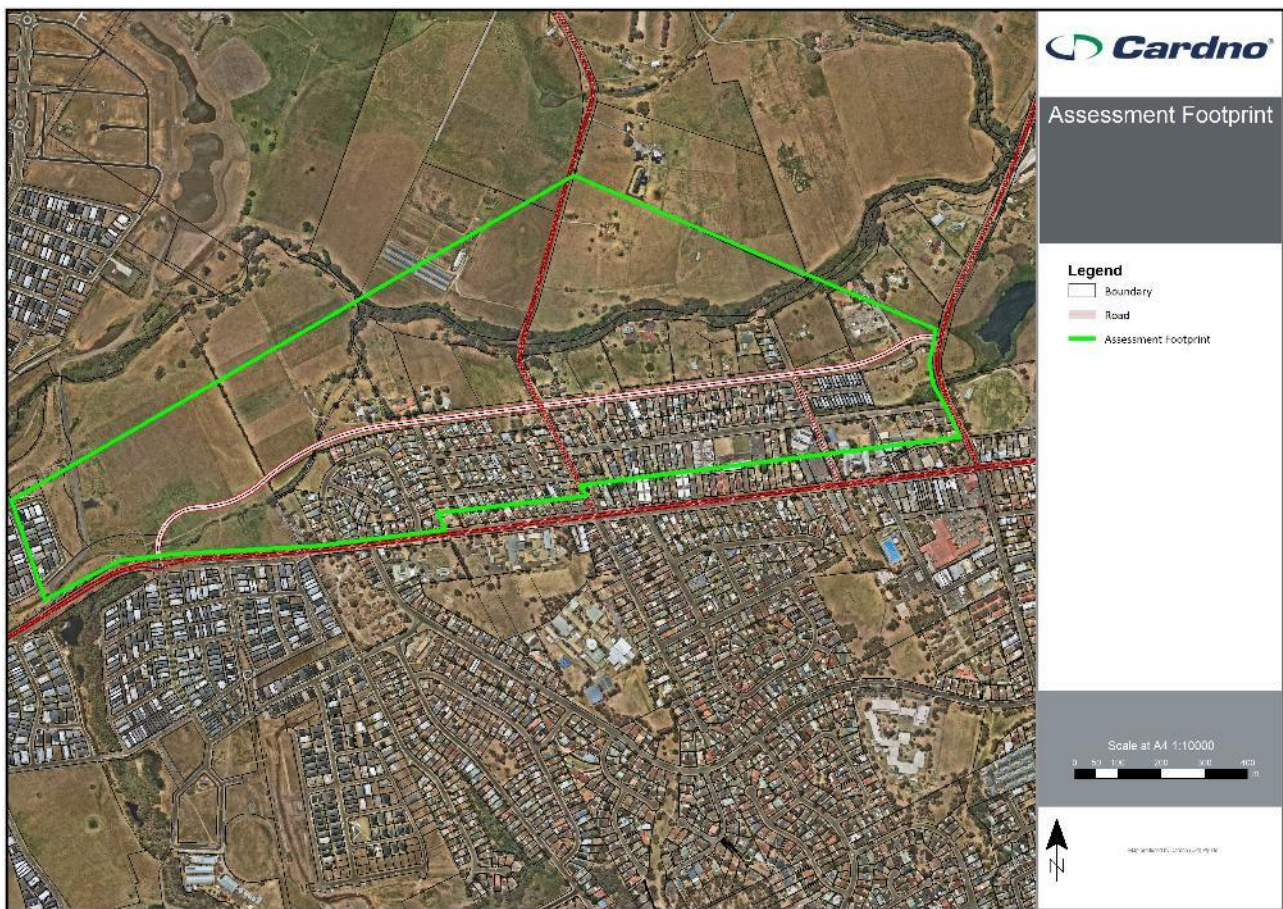
2.4 Determination of the Assessment Footprint

The noise investigation study area was determined in accordance with the Roads and Maritime Noise Criteria Guideline (NCG) (Roads and Maritime, 2015). The investigation study area primarily consists of residential land uses. The assessed subject roads include the proposal between Tongarra Road in the west and Terry Road to the east. Other roads located within the investigation study area include the Tongarra Road, Calderwood Road, and Hamilton Road.

Due to the built up nature of the surrounding area and prevalence of existing roads, the assessment footprint is defined as locations whereby the project will cause an increase in overall traffic noise impacts of 2 dBA or more, when compared to impacts if the project were not to proceed.

The extent of the calculated assessment area is shown below in Figure 2-2. The prediction results used to determine which receivers are eligible for assessment are detailed in Figures A1 to A2 in Appendix A.

Figure 2-2 Project Assessment Extents (Operational Noise)



3 Existing Noise Environment

The acoustic environment within the investigation study area is typical of a suburban area, with ambient noise primarily consisting of traffic noise at varying levels. Residents in the area are generally not impacted by noise from industrial or commercial sources to any significant degree. The investigation study area is proximate to the Shellharbour Airport and may be moderately impacted by occasional overflights from aircraft.

3.1 Unattended Noise Monitoring Methodology

Unattended noise monitoring was conducted between 4 and 12 September 2017 at the following locations;

- **Logger 1** was located at 3 Broughton Avenue, Tullimbar. The microphone was located approximately 1 metre from the dwelling façade, 28 metres from the centreline of Tongarra Road and approximately 40 metres from the roundabout between Tongarra Road and Broughton Avenue.
- **Logger 2** was located at 23 Calderwood Road, Albion Park. The logger was located approximately 15 metres from the centre of Calderwood Road in a free field location.
- **Logger 3** was located at 6 Tripoli Way, Albion Park. The microphone was located 1.4 metres above ground level and approximately 11 metres from the kerb in a free field location.
- **Logger 4** was located at 12 Hamilton Rd, Albion Park. The microphone was located approximately 1.3 metres above ground level and 1 metre from the dwelling.
- **Logger 5** was located on the property of 28 Terry St, Albion Park. The microphone was located 1.3 metres above ground level and approximately 30 metres from the centreline of Terry Street and in a free field location.

The noise monitors were configured with the following instrument settings;

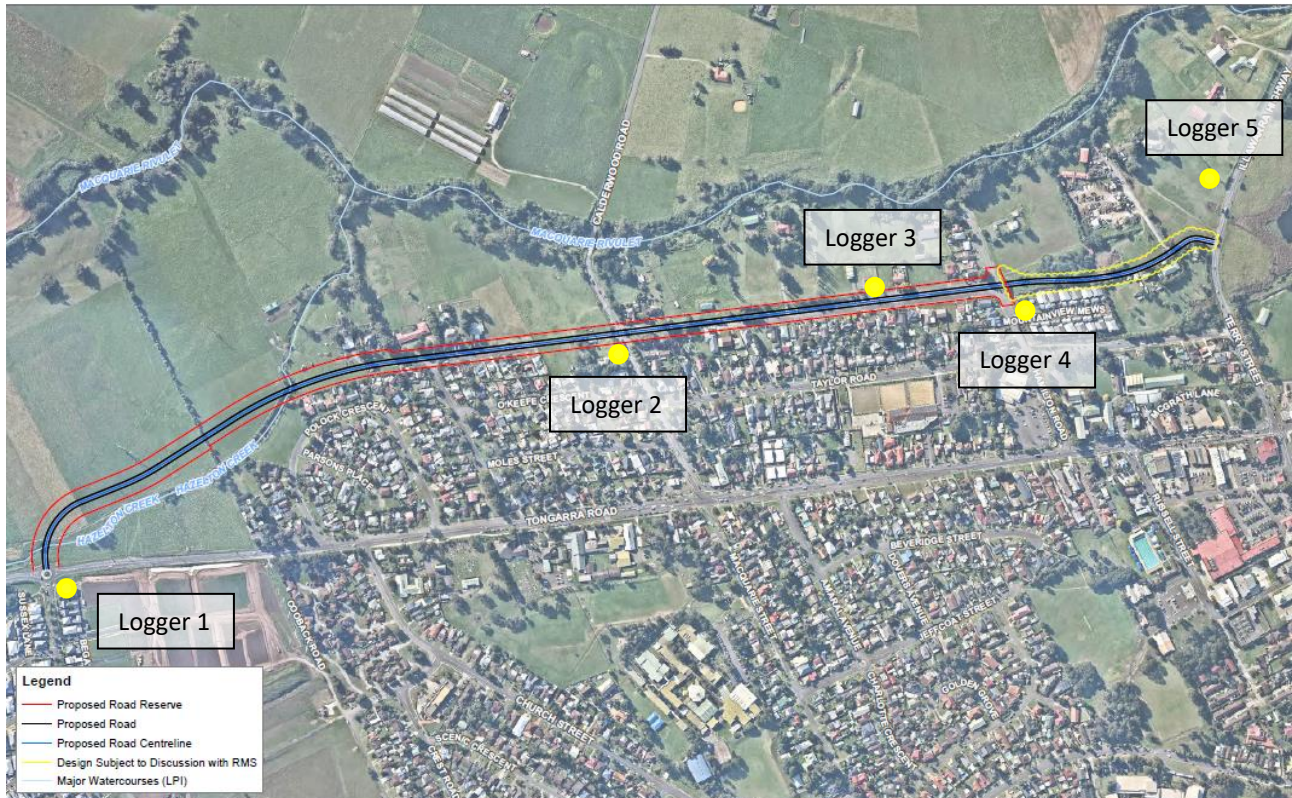
- 'A' weighting
- 'Fast' response
- 15 minute statistical intervals
- Measurement descriptors $L_{A\text{Max}}$, $L_{A\text{eq}}$, L_{A1} , L_{A10} , L_{A90}

Unattended noise monitoring was carried out using the following equipment:

Table 3-1 Noise Monitoring Equipment

Location	Logger Type	Serial Number
1	Rion NL-42EX	01060941
2	Rion NL-42EX	00810713
3	Rion NL-42EX	00410151
4	ARL Ngara	8780EA
5	Rion NL-42EX	00810712

Figure 3-1 Noise Logger Locations



3.2 Equipment Calibration

Calibration of the sound monitoring equipment was conducted before and after the measurement period, with a variance of less than ± 0.3 dB recorded.

3.3 Metrological Monitoring Conditions

A summary of the environmental conditions noted during the measurement period were as follows (sourced from the Bureau of Meteorology (BOM) Albion Park weather station located 2 km from the site):

Rain: Nil.
 Wind: Calm to 10 m/s predominantly from the west
 Humidity: 17 - 99%
 Temperature: 2 – 27 °C

Detailed weather information applicable to the site during the monitoring period is detailed in Appendix C. The data was reviewed to determine time periods that were affected by adverse weather as described in the NSW INP.

3.4 Measurement Parameters

As environmental noise varies with time, the use of statistical descriptors is necessary to understand and describe these variations. For road traffic noise these descriptors are further classified for day time (7am - 10pm) and night time (10pm - 7am).

For environmental noise, the assessment period for day time is further split into day (7am – 6pm) and evening (6pm – 10pm). A-weighted statistical levels are used to describe ambient noise levels. The common descriptors used to describe environmental noise are described as follows:

L_{Amax} :	the A-weighted maximum noise level measured during the measurement period.
L_{A1} :	the A-weighted noise level exceeded for 1% of the measurement period.
L_{A10} :	the noise A-weighted level exceeded for 10% of the measurement period, generally referred to as the average maximum sound pressure level.
L_{A90} :	the A-weighted noise level exceeded for 90% of the measurement period, generally referred to as the background noise level (refer AS 1055.1 – 1997).
L_{Aeq} :	the equivalent continuous noise level over the measurement period, generally referred to as the energetical average sound pressure level over the measurement period.

3.5 Measured Noise Levels

Measured noise levels at each logger location were observed to be affected by the following:

Table 3-2 Observed Existing Noise Environment

Logger	Location	Observed Noise Environment
1	3 Broughton Avenue, Tullimbar	The primary source of noise was from traffic on Tongarra Road. Noise generated by high wind speeds were also recorded.
2	23 Calderwood Road, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on Calderwood Road was also observed. Traffic noise from Tongarra Road was also recorded.
3	6 Tripoli Way, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on Tripoli Way was also observed. Traffic noise from Tongarra Road was also recorded.
4	12 Hamilton Road, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on the local roads were also observed. Traffic noise from Tongarra Road was also noticed. Noise from domestic activities within the dwelling was also identified.
5	28 Terry Street, Albion Park	The primary source of noise was from traffic on Terry Street. Noise generated by rustling leaves was also identified.

3.5.2 Rating Background Noise Level

The Rating Background Level (RBL) for each site was determined in accordance with the Noise Policy for Industry (EPA, 2017) (NSW NPI). The RBL is defined by the NSW INP as follows:

“Rating background noise level (RBL) – the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background noise level is the level used for assessment purposes. Where the rating

background noise level is found to be less than 30 dB(A) for the evening and night periods, then it is set to 30 dB(A); where it is found to be less than 35 dB(A) for the daytime period, then it is set to 35 dB(A).”

The weather affected data (due to wind or rain) was excluded from the analysis in accordance with the INP requirements. The RBL applicable to each site is detailed in Table 3-3.

Table 3-3 Rating Background Noise Level

Logger	Measurement Location	Measured Rating Background Noise Level, dB(A)		
		07:00-18:00	18:00-22:00	22:00-07:00
1	3 Broughton Avenue, Tullimbar	45	33	27
2	23 Calderwood Road, Albion Park	39	33	30
3	6 Tripoli Way, Albion Park	41	35	29
4	12 Hamilton Road, Albion Park	38	34	28
5	28 Terry Street, Albion Park	50	43	33

The measured RBLs from Table 3-3 have been used to formulate the noise objectives for construction noise impacts as detailed in Section 5.2.

3.5.3 Road Traffic Noise Levels

The measured road traffic noise levels are displayed in Table 3-4 below:

Table 3-4 Measured Road Traffic Noise Levels

Logger	Measurement Location	Measured Noise Level, dB(A)	
		L _{Aeq} , 15 hour 07:00-22:00	L _{Aeq} , 9 hour 22:00-07:00
1	3 Broughton Avenue, Tullimbar	61	55
2	23 Calderwood Road, Albion Park	59	53
3	6 Tripoli Way, Albion Park	51	49
4	12 Hamilton Road, Albion Park	48	45
5	28 Terry Street, Albion Park	60	58

Typical measured noise levels, averaged from measured data, and not affected by inclement weather (i.e weather affected data removed), are shown below in Figure 3-2 to Figure 3-6 for all five loggers. Full noise charts are displayed in Appendix A.

Figure 3-2 Averaged Measured Noise Levels – Logger 1

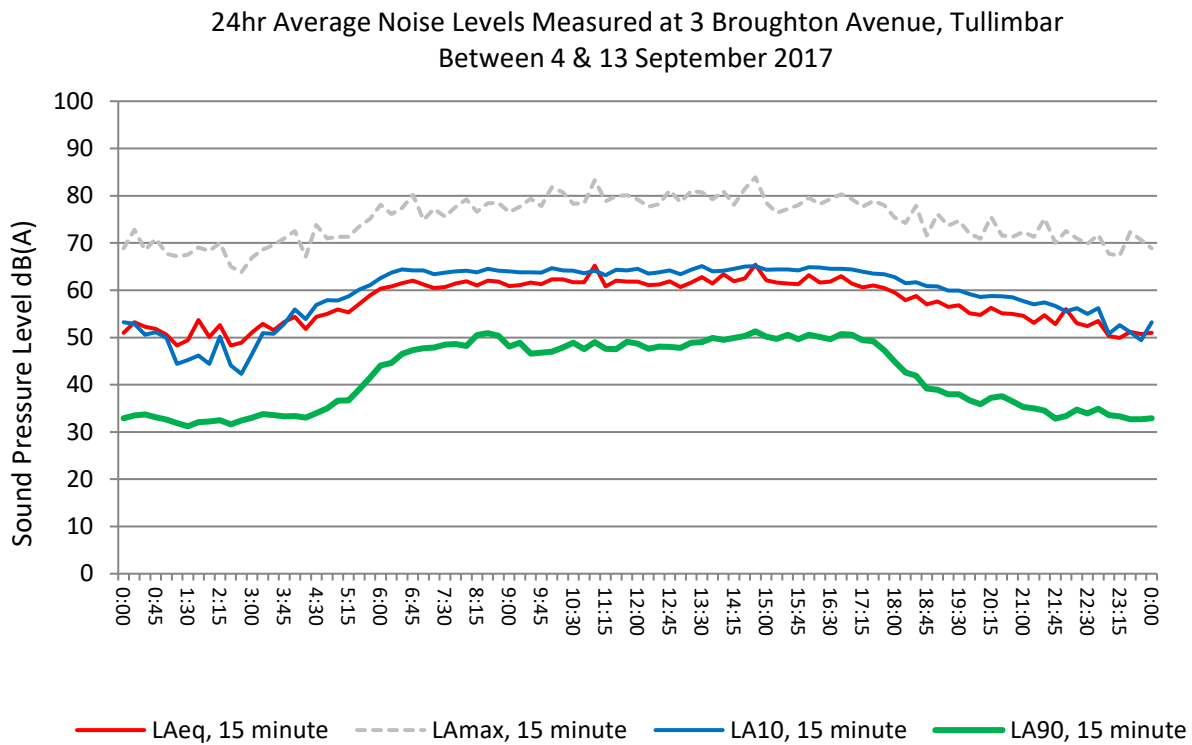


Figure 3-3 Averaged Measured Noise Levels – Logger 2

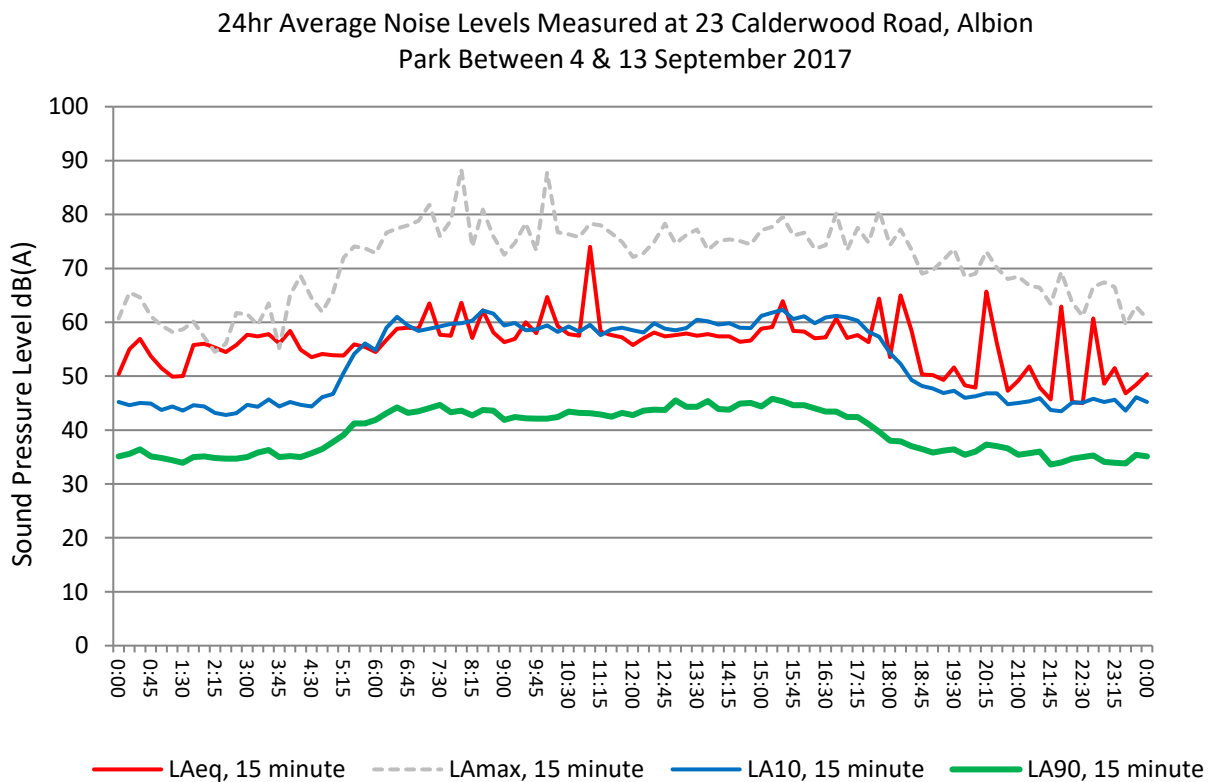


Figure 3-4 Averaged Measured Noise Levels – Logger 3

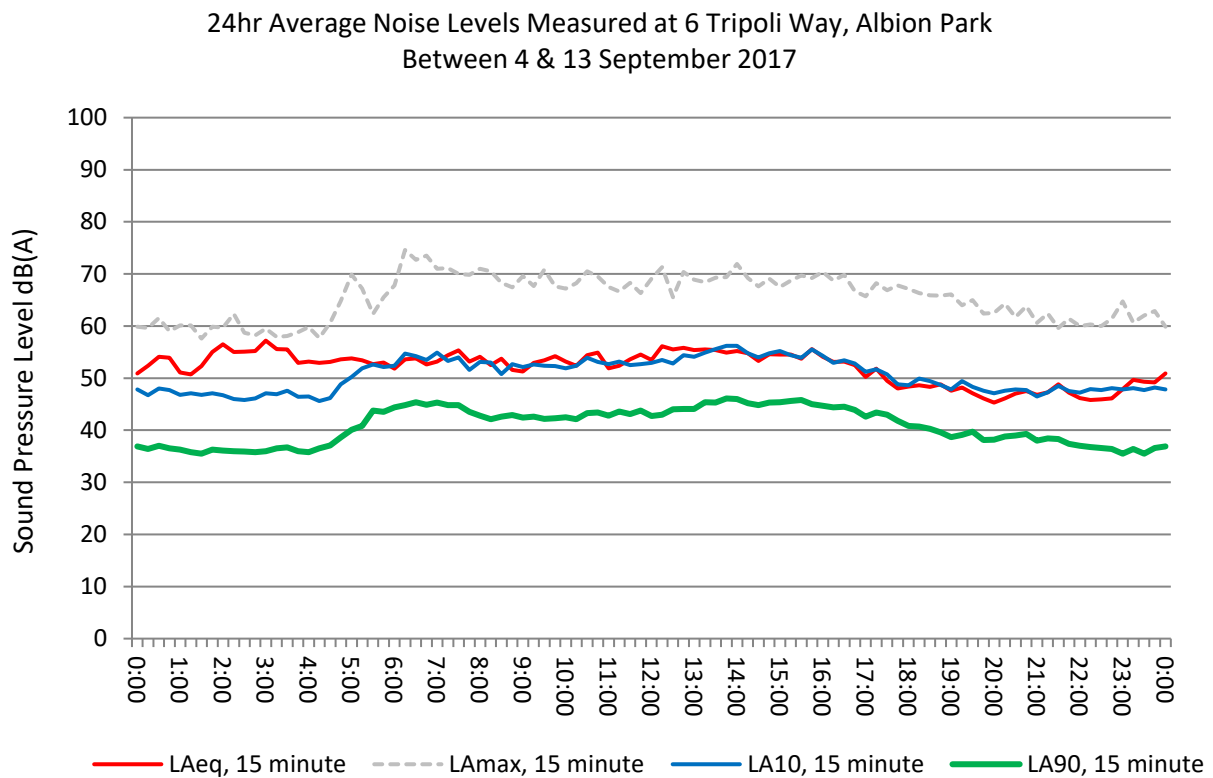


Figure 3-5 Averaged Measured Noise Levels – Logger 4

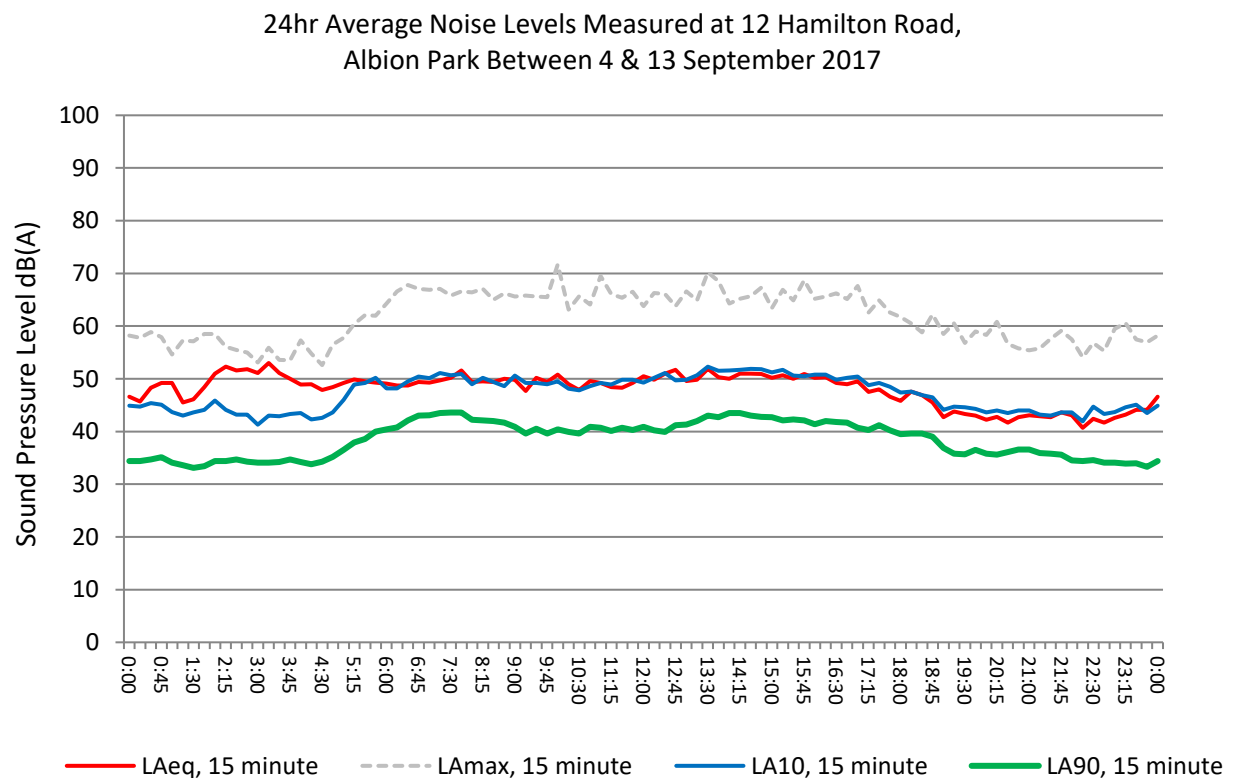
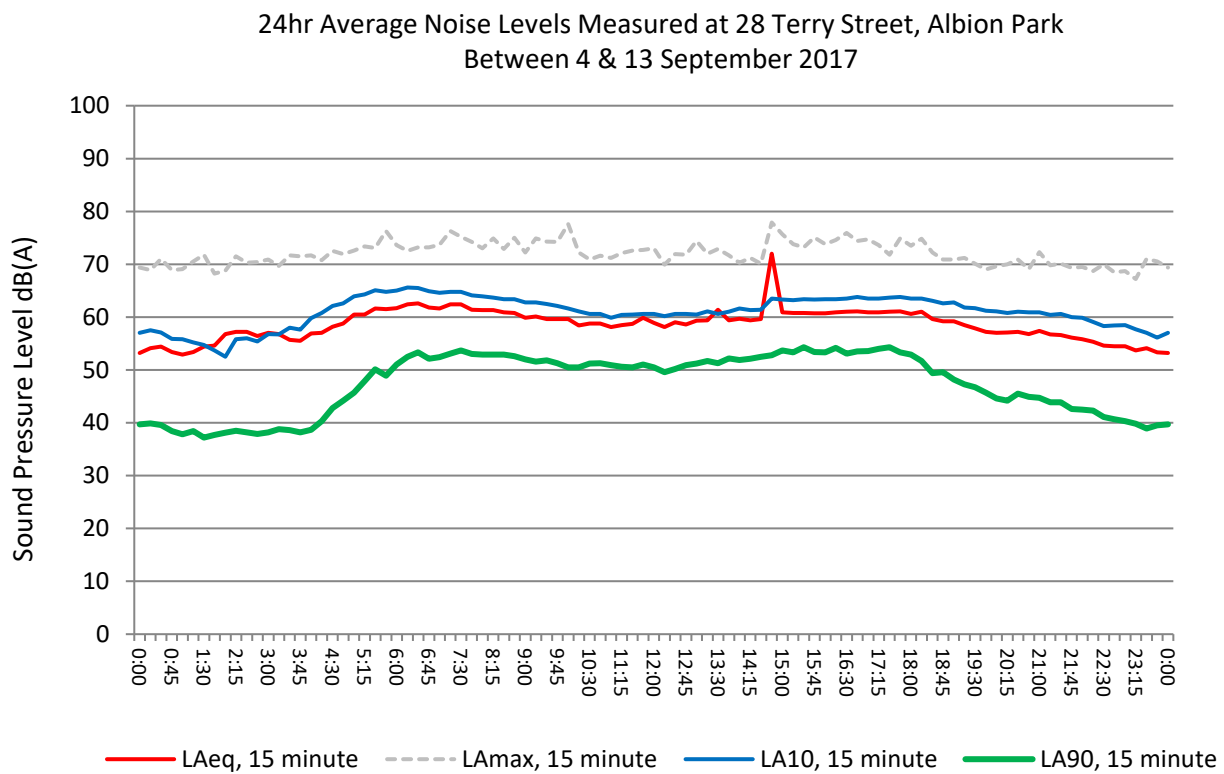


Figure 3-6 Averaged Measured Noise Levels – Logger 5



4 Statutory Noise & Vibration Criteria

4.1 Roads & Maritime Noise Criteria Guideline

Noise criteria are assigned to sensitive receivers using RMS' Noise Criteria Guideline (NCG). RMS' NCG provides guidance on how to apply the NSW Road Noise Policy.

Residences may be assigned new, redeveloped, transition zone or relative increase criteria depending on how the project will influence noise levels. For each facade of the sensitive receiver, the most stringent applicable criteria will be used in the assessment.

Criteria are based on the road development type a sensitive receiver is affected by due to the road project. In some instances, residences may be exposed to noise from new and redeveloped roads or different functional classes. In this instance the proportion of noise from each road is used to establish transition zone criteria and provides a smooth change in noise criteria between adjacent residences. A further check is made to prevent large increases in noise level using the relative increase criteria.

A road is defined as 'new' where the road is a bypass or has been substantially realigned (outside the NCG tolerance band and/or existing grade). However, consideration can be given to whether a road has been substantially realigned for distances less than six times the existing lane width using local context for guidance. This is consistent with the NCG.

The redeveloped road criteria is 5 dB(A) higher than the new road criteria, however, a receiver location with relatively equal exposure to both new and redeveloped roads will have target noise level between the higher and lower of the two noise limits.

4.1.1 Target Criteria

The applicable NCG target criteria for residential receivers located near to arterial and sub-arterial roads are shown in Table 4-1.

Table 4-1 NCG Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project / Land Use	Assessment Criterial, dB(A)	
		L _{Aeq} , 15 hour 07:00-22:00	L _{Aeq} , 9 hour 22:00-07:00
Freeway/arterial/sub-arterial roads	1. Existing residences* affected by noise from new freeway/ arterial/sub-arterial road corridors	55 (external)	50 (external)
	2. Existing residences* affected by noise from redevelopment of existing freeway/arterial/ sub-arterial roads	60 (external)	55 (external)

4.1.2 Relative Increase Criteria

In addition to the assessment criteria outlined in Table 4-1, any increase in the total traffic noise level at a location due to a proposed project or traffic-generating development is required to be considered.

Section 2.4 of the RNP states that residences experiencing increases in total traffic noise level above the relative increase criteria shown below in Table 1-5 should also be considered for mitigation. For road projects where the main subject road is a local road, the relative increase criterion does not apply.

Table 4-2 Relative Increase Criteria for Residential Land Uses

Road Category	Type of project / land use	Total Traffic Noise Level Increase, dB(A)	
		L _{Aeq} , 15 hour 07:00-22:00	L _{Aeq} , 9 hour 22:00-07:00
Freeway/arterial/ sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing + 12 dB(A) (external)	Existing + 12 dB(A) (external)

4.2 Roads & Maritime Noise Mitigation Guideline

The Noise Mitigation Guideline (NMG) provides guidance in managing and controlling road traffic generated noise and describes the principles to be applied when reviewing noise mitigation. The NMG recognises that the criteria recommended by the NCG are not always practicable and that it is not always feasible or reasonable to expect that they should be achieved.

The NMG outlines the applicable methodology for the determination of mitigation in accordance with the project specific noise limits set by the NCG. Noise mitigation options that should be considered are listed in order of preference below:

- (a) Quieter pavement surfaces
- (b) Noise mounds
- (c) Noise walls
- (d) At property treatments

The NMG provides three triggers where a receiver may qualify for consideration of noise mitigation (beyond the adoption of road design and traffic management measures), as follows:

- Trigger 1: The predicted Build noise level exceeds the NCG controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the Build minus the No Build) is greater than 2 dB(A).
- Trigger 2: The predicted Build noise level is 5 dB(A) or more above the criteria (exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project.
- Trigger 3: The noise level contribution from the road project is acute (daytime L_{Aeq,15hr} 65 dB or higher, or night-time L_{Aeq,9hr} 60 dB or higher) then it qualifies for consideration of noise mitigation even if noise levels are dominated by another road.

The eligibility of receivers for consideration of additional noise mitigation is determined before the benefit of additional noise mitigation (quieter pavement and noise barriers) is included. The requirement for the project is to provide reasonable and feasible additional mitigation for these eligible receivers to meet the NCG controlling criterion. If the NCG criterion cannot be satisfied with quieter pavement and noise barriers, then the receiver is eligible for consideration of at-property treatment.

4.2.1 Minor Works

The NCG states the following with regard to minor works:

- Some works may be primarily to improve safety. This may include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments.
- These works are not considered redeveloped or new as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.

- Roads and Maritime applies existing road criteria where the minor works increase noise levels by more than 2.0 dB(A) relative to the existing noise levels at the worst affected receiver.
- The noise catchment area should include all receivers where noise levels increase. A 600 metre noise catchment may not be required.
- Transition zones (where new roads meet existing, and where redeveloped meet new roads) are not applicable to minor works.

Review of the above, indicates that the Minor Works classification applies to this project.

4.3 Roads and Maritime Construction Noise and Vibration Guideline

The Roads and Maritime Construction Noise and Vibration Guideline (Roads and Maritime, 2016) (CNVG) provides a framework for the assessment of noise during the construction phase of the project. The CNVG references the following documents to provide the criteria for the assessment of construction noise and vibration impacts:

- EPA Interim Construction Noise Guidelines
- EPA Assessing Vibration – Technical Guideline
- EPA Road Noise Policy.

The guideline provides recommended minimum separation distances between vibration intensive plant and sensitive receivers for minimising the risk of cosmetic damage. The guideline further states that the minimum working distance for cosmetic damage must be complied with at all times, unless otherwise approved by Council or under the environmental licence as relevant.

4.4 Interim Construction Noise Guideline

4.4.1 Airborne Construction Noise

The NSW Office of Environment & Heritage (OEH) provides guidance for assessing construction noise impacts in the Interim Construction Noise Guideline (DECC, 2009) (NSW ICNG).

The level of noise impact and the requirement for mitigation measures is generally determined by the timing and duration of the noise emissions and the perceived impact of the noise above existing background noise levels.

It is important to note that the guideline distinguishes between qualitative and quantitative noise assessments based on the type and duration of construction activities. For example, a qualitative assessment is warranted for road maintenance type works of short duration, whereas a quantitative assessment is preferred for major infrastructure works.

Section 4 of the guideline outlines the quantitative assessment method, which establishes noise limits and assessment requirements for proposed construction activities over three weeks duration.

The noise criterion for potentially affected residential properties, as taken from Section 4.2 of the guideline, is detailed in Table 4-3.

Table 4-3 Noise at Residences Using Quantitative Assessment (Source: DECC, 2009)

Time of day	Management level L _{Aeq} (15 min)*	How to apply
Recommended standard hours:	Noise affected RBL + 10 dB	<ul style="list-style-type: none"> ▪ The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent

Time of day	Management level L_{Aeq} (15 min)*	How to apply
Monday to Friday: 7am to 6pm Saturday 8am to 1pm: No work on Sundays or public holidays		<p>should apply all feasible and reasonable work practices to meet the noise affected level.</p> <ul style="list-style-type: none"> The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

A strong justification would typically be required for works outside the recommended standard hours (see Table 4-3). The proponent should apply all feasible and reasonable work practices to meet the noise affected level. The definition of feasible and reasonable work practices is outlined in Section 1.4 of the NSW ICNG, with the following excerpts providing a brief description:

“A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.”

“Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.”

A number of factors may be considered in selecting reasonable measures, including the level of impact, the number of people affected, and the order of treatments applied to previous, similar projects. Where all feasible and reasonable practices have been applied and noise remains more than 5 dB(A) above the noise affected level, the proponent should

negotiate with the community on suitable mitigation measures. For guidance on negotiating agreements see section 7.2.2 of the NSW ICNG.

4.4.2 Sleep Disturbance

Section 4.3 of the NSW ICNG defines the assessment of sleep disturbance as follows:

“Where construction works are planned to extend over more than two consecutive nights, and a quantitative assessment method is used, the analysis should cover the maximum noise level, and the extent and the number of times that the maximum noise level exceeds the RBL. Some guidance indicating the potential for sleep disturbance is in the now superseded NSW Environmental Criteria for Road Traffic Noise (EPA 1999).” The NSW Environmental Criteria for Road Traffic Noise (EPA, 1999) (NSW ECRTN) discusses a number of methodologies with respects to sleep disturbance. In general, the methodologies address sleep disturbance due to continuous noise (expressed in terms of a $L_{Aeq, T}$) and the affect multiple short duration noise events (expressed as a L_{Amax}).”

In addition to the night time noise criteria specified in Table 4-1 (which addresses the continuous noise component generated by construction activities), the application of a noise criteria addressing the maximum noise level from construction activities is appropriate when works are planned to extend over more than two consecutive nights. The NSW ECRTN draws the following conclusions with respects to noise limits for sleep disturbance:

“Considering all of the foregoing information the following conclusions can be drawn:

- Maximum internal noise levels below 50–55 dB(A) are unlikely to cause awakening reactions.
- One or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.”

The NSW EPA confirm that a sleep disturbance criterion of $L_{A1, 1min} \leq L_{A90, 15min} + 15dB(A)$, is used for initial assessment for the purpose of this Environmental Impact Statement. It should only be used as a first step guide and where the criteria is not met, more detailed analysis is required to be incorporated into the detailed design and Construction Noise and Vibration Management Plan. The Application Notes of the NSW Industrial Noise Policy (2010) note the detailed analysis should include:

- the extent to which the maximum noise level exceeds the background level
- the number of times this happens during the night-time period, and
- the time of day (normally between 10 pm and 7 am).

4.5 Vibration Criteria

4.5.1 Assessing Vibration: A Technical Guideline (Human Comfort)

Vibration from activities associated with the project could potentially impact on the amenity of the occupants of dwellings or buildings located close to the site. Generally, vibration impact can be summarised into two categories:

- Effect on human comfort; and
- Structural or cosmetic damage to buildings.

Human comfort vibration criteria is addressed in the NSW ICNG and refers to Section 2.5 of the document Assessing Vibration: A Technical Guideline (NSW AV:ATG) issued by DEC (2006).

The NSW AV:ATG outlines vibration limits in relation to human comfort. Criteria in this guideline are based on the British Standard BS6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz).

Vibration sources are defined as Continuous, Impulsive or Intermittent. Table 4-4 provides a definition and examples of each type of vibration.

Table 4-4 Types of Vibration

Type of Vibration	Definition	Examples
Continuous	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

“Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).”

When applying the criteria, it is important to note that vibration may enter the body along different orthogonal axes, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). The three axes are referenced to the human body. Thus, vibration measured in the horizontal plane should be compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y and z- axis criteria if the concern is for people in the lateral position.

Preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced below in Section 5 of this report.

4.5.2 German Standard DIN 4150 (Building Damage)

In relation to structural damage, there is currently no Australian Standard that provides criteria for the assessment of structural damage to buildings. However, the German Standard DIN 4150-3 : 1999-02 - 'Structural vibration - Effects of vibration on structures', provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration. This standard also presents recommended maximum limits over a range of frequencies measured in any direction at the foundation or in the plane of the uppermost floor.

These criteria are summarised in Section 5.

4.6 Australian Standards

The following Australian Standards provide criteria and methodologies that have been adopted in this assessment.

- Australian Standard AS1055:2018 Acoustics – Description and measurement of environmental noise.
- Australian Standard AS 2702 – 1984, Methods for the Measurement of Road Traffic Noise.

5 Design Benchmarks

5.1 Road Traffic Noise

Based on a review of the statutory noise criteria listed in Section 4, a summary of the design benchmarks applicable to this project are provided in Table 5-1 below.

Table 5-1 Summary of Road Traffic Criteria

Applicable Assessment Criteria	Assessment Criteria — dB(A)	
	Day (7 AM–10 PM)	Night (10 PM–7 AM)
Target Noise Criteria (Residential) – New Roads	L _{Aeq} , 15 hour 55 (external)	L _{Aeq} , 9 hour 50 (external)
Target Noise Criteria (Residential) – Redeveloped Roads	L _{Aeq} , 15 hour 60 (external)	L _{Aeq} , 9 hour 55 (external)
Schools (Classrooms)	L _{Aeq} , 1hr 40 (internal) (3) L _{Aeq} , 1hr 50 (external)	Not applicable
Schools (Outdoor Play Areas)	L _{Aeq} , 1hr 60 (external active) L _{Aeq} , 1hr 55 (external passive)	Not applicable
(1) Significant Increase Trigger (Residential)	Design Year “no build” road traffic noise level + 2.0 dB(A)	

Notes:

- (1) This applies when the “existing road upgrade noise limits are predicted to be exceeded” for the “with project, no mitigation” scenario.
- (2) This applies to predicted impacts from project roads only for the year after the year of opening, and within the assessment area only, as defined by the methodology in the RMS NCG.
- (3) Assumes that windows are open and a minimum of 10 dB(A) outside to inside noise reduction is achievable under this condition.

5.2 Construction Noise

The project area has been divided into noise catchment areas where ambient noise levels are likely to be similar to assess the potential construction noise impacts on surrounding receivers. These catchment areas are shown in Figure 7-1.

Works are likely to be carried out, outside of standard hours due to the nature of the project, and the likelihood that traffic will require diversion. For this reason, noise management levels have been calculated for both standard and non-standard hours. These levels are detailed below in Table 5-2.

Taking into consideration the measured RBLs in Section 3.5.2 and the criteria from Section 4.4, the applicable construction noise limits for standard and non-standard hours for the project are shown in Table 5-2.

Table 5-2 Construction Noise Management Levels

Noise Catchment Area	Logger Label	Noise Management Level, dB(A)			Sleep Disturbance L _{A1} , 1 min
		Standard Hours (RBL + 10 dB(A))	Outside Standard Hours (RBL + 5 dB(A))		
		Day	Evening	Night	
1	1	55	38	35	45
2	2	49	38	35	45
3	3	51	50	35	45

Noise Catchment Area	Logger Label	Noise Management Level, dB(A)			Sleep Disturbance L _{A1} , 1 min
		Standard Hours (RBL + 10 dB(A))	Outside Standard Hours (RBL + 5 dB(A))		
		Day	Evening	Night	
4	4	48	39	35	45
5	5	60	48	38	48

5.3 Construction Vibration

5.3.1 Human Comfort Criteria

The following vibration criteria for human comfort apply to this project.

Table 5-3 Preferred & Maximum Levels for Human Comfort

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x & y axis	z-axis	x & y axis
Continuous vibration ³ (Weighted RMS Acceleration, m/s ² , 1-80Hz)					
Critical areas ²	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration ³ (Weighted RMS Acceleration, m/s ² , 1-80Hz)					
Critical areas ²	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92
Intermittent vibration ⁴ (Vibration Dose Values, VDV, m/s ^{1.75} , 1-80Hz)					
Critical areas ²	Day- or night-time	0.10	0.20	-	-
Residences	Daytime	0.20	0.40	-	-
	Night-time	0.13	0.26	-	-
Offices, schools, educational institutions and places of worship	Day- or night-time	0.40	0.80	-	-

Notes:

1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

3. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-2008
4. For continuous and impulsive vibration the preferred and maximum values are weighted acceleration rms values (m/s^2)
5. For intermittent vibration the preferred and maximum values are vibration dose values (VDVs), based on the weighted acceleration values ($\text{m/s}^{1.75}$)

5.3.2 Building Damage Criteria

The minimum 'safe limit' of vibration at low frequencies for commercial and industrial buildings are presented in DIN 4150.3 as follows:

Table 5-4 DIN 4150-3 Structural Damage Criteria

Group	Type of Structure	Vibration Velocity, mm/s			
		At Foundation at Frequency of			Plane of Floor uppermost Storey
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 - 40	40 - 50	40
2	Dwellings and buildings of similar design and/or use	5	5 - 15	15 - 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. buildings under a preservation order)	3	3 - 8	8 - 10	8
Note:	At frequencies above 100 Hz, the values given in this column may be used as minimum values				

6 Operational Noise & Vibration Impacts

6.1 Noise Modelling Methodology

Noise modelling was undertaken using SoundPLAN 8.2 using a digital terrain model calculated from existing ground levels provided by LiDAR. SoundPLAN calculates road traffic noise levels based on the Calculation of Road Traffic Noise (CoRTN, UK Department of Transport, Welsh Division 1988) assessment methodology algorithms.

The predicted results were then compared to the measured levels detailed in Section 3.5.3 to verify the model scenario consisting of pre-existing 2017 conditions. The verified model was used as the basis to produce noise prediction scenarios at all potentially affected receivers for the years 2026 (year of opening) and 2041, both with and without the proposal.

Noise prediction models were based upon the surveyed traffic volumes detailed in Section 6.2.2 and the predicted future traffic volumes detailed in Section 6.3.

6.1.1 Determination of Assessment Footprint

The assessment area was determined by applying the following methodology as detailed in the NCG for urbanised areas as follows.

1. *Initially an assessment area 600 metres either side of the project was selected for assessment. This was then further analysed to determine whether the predicted noise from project roads was significant as determined by the NCG as follows:*
2. *The boundary width of the study was limited to where the noise levels from the project contribute slightly less than half the total noise level. The study area was then defined as the extent to which the project contribution to the total noise level adds no more than 2 dB(A) (less than 2.1 dB(A) at any receiver in the build year.*
3. *“Following definition of this area, the boundary was then expanded to include any receivers where the project contribution exceeded the acute criteria of 65 dB(A) $L_{Aeq,15hr}$ and 60 dB(A) $L_{Aeq,9hr}$ and to meet close-by landmarks to provide a logical boundary. The study area was then extended to include close by landmarks to provide a logical boundary”.*
4. *Landmarks considered included items such as blocks of receivers, roads, parks and reserves, power utility corridors and breaks in the landscape.*
5. *When defining the study area, local roads were excluded from the modelling. Only collector roads, sub-arterial and arterial roads were modelled.”*

6.1.2 Modelled Source Heights

The standard CoRTN assessment methodology of using 4 source lines (one for light vehicles and three for heavy vehicles to allow for differing heights above ground of the truck sources) was adopted — as per standard TfNSW practice. The applicable three source heights were 0.5 metres for car exhausts / engines, 1.5 metres from truck engines and 3.6 metres for truck exhausts. The following correction factors were applied to each of the truck source lines to allow for measured differences between exhaust, engine and tyre noise in accordance with the UK Transportation Noise Reference Book, (Paul Nelson 1987).

Trucks 0.5 metre high source line: 0 dB(A)

Trucks 1.5 metre high source line: - 0.8 dB(A)

Trucks 3.6 metre high source line: - 8 dB(A)

6.1.3 Transition Zones

The NSW NCG provides the process for establishing noise limits in accordance with NSW RNP requirements, with particular detail to the transition zones between existing and redeveloped, and new roads. The target criteria is set to be based on the contribution of noise from new versus existing and redeveloped roads. To determine the applicable target criteria for each receiver, calculations were conducted to determine the contribution of new versus existing road segments, for each receiver point in the model. General determination of the target criteria is displayed by graphical representation in Appendix A (Figures A3 and A4). However note that the *NCG Criteria* (the defining benchmark for compliance or non compliance), represents the limit derived from the more stringent of the *Target Criteria* or the *Relative Increase Criteria*.

6.1.4 Modelled Scenarios

Table 6-1 below, shows the modelled scenarios:

Table 6-1 Modelled Scenarios

Modelled Scenario	Year	Name	Description
1	2019	Existing situation –model verification	Road traffic noise model based on pre-existing road alignments and surveyed traffic volumes for the year 2017
2	2026	Build - year of opening	Predicted 2026 traffic volumes with the proposal roads and adjoining roads.
3	2026	No build - year of opening	Predicted no build 2026 traffic volumes and pre-existing road alignments (i.e year 2026 model if the proposal were not to go ahead)
4	2041	Build - 10 years after opening	Predicted 2041 traffic volumes with the project roads and adjoining roads.
5	2041	No build - 10 years after opening	Predicted no build 2041 traffic volumes and pre-existing road alignments (i.e. year 2041 model if the project were not to go ahead)

6.2 Noise Modelling Inputs & Assumptions

6.2.1 General Modelling Input Data

Table 6-2 details the sources of information used for the prediction of traffic noise levels.

Table 6-2 Modelling Assumptions

Modelling Element	Input / Assumption / Source Reference
Ground Elevation Geometry	Provided by the Spatial Information Exchange
Road Alignment	Provided by Cardno
Site Traffic Flow Data	As presented in Section 6.2.2.
Road Traffic Speed	Existing traffic speeds: Tongarra Road: 50 and 60 km/h All remaining roads: 50 km/h Proposed Speed Limit: Tripoli Way: 60 km/h

Modelling Element	Input / Assumption / Source Reference
Road pavement surfaces	All were assumed to be (Dense Graded Asphalt DGA AC14) with no pavement correction factors added.
Ground Absorption	75% over soft ground
Methodology	Calculation of Road Traffic Noise, UK Department of Transport, 1988
Weather conditions	Calm Conditions
Facade Reflection	+2.5 dB(A) – applied to traffic prediction models, as all receivers are located at facades of receiver.
L _{A10} to L _{Aeq} conversion	$L_{Aeq,1hr} = L_{A10,1hr} - 3 \text{ dB(A)}$
AustRoads Correction to CoRTN for Façade Corrected Australian Conditions	-1.7 dB(A) CoRTN correction for Australian conditions (with reference to AustRoads.)
Receiver Height	Assumed to be 1.4 m above ground level for noise logger microphone heights for the verification model and 1.8 m above ground for prediction models for ground floor. Subsequent floor level receiver heights have been modelled at + 2.8 m above the floor below.

6.2.2 Surveyed Traffic Volumes

Existing traffic volumes were obtained from a survey conducted by Trans Traffic Survey for the duration of the monitoring period between 4 and 11 September 2017. Volumes were obtained in hourly intervals, with the data averaged to reflect 15-hour day periods and 9-hour night time periods.

Table 6-3 Surveyed traffic volumes

Road	Vehicles per 15 hours (Day, 7am-10pm)		Vehicles per 9 hours (Night, 10pm-7am)		Average Annual Daily Traffic (AADT)
	Cars	Heavy vehicles	Cars	Heavy vehicles	
Tongarra Road (East of Pollock Crescent)	8,815	481	1,155	87	10,538
Calderwood Road (North of Tongarra Road)	1,375	95	127	7	1,604
Taylor Road (East of Macquarie Street)	1,292	54	109	4	1,459
Illawarra Highway (North of Taylor Road)	13,224	693	2,414	149	16,480
Tripoli Way	258	12	22	0	2,92

6.3 Predicted Future Traffic Volumes

Predicted traffic volumes for the year 2026 and 2041 were obtained from Cardno Traffic and Transport. Traffic projections were provided for the road segments nominated in Figure 6-1, with the supplied traffic volumes presented in Table 6-4.

Figure 6-1 Modelled road segments



Table 6-4 Future Traffic Volumes

Road	Vehicles per 15 hour (Day, 7am-10pm)		Vehicles per 9 hour (Night, 10pm-7am)	
	Cars	% Heavy vehicles	Cars	% Heavy vehicles
Year 2026 Build				
1. Tripoli Way	7,520	10.8	1,036	15.0
2. Tripoli Way	13,238	12.9	1,820	17.1
3. Tripoli Way	14,674	12.6	2,021	17.0
4. Tongarra Rd	20,780	5.8	2,797	7.9
5. Tongarra Rd	16,123	3.1	2,145	4.2
6. Tongarra Rd	14,583	3.3	1,945	4.5
7. Tongarra Rd	18,514	3.1	2,467	4.3
8. Tongarra Rd	18,069	3.2	2,419	4.8
9. Tongarra Rd	27,119	2.9	3,624	4.1
10. Illawarra Hwy	16,833	6.4	3,283	7.1
11. Illawarra Hwy	18,118	7.5	3,465	8.5
12. Illawarra Hwy	25,404	11.0	4,995	12.0
13. Hamilton Rd	4,976	4.4	504	3.6
14. Hamilton Road	2,370	5.2	234	3.0
15. Calderwood Rd	4,852	9.4	550	8.5
16. Calderwood Rd	4,409	3.2	525	2.1
17. Calderwood Rd	7,094	7.8	682	5.9

Road	Vehicles per 15 hour (Day, 7am-10pm)		Vehicles per 9 hour (Night, 10pm-7am)	
	Cars	% Heavy vehicles	Cars	% Heavy vehicles
Year 2026 No Build				
4. Tongarra Rd	18,816	5.1	2,527	7.0
5. Tongarra Rd	21,283	5.4	2,860	7.4
6. Tongarra Rd	19,396	5.4	2,611	7.4
7. Tongarra Rd	24,619	5.0	3,276	6.5
8. Tongarra Rd	25,412	5.6	3,392	7.2
9. Tongarra Rd	26,787	2.7	3,577	3.7
10. Illawarra Hwy	20,263	8.0	4,288	8.4
11. Illawarra Hwy	20,240	8.0	4,286	8.4
13. Hamilton Rd	5,135	2.8	536	2.2
14. Hamilton Rd	4,468	3.2	460	2.0
15. Calderwood Rd	8,110	3.8	671	2.4
16. Calderwood Rd	7,739	6.9	710	5.2
17. Calderwood Rd	7,739	6.9	710	5.2
Year 2041 Build				
1. Tripoli Way	10,086	16.0	1,416	21.5
2. Tripoli Way	22,427	15.3	3,093	19.8
3. Tripoli Way	24,916	14.8	3,442	19.3
4. Tongarra Rd	26,449	8.7	3,614	11.8
5. Tongarra Rd	19,073	4.9	2,570	6.7
6. Tongarra Rd	16,966	5.1	2,300	7.1
5. Tongarra Rd	20,800	4.5	2,801	6.3
4. Tongarra Rd	22,824	5.0	3,060	6.6
5. Tongarra Rd	30,103	4.8	4,041	6.4
10. Illawarra Hwy	23,722	6.2	4,346	7.2
11. Illawarra Hwy	24,416	6.9	4,489	8.3
12. Illawarra Hwy	36,504	12.7	7,063	14.2
13. Hamilton Rd	4,862	4.3	515	3.7
14. Hamilton Road	3,889	3.3	355	2.0
15. Calderwood Rd	8,036	3.2	828	2.7
16. Calderwood Rd	9,111	3.0	979	2.6

Road	Vehicles per 15 hour (Day, 7am-10pm)		Vehicles per 9 hour (Night, 10pm-7am)	
	Cars	% Heavy vehicles	Cars	% Heavy vehicles
17. Calderwood Rd	16,921	8.0	1,563	6.7
Year 2041 No Build				
4. Tongarra Rd	9,026	5.4	1,200	7.2
5. Tongarra Rd	9,676	6.2	1,285	8.0
6. Tongarra Rd	6,941	7.1	929	8.9
7. Tongarra Rd	9,662	7.4	1,289	9.1
8. Tongarra Rd	9,037	8.4	1,196	9.8
9. Tongarra Rd	8,648	4.7	1,168	6.4
10. Illawarra Hwy	7,968	10.2	1,664	11.4
11. Illawarra Hwy	7,656	9.7	1,595	10.8
13. Hamilton Rd	801	5.5	63	3.2
14. Hamilton Rd	735	4.2	55	3.6
15. Calderwood Rd	2,990	5.0	247	3.2
16. Calderwood Rd	2,793	6.2	238	4.6
17. Calderwood Rd	2,793	6.2	238	4.6

6.4 Modelled Receivers

Locations of the modelled receivers are detailed in Appendix D:

6.5 Modelling Validation

Once the verification model was complete, spot receiver calculations were run for each of the verification locations described below in Table 6-5. Modelled levels were compared to the measured levels presented in Section 3.5.3.

Table 6-5 Measured versus Modelled Existing Road Traffic Noise Levels

Monitoring Location	Measured Noise Level, dB(A)		Modelled Noise Level, dB(A)		Accuracy (Modelled – Measured), dB(A)	
	Day L _{Aeq,15hr}	Night L _{Aeq,9hr}	Day L _{Aeq,15hr}	Night L _{Aeq,9hr}	Day L _{Aeq,15hr}	⁽¹⁾ Night L _{Aeq,9hr}
Logger 1 - 3 Broughton Ave	60.9	57.7	60.9	57.7	0.0	2.7
Logger 2 - 23 Calderwood Road	57.1	53.9	57.1	53.9	-1.5	0.5
Logger 3 - 6 Tripoli Way	47.9	45.4	47.9	45.4	-4	-4.3
Logger 4 - 12 Hamilton Rd	49.4	46.8	49.4	46.8	1	1.5
Logger 5 - 28 Terry Street	58.4	57.7	58.4	57.7	-1.5	0.3
Overall Average Accuracy					-1.5	0.5

(1) Measured locations result may be affected by insect noise at night due to levels of vegetation around monitoring sites.

Generally model tolerances should be less than ± 2 dB(A) in accordance with NMVG requirements. The model is therefore considered verified. It is noted that the night-time model is under predicting, however, it is likely that there were other noise sources, such as insects around the logger locations due to the vegetation.

Given the average accuracy is less ± 2 dB(A) for day and night, the model is therefore considered to be verified.

6.6 Predicted Noise Levels

Modelled traffic noise levels for the day period $L_{Aeq, 15hr}$ and night period $L_{Aeq, 9hr}$ are presented for all modelled receivers in Table 6-6 and Table 6-7. Noise predictions in the form of noise contour maps are presented in Appendix E.

Table 6-6 Predicted Noise Levels (Daytime) – Residential Receivers

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), LAeq 15hr										
3 Broughton Ave	195	GF	N	65	63	64	64	60	4	65	-	-	no	no
4 Broughton Ave	187	GF	N	60	60	59	61	60	1	65	-	2	no	no
5 Broughton Ave	192	GF	W	58	58	58	59	60	-	65	-	1	no	no
6 Broughton Ave	191	GF	E	54	54	54	55	59	-	64	-	2	no	no
7 Broughton Ave	1473	GF	W	52	52	50	53	60	-	65	-	2	yes	no
8 Broughton Ave	1447	GF	E	53	53	52	54	59	-	64	-	2	no	no
9 Broughton Ave	1477	GF	W	52	52	51	53	60	-	65	-	2	no	no
10 Broughton Ave	1449	GF	E	51	52	51	53	59	-	64	-	2	no	no
11 Broughton Ave	1481	GF	N	52	52	52	54	60	-	65	-	2	no	no
12 Broughton Ave	1455	GF	E	50	51	49	52	58	-	63	-	2	yes	no
25 Brushgrove Circuit	169	F 1	S	57	57	55	58	60	-	65	-	3	yes	no
27 Brushgrove Circuit	167	GF	S	55	55	53	56	60	-	65	-	3	yes	no
29 Brushgrove Circuit	165	GF	S	55	55	53	56	60	-	65	-	3	yes	no
31 Brushgrove Circuit	163	GF	S	55	55	53	56	60	-	65	-	3	yes	no
33 Brushgrove Circuit	159	GF	E	52	51	50	53	60	-	65	-	3	yes	no
35 Brushgrove Circuit	156	GF	E	51	51	50	52	60	-	65	-	3	yes	no
37 Brushgrove Circuit	154	GF	S	43	46	41	47	55	-	60	-	6	yes	no
39 Brushgrove Circuit	151	GF	S	42	45	40	46	53	-	58	-	7	yes	no
41 Brushgrove Circuit	147	GF	E	50	50	48	51	60	-	65	-	3	yes	no
43 Brushgrove Circuit	143	GF	N	43	45	41	47	54	-	59	-	6	yes	no
45 Brushgrove Circuit	140	GF	N	41	43	39	44	53	-	58	-	5	yes	no
47 Brushgrove Circuit	1572	GF	S	44	46	42	47	55	-	60	-	5	yes	no
49 Brushgrove Circuit	1574	GF	S	44	45	42	46	56	-	61	-	4	yes	no
51 Brushgrove Circuit	1576	GF	S	41	42	38	44	52	-	57	-	5	yes	no
4 Calderwood Rd	1304	GF	W	61	60	58	61	60	1	65	-	3	yes	yes
5 Calderwood Rd	1670	GF	E	63	63	60	63	60	3	65	-	3	yes	yes
6 Calderwood Rd	899	GF	W	61	59	58	62	60	2	65	-	4	yes	yes
7 Calderwood Rd	1667	GF	E	64	63	61	64	60	4	65	-	3	yes	yes
Unit 2, 8 Calderwood Rd	888	GF	N	55	67	53	69	55	14	60	9	16	yes	yes
Unit 3, 8 Calderwood Rd	881	GF	N	59	68	57	70	55	15	60	10	13	yes	yes
Unit 4, 8 Calderwood Rd	884	GF	W	64	63	61	65	60	5	65	-	4	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
8A Calderwood Rd	900	F 1	NW	54	67	51	69	55	14	60	9	17	yes	yes
9 Calderwood Rd	823	GF	E	63	63	60	63	60	3	65	-	3	yes	yes
10 Calderwood Rd	267	GF	S	53	63	52	65	55	10	60	5	13	yes	yes
11 Calderwood Rd	817	GF	E	63	62	60	63	60	3	65	-	3	yes	yes
12 Calderwood Rd	262	GF	S	62	64	60	65	55	10	60	5	6	yes	yes
13 Calderwood Rd	813	GF	E	63	62	60	63	60	3	65	-	3	yes	yes
15 Calderwood Rd	809	GF	E	64	62	60	64	60	4	65	-	3	yes	yes
17 Calderwood Rd	806	GF	E	63	61	60	63	60	3	65	-	3	yes	yes
19 Calderwood Rd	792	GF	E	64	62	61	64	60	4	65	-	3	yes	yes
21 Calderwood Rd Unit 1	790	GF	E	65	63	62	66	60	6	65	1	4	yes	yes
21 Calderwood Rd Unit 2	787	GF	N	59	59	57	61	59	2	64	-	5	yes	yes
23 Calderwood Rd	782	GF	N	59	62	57	64	56	8	61	3	7	yes	yes
1 Curramore Tce	184	GF	W	57	57	55	58	60	-	65	-	3	yes	no
3 Curramore Ter	182	GF	N	57	57	55	58	60	-	65		3	yes	no
5 Curramore Ter	178	GF	N	56	57	55	58	60	-	65	-	3	yes	no
7 Curramore Ter	175	GF	N	56	57	55	58	60	-	65	-	3	yes	no
9 Curramore Tce	172	GF	NW	55	55	53	56	60	-	65	-	3	yes	no
11 Curramore Ter	170	GF	SW	51	51	49	53	60	-	65	-	4	yes	no
13 Curramore Ter	1412	GF	NW	52	52	50	53	60	-	65	-	4	yes	no
15 Curramore Ter	1416	GF	NW	51	51	49	52	60	-	65	-	4	yes	no
17 Curramore Ter	1420	GF	NW	50	50	48	51	60	-	65	-	4	yes	no
1 Hamilton Rd	1041	GF	E	60	60	55	61	60	1	65	-	6	yes	yes
1A Hamilton Rd	1046	GF	E	60	59	54	61	60	1	65	-	6	yes	yes
1B Hamilton Rd	1048	GF	N	57	59	52	60	58	2	63	-	9	yes	yes
3 Hamilton Rd	1053	GF	E	60	61	54	63	58	5	63	-	9	yes	yes
5 Hamilton Rd	1055	GF	N	51	66	47	68	55	13	60	8	21	yes	yes
7 Hamilton Rd	312	GF	S	51	65	47	67	55	12	60	7	20	yes	yes
9 Hamilton Rd	307	GF	E	50	58	46	59	55	4	60	-	13	yes	yes
10 Hamilton Rd	1149	GF	W	60	61	54	62	58	4	63	-	8	yes	yes
11 Hamilton Rd	305	GF	E	49	55	46	57	55	2	60	-	11	yes	yes
12 Hamilton Rd	1151	GF	N	51	67	47	69	55	14	60	9	22	yes	yes
13 Hamilton Rd	301	GF	E	48	53	45	55	55	-	60	-	10	yes	no
14 Hamilton Rd	318	GF	S	50	55	47	57	55	2	60	-	10	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
15 Hamilton Rd	296	GF	S	46	52	43	54	55	-	60	-	11	yes	no
15 Hamilton Rd	295	GF	W	45	52	42	54	55	-	60	-	12	yes	no
17 Hamilton Rd	290	GF	S	45	52	42	54	55	-	60	-	12	yes	no
19 Hamilton Rd	286	GF	S	47	55	44	56	55	1	60	-	12	yes	yes
1 Moles St Unit 1	1659	GF	NE	55	54	52	55	60	-	65	-	3	yes	no
1 Moles St Unit 2	1664	GF	SE	58	57	55	57	60	-	65	-	3	yes	no
2 Moles St	856	GF	NW	45	46	42	48	55	-	60	-	6	yes	no
3 Moles St	1656	GF	SE	53	52	50	53	60	-	65	-	3	yes	no
4 Moles St	852	GF	NW	47	48	44	50	58	-	63	-	6	yes	no
5 Moles St	1652	GF	SE	54	52	50	53	60	-	65	-	3	yes	no
6 Moles St	848	GF	NW	45	46	42	48	55	-	60	-	6	yes	no
7 Moles St	1646	GF	NW	47	48	45	50	58	-	63	-	5	yes	no
8 Moles St	844	GF	NW	45	47	42	48	56	-	61	-	6	yes	no
9 Moles St	1640	GF	SE	52	51	49	52	60	-	65	-	3	yes	no
10 Moles St	840	GF	NW	44	46	41	47	55	-	60	-	6	yes	no
11 Moles St	1638	GF	NW	46	47	43	49	57	-	62	-	5	yes	no
12 Moles St	836	GF	NW	44	46	42	48	55	-	60	-	6	yes	no
13 Moles St	1635	GF	NW	46	47	43	49	57	-	62	-	5	yes	no
14 Moles St	832	GF	NW	44	46	41	48	55	-	60	-	6	yes	no
15 Moles St	1630	GF	NW	46	47	43	49	57	-	62	-	6	yes	no
16 Moles St	828	GF	NW	44	46	41	48	55	-	60	-	6	yes	no
17 Moles St	1627	GF	NW	45	47	42	48	56	-	61	-	6	yes	no
18 Moles St	824	GF	NW	45	47	42	48	56	-	61	-	6	yes	no
19 Moles St	1622	GF	NW	45	47	42	48	56	-	61	-	6	yes	no
21 Moles St	1618	GF	NW	45	46	42	48	56	-	61	-	6	yes	no
23 Moles St	1617	F 1	SE	53	52	50	53	60	-	65	-	3	yes	no
25 Moles St	1610	GF	NW	45	46	42	48	56	-	61	-	6	yes	no
27 Moles St	1607	GF	NW	46	47	43	48	56	-	61	-	6	yes	no
29 Moles St	1602	GF	NW	45	46	42	48	56	-	61	-	6	yes	no
31 Moles St	1598	GF	SE	54	53	50	53	60	-	65	-	3	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
37 Moles St	647	GF	N	45	46	43	48	56	-	61	-	5	yes	no
39 Moles St	643	GF	N	45	47	42	48	56	-	61	-	6	yes	no
41 Moles St	640	GF	N	45	46	42	47	55	-	60	-	6	yes	no
43 Moles St	634	GF	N	44	46	41	47	55	-	60	-	6	yes	no
45 Moles St	631	GF	N	44	46	41	47	55	-	60	-	7	yes	no
47 Moles St	626	GF	N	44	48	41	49	55	-	60	-	8	yes	no
49 Moles St	625	GF	W	44	47	42	49	55	-	60	-	7	yes	no
49 Moles St	623	GF	E	45	48	42	49	56	-	61	-	7	yes	no
49 Moles St	622	GF	N	44	46	41	48	55	-	60	-	7	yes	no
51 Moles St	618	GF	W	44	50	42	51	55	-	60	-	9	yes	no
53 Moles St	616	GF	E	45	52	42	54	55	-	60	-	12	yes	no
53 Moles St	614	GF	N	44	52	41	54	55	-	60	-	12	yes	no
55 Moles St	610	GF	N	44	57	41	58	55	3	60	-	17	yes	yes
57 Moles St	606	GF	N	45	65	42	66	55	11	60	6	25	yes	yes
1 Mountainview Mews	1205	GF	SW	59	58	54	59	60	-	65	-	6	yes	no
2 Mountainview Mews	1208	GF	NE	48	52	44	53	55	-	60	-	9	yes	no
3 Mountainview Mews	1212	GF	E	47	51	44	53	55	-	60	-	9	yes	no
4 Mountainview Mews	1215	GF	N	48	51	44	53	56	-	61	-	9	yes	no
5 Mountainview Mews	1220	GF	E	46	50	43	52	56	-	61	-	9	yes	no
6 Mountainview Mews	1224	GF	E	46	50	43	51	56	-	61	-	8	yes	no
7 Mountainview Mews	1228	GF	E	47	50	43	52	56	-	61	-	9	yes	no
8 Mountainview Mews	1231	GF	N	48	51	45	53	56	-	61	-	9	yes	no
9 Mountainview Mews	1235	GF	N	48	52	45	54	56	-	61	-	9	yes	no
10 Mountainview Mews	1239	GF	N	49	52	45	54	56	-	61	-	9	yes	no
11 Mountainview Mews	1243	GF	N	49	53	46	55	56	-	61	-	9	yes	no
12 Mountainview Mews	1247	GF	N	49	53	46	55	56	-	61	-	9	yes	no
13 Mountainview Mews	1251	GF	N	49	54	46	55	56	-	61	-	9	yes	no
14 Mountainview Mews	1256	GF	E	51	54	48	56	56	-	61	-	9	yes	no
15 Mountainview Mews	1260	GF	E	49	54	46	56	56	-	61	-	9	yes	no
16 Mountainview Mews	1263	GF	N	50	54	47	56	56	-	61	-	9	yes	no
17 Mountainview Mews	1155	GF	N	49	66	45	68	55	13	60	8	23	yes	yes
18 Mountainview Mews	1159	GF	N	48	66	45	68	55	13	60	8	24	yes	yes
19 Mountainview Mews	1163	GF	N	48	66	45	68	55	13	60	8	24	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
20 Mountainview Mews	1167	GF	N	48	66	45	68	55	13	60	8	24	yes	yes
21 Mountainview Mews	1171	GF	N	48	66	45	68	55	13	60	8	23	yes	yes
22 Mountainview Mews	1175	GF	N	48	66	45	68	55	13	60	8	23	yes	yes
23 Mountainview Mews	1179	GF	N	48	66	45	68	55	13	60	8	23	yes	yes
24 Mountainview Mews	1183	GF	N	48	66	45	68	55	13	60	8	23	yes	yes
25 Mountainview Mews	1187	GF	N	49	66	46	68	55	13	60	8	22	yes	yes
26 Mountainview Mews	1191	GF	N	49	66	46	67	55	12	60	7	22	yes	yes
27 Mountainview Mews	1195	GF	N	49	65	46	67	55	12	60	7	21	yes	yes
28 Mountainview Mews	1199	GF	N	49	65	46	67	55	12	60	7	21	yes	yes
1 O'Keefe Cres	866	GF	N	45	45	42	47	55	-	60	-	5	yes	no
2 O'Keefe Cres	870	GF	NE	51	51	48	52	60	-	65	-	4	yes	no
3 O'Keefe Cres	860	GF	N	48	49	45	51	59	-	64	-	6	yes	no
4 O'Keefe Cres	873	GF	NW	47	48	44	50	58	-	63	-	5	yes	no
5 O'Keefe Cres	779	GF	E	50	50	47	52	60	-	65	-	6	yes	no
6 O'Keefe Cres	879	GF	SW	45	47	42	48	56	-	61	-	6	yes	no
7 O'Keefe Cres	775	F 1	N	52	54	49	56	58	-	63	-	7	yes	no
8 O'Keefe Cres	803	GF	SW	45	47	42	48	56	-	61	-	6	yes	no
9 O'Keefe Cres	770	GF	NW	47	50	45	52	56	-	61	-	7	yes	no
10 O'Keefe Cres	799	GF	N	47	51	45	53	55	-	60	-	8	yes	no
11 O'Keefe Cres	766	GF	NW	47	49	44	51	57	-	62	-	7	yes	no
13 O'Keefe Cres	762	GF	NW	45	49	42	50	56	-	61	-	8	yes	no
15 O'Keefe Cres	758	GF	NW	49	50	46	53	60	-	65	-	7	yes	no
16 O'Keefe Cres	727	GF	NW	52	56	49	58	56	2	61	-	9	yes	yes
17 O'Keefe Cres	754	GF	NW	45	47	42	49	56	-	61	-	7	yes	no
18 O'Keefe Cres	722	GF	NW	51	56	48	57	56	1	61	-	9	yes	yes
19 O'Keefe Cres	750	GF	NW	44	47	41	49	55	-	60	-	7	yes	no
20 O'Keefe Cres	718	GF	NW	48	54	45	55	55	-	60	-	10	yes	no
21 O'Keefe Cres	746	GF	NW	44	47	41	48	55	-	60	-	7	yes	no
22 O'Keefe Cres	714	GF	NW	46	53	44	54	55	-	60	-	10	yes	no
23 O'Keefe Cres	742	GF	NW	44	47	41	48	55	-	60	-	7	yes	no
24 O'Keefe Cres	710	GF	NW	45	51	43	53	55	-	60	-	10	yes	no
25 O'Keefe Cres	738	GF	NW	44	47	41	49	55	-	60	-	7	yes	no
26 O'Keefe Cres	706	GF	NW	45	51	42	53	55	-	60	-	11	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
27 O'Keefe Cres	734	GF	NW	44	47	42	49	55	-	60	-	7	yes	no
28 O'Keefe Cres	704	GF	NW	44	51	42	53	55	-	60	-	11	yes	no
29 O'Keefe Cres	732	GF	NW	44	47	41	49	55	-	60	-	8	yes	no
30 O'Keefe Cres	700	GF	NW	45	51	42	52	55	-	60	-	11	yes	no
32 O'Keefe Cres	696	GF	NW	44	50	42	51	55	-	60	-	10	yes	no
34 O'Keefe Cres	690	GF	NW	43	49	41	51	54	-	59	-	10	yes	no
1 Parsons Pl	430	F 1	NW	49	52	47	53	55	-	60	-	6	yes	no
2 Parsons Pl	508	GF	NE	43	47	41	49	54	-	59	-	8	yes	no
3 Parsons Pl	451	GF	NE	43	46	40	47	53	-	58	-	8	yes	no
4 Parsons Pl	503	GF	NE	44	47	41	49	55	-	60	-	8	yes	no
5 Parsons Pl	456	GF	NE	43	46	40	47	54	-	59	-	7	yes	no
6 Parsons Pl	498	GF	NE	44	47	41	48	55	-	60	-	7	yes	no
7 Parsons Pl	482	GF	NE	43	46	40	47	54	-	59	-	7	yes	no
8 Parsons Pl	494	GF	S	52	51	50	52	60	-	65	-	3	yes	no
9 Parsons Pl	486	GF	NW	44	45	41	47	55	-	60	-	5	yes	no
11 Parsons Pl	491	GF	N	44	47	41	48	55	-	60	-	7	yes	no
4 Pasture Way	1561	GF	N	43	44	41	45	54	-	59	-	4	yes	no
6 Pasture Way	1564	GF	N	42	43	40	45	54	-	59	-	5	yes	no
8 Pasture Way	1591	GF	N	42	43	40	44	53	-	58	-	4	yes	no
10 Pasture Way	1588	F 1	S	52	52	50	53	60	-	65	-	3	yes	no
12 Pasture Way	1582	GF	E	45	46	43	47	57	-	62	-	5	yes	no
14 Pasture Way	1581	F 1	E	51	51	49	52	60	-	65	-	3	yes	no
1 Polock Cres	536	GF	SE	52	51	49	52	60	-	65	-	3	yes	no
2 Polock Cres	417	GF	SW	55	54	52	55	60	-	65	-	3	yes	no
3 Polock Cres	530	GF	NW	45	47	43	48	56	-	61	-	5	yes	no
4 Polock Cres	410	GF	SW	53	52	49	53	60	-	65	-	3	yes	no
5 Polock Cres	479	GF	NE	48	47	44	49	58	-	63	-	4	yes	no
6 Polock Cres	409	GF	SW	51	50	48	51	60	-	65	-	3	yes	no
7 Polock Cres	474	GF	NW	44	45	42	46	55	-	60	-	5	yes	no
8 Polock Cres	402	GF	NW	45	46	42	47	56	-	61	-	5	yes	no
9 Polock Cres	471	GF	NW	43	46	41	47	55	-	60	-	6	yes	no
10 Polock Cres	398	GF	NW	45	46	42	47	56	-	61	-	5	yes	no
11 Polock Cres	466	GF	NW	44	46	42	48	56	-	61	-	6	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
12 Polock Cres	395	GF	NW	43	46	41	47	55	-	60	-	6	yes	no
13 Polock Cres	463	GF	NW	43	47	41	48	55	-	60	-	7	yes	no
14 Polock Cres	391	GF	NW	44	47	42	48	55	-	60	-	6	yes	no
15 Polock Cres	458	GF	NW	43	49	40	50	54	-	59	-	10	yes	no
16 Polock Cres	388	GF	NE	45	48	42	49	56	-	61	-	7	yes	no
17 Polock Cres	447	GF	N	42	50	40	52	54	-	59	-	12	yes	no
18 Polock Cres	385	GF	NE	45	49	42	50	55	-	60	-	8	yes	no
19 Polock Cres	442	GF	N	41	51	39	52	52	-	57	-	14	yes	no
20 Polock Cres	379	GF	NW	43	51	41	52	54	-	59	-	12	yes	no
21 Polock Cres	438	GF	N	43	52	40	53	54	-	59	-	13	yes	no
22 Polock Cres	375	GF	NE	44	53	41	54	55	-	60	-	13	yes	no
23 Polock Cres	435	F 1	NW	48	54	46	55	55	-	60	-	9	yes	no
24 Polock Cres	372	GF	NE	44	58	41	59	55	4	60	-	18	yes	yes
25 Polock Cres	427	GF	NE	41	50	38	51	52	-	57	-	13	yes	no
26 Polock Cres	367	GF	N	43	60	40	61	54	7	59	2	21	yes	yes
27 Polock Cres	510	GF	N	46	52	44	53	55	-	60	-	9	yes	no
28 Polock Cres	362	GF	N	42	61	39	62	53	9	58	4	23	yes	yes
29 Polock Cres	514	GF	N	46	50	44	52	55	-	60	-	7	yes	no
30 Polock Cres	358	GF	N	41	57	38	59	52	7	57	2	21	yes	yes
31 Polock Cres	518	GF	SW	51	51	49	52	59	-	64	-	4	yes	no
32 Polock Cres	355	GF	N	42	60	40	62	54	8	59	3	22	yes	yes
33 Polock Cres	522	GF	SW	53	52	50	53	60	-	65	-	3	yes	no
34 Polock Cres	350	GF	N	41	59	39	60	52	8	57	3	22	yes	yes
35 Polock Cres	527	GF	SW	55	54	53	55	60	-	65	-	2	yes	no
36 Polock Cres	346	GF	N	41	59	38	60	52	8	57	3	22	yes	yes
37 Polock Cres	573	GF	SE	59	57	56	58	60	-	65	-	2	yes	no
38 Polock Cres	342	GF	NW	45	58	43	59	55	4	60	-	16	yes	yes
40 Polock Cres	602	GF	W	51	55	50	56	55	1	60	-	6	yes	yes
42 Polock Cres	599	GF	NW	49	52	48	53	55	-	60	-	5	yes	no
44 Polock Cres	594	GF	W	53	54	52	55	59	-	64	-	3	yes	no
46 Polock Cres	590	GF	SW	54	54	52	55	60	-	65	-	3	yes	no
48 Polock Cres	585	GF	SE	56	54	53	55	60	-	65	-	2	no	no
1 Taylor Rd	905	GF	SW	66	64	62	66	60	6	65	1	4	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
2 Taylor Rd	1307	F 1	W	64	63	61	64	60	4	65	-	3	yes	yes
3 Taylor Rd	908	GF	SE	56	55	53	56	60	-	65	-	3	yes	no
4 Taylor Rd	1311	GF	W	54	53	51	54	60	-	65	-	3	yes	no
5 Taylor Rd	913	GF	NE	45	48	42	50	56	-	61	-	7	yes	no
6 Taylor Rd	1316	GF	E	47	48	43	50	57	-	62	-	7	yes	no
7 Taylor Rd Unit 1	923	GF	NE	47	50	44	51	57	-	62	-	7	yes	no
7 Taylor Rd Unit 2	916	GF	NW	49	54	46	56	55	1	60	-	11	yes	yes
8 Taylor Rd	1320	GF	E	46	48	43	49	57	-	62	-	6	yes	no
8A Taylor Rd	1328	GF	N	47	48	44	49	57	-	62	-	5	yes	no
8B Taylor Rd	1324	GF	W	52	51	49	52	60	-	65	-	3	yes	no
9 Taylor Rd	924	GF	N	47	55	44	57	55	2	60	-	13	yes	yes
10 Taylor Rd	1331	GF	N	46	48	43	49	56	-	61	-	7	yes	no
11 Taylor Rd	932	GF	N	46	50	43	51	56	-	61	-	9	yes	no
12 Taylor Rd	1334	GF	N	46	48	43	49	57	-	62	-	7	yes	no
13 Taylor Rd	936	GF	NW	47	51	44	53	55	-	60	-	9	yes	no
14 Taylor Rd	1338	GF	N	46	48	43	49	56	-	61	-	7	yes	no
15 Taylor Rd	940	GF	NW	44	49	41	51	55	-	60	-	9	yes	no
16 Taylor Rd	1342	GF	N	44	47	41	48	55	-	60	-	7	yes	no
17 Taylor Rd	943	GF	NW	44	47	41	49	55	-	60	-	8	yes	no
18 Taylor Rd	1348	GF	N	45	48	42	50	56	-	61	-	7	yes	no
19 Taylor Rd	947	GF	N	44	47	41	48	54	-	59	-	8	yes	no
19 Taylor Rd unit 1	951	GF	N	44	49	41	51	55	-	60	-	10	yes	no
20 Taylor Rd	1351	GF	N	46	48	43	50	57	-	62	-	7	yes	no
21 Taylor Rd	955	GF	N	45	48	42	50	56	-	61	-	8	yes	no
22 Taylor Rd	1354	GF	N	44	47	41	49	55	-	60	-	8	yes	no
23 Taylor Rd	959	GF	N	44	48	41	50	55	-	60	-	9	yes	no
24 Taylor Rd, Unit 1	1359	GF	N	45	47	42	49	55	-	60	-	7	yes	no
24 Taylor Rd, Unit 2	1372	GF	N	44	46	41	47	55	-	60	-	6	yes	no
25 Taylor Rd	964	GF	N	44	48	41	50	55	-	60	-	9	yes	no
26 Taylor Rd, Unit 1	1362	GF	N	45	47	42	49	55	-	60	-	8	yes	no
26 Taylor Rd, Unit 2	1375	GF	E	47	48	43	49	57	-	62	-	5	yes	no
27 Taylor Rd	968	GF	E	44	48	41	50	55	-	60	-	9	yes	no
28 Taylor Rd, Unit 1	1367	GF	N	46	48	43	50	56	-	61	-	7	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
28 Taylor Rd, Unit 2	1378	GF	N	45	47	42	48	56	-	61	-	6	yes	no
29 Taylor Rd	971	GF	N	44	49	41	50	55	-	60	-	10	yes	no
30 Taylor Rd	1383	GF	N	45	48	42	49	56	-	61	-	7	yes	no
31 Taylor Rd	975	GF	N	45	49	42	51	55	-	60	-	9	yes	no
33 Taylor Rd	981	GF	N	45	50	42	51	55	-	60	-	10	yes	no
35 Taylor Rd	983	GF	N	44	49	41	51	54	-	59	-	10	yes	no
37 Taylor Rd	989	GF	N	45	50	41	51	55	-	60	-	10	yes	no
39 Taylor Rd	991	GF	N	45	50	42	51	55	-	60	-	10	yes	no
41 Taylor Rd	995	GF	N	44	49	41	51	55	-	60	-	10	yes	no
43 Taylor Rd	999	GF	N	44	49	41	51	55	-	60	-	10	yes	no
45 Taylor Rd	1005	GF	N	45	49	42	51	55	-	60	-	9	yes	no
47 Taylor Rd	1009	GF	N	45	50	42	51	55	-	60	-	10	yes	no
49 Taylor Rd	1013	GF	N	45	50	42	52	55	-	60	-	10	yes	no
51 Taylor Rd	1015	GF	N	44	50	41	51	55	-	60	-	10	yes	no
53 Taylor Rd	1021	GF	N	46	50	42	52	55	-	60	-	10	yes	no
54 Taylor Rd	1400	GF	N	48	49	44	51	58	-	63	-	7	yes	no
55 Taylor Rd	1023	GF	N	44	50	41	51	55	-	60	-	11	yes	no
56 Taylor Rd, Unit 1	1397	GF	E	50	50	46	52	59	-	64	-	6	yes	no
56 Taylor Rd, Unit 2	1393	GF	E	53	53	50	54	60	-	65	-	4	yes	no
56 Taylor Rd, Unit 3	1389	GF	E	55	54	51	55	60	-	65	-	4	yes	no
57 Taylor Rd	1027	GF	N	47	51	43	53	55	-	60	-	10	yes	no
58 Taylor Rd	1405	GF	E	54	54	50	54	60	-	65	-	4	yes	no
59 Taylor Rd	1031	GF	N	47	51	43	53	55	-	60	-	10	yes	no
61 Taylor Rd	1036	GF	N	47	51	43	52	56	-	61	-	9	yes	no
62 Taylor Rd	1300	GF	NW	55	56	52	57	60	-	65	-	5	yes	no
64 Taylor Rd	1295	GF	N	57	58	54	59	60	-	65	-	5	yes	no
66 Taylor Rd	1294	GF	NE	59	59	56	60	60	-	65	-	5	yes	no
68 Taylor Rd	1288	GF	NE	60	60	57	61	60	1	65	-	4	yes	yes
30 Terry St	325	GF	S	50	53	46	54	56	-	61	-	8	yes	no
32 Terry St	1595	GF	NW	55	62	51	63	55	8	60	3	12	yes	yes
Lot 1 The Expressway	243	F 1	S	48	62	46	63	55	8	60	3	17	yes	yes
30 The Expy	654	GF	N	46	64	43	65	55	10	60	5	22	yes	yes
31 The Expy	658	GF	NW	46	63	43	65	55	10	60	5	22	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				DAYTIME - dB(A), L _{Aeq} 15hr										
31 The Expy	660	GF	NE	47	63	44	65	55	10	60	5	20	yes	yes
32 The Expy	662	GF	NW	47	64	45	65	55	10	60	5	21	yes	yes
33 The Expy	666	GF	NW	47	63	44	65	55	10	60	5	20	yes	yes
34 The Expy	670	GF	NW	48	64	45	65	55	10	60	5	20	yes	yes
35 The Expy	674	GF	NW	48	64	46	65	55	10	60	5	19	yes	yes
36 The Expy	678	GF	NW	49	63	46	64	55	9	60	4	18	yes	yes
37 The Expy	684	GF	NW	50	63	47	64	55	9	60	4	18	yes	yes
38 The Expy	686	GF	NW	51	64	49	66	55	11	60	6	17	yes	yes
Unit 1 41-43 The Expressway	247	GF	S	47	60	45	61	55	6	60	1	17	yes	yes
Unit 2 41-43 The Expressway	251	GF	S	47	58	44	59	55	4	60	-	15	yes	yes
45 The Expressway	254	GF	S	46	62	44	63	55	8	60	3	19	yes	yes
45A The Expressway	258	GF	S	47	62	44	63	55	8	60	3	19	yes	yes
250 Tongarra Rd	653	GF	S	53	52	49	52	60	-	65	-	3	yes	no
252 Tongarra Rd	425	GF	S	64	63	61	64	60	4	65	-	3	yes	yes
254 Tongarra Rd	421	GF	S	64	63	61	63	60	3	65	-	3	yes	yes
1 Tripoli Way	1142	GF	N	47	65	44	67	55	12	60	7	23	yes	yes
2 Tripoli Way	314	GF	S	48	63	45	65	55	10	60	5	20	yes	yes
3 Tripoli Way	1138	GF	N	46	64	43	65	55	10	60	5	23	yes	yes
4 Tripoli Way	282	GF	S	47	62	43	64	55	9	60	4	20	yes	yes
6 Tripoli Way	278	GF	S	47	65	44	67	55	12	60	7	22	yes	yes
7 Tripoli Way	1134	F 1	N	48	66	45	68	55	13	60	8	23	yes	yes
8 Tripoli Way	270	GF	S	47	54	44	56	55	1	60	-	12	yes	yes
11 Tripoli Way	1131	GF	N	46	65	43	67	55	12	60	7	24	yes	yes
13 Tripoli Way	1127	GF	N	46	66	43	68	55	13	60	8	25	yes	yes
15 Tripoli Way	1122	GF	N	45	64	42	66	55	11	60	6	24	yes	yes
17 Tripoli Way	1121	GF	N	45	64	42	66	55	11	60	6	24	yes	yes
19 Tripoli Way	1114	GF	N	46	66	43	68	55	13	60	8	25	yes	yes
21 Tripoli Way	1110	GF	N	45	64	42	66	55	11	60	6	24	yes	yes
23 Tripoli Way	1108	GF	N	46	66	43	68	55	13	60	8	25	yes	yes
27 Tripoli Way	1102	GF	N	46	65	43	67	55	12	60	7	24	yes	yes
29 Tripoli Way	1098	GF	N	46	66	43	68	55	13	60	8	25	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3		Scenario 2		Scenario 5		Scenario 4		NSW NCG Criteria	Exceedance of NCG criteria for design year, 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year 'build' with no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A) above design year 'no build'?	Does receiver qualify for mitigation?
				No Build 2026		Build with No Mitigation 2026		No Build 2041		Build with No Mitigation 2041								
				DAYTIME - dB(A), L _{Aeq} 15hr														
31 Tripoli Way	1094	GF	N	44	63	41	65	55	10	60	5	23	yes	yes				
33 Tripoli Way	1091	GF	N	46	65	43	67	55	12	60	7	24	yes	yes				
35 Tripoli Way	1088	GF	N	46	66	43	68	55	13	60	8	25	yes	yes				
37 Tripoli Way	1083	GF	N	47	66	44	68	55	13	60	8	25	yes	yes				
39 Tripoli Way	1078	GF	N	47	67	44	69	55	14	60	9	25	yes	yes				
41 Tripoli Way	1074	GF	N	47	66	44	68	55	13	60	8	24	yes	yes				
41A Tripoli Way	1071	GF	N	47	67	45	69	55	14	60	9	25	yes	yes				
41B Tripoli Way	1067	GF	SW	47	60	44	62	55	7	60	2	19	yes	yes				

Table 6-7 Predicted Noise Levels(Night-time) – Residential Receivers

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
3 Broughton Ave	195	GF	N	63	62	63	63	55	8	60	3	0	no	yes
4 Broughton Ave	189	GF	E	57	57	57	59	52	7	57	2	2	yes	yes
5 Broughton Ave	192	GF	W	57	57	57	58	55	3	60	-	1	no	no
6 Broughton Ave	191	GF	E	53	54	53	56	50	6	55	1	3	yes	yes
7 Broughton Ave	1473	GF	W	50	50	49	51	54	-	59	-	3	yes	no
8 Broughton Ave	1447	GF	E	52	53	52	55	54	1	59	-	3	yes	yes
9 Broughton Ave	1477	GF	W	51	51	50	53	55	-	60	-	2	yes	no
10 Broughton Ave	1449	GF	E	51	52	51	53	55	-	60	-	2	yes	no
11 Broughton Ave	1481	GF	N	52	52	52	54	50	4	55	-	2	yes	yes
12 Broughton Ave	1455	GF	E	49	51	49	52	50	2	55	-	3	yes	yes
25 Brushgrove Circuit	169	F 1	S	56	56	55	57	55	2	60	-	2	no	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
27 Brushgrove Circuit	166	GF	E	54	53	53	54	54	-	59	-	1	no	no
29 Brushgrove Circuit	165	GF	S	54	53	53	54	54	-	59	-	1	no	no
31 Brushgrove Circuit	162	GF	E	53	52	52	53	50	3	55	-	1	no	no
33 Brushgrove Circuit	159	GF	E	49	49	48	50	55	-	60	-	2	yes	no
35 Brushgrove Circuit	156	GF	E	49	48	48	50	53	-	58	-	2	no	no
37 Brushgrove Circuit	153	GF	E	48	48	47	49	52	-	57	-	2	no	no
39 Brushgrove Circuit	149	GF	N	46	46	46	47	52	-	57	-	2	no	no
41 Brushgrove Circuit	147	GF	E	47	47	46	48	53	-	58	-	2	yes	no
43 Brushgrove Circuit	145	GF	S	42	47	41	48	51	-	56	-	7	yes	no
45 Brushgrove Circuit	141	GF	E	46	46	45	47	52	-	57	-	2	yes	no
47 Brushgrove Circuit	1572	GF	S	41	46	39	47	53	-	58	-	8	yes	no
49 Brushgrove Circuit	1574	GF	S	41	42	40	43	53	-	58	-	4	yes	no
51 Brushgrove Circuit	1576	GF	S	37	44	36	45	50	-	55	-	9	yes	no
4 Calderwood Rd	1304	GF	W	58	59	57	59	55	4	60	-	2	no	no
5 Calderwood Rd	1670	GF	E	59	60	58	60	55	5	60	-	2	no	no
6 Calderwood Rd	899	GF	W	58	57	57	59	55	4	60	-	2	no	no
7 Calderwood Rd	1666	GF	N	57	58	56	58	52	6	57	1	2	no	yes
Unit 2, 8 Calderwood Rd	888	GF	N	52	64	51	65	50	15	55	10	15	yes	yes
Unit 3, 8 Calderwood Rd	881	GF	N	57	65	57	66	50	16	55	11	10	yes	yes
Unit 4, 8 Calderwood Rd	884	GF	W	61	60	59	61	50	11	55	6	2	no	yes
8A Calderwood Rd	900	F 1	NW	51	63	49	65	50	15	55	10	16	yes	yes
9 Calderwood Rd	823	GF	E	60	60	58	60	55	5	60	-	2	no	no
10 Calderwood Rd	267	GF	S	51	60	50	61	50	11	55	6	12	yes	yes
11 Calderwood Rd	817	GF	E	59	60	58	59	52	7	57	2	2	no	yes
12 Calderwood Rd	263	GF	W	62	62	60	64	50	14	55	9	4	yes	yes
13 Calderwood Rd	813	GF	E	59	59	58	60	54	6	59	1	2	no	yes
15 Calderwood Rd	809	GF	E	60	60	59	61	55	6	60	1	2	no	yes
17 Calderwood Rd	806	GF	E	60	59	58	60	50	10	55	5	2	no	yes
19 Calderwood Rd	792	GF	E	61	59	59	61	52	9	57	4	2	no	yes
21 Calderwood Rd Unit 1	790	GF	E	61	60	60	62	50	12	55	7	2	yes	yes
21 Calderwood Rd Unit 2	787	GF	N	58	57	57	59	55	4	60	-	2	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
23 Calderwood Rd	782	GF	N	57	59	56	61	53	8	58	3	5	yes	yes
1 Curramore Tce	185	GF	N	55	56	54	57	50	7	55	2	3	yes	yes
3 Curramore Ter	182	GF	N	55	55	54	57	50	7	55	2	3	yes	yes
5 Curramore Ter	178	GF	N	54	55	54	56	51	5	56	-	3	yes	yes
7 Curramore Ter	175	GF	N	54	55	53	56	50	6	55	1	3	yes	yes
9 Curramore Tce	174	GF	NE	51	52	51	54	50	4	55	-	3	yes	yes
11 Curramore Ter	1410	GF	NW	47	49	46	50	51	-	56	-	4	yes	no
13 Curramore Ter	1412	GF	NW	49	50	47	51	54	-	59	-	3	yes	no
15 Curramore Ter	1416	GF	NW	48	48	46	50	55	-	60	-	3	yes	no
17 Curramore Ter	1420	GF	NW	47	47	45	49	55	-	60	-	3	yes	no
1 Hamilton Rd	1041	GF	E	57	57	55	57	55	2	60	-	3	yes	yes
1A Hamilton Rd	1046	GF	E	56	56	54	57	52	5	57	-	3	yes	yes
1B Hamilton Rd	1049	GF	E	56	57	54	58	50	8	55	3	4	yes	yes
3 Hamilton Rd	1053	GF	E	56	58	54	59	50	9	55	4	5	yes	yes
5 Hamilton Rd	1055	GF	N	51	63	49	65	50	15	55	10	15	yes	yes
7 Hamilton Rd	312	GF	S	47	62	45	63	50	13	55	8	19	yes	yes
9 Hamilton Rd	307	GF	E	48	55	47	56	50	6	55	1	10	yes	yes
9 Hamilton Rd	306	GF	S	48	55	47	56	50	6	55	1	9	yes	yes
10 Hamilton Rd	1149	GF	W	56	58	54	58	52	6	57	1	4	yes	yes
11 Hamilton Rd	305	GF	E	48	53	47	54	50	4	55	-	7	yes	yes
12 Hamilton Rd	1151	GF	N	50	63	48	65	50	15	55	10	17	yes	yes
13 Hamilton Rd	301	GF	E	46	50	45	51	50	1	55	-	7	yes	yes
14 Hamilton Rd	318	GF	S	46	52	44	53	50	3	55	-	9	yes	yes
15 Hamilton Rd	296	GF	S	45	50	43	51	50	1	55	-	8	yes	yes
17 Hamilton Rd	292	GF	E	47	50	45	51	50	1	55	-	6	yes	yes
19 Hamilton Rd	286	GF	S	44	51	42	53	50	3	55	-	11	yes	yes
1 Moles St Unit 1	1658	GF	NW	47	50	45	50	53	-	58	-	4	yes	no
1 Moles St Unit 2	1663	GF	NE	53	53	51	54	52	2	57	-	2	yes	yes
2 Moles St	856	GF	NW	42	47	40	48	50	-	55	-	7	yes	no
3 Moles St	1656	GF	SE	49	49	47	50	55	-	60	-	2	yes	no
4 Moles St	852	GF	NW	46	47	45	48	52	-	57	-	4	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
5 Moles St	1653	GF	SW	46	47	44	48	50	-	55	-	4	yes	no
6 Moles St	848	GF	NW	44	48	43	49	54	-	59	-	6	yes	no
7 Moles St	1646	GF	NW	44	47	42	48	50	-	55	-	6	yes	no
8 Moles St	847	GF	SW	44	46	43	47	54	-	59	-	4	yes	no
9 Moles St	1645	GF	NE	45	47	43	48	51	-	56	-	5	yes	no
10 Moles St	840	GF	NW	45	48	44	49	51	-	56	-	5	yes	no
11 Moles St	1641	GF	SE	48	47	46	48	55	-	60	-	2	no	no
12 Moles St	839	GF	SW	44	46	43	47	52	-	57	-	5	yes	no
13 Moles St	1636	GF	NE	45	47	43	48	52	-	57	-	5	yes	no
14 Moles St	832	GF	NW	45	48	44	49	50	-	55	-	5	yes	no
15 Moles St	1632	GF	SE	47	46	45	47	55	-	60	-	2	no	no
16 Moles St	828	GF	NW	45	48	44	49	55	-	60	-	5	yes	no
17 Moles St	1627	GF	NW	44	47	43	48	53	-	58	-	6	yes	no
18 Moles St	825	GF	NE	45	48	44	49	52	-	57	-	5	yes	no
19 Moles St	1625	GF	SW	44	46	42	46	50	-	55	-	4	yes	no
21 Moles St	1620	GF	SE	48	47	46	48	55	-	60	-	2	no	no
23 Moles St	1615	GF	NW	45	48	44	49	52	-	57	-	5	yes	no
23 Moles St	1615	F 1	NW	48	49	47	50	53	-	58	-	3	yes	no
25 Moles St	1610	GF	NW	45	48	44	49	52	-	57	-	4	yes	no
27 Moles St	1606	GF	SW	48	48	46	49	52	-	57	-	3	yes	no
29 Moles St	1604	GF	SW	46	47	45	48	52	-	57	-	4	yes	no
31 Moles St	1600	GF	NW	45	48	43	48	50	-	55	-	6	yes	no
37 Moles St	648	GF	E	45	45	43	46	52	-	57	-	3	yes	no
39 Moles St	642	GF	W	43	46	41	47	51	-	56	-	6	yes	no
41 Moles St	641	GF	E	43	46	41	47	51	-	56	-	6	yes	no
43 Moles St	636	GF	S	43	46	42	46	50	-	55	-	4	yes	no
45 Moles St	630	GF	W	41	48	40	49	50	-	55	-	9	yes	no
47 Moles St	626	GF	N	40	44	39	46	52	-	57	-	7	yes	no
49 Moles St	622	GF	N	40	44	38	45	52	-	57	-	7	yes	no
51 Moles St	618	GF	W	43	48	42	49	51	-	56	-	7	yes	no
53 Moles St	616	GF	E	41	49	40	51	50	1	55	-	11	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
55 Moles St	610	GF	N	40	55	38	56	50	6	55	1	18	yes	yes
57 Moles St	606	GF	N	41	62	39	63	50	13	55	8	24	yes	yes
1 Mountainview Mews	1204	GF	NW	53	54	51	54	51	3	56	-	3	yes	yes
2 Mountainview Mews	1210	GF	W	54	53	52	54	55	-	60	-	2	no	no
3 Mountainview Mews	1211	GF	N	44	48	42	50	50	-	55	-	8	yes	no
4 Mountainview Mews	1215	GF	N	44	48	42	49	50	-	55	-	7	yes	no
5 Mountainview Mews	1220	GF	E	43	47	41	48	52	-	57	-	8	yes	no
6 Mountainview Mews	1224	GF	E	43	46	41	48	52	-	57	-	7	yes	no
7 Mountainview Mews	1228	GF	E	43	47	41	48	51	-	56	-	8	yes	no
8 Mountainview Mews	1231	GF	N	44	48	42	49	50	-	55	-	7	yes	no
9 Mountainview Mews	1236	GF	E	44	48	42	50	53	-	58	-	8	yes	no
10 Mountainview Mews	1240	GF	E	45	49	43	51	54	-	59	-	8	yes	no
11 Mountainview Mews	1243	GF	N	46	50	43	51	50	1	55	-	8	yes	yes
12 Mountainview Mews	1247	GF	N	46	50	44	51	50	1	55	-	8	yes	yes
13 Mountainview Mews	1252	GF	E	46	50	43	52	52	-	57	-	8	yes	no
13 Mountainview Mews	1251	GF	N	46	50	44	52	52	-	57	-	8	yes	no
14 Mountainview Mews	1256	GF	E	48	51	46	53	50	3	55	-	7	yes	yes
15 Mountainview Mews	1260	GF	E	46	51	44	52	50	2	55	-	8	yes	yes
16 Mountainview Mews	1264	GF	E	50	52	47	53	50	3	55	-	6	yes	yes
17 Mountainview Mews	1155	GF	N	45	63	43	64	50	14	55	9	22	yes	yes
18 Mountainview Mews	1159	GF	N	45	63	42	65	50	15	55	10	22	yes	yes
19 Mountainview Mews	1163	GF	N	44	63	42	64	50	14	55	9	22	yes	yes
20 Mountainview Mews	1167	GF	N	45	63	42	64	50	14	55	9	22	yes	yes
21 Mountainview Mews	1171	GF	N	45	63	42	64	50	14	55	9	22	yes	yes
22 Mountainview Mews	1175	GF	N	45	63	43	64	50	14	55	9	22	yes	yes
23 Mountainview Mews	1179	GF	N	45	62	43	64	50	14	55	9	21	yes	yes
24 Mountainview Mews	1183	GF	N	45	63	43	64	50	14	55	9	21	yes	yes
25 Mountainview Mews	1187	GF	N	46	62	43	64	50	14	55	9	21	yes	yes
26 Mountainview Mews	1191	GF	N	46	62	44	64	50	14	55	9	20	yes	yes
27 Mountainview Mews	1195	GF	N	46	62	44	63	50	13	55	8	20	yes	yes
28 Mountainview Mews	1199	GF	N	46	62	44	63	50	13	55	8	19	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
1 O'Keefe Cres	867	GF	E	45	48	43	48	55	-	60	-	5	yes	no
2 O'Keefe Cres	870	GF	NE	47	48	46	48	54	-	59	-	3	yes	no
3 O'Keefe Cres	860	GF	N	44	46	42	47	55	-	60	-	5	yes	no
3 O'Keefe Cres	861	GF	E	45	46	43	47	55	-	60	-	4	yes	no
4 O'Keefe Cres	874	GF	NE	47	47	45	48	51	-	56	-	3	yes	no
5 O'Keefe Cres	779	GF	E	46	47	44	49	55	-	60	-	4	yes	no
6 O'Keefe Cres	877	GF	NE	46	46	44	47	55	-	60	-	3	yes	no
7 O'Keefe Cres	775	F 1	N	48	51	46	53	50	3	55	-	6	yes	yes
8 O'Keefe Cres	801	GF	NE	45	45	43	46	54	-	59	-	4	yes	no
9 O'Keefe Cres	772	GF	NE	50	51	49	52	55	-	60	-	4	yes	no
10 O'Keefe Cres	799	GF	N	44	48	42	50	50	-	55	-	7	yes	no
11 O'Keefe Cres	766	GF	NW	48	49	47	50	52	-	57	-	3	yes	no
13 O'Keefe Cres	762	GF	NW	46	48	45	49	50	-	55	-	4	yes	no
15 O'Keefe Cres	758	GF	NW	49	52	48	53	51	2	56	-	5	yes	yes
16 O'Keefe Cres	727	GF	NW	52	54	50	56	50	6	55	1	6	yes	yes
17 O'Keefe Cres	754	GF	NW	46	47	45	48	50	-	55	-	3	yes	no
18 O'Keefe Cres	722	GF	NW	52	54	50	56	50	6	55	1	5	yes	yes
19 O'Keefe Cres	750	GF	NW	45	49	44	50	55	-	60	-	6	yes	no
20 O'Keefe Cres	719	GF	NE	51	53	50	55	50	5	55	-	5	yes	yes
21 O'Keefe Cres	749	GF	SW	39	45	38	46	51	-	56	-	9	yes	no
22 O'Keefe Cres	714	GF	NW	48	51	47	52	51	1	56	-	5	yes	yes
23 O'Keefe Cres	742	GF	NW	41	44	40	45	53	-	58	-	6	yes	no
24 O'Keefe Cres	710	GF	NW	42	48	40	50	50	-	55	-	9	yes	no
25 O'Keefe Cres	741	GF	SW	43	46	41	47	50	-	55	-	6	yes	no
26 O'Keefe Cres	706	GF	NW	42	49	41	50	52	-	57	-	9	yes	no
27 O'Keefe Cres	734	GF	NW	41	48	39	49	50	-	55	-	10	yes	no
28 O'Keefe Cres	704	GF	NW	41	48	39	50	50	-	55	-	11	yes	no
29 O'Keefe Cres	733	GF	NE	39	45	38	46	51	-	56	-	8	yes	no
30 O'Keefe Cres	700	GF	NW	41	48	39	49	52	-	57	-	10	yes	no
32 O'Keefe Cres	696	GF	NW	41	47	39	48	51	-	56	-	9	yes	no
34 O'Keefe Cres	693	GF	SW	41	46	39	47	50	-	55	-	7	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
1 Parsons Pl	430	F 1	NW	45	50	44	51	50	1	55	-	6	yes	yes
2 Parsons Pl	506	GF	SW	45	48	44	49	51	-	56	-	6	yes	no
3 Parsons Pl	453	GF	SW	44	49	43	49	50	-	55	-	7	yes	no
4 Parsons Pl	503	GF	NE	42	49	41	50	50	-	55	-	9	yes	no
5 Parsons Pl	454	GF	SW	45	49	44	49	51	-	56	-	6	yes	no
6 Parsons Pl	501	GF	NW	43	47	41	48	54	-	59	-	6	yes	no
7 Parsons Pl	484	GF	SW	46	49	45	49	50	-	55	-	5	yes	no
8 Parsons Pl	495	GF	W	47	49	46	49	50	-	55	-	4	yes	no
9 Parsons Pl	489	GF	SW	45	48	43	49	50	-	55	-	6	yes	no
11 Parsons Pl	490	GF	W	47	47	46	48	52	-	57	-	2	no	no
4 Pasture Way	1560	GF	E	47	48	46	49	55	-	60	-	3	yes	no
4 Pasture Way	1559	GF	S	48	48	47	49	55	-	60	-	2	no	no
6 Pasture Way	1564	GF	N	39	43	38	44	51	-	56	-	7	yes	no
8 Pasture Way	1591	GF	N	39	40	37	41	51	-	56	-	4	yes	no
10 Pasture Way	1588	F 1	S	49	49	49	51	52	-	57	-	2	no	no
12 Pasture Way	1582	GF	E	42	43	41	44	54	-	59	-	4	yes	no
14 Pasture Way	1581	F 1	E	48	48	48	50	55	-	60	-	2	no	no
1 Polock Cres	537	GF	SW	47	48	46	49	53	-	58	-	3	yes	no
2 Polock Cres	417	GF	SW	52	51	50	52	54	-	59	-	2	no	no
3 Polock Cres	530	GF	NW	42	47	41	48	52	-	57	-	7	yes	no
4 Polock Cres	410	GF	SW	49	49	48	50	54	-	59	-	2	no	no
5 Polock Cres	481	GF	SW	46	48	45	49	50	-	55	-	4	yes	no
6 Polock Cres	409	GF	SW	47	49	46	49	50	-	55	-	4	yes	no
7 Polock Cres	475	GF	NE	44	47	42	47	51	-	56	-	6	yes	no
8 Polock Cres	405	GF	SW	46	47	45	48	55	-	60	-	3	yes	no
9 Polock Cres	471	GF	NW	40	47	38	48	52	-	57	-	9	yes	no
10 Polock Cres	399	GF	SW	45	47	44	48	50	-	55	-	5	yes	no
11 Polock Cres	469	GF	SW	42	47	40	48	50	-	55	-	8	yes	no
12 Polock Cres	396	GF	NE	43	48	41	49	50	-	55	-	7	yes	no
13 Polock Cres	462	GF	SW	43	44	41	45	50	-	55	-	4	yes	no
14 Polock Cres	391	GF	NW	41	47	40	48	53	-	58	-	9	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
15 Polock Cres	458	GF	NW	39	46	38	47	50	-	55	-	10	yes	no
16 Polock Cres	388	GF	NE	42	45	40	46	53	-	58	-	6	yes	no
17 Polock Cres	447	GF	N	39	49	37	50	50	-	55	-	13	yes	no
18 Polock Cres	385	GF	NE	41	46	39	47	50	-	55	-	8	yes	no
19 Polock Cres	442	GF	N	38	49	36	51	50	1	55	-	14	yes	yes
20 Polock Cres	379	GF	NW	40	48	38	49	50	-	55	-	11	yes	no
21 Polock Cres	439	GF	W	40	50	38	51	50	1	55	-	13	yes	yes
22 Polock Cres	375	GF	NE	41	50	39	51	50	1	55	-	13	yes	yes
23 Polock Cres	435	F 1	NW	45	51	44	52	50	2	55	-	8	yes	yes
24 Polock Cres	372	GF	NE	40	55	38	56	50	6	55	1	18	yes	yes
24 Polock Cres	371	GF	NW	40	55	38	56	50	6	55	1	18	yes	yes
25 Polock Cres	427	GF	NE	37	51	35	52	49	3	54	-	16	yes	yes
26 Polock Cres	367	GF	N	40	58	38	59	50	9	55	4	21	yes	yes
27 Polock Cres	510	GF	N	42	52	41	52	50	2	55	-	11	yes	yes
28 Polock Cres	362	GF	N	39	58	37	59	50	9	55	4	23	yes	yes
29 Polock Cres	517	GF	W	46	51	44	52	50	2	55	-	7	yes	yes
30 Polock Cres	358	GF	N	38	56	37	57	50	7	55	2	20	yes	yes
31 Polock Cres	519	GF	NW	45	48	44	49	50	-	55	-	5	yes	no
32 Polock Cres	355	GF	N	39	58	37	59	50	9	55	4	22	yes	yes
33 Polock Cres	522	GF	SW	50	49	49	50	55	-	60	-	1	no	no
34 Polock Cres	350	GF	N	38	57	36	58	50	8	55	3	22	yes	yes
35 Polock Cres	527	GF	SW	52	51	50	52	50	2	55	-	1	no	no
36 Polock Cres	346	GF	N	39	57	38	58	50	8	55	3	20	yes	yes
37 Polock Cres	570	GF	SW	55	54	53	54	51	3	56	-	1	no	no
38 Polock Cres	342	GF	NW	47	57	47	57	50	7	55	2	11	yes	yes
40 Polock Cres	602	GF	W	48	54	47	55	50	5	55	-	8	yes	yes
42 Polock Cres	598	GF	W	50	51	49	52	50	2	55	-	3	yes	yes
44 Polock Cres	594	GF	W	52	53	51	53	50	3	55	-	2	no	no
46 Polock Cres	590	GF	SW	52	52	51	52	54	-	59	-	1	no	no
48 Polock Cres	582	GF	W	51	51	49	51	52	-	57	-	2	no	no
1 Taylor Rd	905	GF	SW	61	60	60	62	50	12	55	7	2	no	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
2 Taylor Rd	1307	F 1	W	60	61	59	61	50	11	55	6	2	no	yes
3 Taylor Rd	909	GF	SW	54	55	53	55	53	2	58	-	1	no	no
4 Taylor Rd	1311	GF	W	49	50	48	50	53	-	58	-	2	no	no
5 Taylor Rd	914	GF	SE	49	50	47	50	52	-	57	-	3	yes	no
6 Taylor Rd	1315	GF	NW	46	47	44	48	51	-	56	-	4	yes	no
7 Taylor Rd Unit 1	923	GF	NE	44	47	42	48	54	-	59	-	6	yes	no
7 Taylor Rd Unit 2	916	GF	NW	45	51	44	53	50	3	55	-	9	yes	yes
8 Taylor Rd	1319	GF	N	44	46	42	47	50	-	55	-	5	yes	no
8A Taylor Rd	1326	GF	S	47	47	45	47	55	-	60	-	2	yes	no
8B Taylor Rd	1324	GF	W	48	48	46	48	55	-	60	-	2	yes	no
9 Taylor Rd	924	GF	N	43	52	42	53	50	3	55	-	12	yes	yes
10 Taylor Rd	1331	F 1	N	45	47	43	48	50	-	55	-	5	yes	no
11 Taylor Rd	932	GF	N	42	46	41	48	50	-	55	-	7	yes	no
12 Taylor Rd	1334	GF	N	42	45	41	46	51	-	56	-	5	yes	no
13 Taylor Rd	936	GF	NW	43	48	42	49	50	-	55	-	8	yes	no
14 Taylor Rd	1338	GF	N	42	44	40	46	50	-	55	-	6	yes	no
15 Taylor Rd	940	GF	NW	41	46	39	47	50	-	55	-	8	yes	no
16 Taylor Rd	1343	GF	E	42	43	40	44	51	-	56	-	4	yes	no
17 Taylor Rd	944	GF	NE	40	44	38	45	50	-	55	-	7	yes	no
18 Taylor Rd	1348	GF	N	42	45	41	46	54	-	59	-	6	yes	no
19 Taylor Rd	948	GF	E	41	45	39	46	51	-	56	-	7	yes	no
19 Taylor Rd unit 1	952	GF	NE	43	47	41	48	50	-	55	-	8	yes	no
20 Taylor Rd	1351	GF	N	42	45	41	46	53	-	58	-	5	yes	no
21 Taylor Rd	956	GF	NE	41	45	39	46	53	-	58	-	7	yes	no
22 Taylor Rd	1354	F 1	N	44	46	42	47	52	-	57	-	6	yes	no
23 Taylor Rd	959	GF	N	41	45	39	46	50	-	55	-	8	yes	no
24 Taylor Rd, Unit 1	1359	GF	N	41	44	39	45	51	-	56	-	6	yes	no
24 Taylor Rd, Unit 2	1372	GF	N	41	43	39	44	53	-	58	-	5	yes	no
25 Taylor Rd	964	GF	N	41	46	39	47	53	-	58	-	9	yes	no
26 Taylor Rd, Unit 1	1362	GF	N	41	44	39	45	53	-	58	-	7	yes	no
26 Taylor Rd, Unit 2	1374	GF	N	43	44	41	45	52	-	57	-	4	yes	no

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
27 Taylor Rd	968	GF	E	41	45	39	47	50	-	55	-	8	yes	no
28 Taylor Rd, Unit 1	1368	GF	E	45	46	43	47	50	-	55	-	4	yes	no
28 Taylor Rd, Unit 2	1378	GF	N	42	44	40	45	52	-	57	-	5	yes	no
29 Taylor Rd	971	GF	N	40	46	38	47	50	-	55	-	9	yes	no
30 Taylor Rd	1384	F 1	E	48	48	46	49	50	-	55	-	3	yes	no
31 Taylor Rd	975	GF	N	42	46	40	48	50	-	55	-	8	yes	no
33 Taylor Rd	981	GF	N	41	46	39	48	50	-	55	-	9	yes	no
35 Taylor Rd	983	GF	N	40	46	38	47	50	-	55	-	9	yes	no
37 Taylor Rd	989	GF	N	41	46	39	48	50	-	55	-	9	yes	no
39 Taylor Rd	994	GF	W	41	44	39	46	50	-	55	-	7	yes	no
41 Taylor Rd	995	GF	N	41	46	39	47	50	-	55	-	9	yes	no
43 Taylor Rd	999	GF	N	41	45	38	47	50	-	55	-	9	yes	no
45 Taylor Rd	1005	GF	N	43	47	41	48	50	-	55	-	7	yes	no
47 Taylor Rd	1009	GF	N	41	46	39	48	50	-	55	-	9	yes	no
49 Taylor Rd	1013	GF	N	42	47	40	48	51	-	56	-	9	yes	no
51 Taylor Rd	1015	GF	N	41	46	38	48	52	-	57	-	9	yes	no
53 Taylor Rd	1021	GF	N	42	47	40	49	50	-	55	-	9	yes	no
54 Taylor Rd	1400	GF	N	44	46	42	47	55	-	60	-	6	yes	no
55 Taylor Rd	1023	GF	N	41	46	38	48	50	-	55	-	10	yes	no
56 Taylor Rd, Unit 1	1397	GF	E	46	47	44	48	50	-	55	-	4	yes	no
56 Taylor Rd, Unit 2	1393	GF	E	49	49	47	50	55	-	60	-	3	yes	no
56 Taylor Rd, Unit 3	1389	GF	E	51	50	49	51	55	-	60	-	3	yes	no
57 Taylor Rd	1027	GF	N	43	48	41	49	50	-	55	-	8	yes	no
58 Taylor Rd	1405	GF	E	50	50	48	51	52	-	57	-	3	yes	no
59 Taylor Rd	1031	GF	N	43	48	41	49	50	-	55	-	8	yes	no
61 Taylor Rd	1037	GF	E	48	49	46	50	50	-	55	-	4	yes	no
62 Taylor Rd	1300	GF	NW	52	52	54	54	50	4	55	-	-	no	no
64 Taylor Rd	1295	GF	N	54	54	55	56	53	3	58	-	0	no	no
66 Taylor Rd	1294	GF	NE	56	56	57	57	50	7	55	2	0	no	yes
68 Taylor Rd	1287	GF	NW	56	56	57	57	50	7	55	2	0	no	yes
30 Terry St	324	GF	E	48	50	46	52	50	2	55	-	6	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
32 Terry St	1596	GF	NE	58	59	58	60	50	10	55	5	3	yes	yes
Lot 1 The Expressway	243	F 1	S	46	60	45	61	50	11	55	6	16	yes	yes
30 The Expy	654	GF	N	42	61	41	62	50	12	55	7	21	yes	yes
31 The Expy	658	GF	NW	42	60	40	61	50	11	55	6	22	yes	yes
31 The Expy	660	GF	NE	44	60	42	61	50	11	55	6	20	yes	yes
32 The Expy	662	GF	NW	44	61	42	62	50	12	55	7	20	yes	yes
33 The Expy	666	GF	NW	43	60	41	61	50	11	55	6	20	yes	yes
34 The Expy	670	GF	NW	44	61	43	62	50	12	55	7	19	yes	yes
35 The Expy	674	GF	NW	45	61	43	62	50	12	55	7	19	yes	yes
36 The Expy	678	GF	NW	45	60	43	61	50	11	55	6	18	yes	yes
37 The Expy	684	GF	NW	46	60	44	61	50	11	55	6	18	yes	yes
38 The Expy	686	GF	NW	52	61	51	63	50	13	55	8	12	yes	yes
Unit 1 41-43 The Expressway	247	GF	S	46	58	44	59	50	9	55	4	15	yes	yes
Unit 2 41-43 The Expressway	251	GF	S	45	57	44	58	50	8	55	3	14	yes	yes
45 The Expressway	254	GF	S	44	59	42	60	50	10	55	5	18	yes	yes
45A The Expressway	258	GF	S	44	59	43	60	50	10	55	5	18	yes	yes
250 Tongarra Rd	652	GF	E	48	49	46	50	51	-	56	-	3	yes	no
252 Tongarra Rd	425	GF	S	62	60	60	61	55	6	60	1	1	no	yes
254 Tongarra Rd	421	GF	S	61	60	60	61	55	6	60	1	1	no	yes
1 Tripoli Way	1142	GF	N	44	62	42	63	50	13	55	8	22	yes	yes
2 Tripoli Way	314	GF	S	44	60	42	61	50	11	55	6	19	yes	yes
3 Tripoli Way	1138	GF	N	46	60	45	62	50	12	55	7	17	yes	yes
4 Tripoli Way	282	GF	S	43	59	41	60	50	10	55	5	19	yes	yes
6 Tripoli Way	278	GF	S	44	61	42	63	50	13	55	8	21	yes	yes
7 Tripoli Way	1134	F 1	N	45	63	43	64	50	14	55	9	22	yes	yes
8 Tripoli Way	270	GF	S	43	51	41	52	50	2	55	-	11	yes	yes
11 Tripoli Way	1131	GF	N	42	62	40	63	50	13	55	8	23	yes	yes
13 Tripoli Way	1127	GF	N	42	62	40	64	50	14	55	9	24	yes	yes
15 Tripoli Way	1122	GF	N	41	61	39	62	50	12	55	7	23	yes	yes

Receiver	SoundPLAN Object Number	Floor level	Façade orientation	Scenario 3	Scenario 2	Scenario 5	Scenario 4	NSW NCG Criteria	Exceedance of NCG criteria with project design year 'build' with no mitigation	Cumulative Noise Limit	Exceedance of Cumulative Limit?	Design year with project and no mitigation increase above design year 'no build'	Is design year 'build' with no mitigation >2dB(A)? above design year 'no build'	Does receiver qualify for mitigation?
				No Build 2026	Build with No Mitigation 2026	No Build 2041	Build with No Mitigation 2041							
				NIGHT TIME - dB(A), L _{Aeq} 9hr										
17 Tripoli Way	1121	GF	N	42	61	40	62	50	12	55	7	22	yes	yes
19 Tripoli Way	1114	GF	N	42	62	40	64	50	14	55	9	24	yes	yes
21 Tripoli Way	1110	GF	N	42	61	40	63	50	13	55	8	23	yes	yes
23 Tripoli Way	1108	GF	N	42	62	40	64	50	14	55	9	24	yes	yes
27 Tripoli Way	1102	GF	N	42	62	40	63	50	13	55	8	23	yes	yes
29 Tripoli Way	1098	GF	N	42	62	40	64	50	14	55	9	24	yes	yes
31 Tripoli Way	1094	GF	N	41	59	39	61	50	11	55	6	22	yes	yes
33 Tripoli Way	1091	GF	N	43	62	41	64	50	14	55	9	23	yes	yes
35 Tripoli Way	1088	GF	N	43	63	41	65	50	15	55	10	24	yes	yes
37 Tripoli Way	1083	GF	N	43	63	41	65	50	15	55	10	24	yes	yes
39 Tripoli Way	1078	GF	N	43	63	41	65	50	15	55	10	23	yes	yes
41 Tripoli Way	1074	GF	N	43	63	42	65	50	15	55	10	23	yes	yes
41A Tripoli Way	1071	GF	N	44	64	42	65	50	15	55	10	23	yes	yes
41B Tripoli Way	1068	GF	N	44	63	43	65	50	15	55	10	22	yes	yes
43 Tripoli Way	928	GF	N	46	64	44	65	50	15	55	10	21	yes	yes
43A Tripoli Way	1064	GF	N	42	56	40	58	50	8	55	3	18	yes	yes
43B Tripoli Way	1059	F 1	N	45	61	43	63	50	13	55	8	20	yes	yes

6.7 Results Overview

A review of the above results indicates that up to 147 dwellings are predicted to be impacted levels exceeding the NCG criteria and therefore qualifying for the consideration of mitigation. Refer to Section 9.1 for recommendations.

The reason a large proportion of the assessed locations qualify for the consideration of mitigation is due to a combination the following reasons;

- Dwellings located along Tripoli Way will have minimal separation distance to the new road.
- When assessing Tripoli Way as a new road project, the resulting criteria is quite stringent. Although parts of Tripoli Way are pre-existing, the proposal to upgrade Tripoli Way from a local road to a sub-arterial road triggers the new road criteria in accordance with the NCG.
- The areas adjacent to the project predominately consist of established low-medium residential development. Residential dwellings situated on pre-existing sections of Tripoli Way may require driveway access to the redeveloped road, therefore acoustic barriers are not a feasible mitigation option.

7 Construction Noise Impact Assessment

7.1 Construction Noise Assessment Methodology

A preliminary assessment on the potential level of construction noise impact has been carried out to determine whether mitigation will be required, and to determine appropriate management controls.

Construction equipment requirements are not yet known. The type and number of plant and equipment associated with the proposed works was assumed based upon experience with similar noise assessments. A further assessment will be required once final construction detail becomes available with progress of the detailed design.

The general construction phases for the project have been assumed based on similar previous projects. This has outlined that the following works, with the potential to generate significant noise, which are detailed below in Section 7.2.

7.2 Modelled Construction Phases

The following construction stages have been modelled:

Table 7-1 Modelled construction phases

Phase No.	Construction Phase Description
1	Mobilisation & Site Establishment
2	Bulk Earthworks
3	Bridge construction
4	Road Surfacing Works

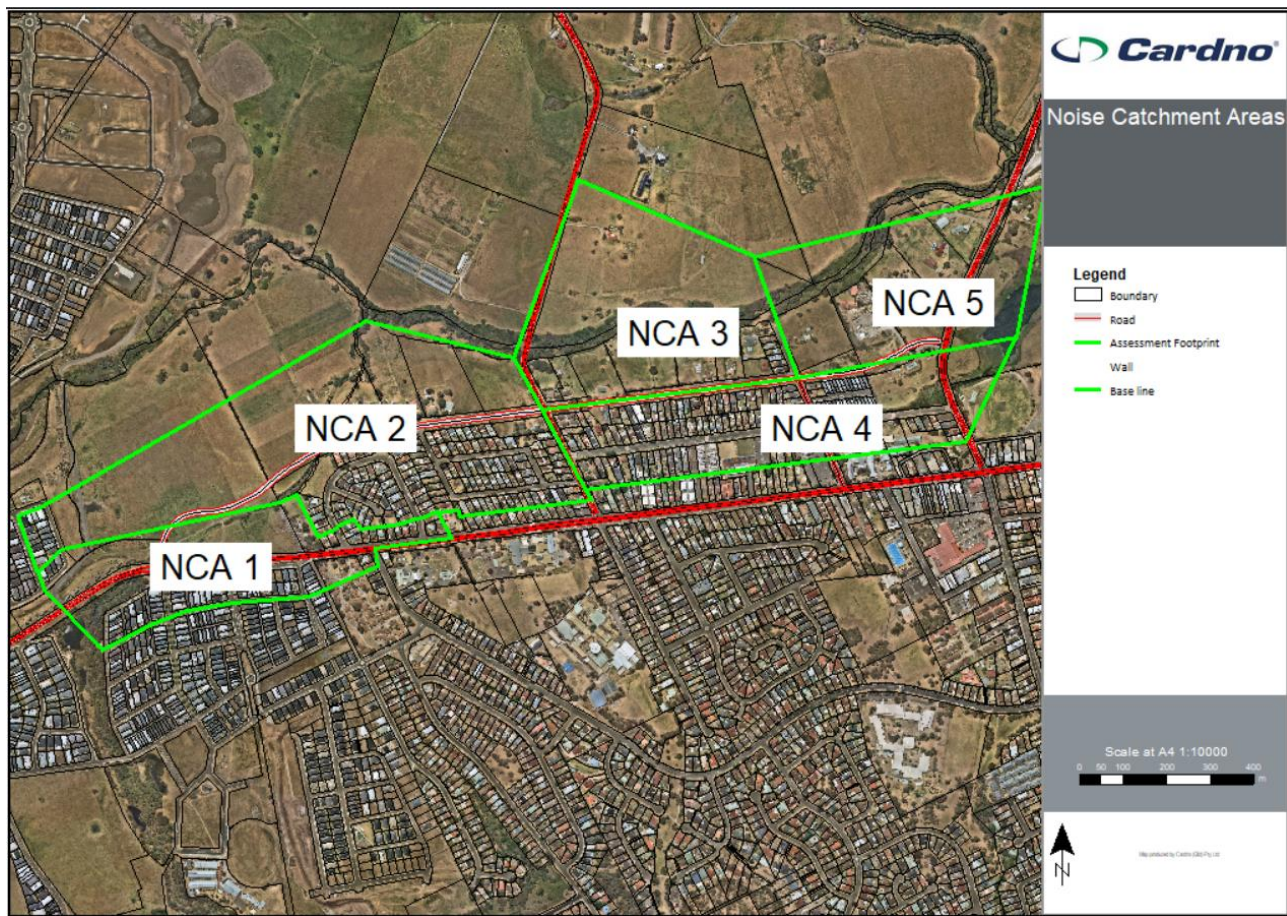
To provide an indicative assessment of construction noise impact, a noise model was created for each of the above construction phases.

7.3 Noise Catchment Areas

Noise modelling was conducted to determine the predicted level of noise impact at sensitive locations surrounding the project.

Works associated with the modelled stages are likely to move along the length of the project and construction noise impacting on more remote receivers from these locations will increase as the works progress closer to them. Sensitive areas have been grouped into noise catchment areas as shown below in Figure 7-1.

Figure 7-1 Noise Catchment Areas



Noise contour maps showing the predicted noise levels for the modelled construction works are detailed in Appendix F.

7.4 Construction Timing

We understand that some construction works are likely to be proposed for outside of standard hours as well as during standard hours for traffic safety reasons.

7.5 Construction Plant & Equipment

The construction plant included in the noise models are presented in Table 7-2. The equipment sound power levels were sourced from Australian Standard AS 2436-2010: Guide to Noise Control on Construction, Maintenance and Demolition Sites and noise measurements of typical construction plant previously conducted by Cardno.

Table 7-2 Construction Plant Sound Power Levels

Construction phase	Plant and equipment	Plant Sound Power Level	Number Operating
1. Clearing and grubbing	Excavator	110	1
	Bulldozer	116	1
	Chainsaws	114	2
	Haulage trucks	103	1
	Light vehicles	88	4

Construction phase	Plant and equipment	Plant Sound Power Level	Number Operating
	Log trucks	107	1
	Mulching equipment/Tub grinder	116	1
	Total Lw	121	-
2. Earthworks and drainage	Excavator	110	1
	Articulated dump trucks	110	2
	Backhoe	111	1
	Bulldozer	116	1
	Compactors	111	1
	Delivery trucks	107	1
	Grader	113	1
	Light vehicles	88	4
	Pad foot rollers	111	1
	Water Cart	110	1
	Total Lw	121	-
3. Bridge Construction	Hydraulic hammer rig	117	1
	Tracked mobile crane	95	1
	Hand-welder	101	1
	Welding Generator	102	1
	Gas cutter	96	1
	Hand-welder	101	1
	Concrete Agitator Trucks	109	1
	Concrete pump	108	1
	Immersion vibrating needles	103	1
	Formwork Carpentry tools	102	1
	Total Lw	119	-
4. Road surfacing	Asphalt paver	114	1
	Bitumen sprayer	106	1
	Drum vibrator	111	1
	Grader	113	1
	Light vehicle	88	4
	Milling machine	98	1
	Rollers	107	1
	Water truck	110	1
	Total Lw	119	-

7.6 Predicted Construction Noise Levels

The predicted noise impact from construction activities in the form of noise contour maps is presented in Appendix F. Predicted construction noise levels at each modelled receiver and scenario are shown below in Table 7-3. The levels below represent the predicted noise impact when the construction plant is closest to each receiver and should therefore be considered as conservative and noise levels as a result of construction activities are likely to be lower than these

levels for most of the construction period. Noise levels predicted to exceed the noise management level are highlighted orange.

Table 7-3 Predicted Construction Noise Levels

Receiver	Obj.- No.	Fl	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
1 Balmoral Parade	214	GF	E	NCA 1	55	52	56	58	54
2 Balmoral Parade	1466	GF	E	NCA 1	55	51	55	55	52
3 Balmoral Parade	216	GF	E	NCA 1	55	50	54	58	51
4 Balmoral Parade	1470	GF	N	NCA 1	55	51	55	57	53
5 Balmoral Parade	1508	GF	E	NCA 1	55	49	53	55	51
6 Balmoral Parade	1502	GF	E	NCA 1	55	49	53	54	50
7 Balmoral Parade	1510	GF	W	NCA 1	55	47	51	42	49
3 Broughton Ave	195	GF	N	NCA 1	55	56	60	53	58
4 Broughton Ave	187	GF	N	NCA 1	55	54	58	52	55
5 Broughton Ave	192	GF	W	NCA 1	55	52	56	36	54
6 Broughton Ave	191	GF	E	NCA 1	55	52	56	45	53
7 Broughton Ave	1475	GF	E	NCA 1	55	47	51	48	48
8 Broughton Ave	1447	GF	E	NCA 1	55	50	54	46	52
9 Broughton Ave	1477	GF	W	NCA 1	55	50	54	33	52
10 Broughton Ave	1449	GF	E	NCA 1	55	49	53	46	51
11 Broughton Ave	1481	GF	N	NCA 1	55	48	52	43	50
12 Broughton Ave	1455	GF	E	NCA 1	55	48	52	46	50
25 Brushgrove Circuit	168	GF	E	NCA 1	55	46	50	49	48
27 Brushgrove Circuit	167	GF	S	NCA 1	55	49	53	51	50
29 Brushgrove Circuit	165	GF	S	NCA 1	55	49	53	52	51
31 Brushgrove Circuit	162	GF	E	NCA 1	55	47	51	49	49
33 Brushgrove Circuit	159	GF	E	NCA 2	49	47	51	49	49
35 Brushgrove Circuit	156	GF	E	NCA 2	49	47	51	49	48
37 Brushgrove Circuit	153	GF	E	NCA 2	49	47	51	49	48
39 Brushgrove Circuit	150	GF	E	NCA 2	49	47	51	49	48
41 Brushgrove Circuit	147	GF	E	NCA 2	49	47	51	49	48
43 Brushgrove Circuit	145	GF	S	NCA 2	49	46	50	51	48
45 Brushgrove Circuit	141	GF	E	NCA 2	49	46	50	49	48
47 Brushgrove Circuit	1572	GF	S	NCA 2	49	45	49	49	46
49 Brushgrove Circuit	1574	GF	S	NCA 2	49	44	48	49	46
51 Brushgrove Circuit	1576	GF	S	NCA 2	49	44	48	48	45
4 Calderwood Rd	1305	GF	N	NCA 4	48	47	51	43	51
5 Calderwood Rd	1670	GF	E	NCA 2	49	44	48	30	49
6 Calderwood Rd	899	GF	W	NCA 4	48	53	57	49	66
7 Calderwood Rd	1666	GF	N	NCA 2	49	47	51	46	52
Unit 2, 8 Calderwood Rd	888	GF	N	NCA 4	48	67	71	46	69
Unit 3, 8 Calderwood Rd	881	GF	N	NCA 4	48	67	71	50	69
Unit 4, 8 Calderwood Rd	885	GF	N	NCA 4	48	58	62	50	64
8A Calderwood Rd	900	F1	NW	NCA 4	48	66	70	48	68
9 Calderwood Rd	822	GF	N	NCA 2	49	46	50	45	52
10 Calderwood Rd	267	GF	S	NCA 3	51	64	68	50	66
11 Calderwood Rd	816	GF	N	NCA 2	49	48	52	42	57
12 Calderwood Rd	262	GF	S	NCA 3	51	64	68	51	68
13 Calderwood Rd	812	GF	N	NCA 2	49	46	50	41	56
15 Calderwood Rd	808	GF	N	NCA 2	49	49	53	42	63
17 Calderwood Rd	805	GF	N	NCA 2	49	52	56	40	68
19 Calderwood Rd	795	GF	N	NCA 2	49	48	52	49	63
21 Calderwood Rd Unit 1	789	GF	N	NCA 2	49	59	63	50	68
21 Calderwood Rd Unit 2	787	GF	N	NCA 2	49	58	62	51	65
23 Calderwood Rd	782	GF	N	NCA 2	49	62	66	50	66
74 Calderwood Rd	275	GF	S	NCA 3	51	49	53	47	51
1 Curramore Tce	185	GF	N	NCA 1	55	51	55	45	52

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
3 Curramore Ter	182	GF	N	NCA 1	55	51	55	50	52
5 Curramore Ter	178	GF	N	NCA 1	55	50	54	51	52
7 Curramore Ter	175	GF	N	NCA 1	55	49	53	50	51
9 Curramore Tce	174	GF	NE	NCA 1	55	48	52	50	50
11 Curramore Ter	1410	GF	NW	NCA 1	55	46	50	45	48
13 Curramore Ter	1414	GF	NE	NCA 1	55	38	42	44	39
15 Curramore Ter	1418	GF	NE	NCA 1	55	41	45	44	42
17 Curramore Ter	1423	GF	SE	NCA 1	55	42	46	45	43
1 Hamilton Rd	1040	GF	N	NCA 4	48	52	56	42	56
1A Hamilton Rd	1045	GF	N	NCA 4	48	54	58	43	61
1B Hamilton Rd	1048	GF	N	NCA 4	48	57	61	43	68
3 Hamilton Rd	1053	GF	E	NCA 4	48	59	63	25	69
5 Hamilton Rd	1055	GF	N	NCA 4	48	67	71	43	69
7 Hamilton Rd	312	GF	S	NCA 3	51	66	70	44	68
9 Hamilton Rd	306	GF	S	NCA 3	51	59	63	39	68
10 Hamilton Rd	1149	GF	W	NCA 4	48	57	61	39	66
11 Hamilton Rd	304	GF	S	NCA 3	51	58	62	44	61
12 Hamilton Rd	1151	GF	N	NCA 4	48	67	71	36	69
13 Hamilton Rd	299	GF	W	NCA 3	51	53	57	44	54
14 Hamilton Rd	318	GF	S	NCA 5	60	57	61	41	60
15 Hamilton Rd	296	GF	S	NCA 3	51	54	58	44	56
17 Hamilton Rd	290	GF	S	NCA 3	51	55	59	44	56
19 Hamilton Rd	286	GF	S	NCA 3	51	56	60	44	58
2105 Illawarra Hwy	340	GF	S	NCA 5	60	49	53	39	51
4 Jerrara St	1435	GF	E	NCA 1	55	43	47	45	44
6 Jerrara St	1439	GF	N	NCA 1	55	41	45	46	42
8 Jerrara St	1428	GF	N	NCA 1	55	42	46	46	44
10 Jerrara St	1424	GF	W	NCA 1	55	39	43	33	41
1 Moles St Unit 1	1658	GF	NW	NCA 2	49	48	52	47	51
1 Moles St Unit 2	1663	GF	NE	NCA 2	49	45	49	42	48
2 Moles St	856	GF	NW	NCA 2	49	48	52	52	50
3 Moles St	1654	GF	NW	NCA 2	49	48	52	47	51
4 Moles St	852	GF	NW	NCA 2	49	47	51	50	50
5 Moles St	1650	GF	NW	NCA 2	49	48	52	47	51
6 Moles St	848	GF	NW	NCA 2	49	47	51	40	50
7 Moles St	1646	GF	NW	NCA 2	49	48	52	47	50
8 Moles St	844	GF	NW	NCA 2	49	48	52	50	50
9 Moles St	1644	GF	NW	NCA 2	49	47	51	47	49
10 Moles St	840	GF	NW	NCA 2	49	47	51	49	49
11 Moles St	1638	GF	NW	NCA 2	49	47	51	48	49
12 Moles St	836	GF	NW	NCA 2	49	48	52	51	50
13 Moles St	1635	GF	NW	NCA 2	49	47	51	49	49
14 Moles St	832	GF	NW	NCA 2	49	48	52	51	50
15 Moles St	1630	GF	NW	NCA 2	49	48	52	51	50
16 Moles St	828	GF	NW	NCA 2	49	47	51	50	50
17 Moles St	1627	GF	NW	NCA 2	49	47	51	49	49
18 Moles St	824	GF	NW	NCA 2	49	48	52	51	50
19 Moles St	1622	GF	NW	NCA 2	49	47	51	50	49
21 Moles St	1618	GF	NW	NCA 2	49	47	51	51	49
23 Moles St	1615	F1	NW	#N/A	#N/A	49	53	53	52
25 Moles St	1610	GF	NW	NCA 2	49	47	51	51	49
27 Moles St	1607	GF	NW	NCA 2	49	48	52	51	50
29 Moles St	1602	GF	NW	NCA 2	49	47	51	50	50
31 Moles St	1600	GF	NW	NCA 2	49	48	52	49	49
37 Moles St	647	GF	N	NCA 2	49	47	51	49	49
39 Moles St	643	GF	N	NCA 2	49	47	51	50	49
41 Moles St	639	GF	W	NCA 2	49	45	49	52	47

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
43 Moles St	635	GF	W	NCA 2	49	45	49	51	46
45 Moles St	631	GF	N	NCA 2	49	49	53	53	51
47 Moles St	626	GF	N	NCA 2	49	51	55	51	53
49 Moles St	622	GF	N	NCA 2	49	51	55	51	53
51 Moles St	619	GF	N	NCA 2	49	54	58	53	56
53 Moles St	614	GF	N	NCA 2	49	56	60	56	58
55 Moles St	610	GF	N	NCA 2	49	60	64	59	61
57 Moles St	606	GF	N	NCA 2	49	67	71	60	68
1 Mountainview Mews	1204	GF	NW	NCA 4	48	54	58	43	59
2 Mountainview Mews	1207	GF	N	NCA 4	48	53	57	27	55
3 Mountainview Mews	1211	GF	N	NCA 4	48	53	57	27	56
4 Mountainview Mews	1215	GF	N	NCA 4	48	53	57	33	56
5 Mountainview Mews	1219	GF	N	NCA 4	48	52	56	27	55
6 Mountainview Mews	1223	GF	N	NCA 4	48	52	56	35	55
7 Mountainview Mews	1227	GF	N	NCA 4	48	52	56	38	55
8 Mountainview Mews	1231	GF	N	NCA 4	48	53	57	40	55
9 Mountainview Mews	1235	GF	N	NCA 4	48	53	57	33	55
10 Mountainview Mews	1239	GF	N	NCA 4	48	54	58	41	56
11 Mountainview Mews	1243	GF	N	NCA 4	48	54	58	41	56
12 Mountainview Mews	1247	GF	N	NCA 4	48	54	58	41	56
13 Mountainview Mews	1251	GF	N	NCA 4	48	54	58	41	56
14 Mountainview Mews	1255	GF	N	NCA 4	48	55	59	41	57
15 Mountainview Mews	1259	GF	N	NCA 4	48	55	59	26	57
16 Mountainview Mews	1263	GF	N	NCA 4	48	55	59	30	57
17 Mountainview Mews	1155	GF	N	NCA 4	48	66	70	36	68
18 Mountainview Mews	1159	GF	N	NCA 4	48	66	70	38	68
19 Mountainview Mews	1163	GF	N	NCA 4	48	66	70	28	68
20 Mountainview Mews	1167	GF	N	NCA 4	48	66	70	32	68
21 Mountainview Mews	1171	GF	N	NCA 4	48	66	70	28	68
22 Mountainview Mews	1175	GF	N	NCA 4	48	66	70	33	68
23 Mountainview Mews	1179	GF	N	NCA 4	48	66	70	28	68
24 Mountainview Mews	1183	GF	N	NCA 4	48	66	70	38	68
25 Mountainview Mews	1187	GF	N	NCA 4	48	66	70	28	67
26 Mountainview Mews	1191	GF	N	NCA 4	48	66	70	39	67
27 Mountainview Mews	1195	GF	N	NCA 4	48	65	69	28	67
28 Mountainview Mews	1199	GF	N	NCA 4	48	65	69	38	66
1 Nimmitabel Street	228	GF	NW	NCA 1	55	51	55	58	52
3 Nimmitabel Street	1542	F1	NW	NCA 1	55	50	54	57	51
5 Nimmitabel Street	1548	GF	NE	NCA 1	55	44	48	55	46
1 O'Keefe Cres	867	GF	E	#N/A	#N/A	47	51	33	50
2 O'Keefe Cres	869	GF	NW	NCA 2	49	45	49	43	50
3 O'Keefe Cres	860	GF	N	NCA 2	49	48	52	47	51
4 O'Keefe Cres	873	GF	NW	NCA 2	49	47	51	44	52
5 O'Keefe Cres	778	GF	N	NCA 2	49	48	52	43	52
6 O'Keefe Cres	879	GF	SW	NCA 2	49	48	52	44	50
7 O'Keefe Cres	775	F1	N	NCA 2	49	55	59	52	57
8 O'Keefe Cres	800	GF	NW	NCA 2	49	49	53	50	52
9 O'Keefe Cres	770	GF	NW	NCA 2	49	53	57	51	56
10 O'Keefe Cres	799	GF	N	NCA 2	49	54	58	48	57
11 O'Keefe Cres	766	GF	NW	NCA 2	49	53	57	45	56
13 O'Keefe Cres	762	GF	NW	NCA 2	49	52	56	51	55
15 O'Keefe Cres	758	GF	NW	NCA 2	49	52	56	48	54
16 O'Keefe Cres	727	GF	NW	NCA 2	49	58	62	45	60
17 O'Keefe Cres	754	GF	NW	NCA 2	49	51	55	51	53
18 O'Keefe Cres	722	GF	NW	NCA 2	49	58	62	42	60
19 O'Keefe Cres	750	GF	NW	NCA 2	49	50	54	51	53
20 O'Keefe Cres	718	GF	NW	NCA 2	49	57	61	39	60

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
21 O'Keefe Cres	746	GF	NW	NCA 2	49	50	54	51	53
22 O'Keefe Cres	714	GF	NW	NCA 2	49	56	60	53	58
23 O'Keefe Cres	742	GF	NW	NCA 2	49	51	55	50	53
24 O'Keefe Cres	710	GF	NW	NCA 2	49	55	59	50	57
25 O'Keefe Cres	738	GF	NW	NCA 2	49	51	55	51	53
26 O'Keefe Cres	706	GF	NW	NCA 2	49	55	59	46	57
27 O'Keefe Cres	734	GF	NW	NCA 2	49	50	54	51	52
28 O'Keefe Cres	704	GF	NW	NCA 2	49	56	60	51	58
29 O'Keefe Cres	732	GF	NW	NCA 2	49	50	54	49	52
30 O'Keefe Cres	700	GF	NW	NCA 2	49	56	60	53	58
32 O'Keefe Cres	696	GF	NW	NCA 2	49	55	59	53	57
34 O'Keefe Cres	690	GF	NW	NCA 2	49	54	58	51	56
1 Parsons Pl	430	F1	NW	NCA 2	49	53	57	64	54
2 Parsons Pl	507	GF	NW	NCA 2	49	50	54	62	52
3 Parsons Pl	451	GF	NE	NCA 2	49	49	53	61	50
4 Parsons Pl	503	GF	NE	NCA 2	49	50	54	62	52
5 Parsons Pl	456	GF	NE	NCA 2	49	48	52	60	50
6 Parsons Pl	498	GF	NE	NCA 2	49	48	52	60	50
7 Parsons Pl	482	GF	NE	NCA 2	49	48	52	59	49
8 Parsons Pl	496	GF	N	NCA 2	49	46	50	56	48
9 Parsons Pl	489	GF	SW	NCA 2	49	47	51	55	49
11 Parsons Pl	490	GF	W	NCA 2	49	49	53	59	50
4 Pasture Way	1561	GF	N	NCA 2	49	46	50	51	48
6 Pasture Way	1563	GF	S	NCA 2	49	45	49	48	46
8 Pasture Way	1591	GF	N	NCA 2	49	41	45	48	43
10 Pasture Way	1587	F1	E	NCA 2	49	46	50	49	48
12 Pasture Way	1582	GF	E	NCA 2	49	44	48	49	46
14 Pasture Way	1581	F1	E	NCA 2	49	46	50	49	47
1 Polock Cres	534	GF	NW	NCA 2	49	47	51	56	49
2 Polock Cres	417	GF	SW	NCA 1	55	46	50	54	47
3 Polock Cres	530	GF	NW	NCA 2	49	47	51	56	49
4 Polock Cres	410	GF	SW	NCA 2	49	46	50	54	48
5 Polock Cres	481	GF	SW	NCA 2	49	46	50	57	47
6 Polock Cres	409	GF	SW	NCA 2	49	46	50	54	48
7 Polock Cres	477	GF	SW	NCA 2	49	47	51	59	49
8 Polock Cres	405	GF	SW	NCA 2	49	46	50	54	48
9 Polock Cres	470	GF	SW	NCA 2	49	48	52	59	49
10 Polock Cres	398	GF	NW	NCA 2	49	47	51	54	48
11 Polock Cres	469	GF	SW	NCA 2	49	49	53	59	51
12 Polock Cres	395	GF	NW	NCA 2	49	48	52	55	49
13 Polock Cres	463	GF	NW	NCA 2	49	51	55	59	53
14 Polock Cres	391	GF	NW	NCA 2	49	49	53	51	51
15 Polock Cres	458	GF	NW	NCA 2	49	53	57	62	55
16 Polock Cres	386	GF	SW	NCA 2	49	48	52	56	50
17 Polock Cres	447	GF	N	NCA 2	49	54	58	64	55
18 Polock Cres	384	GF	NW	NCA 2	49	52	56	59	54
19 Polock Cres	442	GF	N	NCA 2	49	54	58	65	56
20 Polock Cres	379	GF	NW	NCA 2	49	55	59	59	57
21 Polock Cres	438	GF	N	NCA 2	49	55	59	66	56
22 Polock Cres	374	GF	NW	NCA 2	49	57	61	49	58
23 Polock Cres	435	F1	NW	NCA 2	49	56	60	68	58
24 Polock Cres	371	GF	NW	NCA 2	49	61	65	51	63
25 Polock Cres	427	GF	NE	NCA 2	49	55	59	67	56
26 Polock Cres	366	GF	W	NCA 2	49	63	67	64	64
27 Polock Cres	510	GF	N	NCA 2	49	54	58	66	56
28 Polock Cres	362	GF	N	NCA 2	49	64	68	67	66
29 Polock Cres	514	GF	N	NCA 2	49	52	56	63	54

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
30 Pollock Cres	358	GF	N	NCA 2	49	61	65	68	63
31 Pollock Cres	518	GF	SW	NCA 2	49	51	55	61	52
32 Pollock Cres	355	GF	N	NCA 2	49	64	68	72	65
33 Pollock Cres	522	GF	SW	NCA 2	49	49	53	59	51
34 Pollock Cres	350	GF	N	NCA 2	49	63	67	74	64
35 Pollock Cres	527	GF	SW	NCA 1	55	49	53	58	50
36 Pollock Cres	346	GF	N	NCA 2	49	63	67	75	64
37 Pollock Cres	570	GF	SW	NCA 1	55	49	53	58	51
38 Pollock Cres	342	GF	NW	NCA 2	49	63	67	76	64
40 Pollock Cres	603	GF	N	NCA 2	49	56	60	67	57
42 Pollock Cres	598	GF	W	NCA 2	49	53	57	60	55
44 Pollock Cres	594	GF	W	NCA 2	49	52	56	60	54
46 Pollock Cres	592	GF	NE	NCA 2	49	49	53	62	51
48 Pollock Cres	583	GF	NW	NCA 2	49	49	53	60	51
Unit 32, 2 Sophia St	238	GF	N	NCA 1	55	49	53	57	50
Unit 33, 2 Sophia St	234	GF	W	NCA 1	55	49	53	59	51
Unit 35, 2 Sophia St	233	GF	NE	NCA 1	55	50	54	57	51
2 Tallowa Street	198	F1	N	NCA 1	55	56	60	54	57
4 Tallowa Street	200	F1	N	NCA 1	55	55	59	54	57
6 Tallowa Street	203	GF	N	NCA 1	55	54	58	54	56
8 Tallowa Street	208	GF	E	NCA 1	55	55	59	57	56
10 Tallowa Street	209	F1	N	NCA 1	55	54	58	55	56
1 Taylor Rd	906	GF	NW	NCA 4	48	53	57	43	65
2 Taylor Rd	1308	F1	NW	NCA 4	48	50	54	46	57
3 Taylor Rd	910	GF	N	NCA 4	48	52	56	35	57
4 Taylor Rd	1312	GF	N	NCA 4	48	48	52	44	52
5 Taylor Rd	912	GF	NW	NCA 4	48	51	55	48	57
6 Taylor Rd	1315	GF	NW	NCA 4	48	49	53	46	52
7 Taylor Rd Unit 2	916	GF	NW	NCA 4	48	56	60	48	59
8 Taylor Rd	1319	GF	N	NCA 4	48	49	53	45	52
8A Taylor Rd	1328	GF	N	NCA 4	48	45	49	47	47
8B Taylor Rd	1325	GF	N	NCA 4	48	44	48	44	47
9 Taylor Rd	924	GF	N	NCA 4	48	57	61	44	59
10 Taylor Rd	1331	F1	N	NCA 4	48	50	54	44	52
11 Taylor Rd	932	GF	N	NCA 4	48	50	54	46	53
12 Taylor Rd	1334	GF	N	NCA 4	48	48	52	45	50
13 Taylor Rd	936	GF	NW	NCA 4	48	53	57	40	55
14 Taylor Rd	1338	GF	N	NCA 4	48	48	52	45	50
15 Taylor Rd	941	GF	NE	NCA 4	48	49	53	44	51
16 Taylor Rd	1342	GF	N	NCA 4	48	47	51	43	49
17 Taylor Rd	943	GF	NW	NCA 4	48	51	55	43	53
18 Taylor Rd	1348	GF	N	NCA 4	48	48	52	45	50
19 Taylor Rd	947	GF	N	NCA 4	48	50	54	33	51
19 Taylor Rd unit 1	951	GF	N	NCA 4	48	54	58	47	55
20 Taylor Rd	1351	GF	N	NCA 4	48	48	52	45	50
21 Taylor Rd	955	GF	N	NCA 4	48	51	55	40	53
22 Taylor Rd	1354	F1	N	NCA 4	48	50	54	39	52
23 Taylor Rd	959	GF	N	NCA 4	48	50	54	40	52
24 Taylor Rd, Unit 1	1359	GF	N	NCA 4	48	48	52	36	50
24 Taylor Rd, Unit 2	1372	GF	N	NCA 4	48	45	49	42	46
25 Taylor Rd	964	GF	N	NCA 4	48	51	55	45	53
26 Taylor Rd, Unit 1	1362	GF	N	NCA 4	48	48	52	48	50
26 Taylor Rd, Unit 2	1375	GF	E	NCA 4	48	47	51	40	49
27 Taylor Rd	967	GF	N	NCA 4	48	52	56	43	53
28 Taylor Rd, Unit 1	1367	GF	N	NCA 4	48	48	52	45	50
28 Taylor Rd, Unit 2	1378	GF	N	NCA 4	48	47	51	42	49
29 Taylor Rd	971	GF	N	NCA 4	48	51	55	38	53

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
30 Taylor Rd	1383	F1	N	NCA 4	48	50	54	41	52
31 Taylor Rd	975	GF	N	NCA 4	48	52	56	43	54
33 Taylor Rd	981	GF	N	NCA 4	48	52	56	42	54
35 Taylor Rd	983	GF	N	NCA 4	48	52	56	38	54
37 Taylor Rd	989	GF	N	NCA 4	48	52	56	37	54
39 Taylor Rd	991	GF	N	NCA 4	48	52	56	39	54
41 Taylor Rd	995	GF	N	NCA 4	48	52	56	41	54
43 Taylor Rd	999	GF	N	NCA 4	48	52	56	42	53
45 Taylor Rd	1005	GF	N	NCA 4	48	52	56	42	54
47 Taylor Rd	1009	GF	N	NCA 4	48	53	57	43	54
49 Taylor Rd	1013	GF	N	NCA 4	48	53	57	44	55
51 Taylor Rd	1015	GF	N	NCA 4	48	52	56	37	54
53 Taylor Rd	1021	GF	N	NCA 4	48	53	57	45	55
54 Taylor Rd	1400	GF	N	NCA 4	48	50	54	44	52
55 Taylor Rd	1023	GF	N	NCA 4	48	53	57	38	54
56 Taylor Rd, Unit 1	1396	GF	N	NCA 4	48	50	54	44	52
56 Taylor Rd, Unit 2	1392	GF	N	NCA 4	48	49	53	45	51
56 Taylor Rd, Unit 3	1388	GF	N	NCA 4	48	48	52	43	50
57 Taylor Rd	1027	GF	N	NCA 4	48	54	58	44	55
58 Taylor Rd	1404	GF	N	NCA 4	48	50	54	34	53
59 Taylor Rd	1031	GF	N	NCA 4	48	53	57	36	55
61 Taylor Rd	1037	GF	E	NCA 4	48	50	54	37	54
62 Taylor Rd	1300	GF	NW	NCA 4	48	54	58	41	56
64 Taylor Rd	1295	GF	N	NCA 4	48	55	59	41	57
66 Taylor Rd	1293	GF	NW	NCA 4	48	56	60	30	58
68 Taylor Rd	1288	GF	NE	NCA 4	48	57	61	36	58
24 Terry St	335	GF	SW	NCA 5	60	53	57	40	54
26 Terry St	333	GF	SW	NCA 5	60	55	59	40	56
28 Terry St	327	F1	S	NCA 5	60	55	59	41	56
30 Terry St	325	GF	S	NCA 5	60	54	58	42	56
32 Terry St	1595	GF	NW	NCA 4	48	61	65	41	63
34 Terry St	1279	GF	N	NCA 4	48	63	67	40	65
36 Terry St, Unit 1	1277	GF	N	NCA 4	48	63	67	35	65
36 Terry St, Unit 2	1283	GF	N	NCA 4	48	57	61	31	58
38 Terry St	1271	GF	N	NCA 4	48	58	62	40	59
40 Terry St	1270	GF	E	NCA 4	48	54	58	21	56
Lot 1 The Expressway	243	F1	S	NCA 2	49	64	68	65	66
30 The Expy	654	GF	N	NCA 2	49	66	70	55	68
31 The Expy	658	GF	NW	NCA 2	49	66	70	50	67
32 The Expy	662	GF	NW	NCA 2	49	66	70	48	68
33 The Expy	666	GF	NW	NCA 2	49	66	70	50	68
34 The Expy	670	GF	NW	NCA 2	49	67	71	51	69
35 The Expy	674	GF	NW	NCA 2	49	67	71	51	68
36 The Expy	678	GF	NW	NCA 2	49	66	70	44	68
37 The Expy	684	GF	NW	NCA 2	49	66	70	43	68
38 The Expy	686	GF	NW	NCA 2	49	67	71	52	68
Unit 1 41-43 The Expressway	247	GF	S	NCA 2	49	63	67	60	64
Unit 2 41-43 The Expressway	251	GF	S	NCA 2	49	61	65	56	63
45 The Expressway	254	GF	S	NCA 2	49	64	68	58	65
45A The Expressway	258	GF	S	NCA 2	49	64	68	56	66
250 Tongarra Rd	651	GF	N	NCA 2	49	47	51	51	49
252 Tongarra Rd	423	GF	N	NCA 1	55	47	51	47	49
254 Tongarra Rd	419	GF	N	NCA 1	55	47	51	53	49
256 Tongarra Rd	539	GF	W	NCA 1	55	47	51	56	48
257 Tongarra Rd	240	GF	N	NCA 1	55	49	53	57	50

Receiver	Obj.- No.	FI	Dir	NCA	Noise Management Level	Predicted Construction Noise Level, L _{Aeq} 15min			
						Phase 1	Phase 2	Phase 3	Phase 4
258 Tongarra Rd	544	GF	N	NCA 1	55	49	53	58	50
260 Tongarra Rd	548	GF	N	NCA 1	55	48	52	56	49
262 Tongarra Rd	552	GF	N	NCA 1	55	48	52	58	50
264 Tongarra Rd	556	GF	N	NCA 1	55	49	53	58	50
266 Tongarra Rd	560	GF	N	NCA 1	55	49	53	58	51
268 Tongarra Rd	564	GF	N	NCA 1	55	49	53	59	50
270 Tongarra Rd	568	GF	N	NCA 1	55	49	53	59	50
272 Tongarra Rd	580	GF	N	NCA 1	55	50	54	60	52
274 Tongarra Rd	577	GF	NW	NCA 1	55	51	55	58	53
294 Tongarra Rd	589	GF	NW	NCA 1	55	53	57	61	55
1 Toolijooa St	1485	GF	N	NCA 1	55	47	51	50	49
3 Toolijooa St	1489	GF	N	NCA 1	55	47	51	49	49
5 Toolijooa St	1493	GF	N	NCA 1	55	46	50	46	48
7 Toolijooa St	1499	GF	N	NCA 1	55	47	51	51	48
11 Toolijooa Street	1511	GF	N	NCA 1	55	47	51	53	49
13 Toolijooa Street	1515	F1	N	NCA 1	55	51	55	56	52
14 Toolijooa Street	218	GF	N	NCA 1	55	52	56	56	54
15 Toolijooa Street	1522	GF	E	NCA 1	55	48	52	56	49
16 Toolijooa Street	221	GF	N	NCA 1	55	51	55	56	53
17 Toolijooa Street	1524	GF	N	NCA 1	55	50	54	56	51
19 Toolijooa Street	1529	GF	N	NCA 1	55	50	54	54	52
21 Toolijooa Street	1536	GF	W	NCA 1	55	47	51	50	48
22 Toolijooa Street	224	GF	N	NCA 1	55	51	55	57	53
23 Toolijooa Street	1538	F1	N	NCA 1	55	50	54	56	51
24 Toolijooa Street	226	GF	N	NCA 1	55	51	55	57	52
1 Tripoli Way	1142	GF	N	NCA 4	48	66	70	45	68
2 Tripoli Way	314	GF	S	NCA 3	51	64	68	44	66
3 Tripoli Way	1138	GF	N	NCA 4	48	65	69	38	66
4 Tripoli Way	282	GF	S	NCA 3	51	64	68	41	66
6 Tripoli Way	278	GF	S	NCA 3	51	66	70	45	67
7 Tripoli Way	1134	F1	N	NCA 4	48	66	70	42	67
8 Tripoli Way	270	GF	S	NCA 3	51	55	59	47	57
11 Tripoli Way	1131	GF	N	NCA 4	48	66	70	40	67
13 Tripoli Way	1127	GF	N	NCA 4	48	66	70	43	68
15 Tripoli Way	1122	GF	N	NCA 4	48	65	69	42	67
17 Tripoli Way	1121	GF	N	NCA 4	48	65	69	37	67
19 Tripoli Way	1114	GF	N	NCA 4	48	66	70	44	68
21 Tripoli Way	1110	GF	N	NCA 4	48	65	69	40	67
23 Tripoli Way	1108	GF	N	NCA 4	48	66	70	44	68
27 Tripoli Way	1102	GF	N	NCA 4	48	66	70	36	67
29 Tripoli Way	1098	GF	N	NCA 4	48	66	70	43	68
31 Tripoli Way	1094	GF	N	NCA 4	48	65	69	41	66
33 Tripoli Way	1091	GF	N	NCA 4	48	66	70	31	67
35 Tripoli Way	1088	GF	N	NCA 4	48	66	70	43	68
37 Tripoli Way	1083	GF	N	NCA 4	48	66	70	43	68
39 Tripoli Way	1078	GF	N	NCA 4	48	67	71	43	68
41 Tripoli Way	1074	GF	N	NCA 4	48	66	70	40	68
41A Tripoli Way	1071	GF	N	NCA 4	48	67	71	46	69
41B Tripoli Way	1068	GF	N	NCA 4	48	67	71	45	69
43 Tripoli Way	928	GF	N	NCA 4	48	67	71	46	68
43A Tripoli Way	1064	GF	N	NCA 4	48	62	66	41	63
43B Tripoli Way	1059	F1	N	NCA 4	48	65	69	44	67

7.7 Construction Noise Results Summary

In accordance with the criteria stipulated in Section 5.2, dwellings exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the daytime noise management level of RBL +10 dB(A) considered noise affected.

Construction noise levels are predicted to exceed noise management levels for “non-standard” hours of operation for all construction phases at the nearby residential receivers. This is due to the proximity of receivers to the construction works.

Predicted levels were noted to impact receivers below 75 dB(A); therefore no receiver locations are predicted to be highly noise affected. If any receivers are however located within 15 metres of the works at any stage of the project, it is likely that the highly noise affected criteria may be exceeded.

It should be noted that this assessment has endeavoured to carry out “worst case” noise modelling, and noise levels are predicted based on a moving line source representative of the total construction noise level moving along the length of the project. Should the work sites or plant and equipment be relocated so that other receivers are located closer to the works, these receivers are likely to be affected more significantly than predicted in this report.

7.7.1 Sleep Disturbance

The most likely source of potential sleep disturbance from the night construction works will be from the use of pneumatic hammer/s or saw cutting during services relocation and/ or road pavement works or from truck movements on site, in particular the application of air brakes. We recommend that if night works are proposed, that they be conducted in accordance with a detailed Construction Noise and Vibration Management Plan.

8 Construction Vibration Assessment

8.1 Vibration limits

Vibration from construction activities associated with the project could potentially impact on the amenity of the occupants of dwellings or buildings located close to the construction works. Generally, vibration impact can be summarised into two categories:

1. Effect on human comfort
2. Structural or cosmetic damage to buildings.

Vibration criteria is addressed in the CVNG and refers to Section 2.5 of the document *Assessing Vibration: A Technical Guideline* (NSW AVATG) issued by DEC (2006). The NSW AVATG outlines vibration limits in relation to human comfort. Criteria in this guideline are based on the British Standard BS6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz). A summary of these criteria are detailed in Table 5-2.

In relation to structural damage, there is currently no Australian Standard that provides criteria for the assessment of structural damage to buildings. However, the German Standard DIN4150 Part 3 can be used to assess structural damage to buildings and provides maximum vibration levels, which are assessed over a frequency range. These criteria are summarised in Section 5.3.

The recommended minimum working distance between vibration intensive plant and sensitive receivers for minimising the risk of cosmetic damage are listed in the CNVG and are shown in Table 5-4. The minimum working distances for cosmetic damage as outlined in Table 5-4 must be adhered to unless otherwise approved by Transport for NSW.

8.1.1 Vibration assessment

Construction works may be undertaken within 10 metres from the nearest residential buildings, based on the expected plant to be used for the proposal as detailed in Table 7-2. The following minimum safe working distances are recommended in the CNVG.

Table 8-1 Recommended minimum working distance from sensitive receivers

Plant item	Rating/Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E vibration guideline)
Vibratory roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small hydraulic hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large hydraulic hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Given that the nearest structures are within 10 metres of the proposed works, strategies for monitoring and mitigating vibration impacts during the construction phase should be addressed in a detailed Construction Vibration Management Plan. Refer to Section 9.2 for further recommendations.

9 Recommended Mitigation Measures

9.1 Operational Road Traffic Noise

The NMG outlines the TfNSW approach to implementing feasible and reasonable noise mitigation measures. In cases where affected receivers qualify for consideration of noise mitigation, the order of preference for treatments under the NSW RNP are as follows;

1. Quieter pavement surfaces
2. Noise mounds
3. Noise walls
4. At-property treatments

Based on the predicted operational traffic noise impacts and the various site constraints, the above treatment options are presented in the following sections.

9.1.1.1 Quieter pavement surfaces

The assessment is based upon the Tripoli Way road surface consisting of Dense Graded Asphalt (AC14). With reference to the NMVG, there are a limited options for quieter road surfaces, with Stone Mastic Asphalt potentially reducing impacts by -1.0 dBA. According the NSW Environmental Noise Measurement Manual (ENMM) (RTA 2001), noise from road surface/tyre interaction appears to dominate at traffic speeds of around 70 km/h, therefore, as Tripoli Way will be posted as a 60km/h zone, surface treatments may not be overly effective.

9.1.1.2 Noise mounds and noise walls

After pavement treatments, acoustic barriers are the next preferred form of mitigation. The NSW NMG states the following key points in relation to acoustic barriers:

Section 7

“For it to be considered reasonable to provide noise mounds and noise walls there needs to be four or more closely spaced receivers that benefit. Where there are four or more closely spaced receivers, the specific combination of noise mitigation measures is subject to further evaluation.”

AND

Section 8.2

“Barrier heights above 8 metres will not be considered”

AND

Section 8.9

“As a guide noise walls or mounds are considered to be a reasonable noise mitigation option where they are capable of providing an insertion loss of:

- *5 dBA at representative receivers for heights up to 5 metres high*
- *10 dBA at representative receivers for heights above 5 metres and up to 8 metres high.”*

When considering the above statements, a review of the exceedances with no mitigation applied indicates that noise mounds and noise walls are not a feasible treatment option on the basis that there are a high number of residential properties that will require driveway access to Tripoli Way. Therefore, it would not be possible to construct a continuous barrier structure able to provide the attenuation required to reduce traffic noise to acceptable levels.

9.1.1.3 At property treatments

The increased traffic noise levels due to the implementation of the project are predicted to exceed the NCG criteria at residential receivers identified in Table 9-1. The highest exceedance of the NCG external criteria is 16 dBA. Hence, property treatments (e.g. mechanical ventilation, upgraded glazing) may be the only suitable option in cases where an additional reduction in noise levels is required.

In accordance with the NSW RNP, the extent of mitigation should be selected on the basis of feasible measures, which are considered reasonable on the basis of social, economic, and environmental effects, including the cost of the abatement measures.

Table 9-1 also provides information as to which properties are expected to experience exceedances of the criteria in the year of opening as well as the design year, to assist Council with prioritising the implementation of treatments.

Table 9-1 Summary of Proposed Properties Requiring Treatment

Property	Maximum Day/Night Exceedance of NCG criteria with project, design year 2041	Exceeds criteria in 2041 only	Exceeds the criteria in both 2026 and 2041
Unit 3, 8 Calderwood Rd	16	No	Yes
Unit 2, 8 Calderwood Rd	15	No	Yes
41A Tripoli Way	15	No	Yes
43 Tripoli Way	15	No	Yes
8A Calderwood Rd	15	No	Yes
12 Hamilton Rd	15	No	Yes
39 Tripoli Way	15	No	Yes
5 Hamilton Rd	15	No	Yes
18 Mountainview Mews	15	No	Yes
35 Tripoli Way	15	No	Yes
37 Tripoli Way	15	No	Yes
41 Tripoli Way	15	No	Yes
41B Tripoli Way	15	No	Yes
20 Mountainview Mews	14	No	Yes
7 Tripoli Way	14	No	Yes
17 Mountainview Mews	14	No	Yes
19 Mountainview Mews	14	No	Yes
24 Mountainview Mews	14	No	Yes
21 Mountainview Mews	14	No	Yes
22 Mountainview Mews	14	No	Yes
23 Mountainview Mews	14	No	Yes
19 Tripoli Way	14	No	Yes
29 Tripoli Way	14	No	Yes
25 Mountainview Mews	14	No	Yes
13 Tripoli Way	14	No	Yes
23 Tripoli Way	14	No	Yes
12 Calderwood Rd	14	No	Yes
26 Mountainview Mews	14	No	Yes
33 Tripoli Way	14	No	Yes
7 Hamilton Rd	13	No	Yes
11 Tripoli Way	13	No	Yes
27 Mountainview Mews	13	No	Yes
1 Tripoli Way	13	No	Yes
27 Tripoli Way	13	No	Yes
28 Mountainview Mews	13	No	Yes
6 Tripoli Way	13	No	Yes
57 Moles St	13	No	Yes
43B Tripoli Way	13	No	Yes
38 The Expy	13	No	Yes
21 Tripoli Way	13	No	Yes
17 Tripoli Way	12	No	Yes
15 Tripoli Way	12	No	Yes
21 Calderwood Rd Unit 1	12	No	Yes

Property	Maximum Day/Night Exceedance of NCG criteria with project, design year 2041	Exceeds criteria in 2041 only	Exceeds the criteria in both 2026 and 2041
30 The Expy	12	No	Yes
3 Tripoli Way	12	No	Yes
34 The Expy	12	No	Yes
32 The Expy	12	No	Yes
35 The Expy	12	No	Yes
1 Taylor Rd	12	No	Yes
Unit 4, 8 Calderwood Rd	11	No	Yes
10 Calderwood Rd	11	No	Yes
31 The Expy	11	No	Yes
31 The Expy	11	No	Yes
2 Tripoli Way	11	No	Yes
33 The Expy	11	No	Yes
37 The Expy	11	No	Yes
36 The Expy	11	No	Yes
31 Tripoli Way	11	No	Yes
Lot 1 The Expressway	11	No	Yes
2 Taylor Rd	11	No	Yes
45A The Expressway	10	No	Yes
32 Terry St	10	No	Yes
45 The Expressway	10	No	Yes
4 Tripoli Way	10	No	Yes
17 Calderwood Rd	10	No	Yes
28 Polock Cres	9	No	Yes
32 Polock Cres	9	No	Yes
Unit 1 41-43 The Expressway	9	No	Yes
3 Hamilton Rd	9	No	Yes
19 Calderwood Rd	9	No	Yes
26 Polock Cres	9	No	Yes
3 Broughton Ave	8	No	Yes
34 Polock Cres	8	No	Yes
36 Polock Cres	8	No	Yes
43A Tripoli Way	8	No	Yes
1B Hamilton Rd	8	No	Yes
23 Calderwood Rd	8	No	Yes
Unit 2 41-43 The Expressway	8	No	Yes
11 Calderwood Rd	7	No	Yes
38 Polock Cres	7	No	Yes
1 Curramore Tce	7	No	Yes
68 Taylor Rd	7	No	Yes
66 Taylor Rd	7	No	Yes
4 Broughton Ave	7	No	Yes
3 Curramore Ter	7	No	Yes
30 Polock Cres	7	No	Yes
7 Curramore Ter	6	No	Yes
10 Hamilton Rd	6	No	Yes
55 Moles St	6	No	Yes
252 Tongarra Rd	6	No	Yes
9 Hamilton Rd	6	No	Yes
9 Hamilton Rd	6	No	Yes
24 Polock Cres	6	No	Yes
24 Polock Cres	6	No	Yes
254 Tongarra Rd	6	No	Yes
7 Calderwood Rd	6	No	Yes
6 Broughton Ave	6	No	Yes
13 Calderwood Rd	6	No	Yes
16 O'Keefe Cres	6	No	Yes
18 O'Keefe Cres	6	No	Yes
15 Calderwood Rd	6	No	Yes
5 Curramore Ter	5	No	Yes

Property	Maximum Day/Night Exceedance of NCG criteria with project, design year 2041	Exceeds criteria in 2041 only	Exceeds the criteria in both 2026 and 2041
9 Calderwood Rd	5	No	Yes
1A Hamilton Rd	5	No	Yes
20 O'Keefe Cres	5	No	Yes
40 Polock Cres	5	No	Yes
5 Calderwood Rd	5	No	Yes
11 Broughton Ave	4	No	Yes
21 Calderwood Rd Unit 2	4	No	Yes
9 Curramore Tce	4	No	Yes
11 Hamilton Rd	4	No	Yes
6 Calderwood Rd	4	No	Yes
4 Calderwood Rd	4	No	Yes
14 Hamilton Rd	3	No	Yes
37 Polock Cres	3	No	Yes
16 Mountainview Mews	3	No	Yes
1 Mountainview Mews	3	No	Yes
9 Taylor Rd	3	No	Yes
19 Hamilton Rd	3	No	Yes
7 Taylor Rd Unit 2	3	No	Yes
14 Mountainview Mews	3	No	Yes
7 O'Keefe Cres	3	No	Yes
25 Polock Cres	3	No	Yes
64 Taylor Rd	3	No	Yes
27 Polock Cres	2	No	Yes
23 Polock Cres	2	No	Yes
8 Tripoli Way	2	No	Yes
12 Broughton Ave	2	No	Yes
1 Hamilton Rd	2	No	Yes
15 Mountainview Mews	2	No	Yes
15 O'Keefe Cres	2	No	Yes
29 Polock Cres	2	No	Yes
30 Terry St	2	No	Yes
1 Moles St Unit 2	2	No	Yes
42 Polock Cres	2	No	Yes
13 Hamilton Rd	1	Yes	No
12 Mountainview Mews	1	Yes	No
22 O'Keefe Cres	1	Yes	No
22 Polock Cres	1	Yes	No
15 Hamilton Rd	1	Yes	No
21 Polock Cres	1	Yes	No
17 Hamilton Rd	1	Yes	No
11 Mountainview Mews	1	Yes	No
1 Parsons Pl	1	Yes	No
8 Broughton Ave	1	Yes	No
53 Moles St	1	Yes	No
19 Polock Cres	1	Yes	No

The following property treatments should be considered where the criteria are not reasonably or feasibly achievable with barriers located within the road reserve:

- Fresh air ventilation systems that meet Building Code of Australia requirements with the windows and doors shut
- Upgraded windows and glazing and solid core doors on the exposed façades of masonry structures only (these techniques would be unlikely to produce any noticeable benefit for light frame structures with no acoustic insulation in the walls)
 - Upgrading window and door seals
 - The sealing of wall vents, and

- The installation of external screen walls.

The above treatments are recommended for the properties listed in Table 9-1. It should be noted that each property will require inspection to determine the appropriate reasonable and feasible property mitigation, as the existing construction of some of the affected properties may preclude the above recommended treatments.

In general property treatments should be selected so that an internal noise level within the property of at least 10 dB(A) below the external criterion can be achieved.

The specific mitigation measures should be determined with an operational noise impact assessment once the project is complete. The operational noise impact assessment should include additional traffic noise monitoring to verify the results of this assessment, and specify acoustic treatment to affected dwellings, if required.

9.2 Construction Noise & Vibration

The following best practice construction noise and vibration mitigation measures are based on recommendations provided within the NSW ICNG and Australian Standard AS 2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites. The following best practice measures apply to the proposed construction activities.

Construction noise and vibration should be minimised as far as is practically possible using methods such as:

- Development and implementation of all reasonable and feasible site specific mitigation measures to meet noise criteria applicable to the proposal in consultation with residents.
- Use of noise attenuating controls at the source, such as mufflers, acoustic screens, etc.
- Keeping plant and equipment well maintained.
- Locating static sources of noise such as the generators as remotely as possible from noise sensitive receivers.
- Developing proposed hours of operation in consultation with the residents / occupants of the affected receivers, and RMS with a view to minimising potential impacts as far as is practically feasible.
- Allowing construction to occur only during approved construction hours, unless otherwise required as a condition of RMS safety requirements.
- Informing potentially affected receivers with adequate notice of the construction program and any planned activities that may exceed noise and vibration targets.
- Conducting noise monitoring during operations for the purposes of assisting in noise mitigation and to verify the findings of this noise assessment, if complaints are received or proposed activities and number of plant exceed those assumed in this assessment.
- Use of temporary noise barriers where practical.
- Application of respite periods for noisy activities
- Reduce the number of plant operating at one time where works are required to be carried out outside of standard hours.
- Preference should be for electric powered plant over combustion engine powered plant.
- Preference should be for hydraulic or electric powered plant over pneumatic powered plant.
- Avoid metal to metal contact on equipment to reduce impulsive or scraping noise.
- Use of broadband reversing alarms, or “quackers”, on mobile equipment in accordance with the relevant health and safety regulations.
- Modification of work activities where noise or vibration is found to cause unacceptable impact.

- Should operations be required outside daytime hours, all reasonable and feasible efforts should be undertaken to ensure noise levels would not exceed the INP Noise criteria stated in Section 5.2 and Table 5-1 of this assessment by carrying out night-works adjacent to the school rather than nearby residential receivers for example.
- Implementing a procedure for dealing with complaints to ensure that all complaints are registered and dealt with appropriately.

An operational Noise and Vibration Management Plan should be prepared for the project, to include, but not be limited to, the above measures.

9.3 Site Specific Measures

The following site specific mitigation measures are recommended:

9.3.1 Site Controls

- Due to the proximity of residents to the project, temporary barriers (i.e. 2 metre high solid screens) may be a feasible treatment option to mitigate noise from activities such as services relocations or other activities that may occur during the night period.
- Site offices, car-parks, and hard stand areas should ideally be located at the western extent of the project, on the northern side of the alignment in order to maximise separation distance to as many residents as possible.

9.3.2 Manage Hours of Operation

- Carrying out works within daytime hours as follows:
 - 7:00 am to 6:00 pm Monday to Friday,
 - 8:00 am to 1:00 pm Saturdays
 - No work on Sunday and public holidays.
- Do not carry out operations during evening or night-time hours, unless absolutely necessary for road safety reasons.

9.3.3 Management and Behaviour Controls

- Ensure that managers effectively communicate acceptable and unacceptable work practices for the site, through staff site inductions, notice boards, and prestart meetings.
- Avoid the need for reversing in the new area by creating a loop road or similar.
- Avoid dropping materials from height.
- Workers should avoid shouting, minimise talking loudly, and avoid slamming vehicle doors.

10 Conclusions

This assessment has determined the following conclusions:

10.1 Operational Road Traffic Noise Impacts

The assessment of road traffic noise was conducted in accordance with the NSW RNP, NCG and NMG. The assessment of current and future traffic conditions has resulted in the following conclusions:

- Traffic noise levels for the year 2041, following completion of the project, are predicted to exceed the criteria at 147 residential receiver locations. This is due to the new road traversing a built-up location in close proximity to residents.
- Options for mitigation include road surface treatments, acoustic barriers/earth mounds, and at-property treatments. The proposed road surface is Dense Graded Asphalt (DGA - AC14), therefore there are limited options for quieter pavement options. Barriers and earth mounds are not a feasible treatment option as driveway access to Tripoli Way will be needed.
- In accordance with the NMG, properties where the noise criteria are predicted to be exceeded are eligible for the consideration of at-property acoustic treatments to mitigate traffic noise intrusion. Therefore at-property treatments have been recommended for the properties where predicted road traffic noise levels exceed the project criteria.
- The specific mitigation measures should be determined with an operational noise impact assessment during the detail design phase or once the project is complete. The operational noise impact assessment should include additional traffic noise monitoring to verify the results of this assessment, and specify acoustic treatment to affected dwellings, if required.

10.2 Construction Noise Impacts

- In accordance with the criteria stipulated in Section 5.2, dwellings exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the daytime RBL +10 dB(A) considered noise affected.
- It is expected that construction of the project would take in the order of 12 months to complete. Standard hours (Monday to Friday 7.00am to 6.00pm, Saturday 8.00am to 1.00pm) would be adopted for the majority of the project, with some out of hours works occasionally required, where works during standard hours would result in unacceptable delays to traffic.
- Construction noise levels are predicted to exceed the NSW ICNG management levels for “standard” hours at a number of residents due to their proximity to the proposed works.
- Construction noise levels are predicted to exceed management levels for “non-standard” hours of operation for all construction phases at the nearby residential receivers. This is due to the proximity of receivers to the construction works.
- Predicted levels were noted to impact receivers below 75 dB(A); therefore no receiver locations are predicted to be highly noise affected. However, if any receivers are located within 15 metres of the works at any stage of the project, it is likely that the highly noise affected criteria may be exceeded.
- It should be noted that this assessment has endeavoured to carry out “worst case” noise modelling, and noise levels are predicted based on a moving line source representative of the total construction noise level moving along the length of the project. Should the work sites or plant and equipment be relocated so that other receivers are located closer to the works, these receivers are likely to be affected more significantly than predicted in this report.

- The predicted exceedances are generally a result of works being located in close proximity to the adjacent receivers. This modelling has been carried out to provide a worst case scenario and it may be possible to reduce the number of plant operating simultaneously, particularly at night, once detailed construction schedules are known.
- Best practice mitigation measures are recommended in Section 9.2 of this report.
- A detailed assessment of L_{Amax} impact has not been carried out for this assessment as it is difficult to predict L_{Amax} for construction noise sources and it is expected that if the night-time noise management levels are complied with then sleep disturbance is not likely to occur unless high impact noise sources such as piling or jack hammering are proposed for night-time, which should not be carried out for this project.

10.3 Construction Vibration Impacts

- Based on the above results human discomfort may be caused should vibratory rolling be carried out within 100 metres of nearby receivers during standard construction hours. For this reason, nearby residential receivers are also likely to be affected. Therefore, vibratory rolling should not be carried out at night due to the increased required separation distance and high potential for sleep disturbance.
- Based on the above results building damage may occur should vibratory rolling be carried out within 10 metres of residential dwellings. Where works are proposed to be close to existing receivers it is recommended that a construction vibration management plan be produced to determine a management methodology to monitor and prevent building damage. This may include provision of pre-construction dilapidation surveys and vibration monitoring during construction.

Tripoli Way Upgrade –
Albion Park, NSW

APPENDIX A

PROJECT
ASSESSMENT AREA



Figure A1 Project Assessment Area – Daytime $L_{Aeq,15hr}$. Predicted Increase in Noise Levels as a Result of the Project



Figure A2 Project Assessment Area – Night-time $L_{Aeq, 9hr}$ Predicted Increase in Noise Levels as a Result of the Project



Figure A3 Target Criteria Transition Zones – Day-time $L_{Aeq, 15hr}$

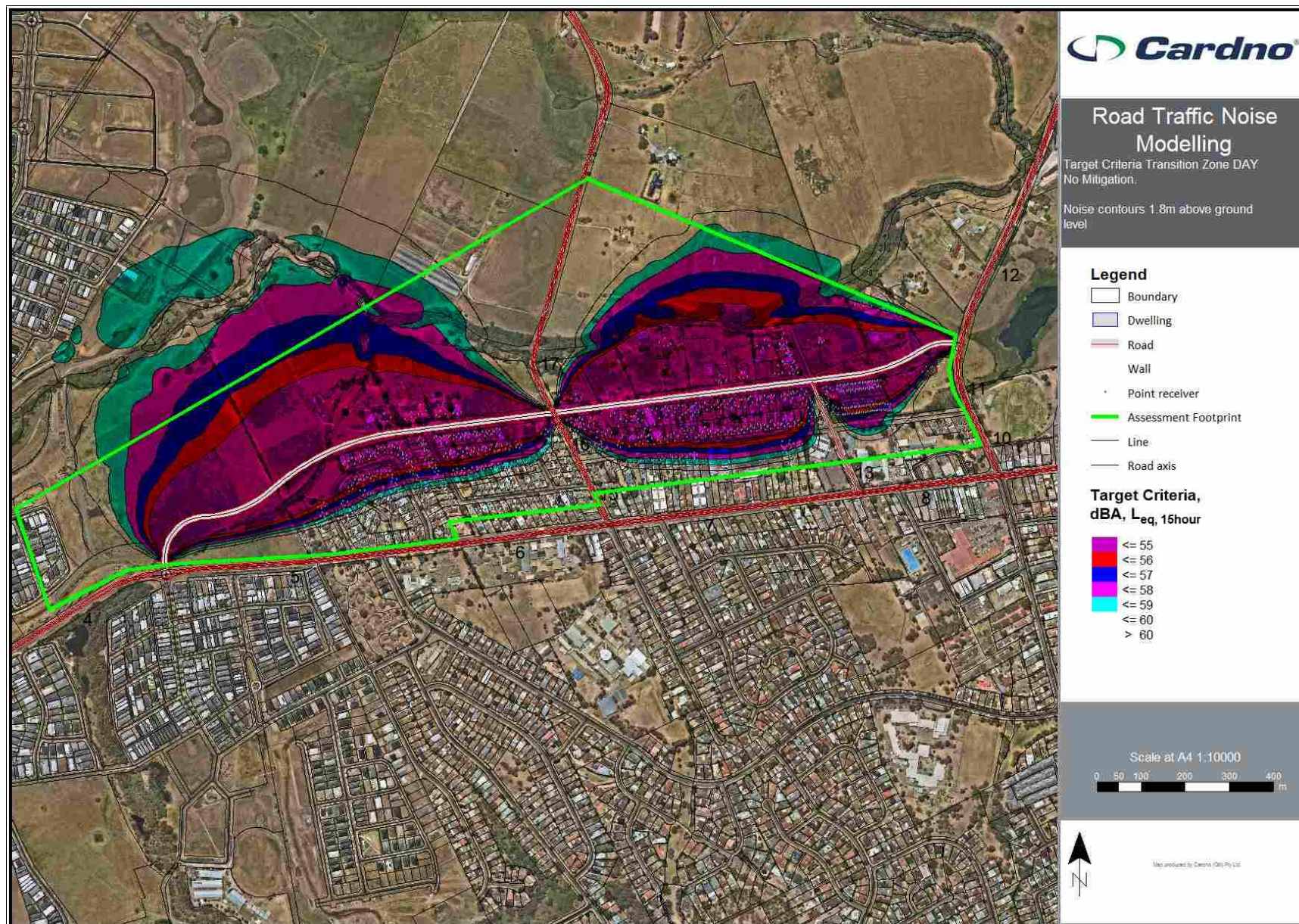
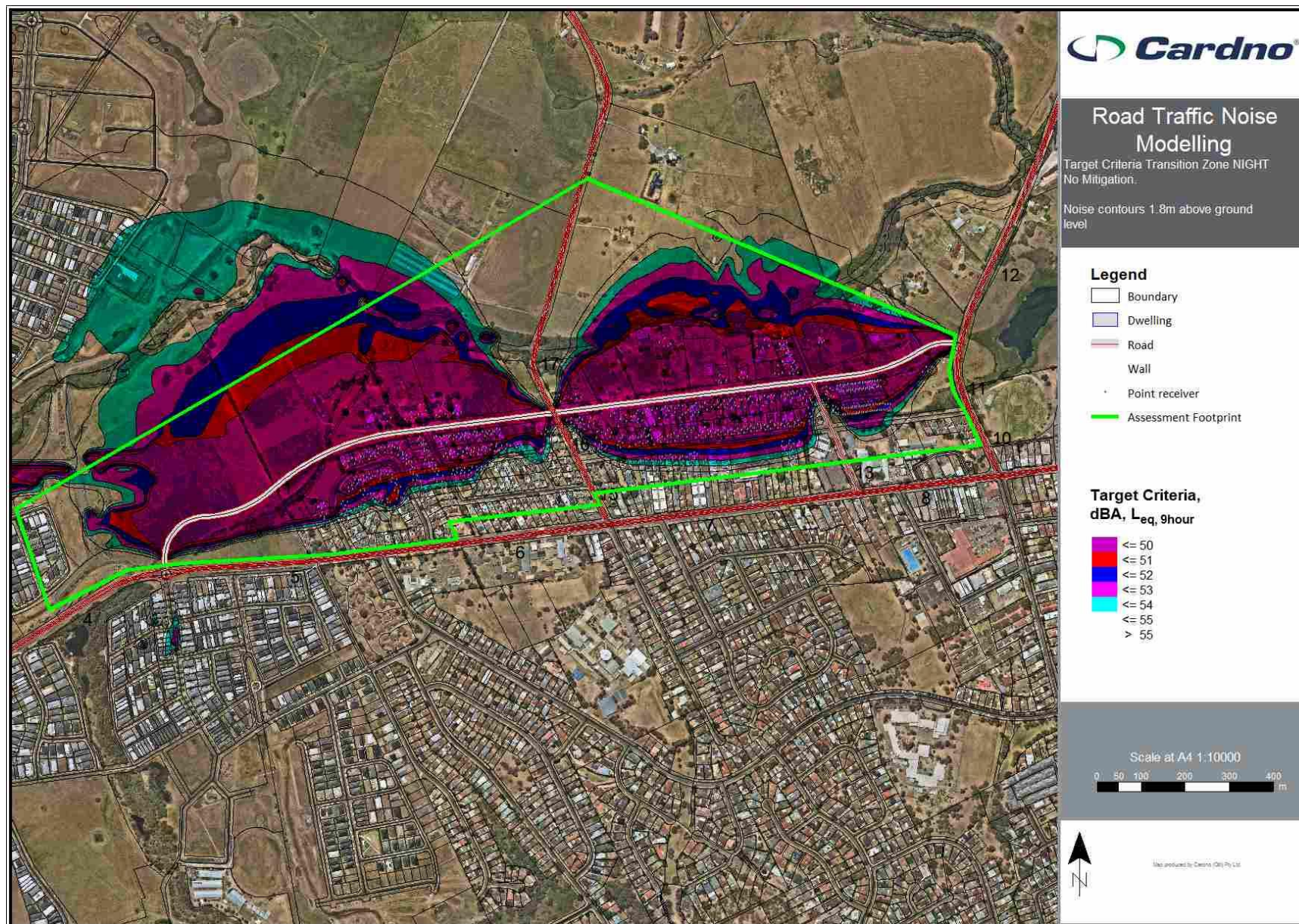


Figure A4 Target Criteria Transition Zones – Night-time $L_{Aeq, 9hr}$



Tripoli Way Upgrade –
Albion Park, NSW

APPENDIX B

NOISE
MONITORING
CHARTS



Figure B1 Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 1

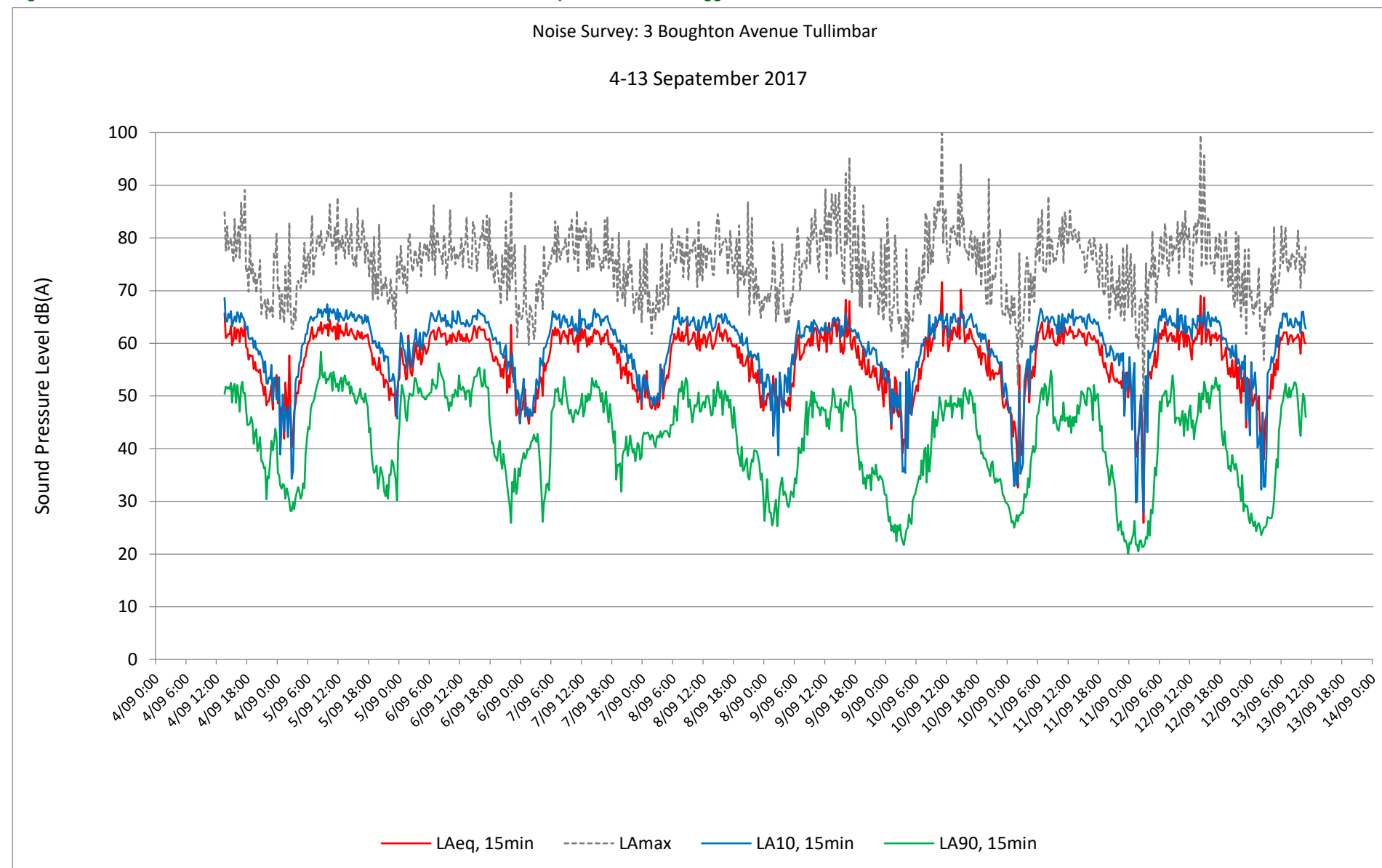


Figure B2 Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 2

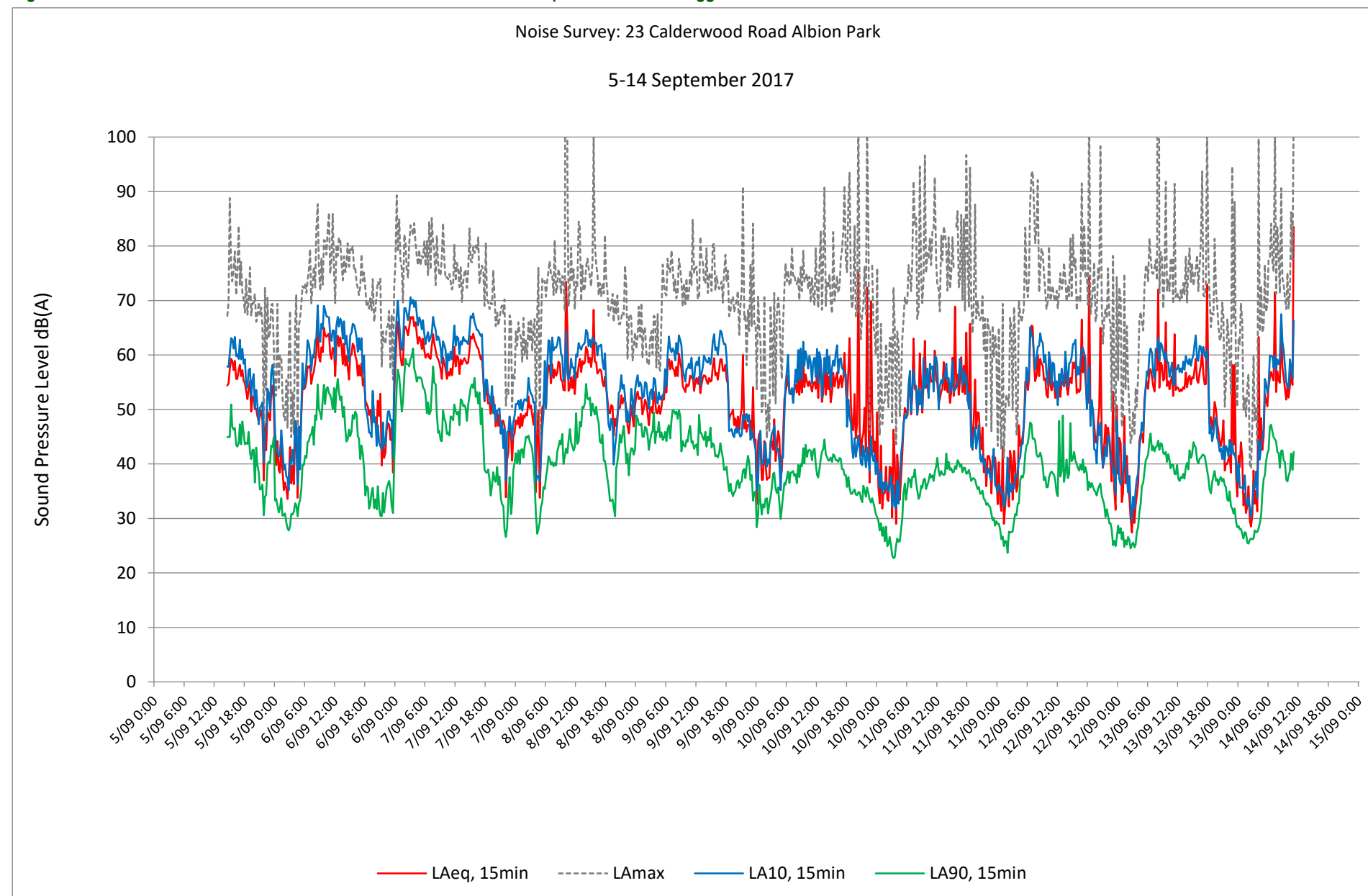


Figure B3 Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 3

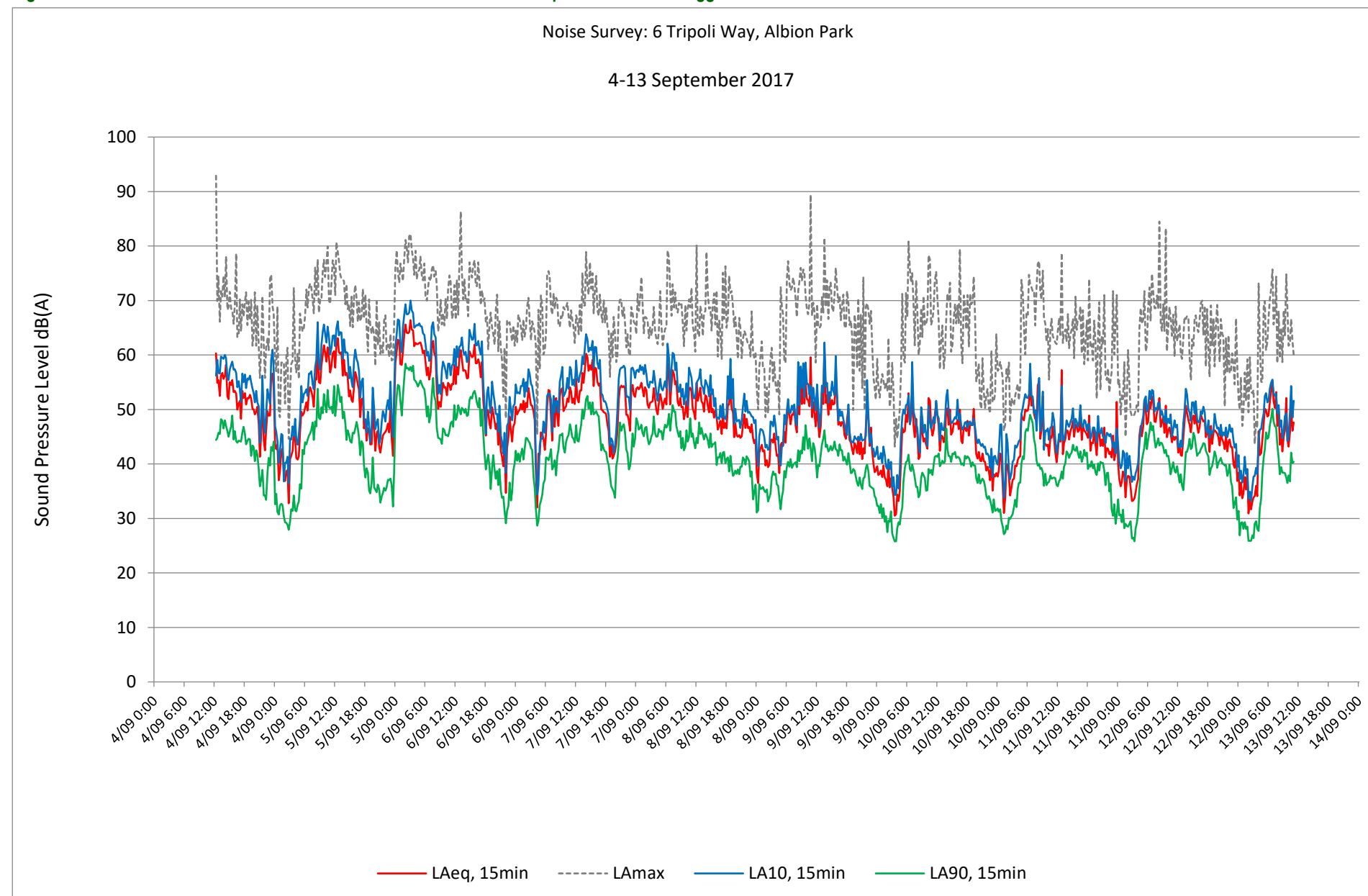


Figure B4 Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 4

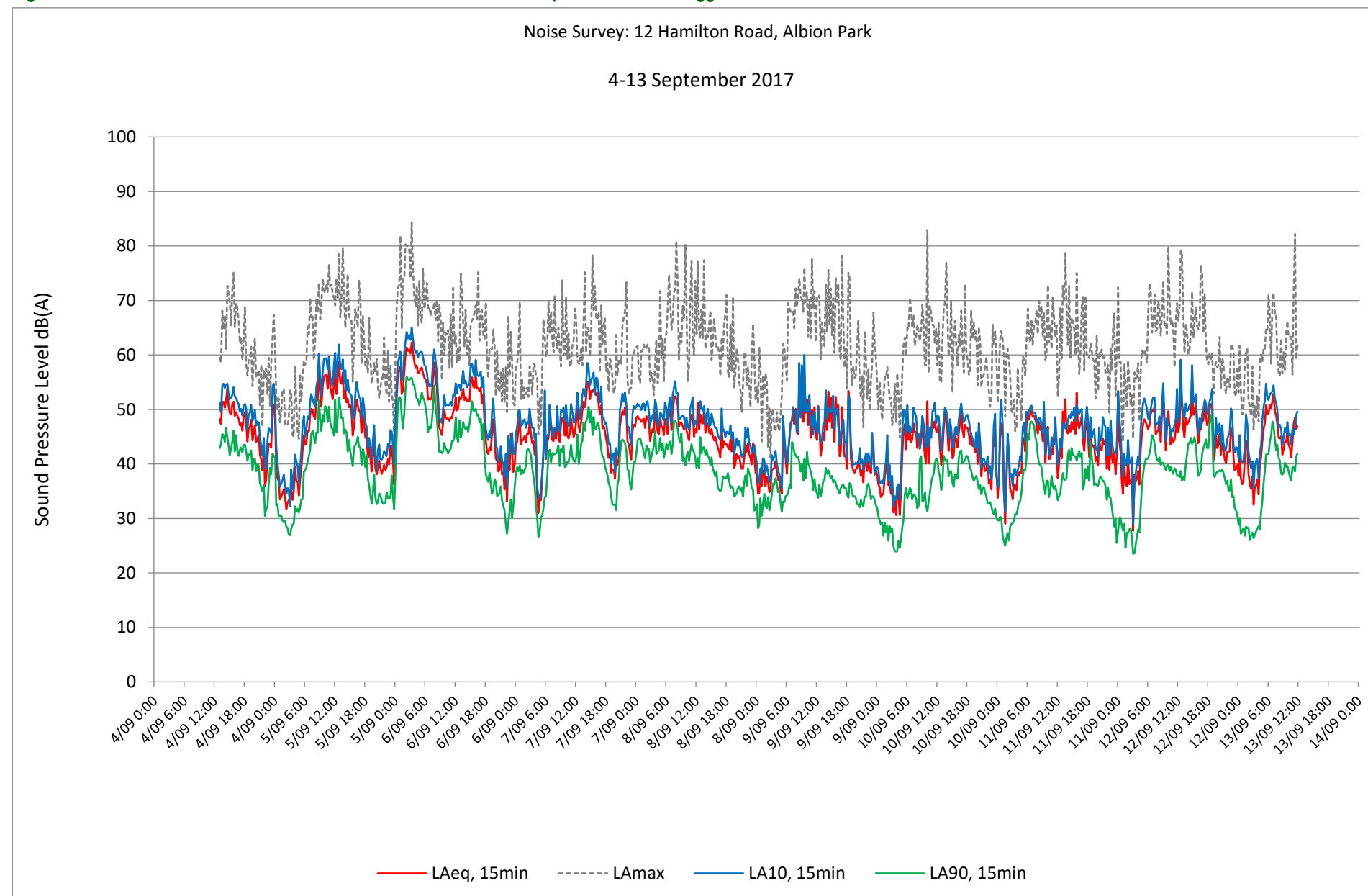
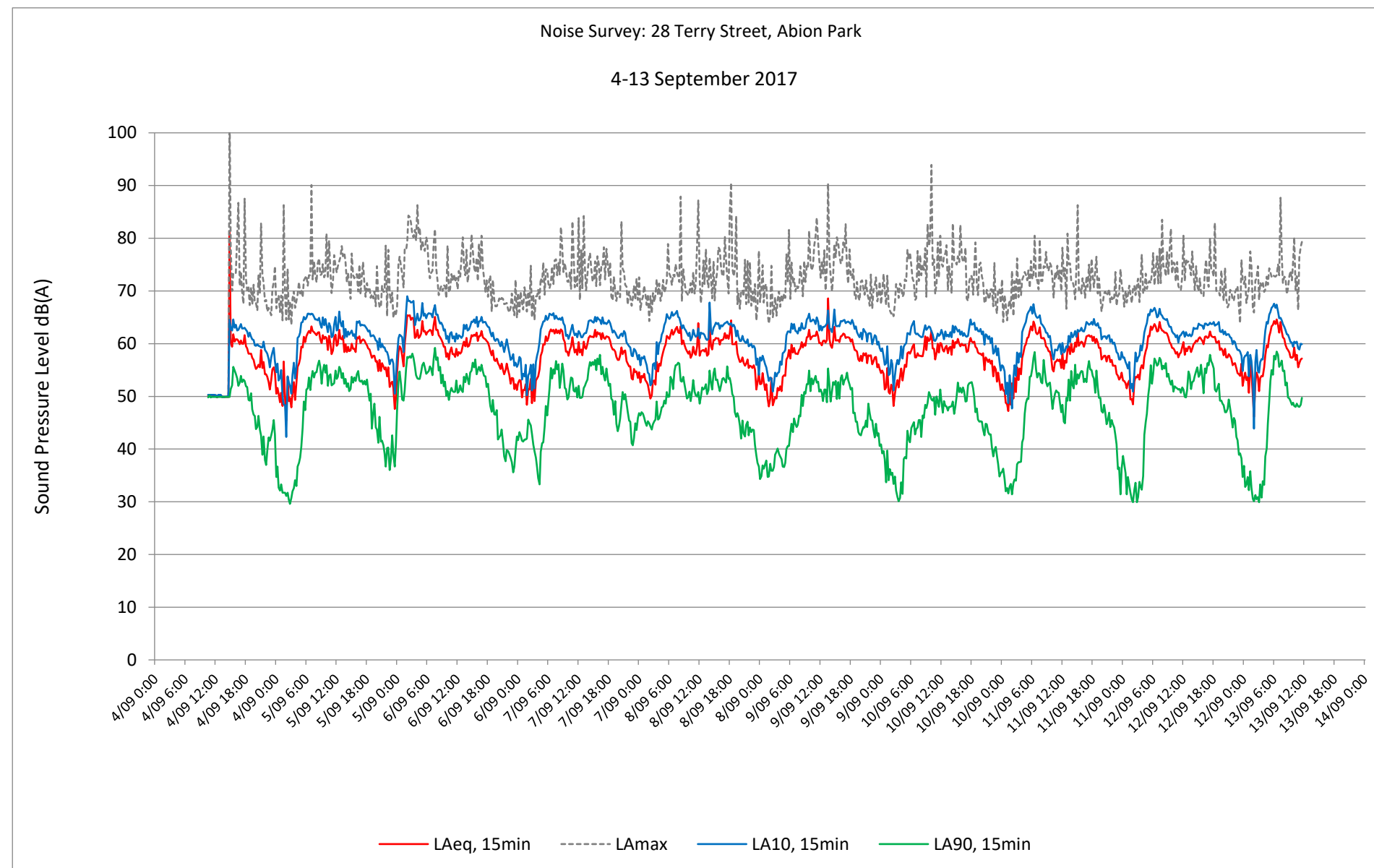


Figure B5 Ambient Noise Levels Measured Between 4 and 13 September 2017 at Logger Location 5



Tripoli Way Upgrade –
Albion Park, NSW

APPENDIX C

WEATHER DATA
NOISE
MONITORING
PERIOD



Table C1 Recorded Weather Data during the Monitoring Period – Shellharbour Airport

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
03/02:30pm	22.4	1004.1	0	51	NE	3.3
03/03:00pm	20.2	1003.7	0	64	ENE	3.5
03/03:30pm	21.2	1002.4	0	63	ENE	3.5
03/04:00pm	26.4	1002.2	0	24	NNW	1.9
03/04:30pm	27.4	1001.8	0	17	NNW	6.2
03/05:00pm	26.4	1001.8	0	18	NNW	6.2
03/05:30pm	26.2	1002	0	19	NNW	4.9
03/06:00pm	24.8	1002.4	0	22	NNW	3.5
03/06:30pm	22.1	1004.2	0	33	WSW	8.4
03/07:00pm	20.5	1004.9	0	36	W	5.6
03/07:30pm	19.8	1005.4	0	39	W	7.2
03/08:00pm	19	1005.7	0	43	W	5.3
03/08:30pm	18.4	1006.3	0	46	W	4.6
03/09:00pm	18.1	1006.7	0	44	W	4.6
03/09:30pm	17.7	1007.2	0	39	W	4.2
03/10:00pm	17.5	1007.3	0	33	W	3.9
03/10:30pm	16.3	1007.7	0	37	WSW	4.9
03/11:00pm	14.9	1008.2	0	45	W	2.6
03/11:30pm	14	1008.6	0	48	W	2.6
04/12:00am	14.4	1008.5	0	48	W	3.0
04/12:30am	13	1009	0	53	WNW	2.6
04/01:00am	13.3	1009.1	0	51	WNW	2.3
04/01:30am	12.3	1008.8	0	54	W	2.3
04/02:00am	10.8	1008.8	0	58	N	1.1
04/02:30am	9.1	1008.7	0	68	NNE	1.1
04/03:00am	7.4	1008.6	0	69	NNE	0.4
04/03:30am	6.7	1008.4	0	75	SSE	0.4
04/04:00am	4.4	1008.4	0	83	SW	1.1
04/04:30am	4.5	1008.6	0	88	W	0.4
04/05:00am	4.2	1008.8	0	91	CALM	0.0
04/05:30am	3.4	1009	0	90	CALM	0.0
04/06:00am	2.4	1009.2	0	89	W	0.7
04/06:30am	2.9	1009	0	94	CALM	0.0
04/07:00am	4.1	1009	0	93	CALM	0.0
04/07:30am	7.3	1009.1	0	83	SSW	0.4
04/08:00am	10.1	1009.2	0	72	CALM	0.0
04/08:30am	15.4	1009	0	48	NW	1.2
04/09:00am	17	1008.5	0	38	WNW	3.9
04/09:30am	17.1	1008.4	0	35	W	7.2
04/10:00am	18	1008.2	0	35	WNW	5.8
04/10:30am	18.3	1008	0	34	W	6.9
04/11:00am	18.2	1007.7	0	32	W	7.6
04/11:30am	19.3	1007.3	0	32	W	5.8
04/12:00pm	19.7	1006.9	0	30	W	5.8
04/12:30pm	19.9	1006.5	0	28	W	5.6
04/01:00pm	20	1006.2	0	27	WNW	5.8
04/01:30pm	20.1	1006.1	0	28	W	6.9
04/02:00pm	20	1005.7	0	27	WNW	7.6
04/02:30pm	20.1	1005.6	0	28	WNW	7.2
04/03:00pm	19.7	1005.8	0	31	W	5.8
04/03:30pm	18.7	1005.9	0	33	W	5.8
04/04:00pm	17.3	1007.1	0	42	W	6.9
04/04:30pm	16.9	1006.9	0	39	WNW	5.8
04/05:00pm	16.5	1007.2	0	37	WNW	7.2
04/05:30pm	15.8	1007.3	0	42	WNW	6.2
04/06:00pm	15.5	1007.5	0	43	W	5.8
04/06:30pm	15.3	1007.7	0	44	W	6.2
04/07:00pm	15.3	1007.7	0	41	W	6.5

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
04/07:30pm	14.8	1008	0	43	W	4.6
04/08:00pm	15	1008.4	0	43	WNW	5.8
04/08:30pm	14.7	1008	0	43	WNW	4.2
04/09:00pm	15.2	1008	0	41	WNW	6.2
04/09:30pm	15	1008.7	0	43	WNW	5.3
04/10:00pm	13.4	1009.2	0	51	SW	3.3
04/10:30pm	13.6	1008.8	0	51	W	3.9
04/11:00pm	13.5	1008.2	0	48	WNW	4.2
04/11:30pm	13.5	1008.9	0	49	W	6.9
05/12:00am	11.7	1009.3	0	55	WSW	5.8
05/12:30am	11.3	1009.3	0	57	SW	1.6
05/01:00am	10.9	1009.2	0	53	SW	1.9
05/01:30am	11.4	1008.8	0	50	WSW	1.6
05/02:00am	11.3	1008.9	0	53	WNW	2.6
05/02:30am	10.6	1008.5	0	56	W	2.3
05/03:00am	11.3	1008	0	53	W	3.0
05/03:30am	10.7	1008.2	0	55	W	3.0
05/04:00am	10.9	1008.2	0	54	W	3.9
05/04:30am	11	1008.5	0	53	W	3.5
05/05:00am	10.9	1008.4	0	54	WNW	3.5
05/05:30am	11.1	1009	0	51	WNW	4.2
05/06:00am	10.8	1009.6	0	49	W	4.2
05/06:30am	10.4	1010	0	49	W	3.5
05/07:00am	10.9	1010.5	0	47	W	5.8
05/07:30am	11.2	1010.9	0	47	W	5.6
05/08:00am	11.6	1010.8	0	45	W	6.2
05/08:30am	12.4	1010.9	0	41	W	5.8
05/09:00am	12.6	1010.7	0	39	W	8.1
05/09:30am	13.5	1010.6	0	37	W	8.1
05/10:00am	14.3	1010.4	0	36	W	6.9
05/10:30am	14.7	1010.4	0	34	W	7.6
05/11:00am	15.3	1010.1	0	33	W	7.7
05/11:30am	15.5	1009.8	0	32	WNW	8.8
05/12:00pm	15.6	1009.3	0	31	W	8.4
05/12:30pm	16.6	1008.9	0	31	W	8.4
05/01:00pm	16.2	1008.4	0	29	W	7.6
05/01:30pm	16.9	1008.3	0	30	W	8.1
05/02:00pm	16.5	1008.6	0	30	W	8.1
05/02:30pm	16.7	1008.6	0	30	W	7.6
05/03:00pm	16.7	1008.9	0	30	W	6.2
05/03:30pm	16.7	1008.9	0	30	W	5.3
05/04:00pm	16.3	1009.1	0	32	WNW	6.5
05/04:30pm	15.5	1009.4	0	34	W	5.3
05/05:00pm	15	1009.8	0	35	W	5.8
05/05:30pm	13.8	1010.2	0	39	W	7.6
05/06:00pm	13.2	1010.4	0	41	WNW	3.5
05/06:30pm	13.1	1010.6	0	41	WNW	3.0
05/07:00pm	13.2	1010.8	0	40	NW	3.3
05/07:30pm	13.2	1011.2	0	41	WNW	3.3
05/08:00pm	13.3	1011.5	0	42	WNW	2.6
05/08:30pm	13.1	1011.5	0	44	WNW	4.2
05/09:00pm	12.6	1011.2	0	46	WNW	2.6
05/09:30pm	13.1	1011	0	44	NW	3.5
05/10:00pm	13	1010.5	0	45	WNW	3.9
05/10:30pm	13.3	1010.3	0	44	WNW	5.3
05/11:00pm	13.4	1010	0	45	W	5.3
05/11:30pm	13.2	1010.2	0	46	W	4.9
06/12:00am	13.2	1009.5	0	47	WNW	5.8
06/12:30am	13	1007.5	0	50	WNW	9.5
06/01:00am	12.6	1008.3	0	52	W	8.8

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
06/01:30am	12.7	1008.3	0	52	W	8.8
06/02:00am	12.4	1007.6	0	52	W	9.9
06/02:30am	12.2	1007	0	51	W	10.4
06/03:00am	12.3	1006.9	0	46	W	9.9
06/03:30am	12.5	1007.1	0	43	W	9.5
06/04:00am	12.2	1007.8	0	45	W	8.4
06/04:30am	12	1008	0	45	W	7.6
06/05:00am	11.7	1008.2	0	48	W	8.8
06/05:30am	11.3	1008.1	0	50	W	9.5
06/06:00am	11.6	1008.7	0	48	W	9.5
06/06:30am	11.5	1010.3	0	48	W	6.2
06/07:00am	11.8	1011.1	0	48	W	4.9
06/07:30am	12.3	1010.8	0	41	W	8.1
06/08:00am	12.6	1012.2	0	43	W	5.6
06/08:30am	13.4	1013	0	43	W	4.9
06/09:00am	13.8	1013.5	0	41	W	3.3
06/09:30am	14.2	1013.9	0	38	W	5.3
06/10:00am	15.1	1014	0	39	W	6.5
06/10:30am	15.2	1014.2	0	35	W	5.8
06/11:00am	15.9	1013.9	0	35	W	6.2
06/11:30am	16.3	1013.9	0	33	W	5.8
06/12:00pm	16.3	1013.4	0	33	W	7.2
06/12:30pm	16.6	1013	0	32	W	6.9
06/01:00pm	16.9	1012.6	0	32	WNW	7.2
06/01:30pm	17	1012.4	0	30	W	8.4
06/02:00pm	17.1	1012.5	0	31	W	7.2
06/02:30pm	16.8	1012.2	0	31	WNW	9.1
06/03:00pm	16.6	1012.5	0	33	WNW	8.1
06/03:30pm	16.3	1012.8	0	34	W	6.9
06/04:00pm	16.1	1013.4	0	34	W	6.9
06/04:30pm	15.7	1013.5	0	36	W	7.2
06/05:00pm	15	1013.9	0	39	W	8.1
06/05:30pm	14.3	1014.5	0	42	W	4.6
06/06:00pm	13.9	1015.1	0	44	W	3.3
06/06:30pm	13.7	1015.5	0	45	W	3.3
06/07:00pm	13.3	1015.8	0	49	NW	2.3
06/07:30pm	13.1	1016.1	0	50	WNW	3.3
06/08:00pm	13.1	1016.6	0	50	NW	1.9
06/08:30pm	12.6	1016.6	0	52	WNW	3.5
06/09:00pm	13	1016.8	0	52	W	3.5
06/09:30pm	13	1017	0	52	W	2.3
06/10:00pm	12.6	1017.2	0	55	W	2.6
06/10:30pm	12.5	1016.9	0	56	W	1.9
06/11:00pm	12.7	1016.8	0	56	W	3.5
06/11:30pm	12.7	1016.4	0	57	W	3.9
07/12:00am	12.9	1016.1	0	57	WSW	5.6
07/12:30am	13.1	1016	0	55	WSW	5.8
07/01:00am	13.2	1016	0	56	WSW	5.8
07/01:30am	12.8	1015.8	0	57	W	5.3
07/02:00am	12.8	1015.5	0	56	W	4.9
07/02:30am	13.1	1015.5	0	55	WSW	4.6
07/03:00am	13	1015.5	0	56	WSW	4.2
07/03:30am	13.3	1015.5	0	55	WSW	3.3
07/04:00am	12.9	1015.9	0	57	W	3.5
07/04:30am	12.4	1016.2	0	58	WSW	2.3
07/05:00am	13.2	1016	0	55	SW	5.6
07/05:30am	13.2	1016.5	0	54	SW	3.9
07/06:00am	12.8	1017	0	58	WSW	3.5
07/06:30am	12.7	1017.3	0	58	W	3.3
07/07:00am	13.3	1017.8	0	53	SSW	2.3

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
07/07:30am	13.9	1018	0	47	WSW	3.9
07/08:00am	14.6	1018.4	0	45	WSW	3.5
07/08:30am	15	1018.4	0	44	WSW	5.6
07/09:00am	15.7	1018.4	0	42	WSW	5.8
07/09:30am	16.5	1018.5	0	41	W	6.9
07/10:00am	16.7	1018.5	0	39	W	5.8
07/10:30am	17.2	1018.4	0	37	WSW	4.9
07/11:00am	17.5	1017.9	0	35	WSW	6.9
07/11:30am	17.7	1017.4	0	34	W	5.8
07/12:00pm	18.6	1017	0	32	W	6.2
07/12:30pm	18.5	1016.5	0	32	W	5.6
07/01:00pm	18.7	1016.2	0	30	W	6.5
07/01:30pm	18.7	1015.7	0	30	W	7.2
07/02:00pm	18.7	1015.6	0	30	W	7.7
07/02:30pm	18.5	1015.3	0	32	W	8.8
07/03:00pm	18.1	1015.5	0	32	WSW	8.8
07/03:30pm	17.7	1015.5	0	33	WSW	8.1
07/04:00pm	17.2	1015.6	0	33	WSW	8.1
07/04:30pm	16.6	1015.8	0	34	W	8.8
07/05:00pm	16.1	1016.4	0	38	W	6.5
07/05:30pm	15.4	1016.9	0	40	W	5.8
07/06:00pm	15.3	1017.4	0	40	WSW	4.9
07/06:30pm	14.7	1017.7	0	44	SW	3.3
07/07:00pm	13.6	1018	0	49	WSW	3.5
07/07:30pm	13.6	1018.1	0	50	WSW	3.9
07/08:00pm	13.1	1017.6	0	52	WSW	3.0
07/08:30pm	13	1017.5	0	52	WSW	3.0
07/09:00pm	13.4	1017.4	0	51	WSW	6.9
07/09:30pm	13.6	1017.3	0	50	W	8.1
07/10:00pm	13.6	1017.3	0	50	WSW	7.6
07/10:30pm	13.2	1017.6	0	52	WSW	5.8
07/11:00pm	13.1	1017.4	0	53	WSW	5.3
07/11:30pm	13	1017.3	0	53	WSW	6.9
08/12:00am	12.9	1016.9	0	53	W	6.9
08/12:30am	13	1016.9	0	53	W	7.2
08/01:00am	13	1016.5	0	54	WSW	7.2
08/01:30am	12.8	1016.4	0	55	WSW	6.5
08/02:00am	12.9	1015.9	0	55	WSW	6.2
08/02:30am	12.4	1015.2	0	57	W	5.8
08/03:00am	12.4	1015.1	0	56	W	6.2
08/03:30am	12.5	1014.9	0	55	W	6.9
08/04:00am	12.2	1014.9	0	56	W	7.6
08/04:30am	12.2	1014.9	0	56	W	6.2
08/05:00am	12.2	1015	0	57	W	7.6
08/05:30am	12.1	1015	0	58	W	6.5
08/06:00am	12	1015	0	60	W	6.2
08/06:30am	12.7	1015.2	0	57	W	7.6
08/07:00am	13.1	1015.5	0	56	W	6.2
08/07:30am	14	1016.2	0	52	WSW	7.7
08/08:00am	14.9	1016.5	0	48	W	8.4
08/08:30am	15.7	1016.9	0	46	W	5.6
08/09:00am	16.4	1017	0	43	W	5.6
08/09:30am	16.8	1017.3	0	43	W	5.6
08/10:00am	17.2	1017.2	0	41	WSW	4.9
08/10:30am	17.7	1017.1	0	38	W	5.6
08/11:00am	17.6	1017.1	0	35	WSW	6.5
08/11:30am	17.8	1016.9	0	34	W	5.6
08/12:00pm	17.4	1016.7	0	34	SW	3.3
08/03:00pm	17.1	1015.9	0	51	SSW	3.9
08/03:30pm	16.1	1016	0	56	E	1.9

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
08/04:00pm	16.2	1016	0	56	ENE	2.3
08/04:30pm	16.2	1016.3	0	52	SE	1.9
08/05:00pm	15.4	1016.7	0	53	SE	2.3
08/05:30pm	14.7	1017.4	0	57	S	1.2
08/06:00pm	13.3	1017.7	0	60	SW	1.2
08/06:30pm	13.6	1018.1	0	37	WSW	4.2
08/07:00pm	13.3	1018.6	0	39	WSW	3.5
08/07:30pm	12.6	1018.8	0	41	WSW	3.0
08/08:00pm	12.2	1018.9	0	44	W	3.5
08/08:30pm	12.1	1019.1	0	44	W	4.6
08/09:00pm	11.9	1019	0	45	W	4.6
08/09:30pm	11.9	1019.1	0	44	WSW	4.9
08/10:00pm	11.8	1019.1	0	44	W	5.3
08/10:30pm	11.1	1019.1	0	46	W	5.6
08/11:00pm	10.8	1019.3	0	46	W	5.3
08/11:30pm	10.8	1019.4	0	46	W	4.6
09/12:00am	10.4	1019.6	0	47	W	4.9
09/12:30am	10.4	1019.5	0	47	W	4.6
09/01:00am	10.1	1019.7	0	48	W	4.6
09/01:30am	10.3	1019.7	0	48	W	5.3
09/02:00am	11	1019.6	0	46	W	5.8
09/02:30am	10.6	1019.9	0	49	W	5.6
09/03:00am	10.5	1019.7	0	51	W	6.2
09/03:30am	9.9	1019.9	0	54	W	5.6
09/04:00am	9.7	1020.3	0	55	W	5.6
09/04:30am	9.7	1020.5	0	55	W	4.9
09/05:00am	8.9	1020.8	0	58	W	4.2
09/05:30am	8.3	1021.2	0	60	WSW	3.5
09/06:00am	8.8	1021.6	0	57	WSW	3.3
09/06:30am	9.7	1021.7	0	54	W	4.2
09/07:00am	10.6	1022	0	49	WSW	4.2
09/07:30am	11.5	1022.2	0	48	W	3.3
09/08:00am	12.3	1022.3	0	44	WSW	3.5
09/08:30am	13.3	1022.3	0	42	W	3.5
09/09:00am	14.2	1022.3	0	39	WSW	3.0
09/09:30am	14.8	1022	0	35	SSW	4.2
09/10:00am	15.3	1022	0	34	SW	6.2
09/10:30am	16.3	1021.8	0	34	SSW	3.9
09/11:00am	16	1022.1	0	34	SSW	4.2
09/11:30am	16.7	1022	0	32	SSW	4.2
09/12:00pm	17.1	1021.5	0	32	SSW	3.0
09/12:30pm	16.2	1021.2	0	36	SSE	2.3
09/01:00pm	16.6	1020.8	0	41	SE	3.3
09/01:30pm	15.9	1020.5	0	43	SE	3.5
09/02:00pm	15.8	1020.6	0	45	E	3.9
09/02:30pm	16.1	1020.5	0	46	ESE	3.0
09/03:00pm	16	1020.5	0	46	SE	2.6
09/03:30pm	15.5	1020.7	0	48	ESE	2.6
09/04:00pm	15.2	1020.8	0	50	ESE	3.0
09/04:30pm	15	1020.8	0	52	SE	2.3
09/05:00pm	14.2	1021	0	54	ESE	1.9
09/05:30pm	13.4	1021	0	58	ESE	1.2
09/06:00pm	12.6	1021.2	0	61	SE	1.2
09/06:30pm	10.4	1021.6	0	67	S	1.2
09/07:00pm	8.5	1022.2	0	80	WSW	1.9
09/07:30pm	8.1	1022.5	0	82	W	1.2
09/08:00pm	7.2	1022.7	0	84	W	1.9
09/08:30pm	6.8	1022.7	0	84	WSW	1.2
09/09:00pm	7.3	1022.5	0	89	WNW	1.6
09/09:30pm	6.5	1022.6	0	87	WSW	1.1

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
09/10:00pm	5.5	1022.7	0	88	W	1.1
09/10:30pm	5.1	1022.5	0	91	WSW	0.4
09/11:00pm	4.6	1022.5	0	93	W	1.2
09/11:30pm	4.5	1022.5	0	95	CALM	0.0
10/12:00am	4	1022.7	0	95	WSW	1.2
10/12:30am	4	1022.7	0	95	CALM	0.0
10/01:00am	3.8	1022.3	0	96	CALM	0.0
10/01:30am	3.8	1022.1	0	96	CALM	0.0
10/02:00am	3.4	1021.8	0	97	WNW	0.4
10/02:30am	3.7	1021.5	0	96	NNW	0.7
10/03:00am	2.7	1021.2	0	95	WSW	0.4
10/03:30am	2.9	1021.1	0	97	SW	0.4
10/04:00am	4.1	1021	0	98	SW	1.9
10/04:30am	3.9	1021	0	93	SW	1.1
10/05:00am	3.4	1021.1	0	94	CALM	0.0
10/05:30am	2.9	1021.5	0	94	SW	1.1
10/06:00am	3.4	1021.9	0	97	SW	1.2
10/06:30am	4.5	1022.2	0	96	SW	1.2
10/07:00am	6.5	1022.7	0	94	SW	1.1
10/07:30am	10	1022.8	0	76	SW	1.1
10/08:00am	13	1023	0	63	WSW	1.9
10/08:30am	14.8	1023.1	0	57	SW	1.1
10/09:00am	15.7	1023	0	55	SSW	1.9
10/09:30am	16.8	1023	0	52	E	1.6
10/10:00am	17.2	1022.6	0	48	NE	1.9
10/10:30am	17.1	1022.5	0	47	NE	2.3
10/11:00am	17.3	1022.4	0	47	ENE	2.3
10/11:30am	17.4	1022.1	0	47	NE	3.0
10/12:00pm	17.6	1021.7	0	48	ENE	2.3
10/12:30pm	17.9	1021.5	0	48	ESE	2.3
10/01:00pm	17.5	1021.1	0	49	E	2.3
10/01:30pm	17.6	1020.9	0	48	ENE	2.6
10/02:00pm	17.2	1020.8	0	47	NE	3.3
10/02:30pm	17.7	1020.7	0	47	ENE	3.0
10/03:00pm	17.2	1020.6	0	48	E	2.6
10/03:30pm	16.8	1020.5	0	51	ESE	2.6
10/04:00pm	16.4	1020.5	0	51	ENE	2.6
10/04:30pm	15.9	1020.4	0	53	NE	2.3
10/05:00pm	15.5	1020.4	0	56	NE	1.9
10/05:30pm	14.7	1020.5	0	59	ENE	1.9
10/06:00pm	14.3	1020.6	0	62	NE	1.6
10/06:30pm	11.1	1021	0	72	W	1.2
10/07:00pm	9.9	1021.2	0	77	W	1.6
10/07:30pm	8.8	1021.4	0	82	W	1.1
10/08:00pm	8.8	1021.6	0	85	WSW	1.1
10/08:30pm	8.6	1021.8	0	88	WNW	1.6
10/09:00pm	8.1	1022	0	88	WSW	1.6
10/09:30pm	7.7	1022.2	0	90	CALM	0.0
10/10:00pm	8	1022	0	89	NW	0.4
10/10:30pm	6.9	1022.1	0	87	WSW	1.1
10/11:00pm	7.7	1022	0	90	CALM	0.0
10/11:30pm	6.2	1021.9	0	93	NW	1.1
11/12:00am	6	1022	0	96	CALM	0.0
11/12:30am	5.7	1021.7	0	98	CALM	0.0
11/01:00am	5	1021.5	0	96	WSW	1.1
11/01:30am	5.2	1021.2	0	96	CALM	0.0
11/02:00am	4.9	1020.8	0	98	CALM	0.0
11/02:30am	4.8	1020.4	0	98	CALM	0.0
11/03:00am	4.2	1020	0	97	CALM	0.0
11/03:30am	3.9	1019.7	0	99	CALM	0.0

Day/Time	Air Temp. C	Air Pressure	Rain, mm	Humidity %	Wind direction	Wind Speed, m/s
11/04:00am	3.7	1019.6	0	99	CALM	0.0
11/04:30am	3.3	1019.7	0	99	CALM	0.0
11/05:00am	3.5	1019.7	0	99	CALM	0.0
11/05:30am	2.8	1019.7	0	99	CALM	0.0
11/06:00am	3.2	1020	0	99	WSW	0.4
11/06:30am	3.2	1020.1	0	99	W	1.2
11/07:00am	5.3	1019.9	0	99	CALM	0.0
11/07:30am	7.7	1019.8	0	98	WSW	0.4
11/08:00am	11.6	1019.7	0	75	SW	1.1
11/08:30am	14.4	1019.5	0	65	SW	1.6
11/09:00am	16.7	1019.1	0	52	SW	1.2
11/09:30am	18.7	1018.5	0	39	NNW	1.6
11/10:00am	20.1	1017.9	0	32	NW	3.0
11/10:30am	21	1017.7	0	30	WNW	3.9
11/11:00am	22	1017.6	0	30	W	2.3
11/11:30am	22.4	1016.9	0	28	W	1.9
11/12:00pm	23.1	1016.1	0	25	NW	1.9
11/12:30pm	22.1	1015.7	0	34	E	3.5
11/01:00pm	21.9	1015.5	0	36	NE	2.6
11/01:30pm	22.4	1015.1	0	34	E	2.6
11/02:00pm	22.1	1015	0	39	E	3.0
11/02:30pm	21.4	1014.8	0	37	ENE	3.3

Tripoli Way Upgrade –
Albion Park, NSW

APPENDIX D

NOISE CONTOUR
MAPS – ROAD
TRAFFIC NOISE
IMPACT



Figure E1 Predicted 2026 Road Traffic Noise Levels – With Build - Daytime Residential ($L_{Aeq,15hr}$)

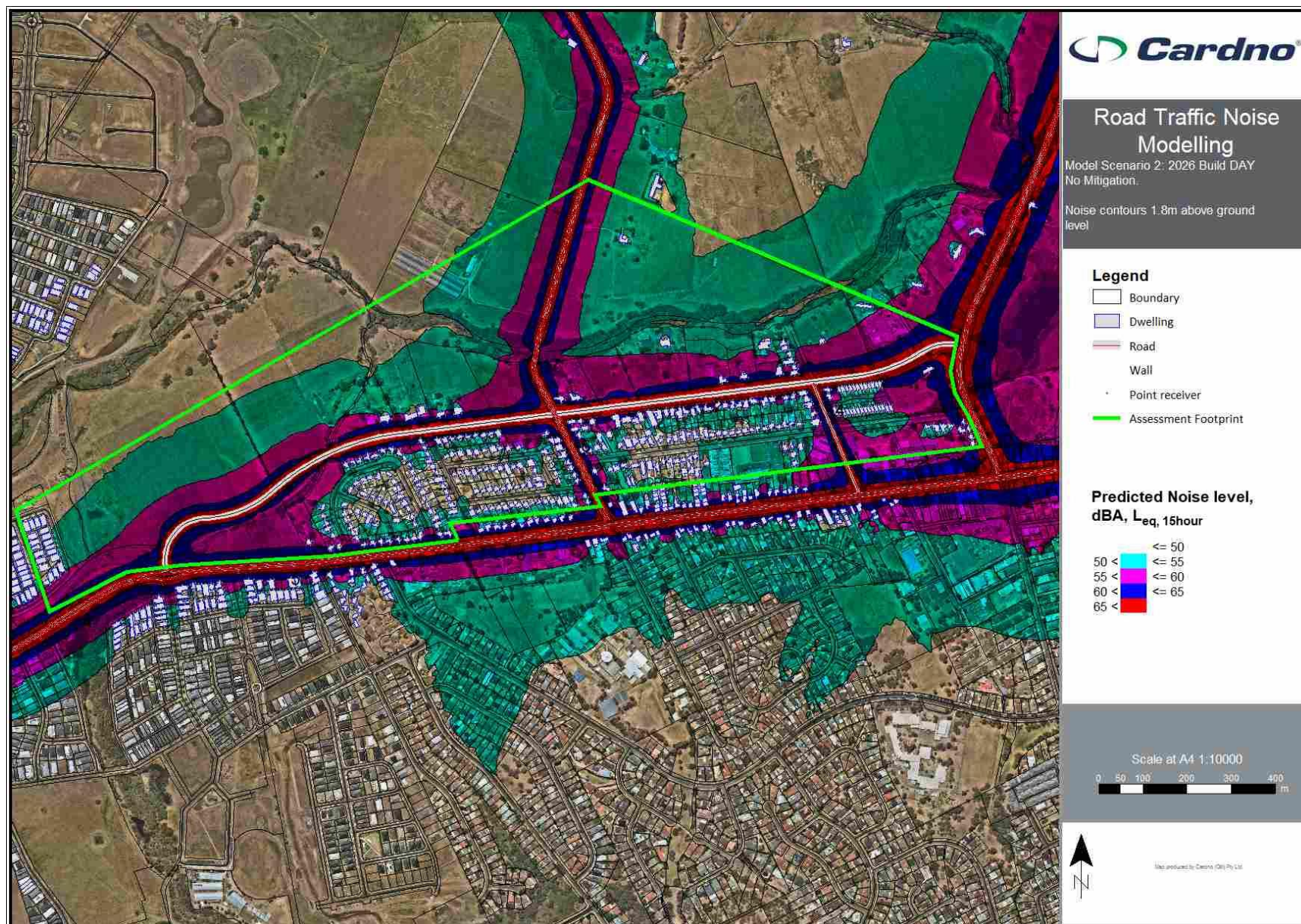


Figure E2 Predicted 2026 Road Traffic Noise Levels – With Build – Night time Residential ($L_{Aeq,9hr}$)

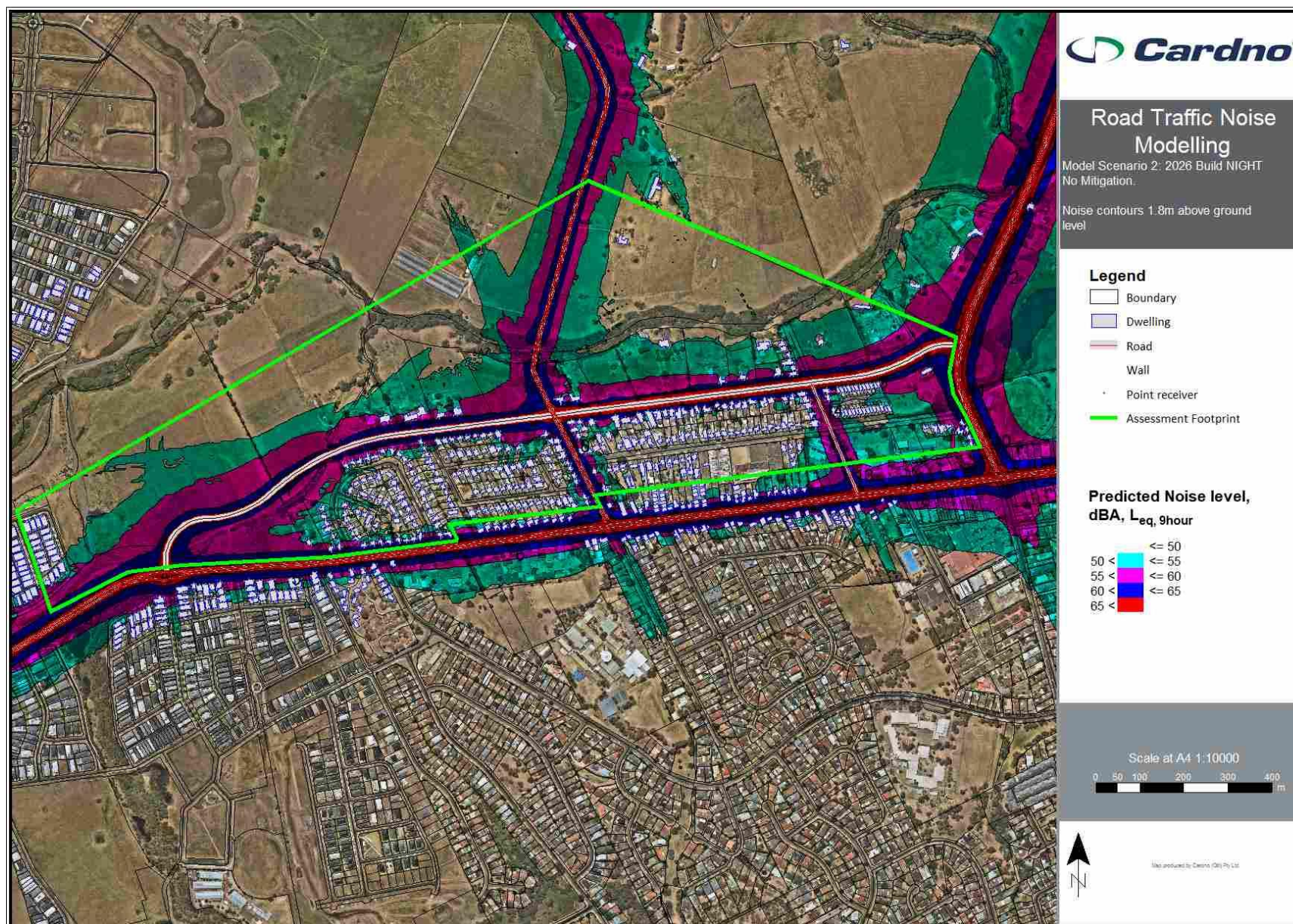


Figure E3 Predicted 2026 Road Traffic Noise Levels – No Build – Daytime Residential ($L_{Aeq,15hr}$)



Figure E4 Predicted 2026 Road Traffic Noise Levels – No Build – Night time Residential ($L_{Aeq,9hr}$)

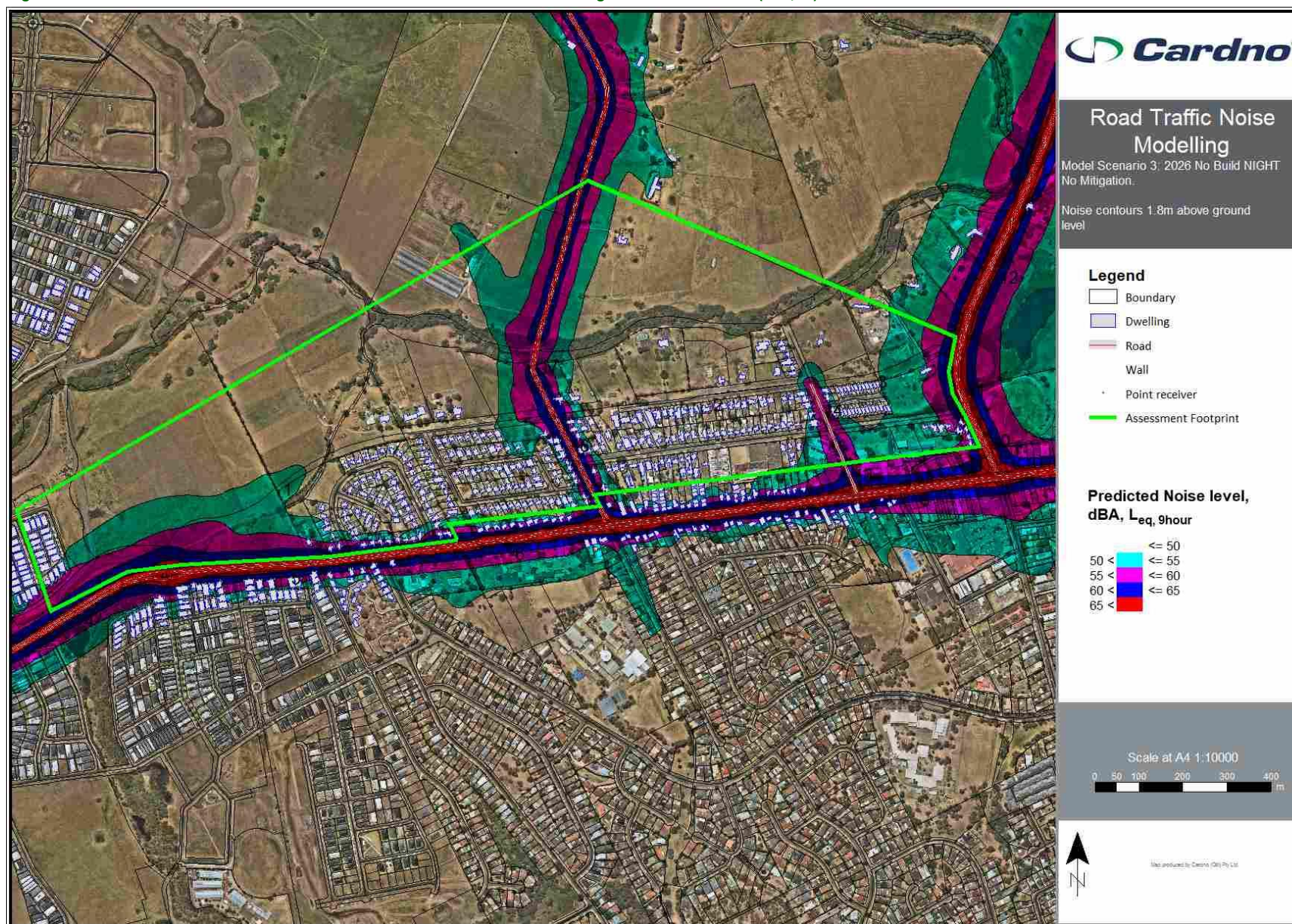


Figure E5 Predicted 2041 Road Traffic Noise Levels – With Build - Daytime Residential ($L_{Aeq,15hr}$)



Figure E6 Predicted 2041 Road Traffic Noise Levels – With Build - Night-time Residential ($L_{Aeq,9hr}$)

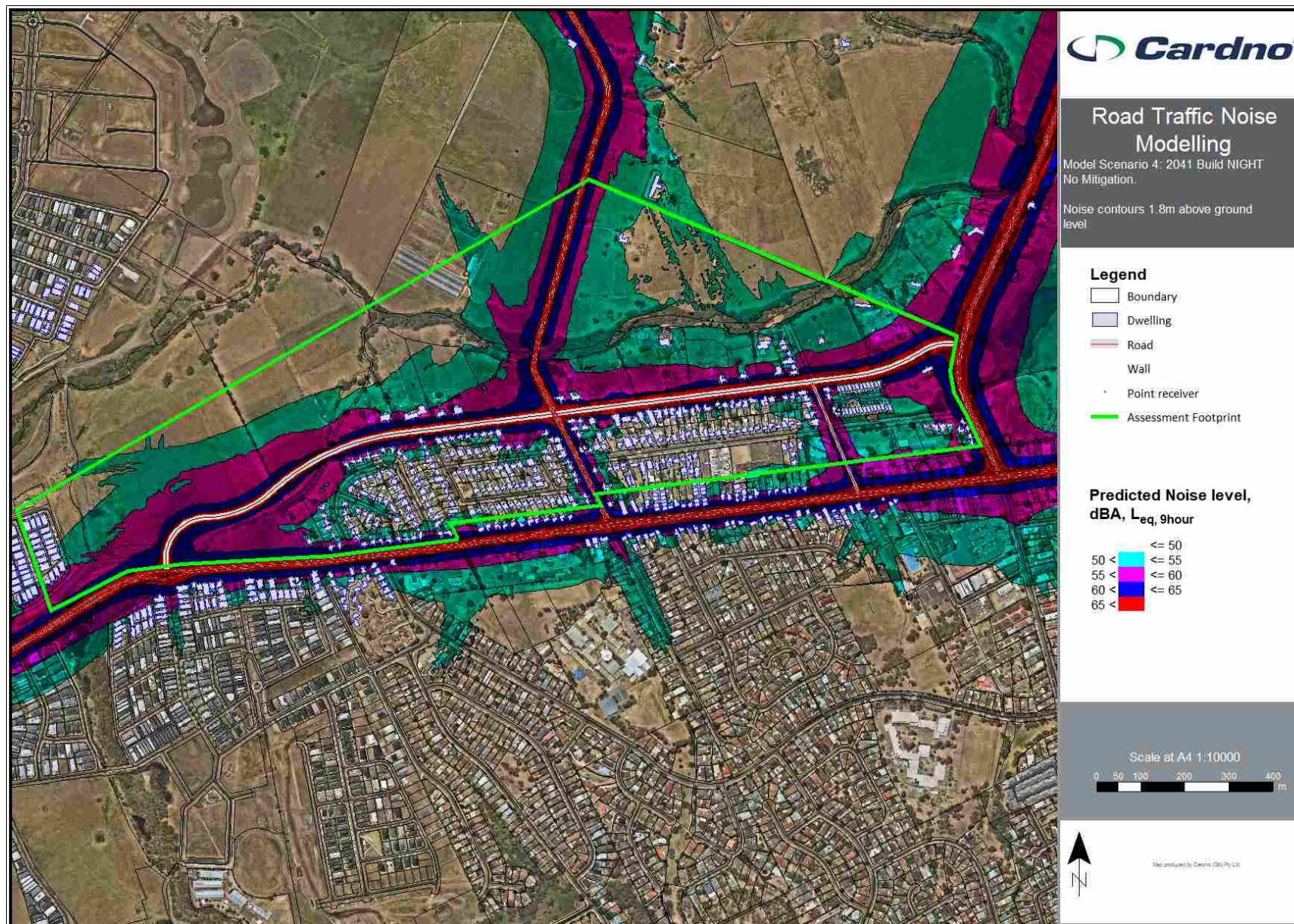


Figure E7 Predicted 2041 Road Traffic Noise Levels – No Build – Daytime Residential ($L_{Aeq,15hr}$)

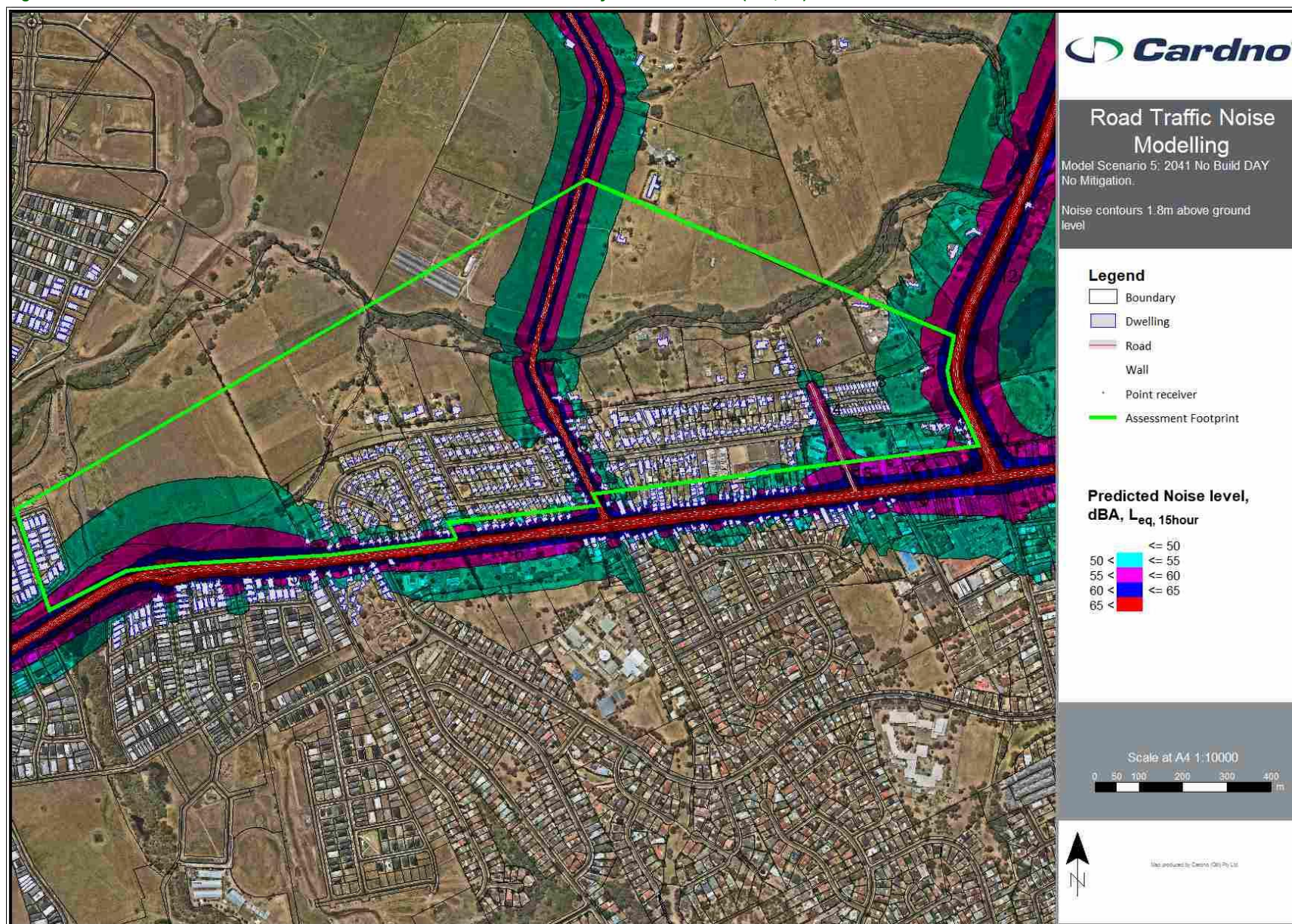
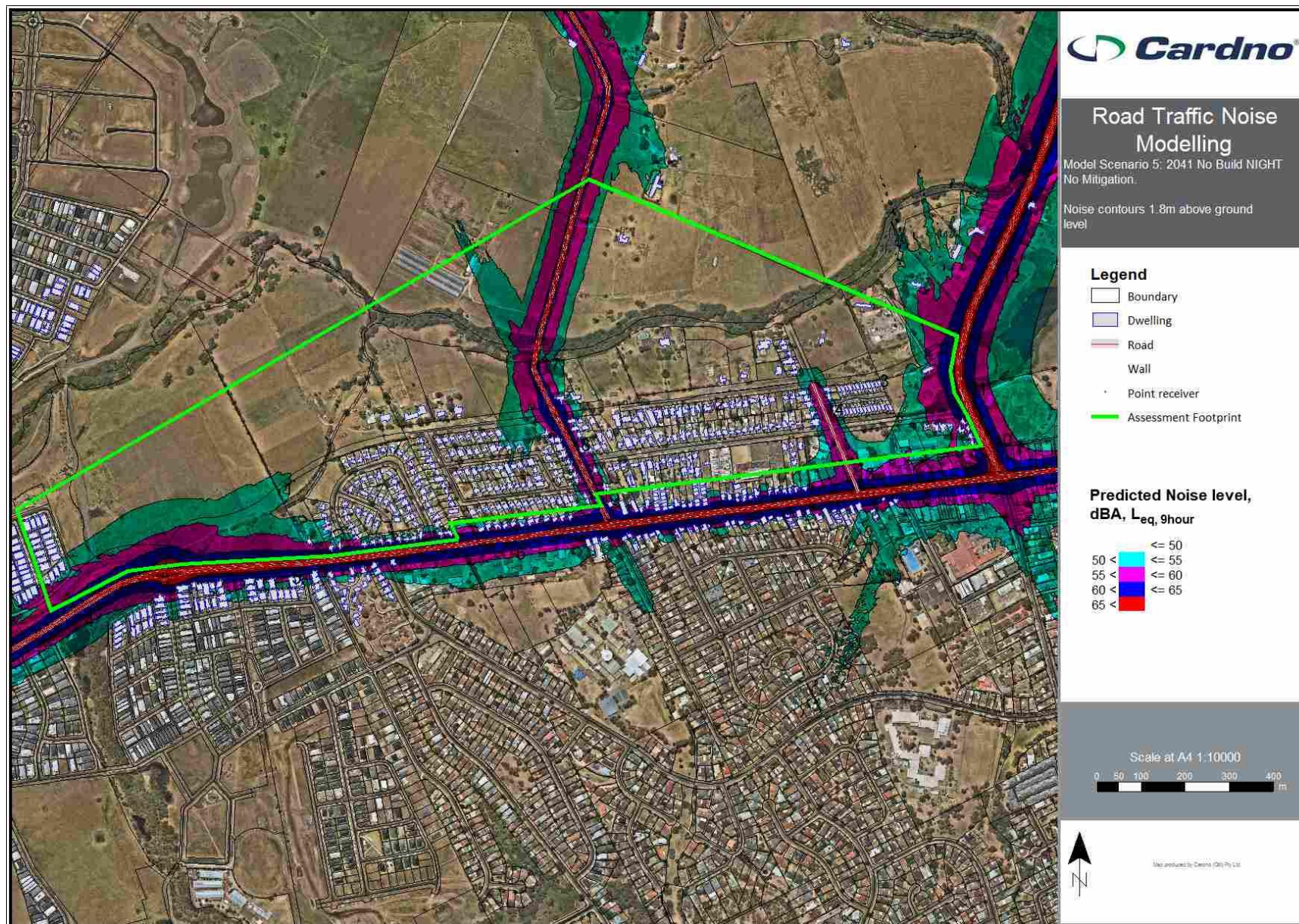


Figure E8 Predicted 2041 Road Traffic Noise Levels – No Build – Night time Residential ($L_{Aeq,9hr}$)



Tripoli Way Upgrade –
Albion Park, NSW

APPENDIX E

NOISE CONTOUR
MAPS – PREDICTED
CONSTRUCTION
NOISE IMPACT



Figure F1 Predicted Construction Noise Impact Worst Case – Site Establishment

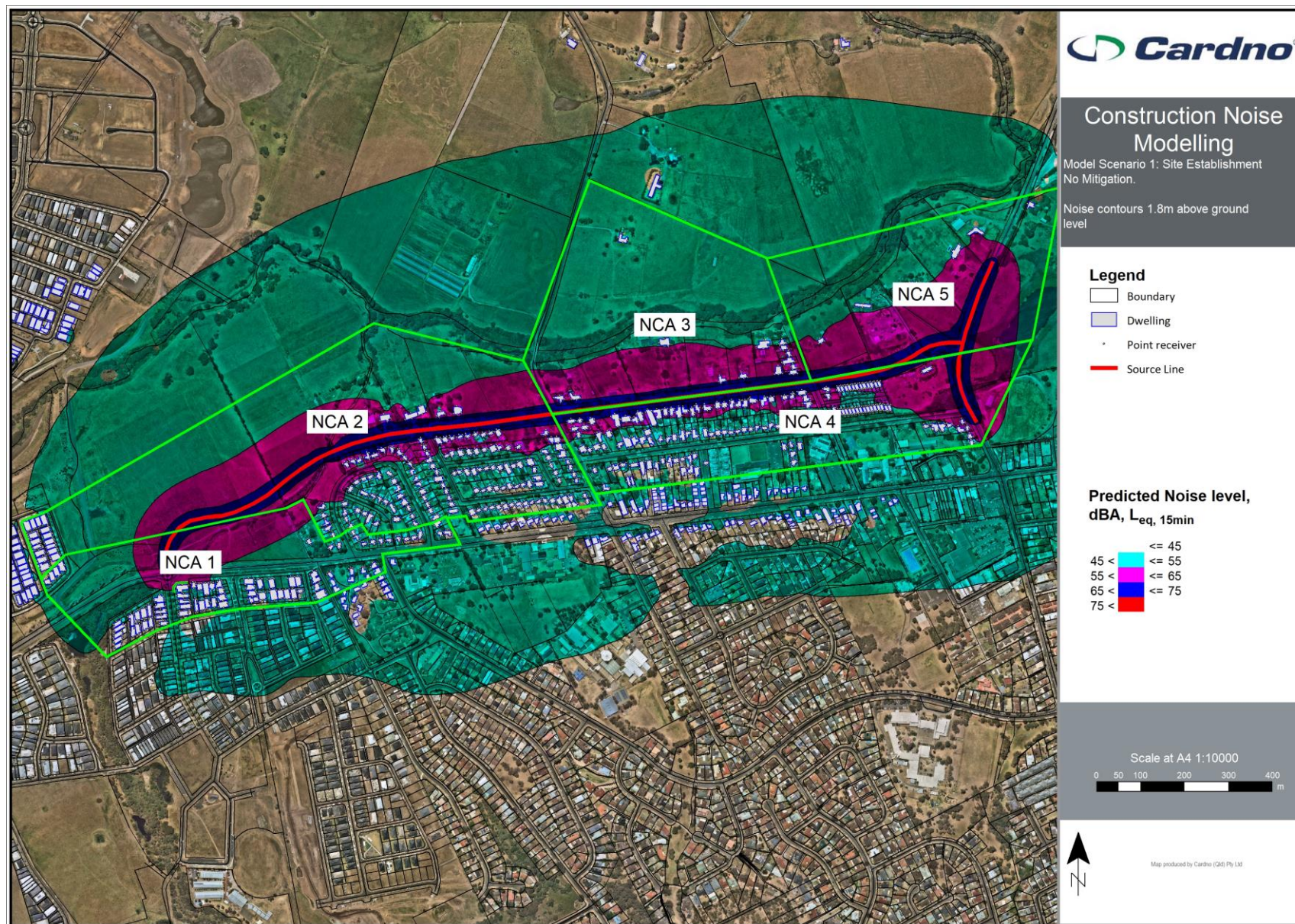


Figure F2 Predicted Construction Noise Impact Worst Case – Bulk Earthworks



Figure F3 Predicted Construction Noise Impact Worst Case – Bridge Works

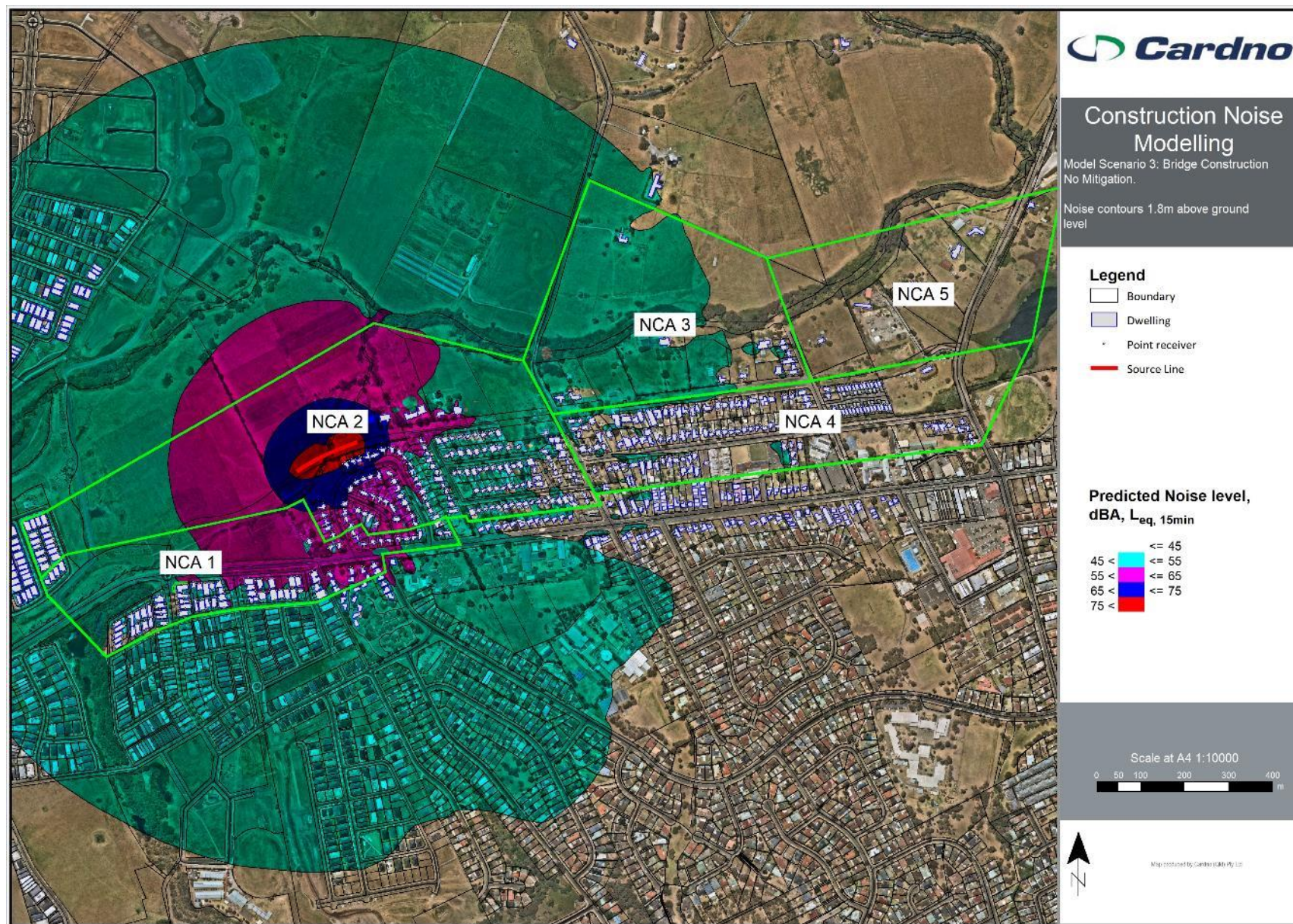


Figure F4 Predicted Construction Noise Impact Worst Case – Surface Works

