General – All Project Works – Operational Noise Assessment Report

NorthConnex & M2 Integration Project

Lend Lease Bouygues Joint Venture

	Name	Position	Date	Signed/Authorised
Originator(s)	Beau Weyers	Senior Acoustic Engineer - ANE	02/12/2019	pp:
Originator(s)	Neil Gross	Director – Wilkinson Murray	02/12/2019	pp:
Authorised	Martin Howe	Environment & Sustainability Manager	02/12/2019	

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ACOUSTICS AND AIR

NORTHCONNEX & M2 INTEGRATION PROJECTS

OPERATIONAL NOISE ASSESSMENT REPORT

REPORT NO. 13245-O
VERSION J

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PREPARED FOR

LEND LEASE BOUYGUES JOINT VENTURE
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WEST PENNANT HILLS NSW 2125

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

'A' Frequency Weighting – The 'A' frequency weighting roughly approximates to the Fletcher-Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40dB at 1kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (ie. 500Hz to 6kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

Audible – Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

'C' Frequency Weighting – The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100dB.

Decibel – The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0dB to 120dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50dB, and another similar machine is placed beside it, the level will increase to 53dB (from 10 log10 (10(50/10) + 10(50/10)) and not 100dB. In theory, ten similar machines placed side by side will increase the sound level by 10dB, and one hundred machines increase the sound level by 20dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one so the logarithmic decibel scale is useful for acoustical assessments.

Free Field – In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

Frequency – The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1Hz is equivalent to one cycle per second. 1000Hz is 1kHz.

Insertion Loss – Barrier performance is measured by its insertion loss defined as the difference in sound pressure level before and after the barrier is constructed.

Noise – Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

Noise Barrier – Any natural or artificial physical barrier to the propagation of noise (from a roadway), but generally referring to acoustically reflective or absorbent fences, walls or mounds (or combinations thereof) constructed beside a roadway.

Noise Level (target) – A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.

Mound – A type of noise control barrier consisting of an artificial earthen embankment or knoll constructed between a roadway and a noise receptor area.

Reverberant Time (L_{60}) – The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60dB. The first 5dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30dB is measured and the result doubled to determine the T60. The Early Decay Time (EDT) is the slope of the decay curve in the first 10dB normalised to 60dB.

Sound Absorption Coefficient- Sound is absorbed in porous materials by the viscous conversion of sound energy to a small amount of heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, a. An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average from 250 to 2 kHz is termed the Noise Reduction Coefficient (NRC).

Sound Attenuation – A reduction of sound due to distance, enclosure or some other devise. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20dB reduces the sound energy by one hundred times.

Sound Pressure – The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m2).

Sound Pressure Level (Lp) – The level of sound measured on a sound level meter and expressed in decibels (dB). Where LP = 10 log10 (Pa/Po)2dB (or 20 log10 (Pa/ Po) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 µPa (20 x 10-6 Pa) for airborne sound. Lp varies with distance from a noise source.

Sound Power – The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A measures the rate of energy flow, conversion or transfer.

Sound Power Level (Lw) – The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment. Lw = Lp + 10 log10 'a' dB, re: 1pW, (10-12 watts) where 'a' is the measurement noise-emission area (m2) in a free field.

Sound Transmission Class (STC) – An internationally standardised method of rating the sound transmission loss of partition walls to indicate the sound reduction from one side of a partition to the other in the frequency range of 125Hz to 4000kHz. (Refer: Australian Standard AS1276 – 1979). Now not in general use in Australia see: weighted sound reduction index.

Sound Transmission Loss – The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 – 2002.

Spectrum – The spectrum is the result of transforming a time domain signal to the frequency domain. Spectrum analysis is the procedure of doing the transformation, and it is most commonly done with an FFT analyser.

Traffic Noise – The total noise resulting from road traffic, including both light and heavy vehicles, steady and intermittent traffic flow and specific events such as the use of engine brakes.

Weighted Sound Reduction Index (R_W) – This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100Hz to 3.150kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999). Internal partition wall R_w + C ratings are frequency weighted to simulate insulation from human voice noise. The R_w + C is similar in value to the STC rating value. External walls, doors and windows may be R_w + C_{tr} rated to simulate insulation from road traffic noise. The spectrum adaptation term Ctr adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

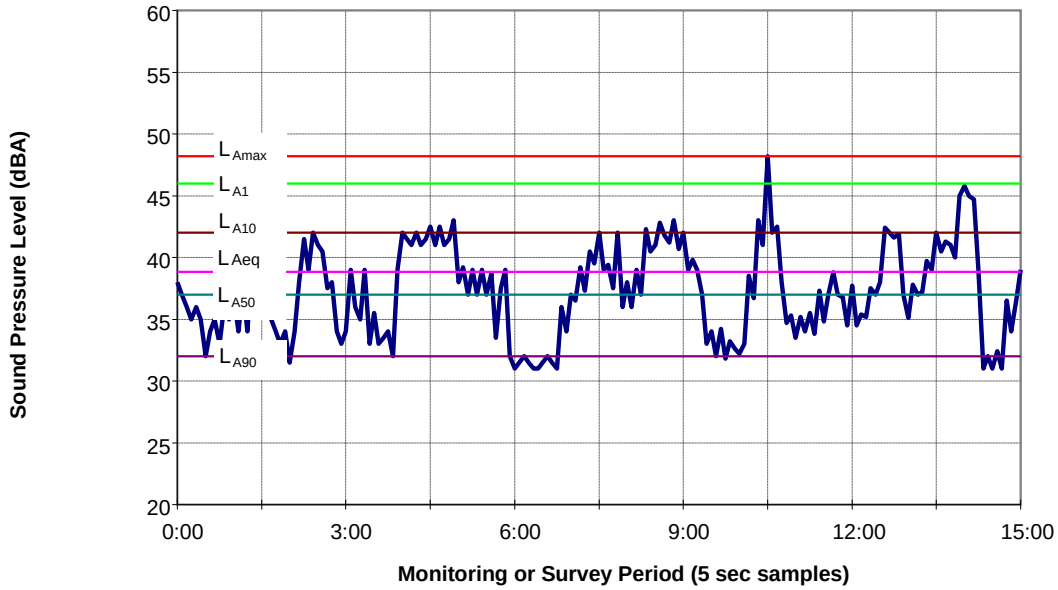
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray has been commissioned by Lend Lease Bouygues Joint Venture (LLBJV) to prepare an operational noise management report for the NorthConnex and M2 Integration projects. In particular, this report details the findings regarding operational traffic noise associated with the NorthConnex Northern Section, NorthConnex Southern Section, M2 Integration, portals, and associated roadworks, including mitigation measures.

This includes a number of minor design changes since Version G of this report was prepared in November 2016. Where a more detailed review of some localised areas has been required, updated information regarding residential building layouts, RL of the upper floor levels have been incorporated into the noise model and results updated in this report.

The road traffic noise predictions have been kept in line with the original assessment with an intended opening of the project in late 2019. Modelling of the Build scenario for 10 years after opening (2029) with the recommended noise barriers based on the required Roads and Maritime optimisation process outlined in their Environmental Noise Management Manual. LLBJV have advised there will be a slight delay to the road opening to 2020.

In addition, noise criteria have been reviewed and established and operational noise assessed for operations of the permanent Southern, Wilson, Trelawney and Northern compounds, which includes noise generated by mechanical plant located within the ventilation buildings and for the Southern compound also includes vehicle movements associated with the Motorway Operations Centre and the Maintenance / Workshop Facility.

Noise criteria to be met by the jet fans located within the tunnels are also provided.

The noise design associated with the mechanical systems has been undertaken on behalf of LLBJV by Air Noise Environment Pty Ltd. To allow for the cumulative noise for on-site vehicle noise and mechanical systems noise to meet overall site limits, individual contribution noise limits were established. The sections of the report relevant to mechanical systems have been authored by ANE and have not been independently checked by Wilkinson Murray.

Relevant information contained within the previous Environmental Impact Statement (EIS) has been utilised in the current noise survey, where it is still considered appropriate. In particular, Appendix F – Technical working paper: Noise and vibration in Volume 2 of the EIS has been utilised (ref RMS/Pub: 14.187).

In addition, the "Noise & Vibration Baseline Information Report in Response to COA D9", prepared by Wilkinson Murray in May 2015 (13245-CD-3 version L), has been referenced in this assessment. The Report documents baseline noise information for the NorthConnex and M2 Integration projects, as required by condition D9 of the "Noise and Vibration" section of the Infrastructure approval released by the Minister for Planning on 13 January 2015.

This assessment has been carried out in accordance with the EPA *Road Noise Policy* (*RNP*, 2011), RMS *Environmental Noise Management Manual* (*ENMM*, 2001) and the EPA *Industrial Noise Policy* (*INP*, 2000).

1.1 Project Overview

Roads and Maritime Services of NSW (Roads and Maritime) was granted with approval by the Minister for Planning under Section 115ZB of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the construction and operation of a multi-lane tolled motorway linking the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills in northern Sydney (the project).

Key features of the project will include:

- Twin motorway tunnels up to around nine kilometres in length with two lanes in each direction. The tunnel would be constructed with provision for a possible third lane in each direction if required in the future;
- A northern interchange with the M1 Pacific Motorway and Pennant Hills Road, including sections of tunnel for on-ramps and off-ramps, which also facilitate access to and from the Pacific Highway;
- A southern interchange with the Hills M2 Motorway and Pennant Hills Road, including sections of tunnel for on-ramps and off-ramps;
- Integration works with the Hills M2 Motorway including alterations to the eastbound carriageway to accommodate traffic leaving the Hills M2 Motorway to connect to the project travelling northbound and the provision of a new westbound lane on the Hills M2 Motorway extending through to the Windsor Road off ramps;
- Tie-in works with the M1 Pacific Motorway extending to the north of Edgeworth David Avenue.
- A motorway operation complex located near the southern interchange on the corner of Eaton Road and Pennant Hills Road that includes operation and maintenance facilities (Southern Compound);
- Ventilation facilities (Northern and Southern Compounds);
- Two tunnel support facilities incorporating emergency smoke extraction outlets (Wilson and Trelawney);
- Ancillary facilities for motorway operation, such as electronic tolling facilities, signage, ventilation systems and fire and life safety systems including emergency evacuation infrastructure;
- Modifications to service utilities and associated works at surface roads near the two interchanges and operational ancillary facilities;
- Modifications to local roads, including widening of Eaton Road near the southern interchange, and repositioning of the Hewitt Avenue cul-de-sac near the northern interchange; and
- Ancillary temporary construction facilities and temporary works to facilitate the construction of the project.

The project will be located within The Hills, Hornsby and Ku-ring-gai local government areas about 20 kilometres north-west of the central business district of Sydney. The regional context of the project is shown in Figure 1-1.

1.2 Scope of Work

This assessment has been carried out in accordance with the EPA *Road Noise Policy* (*RNP*, 2011), RMS *Environmental Noise Management Manual* (*ENMM*, 2001) and the EPA *Industrial Noise Policy* (*INP*, 2000).

This operational noise assessment addresses the requirements outlined in conditions E23 and some of the requirements E24, section Noise and Vibration of the Infrastructure approval released by the Minister for Planning on 13 January 2015.

Conditions 23 and 24 state the following:

E23 The Proponent shall design and operate all fixed facilities, including the northern and southern tunnel portals; northern and southern ventilation facilities; the Motorway Operations Complex; the Trelawney Street and Wilson Road emergency smoke extraction outlets and the Coral Tree Drive switching station, with the objective of not exceeding the requirements of the NSW Industrial Noise Policy (EPA 2000) and the Sleep Disturbance Application Note to the Industrial Noise Policy (DEC 2007). The Proponent shall apply mitigation at existing receivers where the noise requirements cannot be achieved.

E24 A detailed Operational Noise Management Plan shall be prepared as part of the OEMP, to the satisfaction of the Secretary. The Plan shall provide details of noise and vibration control measures to be undertaken during the operation stages, sufficient to address the technical requirements of the EPA, and generally in accordance with the Road Noise Policy (DECCW 2011) and the Industrial Noise Policy (EPA 2000).

The Plan shall include, but not be limited to:

- *(a) tests for ascertaining acoustic parameters;*
- *(b) predicted noise levels;*
- *(c) noise criteria for operation of the project;*
- *(d) location, type and timing of erection of permanent noise barriers and/or other noise mitigation measures demonstrating best practice including silencers and building treatments for associated plant rooms and enclosures for exposed plant;*
- *(e) specific physical and managerial measures for controlling noise; and,*
- *(f) noise monitoring, reporting and response procedures including the monitoring on surrounding roads which experience significantly increased traffic volumes as a result of the project, including but not limited to North Rocks Road.*

With regard to sub points e) as it relates to "managerial measures for controlling noise" and sub point f), these will be responded to as part to the Operational Noise Management Plan.

A regional context of the project can be seen in Figure 1-1.

Figure 1-1 Regional Context of the Project

2 DESCRIPTION OF THE PROPOSAL & STUDY AREA

2.1 Operation

Hills M2 Integration Works

As part of the project, modifications to the Hills M2 Motorway would be undertaken west of Pennant Hills Road to enable southbound traffic from the project to merge safely with existing westbound traffic on the motorway. These works would extend for a distance of around 3.5 kilometres west of the Pennant Hills Road interchange until the existing Windsor Road off-ramp. This would include an additional westbound lane on the Hills M2 Motorway, widening of Yale Close Bridge and Darling Mill Creek Bridge and lengthening of Barclay Road overbridge.

Minor alterations would also be required to allow eastbound traffic from the Hills M2 Motorway to leave the motorway and join the northbound carriageway of the project.

Southern Interchange

The southern interchange would be located near the existing intersection of the Hills M2 Motorway / Pennant Hills Road at Carlingford. The interchange would provide connections to and from the project with the Hills M2 Motorway and Pennant Hills Road. Existing movements catered for at the Hills M2 Motorway intersection with Pennant Hills Road would be maintained.

Portals to the northbound on-ramp and southbound off-ramp along Pennant Hills Road would be located south of Eaton Road. The main alignment tunnel portals would emerge adjacent to the shoulders of the Hills M2 Motorway to the west of Pennant Hills Road.

Main Tunnels and On- & Off-Ramps (in Tunnel)

The main alignment tunnels would consist of twin motorway tunnels around nine kilometres in length with separate northbound and southbound carriageway tunnels. On- and off-ramps would provide connections to the surface roads at the southern and northern interchanges.

The tunnel depth would vary depending on the geological conditions, and the tunnel crown (top of tunnel) would vary up to a maximum depth of around 90 metres below ground with shallower sections approaching the portals.

Tunnel Support Facilities

Two tunnel support facilities would be provided at Wilson Road, Pennant Hills and Trelawney Street, Thornleigh. Each tunnel support facility would include an emergency smoke extraction facility. The tunnel support facility at Wilson Road would also include a Disaster Recovery Site.

Northern Interchange

The northern interchange would be located near the intersection of the M1 Pacific Motorway and Pennant Hills Road at Wahroonga, and would provide connections to the M1 Pacific Motorway, Pennant Hills Road and the Pacific Highway. Portals to the southbound on-ramp and northbound off-ramp for Pennant Hills Road would be located to the east of Pennant Hills Road within the median of the Pennant Hills Road / M1 Pacific Motorway connector. The portals of the main alignment tunnels would emerge in the shoulders of the M1 Pacific Motorway to the north of Alexandria Parade in the vicinity of Bareena Avenue, Wahroonga. Local road changes around the northern interchange would also include the widening of Pennant Hills Road northbound (at Pearces Corner) to create a permanent additional right-turn lane onto the Pacific Highway.

The M1 Pacific Motorway Tie-In Works

To provide connection to the project, modifications to the M1 Pacific Motorway beyond the northern interchange would be required. The works would extend around 200 metres north of Edgeworth David Avenue in Wahroonga. Surface works along the M1 Pacific Motorway would generally involve widening of the road surface for the merge and diverge to and from the main alignment tunnels.

Ventilation System & Facilities

During operation, the ventilation system would draw fresh air into the tunnels and emit air from within the tunnels via two ventilation facilities. During emergency conditions, depending on the location of the incident, the ventilation system would extract smoke from the tunnels which would be emitted from one or more of the following locations:

- Southern ventilation facility located within the motorway operations complex.
- Wilson Road tunnel support facility, occasionally only.
- Trelawney Street tunnel support facility, occasionally only.
- Northern ventilation facility located primarily above the cut and cover section of the northbound main alignment near the connection with the M1 Pacific Motorway.
- Tunnel portals.

Jet fans would be mounted in pairs throughout the tunnels, with each pair separated by a minimum linear distance of 90 metres. A total of 80 fans would be installed in the northbound tunnel and ramps and 60 fans would be installed in the southbound tunnel and ramps. The fans would operate on an as required basis to maintain in tunnel air quality requirements.

Each ventilation outlet facility would consist of five axial fans. At full capacity, Northern and Southern ventilation outlet facility will operate with four fans, with the fifth fan on standby. Each ventilation facility would be around 15 metres in height, as measured from the ground level of the adjoining land.

Each tunnel support facility would consist of four vertically mounted bi-directional axial fans. Emergency smoke extraction and normal mode requirements could be achieved with three fans, with the fourth fan on standby. During low speed traffic / congested conditions, the tunnel support may be used to supply additional fresh air to the tunnels.

Motorway Operations Complex

The project would involve construction and operation of a 24-hour manned Motorway Operations Complex (MOC), located near the southern interchange on the corner of Pennant Hills Road and Eaton Road, West Pennant Hills. The MOC would include facilities necessary for the monitoring, maintenance and control of tunnel services including tunnel safety, ventilation, power, lighting and other road systems required for the safe and efficient operation of the main alignment tunnels. Facilities would include a tunnel control room, training / incident response room, workshop space, emergency vehicle depot, garage, storage and parking facilities.

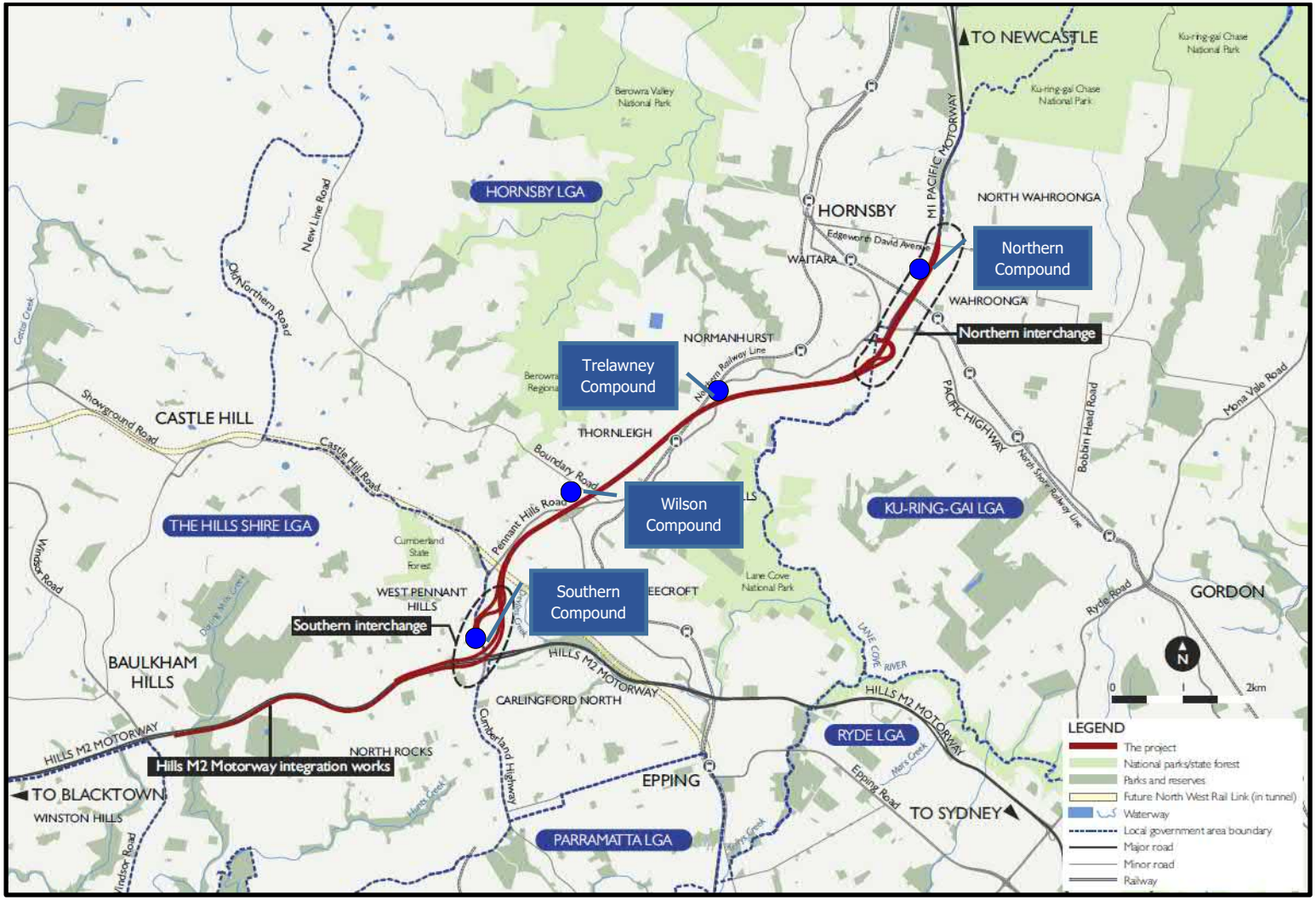
The general location and key features of the project are shown in Figure 2-1.

Coral Tree Drive Sub Station

Electricity supply infrastructure would be installed to supply power to the main alignment tunnels and associated mechanical and electrical equipment on the south-west side of the Pennant Hills Road / Hills M2 Motorway interchange on Coral Tree Drive.

The general location and key features of the project are shown in Figure 2-1.

Figure 2-1 Project Area



2.2 Noise Catchment Areas

The noise-sensitive receivers considered in this assessment and the Noise Catchment Areas (NCA's) have been referred from report 13245-CD-3 version L and are shown in Appendix A.

Table 2-1 and Table 2-2 list the non-residential noise-sensitive receivers considered in this assessment.

Table 2-1 NorthConnex Northern Non-Residential Noise-Sensitive Receivers

ID	NCA	Address	Type
NR-5	1C	1711 Pacific Highway	School
NR-14	5C	1711 Pacific Highway	Place of Worship

Table 2-2 NorthConnex Southern & M2 Integration Non-Residential Noise-Sensitive Receivers

ID	NCA	Address	Type
NR-101	10B	41-43 Eaton Road	Church
NR-102	11B	365 North Rocks Road	School: RIDBC
NR-103	11B	365 North Rocks Road	School: RIDBC
NR-104	11B	365 North Rocks Road	School: RIDBC
NR-105	11B	365 North Rocks Road	School: RIDBC
NR-106	11B	365 North Rocks Road	School: RIDBC
NR-107	11B	365 North Rocks Road	School: RIDBC
NR-108	11B	365 North Rocks Road	School: RIDBC
NR-109	11B	365 North Rocks Road	School: RIDBC
NR-110	11B	365 North Rocks Road	School: RIDBC
NR-111	11B	365 North Rocks Road	School: RIDBC
NR-112	11B	365 North Rocks Road	School: RIDBC
NR-113	11B	365 North Rocks Road	School: RIDBC
NR-114	12	9-13 Barclay Road	Muirfield High School
NR-115	12	9-13 Barclay Road	Muirfield High School
NR-116	12	9-13 Barclay Road	Muirfield High School
NR-117	11B	2-12 Carmen Drive	Commercial
NR-118	10D	60 Oakes Road	Dental Surgery (Commercial)
NR-119	10D	58 Oakes Road	Dental Surgery (Commercial)
NR-120	11B	1 Carmen Drive	Doctor Surgery (Commercial)
NR-121	11B	14-20 Carmen Drive	Commercial
NR-122	11B	Murray Farm Road	Active: Murray Farm Reserve

3 TRAFFIC NOISE MEASUREMENTS & TRAFFIC COUNTS

Noise measurements of existing traffic were conducted to characterise the existing noise environment and to validate the traffic noise model. The measured data has been referred from the Noise & Vibration Baseline Information Report COA D9 13245-CD-3 version L which has been approved by the Department of Planning and Environment. Four logger locations were utilised to calibrate NorthConnex Northern whilst five logger locations were utilised to calibrate NorthConnex Southern and M2 Integration.

3.1 Unattended Noise Monitoring Procedure

Unattended noise monitoring locations were selected based on a detailed inspection of potentially affected areas, giving consideration to other noise sources which may adversely influence the measurements, security issues for the noise monitoring devices and gaining permission for access from the residents or landowner.

Table 3-1 shows the details of the noise monitoring locations, whilst an aerial view can be seen in Appendix B.

Table 3-1 Unattended Noise Monitoring Locations

ID	NCA	Address	Measurement Period	Position	Setback Distance to Edge of Road (m)
NCA-1A-T1	1A	45 Bareena Avenue, Wahroonga	18/3/15-1/4/15	Facade	25
NCA-2A-T2	2A	118A Coonanbarra Road, Wahroonga	18/3/15-1/4/15	Facade	70
NCA-2D-T3	2A	22 Woonona Avenue South, Wahroonga	18/3/15-1/4/15	Facade	16
NCA-3-T4	3	10 Pennant Hills Road, Wahroonga	3/3/15-11/3/15	Facade	24
NCA-10B-B15	10B	3 Mundon Place, West Pennant Hills	16/3/15-25/3/15	Free field	50
NCA-10D-B17	10D	58 Oakes Road, North Rocks	2/3/15-10/3/15	Free field	71
NCA-11B-T11	11B	66 Carmen Drive, North Rocks	28/4/15-19/5/15	Facade	112
NCA-13-T12	13	122 Barclay Road, North Rocks	25/2/15-10/3/15	Facade	37
NCA-14-T13	14	25 Williams Road, North Rocks	25/2/15-10/3/15	Facade	50

The unattended noise monitoring equipment used for these measurements consisted of an environmental noise logger set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later analysis. The equipment calibration was checked before and after the survey and no significant disparity was observed.

Meteorological data for the relevant periods was obtained from the nearest weather station at Sydney Olympic Park. Periods in which it was likely to be raining, or when wind speeds exceeded 5m/s at microphone height, were excluded from analysis, in accordance with principles agreed by the Environment Protection Authority (EPA).

3.2 Noise Monitoring Results

A summary of the noise logger data is shown in Table 3-2. Any short-term extraneous noise that is not typical of traffic has been excluded.

Table 3-2 Traffic Noise Summary

ID	NCA	Daytime $L_{Aeq,15hr}$ (dBA)	Night Time $L_{Aeq,9hr}$ (dBA)
NCA-1A-T1	1A	64.3	60.5
NCA-2A-T2	2A	57.8	53.7
NCA-2D-T3	2A	64.5	60.3
NCA-3-T4	3	61.5	54.9
NCA-10B-	10B	54.1	49.6
NCA-10D-	10D	58.6	53.2
NCA-11B-	11B	55.5	51.0
NCA-13-T12	13	56.0	51.9
NCA-14-T13	14	58.9	54.4

3.3 Traffic Counts

Simultaneous traffic counts were carried out on relevant roads for NorthConnex Northern by the company "CEF Information Technologies" as follows:

- Pennant Hills Road – between Pacific Highway and M1 Motorway intersection; and
- M1 Motorway – between Pacific Highway ramps and Ku-ring-gai Chase Road.

The traffic counts from Pennant Hills Road are shown in Table 3-3 and those from the M1 are shown in Table 3-4. Given the start and finish time of day, all counts were over a 7-day period.

Table 3-3 Traffic Count Results – Pennant Hills Road

Location	Duration	Direction	Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
Pennant Hills Road	2/3/15 – 8/3/15 inclusive	Northbound	Day (15 hr)	10047	1062	11109	9.6
			Night (9 hr)	1477	170	1647	10.3
		Southbound	Day (15 hr)	10381	1272	11654	10.9
			Night (9 hr)	1245	137	1382	9.9

Table 3-4 Traffic Count Results – M1 Motorway

Location	Duration	Direction	Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
M1 Motorway	20/3/15 – 26/3/15 inclusive	Northbound	Day (15 hr)	33,833	3,615	37,448	9.7
			Night (9 hr)	3,742	1,042	4,784	21.8
		Southbound	Day (15 hr)	35,096	2,756	37,852	7.3
			Night (9 hr)	6691	1555	8247	19

In addition, traffic volumes associated with NorthConnex Southern and M2 Integration were obtained from the M2 Main Toll Plaza, Pennant Hills Road Eastbound Off-Ramp and Pennant Hills Road Westbound On-Ramp. Based on the available data, the following sections of roads were considered in the calibration of the noise model:

- M2 Motorway – between Windsor Road and Pennant Hills Road On- / Off-Ramps;
- M2 Motorway – between Pennant Hills Road On- / Off-Ramps and M2 Main Toll Plaza;
- M2 Motorway – Pennant Hills Road Eastbound Off-Ramp; and
- M2 Motorway – Pennant Hills Road Westbound On-Ramp.

Traffic counts used for the calibration of the M2 Motorway are shown in Table 3-5, Table 3-6 and Table 3-7.

Table 3-5 Traffic Count Results – M2 Motorway between Windsor Road & Pennant Hills Road On/Off Ramps

Location	Duration	Direction	Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
M2 Motorway	20/2/15 – 25/3/15 & 28/4/15 – 19/5/15	Eastbound	Day (15 hr)	43,323	3,499	46,822	7.5
			Night (9 hr)	6,867	1,120	7,987	14.0
		Westbound	Day (15 hr)	46,152	4,003	50,155	8.0
			Night (9 hr)	5,010	697	5,707	12.2

Table 3-6 Traffic Count Results – M2 Motorway between Pennant Hills Road On/ Off Ramps & M2 Main Toll Plaza

Location	Duration	Direction	Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
M2 Motorway	20/2/15 – 25/3/15 & 28/4/15 – 19/5/15	Eastbound	Day (15 hr)	32,226	1,831	34,056	5.4
			Night (9 hr)	5,459	476	5,935	8.0
		Westbound	Day (15 hr)	34,886	2,258	37,144	6.1
			Night (9 hr)	3,521	194	3,715	5.2

Table 3-7 Traffic Count Results – M2 Motorway at Pennant Hills Road Ramps

Location	Duration	Direction	Period	Light Vehicles	Heavy Vehicles	Total Vehicles	% Heavy Vehicles
M2 Motorway	20/2/15 – 25/3/15 & 28/4/15 – 19/5/15	Eastbound PHR Off-Ramp	Day (15 hr)	11,097	1,668	12,766	13.1
			Night (9 hr)	1,409	644	2,053	31.4
		Westbound PHR On-Ramp	Day (15 hr)	11,267	1,745	13,011	13.4
			Night (9 hr)	1,489	502	1,992	25.2

4 PROJECT REQUIREMENTS & TRAFFIC NOISE CRITERIA

4.1 Road Noise Policy

The EPA's *Road Noise Policy* (*RNP*) sets out criteria for assessment of noise from vehicles on public roads.

The *RNP* sets out noise criteria for 'freeways', 'arterial', 'sub-arterial' and 'local roads'. The highway and all associated ramps are considered to be in the 'freeways' category.

Under the *RNP*, road projects are classified as either "new road" or "redevelopment of an existing road". As discussed in the EIS, the "redeveloped road" criterion has been applied to the project for the following reasons:

- Receivers along the Hills M2 Motorway, M1 Pacific Motorway, Pacific Highway and Pennant Hills Road are subject to existing road traffic noise and works fall within the existing road corridor; and
- While the subterranean tunnel would be considered a 'new road', traffic noise from the tunnel would be effectively attenuated at nearby sensitive receivers with the exception of the areas around the southern and northern portals. However, receivers in the vicinity of the portals have an existing road traffic noise exposure and therefore the redeveloped road criteria will apply in accordance with the *RNP*.

4.2 Noise Criteria for Residential Land Use

For residential receivers, the *RNP* sets two forms of noise criteria, defined as "Noise Assessment Criteria" and "Relative Increase Criteria". The applicable criteria for "existent residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads" are given in Table 4-1. The "Relative Increase Criteria" are primarily intended to protect existing quiet areas from excessive changes in amenity due to noise from additional traffic. Quiet areas are areas where existing traffic noise levels are 12dB or more below the relevant Noise Assessment Criterion. Because this is not the case for any of the receivers considered in this project, the "Noise Assessment Criteria" are the most stringent criteria to be applied in this assessment and are referred as the "base" criteria.

Table 4-1 *RNP* Criteria for Redevelopment of Freeways

Criteria	Time Period	
	Day (7am-10pm)	**Night (10pm-7am)**
Noise Assessment Criteria	$L_{Aeq,15hr}$, 60dBA (external)	$L_{Aeq,9hr}$ 55dBA (external)
Relative Increase Criteria	Existing traffic $L_{Aeq,15hr}$ + 12dB (external)	Existing traffic $L_{Aeq,9hr}$ + 12dB (external)

4.3 Assessment Timeframe

For road redevelopment projects, the *RNP* requires assessment in two timeframes:

- Timeframe 1 – *within one year of changed traffic conditions.* This is generally referred to as the Opening Year, which in this case is year 2019.
- Timeframe 2 – *a design year, typically 10 years after changed traffic conditions*. This is generally referred to as the Design Year, which in this case is 2029.

For each timeframe the *RNP* requires comparison between:

- the road traffic noise levels if the project proceeds (termed the "build" option).
- the corresponding road traffic noise levels, due to general traffic growth, that would have occurred if the project had not proceeded (termed the "no build" option).

4.4 Feasible & Reasonable Mitigation Options

Where predicted noise levels exceed the "base" criteria, an assessment of all feasible and reasonable mitigation options should be considered. The *RNP* states that "in assessing feasible and reasonable mitigation measures, *an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person*".

Practice Note (iv) of the *ENMM* provides further discussion of situations where provision of additional controls would be considered "feasible and reasonable". In addition, *RMS* (previously known as *RTA*) released in October 2008 a document called "Environmental Directions: Direction No: 24" aimed at clarifying the process of considering noise mitigation in conjunction with redevelopment of existing roads

A two-step procedure is applied to determine whether a sensitive receiver should be assessed for feasible and reasonable mitigation:

Step 1
The project noise assessment will identify if a sensitive receiver within the identified project noise catchment will exceed the ECRTN criteria at a time 10 years post project opening.

↓

Step 2
For each sensitive receiver identified in Step 1 determine if it is reasonable to consider noise mitigation by considering:

a) Is there predicted to be a noticeable increase in road traffic noise due to the road project (ie more than 2dB(A) increase in traffic noise from the time of project opening and if the project had not proceeded compared to a time 10 years post project opening).
b) Will the level of road traffic noise be acute (ie $L_{Aeq\ 15hr}$ 65dB(A) or more during the day and $L_{Aeq\ 9hr}$ 60dB(A) or more during the night) at a time 10 years post project opening.

Noise-sensitive receivers include residences, schools, places of worship or health care institutions.

4.5 Noise Criteria for Non-Residential Noise-Sensitive Receivers

Several non-residential noise-sensitive receivers were identified within the study area. Section 2.3.2 of the *RNP* defines different criteria for non-residential land uses than those specified for residential land use. The applicable noise criteria are provided in Table 4-2.

Table 4-2 Assessment Criteria for Operational Traffic Noise – Non-Residential Receivers

Existing Sensitive Land Use	Assessment Criteria –dBA		
	Day (7am-10pm)	Night (10pm-7am)	Additional Considerations
1. School classrooms	$L_{Aeq,1hr}$ 40 (internal) * when in use	-	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000)
2. Hospital wards	$L_{Aeq,1hr}$ 35 (internal) *	$L_{Aeq,1hr}$ 35 (internal) *	
3. Places of worship	$L_{Aeq,1hr}$ 40 (internal) *	$L_{Aeq,1hr}$ 40 (internal) *	The criteria are internal, ie. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see row 5 Open space (passive use) of this table) may be applied.
4. Open space (active use)	$L_{Aeq,15hr}$ 60 (external) when in use	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, eg. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, eg. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
5. Open space (passive use)	$L_{Aeq,15hr}$ 55 (external) when in use	-	
8. Childcare facilities	Sleeping rooms $L_{Aeq,1hr}$ 35 (internal) * Indoor play areas $L_{Aeq,1hr}$ 40 (internal) * Outdoor play areas $L_{Aeq,1hr}$ 55 (external)	-	Multi-purpose spaces, eg. shared indoor play / sleeping rooms should meet the lower of the respective criteria. Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.
9. Aged Care facilities	-	-	Residential land use noise assessment criteria should be applied to these facilities.

Note: * The noise criteria applies for internal noise measurement.

Commercial receivers are not considered noise-sensitive receivers and therefore are not assessed for operational noise impacts.

Internal noise levels refer to the noise level at the centre of the habitable room that is most exposed to the traffic noise with openable windows being opened sufficiently to provide adequate ventilation (Refer to the Building Code of Australia (Australian Building Codes Board 2010) for additional information). To predict internal noise levels, it is assumed that internal noise is 10dBA less than external noise. This is based on a façade facing the road with windows open for ventilation. This is a conservative and standard practice as it is likely that the structure of the building will provide a noise reduction greater than 10dB.

5 TRAFFIC NOISE ASSESSMENT MODEL & VALIDATION

5.1 Methodology of Assessing Traffic Noise Impact

To assess the potential impacts of the project on sensitive receivers, the following steps have been completed:

- Modelling of road traffic noise levels with existing (2015) road traffic volumes, to provide a baseline for the assessment of future noise levels. This model was calibrated with noise measurements and road traffic surveys.
- Modelling of road traffic noise levels for both the Build (with project) and No Build (without project) scenarios for 10 years after opening (2029). These predictions are undertaken prior to optimisation of the noise barriers and aim to determine all receivers eligible for consideration of noise mitigation.
- Modelling of the Build scenario for 10 years after opening (2029) with recommended noise barriers after an optimisation process to identify further feasible and reasonable noise mitigation recommendations such as architectural treatment. The optimisation process must ensure that all receivers identified in the item above as eligible for consideration of noise mitigation are exposed to noise levels below the base criteria. If base criteria are not achieved, the residence is considered to be eligible for consideration of architectural treatment.

The following factors have been considered during the assessment process:

- Traffic volume and proportions of heavy vehicles;
- Vehicle speed;
- Road surface types;
- Road gradient;
- Different noise emission levels and source heights;
- Topographical information along and surrounding the project area;
- Location of potentially affected receivers; and
- Allocation of traffic to different lanes.

5.2 Noise Modelling Procedures

Noise levels from the proposed road designs were calculated using procedures based on the *CoRTN (Calculation of Road Traffic Noise)* (UK Department of Transport, 1988) prediction algorithms. The standard prediction procedures were modified as follows:

- L_{Aeq} values were calculated from the L_{A10} values predicted by the *CoRTN* algorithms using the well-validated approximation $L_{Aeq,1hour} = L_{A10,1hr} - 3$ (NSW RTA, 2001). It is worth noting the predicted $L_{Aeq,1hr}$ is equivalent to the $L_{Aeq,period}$ as required by the noise criteria since the input is the "average" traffic flow per hour over the given daytime and night time periods;
- Noise source heights were set at 0.5m for cars, 1.5m for heavy vehicle engines and 3.6m for heavy vehicle exhausts, representative of typical values for Australian vehicles (*Road Traffic Noise: Interim Traffic Noise Policy*, 1992);

- Noise from a heavy vehicle exhaust is 8dBA lower than the (steady continuous) noise from the engine.

Table 5-1 summarises other variables used in the noise model.

Table 5-1 Variables used for Noise Modelling

Parameter	Comment
Noise Model	The model was implemented in SoundPLAN software (Version 7.4) – CoRTN Australia (NSW)
Traffic Speed	Existing roads: traffic speeds have been based on posted road speeds. In particular, traffic speeds along M1 Pacific Motorway were gradually modified by 10km/h increments (60-110km/h range) whilst traffic speeds along M2 Hills Motorway were considered to be 100km/h. Proposed roads: 80km/h has been considered for the new sections surrounding the tunnels.
Road Surface	Model Calibration M1 Pacific Motorway: open graded asphalt (OGA) on both northbound and southbound carriageways. Southbound carriageway consists of a very deteriorated surface. Corrections applied are -3.5dB below 100km/h and -4dB from 100km/h on northbound carriageway and 0dB on southbound carriageway. M2 Hills Motorway: open graded asphalt (OGA) on both northbound and southbound carriageways. Corrections applied are -4dB. Other Roads: dense graded asphalt (DGA). Corrections applied are -1dB below or equal to 75km/h and 0dB from 75km/h. No Build Option 2019-2029 M1 Pacific Motorway: it has been assumed that the road surface on the southbound carriageway would be resurfaced with OGA. Corrections applied are -3.5dB below 100km/h and -4dB from 100km/h on both northbound carriageways. M2 Hills Motorway: open graded asphalt (OGA) on both northbound and southbound carriageways. Corrections applied are -4dB. Other Roads: dense graded asphalt (DGA). Corrections applied are -1dB below or equal to 75km/h and 0dB from 75km/h. Build Option 2019-2029 M1 Pacific Motorway: it has been assumed that the road surface on the southbound carriageway would be resurfaced with OGA. Corrections applied are -3.5dB below 100km/h and -4dB from 100km/h on both northbound carriageways. M2 Hills Motorway: open graded asphalt (OGA) on both northbound and southbound carriageways. Corrections applied are -4dB. Portal Ramps have been modelled with stone mastic asphalt (SMA). Correction applied is -2.5dB. Other Roads: dense graded asphalt (DGA). Corrections applied are -1dB below or equal to 75km/h and 0dB from 75km/h.
Traffic Volume	Traffic volumes were provided by AECOM's Principal Transport Planner, Mr Seamus Christley. Files: "1. North_2029 AADT without project", "2. North_2029_AADT_with project" and "M2 PHR Volumes 2019 and 2029".
Terrain	Off-site contours extracted from 3D EIS noise model.
Roadway Gradient	Road design information was based on data supplied by LLBJV (Based on the development of the road design at this date). Roadway gradient effects has been taken into account. Files containing design road alignments "151209 M2 Design Road Align.dxf" and "151209 M1 Design Road Align.dxf"

Parameter	Comment
Façade Correction	+2.5dB in accordance with *CoRTN*.
Australian Conditions	The Australian correction of -1.7dB was applied to facade predictions and -0.7dB to free field predictions (April 1983 Australian Road Research Board report – Research Report ARR No.122).
Calibration Adjustments	Not required as model calibrates well at all noise monitoring locations for both day and night time periods.
Sensitivity Allowance for future predictions	To allow for a small degree of uncertainty in the generation of noise from the project the following sensitivity adjustments have been made: +1dB for sections of OGAC to take into consideration longer term degradation effects +1dB for sections of SMA to take into consideration a variable initial performance +1dB in vicinity of intersection ramps to cover any residual engine braking
Buildings & Receivers	Land use survey was carried out by Wilkinson Murray during April and May 2015 to identify height information associated with all noise-sensitive receivers visible from the public domain.
Noise Barriers	Existing noise barrier locations and heights were provided by LLBJV (Based on the last update of survey available at this date). Files: - 151211_M1 Existing Noise Wall To Stay - 151211 M2 Existing Noise Wall To Stay Design noise barrier locations were provided by LLBJV (Based on the last update of the design development available at this date). Files: - 151209 M1 Design Noise Walls Top & Bottom - 151209 M2 Design Noise Walls Top & Bottom Design noise barrier were extended where necessary.
Ground Absorption	Ground absorption factor was set to 50% for the entire area.
Noise Contours Calculation Settings	Grid space of 5m; Height above ground = 1.5m; Grid interpolation field size = 9 x 9; Grid interpolation min/max = 2dB; Grid interpolation difference = 0.1dB; Number of reflections = 0; Max. search radius = 5000m Parameters included: façade correction (+2.5dB), Australian conditions (-1.7dB) and sensibility allowance for future predictions (+1dB).

Note: corrections applied on roads represent the noise reduction benefit as a result of the road surface.

5.3 Validation of Noise Model

The noise modelling process used to predict existing and future noise levels was validated against existing noise levels and any calibration adjustments were included accordingly. The SoundPLAN noise model (using *CoRTN*) has been established primarily on this basis. Measured results are compared with model predictions for the existing road using current traffic volumes and using realistic traffic speeds for several roads. The measured noise levels will include traffic noise and possible other extraneous noise. Extraneous noise as a proportion of road traffic noise typically increases with distance from the road.

Table 5-2 and Table 5-3 show the difference between measured and predicted values of the measurement locations for NorthConnex and M2 Integration. The results are discussed below.

Table 5-2 Model Validation Results for NorthConnex Northern

Monitoring Location	Measured		Predicted		Difference	
	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day	Night
NCA-1A-T1	64.3	60.5	64.2	61.1	-0.1	+0.6
NCA-2A-T2	57.8	53.7	57.6	54.7	-0.2	+1.0
NCA-2D-T3	64.5	60.3	63.8	61.0	-0.7	+0.7
NCA-3-T4	61.5	54.9	62.1	55.9	+0.6	+1.0

Table 5-3 Model Validation Results for NorthConnex Southern and M2 Integration

Monitoring Location	Measured		Predicted		Difference	
	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day	Night
NCA-10B-B15	54.1	49.6	50.7	46.4	-3.4	-3.2
NCA-10D-B17	58.6	53.2	57.3	52.5	-1.3	-0.7
NCA-11B-T11	55.5	51.0	56.1	51.1	0.6	0.1
NCA-13-T12	56.0	51.9	57.3	52.3	1.3	0.4
NCA-14-T13	58.9	54.4	59.9	55.1	1.0	0.7

Results to within 2dBA (measured vs. predicted) are generally considered acceptable given the expected accuracy of standard noise monitoring and modelling procedures in conjunction with variability in traffic speeds and variability in pavement wear along the whole alignment.

For monitoring locations within 100m from the road, predicted noise levels at daytime and night time are all in the +/- 1dB range which is considered to be "ideal".

Due to more stringent criteria applying at night time and the expectation of lower extraneous noise, the night time period is generally considered more important with respect to the traffic noise assessment and is therefore the focus with regards to model validation.

For NorthConnex Northern the model validation results are considered satisfactory as the difference between measured and predicted noise levels falls within the +/- 1dB range for both day and night time periods. Because the model over-predicts the noise at night by up to 1dB at all of the monitoring locations when compared to the measured noise level, the model results are considered conservative.

For NorthConnex Southern and M2 Integration the model validation results are generally satisfactory for all noise monitoring locations as the difference between measured and predicted noise levels falls within the +/- 2dB range for both day and night time periods except at monitoring location NCA-10B-B15. The noise model under predicts at this location by 3.4dB and 3.2dB during the day and night time periods respectively. From our site observations, this difference can be primarily attributed to the noise generated by truck engine brakes on the ramps at the intersection between Pennant Hills Road and the M2.

Location NCA-10D-B17 was also found to be affected by truck engine brake noise. As the noise generated by the truck engine brakes will significantly decrease due to the use of the tunnels, a correction to the predicted noise levels has not been applied as it would result in over predicting the noise levels for the future scenario. The logger charts recorded at monitoring location NCA-10B-B15 and NCA-10D-B17 are shown in Appendix C.

Because the model over-predicts the noise at night at locations NCA-11B-T11, NCA-13-T12 and NCA-14-T13 when compared to the measured noise levels, the model results are considered conservative.

In order to provide more confidence in the modelling, noise logging data from the EIS has been incorporated into the detailed design noise model in the area surrounding monitoring locations NCA-10B-B15 and NCA-10D-B17. Table 5-4 shows the relevant information associated with the EIS noise monitoring locations.

Table 5-4 EIS Unattended Noise Monitoring Locations

Monitoring Location	Address	Measurement Period	Daytime $L_{Aeq,15hr}$ (dBA)	Night Time $L_{Aeq,9hr}$ (dBA)
NL17	33-37 Carmen Drive, Carlingford	10-18 December 2013	56.6	52.5
NL18A	46 Westmore Drive, West Pennant Hills	10-18 December 2013	54.9	49.8

Note: Assumes façade measurement locations.

The noise model was used to predict noise levels at both EIS noise monitoring locations using 2015 traffic counts shown in section 3.3. Those traffic counts are expected to be slightly higher than the traffic volumes present between 10-18 December 2013. Considering a 3% as a typical annual traffic growth on the M2 Hills Motorway, a correction of -0.2dB has been applied to the predicted noise levels to represent the 2013 measurements. Table 5-5 shows the difference between measured and predicted values at NL17 and NL18A.

Table 5-5 Additional Model Validation Results

Monitoring Location	Measured		Predicted		Difference	
	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day	Night
NL17	56.6	52.5	57.3	52.1	0.7	-0.4
NL18A	54.9	49.8	55.1	50.0	0.2	0.2

The model validation results are considered "ideal" as the difference between measured and predicted noise levels falls within the +/- 1dB range for both day and night time periods. This reinforces our view that the under predictions experienced at locations NCA-10B-B15 and NCA-10D-B17 are likely to be attributed to noise from truck engine brakes.

5.4 Comparison Modelling Parameters with EIS

A detailed comparison between the most relevant parameters used in the noise model during the EIS and detailed design stages is provided in Table 5-6.

Table 5-6 Comparison of Variables during Detailed Design and EIS Stages

Parameter	Detailed Design Wilkinson Murray	EIS AECOM	Brief Explanation
Noise Model	SoundPLAN software (Version 7.4) - CoRTN Australia (NSW).	SoundPLAN software (Version 7.2) – CoRTN.	CoRTN Australia (NSW) not available when EIS was carried out. The advantage of this method is that a new emission input was implemented in SoundPLAN which gives the user the possibility to split noise emission over three source lines with user definable heights. This is a simpler method that reduces the risk of entering manual errors in the calculations. The same results are obtained by using CoRTN Australia (NSW) or CoRTN, as confirmed with a simplified example.
Traffic Speed	Existing roads: based on posted road speeds. Traffic speeds along M1 Pacific Motorway was gradually modified by 10km/h increments (60-110km/h range) whilst traffic speeds along M2 Hills Motorway was considered to be 100km/h.	Existing roads: based on posted road speeds.	A gradual increase/reduction of speed provides a more realistic representation of traffic noise levels.
	Proposed roads: 80km/h has been considered for the new sections surrounding the tunnels.	Proposed roads: 80km/h for the main underground tunnel alignment	No difference
Road Surface	Model Calibration M1 Pacific Motorway: OGA on northbound carriageways (-3.5dB below 100km/h and -4dB from 100km/h for all vehicles) and deteriorated OGA on southbound carriageways (0dB)	Model Calibration M1 Pacific Motorway: OGA on northbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles) and deteriorated OGA on southbound carriageways (+2dB for light and heavy tyre emissions)	There is not a standardized procedure to implement road surface corrections. Different companies have different views in this topic based on experience and noise compliance assessments. Table 3.1, Section 3 of the *ENMM* provides road surface corrections for several surface types. Wilkinson Murray's view is to apply the road surface corrections to all noise source heights. This is based on the fact that originally CoRTN was developed for a 0.5m height only and road surface corrections were applied to the total of the acoustic energy. Over the years, companies incorporated three noise source heights. This results in a distribution of the acoustic energy over three heights resulting in the need of applying the road surface correction to all three source height in order to keep consistency with the original approach.
	M2 Hills Motorway: OGA on both northbound and southbound carriageways (-4dB for all vehicles)	M2 Hills Motorway: OGA on both northbound and southbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles)	
	Other Roads M1 & M2: DGA (-1dB below or equal to 75km/h and 0dB from 75km/h for all vehicles)	Other Roads M1: DGA ("correction not available in EIS")	
	No Build Option 2019-2029 M1 Pacific Motorway: OGA on both northbound and southbound carriageways (-3.5dB below 100km/h and -4dB from 100km/h for all vehicles)	No Build Option 2019-2029 M1 Pacific Motorway: OGA on both northbound and southbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles)	
	M2 Hills Motorway: OGA on both northbound and southbound carriageways (-4dB for all vehicles)	M2 Hills Motorway: OGA on both northbound and southbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles)	

Parameter	Detailed Design Wilkinson Murray	EIS AECOM	Brief Explanation
	Other Roads M1 & M2: DGA (-1dB below or equal to 75km/h and 0dB from 75km/h for all vehicles)	Other Roads M1: DGA ("correction not available in EIS")	
	Build Option 2019-2029 M1 Pacific Motorway: OGA on both northbound and southbound carriageways (-3.5dB below 100km/h and -4dB from 100km/h for all vehicles)	Build Option 2019-2029 M1 Pacific Motorway: OGA on both northbound and southbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles)	
	M2 Hills Motorway: open graded asphalt (OGA) on both northbound and southbound carriageways (-4dB for all vehicles)	M2 Hills Motorway: OGA on both northbound and southbound carriageways (-3dB light vehicles and -4.9dB heavy vehicles)	
		Hills M2 Motorway/Pennant Hills Road interchange on and off- ramps: DGA ("correction not available in EIS")	
	All Portal Ramps: SMA (-2.5dB for all vehicles)	All Portal Ramps: SMA (-2.2dB light vehicles and -4.3 heavy vehicles)	
	Other Roads M1 & M2: DGA (-1dB below or equal to 75km/h and 0dB from 75km/h for all vehicles)	Other Roads M1: DGA ("correction not available in EIS")	
Traffic Volume	Traffic volumes were provided by AECOM's Principal Transport Planner, Mr Seamus Christley. Files: "1. North_2029 AADT without project", "2. North_2029_AADT_with project" and "M2 PHR Volumes 2019 and 2029".	Sourced from traffic modelling as presented within the technical working paper: traffic and transport (AECOM, 2014)	Inconsistencies were found in the traffic volume data used in the EIS noise model. Data was re-entered during the detailed design and all inconsistencies were fixed.
Terrain	Off-site contours extracted from 3D EIS noise model.	"not available in EIS"	Same data used in both noise models
Roadway Gradient	Road design information was based on data supplied by LLBJV (Based on the development of the road design at this date). Roadway gradient effects has been taken into account. Files containing design road alignments "151209 M2 Design Road Align.dxf" and "151209 M1 Design Road Align.dxf"	"not available in EIS"	Different road alignments were used in the assessment
Façade Correction	+2.5dB	"not specified in EIS"	As a result of these corrections, WM assessment is considered to be more conservative. Calibration adjustments were not required in the noise model carried out by WM which indicates the reliability of the noise predictions.
Australian Conditions	-1.7dB façade correction & -0.7 for free field	"not specified in EIS"	

Parameter	Detailed Design Wilkinson Murray	EIS AECOM	Brief Explanation
Calibration Adjustments	Not required	Northern Section: -1.4dB for daytime and -1.1dB for night time; Southern Section: -1.7dB	
Sensitivity Adjustment	+1dB	"not specified in EIS"	
Buildings & Receivers	Land use survey was carried out by Wilkinson Murray during April and May 2015	The height of all buildings was determined through a ground-truthing exercise	More detailed information in WM assessment
Noise Barriers	Existing noise barrier locations and heights were provided by LLBJV (Based on the last update of survey available at this date). Files: - 151211_M1 Existing Noise Wall to Stay - 151211 M2 Existing Noise Wall to Stay Design noise barrier locations were provided by LLBJV (Based on the last update of the design development available at this date). Files: - 151209 M1 Design Noise M2s Top & Bottom - 151209 M2 Design Noise Walls Top & Bottom Design noise barrier were extended where necessary.	Existing noise barrier locations and heights were largely provided by the Aerial Survey and Lidiar (ASL) data. Some barrier (such as those located in dense foliage) were not picked up by the survey. The heights of these barriers were estimated from site inspections.	Details of the noise barriers used in the EIS is unknown. However, it is known that the design has developed since the EIS was published and the location of the design noise barriers changed. The location, extent and bottom height of proposed noise barriers are relevant factors during the optimisation process. As a result of this, the recommended heights could significantly differ from one assessment to other. WM assessment is based on most updated data and noise barriers heights were optimized to maximize their acoustic performance.
Ground Absorption	Set to 50% for the entire area	Set to 75% for the entire area.	Ground absorption of 50% is considered to be more conservative than 70%

6 PREDICTED FUTURE TRAFFIC NOISE LEVELS

6.1 General Assessment Methodology

Detailed traffic volumes associated with NorthConnex and M2 Integration were provided by AECOM's Principal Transport Planner. The predicted flows for the 2029 noise model are shown in Appendix D.

Noise level predictions for the year 2029 (10 years after opening) have been calculated at all potentially affected residential and non-residential locations for NorthConnex and M2 Integration projects.

Based on the outputs of the noise model, a greater number of residences exceed the base criteria during the night time period and also exhibit the largest increase when compared to existing noise levels (Comparison between Build 2029 and No Build 2029). Consequently, most receivers exceeding RNP criteria do so either only during the night, or in combination with the day. Mitigation measures designed to meet relevant criteria at night will also meet them during the daytime.

6.2 Predicted Noise Levels for 2029 (10 Years after Opening) Prior to Noise Barrier Optimisation

The following inputs have been considered in the calculations:

- No Build Option: includes all existing noise walls; and
- Build Option: the project involves the widening of Pennant Hills Road, M1 Pacific Highway and M2 Hills Motorway. As a result of this, several existing noise barriers will be demolished and replaced by design noise walls in a revised location. The build option includes all existing noise walls that will not be demolished and all design noise walls along sections were currently exist a noise wall.
    - The height of the design noise walls ("initial height" as a starting point) has been set to a height that provides a similar acoustic performance compared to the existing noise walls that will be demolished. This is considered a "sensible" approach.
    - The "initial height" has been considered as the minimum height to be recommended in this assessment; and
    - Design noise walls have not been considered in the initial calculations in sections where currently there is no noise walls.

The results are summarised in Table 6-1 and Table 6-2.

Table 6-1 Summary Results Prior to Noise Barrier for NorthConnex Northern

Criteria	Residential Receivers			Non-Residential Receivers		
	Day	Night	TOTAL	Day	Night	TOTAL
Receivers that exceed base criteria and experience relative increase in noise levels greater than 2dB but not acute	13	9	13 (14)	0	0	0
Receivers exposed to acute levels	42	54	54 (100)	2	1	2
Receivers eligible for consideration of noise mitigation	**-**		**67 (114)**	**-**		**2**

Notes: Base Criteria: for residential >$L_{Aeq,15hr}$ 60dBA (Day) or >$L_{Aeq,9hr}$ 55dBA (Night).
for non-residential >$L_{Aeq,1hr}$ 50dBA (external). Refer to Table 4-2.
Acute: for residential and non-residential: $L_{Aeq,15hr}$ 65dBA (Day) or ≥$L_{Aeq,9hr}$ 60dBA (Night).
The number between brackets represents the number of receivers including the different units within Strata.
For more information on Strata Groups refer to Appendix I.

Based on the findings above, a total of 67 residential receivers (114 units) in addition to the 2 non-residential receivers are eligible for consideration of noise mitigation for NorthConnex Northern.

Table 6-2 Summary Results Prior to Noise Barrier for NorthConnex Southern and M2 Integration

Criteria	Residential Receivers			Non-Residential Receivers		
	Day	Night	TOTAL	Day	Night	TOTAL
Receivers that exceed base criteria and experience relative increase in noise levels greater than 2dB but not acute	8	6	8 (8)	0	0	0
Receivers exposed to acute levels	23	49	49 (52)	0	0	0
Receivers eligible for consideration of noise mitigation	**-**		**57 (60)**	**-**		**0**

Notes: Base Criteria: for residential >$L_{Aeq,15hr}$ 60dBA (Day) or >$L_{Aeq,9hr}$ 55dBA (Night).
for non-residential >$L_{Aeq,1hr}$ 50dBA (external) or >$L_{Aeq,15hr}$ 60dBA (external). Refer to Table 4-2.
Acute: for residential and non-residential: $L_{Aeq,15hr}$ 65dBA (Day) or ≥$L_{Aeq,9hr}$ 60dBA (Night).
The number between brackets represents the number of receivers including the different units within Strata.
For more information on Strata Groups refer to Appendix I.

Based on the findings above, a total of 57 residential receivers (60 units) are eligible for consideration of noise mitigation for NorthConnex Southern and M2 Integration. All receivers eligible for consideration of noise mitigation are shown in Appendix E. Details concerning noise levels for all relevant receivers in 2029 prior to noise barrier optimisation are shown in Appendix F. Further calculations with consideration of optimised noise barriers have been carried out and have been provided later in this report.

6.3 Comparison of Receivers Eligible for Consideration of Noise Controls with EIS

A comparison between the receivers eligible for consideration of noise mitigation identified in the EIS and the detailed design assessment is provided in Table 6-3 and Table 6-4.

Table 6-3 Receivers Eligible for Consideration of Architectural Treatment for NorthConnex Northern

ID WM	ID EIS	Type	Address	Units in Strata	WM Eligible Noise Mitigation	EIS Eligible Noise Mitigation
80	196	Res	132 Burdett Street	-	Y	N
79	197	Res	130 Burdett Street	-	Y	N
81	216	Res	134 Burdett Street	-	Y	N
82	248	Res	10-12 Carrington Road	5,6	Y	N
70	254	Res	45A Woonona Avenue South	-	Y	N
69	255	Res	10-12 Carrington Road	8	Y	N
68	269	Res	10-12 Carrington Road	7	Y	N
84	299	Res	10-12 Carrington Road	1, 2	Y	N
63	305	Res	6-8 Carrington Road	2,3	Y	N
85	346	Res	7 Carrington Road	1,2	Y	N
86	371	Res	7 Carrington Road	3,4	Y	N
87	396	Res	7 Carrington Road	5,6	Y	N
104	411	Res	142 Coonanbarra Road	-	Y	N
105	422	Res	140 Coonanbarra Road	-	Y	N
88	424	Res	4 Deakin Way	1,2,3,4,5,6,7	Y	N
56	437	Res	2 Deakin Way	-	Y	N
3675	443	Res	6 Deakin Way	-	Y	N
89	468	Res	7 Deakin Way	-	Y	N
402	541	Res	130 Coonanbarra Road	-	Y	N
398	609	Res	21 Lochville Street	-	Y	N
397	618	Res	120 Coonanbarra Road	-	Y	N
396	650	Res	118B Coonanbarra Road	-	Y	N
352	667	Res	8 Lochville Street	-	Y	Y
353	669	Res	8 Lochville Street	-	Y	N
395	673	Res	118A Coonanbarra Road	-	N	Y
358	691	Res	27 Woonona Avenue North	-	Y	Y
391	722	Res	114 Coonanbarra Road	-	N	Y
388	730	Res	31 Bareena Avenue	-	N	Y
390	735	Res	37B Bareena Avenue	-	Y	Y
359	737	Res	45A Bareena Avenue	-	N	Y
413	743	Res	37A Bareena Avenue	-	Y	Y
385	775	Res	26 Bareena Avenue	-	N	Y
386	785	Res	28 Bareena Avenue	-	Y	Y
383	821	Res	4A Burns Road	-	Y	N

ID WM	ID EIS	Type	Address	Units in Strata	WM Eligible Noise Mitigation	EIS Eligible Noise Mitigation
380	858	Res	2 Burns Road	4, 5	Y	N
379	872	Res	2 Burns Road	2,3	Y	N
3988	929	Res	1-3 Burns Road	9	Y	Y
374	936	Res	42 Woonona Avenue North	-	N	Y
551	951	Res	1-3 Burns Road	6,7	Y	Y
550	966	Res	1-3 Burns Road	-	N	Y
656	972	Res	9-11 Benson Close	-	N	Y
560	976	Res	1-9 Woniora Avenue	-	N	Y
653	1017	Res	7A Benson Close	-	Y	Y
643	1053	Res	5 Benson Close	-	Y	Y
3952	1084	Res	30 Woonona Avenue	-	Y	Y
642	1088	Res	3A Benson Close	-	Y	Y
640	1147	Res	1 Benson Close	-	N	Y
639	1161	Res	93 Alexandria Parade	-	Y	N
3051	1571	Res	5-7 Pacific Highway	Level 1: 1,2,3 Level 2: 4,5,6 Level 3: 7,8	Y	N
NR-5	1574	School	1711 Pacific Highway	-	Y	Y
743	1575	Res	1707 Pacific Highway	1,2,3,4	Y	Y
769	1577	Res	1709 Pacific Highway	1,2,3,4	Y	Y
NR-14	1580	Place of Worship	1711 Pacific Highway	-	Y	Y
3052	1582	Res	3 Pacific Highway	-	Y	Y
734	1605	Res	1740 Pacific Highway	1,2,3,4,5,6	Y	Y
738	1606	Res	1740 Pacific Highway	7,8,9,10	Y	Y
737	1614	Res	1740 Pacific Highway	-	N	Y
739	1616	Res	1740 Pacific Highway	11,12,13	Y	Y
1028	1617	Res	7 Lucinda Avenue	-	Y	Y
726	1619	Res	1740 Pacific Highway	-	N	Y
725	1622	Res	1740 Pacific Highway	49,50,51,52	Y	Y
1029	1626	Res	9 Lucinda Avenue	-	N	Y
1030	1648	Res	11 Lucinda Avenue	-	N	Y
724	1654	Res	1740 Pacific Highway	-	N	Y
1031	1656	Res	11A Lucinda Avenue	-	Y	Y
1032	1661	Res	15 Lucinda Avenue	-	N	Y
723	1754	Res	1740 Pacific Highway	-	N	Y
722	1777	Res	1740 Pacific Highway	-	N	Y
740	1780	Res	1740 Pacific Highway	-	N	Y

ID WM	ID EIS	Type	Address	Units in Strata	WM Eligible Noise Mitigation	EIS Eligible Noise Mitigation
791	1781	Res	13 Kingsley Close	-	N	Y
792	1782	Res	14 Kingsley Close	-	N	Y
741	1783	Res	1740 Pacific Highway	-	N	Y
721	1787	Res	1740 Pacific Highway	-	N	Y
797	1800	Res	10 Kingsley Close	-	N	Y
798	1801	Res	9 Kingsley Close	-	N	Y
4005	1822	Res	11A Hewitt Avenue	-	N	Y
731	1827	Res	1 Aaron Place	13 - 18	Y	N
720	1828	Res	1 Aaron Place	-	N	Y
742	1829	Res	1 Aaron Place	19,20,21	Y	Y
805	1833	Res	13 Hewitt Avenue	-	N	Y
730	1839	Res	1 Aaron Place	-	N	Y
736	1843	Res	1 Aaron Place	22,23,24,25	Y	Y
719	1844	Res	3 Aaron Place	-	Y	Y
806	1850	Res	9 Hewitt Avenue	-	N	Y
807	1852	Res	11 Hewitt Avenue	-	N	Y
735	1856	Res	5 Aaron Place	26,27,28,29	Y	Y
3061	1890	Res	14 Pennant Hills Road	-	Y	Y
3060	1892	Res	52 Russell Avenue	-	Y	Y
3667	1896	Res	61 Russell Avenue	-	Y	Y
3028	1897	Res	59 Russell Avenue	-	Y	Y
3035	1899	Res	53 Russell Avenue	-	Y	Y
3029	1908	Res	55 Russell Avenue	-	Y	Y
3062	1914	Res	16 Pennant Hills Road	-	Y	Y
3729	1917	Res	52A Russell Avenue	-	N	Y
3063	1926	Res	20 Pennant Hills Road	-	Y	Y
3064	1931	Res	20 Pennant Hills Road	-	Y	Y
3065	1971	Res	22 Pennant Hills Road	-	Y	Y
3066	1982	Res	24 Pennant Hills Road	-	Y	Y
812	1986	Res	2 Havilah Avenue	-	N	Y
3067	1989	Res	24 Pennant Hills Road	-	Y	Y
3732	1992	Res	2A Edwards Road	-	Y	Y
813	1996	Res	4 Havilah Avenue	-	N	Y
817	1998	Res	27 Pennant Hills Road	3,4	Y	Y
			TOTAL		**69**	**74**

Table 6-4 Receivers Eligible for Consideration of Architectural Treatment for NorthConnex Southern and M2 Integration

ID WM	ID EIS	Type	Address	Units in Strata	WM Eligible Noise Mitigation	EIS Eligible Noise Mitigation
2172	3468	Res	50A Coral Tree Drive	-	Y	Y
2173	3477	Res	56 Coral Tree Drive	-	Y	N
2044	3478	Res	2 Eaton Road	-	Y	N
2108	3481	Res	20 Gum Grove Place	-	N	Y
2109	3504	Res	22 Gum Grove Place	-	Y	N
2110	3533	Res	13 Gum Grove Place	-	Y	N
2233	3727	Res	29 Coral Tree Drive	-	Y	N
2238	3748	Res	32 Coral Tree Drive	-	Y	N
2239	3769	Res	30 Coral Tree Drive	-	Y	N
2240	3787	Res	28 Coral Tree Drive	-	Y	N
2242	3825	Res	24 Coral Tree Drive	-	Y	N
2243	3842	Res	22 Coral Tree Drive	-	Y	N
2491	4237	Res	5 Carmen Drive	-	Y	Y
2492	4257	Res	7 Carmen Drive	-	N	Y
2501	4444	Res	25 Carmen Drive	-	Y	Y
2502	4459	Res	27 Carmen Drive	-	Y	Y
2503	4475	Res	29 Carmen Drive	-	Y	Y
2519	4477	Res	46 Carmen Drive	-	Y	Y
2504	4483	Res	31 Carmen Drive	-	Y	Y
2520	4515	Res	48 Carmen Drive	-	Y	Y
2505	4518	Res	33 Carmen Drive	-	Y	Y
2521	4529	Res	50 Carmen Drive	-	Y	Y
2522	4540	Res	52B Carmen Drive	-	Y	Y
2524	4565	Res	56 Carmen Drive	-	Y	Y
2526	4628	Res	53 Carmen Drive	-	Y	N
2325	4631	Res	70 Westmore Drive	-	Y	Y
2528	4642	Res	4 Morton Avenue	-	Y	N
2527	4656	Res	2 Morton Avenue	-	Y	N
2327	4668	Res	74 Westmore Drive	-	Y	Y
2328	4681	Res	74 Westmore Drive	-	Y	Y
2330	4717	Res	78 Westmore Drive	-	N	Y
2563	4720	Res	100 Murray Farm Road	-	Y	N
2449	4740	Res	78-106 Westmore Drive	-	Y	N
2567	4762	Res	9 Wilshire Avenue	-	N	Y
2568	4770	Res	11 Wilshire Avenue	-	Y	Y
3918	4884	Res	15 Wilshire Avenue	-	Y	Y

ID WM	ID EIS	Type	Address	Units in Strata	WM Eligible Noise Mitigation	EIS Eligible Noise Mitigation
2569	4889	Res	11 Wilshire Avenue	-	N	Y
2448	4910	Res	78-106 Westmore Drive	-	Y	N
2447	4912	Res	78-106 Westmore Drive	-	Y	N
2435	5048	Res	14 Virginia Place	-	Y	N
2729	5155	Res	24 Yale Close	-	Y	Y
2827	5434	Res	37 Mill Drive	-	N	Y
2860	5564	Res	114-116 Barclay Road	-	Y	N
2861	5574	Res	118 Barclay Road	-	Y	Y
2862	5587	Res	120 Barclay Road	-	Y	Y
2864	5607	Res	124 Barclay Road	-	N	Y
2892	5617	Res	10 Rajola Place	-	N	Y
3936	5621	Res	1 Mill Drive	-	Y	N
3934	5623	Res	7 Rajola Place	-	Y	Y
2890	5638	Res	8 Rajola Place	-	Y	Y
2889	5647	Res	6 Rajola Place	-	N	Y
2887	5692	Res	11 Williams Road	-	Y	Y
2886	5698	Res	13 Williams Road	-	N	Y
2885	5706	Res	15 Williams Road	-	Y	Y
2884	5720	Res	17 Williams Road	-	Y	Y
2883	5731	Res	19 Williams Road	-	Y	Y
2882	5743	Res	21 Williams Road	-	Y	Y
2881	5754	Res	23 Williams Road	-	Y	Y
2880	5770	Res	25 Williams Road	-	Y	Y
2879	5777	Res	27 Williams Road	-	N	Y
2878	5790	Res	29 Williams Road	-	Y	Y
2872	5830	Res	41 Williams Road	-	Y	N
2931	5836	Res	43 Williams Road	-	Y	N
3013	5876	Res	48 Roland Avenue	-	Y	Y
3015	5879	Res	33 Roland Avenue	-	N	Y
3003	5882	Res	48 Dremeday Street	-	Y	Y
3012	5884	Res	46 Roland Avenue	-	Y	Y
3002	5888	Res	42-44 Dremeday Street	1,2,3,4	Y	Y
2983	5910	Res	41 Dremeday Street	-	Y	N
			TOTAL		**57**	**46**

6.4 Design of Operational Noise Mitigation Measures

For all locations where noise mitigation would be required, guidance is taken from the *ENMM* which was published to assist in interpretation of the *Environmental Criteria for Road Traffic Noise (ECRTN)* and in particular, provides guidance on the selection of appropriate mitigation measures.

This guideline was still in place at the time of the approval, although has since been partially replaced. It should be noted that the *ENMM* states that community views should be fully taken into account in following the processes for evaluating and selecting noise treatments.

In the *ECRTN* the EPA recommends the priority for treatment as follows:

- Road design and traffic management;
- Quiet pavement surface;
- In corridor noise barriers / mounds; and
- At property treatments or localised barriers/ mounds.

Road design and traffic management has already been considered in previous stages of the project. In considering road pavement, the M1 and M2 currently has low noise pavement (OGA). In particular, the southbound carriageway along the M1 would be resurfaced with OGA due to its deteriorated condition. Portal ramps would be built with stone mastic asphalt (SMA). As a result of this, noise barriers and property treatments will be considered to minimise the noise impact at relevant sensitive receivers.

The *ENMM* Practice Note IV gives the following guidance concerning selection of cost-effective noise barriers:

> *In order to be considered cost-effective and therefore warrant consideration as a viable noise treatment option, noise barriers must provide an "insertion loss" — the actual noise reduction, taking account of the barrier's reduction of noise from the proposal and noise from all other road traffic noise sources — of at least 5dBA at the most affected residence.*

And;

- *For noise barriers more than 3 m high, the insertion loss must be more than 5 dBA at the most affected residence.*
- *For barriers which are 5 m high or higher, the insertion loss must be at least 10 dBA at the most affected residence.*
- *Noise barriers more than 8 m high are generally considered visually unacceptable.*

In situations where exceedances of the *RNP* criteria are at isolated receivers, or small groups of receivers (3 or less receivers, as described in the *ENMM*), it is not generally considered reasonable to provide at-road noise mitigation, such as noise barriers or low noise pavement. Such measures are not generally considered cost-effective when only a few receivers benefit. In such cases, it may be considered reasonable to provide at property mitigation. Such treatment is usually in the form of acoustic architectural treatment to the residential building.

Possible further noise mitigations can be classified as follows and are shown in sections 6.5 and 0:

- Optimisation of proposed noise barriers; and
- Increase of height of existing noise barriers that will not be demolished.

6.5 Optimisation of Proposed Noise Barriers

The analysis has been performed in accordance with the recommendations of the *Environmental Noise Management Manual (ENMM).* The primary steps in the optimisation process can be summarised as follows:

- Calculate the noise levels at all dwellings and other sensitive receivers within each segment of the catchment area, assuming there are no proposed noise barriers.
- All receivers that are exposed to noise levels above 50dBA $L_{Aeq,15hr}$ or 45dBA $L_{Aeq,9hr}$ (cumulative, from all road traffic noise sources) under the "do nothing" scenario should be considered in the optimisation process. "Do nothing" refers to no proposed noise barriers.
- Select all proposed noise barriers that will be considered in the optimisation process.
- Then increase the height of the proposed noise barriers in steps of 0.6 m, and calculate the new noise levels for each height at all receivers identified above. For each barrier height option, the highest noise level predicted at any receiver (taking account of all road traffic noise sources) should also be recorded.
- Calculate the "total noise benefit" (TNB), "marginal benefit value" (MBV) and "Total Noise Benefit per Unit Area" (TNBA) for a number of barrier designs and selection of an appropriate design using procedures detailed in Practice Note IV of the *ENMM*. The relevant descriptors are defined as follows:
  - "**total noise benefit**" (TNB) for each barrier height option is the sum of the dBA reductions achieved (taking account of all road traffic noise sources) at all residences and other noise-sensitive receivers within each segment.
  - The "**marginal benefit value**" (MBV) for a particular barrier height option is the increase in "total noise benefit" (TNB) divided by the increase in barrier height or area. (The methodology assumes barrier costs are proportional to barrier areas and are hence proportional to barrier heights, even though other factors such as barrier material will also have an influence on costs.)
  - The "total benefit per unit barrier area" (TNBA) is the "total noise benefit" (TNB) divided by the total area of the barrier in the road section being examined.
- Plot the TNB, MBV, TNBA and highest noise level at any dwelling against barrier heights. Peaks (local maxima) in the MBV curve correspond to barrier options with the greatest marginal cost-effectiveness, while peaks in the TNBA curve correspond to barrier options with the greatest overall cost-effectiveness, compared with the other barrier height options being considered.
- The "**assessed barrier option"** is the barrier option selected after considering all of these parameters. The "**target barrier option**" is the barrier option that results in the base noise levels being met at the most affected residence, or if these targets cannot be met because of traffic noise from other roads, the barrier option which results in the lowest feasibly achievable traffic noise levels. The assessed barrier should be selected primarily based on maxima in the MBV curve with support from examining the peak in the TNBA curve.
- The *ENMM* does not explicitly indicate that an arbitrary barrier height located between the assessed barrier option and target barrier option can be selected. Based on this, the recommended barrier height has been selected considering three options only: initial height, assessed barrier height or target barrier height. In the situation when the assessed barrier and/or target barrier has a height lower than the initial height considered in section 6.2, the initial height has been adopted as the recommended height for the proposed noise barriers.

Once a barrier height had been optimised, in some situations localised design issues such as how barriers tie into existing barriers or the need to overlap barriers to allow access to the motorway required more detailed review to ensure no receivers were noticeably affected by the final design. Where these issues have arisen, they are dealt with for each barrier, after the optimisation process. As the night time period is more stringent for this project, the barrier optimisation process has been undertaken for the night time period.

6.6 NorthConnex Northern Barrier Optimisation

The barriers for the NorthConnex northern section are shown in Figure 6-1.

The optimisation of noise barriers has been considered along sections of walls within NCA's 1A, 2A, 4A and 5A. The acoustic performance of 9 proposed noise barriers was optimised in this assessment in accordance with *ENMM* procedures. As the night time period is more stringent for this project, the barrier optimisation process has been undertaken for the night time period.

In addition, a noise barrier located on the western side of Pearce's Corner (optional wall) was initially considered to reduce noise levels at the townhouses encircled by Pacific Highway, Pennant Hills Road and M1 Motorway. This wall would be sited inside the private property land on a mound. Heights up to 2.5m were considered resulting in minor noise benefits. For this reason, this wall was discarded from the calculations. This wall is also shown in Figure 6-1.

Figure 6-1 Design Noise Barriers (1 of 2)

Figure 6-2 Design Noise Barriers (2 of 2)

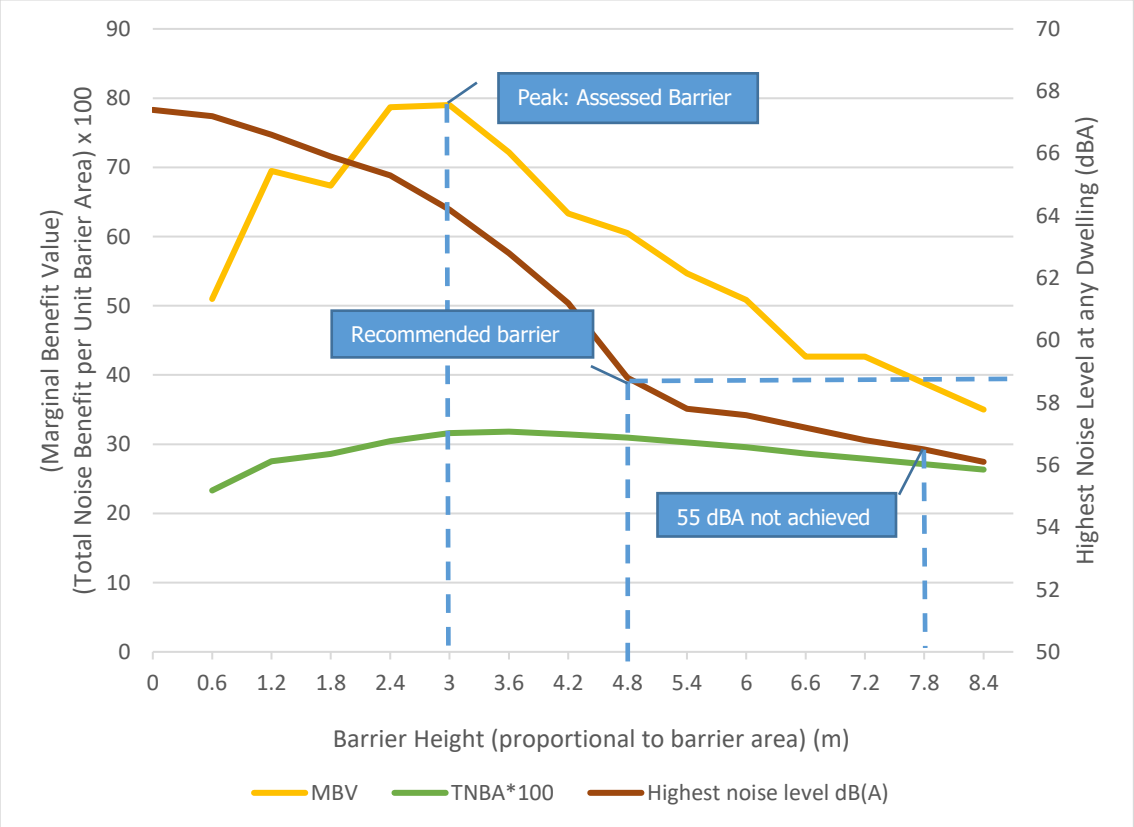
6.6.1 NorthConnex Northern Wall 1 (NW-N-1M0-02) and Woodlands Wall (NW-N-1M0-03)

The initial height considered for Wall 1 prior to the optimisation process (Section 6.2) is 4.5m as it is expected to provide a similar acoustic performance compared to the existing noise wall that will be demolished. The target barrier was found to exceed 8m high as a noise barrier below 8m high would not meet the base criteria at night. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. The assessed barrier is 3.0m as this would maximise the TNBA and MBV. This barrier is lower compared to the initial design barrier height. The recommended noise barrier must be a multiple of 0.6m for construction reasons and has been set to 4.8m high. Further details can be seen in Table 6-5 and Figure 6-3.

Table 6-5 *ENMM* Analysis of Proposed Wall NW-N-1M0-02

Parameter	Value
Length	219m
Initial Design Barrier Height	4.5m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.0m
Recommended Barrier Height	4.8m

Figure 6-3 *ENMM* Analysis of Proposed Wall NW-N-1M0-02



Separate to the NorthConnex project, but undertaken by RMS to coincide with the NorthConnex works in this area, the Woodlands barrier was replaced with a new masonry barrier, which tied into the new barrier to the south (Wall 1). Investigation identified the building layout was different and the floor levels required updating. The updated results are shown in Appendix F.

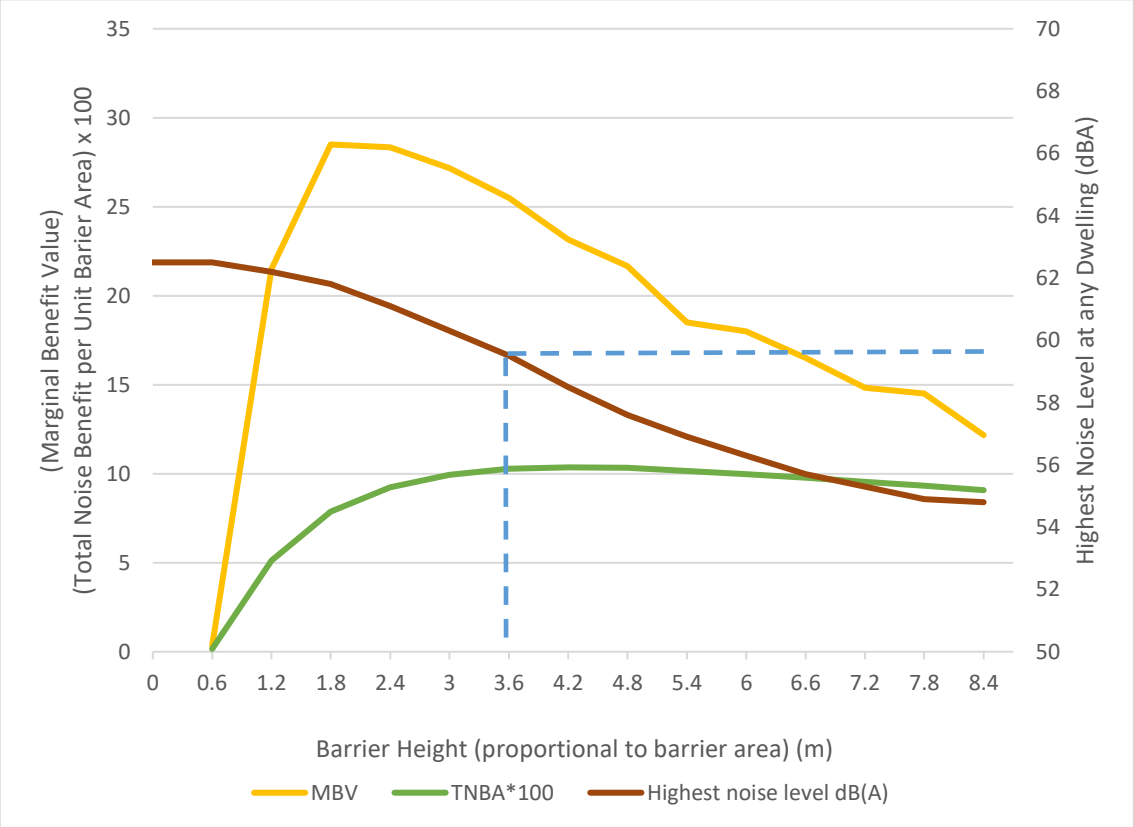
6.6.2 NorthConnex Northern Wall 2 (NW-N-1R0-02)

The target barrier is 7.8m high whilst the assessed barrier 1.8m high. The insertion loss provided by the 7.8m high barrier at the most affected residence is 7.6dB. As the target barrier does not satisfy the minimum insertion loss requirements of 10dB, it has been discarded. The 1.8m high barrier has also been discarded as it is lower than the initial design barrier height. The recommended barrier height is 3.6m (multiple of 0.6m). Further details can be seen in Table 6-6 and Figure 6-4.

Table 6-6 *ENMM* Analysis of Proposed Wall NW-N-1R0-02

Parameter	Value
Length	213m
Initial Design Barrier Height	3.5m
Target Barrier Height	7.8m
Assessed Barrier Height	1.8m
Recommended Barrier Height	3.6m

Figure 6-4 *ENMM* Analysis of Proposed Wall NW-N-1R0-02



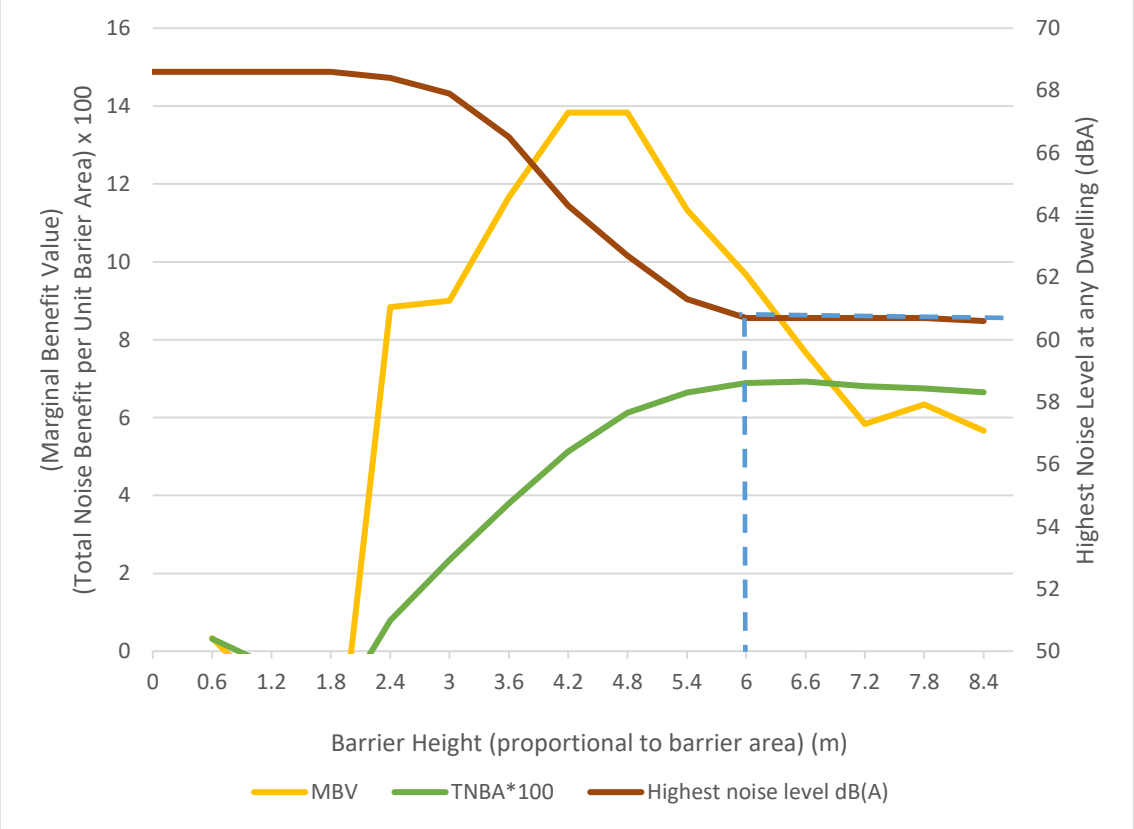
6.6.3 NorthConnex Northern Wall 3 (NW-N-110-06)

The target barrier exceeds 8m high whilst the assessed barrier is 4.8m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 5.5m high, the 4.8m high barrier has been discarded. Based on this, the recommended barrier height is 6.0m. Further details can be seen in Table 6-7 and Figure 6-5.

Table 6-7 *ENMM* Analysis of Proposed Wall NW-N-110-06

Parameter	Value
Length	105m
Initial Design Barrier Height	5.5m
Target Barrier Height	>8.0m
Assessed Barrier Height	4.8m
Recommended Barrier Height	6.0m

Figure 6-5 *ENMM* Analysis of Proposed Wall NW-N-110-06



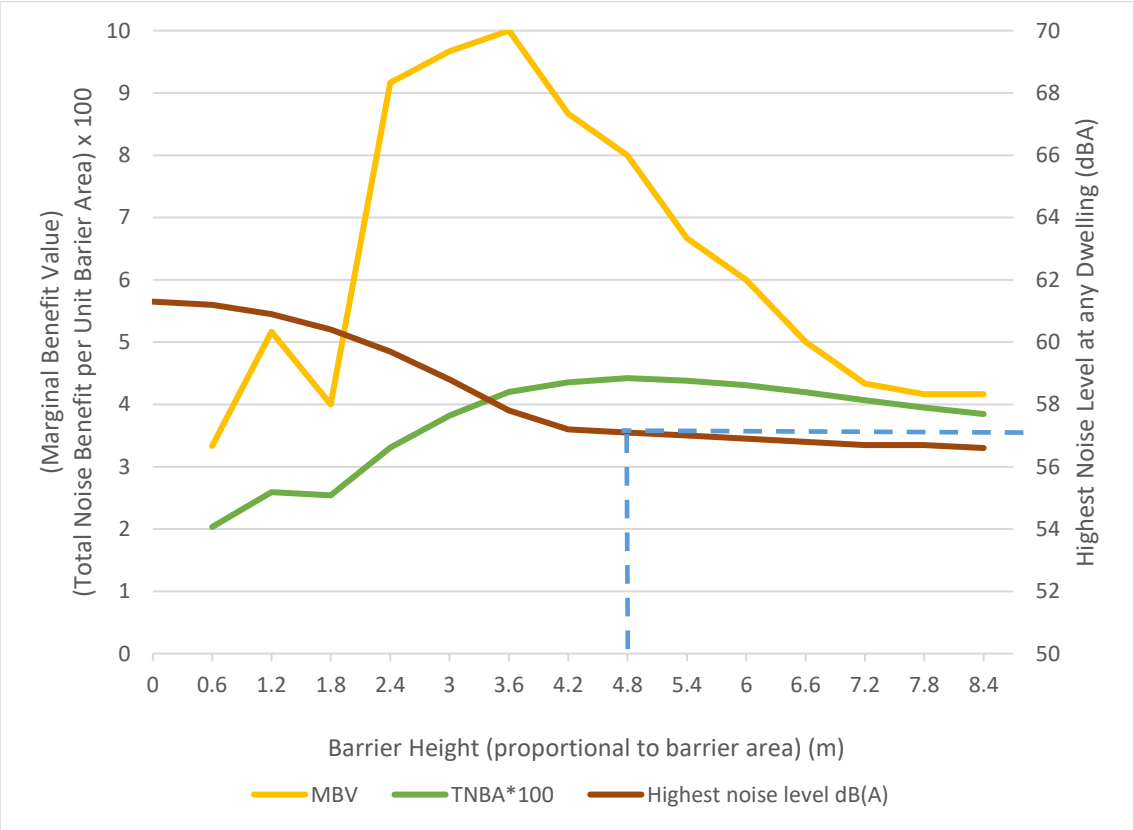
6.6.4 NorthConnex Northern Wall 4 (NW-N-110-07)

The target barrier exceeds 8m high whilst the assessed barrier is 3.6m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 4.0m high, the 3.6m high barrier has been discarded. Based on this, the recommended barrier height is 4.2m. The Further details can be seen in Table 6-8 and Figure 6-6.

Table 6-8 *ENMM* Analysis of Proposed Wall NW-N-110-07

Parameter	Value
Length	164m
Initial Design Barrier Height	4.0
Target Barrier Height	>8.0m
Assessed Barrier Height	3.6m
Recommended Barrier Height	4.2m

Figure 6-6 *ENMM* Analysis of Proposed Wall 4 (NW-N-110-07)



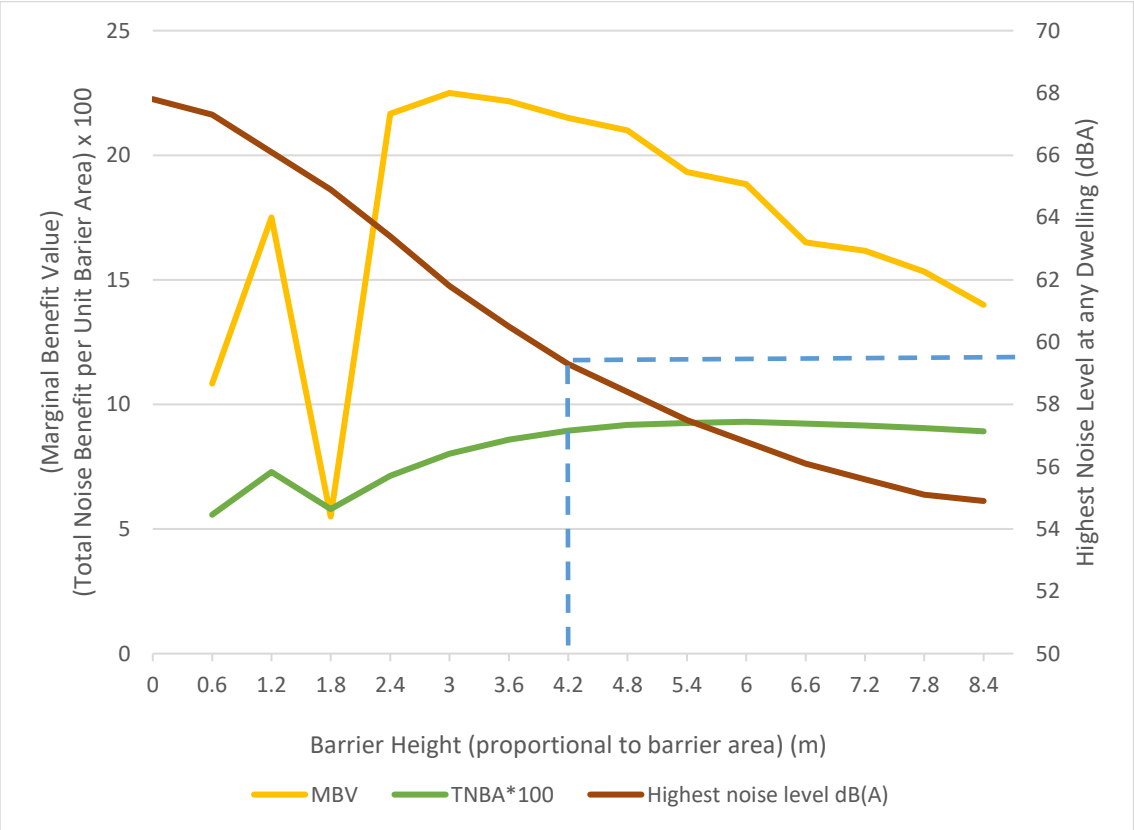
6.6.5 NorthConnex Northern Wall 5 (NW-N-110-01)

The target barrier exceeds 8m high whilst the assessed barrier is 3m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 4m high, the 3m high barrier has been discarded. Based on this, the recommended barrier height is 4.2m (multiple of 0.6m). Further details can be seen in Table 6-9 and Figure 6-7.

Table 6-9 *ENMM* Analysis of Proposed Wall NW-N-110-01

Parameter	Value
Length	194m
Initial Design Barrier Height	4.0m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.0m
Recommended Barrier Height	4.2m

Figure 6-7 *ENMM* Analysis of Proposed Wall NW-N-110-01



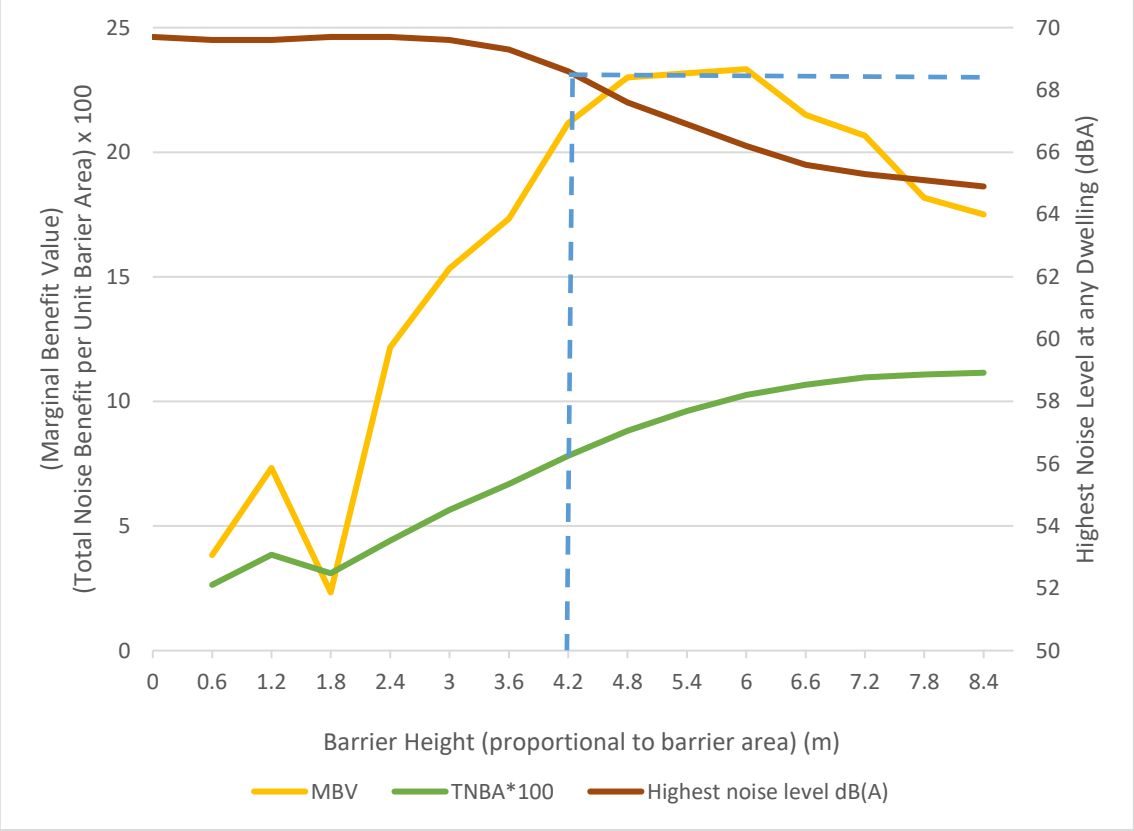
6.6.6 NorthConnex Northern Wall 6 (NW-N-110-02)

The target barrier exceeds 8m high whilst the assessed barrier is 6m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. The insertion loss provided by the 6m high barrier is 5dB which does not satisfy the minimum requirement of 10dB. Based on this, the recommended barrier height is 4.2m (multiple of 0.6m). Further details can be seen in Table 6-10 and Figure 6-8.

Table 6-10 *ENMM* Analysis of Proposed Wall NW-N-110-02

Parameter	Value
Length	145m
Initial Design Barrier Height	4.0m
Target Barrier Height	>8.0m
Assessed Barrier Height	6.0m
Recommended Barrier Height	4.2m

Figure 6-8 *ENMM* Analysis of Proposed Wall 6 (NW-N-110-02)



6.6.7 NorthConnex Northern Wall 7 (NW-N-120-04)

This wall is comprised of two segments:

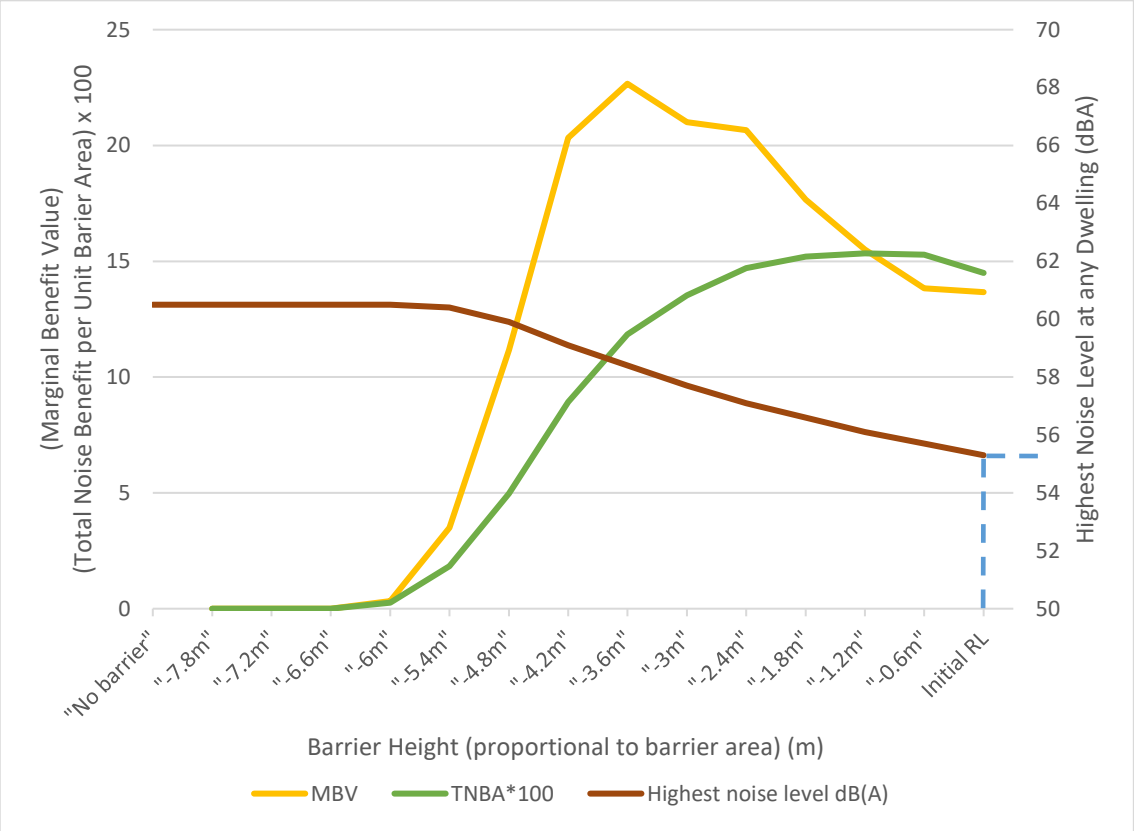
- A 99m long segment will replace the existing noise barrier. The initial height of the new noise barrier was considered to provide a similar acoustic performance compared to the existing noise wall. Its height is variable, starting with a top height of RL 160.5m on the northern end and increasing gradually towards the southern end until it reaches a top height of RL 163m. The average height along this section is 6.7m. The proposed terrain where this barrier will be built is considerably lower compared to the current location of the existing barrier resulting in sections of the barrier up to 8m high. In the barrier optimisation process, the starting point is the initial design barrier height which has been reduced in 0.6m steps.
- The 99m long noise barrier will be extended by 64m along the southern end in order to avoid gaps that would significantly reduce the acoustic performance of the noise barriers. This section of barrier would have a constant RL equal to the RL used for the southern end of the 99m long barrier.

A target barrier greater > RL 163m has been discarded as this would require that sections of the 99m long barrier would exceed 8m high. In addition, the insertion loss provided by the assessed barrier does not meet the minimum of 5dB at any of the residences and has also been discarded. As a result of this, the initial design barrier height has been recommended. Further details can be seen in Table 6-11 and Figure 6-9. A shape file has been provided to clarify the recommended barrier height.

Table 6-11 *ENMM* Analysis of Proposed Wall NW-N-120-04

Parameter	Value
Length	99m + 64m
Initial Design Barrier Height	northern end RL 160.5m; southern end RL 163m
Target Barrier Height	> RL 163m
Assessed Barrier Height	RL 163m minus 3.6m
Recommended Barrier Height	northern end RL 160.5m; southern end RL 163m

Figure 6-9 *ENMM* Analysis of Proposed Wall NW-N-120-04



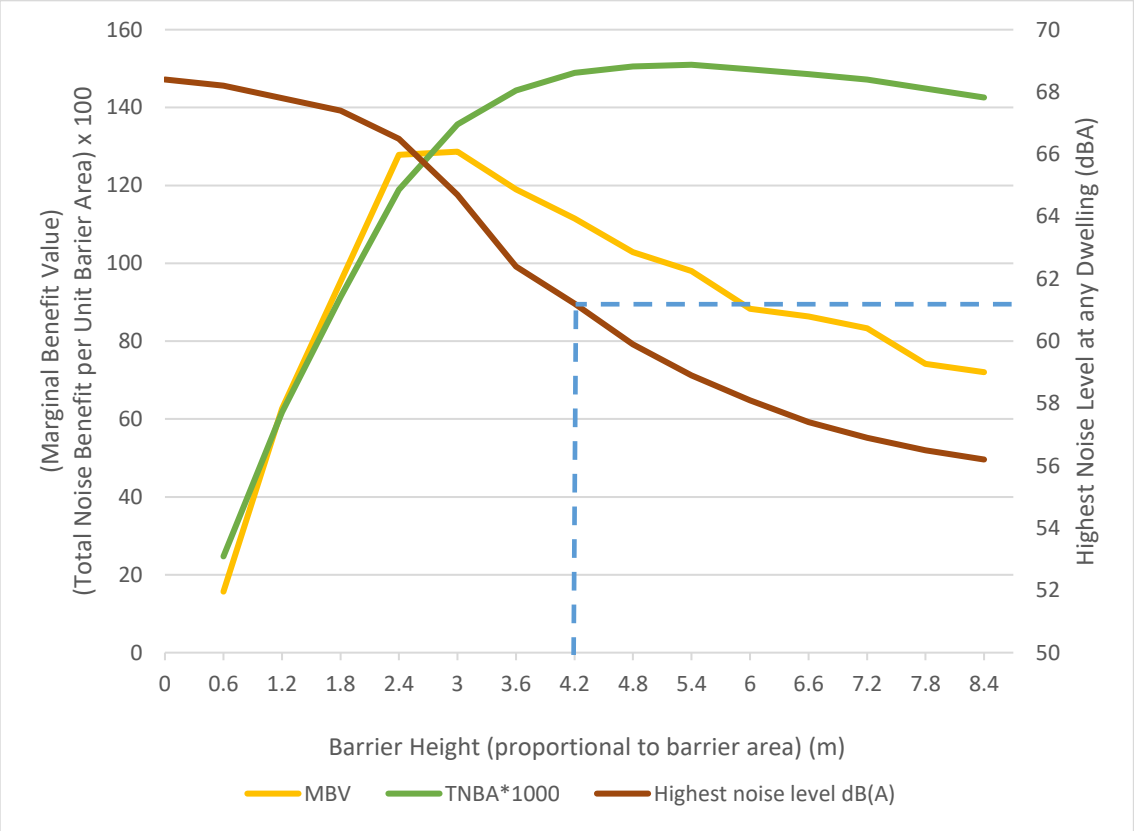
6.6.8 NorthConnex Northern Wall 8 (NW-N-120-02)

The target barrier exceeds 8m high whilst the assessed barrier is 3m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 4m high, the 3m high barrier has been discarded. Based on this, the recommended barrier height is 4.2m (multiple of 0.6m). Further details can be seen in Table 6-12 and Figure 6-10.

Table 6-12 *ENMM* Analysis of Proposed Wall NW-N-120-02

Parameter	Value
Length	634m
Initial Design Barrier Height	4.0m
Target Barrier Height	>8m
Assessed Barrier Height	3.0m
Recommended Barrier Height	4.2m

Figure 6-10 *ENMM* Analysis of Proposed Wall NW-N-120-02



In the vicinity of Woniora Avenue a short length (30m) of an existing noise wall, which was originally proposed to be replaced can now be maintained. The new wall was marginally higher in this section and included a 3m overlap. The new wall no longer needs to extend as far to the south. Maintaining the existing wall and a 3m overlap accords with the project approach to noise mitigation. The updated predicted noise levels are summarised in Appendix F.

6.7 NorthConnex Southern and M2 Intergration Barrier Optimisation

For the NorthConnex Southern and M2 Integration section all design noise barriers are shown in Figure 6-11, Figure 6-12, Figure 6-13 and Figure 6-14.

The optimisation of noise barriers has been considered along sections of walls contained within NCA's 10A, 10B, 10C, 10D, 11A, 11B, 12 and 14.

Figure 6-11 Design Noise Barriers (1 of 4)

Figure 6-12 Design Noise Barriers (2 of 4)

Figure 6-13 Design Noise Barriers (3 of 4)

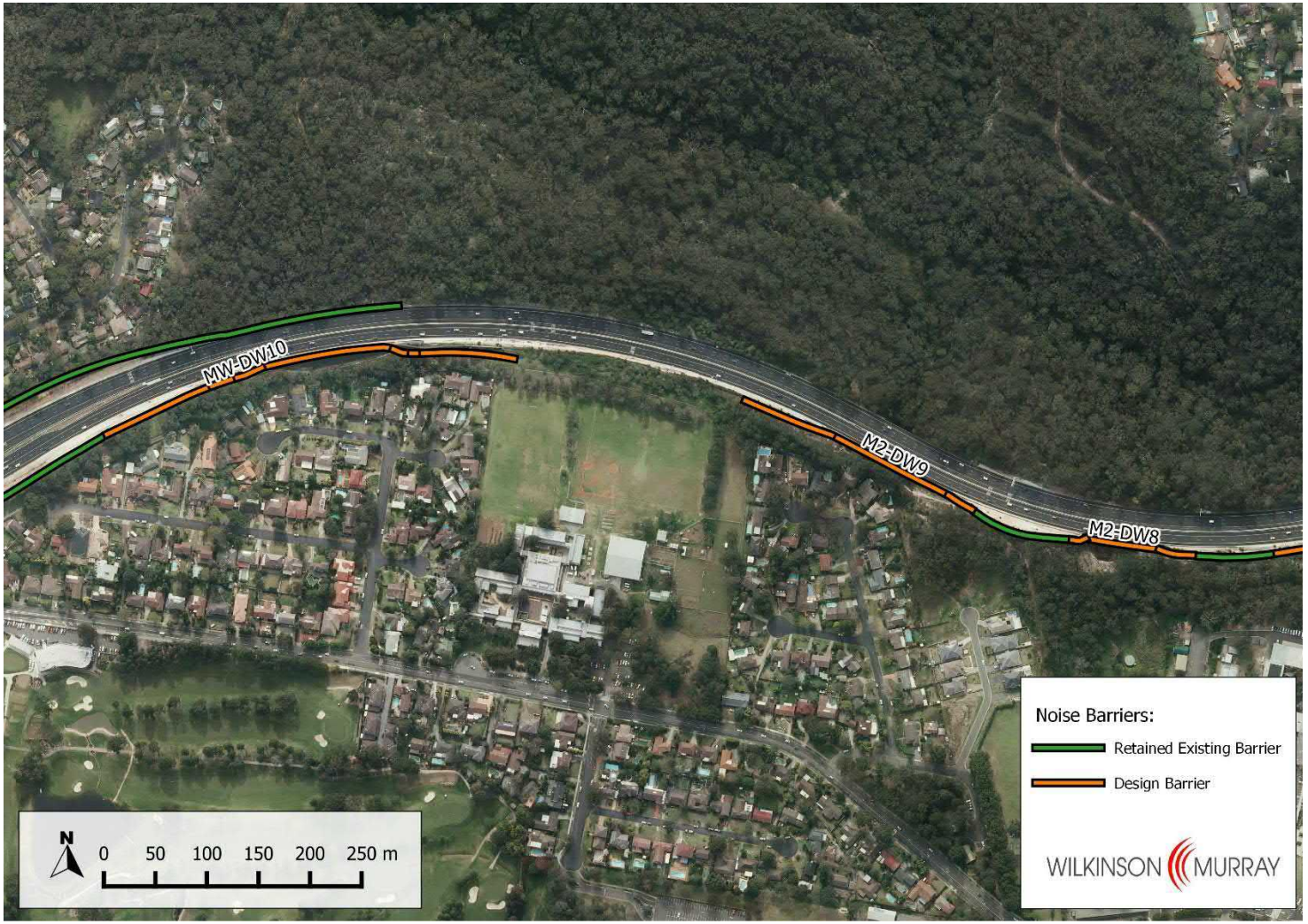
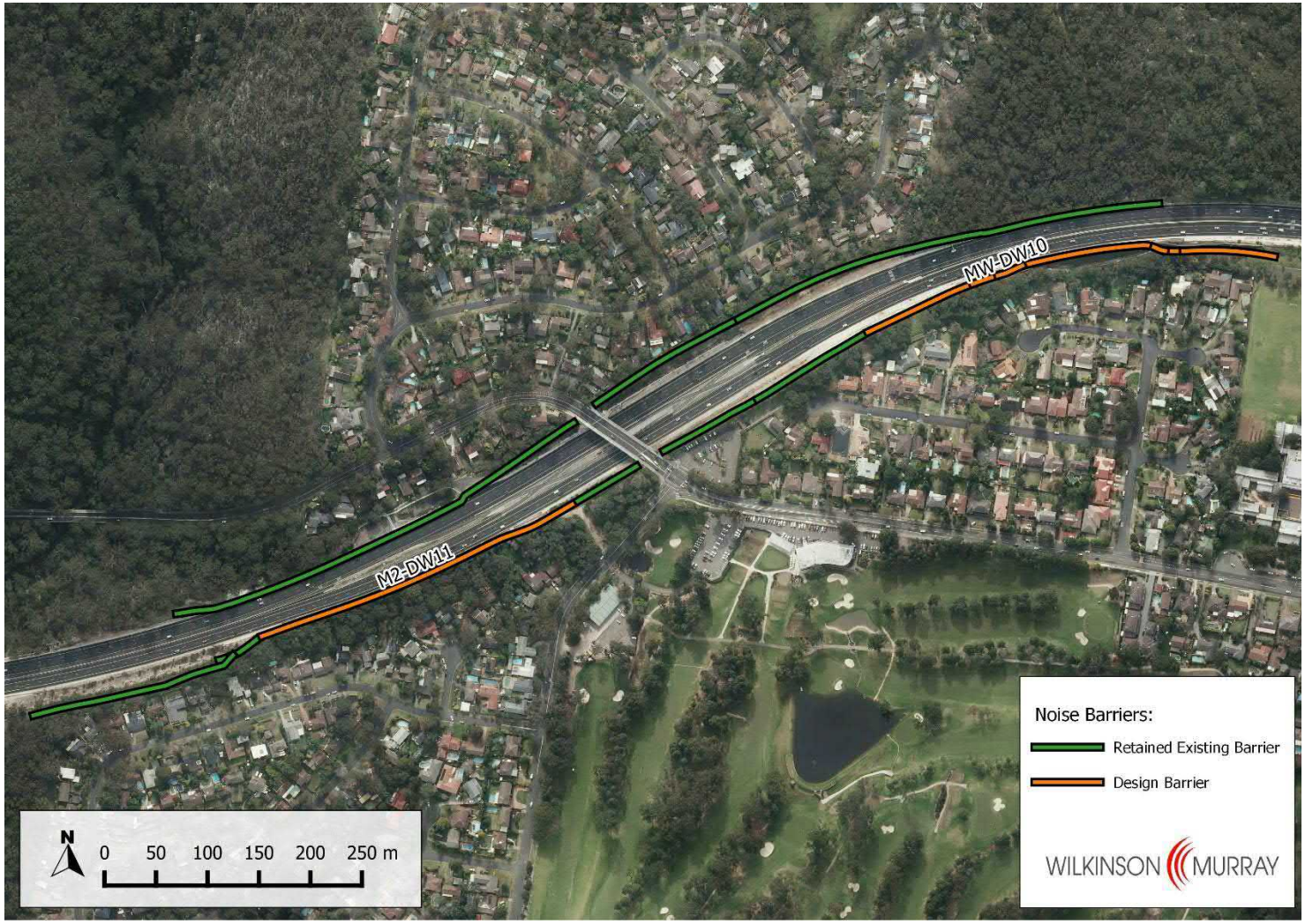


Figure 6-14 Design Noise Barriers (4 of 4)



The acoustic performance of 11 proposed noise barriers was optimised in this assessment in accordance with *ENMM* procedures.

As mentioned previously, the initial design barrier height should provide a similar acoustic performance compared to the existing noise barriers that will be demolished. In situations when the design noise barrier will be built close to the existing noise barrier, the top of the design barrier should not be lower than the top of the existing barrier. This height would ensure a similar acoustic performance, which is consistent with the suggestion in the EIS that the relative level (RL) of the top of the existing barrier must be maintained.

Project traffic exiting westbound will exit from a tunnel portal built at the location of the existing noise barrier. As a result of this, the terrain level in the area will be drastically reduced and the existing noise barrier will be replaced with several design barriers on both sides of the westbound off-tunnel lanes.

The design barriers on the internal side of the road defined as NW-S-120-06 and NW-S-120-03 would have to exceed 8m high in order to achieve the same top RL height of the existing barrier. This assessment has considered a limit height of 8m as recommended in the *ENMM*.

Other barriers were then optimised following the normal process, with a slight modification to allow variable height barriers where the RL of the top of the barrier is optimised relative to the road level of the dominant traffic noise rather than the natural topography.

A summary of the considered noise barriers are as follows:

- NW-S-120-01 is a new barrier formed as a part of minor widening of the M2 Integration works replacing an existing noise barrier;
- NW-S-120-02 is a continuation of barrier NW-S-120-01 and includes the western part of the previous considered M2-DW4;
- NW-S-120-03 is a relocated barrier;
- NW-S-120-05 is a new barrier on the southern side of the portal to shield the Pennant Hills Road westbound on ramp and traffic on the M120 exiting the portal;
- NW-S-120-06 is a relocated wall with a gap to allow the PHR westbound on ramp to merge with traffic on the M120 exiting the tunnel; and
- NW-S120-07 is a continuation of barrier NW-S-120-02 allowing for cycle access.

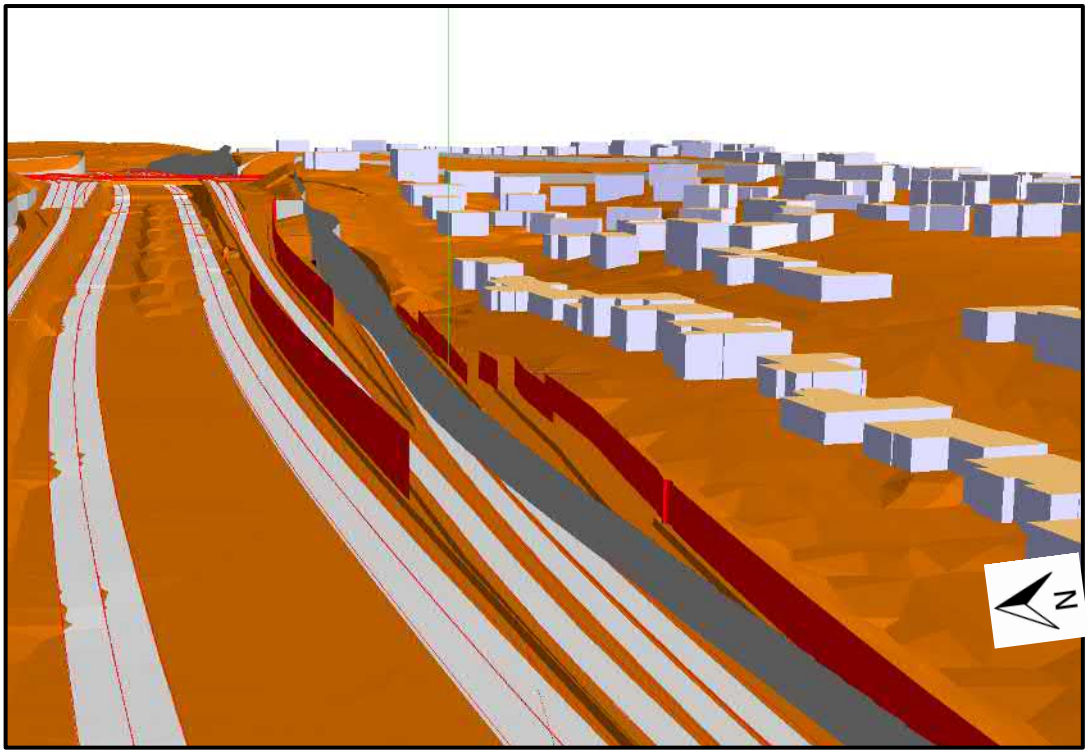
In addition, a new barrier along the western side of the southern compound between the M2 and the entrance to the compound from Eaton Road has been included in the calculations. Previously the residences in Eaton Road, Hillside Place and Gum Grove Place were partially shielded by an existing barrier on the western side of Pennant Hills Road, which extended 190 meters north of the M2 eastbound off ramp, and also the residences in Pennant Hills Road which have been demolished to make way for the Motorway Operations Centre.

Noise barriers are most affective when they are located near the noise source (e.g. road) or the noise receiver. The new barrier is positioned close to the receivers along the east side of Gums Grove Place, Hillside Place and Eaton Road. In addition to this, the new barrier is likely to provide a better acoustic performance because the barrier extends farther than the previous noise barrier.

This new barrier serves two purposes, to control traffic noise from Pennant Hills Road to the residences (in conjunction with buildings on the site) and also to control noise from the 24-hour on-site activities which includes vehicle movements and mechanical plant. The same optimisation principles to design the boundary barrier to ensure shielding from road traffic noise is no worse

than currently provided and to meet EPA intrusive noise limits for operational noise was made. The design outcome has resulted in a 4.8m high barrier. This has been mindful of the height of a retaining wall the barrier sits above. More details justifying the height are included in Section 9.4.

Figure 6-15 Existing Noise Barrier (Grey) to be Demolished & Design Barriers (Red)



6.7.1 NorthConnex Southern and M2 Integration NW-S-120-01

The initial height considered for this noise barrier prior to the optimisation process is 4.8m as it is expected to provide a similar acoustic performance compared to the existing noise wall that will be demolished.

The target barrier was found to exceed 8m high as a noise barrier below 8m high would not meet the base criteria at night. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded

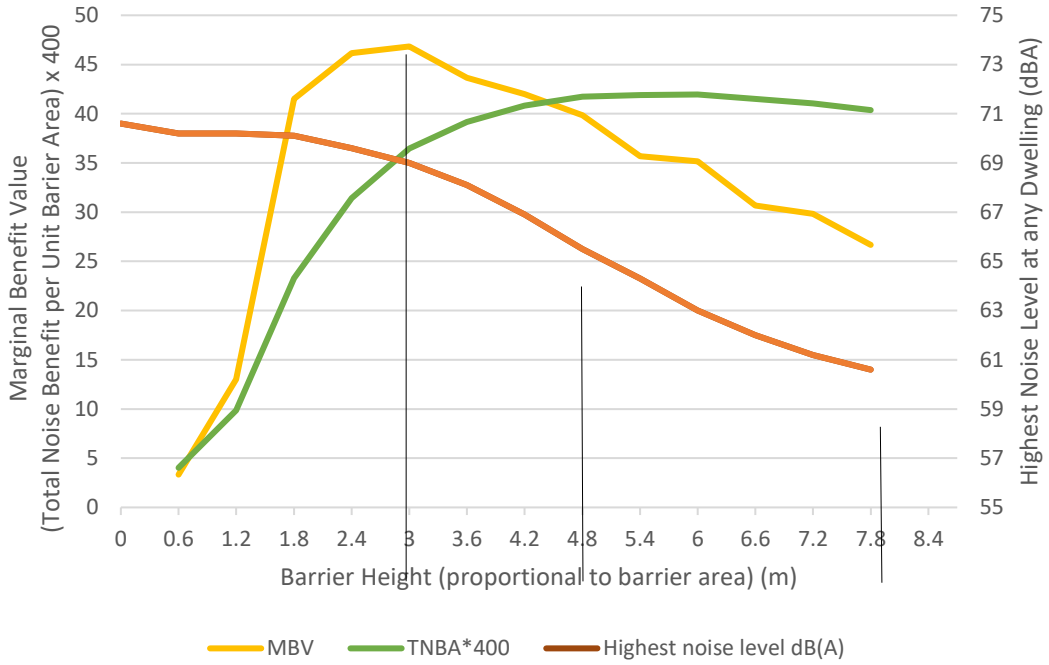
The assessed barrier is 3.0m as this would maximise the TNBA and MBV. This barrier is lower compared to the initial design barrier height. The recommended noise barrier must be a multiple of 0.6m for construction reasons and has been set to 4.8m high Further details can be seen in Table 6-13 and Figure 6-16.

Table 6-13 *ENMM* Analysis of Proposed NW-S-120-01

Parameter	Value
Length	331m
Initial Design Barrier Height	4.8m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.0m

Recommended Barrier Height	4.8m

Figure 6-16 *ENMM* Analysis of Proposed NW-S-120-01



6.7.2 NorthConnex Southern and M2 Integration NW-S-120-02 and NW-S-120-07

The initial height considered for this noise barrier prior to the optimisation process is 4.8m (design height) as it is expected to provide a similar acoustic performance compared to the existing noise wall that will be demolished.

The target barrier was found to exceed 8m high as a noise barrier below 8m high would not meet the base criteria at night. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded

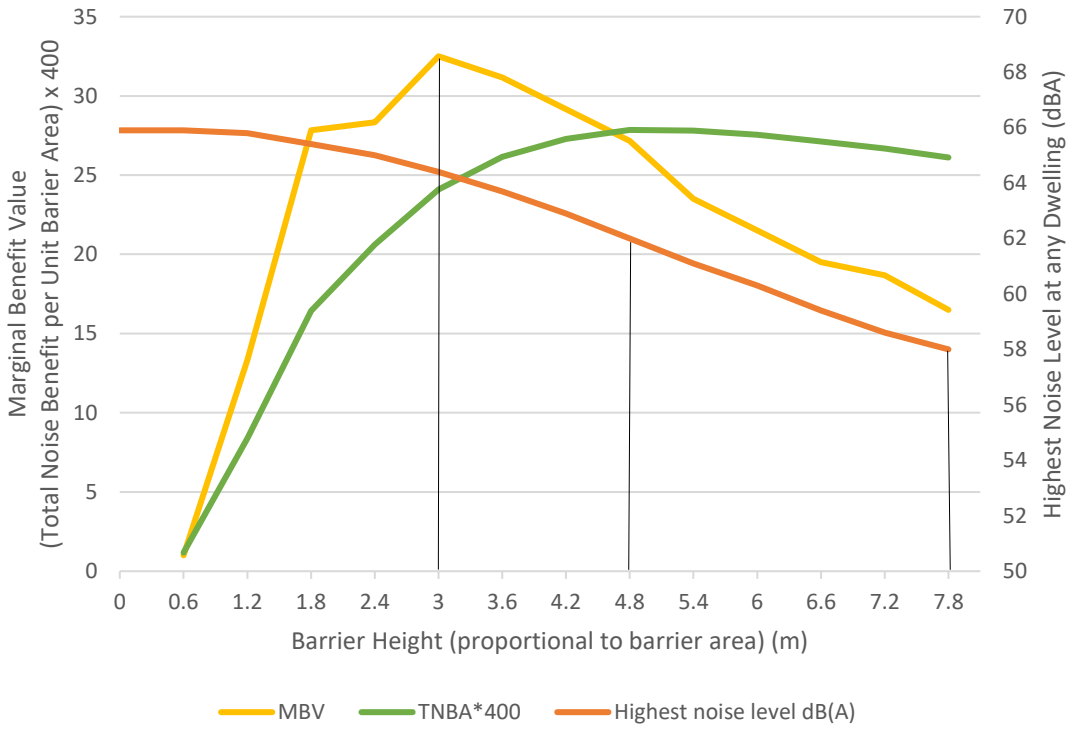
The assessed barrier is 3.0m as this would maximise the TNBA and MBV. This barrier is lower compared to the initial design barrier height. The recommended noise barrier must be a multiple of 0.6m for construction reasons and has been set to 4.8m high

Further details can be seen in Table 6-14 and Figure 6-17.

Table 6-14 *ENMM* Analysis of Proposed NW-S-120-02 & -07

Parameter	NW-S-120-02	NW-S-120-07
Length	290m	51m
Initial Design Barrier Height	4.2m-4.8m	4.2m-4.8m
Target Barrier Height	>8.0m	>8.0m
Assessed Barrier Height	3.0m	3.0m
Recommended Barrier Height	4.8m	4.8m

Figure 6-17 *ENMM* Analysis of Proposed NW-S-120-02 & -07



6.7.3 NorthConnex Southern and M2 Integration NW-S-120-03 and NW-S-120-06

The westbound off-tunnel lanes will be built at the location of the existing barrier and as a result of this, the terrain level in the area will be drastically reduced. The existing noise barrier will be replaced with several design barriers on the northern (NW-S-120-03 and NW-S-120-06) and southern (NW-S-120-05) sides of the westbound off-tunnel lanes.

The design noise barrier NW-S-120-03 and NW-S-120-06 have not been optimised in accordance with *ENMM* procedures as it needs to achieve a noise level reduction equivalent to the existing barriers.These barriers have been considered to have a height equal to the RL of the top of the existing noise wall with a maximum height of 8m.

Further details can be seen in Table 6-15.

Table 6-15 Details of Proposed Barrier NW-S-120-03 and NW-S-120-06

Parameter	Value
Length NW S 120 06	184m
Length NW S 120 03	216m
Recommended Barrier Height	7.8m

6.7.4 NorthConnex Southern and M2 Integration NW-S-120-05

To aid the optimisation process the designated barrier NW-S-120-05 is split into multiple conjoined barriers with the following rational:

- NW-S-120-05-01A is designed to control the noise from traffic flow on Pennant Hills Road on-ramp, and as such is optimised relative to the ramp level; and
- NW-S-120-05-01B is designed to control noise from the M120 exiting the tunnel portal, and as such is optimised relative to the M120.

Given that NW-S-120-05-01B is required to control noise from the project for the purpose of optimisation they are considered new barriers. Urban design implications have also been considered for this barrier and discussed for information purposes.

Figure 6-18 NW-S-120-05 Barrier Naming Convention

NW-S-120-05-01A

NW-S-120-05-01A is designed to control the noise from traffic flow on Pennant Hills Road on-ramp (M1V0), and as such is optimised relative to the ramp level.

The initial height considered for this noise barrier prior to the optimisation process is 4.8m (design height) as it is expected to provide a similar acoustic performance compared to the existing noise wall that will be demolished.

The target barrier was found to exceed 8m high as a noise barrier below 8m high would not meet the base criteria at night. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded

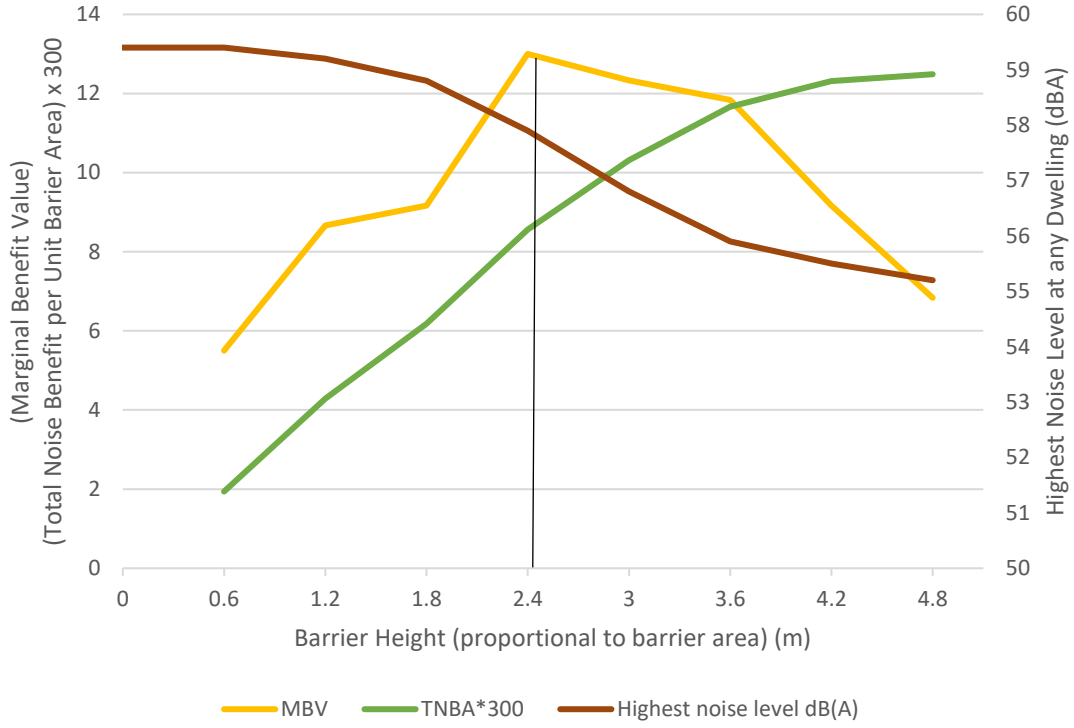
The assessed barrier is 2.4m (relative to Pennant Hills Road On-ramp) as this would maximise the TNBA and MBV. This barrier is lower compared to the initial design barrier height on the west side but increases in height to the east as RL of Pennant Hills Road on-ramp increases.

The recommended noise barrier must be a multiple of 0.6m for construction reasons and has been set to 4.8m high transitioning to 6m high to ensure a relative height to Pennant Hills Road

WB on-ramp of 2.4m.

For clarity and assistance interpretation Figure 6-19 only considers noise contribution from the Pennant Hills Road WB on-ramp.

Figure 6-19 *ENMM* Analysis of NW-S-120-05-01A considering only Pennant Hills Road Traffic



NW-S-120-5-01B

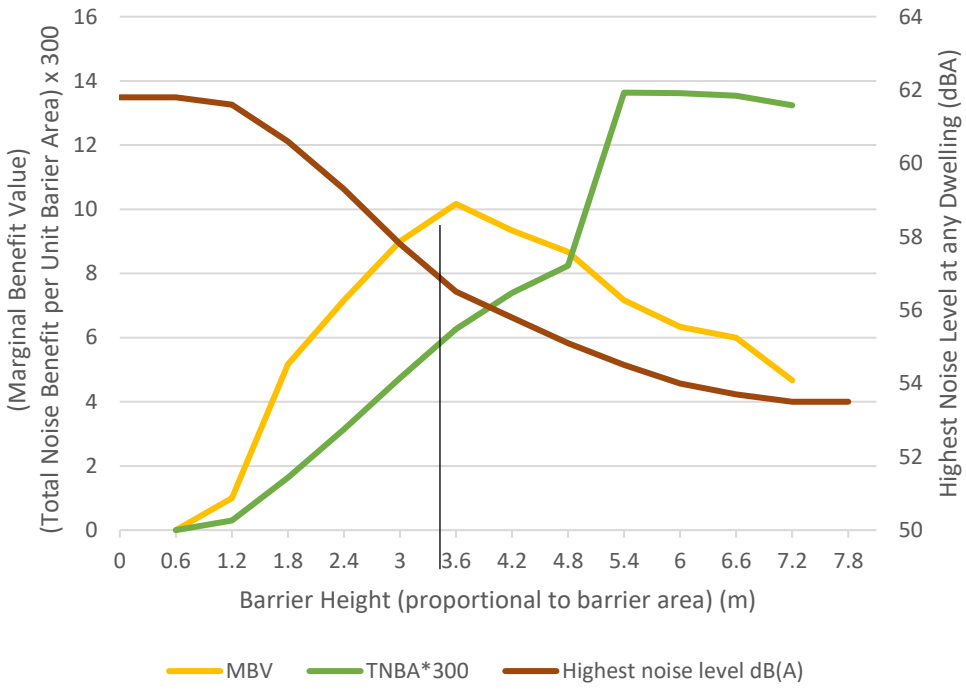
NW-S-120-05-01B is designed to control noise from the M120 exiting the tunnel portal, and as such is optimised relative to the M120. No initial design height is considered for this noise barrier prior to optimisation.

The target barrier was found to exceed 8m high as a noise barrier below 8m high would not meet the base criteria at night. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded

The assessed barrier is 3.6m as this would maximise the TNBA and MBV.

For clarity and assistance in interpretation Figure 6-20 discounts noise contribution from the M2 Motorway.

Figure 6-20 ENMM Analysis of NW-S-120-05-01B Discounting M2 Motorway

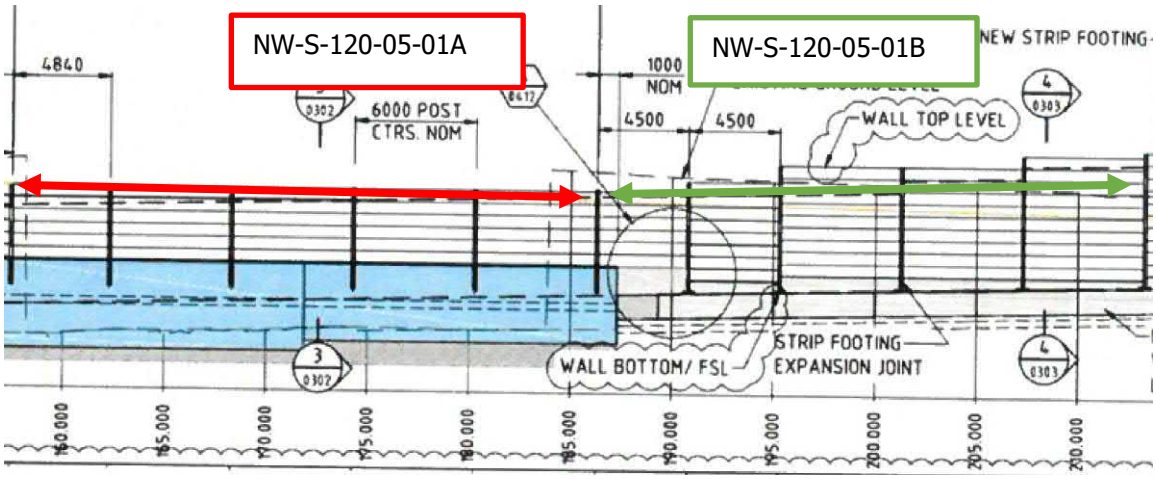


A summary of barrier heights for NW-S-120-05 is provided in Table 6-16 below. As noted earlier, the noise barrier NW-S-120-05-01A controls the noise from traffic flow on Pennant Hills Road on-ramp, and as such is optimised relative to the ramp level. The elevation drawings of NW-S-120-05-01A and NW-S-120-05-01B is shown in Figure 6-21. The blue in the figure represents the retaining wall.

Table 6-16 *ENMM* Analysis of Proposed NW-S-120-05

Parameter	NW-S-120-05-01A	NW-S-120-05-01B
Length	70m	72m
Initial Design Barrier Height	4.2m-4.8m	-
Target Barrier Height	>8.0m	>8.0m
Assessed Barrier Height	2.4m above ramp	3.6m above NCX
Recommended Barrier Height	4.8 – 6m above ground	3.6m above NCX

Figure 6-21 Elevation Drawings of NW-S-120-05



NW-S-120-05 Urban Design Considerations

The optimised height of this barrier would result in a barrier with sudden step changes in height at various locations along its length. As an alternative a barrier at 4.8m above ground level and remaining at least 4.8m above the MV120 level until it reduces to zero height alongside the dive was also assessed. This barrier has an increased surface area compared with the optimised design and provides a net benefit in terms of overall noise changes from traffic exiting the southbound North Connex portal. In terms of overall noise contribution, including all traffic, the smooth top barrier results in no change in predicted noise levels.

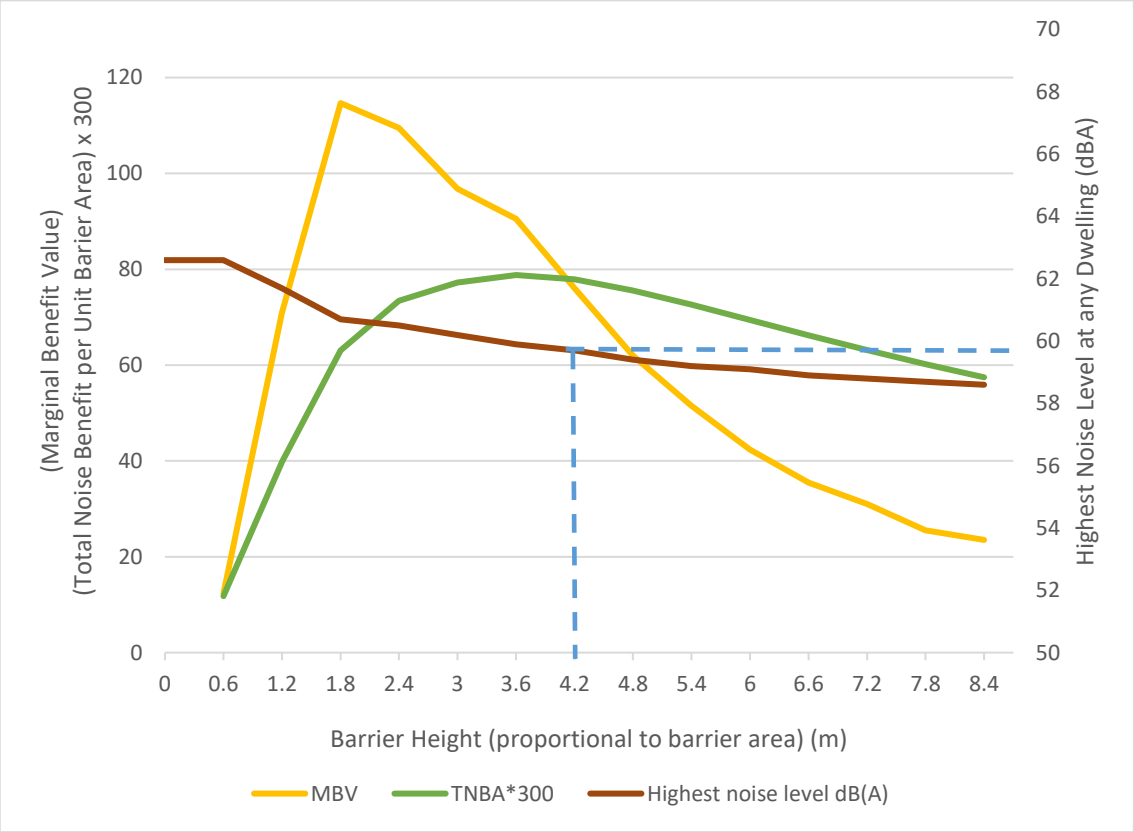
6.7.5 NorthConnex Southern and M2 Integration (NW-S-110-01 & NW-S-110-02)

The target barrier exceeds 8m high whilst the assessed barrier is 1.8m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 4.2m high, the 1.8m high barrier has been discarded. Based on this, the recommended barrier height is 4.2m. Further details can be seen in Table 6-17 and Figure 6-22.

Table 6-17 *ENMM* Analysis of Proposed NW-S-110-01 & NW-S-110-02

Parameter	Value
Length	314m
Initial Design Barrier Height	4.2m
Target Barrier Height	>8.0m
Assessed Barrier Height	1.8m
Recommended Barrier Height	4.2m

Figure 6-22 *ENMM* Analysis of Proposed NW-S-110-01 & NW-S-110-02



6.7.6 NorthConnex Southern and M2 Integration NW-S-120-08

The noise barrier NW-S-120-08 will be built in a similar location of the existing barrier which is to be demolished. The design noise barrier has not been optimised in accordance with *ENMM* procedures. This barrier has been considered to have a height equal to the RL of the top of the existing noise wall. Details of the barrier can be seen in Table 6-18.

Table 6-18 Details of Proposed Barrier NW-S-120-08

Parameter	Value
Length NW S 120 08	45m
Recommended Barrier Height	4.8 & 7.8m

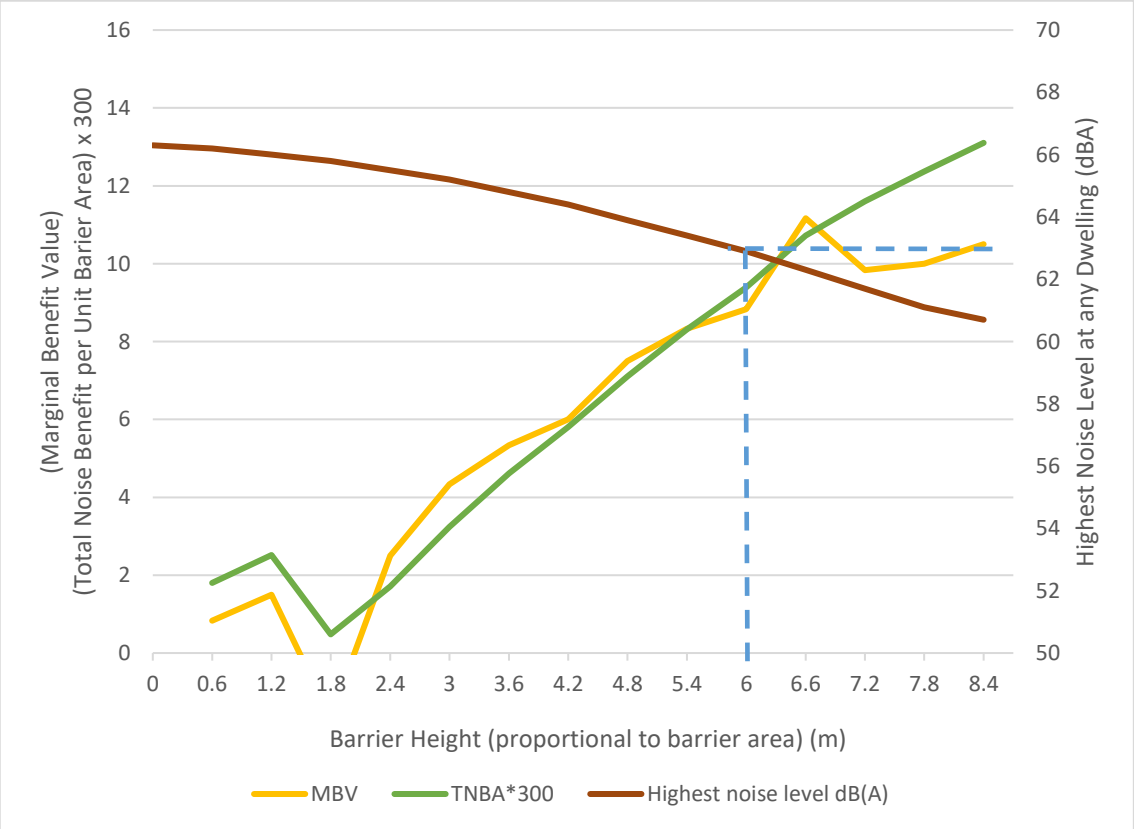
6.7.7 NorthConnex Southern and M2 Integration M2-DW6

The target barrier exceeds 8m high whilst the assessed barrier is 6.6m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. The 6.6m high barrier offers an insertion loss of 4dB at the most affected residence. As 10dB is the minimum insertion loss recommended by the *ENMM* for noise barriers more than 5m high, the 6.6m high barrier has been discarded. As the initial design barrier is 6.0m high, the recommended barrier height is 6.0m. Further details can be seen in Table 6-19 and Figure 6-23.

Table 6-19 *ENMM* Analysis of Proposed M2-DW6

Parameter	Value
Length	139m
Initial Design Barrier Height	6.0m
Target Barrier Height	>8.0m
Assessed Barrier Height	6.6m
Recommended Barrier Height	6.0m

Figure 6-23 *ENMM* Analysis of Proposed M2-DW6



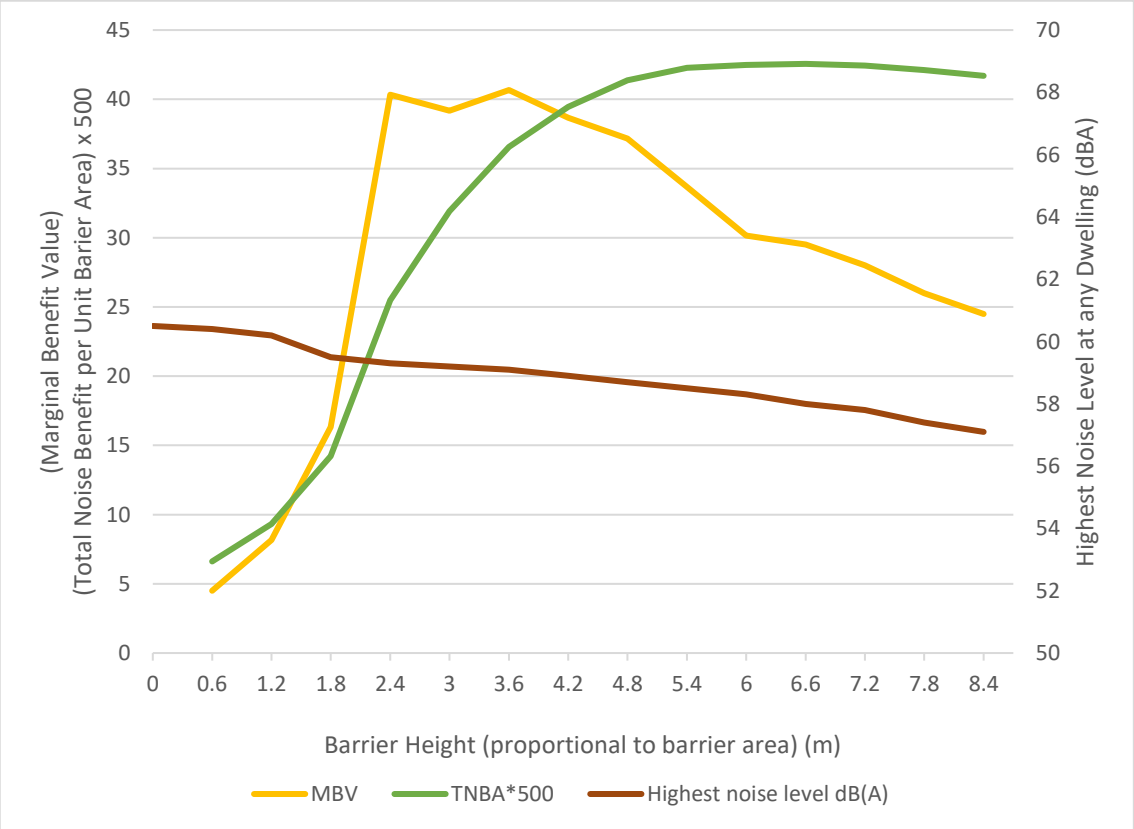
6.7.8 NorthConnex Southern and M2 Integration M2-DW7

The target barrier exceeds 8m high whilst the assessed barrier is 3.6m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial barrier design is between 7.2m to 7.8m high, the 3.6m high barrier has been discarded. Based on this, the recommended barrier height is the initial design barrier height. Further details can be seen in Table 6-20 and Figure 6-24. A shape file has been provided to clarify the recommended barrier height.

Table 6-20 *ENMM* Analysis of Proposed M2-DW7

Parameter	Value
Length	340m
Initial Design Barrier Height	7.2m to 7.8m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.6m
Recommended Barrier Height	7.2m to 7.8m

Figure 6-24 *ENMM* Analysis of Proposed M2-DW7



6.7.9 NorthConnex Southern and M2 Integration M2-DW8 **(NW5A)**

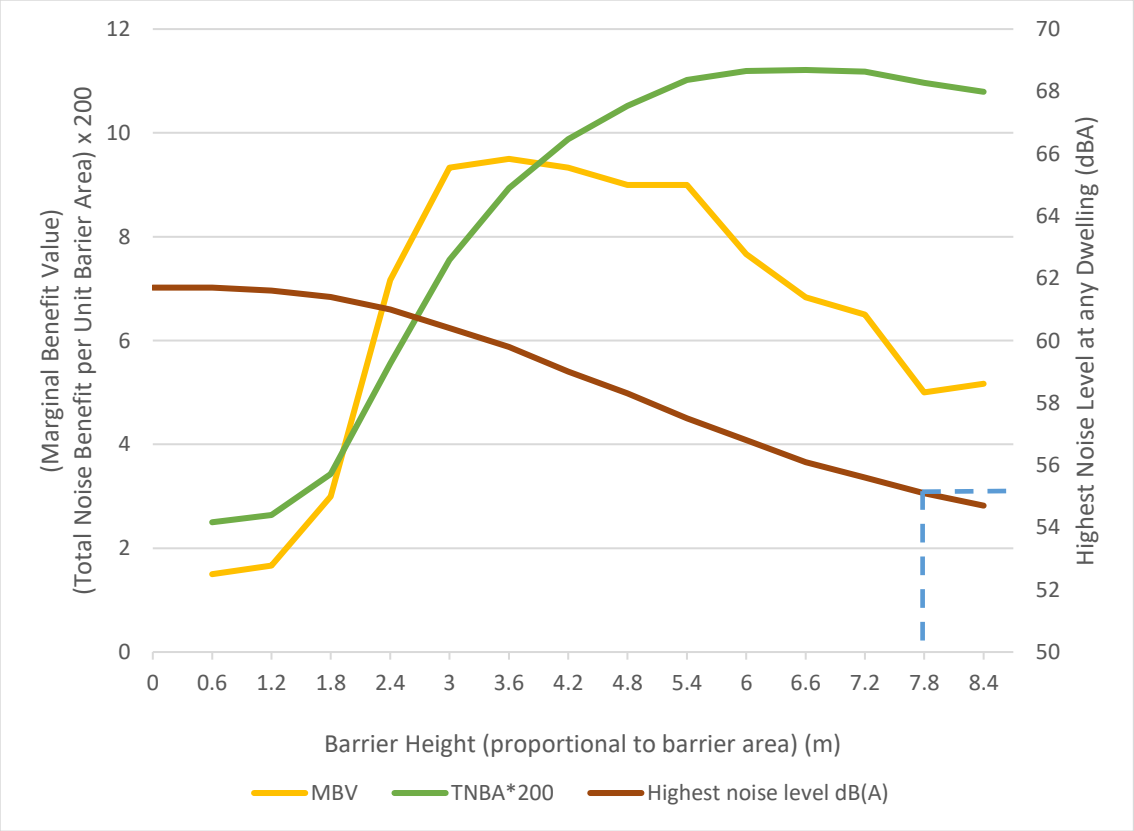
The target barrier exceeds 8m high whilst the assessed barrier is 3.6m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is 7.8m high, the 3.6m high barrier has been discarded. Based on this, the recommended barrier height is 7.8m. At the western end of this noise wall ties into the existing noise wall, which is retained and remains at least 7.8m above the existing road level.

Further details can be seen in Table 6-21 and Figure 6-25.

Table 6-21 *ENMM* Analysis of Proposed M2-DW8

Parameter	Value
Length	120m
Initial Design Barrier Height	7.8m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.6m
Recommended Barrier Height	7.8m

Figure 6-25 *ENMM* Analysis of Proposed M2-DW8



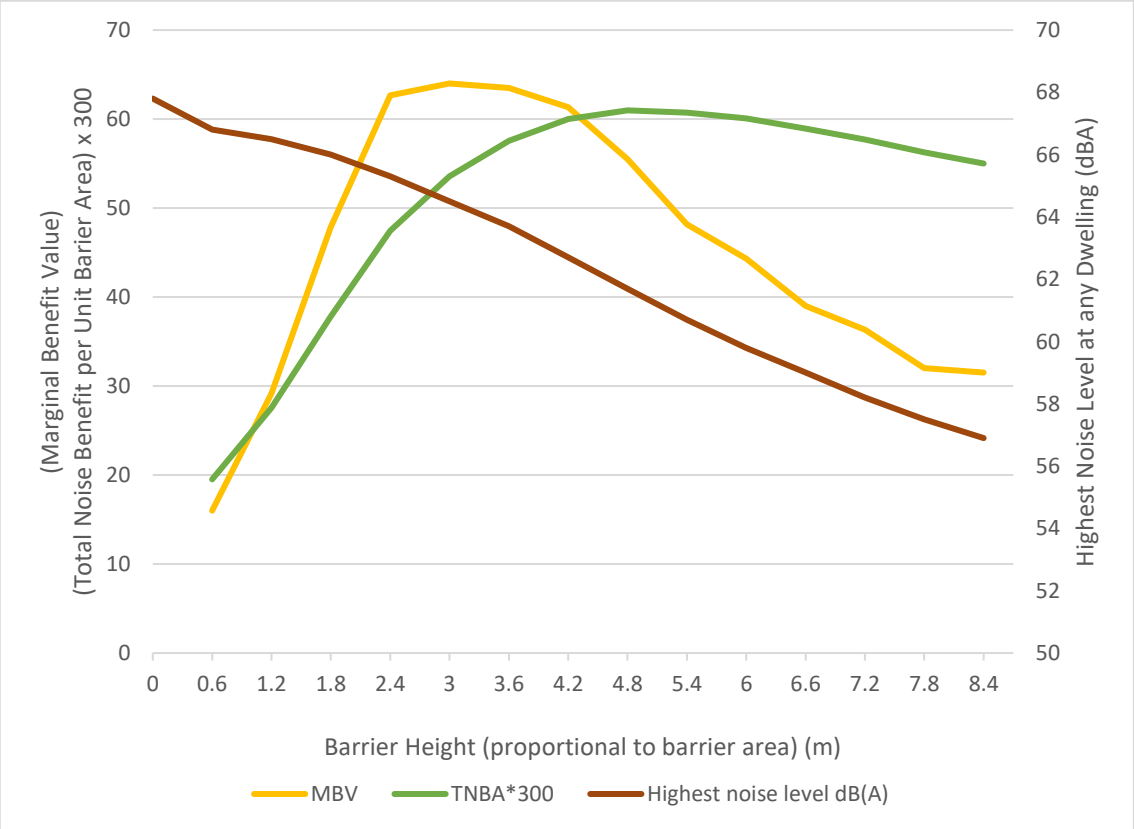
6.7.10 NorthConnex Southern and M2 Integration M2-DW9

The target barrier exceeds 8m high whilst the assessed barrier is 3.0m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier is between 5.4m and 6.0m high, the 3m high barrier has been discarded. Based on this, the recommended barrier height is the initial design barrier height. Further details can be seen in Table 6-22 and Figure 6-26. A shape file has been provided to clarify the recommended barrier height.

Table 6-22 *ENMM* Analysis of Proposed M2-DW9

Parameter	Value
Length	246m
Initial Design Barrier Height	5.4m to 6.0m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.0m
Recommended Barrier Height	5.4m to 6.0m

Figure 6-26 *ENMM* Analysis of Proposed M2-DW9



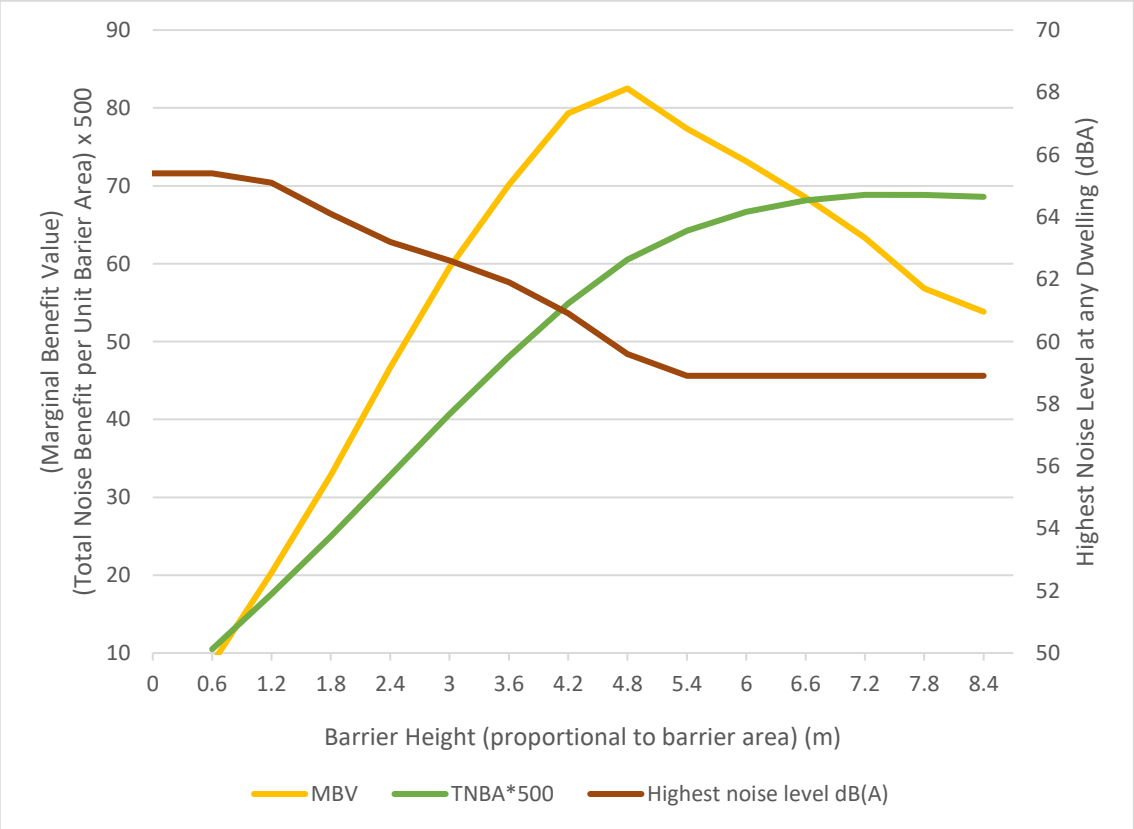
6.7.11 NorthConnex Southern and M2 Integration M2-DW10

The target barrier exceeds 8m high whilst the assessed barrier is 4.8m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial design barrier reaches a maximum height of 6.6m in the area of interest, the 4.8m high barrier has been discarded. Based on this, the recommended barrier height is the initial design barrier height. Further details can be seen in Table 6-23 and Figure 6-27. A shape file has been provided to clarify the recommended barrier height.

Table 6-23 *ENMM* Analysis of Proposed M2-DW10

Parameter	Value
Length	413m
Initial Design Barrier Height	2.4m to 6.6m
Target Barrier Height	>8.0m
Assessed Barrier Height	4.8m
Recommended Barrier Height	2.4m to 6.6m

Figure 6-27 *ENMM* Analysis of Proposed M2-DW10



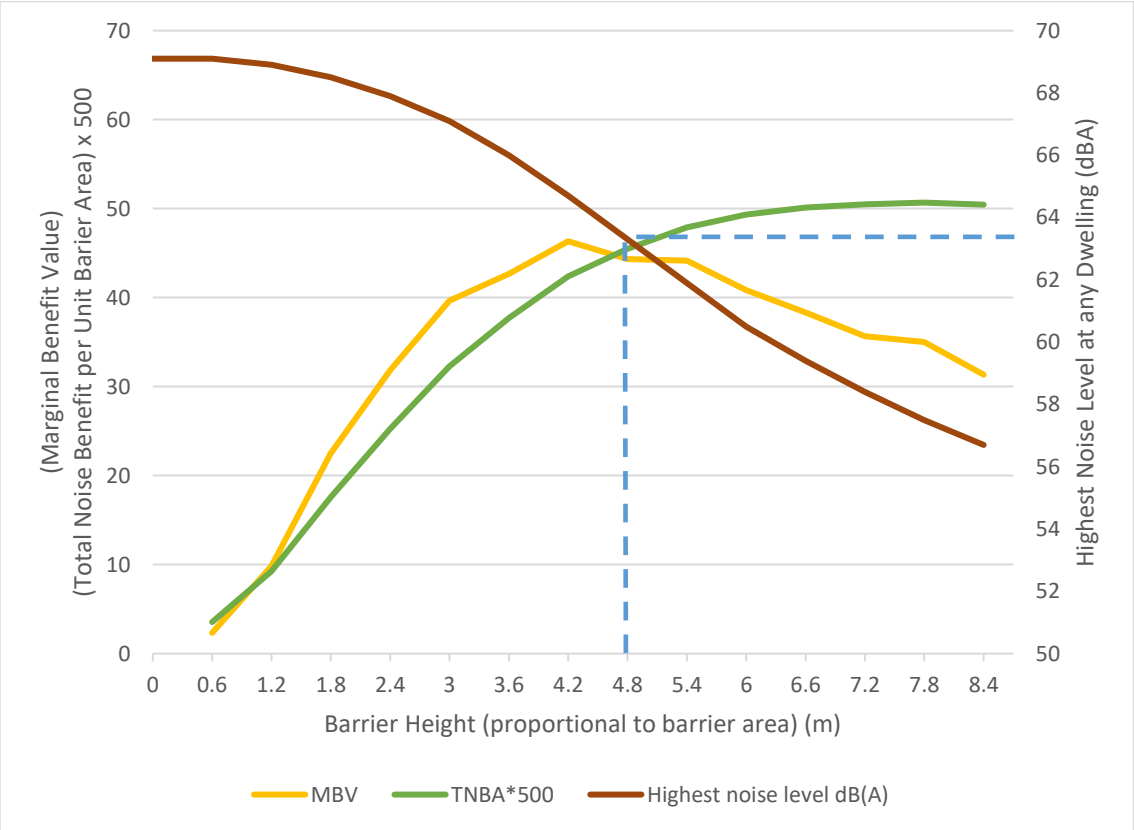
6.7.12 NorthConnex Southern and M2 Integration M2-DW11

The target barrier exceeds 8m high whilst the assessed barrier is 4.2m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial barrier design is 4.8m high, the 4.2m high barrier has been discarded. Based on this, the recommended barrier height is 4.8m. Further details can be seen in Table 6-24 and Figure 6-28.

Table 6-24 *ENMM* Analysis of Proposed M2-DW11

Parameter	Value
Length	329m
Initial Design Barrier Height	4.8m
Target Barrier Height	>8.0m
Assessed Barrier Height	4.2m
Recommended Barrier Height	4.8m

Figure 6-28 *ENMM* Analysis of Proposed M2-DW11



6.8 Increase of Height of Existing Noise Barriers that will not be Demolished

The procedure in the *ENMM* generally applies to cases where there is no existing barrier, but to keep consistency in the procedures utilised in this assessment it was applied in this case to increases in the height of existing barriers. Where 3 or fewer receivers are eligible for consideration of noise mitigation, such increases have not been considered, as indicated in the *ENMM*.

As indicated by Lend Lease Bouygues Joint Venture, if existing noise barriers are to be increased in height, they would have to be completely demolished and rebuilt primarily due to the following reasons:

- Practicability – satisfactorily joining any existing wall and its extension is difficult as the structural moments of the structure would be higher; and
- The footing details of the existing walls are unknown, resulting in safety and durability issue.

The minimum cost per square metre would be $550 which includes the demolition works.

As the night time period is more stringent for this project, the barrier optimisation process has been undertaken for the night time period in accordance with *ENMM* procedures. Considering that the barrier would have to be rebuilt, increments in height of 0.6m starting from the terrain level have been considered.

One barrier in the NorthConnex northern section was identified as a potential candidate to reduce the noise exceedances at residential receivers. A total of 9 properties along the 280m long barrier are eligible for consideration of noise mitigation. This barrier presents a significant difference in height between its southern and northern ends. In order to optimise the analysis, this barrier has been divided in two sections defined as follows:

- Remaining Existing Barrier "REB-1a": 3 properties along the 117m long wall are eligible for consideration of noise mitigation; and
- Remaining Existing Barrier "REB-1b": 6 properties along the 163m long wall are eligible for consideration of noise mitigation.

The relevant sections of the existing barrier are shown in Figure 6-29.

Figure 6-29 Existing Noise Barriers: REB-1a & REB-1b

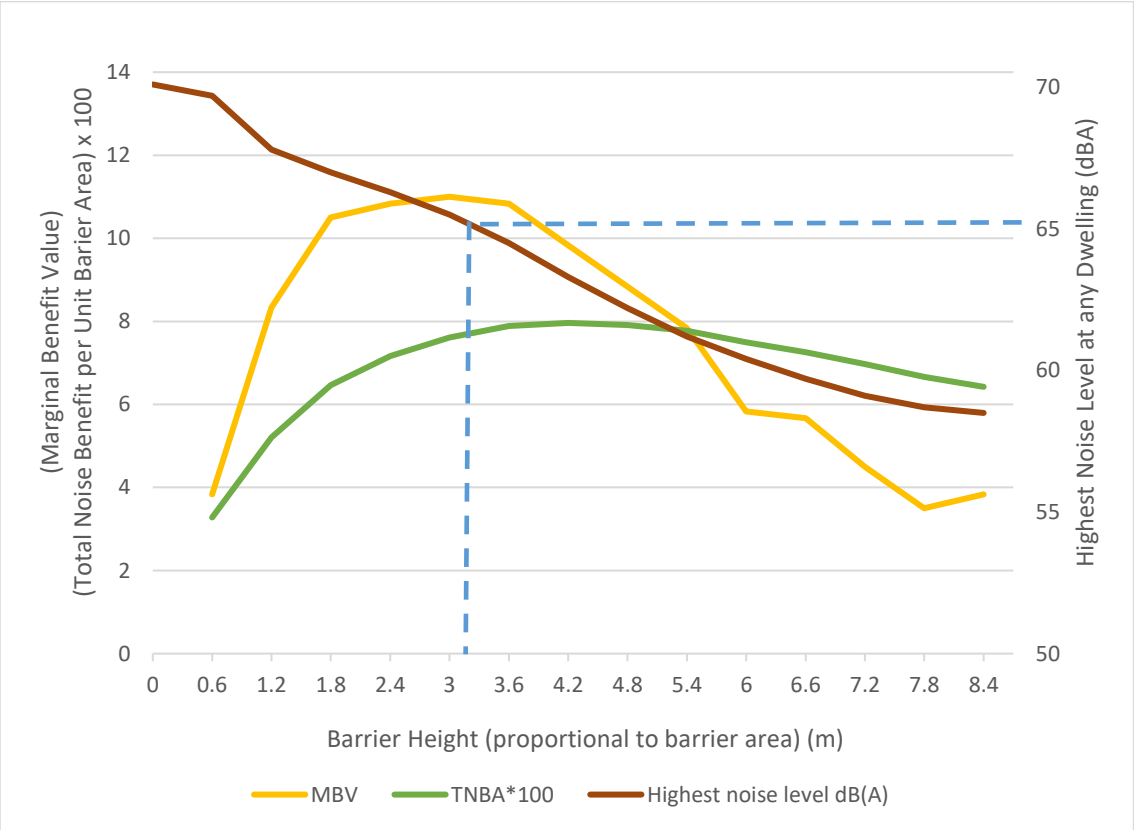
6.8.1 NorthConnex Northern REB-1a

The target barrier exceeds 8m high whilst the assessed barrier is 3m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial barrier design is 3.2m high, the 3m high barrier has been discarded. Based on this, there is no need to modify the height of the exiting noise wall. Further details can be seen in Table 6-25 and Figure 6-30.

Table 6-25 *ENMM* Analysis of Existing Barrier "REB-1a"

Parameter	Value
Length	117m
Existing Average Barrier Height	3.2m
Target Barrier Height	>8.0m
Assessed Barrier Height	3.0m
Recommended Barrier Height	Existing noise barrier

Figure 6-30 *ENMM* Analysis of Existing Barrier "REB-1a"



6.8.2 NorthConnex Northern REB-1b

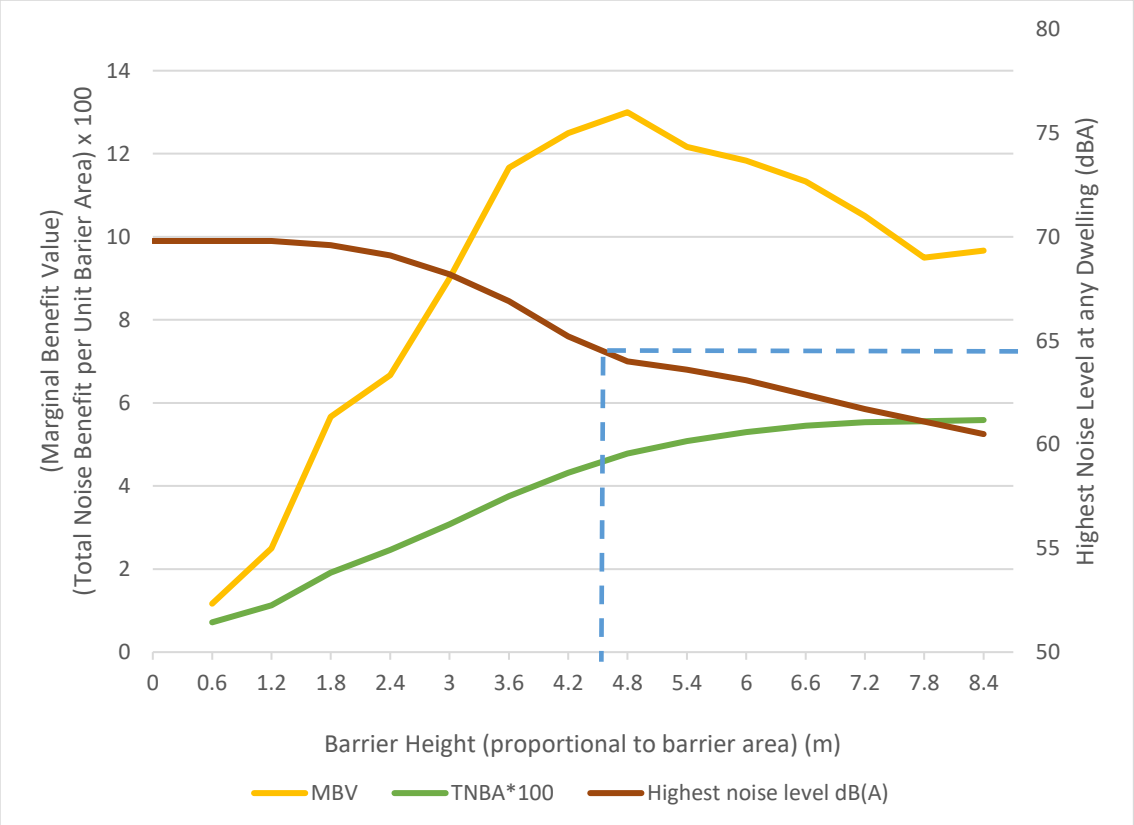
Residence ID 82 located at 10-12 Carrington road has been excluded from the calculations due to its proximity and angle of view to the road alignment. Architectural treatment is recommended at this residence.

The target barrier exceeds 8m high whilst the assessed barrier is 4.8m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. The 4.8m high barrier offers an insertion loss of 6.6dB at the most affected residence which satisfies the minimum requirement of 5dB. Based on this, the recommended barrier height would be 4.8m. However, the noise benefit provided by a barrier 0.2m higher than the existing height is less than 2dB and would not reduce the number of properties that require architectural treatment. Based on this, there is no need to modify the height of the exiting noise wall. Further details can be seen in Table 6-26 and Figure 6-31.

Table 6-26 *ENMM* Analysis of Existing Barrier "REB-1b"

Parameter	Value
Length	163m
Existing Average Barrier Height	4.6m
Target Barrier Height	>8.0m
Assessed Barrier Height	4.8m
Recommended Barrier Height	Existing noise barrier

Figure 6-31 *ENMM* Analysis of Existing Barrier "REB-1b"



6.8.3 NorthConnex Southern and M2 Integration M2-EW1

Two existing barriers were identified in the NorthConnex Southern and M2 Integration section as a potential candidate to reduce the noise exceedances at residential receivers. These barriers have been defined as follows:

- Existing Barrier "M2-EW1": 10 properties along the 324m long wall are eligible for consideration of noise mitigation; and
- Existing Barrier "M2-EW2": 6 properties along the 240m long wall are eligible for consideration of noise mitigation. For optimisation purposes the existing wall was extended by 127m to the west totalling a 327m long wall.

The relevant sections of the existing barriers are shown in Figure 6-32 and Figure 6-33.

Figure 6-32 Existing Noise Barrier: M2-EW1

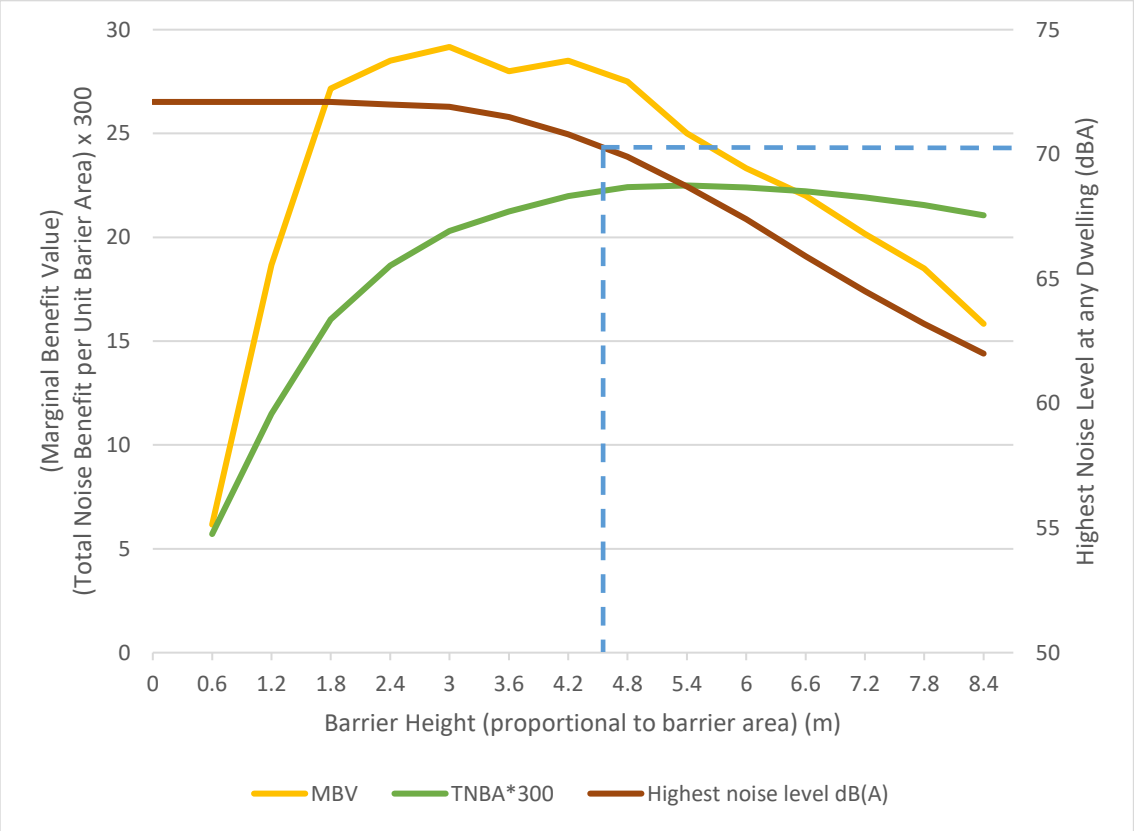
Figure 6-33 Existing Noise Barrier: M2-EW2

The target barrier exceeds 8m high whilst the assessed barrier is 4.2m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. As the initial barrier design is 4.5m high, the 4.2m high barrier has been discarded. Based on this, there is no need to modify the height of the exiting noise wall. Further details can be seen in Table 6-27 and Figure 6-34.

Table 6-27 *ENMM* Analysis of Existing Barrier "M2-EW1"

Parameter	Value
Length	324m
Existing Average Barrier Height	4.5m
Target Barrier Height	>8m
Assessed Barrier Height	4.2m
Recommended Barrier Height	Existing noise barrier

Figure 6-34 *ENMM* Analysis of Existing Barrier "M2-EW1"



6.8.4 NorthConnex Southern and M2 Integration M2-EW2

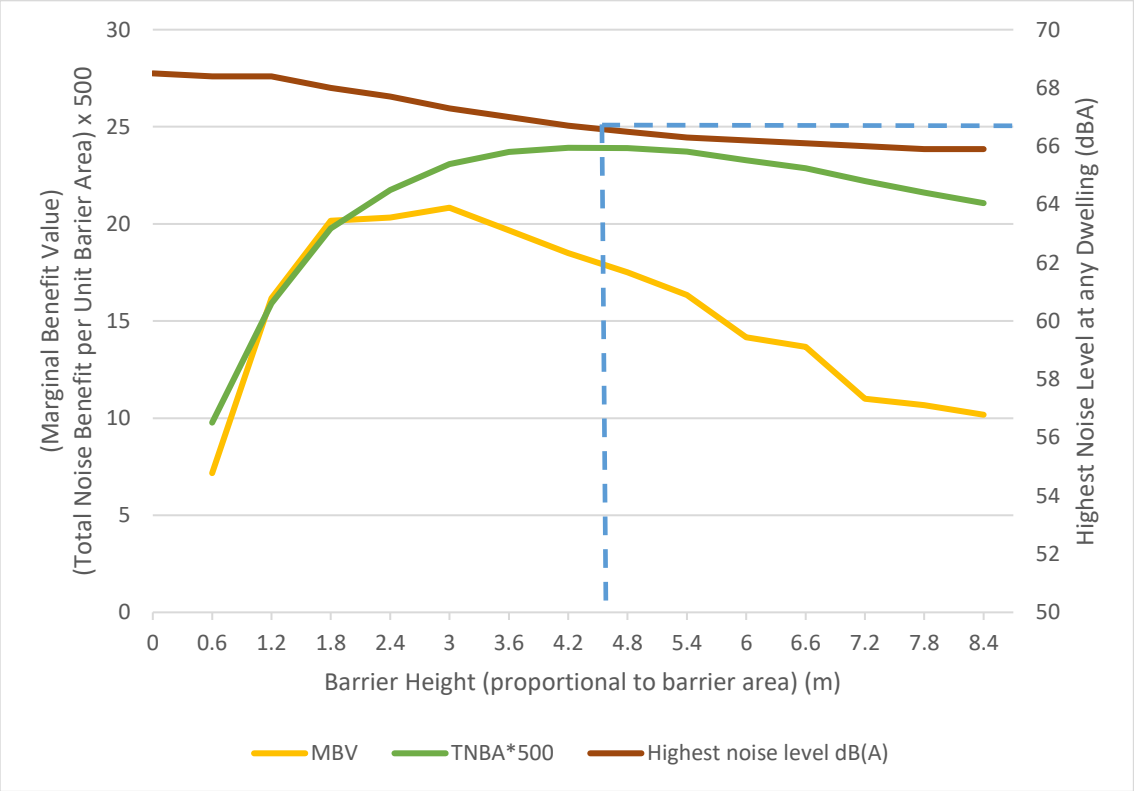
The target barrier exceeds 8m high whilst the assessed barrier is 3m high. As noise barriers more than 8m high are considered visually unacceptable, the target barrier has been discarded. This indicates that properties ID 2872 and 2931 are entitled for consideration of architectural treatment under all circumstances as base criteria cannot be met with the implementation of noise barriers below 8m high.

The 3.0m high barrier offers an insertion loss of 1dB at the most affected residence. As 5dB is the minimum insertion loss recommended by the *ENMM* for noise barriers between 3m and 5m high, the 3.0m high barrier has been discarded. Based on this, there is no need to modify the height of the existing noise wall and no extension is required. Further details can be seen in Table 6-28 and Figure 6-35.

Table 6-28 *ENMM* Analysis of Existing Barrier "M2-EW2"

Parameter	Value
Length	240m existing + 127m extension
Existing Average Barrier Height	4.6m
Target Barrier Height	>8m
Assessed Barrier Height	3.0m
Recommended Barrier Height	Existing noise barrier No extension required

Figure 6-35 *ENMM* Analysis of Existing Barrier "M2-EW2"



6.9 Predicted Noise Levels for 2029 (10 Years after Opening) After Noise Barrier Optimisation

Further calculations have been carried out for the Build Option 2029 considering the implementation of the optimised proposed design noise barriers detailed in Section 6.4.

6.9.1 NorthConnex Northern

A summary of the recommended barrier heights is shown in Table 6-29.

Table 6-29 Summary of Recommended Barrier Heights for NorthConnex Northern

Wall	Recommended Barrier Height (m) EIS	Recommended Barrier Height (m) WM
NW-N-1M0-01	Existing height	4.8
NW-N-1R0-02	3.5	3.6
NW-N-110-06	Existing height	6.0
NW-N-110-07		4.2
NW-N-110-01		4.2
NW-N-110-02	Existing height	4.2
NW-N-120-04	Existing height	northern end RL 160.5m; southern end RL 163m
NW-N-120-02	Existing height	4.2
REB-1a	Existing noise barrier	Existing noise barrier
REB-1b		Existing noise barrier

The results are summarised in Table 6-30.

Table 6-30 Summary Results After Noise Barrier optimisation for NorthConnex Northern

Criteria	Residential Receivers	Non-Residential Receivers
Before Noise Barrier Optimisation		
Receivers that were eligible for consideration of noise mitigation	68 (116)	2
After Noise Barrier Optimisation, amongst receivers eligible for consideration of noise mitigation		
Receivers that do not exceed base criteria as a result of noise barrier optimisation	4 (4)	2
Receivers eligible for consideration of Architectural Treatment	**64 (112)**	**2**

Notes: Base Criteria: for residential >$L_{Aeq,15hr}$ 60dBA (Day) or >$L_{Aeq,9hr}$ 55dBA (Night).
for non-residential >$L_{Aeq,1hr}$ 50dBA (external). Refer to Table 4-2.
The number in brackets represents the number of receivers including the different units within Strata. For more information on Strata Groups refer to Appendix I.

The noise predictions prior to noise barriers optimisation (Table 6-1) indicated that a total of 68 residential receivers (116 units) and 2 non-residential receivers are eligible for consideration of noise mitigation. The optimisation process would reduce the noise levels at numerous receivers but only 4 out of the 68 identified above would meet the base criteria. This is attributed to the similarity in height between the initial barrier height and recommended barrier height. Based on the findings above, a total of 64 residential receivers (112 units) in addition to 2 non-residential receivers are eligible for consideration for architectural treatment.

A summary of all residential and non-residential receivers eligible for consideration for architectural treatment is shown in Table 6-31. Details concerning noise levels for all receivers in 2029 post noise barrier optimisation are shown in Appendix F. Recommended noise barriers, and all receivers eligible for consideration of architectural treatment, are shown in Appendix G. Contours showing the $L_{Aeq,15hrs}$ (Day) and $L_{Aeq,9hr}$ (Night) post optimisation process in 2029 for the entire area are shown in Appendix H.

Table 6-31 Summary of Relevant Results After Noise Barrier Optimisation

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
56	437	1A	Residence	Yes (1)	2 Deakin Way	60	55	Y	64	60	Y(1)
63	305	1A	Residence	Yes (2)	6-8 Carrington Road	60	55	Y	68	64	Y(2)
68	269	1A	Residence	Yes (1)	10-12 Carrington Road	60	55	Y	64	61	Y(1)
69	255	1A	Residence	Yes (1)	10-12 Carrington Road	60	55	Y	68	64	Y(1)
70	254	1A	Residence	No	45A Woonona Avenue South	60	55	Y	64	61	Y(1)
79	197	1A	Residence	No	130 Burdett Street	60	55	Y	64	61	Y(1)
80	196	1A	Residence	No	132 Burdett Street	60	55	Y	69	65	Y(1)
81	216	1A	Residence	No	134 Burdett Street	60	55	Y	68	64	Y(1)
82	248	1A	Residence	Yes (2)	10-12 Carrington Road	60	55	Y	75	72	Y(2)
84	299	1A	Residence	Yes (2)	10-12 Carrington Road	60	55	Y	70	66	Y(2)
85	346	1A	Residence	Yes (2)	7 Carrington Road	60	55	Y	72	68	Y(2)
86	371	1A	Residence	Yes (2)	7 Carrington Road	60	55	Y	70	66	Y(2)
87	396	1A	Residence	Yes (2)	7 Carrington Road	60	55	Y	67	63	Y(2)
88	424	1A	Residence	Yes (3)	4 Deakin Way	60	55	Y	72	69	Y(3)
89	468	1A	Residence	Yes (1)	7 Deakin Way	60	55	Y	68	64	Y(1)
352	667	1A	Residence	No	8 Lochville Street	60	55	Y	74	70	Y(1)
353	669	1A	Residence	No	6 Lochville Street	60	55	Y	64	61	Y(1)
358	691	1A	Residence	No	27 Woonona Avenue North	60	55	Y	64	60	Y(1)
379	872	2A	Residence	Yes (2)	2 Burns Road	60	55	Y	62	58	Y(1)
380	858	2A	Residence	Yes (2)	4-5/2 Burns Road	60	55	Y	64	60	Y(1)
383	821	2A	Residence	No	4A Burns Road	60	55	Y	62	58	Y(1)
386	785	2A	Residence	No	28 Bareena Avenue	60	55	Y	63	58	Y(1)

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
390	735	2A	Residence	No	37B Bareena Avenue	60	55	Y	61	57	Y(1)
396	650	2A	Residence	No	118B Coonanbarra Road	60	55	Y	61	57	Y(1)
398	609	2A	Residence	No	21 Lochville Street	60	55	Y	59	56	Y(1)
413	743	2A	Residence	No	37A Bareena Avenue	60	55	Y	63	60	Y(1)
550	950	2A	Residence	Yes (3)	4,5&8/1-3 Burns Road	60	55	Y	68	62	Y(2) 4&5 only
551	951	2A	Residence	Yes (2)	6&7/1-3 Burns Road	60	55	Y	66	61	Y(2)
639	1161	1A	Residence	No	93 Alexandria Parade	60	55	Y	64	60	Y(1)
642	1088	1A	Residence	No	3A Benson Close	60	55	Y	64	60	Y(1)
643	1053	1A	Residence	No	5 Benson Close	60	55	Y	64	60	Y(1)
653	1017	1A	Residence	No	7A Benson Close	60	55	Y	64	60	Y(1)
719	1844	4A	Residence	Yes (1)	1 Aaron Place	60	55	Y	64	60	Y(1)
725	1622	4A	Residence	Yes (4)	1740 Pacific Highway	60	55	Y	65	61	Y(4)
731	1827	4B	Residence	Yes (6)	1 Aaron Place	60	55	Y	66	62	Y(6)
734	1605	4B	Residence	Yes (6)	1740 Pacific Highway	60	55	Y	71	67	Y(6)
735	1856	4A	Residence	Yes (4)	1 Aaron Place	60	55	Y	70	67	Y(4)
736	1843	4B	Residence	Yes (4)	1 Aaron Place	60	55	Y	69	66	Y(4)
738	1606	4B	Residence	Yes (4)	1740 Pacific Highway	60	55	Y	72	69	Y(4)
739	1616	4B	Residence	Yes (3)	1740 Pacific Highway	60	55	Y	67	64	Y(3)
742	1829	4B	Residence	Yes (3)	1 Aaron Place	60	55	Y	72	68	Y(3)
743	1575	1C	Residence	Yes (4)	1707 Pacific Highway	60	55	Y	73	69	Y(4)
769	1577	1C	Residence	Yes (4)	1709 Pacific Highway	60	55	Y	73	69	Y(4)
817	1998	5A	Residence	Yes (2)	27 Pennant Hills Road	60	55	Y	73	70	Y(2)
1028	1617	5A	Residence	No	7 Lucinda Avenue	60	55	Y	65	62	Y(1)
1031	1656	5A	Residence	No	11A Lucinda Avenue	60	55	Y	65	61	Y(1)

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
3028	1897	3	Residence	No	59 Russell Avenue	60	55	Y	67	63	Y(1)
3029	1908	3	Residence	No	55 Russell Avenue	60	55	Y	69	66	Y(1)
3035	1899	3	Residence	No	53 Russell Avenue	60	55	Y	60	56	Y(1)
3051	1571	3	Residence	Yes (8)	5-7 Pacific Highway	60	55	Y	71	68	Y(6)
3052	1582	3	Residence	No	3 Pacific Highway	60	55	Y	74	70	Y(1)
3060	1892	3	Residence	No	52 Russell Avenue	60	55	Y	74	71	Y(1)
3061	1890	3	Residence	No	14 Pennant Hills Road	60	55	Y	75	72	Y(1)
3062	1914	3	Residence	No	16 Pennant Hills Road	60	55	Y	74	70	Y(1)
3063	1926	3	Residence	No	18 Pennant Hills Road	60	55	Y	75	71	Y(1)
3064	1931	3	Residence	No	20 Pennant Hills Road	60	55	Y	75	72	Y(1)
3065	1971	3	Residence	No	22 Pennant Hills Road	60	55	Y	75	71	Y(1)
3066	1982	3	Residence	No	24 Pennant Hills Road	60	55	Y	75	71	Y(1)
3067	1989	3	Residence	No	26 Pennant Hills Road	60	55	Y	75	72	Y(1)
3667	1896	3	Residence	No	61 Russell Avenue	60	55	Y	68	65	Y(1)
3675	443	1A	Residence	Yes (1)	6 Deakin Way	60	55	Y	70	66	Y(1)
3732	1992	3	Residence	No	2A Edwards Road	60	55	Y	66	62	Y(1)
3952	1084	2A	Residence	No	30 Woonona Avenue	60	55	Y	66	62	Y(1)
3988	929	2A	Residence	Yes (1)	9/1-3 Burns Road	60	55	Y	67	62	Y(1)
NR-5	1574	1C	School	No	1711 Pacific Highway	50	-	Y	73	69	Y(1)
NR-14	1580	5C	Place of Worship	No	1711 Pacific Highway	50	50	Y	73	69	Y(1)

Note: * indicates noise levels at most exposed façade.

6.9.2 NorthConnex Southern and M2 Integration

A summary of the recommended barrier heights is shown Table 6-32. The results are summarised in Table 6-33.

Table 6-32 Summary of Recommended Barrier Heights for NorthConnex Southern and M2 Integration

Wall	Recommended Barrier Height (m) EIS	Recommended Barrier Height (m) WM
NW-S-110-04	Existing barrier	5.4
NW-S-110-03		4.8
NW-S-110-07	-	4.8
NW-S-120-01	Existing noise barrier	4.8m
NW-S-120-02	Existing height	4.8m
NW-S-120-03	-	7.8m
NW-S-120-05-01A	Existing height	4.8m to 6.0m
NW-S-120-05-01B	Existing height	3.6m above MV120
NW-S-120-05-02	Existing height	No barrier required
NW-S-120-06	-	7.8m
NW-S-120-07	Existing height	4.8m
NW-S-120-08	-	4.8m to 7.8m
NW-S-110-01	Existing height	4.2m
NW-S-110-02	Existing height	4.2m
M2-DW6	Existing height	6.0
M2-DW7	Existing height	7.2 to 7.8
M2-DW8		7.8
M2-DW9		5.4 to 6.0
M2-DW10	Existing noise barrier	2.4 to 6.6
M2-DW11	5	4.8
M2-EW1	Existing noise barrier	Existing noise barrier
M2-EW2	5	Existing noise barrier

Table 6-33 Summary Results After Noise Barrier for NorthConnex Southern and M2 Integration

Criteria	Residential Receivers	Non-Residential Receivers
Before Noise Barrier Optimisation		
Receivers that were eligible for consideration of noise mitigation	57 (60)	0
After Noise Barrier Optimisation, amongst receivers eligible for consideration of noise mitigation		
Receivers that do not exceed base criteria as a result of noise barrier optimisation	0 (0)	0
Receivers eligible for consideration of Architectural Treatment	**57 (60)**	**0**

Notes: Base Criteria: for residential >$L_{Aeq,15hr}$ 60dBA (Day) or >$L_{Aeq,9hr}$ 55dBA (Night).
The number between brackets represents the number of receivers including the different units within Strata. For more information on Strata Groups refer to Appendix I.

The noise predictions prior to noise barriers optimisation (Table 6-2) indicated that a total of 57 residential receivers (60 units) are eligible for consideration of noise mitigation. The optimisation process would reduce the noise levels at numerous receivers but all 57 residential receivers (60 units) would be still exposed to noise level above base criteria. This is attributed to the similarity in height between the initial barrier height and recommended barrier height. Based on the findings above, a total of 57 residential receivers (60 units) are eligible for consideration of architectural treatment.

However, the following should be noted:

- The receiver located at 29 Coral Tree Drive (WM ID 2233) is no longer considered eligible for consideration of architectural treatment. 29 Coral Tree was provided with Type 1 architectural treatment before the commence of the project; and
- The receiver located at 26 Coral Tree Drive (WM ID 2241) is now considered eligible for consideration of architectural treatment.

A summary of all residential and non-residential receivers eligible for consideration of architectural treatment are shown in Table 6-34. Details concerning noise levels for all receivers in 2029 post noise barrier optimisation are shown in Appendix F. Recommended noise barriers and all receivers eligible for consideration of architectural treatment are shown in Appendix G. Contours showing the $L_{Aeq,15hr}$ (Day) and $L_{Aeq,9hr}$ (Night) post optimisation process in 2029 for the entire area are shown in Appendix H.

Table 6-34 Summary of Relevant Results After Noise Barriers Optimisation

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
2044	3478	10A	Residence	No	2 Eaton Road	60	55	Y	59	56	Y (1)
2109	3504	10A	Residence	No	22 Gum Grove Place	60	55	Y	60	57	Y (1)
2110	3533	10A	Residence	No	13 Gum Grove Place	60	55	Y	62	59	Y (1)
2172	3468	10C	Residence	No	50A Coral Tree Drive	60	55	Y	68	65	Y (1)
2173	3477	10C	Residence	No	56 Coral Tree Drive	60	55	Y	64	60	Y (1)
~~2233~~	~~3727~~	~~10C~~	~~Residence~~	~~No~~	~~29 Coral Tree Drive~~	~~60~~	~~55~~	~~Y~~	~~62~~	~~57~~	~~Y (1)~~
2238	3748	10C	Residence	No	32 Coral Tree Drive	60	55	Y	61	58	Y (1)
2239	3769	10C	Residence	No	30 Coral Tree Drive	60	55	Y	60	57	Y (1)
2240	3787	10C	Residence	No	28 Coral Tree Drive	60	55	Y	62	59	Y (1)
2241	3801	10C	Residence	No	26 Coral Tree Drive	60	55	Y	60	58	Y (1)
2242	3825	10D	Residence	No	24 Coral Tree Drive	60	55	Y	60	58	Y (1)
2243	3842	10D	Residence	No	22 Coral Tree Drive	60	55	Y	63	60	Y (1)
2325	4631	11A	Residence	No	70 Westmore Drive	60	55	Y	62	58	Y (1)
2327	4668	11A	Residence	No	74 Westmore Drive	60	55	Y	63	59	Y (1)
2328	4681	11A	Residence	No	76 Westmore Drive	60	55	Y	63	60	Y (1)
2435	5048	11A	Residence	No	14 Virginia Place	60	55	Y	64	60	Y (1)
2447	4912	11A	Residence	No	88 Westmore Drive	60	55	Y	64	60	Y (1)
2448	4910	11A	Residence	No	86 Westmore Drive	60	55	Y	64	60	Y (1)
2449	4740	11A	Residence	No	84 Wstmore Drive	60	55	Y	64	61	Y (1)
2491	4237	11B	Residence	No	5 Carmen Drive	60	55	Y	64	61	Y (1)
2501	4444	11B	Residence	No	25 Carmen Drive	60	55	Y	64	60	Y (1)
2502	4459	11B	Residence	No	27 Carmen Drive	60	55	Y	69	66	Y (1)

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
2503	4475	11B	Residence	No	29 Carmen Drive	60	55	Y	69	65	Y (1)
2504	4483	11B	Residence	No	31 Carmen Drive	60	55	Y	69	65	Y (1)
2505	4518	11B	Residence	No	33 Carmen Drive	60	55	Y	74	71	Y (1)
2519	4477	11B	Residence	No	46 Carmen Drive	60	55	Y	64	61	Y (1)
2520	4515	11B	Residence	No	48 Carmen Drive	60	55	Y	65	61	Y (1)
2521	4529	11B	Residence	No	50 Carmen Drive	60	55	Y	65	61	Y (1)
2522	4540	11B	Residence	No	52A Carmen Drive	60	55	Y	65	61	Y (1)
2524	4565	11B	Residence	No	56 Carmen Drive	60	55	Y	64	60	Y (1)
2526	4628	11B	Residence	No	53 Carmen Drive	60	55	Y	67	63	Y (1)
2527	4656	11B	Residence	No	2 Morton Avenue	60	55	Y	64	60	Y (1)
2528	4642	11B	Residence	No	4 Morton Avenue	60	55	Y	65	61	Y (1)
2563	4720	11B	Residence	No	100 Murray Farm Road	60	55	Y	64	60	Y (1)
2568	4770	11B	Residence	No	11 Wilshire Avenue	60	55	Y	64	61	Y (1)
2729	5155	12	Residence	No	24 Yale Close	60	55	Y	64	60	Y (1)
2860	5564	13	Residence	No	114-116 Barclay Road	60	55	Y	65	61	Y (1)
2861	5574	13	Residence	No	118 Barclay Road	60	55	Y	64	60	Y (1)
2862	5587	13	Residence	No	120 Barclay Road	60	55	Y	64	60	Y (1)
2872	5830	14	Residence	No	41 Williams Road	60	55	Y	65	61	Y (1)
2878	5790	14	Residence	No	29 Williams Road	60	55	Y	67	63	Y (1)
2880	5770	14	Residence	No	25 Williams Road	60	55	Y	67	63	Y (1)
2881	5754	14	Residence	No	23 Williams Road	60	55	Y	65	62	Y (1)
2882	5743	14	Residence	No	21 Williams Road	60	55	Y	70	66	Y (1)
2883	5731	14	Residence	No	19 Williams Road	60	55	Y	65	62	Y (1)
2884	5720	14	Residence	No	17 Williams Road	60	55	Y	64	60	Y (1)

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		Post Optimisation			
								Eligible for Consideration of Noise Mitigation?	"Build" 2029*		Eligible for Consideration of Architectural Treatment? (Units)
						Day	Night		Day	Night	
									$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	
2885	5706	14	Residence	No	15 Williams Road	60	55	Y	66	62	Y (1)
2887	5692	14	Residence	No	11 Williams Road	60	55	Y	63	60	Y (1)
2890	5638	14	Residence	No	8 Rajola Place	60	55	Y	67	63	Y (1)
2931	5836	14	Residence	No	43 Williams Road	60	55	Y	64	60	Y (1)
2983	5910	15B	Residence	No	41 Dremeday Street	60	55	Y	67	63	Y (1)
3002	5888	15B	Residence	Yes (4)	42-44 Dremeday Street	60	55	Y	67	63	Y (1)
3003	5882	15B	Residence	No	48 Dremeday Street	60	55	Y	69	66	Y (4)
3012	5884	15B	Residence	No	46 Roland Avenue	60	55	Y	65	62	Y (1)
3013	5876	15B	Residence	No	48 Roland Avenue	60	55	Y	65	62	Y (1)
3918	4884	11B	Residence	No	15 Wilshire Avenue	60	55	Y	70	67	Y (1)
3934	5623	14	Residence	No	7 Rajola Place	60	55	Y	64	61	Y (1)
3936	5621	13	Residence	No	1 Mill Drive	60	55	Y	63	60	Y (1)

6.10 Architectural Treatments

Architectural treatment for mitigation of noise (after construction of barriers) usually depends on the level of exceedance over the target noise criteria. Typically, the following levels of treatment are offered:

Type 1 – Exceedances up to 10dB

In general, the following treatments are recommended:

- Fresh air ventilation
- Sealing of wall vents
- Upgraded windows and door seals

Type 2 – Exceedances over 10dB

- Additional upgrade of windows and door may be considered such as upgraded to double glazing.

Predicted noise levels in the study area are in both categories. The budget for architectural treatment is typically $15,000 to $20,000 per residence.

A residence may qualify for treatment if, during an inspection, it can be confirmed that there are 'habitable zones' as defined by the Building Code of Australia along noise affected facades. This will depend on the individual building layout, orientation of each residence and verification of the residence in the noise model.

Other factors that will also be considered during the inspection are the building and façade condition, construction, and whether the habitable zones can receive fresh air ventilation from an unaffected region without additional treatment.

In addition, it is sometimes possible to provide localised shielding at a receiver, for example by building a wall around a courtyard or garden. This has the benefit of reducing noise at the façade, thus reducing requirements for treatment to the house itself, and providing outdoor areas with a lower noise level.

The suitability of such treatment is decided on a case-by-case basis and would be negotiated with property owners.

All residential and non-residential receivers that would require architectural treatment are listed in Table 6-35, Table 6-36, Table 6-37 and Table 6-38. It is important to mention that some of these receivers would have received acoustic architectural treatment during the construction of the nearest road. It is also possible that newer residences may have had architectural treatment as part of the DA process for residences in a noise impacted zone in accordance with the State Environmental Planning Policy (Infrastructure) 2007.

The non-residential buildings would need to be investigated further. This would involve noise monitoring within the relevant rooms of the building that are eligible for consideration for architectural treatment, as a conservative transmission loss of 10dB provided by the external façade has been considered in the calculations. It is likely that some façades would provide a higher transmission loss than what has been assumed in this assessment which may result in no requirement for architectural treatment.

Table 6-35 Single Receivers Eligible for Consideration of Architectural Treatment for NorthConnex Northern

ID WM	ID EIS	NCA	Type	Address	Architectural Treatment Type
70	254	1A	Residence	45A Woonona Avenue South	Type 1
79	197	1A	Residence	130 Burdett Street	Type 1
80	196	1A	Residence	132 Burdett Street	Type 2
81	216	1A	Residence	134 Burdett Street	Type 1
352	667	1A	Residence	8 Lochville Street	Type 2
353	669	1A	Residence	6 Lochville Street	Type 1
358	691	1A	Residence	27 Woonona Avenue North	Type 1
383	821	2A	Residence	4A Burns Road	Type 1
386	785	2A	Residence	28 Bareena Avenue	Type 1
390	735	2A	Residence	37B Bareena Avenue	Type 1
396	650	2A	Residence	118B Coonanbarra Road	Type 1
398	609	2A	Residence	21 Lochville Street	Type 1
413	743	2A	Residence	37A Bareena Avenue	Type 1
639	1161	1A	Residence	93 Alexandria Parade	Type 1
642	1088	1A	Residence	3A Benson Close	Type 1
643	1053	1A	Residence	5 Benson Close	Type 1
653	1017	1A	Residence	7A Benson Close	Type 1
1028	1617	5A	Residence	7 Lucinda Avenue	Type 1
1031	1656	5A	Residence	11A Lucinda Avenue	Type 1
3028	1897	3	Residence	59 Russell Avenue	Type 1
3029	1908	3	Residence	55 Russell Avenue	Type 2
3035	1899	3	Residence	53 Russell Avenue	Type 1
3052	1582	3	Residence	3 Pacific Highway	Type 2
3060	1892	3	Residence	52 Russell Avenue	Type 2
3061	1890	3	Residence	14 Pennant Hills Road	Type 2
3062	1914	3	Residence	16 Pennant Hills Road	Type 2
3063	1926	3	Residence	18 Pennant Hills Road	Type 2
3064	1931	3	Residence	20 Pennant Hills Road	Type 2
3065	1971	3	Residence	22 Pennant Hills Road	Type 2
3066	1982	3	Residence	24 Pennant Hills Road	Type 2
3067	1989	3	Residence	26 Pennant Hills Road	Type 2
3667	1896	3	Residence	61 Russell Avenue	Type 1
3732	1992	3	Residence	2A Edwards Road	Type 1
3952	1084	2A	Residence	30 Woonona Avenue	Type 1
NR-5	1574	1C	School	1711 Pacific Highway	Type 2
NR-14	1580	5C	Place of Worship	1711 Pacific Highway	Type 2

Table 6-36 Strata Groups Eligible for Consideration of Architectural Treatment for NorthConnex Northern

Address	ID WM	ID EIS	NCA	Unit/Address	Architectural Treatment Type
1 Aaron Pl	719	1844	4A	western façade/1 Aaron Place	Type 1
	731	1827	4B	13/1 Aaron Place	Type 1
	731	1827	4B	16/1 Aaron Place	Type 1
	731	1827	4B	14/1 Aaron Place	Type 1
	731	1827	4B	15/1 Aaron Place	Type 1
	731	1827	4B	17/1 Aaron Place	Type 1
	731	1827	4B	18/1 Aaron Place	Type 1
	735	1856	4A	26/1 Aaron Place	Type 2
	735	1856	4A	27/1 Aaron Place	Type 2
	735	1856	4A	28/1 Aaron Place	Type 2
	735	1856	4A	29/1 Aaron Place	Type 2
	736	1843	4B	22/1 Aaron Place	Type 2
	736	1843	4B	23/1 Aaron Place	Type 2
	736	1843	4B	24/1 Aaron Place	Type 2
	736	1843	4B	25/1 Aaron Place	Type 2
	742	1829	4B	19/ 1 Aaron Place	Type 1
	742	1829	4B	20/1 Aaron Place	Type 2
	742	1829	4B	21/1 Aaron Place	Type 2
1740 Pacific Hwy	725	1622	4A	49/1740 Pacific Highway	Type 1
	725	1622	4A	50/1740 Pacific Highway	Type 1
	725	1622	4A	51/1740 Pacific Highway	Type 1
	725	1622	4A	52/1740 Pacific Highway	Type 1
	734	1605	4B	1/1740 Pacific Highway	Type 2
	734	1605	4B	2/1740 Pacific Highway	Type 2
	734	1605	4B	3/1740 Pacific Highway	Type 2
	734	1605	4B	4/1740 Pacific Highway	Type 2
	734	1605	4B	5/1740 Pacific Highway	Type 2
	734	1605	4B	6/1740 Pacific Highway	Type 2
	738	1606	4B	10/1740 Pacific Highway	Type 2
	738	1606	4B	7/1740 Pacific Highway	Type 2
	738	1606	4B	8/1740 Pacific Highway	Type 2
	738	1606	4B	9/1740 Pacific Highway	Type 2
	739	1616	4B	11/1740 Pacific Highway	Type 1
	739	1616	4B	12/1740 Pacific Highway	Type 1
	739	1616	4B	13/1740 Pacific Highway	Type 1
1-3 Burns Rd	3988	929	2A	9/1-3 Burns Road	Type 1
	551	951	2A	6/1-3 Burns Road	Type 1
	551	951	2A	7/1-3 Burns Road	Type 1
2 Burns Rd	379	872	2A	2/2 Burns Road	Type 1
	379	872	2A	3/2 Burns Road	-

Address	ID WM	ID EIS	NCA	Unit/Address	Architectural Treatment Type
	380	858	2A	4/2 Burns Road	-
	380	858	2A	5/2 Burns Road	Type 1
27 Pennant Hills Rd	817	1998	5A	3/27 Pennant Hills Road	Type 2
	817	1998	5A	4/27 Pennant Hills Road	Type 2
10-12 Carrington Rd	68	269	1A	7/10-12 Carrington Road	Type 1
	69	255	1A	8/10-12 Carrington Road	Type 1
	82	248	1A	5/10-12 Carrington Road	Type 2
	82	248	1A	6/10-12 Carrington Road	Type 2
	84	299	1A	2/10-12 Carrington Road	Type 2
	84	299	1A	1/10-12 Carrington Road	Type 2
6-8 Carrington Rd	63	305	1A	2/6-8 Carrington Road	Type 1
	63	305	1A	3/6-8 Carrington Road	Type 1
7 Carrington Rd	85	346	1A	1/7 Carrington Road	Type 2
	85	346	1A	2/7 Carrington Road	Type 2
	86	371	1A	4/7 Carrington Road	Type 2
	86	371	1A	3/7 Carrington Road	Type 2
	87	396	1A	5/7 Carrington Road	Type 1
	87	396	1A	6/7 Carrington Road	Type 1
1707 Pacific Hwy	743	1575	1C	1/1707 Pacific Highway	Type 2
	743	1575	1C	2/1707 Pacific Highway	Type 2
	743	1575	1C	3/1707 Pacific Highway	Type 2
	743	1575	1C	4/1707 Pacific Highway	Type 2
1709 Pacific Hwy	769	1577	1C	1/1709 Pacific Highway	Type 2
	769	1577	1C	2/1709 Pacific Highway	Type 2
	769	1577	1C	3/1709 Pacific Highway	Type 2
	769	1577	1C	4/1709 Pacific Highway	Type 2
1 Deakin Way	3882	456	1A	1/4 Deakin Way	-
	56	437	1A	2/4 Deakin Way	Type 1
	88	424	1A	3/4 Deakin Way	Type 1
	88	424	1A	4/4 Deakin Way	Type 1
	88	424	1A	5/4 Deakin Way	Type 2
	3675	443	1A	6/4 Deakin Way	Type 2
	89	468	1A	7/4 Deakin Way	Type 1
5-7 Pacific Hwy	3051	1571	3	1/5-7 Pacific Highway	Type 2
	3051	1571	3	2/5-7 Pacific Highway	Type 2
	3051	1571	3	3/5-7 Pacific Highway	Type 2
	3051	1571	3	4/5-7 Pacific Highway	Type 2
	3051	1571	3	5/5-7 Pacific Highway	Type 2
	3051	1571	3	6/5-7 Pacific Highway	Type 2
	3051	1571	3	7/5-7 Pacific Highway	-
	3051	1571	3	8/5-7 Pacific Highway	-

Note: For more details on Strata groups, refer to Appendix I.

Table 6-37 Single Receivers Eligible for Consideration of Architectural Treatment for NorthConnex Southern and M2 Integration

ID WM	ID EIS	NCA	Type	Address	Architectural Treatment Type
2044	3478	10A	Residence	2 Eaton Road	Type 1
2109	3504	10A	Residence	22 Gum Grove Place	Type 1
2110	3533	10A	Residence	13 Gum Grove Place	Type 1
2172	3468	10C	Residence	50A Coral Tree Drive	Type 1
2173	3477	10C	Residence	56 Coral Tree Drive	Type 1
~~2233~~	~~3727~~	~~10C~~	~~Residence~~	~~29 Coral Tree Drive~~	Type 1 provided before reassessment
2238	3748	10C	Residence	32 Coral Tree Drive	Type 1
2239	3769	10C	Residence	30 Coral Tree Drive	Type 1
2240	3787	10C	Residence	28 Coral Tree Drive	Type 1
2241	3801	10C	Residence	26 Coral Tree Drive	Type 1
2242	3825	10D	Residence	24 Coral Tree Drive	Type 1
2243	3842	10D	Residence	22 Coral Tree Drive	Type 1
2325	4631	11A	Residence	70 Westmore Drive	Type 1
2327	4668	11A	Residence	74 Westmore Drive	Type 1
2328	4681	11A	Residence	76 Westmore Drive	Type 1
2435	5048	11A	Residence	14 Virginia Place	Type 1
2447	4912	11A	Residence	88 Westmore Drive	Type 1
2448	4910	11A	Residence	86 Westmore Drive	Type 1
2449	4740	11A	Residence	84 Wstmore Drive	Type 1
2491	4237	11B	Residence	5 Carmen Drive	Type 1
2501	4444	11B	Residence	25 Carmen Drive	Type 1
2502	4459	11B	Residence	27 Carmen Drive	Type 2
2503	4475	11B	Residence	29 Carmen Drive	Type 2
2504	4483	11B	Residence	31 Carmen Drive	Type 2
2505	4518	11B	Residence	33 Carmen Drive	Type 2
2519	4477	11B	Residence	46 Carmen Drive	Type 1
2520	4515	11B	Residence	48 Carmen Drive	Type 1
2521	4529	11B	Residence	50 Carmen Drive	Type 1
2522	4540	11B	Residence	52A Carmen Drive	Type 1
2524	4565	11B	Residence	56 Carmen Drive	Type 1
2526	4628	11B	Residence	53 Carmen Drive	Type 1
2527	4656	11B	Residence	2 Morton Avenue	Type 1
2528	4642	11B	Residence	4 Morton Avenue	Type 1
2563	4720	11B	Residence	100 Murray Farm Road	Type 1
2568	4770	11B	Residence	11 Wilshire Avenue	Type 1
2729	5155	12	Residence	24 Yale Close	Type 1
2860	5564	13	Residence	114-116 Barclay Road	Type 1
2861	5574	13	Residence	118 Barclay Road	Type 1

ID WM	ID EIS	NCA	Type	Address	Architectural Treatment Type
2862	5587	13	Residence	120 Barclay Road	Type 1
2872	5830	14	Residence	41 Williams Road	Type 1
2878	5790	14	Residence	29 Williams Road	Type 1
2880	5770	14	Residence	25 Williams Road	Type 1
2881	5754	14	Residence	23 Williams Road	Type 1
2882	5743	14	Residence	21 Williams Road	Type 2
2883	5731	14	Residence	19 Williams Road	Type 1
2884	5720	14	Residence	17 Williams Road	Type 1
2885	5706	14	Residence	15 Williams Road	Type 1
2887	5692	14	Residence	11 Williams Road	Type 1
2890	5638	14	Residence	8 Rajola Place	Type 1
2931	5836	14	Residence	43 Williams Road	Type 1
2983	5910	15B	Residence	41 Dremeday Street	Type 1
3003	5882	15B	Residence	48 Dremeday Street	Type 2
3012	5884	15B	Residence	46 Roland Avenue	Type 1
3013	5876	15B	Residence	48 Roland Avenue	Type 1
3918	4884	11B	Residence	15 Wilshire Avenue	Type 2
3934	5623	14	Residence	7 Rajola Place	Type 1
3936	5621	13	Residence	1 Mill Drive	Type 1

Table 6-38 Strata Groups Eligible for Consideration of Architectural Treatment for NorthConnex Southern and M2 Integration

Address	ID WM	ID EIS	NCA	Unit/Address	Architectural Treatment Type
42-44 Dremeday St	3002	5888	15B	1/42-44 Dremeday Street	Type 1
	3002	5888	15B	2/42-44 Dremeday Street	Type 1
	3002	5888	15B	3/42-44 Dremeday Street	Type 1
	3002	5888	15B	4/42-44 Dremeday Street	Type 1

Note: For more details on Strata groups, refer to Appendix I.

6.11 General Recommendations

The performance of a noise barrier is characterised by the combination of noise transmitted through the barrier and the sound diffracted around the barrier. If the sound transmitted through the barrier is negligible, the acoustic field in the shadow region is dominated by the sound diffracted around the barrier. In practice, noise barriers do not offer an insertion loss greater than 20dB.

For this project, noise barriers with a (R_W +C_{tr}) value of no less than 30dB is recommended, which will ensure that sound transmitted through the barrier is negligible compared with that diffracted over the barrier. Special attention must be given in their construction to avoid any flanking paths between two panels or underneath panels, as this may significantly decrease the effectiveness of the barriers. The document called "Noise wall design guideline - Design guidelines to improve the appearance of noise walls in NSW" released by RMS (RTA) in 2006 provides useful information regarding materials and consideration for the proposed noise barriers. In addition to aesthetic considerations, criteria for material selection for noise walls should include:

- Durability. Consider the design life of the wall. A wall that is expected to last for 25 years or more without reconstruction will need highly durable materials, especially in areas with aggressive climate conditions such as along the coast;
- Weathering. Consider the detailing of the wall. How will the material weather? Is it liable to stain or suffer other deleterious effects?;
- Vandal proofing. Ensure that materials are as vandal proof as possible. This generally rules out any lightweight or soft skin materials that can be cut or scratched, such as aluminium sandwich panels or high gloss plastics;
- Graffiti. How will the material react to graffiti and how easily can it be repaired? Consider the use of a rough textured finish to deter graffiti artists. Smooth surfaces are more attractive targets for tagging, but are easier to clean or repaint than textured finishes;
- Safety. Are there any risks inherent in the material?; and
- Fire retardance. Is the material flammable?

A list of materials typically used for the construction of noise barriers is presented as follows:

- Precast concrete;
- Masonry;
- Lightweight concrete panels;
- Stone;
- Gabions;
- Timber;
- Transparent panels (glass and plastics); and
- Metal.

All these materials could be used for the specific barrier design depending on the urban design principles.

7 BACKGROUND & AMBIENT NOISE MEASUREMENTS FOR COMPOUNDS OPERATIONS

This section provides ambient noise data in addition to the information provided in section 3, which is used to assess the operational noise impact associated with the operations of the permanent compounds.

The background and ambient noise level measurements carried out and reported in the EIS were based on measurement locations which were not considered to be appropriate for all noise environments relevant to the assessment of use of compounds. Accordingly, additional background and ambient noise measurements have been carried out to ensure that the background and ambient noise levels for all noise-sensitive receivers potentially affected by noise from the compounds are known. The measured data has been referred from the Noise & Vibration Baseline Information in Response to COA D9 Report 13245-CD-3 Version L which has been approved by Department of Planning and Environment.

7.1 Unattended Noise Monitoring Procedure

Table 7-1 shows the details of the noise monitoring locations whilst an aerial view can be seen in Appendix J.

Table 7-1 Unattended Noise Monitoring Locations (EIS and Condition D9)

Compound	Logger ID	Address
Northern	NCA-1A-T1	45 Bareena Avenue
	NL02[1]	4 Douglas Avenue, Wahroonga
	NCA-2A-T2	118A Coonanbarra Road
	NL03[1]	18 Woniora Avenue, Wahroonga
Northern Portal	NCA-3-T4	10 Pennant Hills Road
	NCA-5A-B6	23/1740 Pacific Highway
	NCA-5A-B8	9 Kingsley Close
Trelawney	NCA-6A-B9	223 Pennant Hills Road
	NCA-6B-B10	12 Trelawney Street
	NL09[1]	6 Trelawney Street, Thornleigh
	NCA-6C-B11	6 Duffy Avenue
Wilson	NCA-7A-B19	440 Pennant Hills Road
	NCA-7B-B18	1A Killaloe Avenue
	NL10[1]	18 Wilson Road, Pennant Hills
	NCA-7C-B12	449C Pennant Hills Road
Southern	NCA-8B-B13	606 Pennant Hills Road
	NL15[1]	28 Maher Close [1]
	NL13[1]	7 Eaton Road[1]
	NL16[1]	35 Coral Tree Drive
	NCA-10C-B16	35 Coral Tree Drive

Note: 1. Indicates noise logger results from EIS.

The unattended noise monitoring equipment used for these measurements consisted of an environmental noise logger set to A-Weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later analysis. The equipment calibration was checked before and after the survey and no significant disparity was observed.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the existing noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level and is represented by RBL. The L_{Aeq} level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels. This descriptor is used to measure and assess road traffic noise.

Meteorological data for the relevant periods was obtained from the nearest weather station at Sydney Olympic Park. Periods in which it was likely to be raining, or when wind speeds exceeded 5m/s at microphone height, were excluded from analysis, in accordance with principles agreed by the Environment Protection Authority (EPA).

7.2 Background and Ambient Noise Levels

The measurement locations and the measured daytime, evening and night time background and ambient noise levels are shown in Table 7-2. This table also shows the relevant noise levels measured and reported in the EIS where these were retained. All measurements were free-field measurements at a height of 1.5m above the ground.

Table 7-2 Background and Ambient Noise Levels

Compound	Logger ID	RBL			L_{AEQ}		
		Day	Eve	Night	Day	Eve	Night
Northern	NCA-1A-T1	55	48	38	61	60	56
	NL02[1]	56	54	43	60	59	57
	NCA-2A-T2	51	46	38	57	54	52
	NL03[1]	53	50	41	62	58	54
Trelawney	NCA-6A-B9	46	46	41	57	57	51
	NCA-6B-B10	45	43	38	45	43	38
	NL09[1]	47	47	39	59	56	52
	NCA-6C-B11	50	48	44	60	57	55
Northern Portal	NCA-3-T4	51	46	38	62	60	55
	NCA-5A-B6	47	45	40	52	51	47
	NCA-5A-B8	48	45	39	62	60	50
Wilson	NCA-7A-B19	57	52	43	66	65	64
	NCA-7B-B18	45	42	37	54	51	50
	NL10[1]	41	38	30	53	50	47
	NCA-7C-B12	58	54	42	68	64	63
Southern	NCA-8B-B13	52	51	44	52	51	44
	NL15[1]	48	48	44	56	55	53
	NL13[1]	44	44	39	55	53	51
	NL161	44	40	36	55	53	50
	NCA-10C-B16	43	43	40	52	58	49

Note: 1. Indicates noise logger results from EIS.

All measured noise levels were analysed in order to utilise the most representative noise logger locations only. Table 7-3 shows the reasons considered for the inclusion and exclusion of the noise loggers.

Table 7-3 Selection of Representative Unattended Noise Monitoring Locations

Compound	Logger ID	Comments
Northern	NCA-1A-T1	Location considered representative of noise environment.
	NL02[1]	Location excluded as background noise levels are significantly higher compared to location NCA-1A-B4. Noise levels likely to be affected by traffic on Edgeworth David Avenue.
	NCA-2A-T2	Location considered representative of noise environment
	NL03[1]	Location excluded due to the close proximity to the road. Background noise levels slightly higher here compared to location NCA-2A-T2.
Northern Portal	NCA-5A-B6	Location considered representative of noise environment
Trelawney	NCA-6A-B9	Location excluded as background noise levels measured at location NL09 are slightly more conservative.
	NCA-6B-B10	Location considered representative of noise environment.
	NL09[1]	Location considered representative of noise environment.
	NCA-6C-B11	Location excluded as non-residential criterion has been considered at this location.
Wilson	NCA-7A-B19	Location considered representative of noise environment.
	NCA-7B-B18	Location considered representative of noise environment.
	NL10[1]	Location considered representative of noise environment.
	NCA-7C-B12	Location excluded as non-residential criterion has been considered at this location.
Southern	NCA-8B-B13	Location considered representative of noise environment.
	NL15[1]	Location considered representative of noise environment.
	NL13[1]	Location considered representative of noise environment.
	NL16[1]	Location excluded as background noise levels are more current at location NCA-10C-B16.
	NCA-10C-B16	Location considered representative of noise environment.

Note: 1. Indicates noise logger results from EIS.

8 COMPOUNDS OPERATIONAL NOISE CRITERIA

8.1 Industrial Noise Policy (INP)

The *NSW Industrial Noise Policy (INP)* recommends two noise criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise at residences. In most situations for continuous noise, one of these is more stringent than the other and is the controlling noise criterion for assessment purposes. The noise criteria are based on the L_{Aeq} descriptor, which is explained in the Glossary of Acoustic Terms.

8.1.1 Intrusiveness Noise Criteria

Intrusiveness criteria apply for residential receivers only.

The intrusiveness criterion requires that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the Rating Background Noise Level (RBL) by more than 5dB. The RBL represents the 'background' noise in the area, and is determined from measurement of L_{A90} noise levels, in the absence of noise from the source. The definition of L_{A90} and the procedure for calculating the RBL is given in Glossary of Acoustic Terms.

The relevant intrusiveness criteria for each compound of this project are shown in Table 8-1. This table only contains the relevant locations in accordance with Table 7-3.

Table 8-1 Intrusiveness Criteria, $L_{Aeq,15\ min}$ dBA

Compound	Logger ID	L_{AEQ}		
		Day	Eve	Night
Northern	NCA-1A-T1	60	53	43
	NCA-2A-T2	56	51	43
Northern Portal	NCA-5A-B6	52	50	45
Trelawney	NCA-6B-B10	50	48	43
	NL09[1]	52	52	44
Wilson	NCA-7A-B19	62	57	48
	NCA-7B-B18	50	47	42
	NL10[1]	46	43	35
Southern	NCA-8B-B13	57	56	49
	NL15[1]	53	53	49
	NL13[1]	49	49	44
	NCA-10C-B16	48	48	45

Note: 1. Indicates noise logger results from EIS.

8.1.2 Amenity Noise Criteria

The amenity criteria sets a limit on the total noise level from *all industrial noise sources* affecting a receiver. Different criteria apply for different types of receiver (eg. residence, school classroom); different areas (eg. rural, suburban); and different time periods, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am).

The noise level to be compared with this criterion is the L_{Aeq} noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources, such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion.

However, if there is significant existing industrial noise, the criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the *INP.* The relevant amenity criteria for this project are shown in Table 8-2.

Given the location of the compounds there are no other existing industrial noise sources in the vicinity of potentially-affected receivers, and hence the full amenity limits would apply to this project.

Table 8-2 NSW EPA Amenity Criteria – Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Period	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
Place of worship – internal	All	When in use	40	45
Commercial Premises	All	When in use	65	70

In addition, in areas of high traffic noise where the industrial sources are effectively inaudible, the amenity criterion for noise from industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 10dB. Details of situations where this criterion may apply can be found in section 2.2.3 of the *INP*. As traffic is the dominant noise source in the areas of interest, the ambient noise levels L_{Aeq} shown in Table 7-2 have been utilised to adjust the recommended amenity criterion. However, as future traffic noise levels are forecast to differ when compared to existing traffic noise levels, a correction has been applied to the measured L_{Aeq}'s prior to modifying the recommended amenity criterion. A conservative approach has been considered in this assessment. Traffic volumes were referenced from data provided by AECOM's Principal Transport Planner. The following corrections have been applied:

- L_{Aeq}'s measured at locations NCA-1A-B4 and NCA-2A-T2 have not been modified as traffic surrounding the Northern Compound is expected to increase due to the project;
- Heavy vehicle traffic on Pennant Hills Road in the area of the Trelawney Compound is expected to decrease by approximately 50% due to the project. As a result of this, a correction of -2dB has been applied to the L_{Aeq} measured at locations NCA-6B-B10 and NL09;

- Heavy vehicle traffic on Pennant Hills Road in the area of Wilson Compound is expected to decrease by approximately 60% due to the project. As a result of this, a correction of -4dB has been applied to the L_{Aeq} measured at locations NCA-7A-B19, NCA-7B-B18 and NL10.
- Heavy vehicle traffic in the proximity of locations NCA-8B-B13 and NL13 is expected to decrease by approximately 60% due to the project. As a result of this, a correction of -3dB has been applied to the L_{Aeq} measured at these locations.
- Light and heavy vehicle traffic in the proximity of location NL15 is expected to slightly decrease. As a result of this, a conservative correction of -1dB has been applied to the L_{Aeq} measured at this location.
- Light and heavy vehicle traffic in the proximity of location NCA-10C-B16 is expected to slightly increase and decrease respectively. As a result of this, a conservative correction of -1dB has been applied to the L_{Aeq} measured at this location.

The relevant adjusted amenity criteria for this project are shown in Table 8-3.

Table 8-3 Amenity Criteria, $L_{Aeq,period}$ dBA

Compound	Logger ID	L_{AEQ}		
		Day	Eve	Night
Northern	NCA-1A-T1	55	50	46
	NCA-2A-T2	55	45	42
Northern Portal	NCA-5A-B6	55	45	40
Trelawney	NCA-6B-B10	55	45	40
	NL09[1]	55	45	40
	Commercial Premises	65	65	65
	Place of worship external*	50	50	50
Wilson	NCA-7A-B19	55	51	50
	NCA-7B-B18	55	45	40
	NL10[1]	55	45	40
Southern	NCA-8B-B13	55	45	40
	NL15[1]	55	45	42
	NL13[1]	55	45	40
	NCA-10C-B16	55	47	40

Notes: 1. Indicates noise logger results from EIS.
* Indicates external noise level. It is assumed that the structure offers a conservative transmission loss of 10dB.

8.1.3 Sleep Disturbance Noise Criterion

Short term noise level events, such as engines starting, doors closing, truck pass-bys, and handling of materials, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The *INP* does not specifically address sleep disturbance from high noise level events.

There is no universally accepted criterion governing the likelihood of sleep disturbance. In other words, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance (for all or even a majority of people).

The Application notes of the *INP* states the following:

- *From the research, the EPA recognised that the current sleep disturbance criterion of an $L_{A1, (1\ minute)}$ not exceeding the $L_{A90, (15\ minute)}$ by more than 15 dBA is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.*

This approach has been utilised for Northern, Wilson and Trelawney compounds.

The *Road Noise Policy (RNP*) provides additional discussion of sleep disturbance impacts due to intermittent noise, and this has been used when assessing sleep disturbance for Southern Compound. A summary of the discussion of sleep disturbance contained in the *RNP* is as follows:

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

An internal noise level of 50dBA is equivalent to an external noise level of 60dBA with windows open, and this level has been adopted as the sleep disturbance criterion for the Southern compound.

8.2 Operational Project-Specific Industrial Noise Criteria

According to the *INP*, it is recommended that the more stringent noise limits be applied to protect the existing acoustic amenity from deteriorating.

It should be noted that different time periods apply for the noise criteria as the intrusive criterion considers a 15-minute assessment period while the amenity criterion requires assessment over the total length of time period that a site is operational within each day, evening or night. However, in order to ensure compliance under all circumstances, a 15-minute period assessment has conservatively been considered for both forms of criterion.

The modifying factors such as tonality or low frequency are to be applied when necessary in accordance with the character of total noise at the receiver, not in accordance with the character of noise from any particular noise source.

The selected project-specific noise levels (PSNL) and the sleep disturbance criteria associated with continuous operational noise are presented in Table 8-4. Both intrusiveness and amenity criterion have been considered to establish the PSNL. A graphical representation of all areas covered by the PSNL can be seen in Appendix J.

Table 8-4 Summary of Operational Noise Criteria –dBA

Compound	Logger ID Representative of the Area	PSNL L_{Aeq}			Sleep Disturbance L_{Amax}
		Day	Eve	Night	Night
Northern	NCA-1A-T1	55	50	43	53
	NCA-2A-T2	55	45	42	53
Northern Portal	NCA-5A-B6	52	45	40	60
Trelawney	NCA-6B-B10	50	45	40	53
	NL09[1]	52	45	40	54
	Commercial Premises	65	65	65	-
	Place of worship – external*	50	50	50	-
Wilson	NCA-7A-B19	55	51	48	58
	NCA-7B-B18	50	45	40	52
	NL10[1]	46	43	35	45
Southern	NCA-8B-B13	55	45	40	60
	NL15[1]	53	45	42	60
	NL13[1]	49	45	40	60
	NCA-10C-B16	48	47	40	60

Notes: 1. Indicates noise logger results from EIS.
- Indicates not applicable.
* Indicates external noise level. It is assumed that the structure offers a conservative transmission loss of 10dB.

At the Southern Compound, the PSNL needs to be shared between the following noise sources;

- Tunnel ventilation systems associated with the main ventilation building at the southern part of the site and jet fans within the tunnels escaping at the portals;
- Mechanical plant associated with the Motorway Operations Centre; and
- Vehicular movements on this site at both daytime and night time.

This is discussed in Section 9.4.

9 PREDICTED OPERATIONAL NOISE LEVELS & ASSESSMENT

Air Noise Environment have assessed all mechanical systems noise at each site and the jet fan noise from the tunnel portals. Wilkinson Murray have assessed the remaining operational noise (vehicle movements), which only affects the Southern Compound.

Two main ventilation outlets VSO1 – Southern and VSO4 - Northern will be constructed as part of the project (refer Figure 2-1). The tunnel ventilation system has been designed to utilise a series of axial and jet fans to regulate air flows through the tunnels and thereby exhaust flows from the ventilation outlets.

Axial fans located within the ventilation outlet buildings are used to control the air movement from the tunnels and out of the ventilation outlets. In addition, a separate exhaust system is included in the NorthConnex design to control emissions during emergency or abnormal operations. Emissions during these conditions are transported along separate exhaust ducts at midpoints of the mainline tunnel and emitted via a separate exhaust outlet contained within the ventilation outlet buildings locations VSO2 – Wilson and VSO3 – Trelawney (refer Figure 2-1).

These facilities will provide make-up air at intermediate locations along the mainline tunnel and are able to operate in reverse to extract air from the tunnel in an emergency. The acoustic assessments have been completed based on the passive make-up operation only, except for consideration of achieving NR85 in-tunnel during emergency smoke mode and emergency testing.

Jet fans are to be used primarily as a means of controlling the speed and quantity of air flowing through the tunnel and tunnel portals. This includes fan operation both with and against the flow of traffic. The jet fans are only operated in reverse in the off ramps to prevent portal emissions. This control of air is required to maintain the ventilation system operations within the project constraints.

The assessment of emissions from noise sources included in the NorthConnex ventilation design has considered noise emissions from a range of sources including jet fans, axial fans, electrical substations and condenser units.

Table 9-1 provides a summary of the noise sources identified in each of the main VSO areas considered in the assessment (i.e. the area surrounding the northern ventilation outlet building VSO4, southern ventilation outlet building VSO1, and the emergency facilities Wilson VSO2 and Trelawney VSO3).

Noise from additional facilities and tunnel portals has also been considered as follows; Coral Tree Drive Transformer facility, Ventilation Egress Passage, M120, Maintenance Yard, Motorway Control Centre (MCC) Building as part of the VS01 Southern Compound and the Wahroonga Interchange portal emissions.

The detailed assumptions and noise assessment for each area is provided in Appendix K.

LLBJV, in conjunction with Air Noise Environment Pty Ltd, have identified noise sources and operating scenarios for consideration in the modelling. LLBJV nominated specific operating conditions for the assessment and provided source noise data from equipment suppliers for integration in the noise modelling assessment of environmental noise emissions. This information has been based on the selected plant and equipment and the final project design.

Table 9-1 Summary of Noise Sources Considered in Assessment

Source Type	VSO1 – South	VSO2 – Wilson	VSO3 – Trelawney	VSO4 – North
Ventilation Building Noise • Emissions from Ventilation Release Point • Noise transmission through ventilation building (roof and walls)	Yes	Yes	Yes	Yes
External Electrical Substation Noise • Air cooling condensers • Electrical transformers	Yes	Yes	-	Yes
Noise within Tunnels • Jet Fans • Noise transferred to driven tunnel from ventilation outlet buildings	Yes	Yes	Yes	Yes
Noise Emitted from Tunnel Portals • Jet Fans • Noise transferred to driven tunnel from ventilation outlet buildings	Yes	-	-	Yes
Maintenance Auxiliary Plant	Yes	Yes	-	Yes
Fire Services – Deluge Water Pumps	-	-	-	Yes
Water Treatment Plant	Yes	-	-	-

Noise predictions associated with the typical operation of the compounds have been conducted. The noise modelling was used to assess the potential for noise impact at the nearby surrounding receivers.

Site related operational noise emissions were modeled using the "SoundPLAN 7.4" acoustic noise prediction software. Air Noise Environment used CadnaA. Factors that are addressed in the noise modeling are:

- Equipment sound level emissions and location;
- Attenuation along ducts and silencers
- Transmission loss of building elements
- Screening effects from buildings and barriers;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

To allow assessment of cumulative noise from each of the ventilation stations, noise emissions from other ancillary equipment associated with ventilation buildings and substation buildings (such as condenser units, exhaust fans, supply air fans, relief air fans and transformers) were also included in the ventilation facility noise models.

Mitigation measures were then determined for the ancillary equipment and buildings (e.g. silencers, acoustic louvres, acoustic doors, etc) so that the total predicted cumulative noise remained within the project criterion.

It is assumed in the modelling that the water treatment plant, substation facilities, and all appropriate condenser units operate continuously (where redundant units are installed, only the duty units are modelled).

Typically, modelling and mitigation of general maintenance activities has been based on these activities occurring during the night period, to be conservative. Noise from fire pumps operating in an emergency situation (and during routine testing) were designed to comply with the daytime and evening noise criteria for operation of the electric pumps, and daytime criteria for the diesel pumps inside the fire pump room. This is because noise testing of emergency plant is a routine requirement. It is noted, however, that in an emergency event, operation of this plant could occur at night and may last for several hours. Modelling investigation of completing the routine testing during night period identified significant non-compliances. Therefore, it is recommended, where possible, that the operational procedures should avoid programming routine testing of this plant during the night and evening periods.

9.1 VS04 – Northern

The site location and nearest receivers are shown in Figure 9-1.

Figure 9-1 VS04 – Northern Layout & Receivers

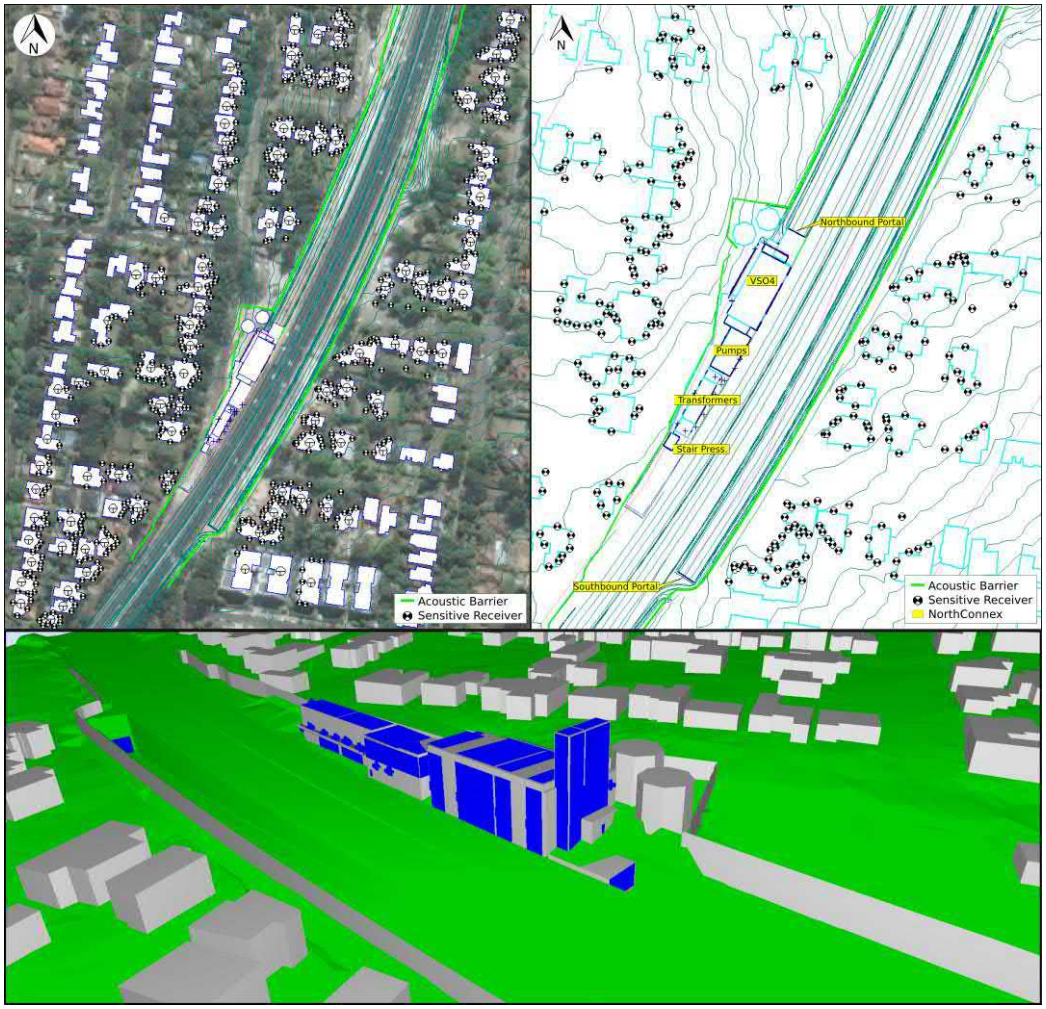
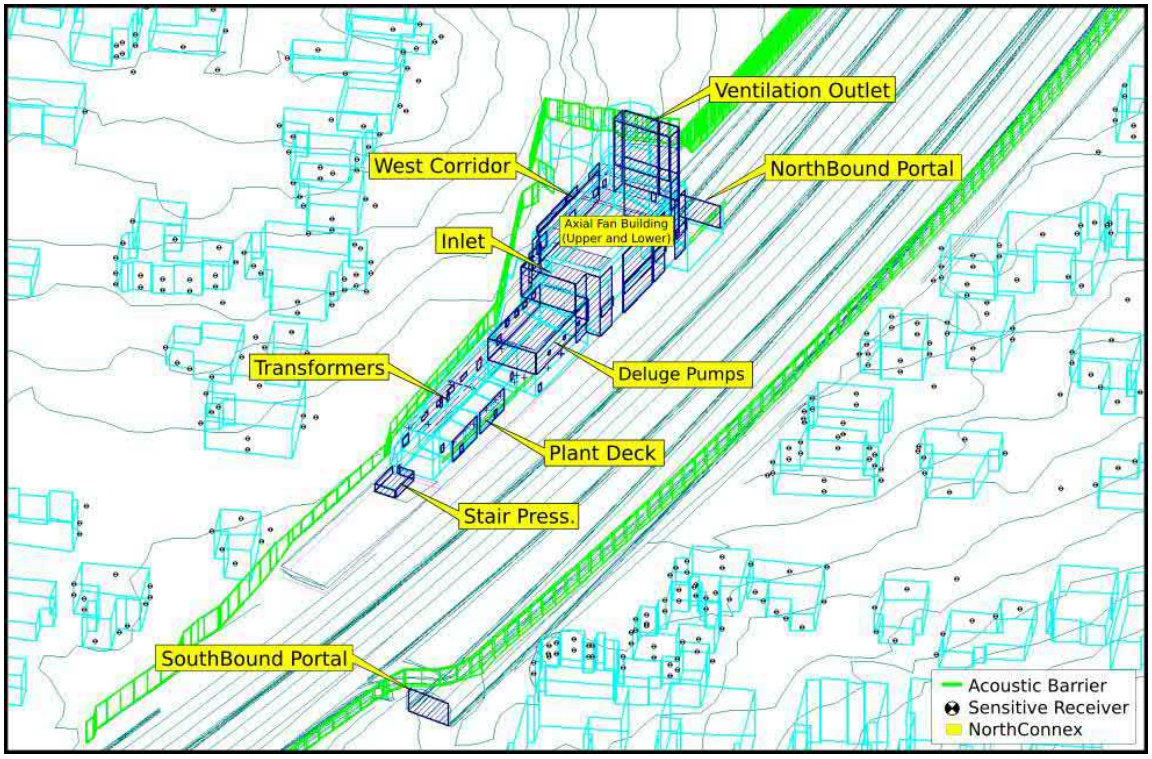


Figure 9-2 presents a 3-D wire-model prepared using the acoustic model to illustrate the relevant areas of the VSO4 building and nearest sensitive receptors.

Figure 9-2 VSO4 3-D Model & Location of Nearest Sensitive Receptors



Noise prediction for VSO4 operations assumed three scenarios (all fans and plant items operating) impacting on the surrounding sensitive receiver area. The three operational scenarios are summarised below:

- Scenario 1: 4 off Axial fans operating at 100%. Daytime and evening criteria.
- Scenario 2: 5 off Axial fans operating at 80%. Day, evening and night time criteria.
- Scenario 3: 5 off Axial fans operating at 72%. Day, evening and night time criteria.

Figure 9-3 presents graphical representation of the noise predictions on the surrounding areas for the worst-case night time modelled scenario – Scenario 2.

The results indicate that the predicted receptor noise levels are within the adopted night time criteria for all receivers, under all of the normal operating scenarios considered. It is noted that Scenario 1 is not proposed to occur outside daytime hours, however consideration of the potential for early morning traffic congestion (before 7.00am) to necessitate Scenario 1 fan operations has been assessed against the night time criteria. Maintenance testing during other periods has been considered in the following section for daytime/evening periods.

The partial noise level results for detailed individual receiver analysis were reviewed during the detailed design phase. This identified the relative impact from each noise source, and assisted in focusing design, location, mitigation, and overall optimisation of noise emissions from the project. The resulting predictions have aided in establishment of required barrier heights, silencers and attenuators, building materials, and selection of mechanical plant items.

The daytime and evening periods have criteria at least 3dBA higher than the night. Therefore,

compliance is predicted for all areas and normal operation scenarios for these periods.

The predicted noise levels (Appendix K) are compared to the relevant acoustic criteria for the operational period. The predicted noise levels are L_{Aeq} do not include a facade correction. This is in accordance with the requirements of the *INP* and allows direct comparison with the free field criteria adopted for the airborne noise assessment.

Figure 9-3 Noise Contour Plot – VSO4 (Northern), Scenario 2 - 5 off Axial fans operating at 80%. Day, evening and night time criteria

Compliance with the acoustic assessment criteria is predicted at all sensitive receivers in the surrounding area of VSO4, based on the building design, equipment performance, and attenuator performance items detailed in Appendix K:

Review of the results and partial noise levels indicate that predicted receptor noise levels are within the adopted criteria for all receivers, during the proposed operating hours.

9.2 VS02 – Wilson

The site location and nearest receivers are shown in Figure 9-4.

Figure 9-4 VS02 – Wilson Layout & Receivers

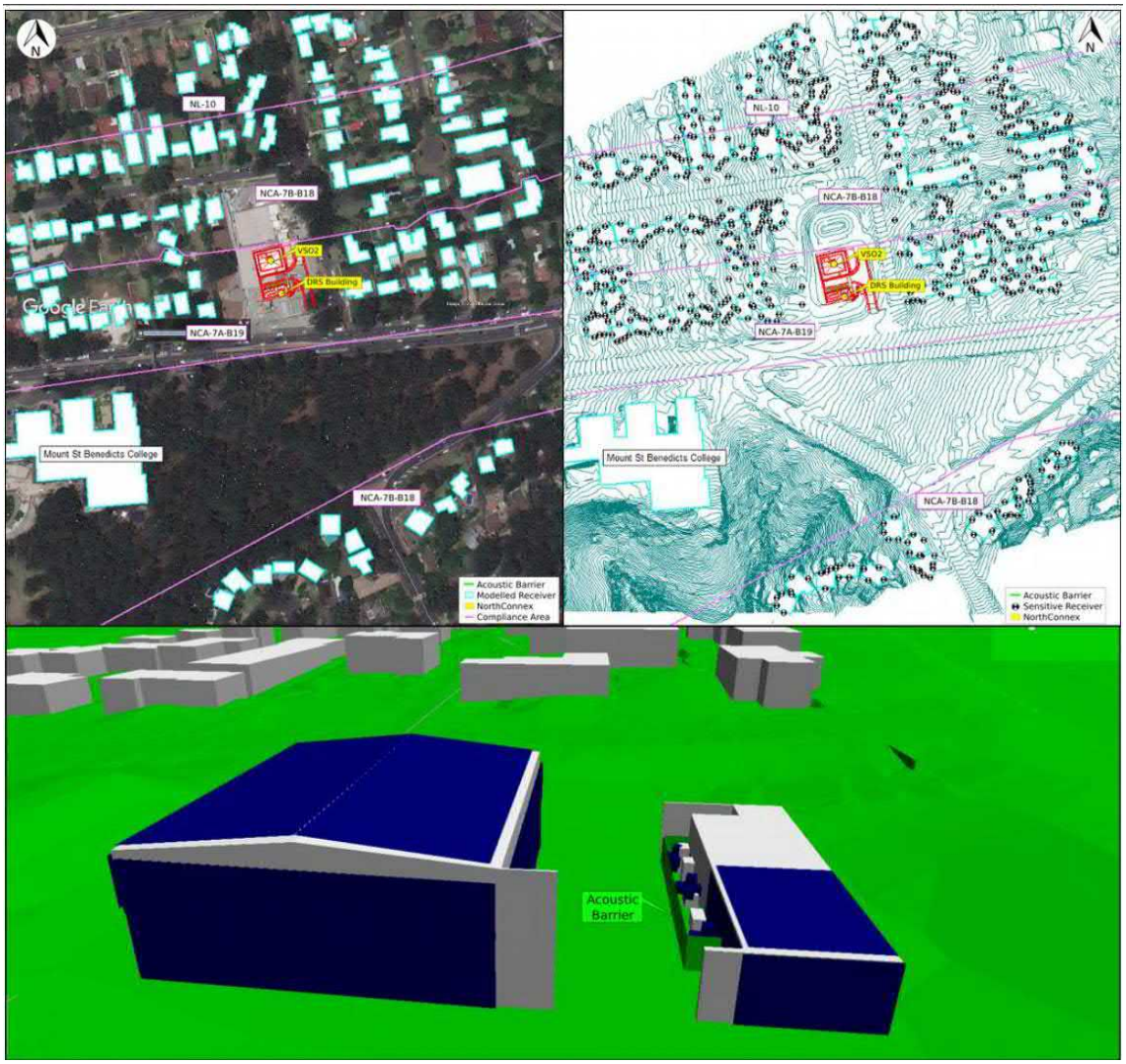
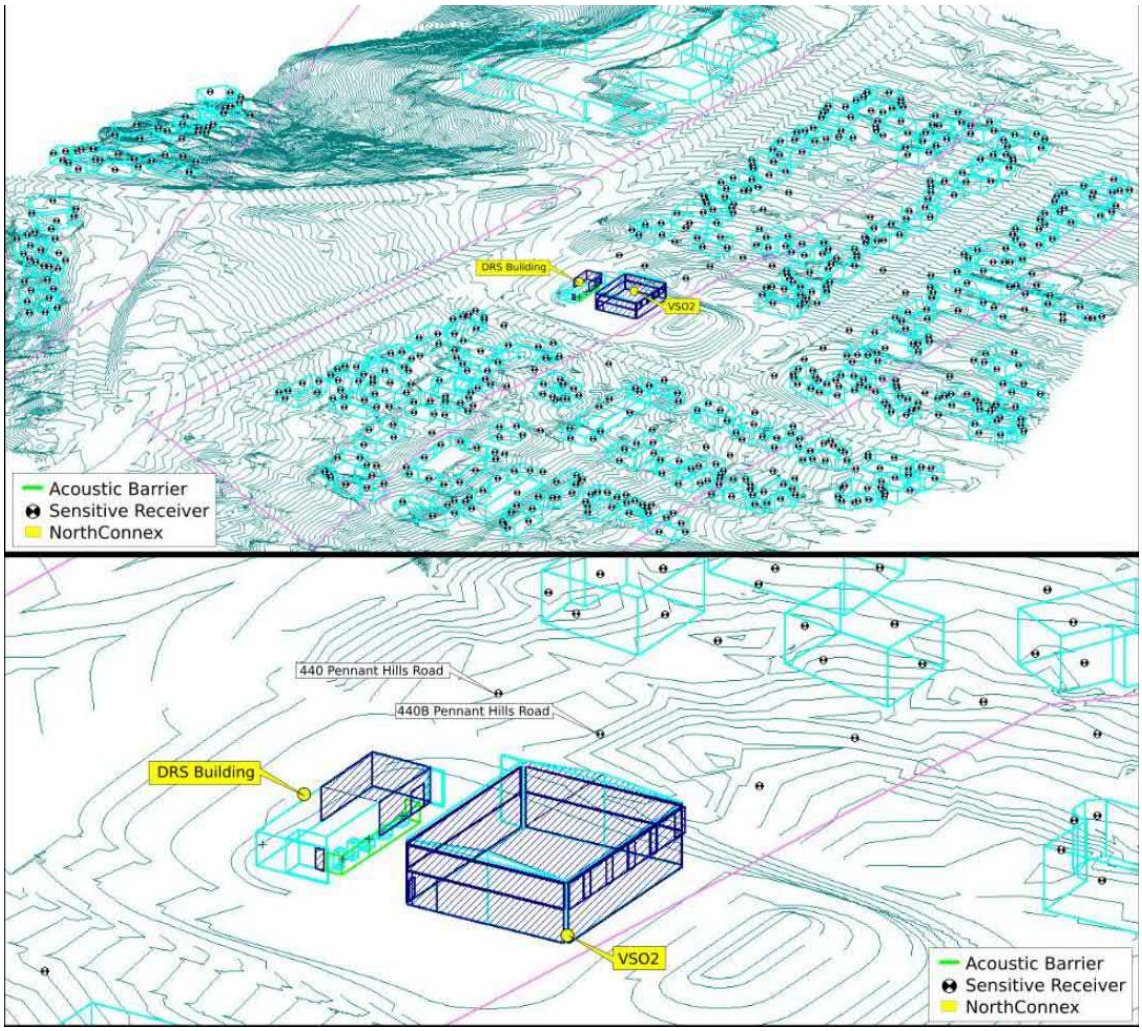


Figure 9-5 presents a 3-D wire-model prepared using the acoustic model to illustrate the relevant areas of the VSO2 building and nearest sensitive receptors.

Figure 9-5 VSO2 3-d Model & Location of Nearest Sensitive Receptors



Noise prediction for VSO2 operations assumed two scenarios (all fans and plant items operating) impacting on the surrounding sensitive receiver area. The three operational scenarios are summarised below:

- Scenario 1: 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night.
- Scenario 2: 3 x Axial fans operating at 100%, in forward mode. Emergency only.

Figure 9-6 presents graphical representation of the noise predictions for the surrounding areas for the modelled scenarios.

The results indicate that the predicted receptor noise levels are within the adopted night time criteria for all receivers, under the relevant operating scenario (Scenario 1) It is noted that Scenario 2 relates to an emergency event. Therefore, external compliance has not been reviewed. However, the modelling has considered the requirement to achieve NR85 within the driven-tunnel during this operation (to allow audibility of emergency messages within the tunnel).

Maintenance testing of the fans operating in the FWD mode will not include full operation of all 3

fans hence noise emissions will be significantly lower than during an emergency event.

Review of the partial noise level results for individual receivers was completed during the detailed design phase. This identifies the relative impact from each noise source, and assists in focusing design, location, mitigation, and overall optimisation of noise emissions from the project. The resulting predictions allow determination of required barrier heights, silencers and attenuators, building materials, and selection of mechanical plant items.

The noise predictions for the final design indicate compliance with the assessment criteria for all modelled sensitive receiver buildings, inclusive of a 7dB risk adjustment factor.

It should be noted that the assessment included representative modelling positions for the pre-existing 440 Pennant Hills Road sensitive receivers. This property has been utilised during the construction phase of the project, however is currently designated to be returned to use as a residential allotment at completion (and therefore will be present during the operational phase).

The daytime and evening periods have criteria at least 5dBA higher than the night for all zones.

Therefore, compliance is predicted for all areas and scenarios for these periods, based on compliance for the night time.

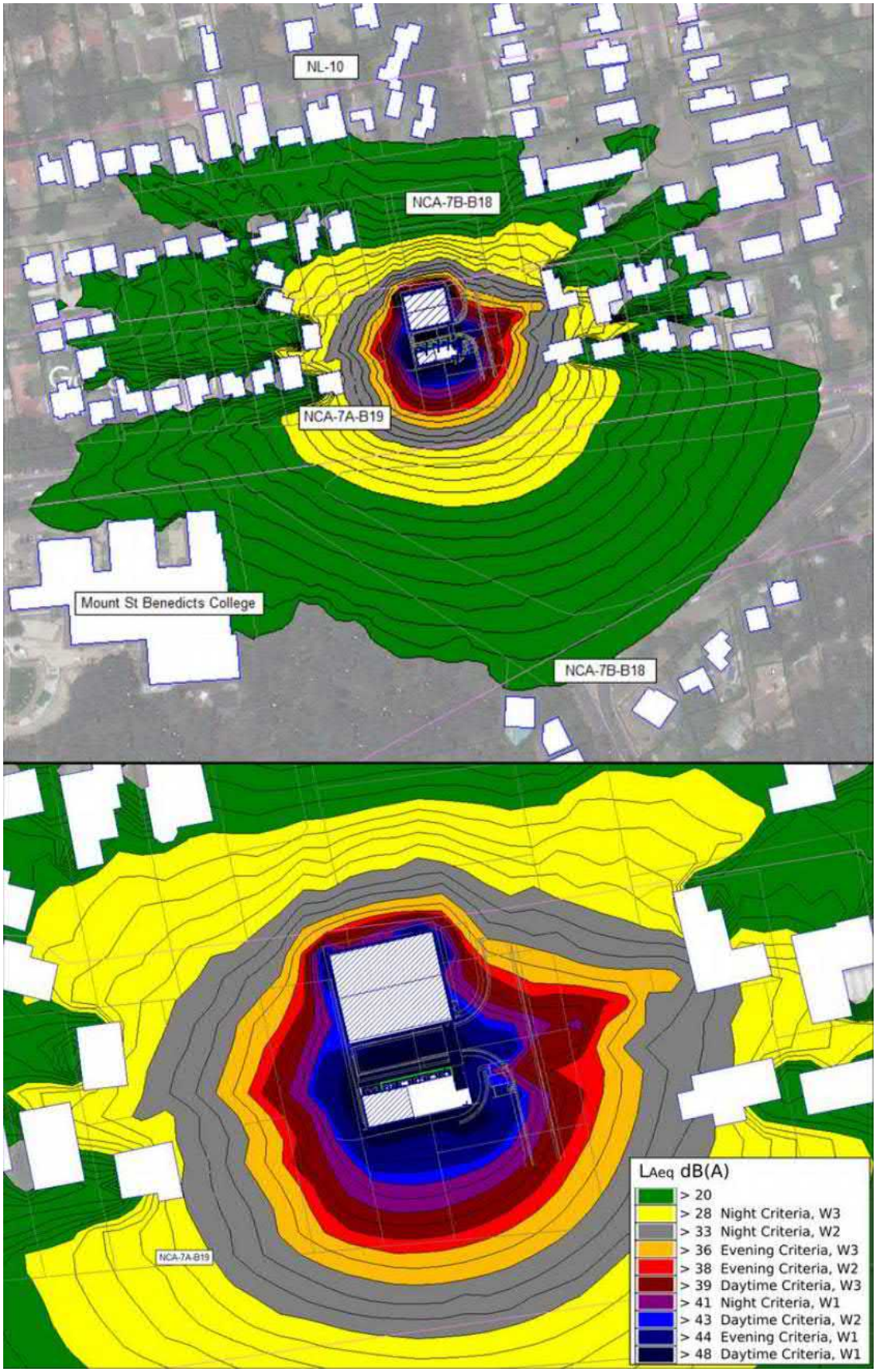
The predicted noise levels (Appendix K) are compared to the relevant acoustic criteria for the operational period. The predicted noise levels are L_{Aeq} and do not include a facade correction. This is in accordance with the requirements of the *INP*, and allows direct comparison with the free field criteria adopted for the airborne noise assessment.

Compliance with the acoustic assessment criteria is predicted at all sensitive receivers (including 440 Pennant Hills Road) in the area surrounding VSO2, based on the following building design, equipment performance, and attenuator performance items in Appendix K:

- including a 2.2m acoustic barrier to external plant bay of DRS building.

For the most restrictive criteria (night time) of 41, 33, or 28 dBA for the 3 identified zones setback from Pennant Hills Road, full compliance is predicted at all sensitive receivers.

Figure 9-6 Noise Contour Plot – VSO2 (Wilson), Scenario 1: Fresh Air 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night.



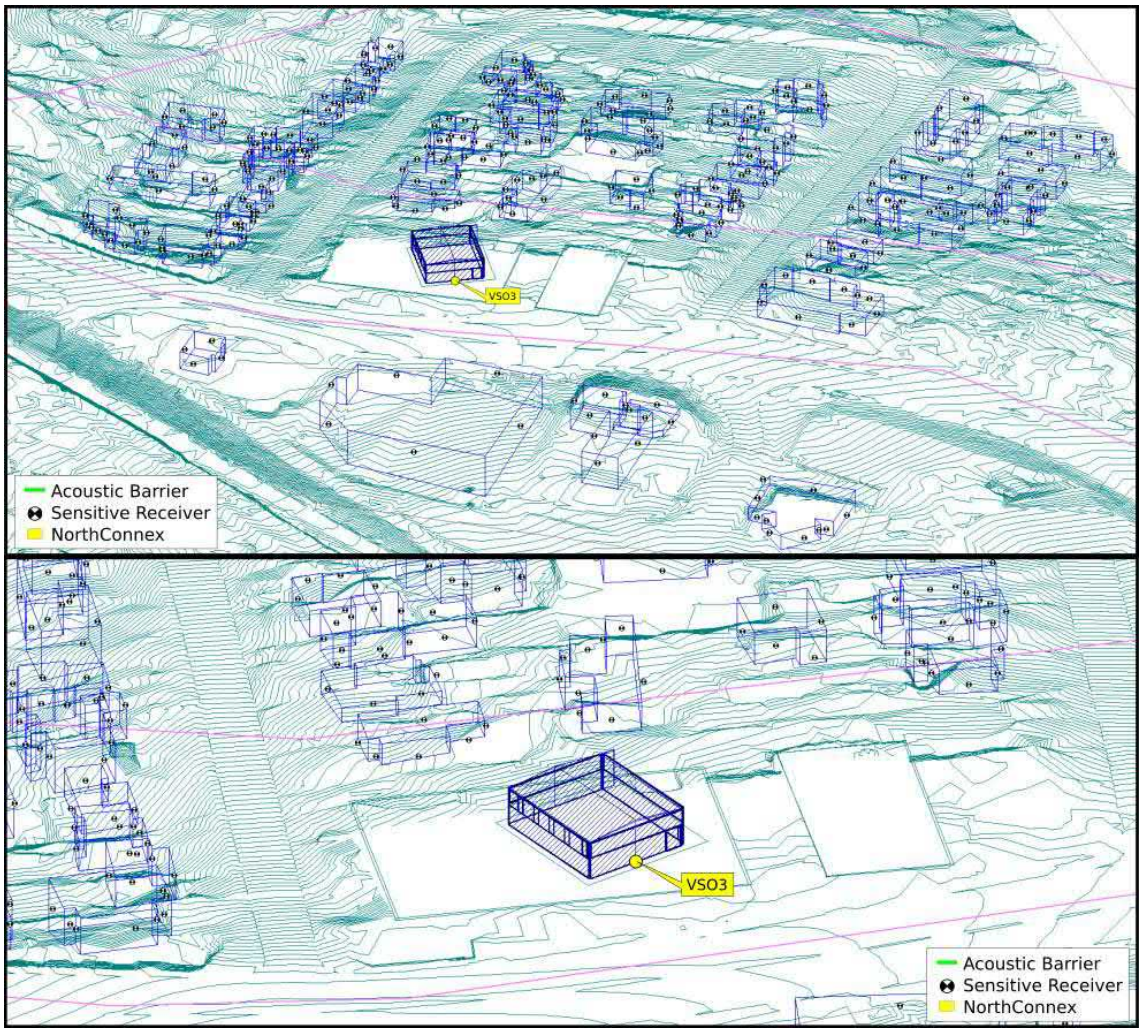
9.3 VS03 – Trelawney

The site location and nearest receivers are shown in Figure 9-7.

Figure 9-7 VS03 – Trelawney Layout & Receivers

Figure 9-8 presents a 3-D wire-model prepared using the acoustic model to illustrate the relevant areas of the VSO3 building and nearest sensitive receptors.

Figure 9-8 VSO3 3-D Model & Location of Nearest Sensitive Receptors



Noise prediction for VSO3 operations assumed two scenarios (all fans and plant items operating) impacting on the surrounding sensitive receiver area. The three operational scenarios are summarised below:

- Scenario 1: 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night.
- Scenario 2: 3 x Axial fans operating at 100%, in forward mode. Emergency only.

Figure 9-9 present graphical representation of the noise predictions for the surrounding areas for the modelled scenarios.

The results indicate that the predicted receptor noise levels are within the adopted night time criteria for all receivers, under the relevant operating scenario (Scenario 1).

It is noted that Scenario 2 will occur only during an emergency event. Therefore, compliance with external noise criteria have not been completed. However, the modelling has considered the requirement to achieve NR85 within the driven-tunnel during this operation (to allow audibility of emergency messages within the tunnel). Maintenance testing of the fans operating in the FWD

mode will not include full operation of all 3 fans and in-tunnel noise levels will be significantly lower than during an emergency event.

Review of the partial noise level results for detailed individual receiver analysis were completed during the detailed design phase. This identifies the relative impact from each noise source, and assists in focusing design, location, mitigation, and overall optimisation of noise emissions from the project. The resulting predictions have provided for determination of required barrier heights, silencers and attenuators, building materials, and selection of mechanical plant items.
The noise predictions for the final design indicate compliance with the assessment criteria for all modelled sensitive receiver buildings, inclusive of a 7dB risk factor.

The daytime and evening periods have criteria at least 5dBA higher than the night for all zones.

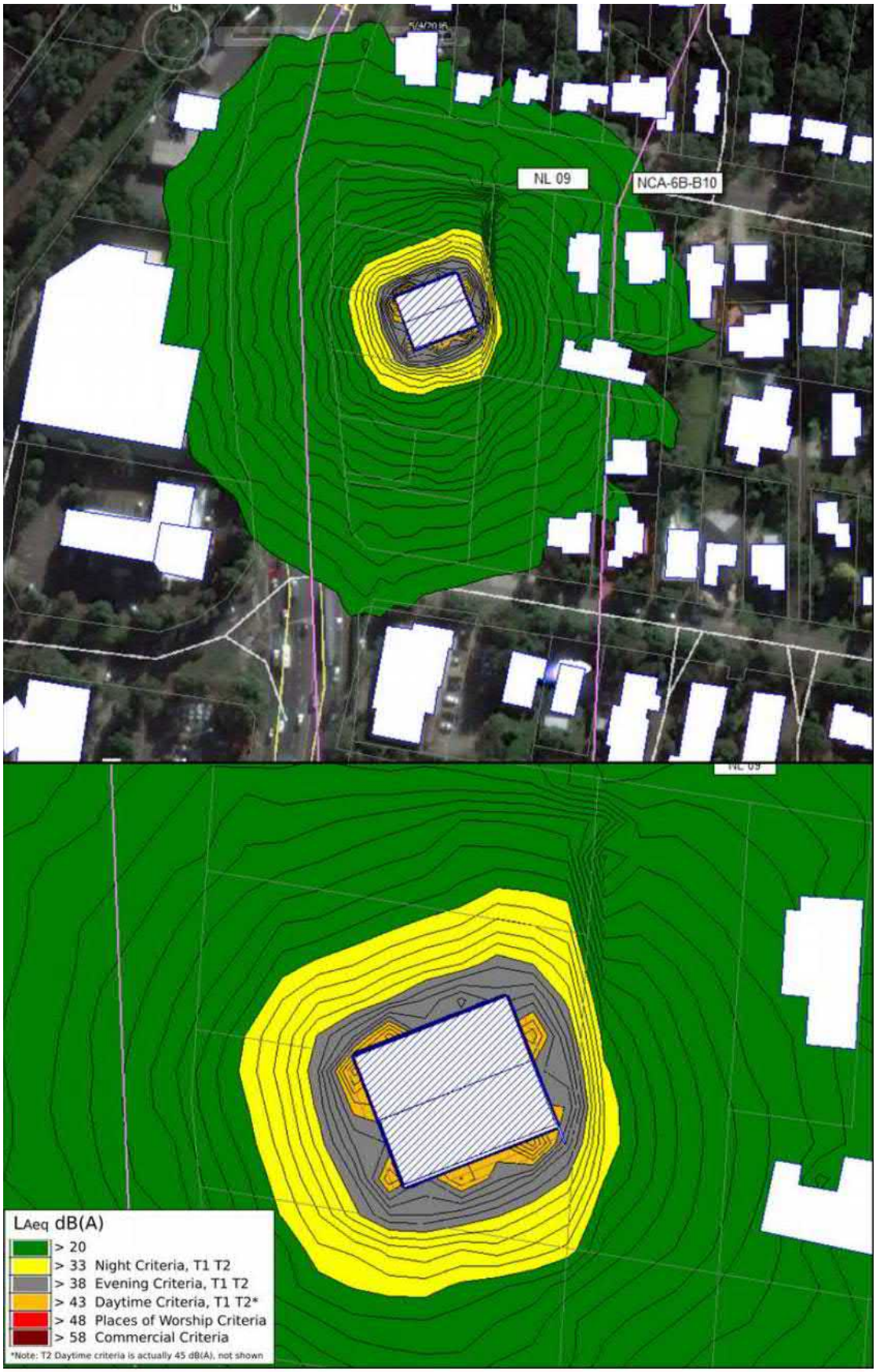
Therefore, compliance is predicted for all areas and scenarios for these periods, based on compliance for the night time.

The predicted noise levels (Appendix K) are compared to the relevant acoustic criteria for the operational period. The predicted noise levels are presented as L_{Aeq} values, and do not include a facade correction. This is in accordance with the requirements of the *INP*, and allows direct comparison with the free field criteria adopted for the airborne noise assessment.

Compliance with the acoustic assessment criteria is predicted at all sensitive receivers (including commercial and places of worship) in the area surrounding VSO3, based on the following building design, equipment performance, and attenuator performance in Appendix K.

For the most restrictive criteria (night time) of 33dBA for the nearest and most affected sensitive receivers, full compliance is predicted. Compliance is also predicted at nearby commercial receivers and places of worship.

Figure 9-9 Noise Contour Plot – VSO3 (Trelawney), Scenario 1: Fresh Air - 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night



9.4 VS01 – Southern Compound, Coral Tree Drive & Motorway Operations Centre

The Southern compound involves a larger number of noise sources, such as ventilation fans, condensers at several buildings, transformers, car parking for permanent staff and a vehicle holding area for maintenance vehicles, as well as vehicles towed from the tunnel. Noise emission from the workshop is not expected to generate any significant noise impact at the closest residence due to the location of the building and the proposed nature of works occurring at daytime. There are two tunnel portals in this area and the substation at Coral Tree Drive is also assessed.

Several nights per year the Southern Compound is used as a base to support the tunnel maintenance regime when the tunnel is closed at night time. This is associated with higher than usual vehicle movements.

At the Southern Compound the overall noise limits need to be shared between mechanical system noise and other noise. Since operations occur 24 hours per day, the night time period is the potentially most sensitive. At residences along the western boundary to the site, to enable design to be undertaken the contribution from the two sources has been split as follows:

- Mechanical Systems – 38dBA (To account for low frequency content a design goal of 33dBA is required to be achieved); and
- On-site vehicular traffic – 33dBA.

Marginal exceedances of these individual limits may be appropriate if the same residential receivers are not equally affected by both operational sources.

A 4.8m high noise barrier along the western boundary of the site extending from the barriers on the M2 to the site entrance on Eaton Road has been included in the model. 4.8m was initially selected as the minimum height identified in the EIS and a height which provided shielding to be equivalent to the buildings along Pennant Hills road which were demolished.

The MOC building has an open car park at the lower ground level, which would allow car park noise to escape and also road traffic noise from Pennant Hills Road to pass under the building.

A noise barrier extending above the surface level to an RL equivalent to the underside of the car park soffit is required along the western boundary. This is also included in the model.

The surrounding sensitive receptor buildings are shown in Figure 9-10. These barriers are shown in Figure 9-11. Urban design implications have also been considered for this western barrier and for information purposes discussed later in Section 9.4.2.

Noise prediction for VSO1 operations assumed two scenarios (all fans and plant items operating) impacting on the surrounding sensitive receiver area. The three operational scenarios are summarised below:

- Scenario 1: 4 off Axial fans operating at 100%. Daytime and evening only.
- Scenario 2: 5 off Axial fans operating at 80%. Day, evening or night.
- Scenario 3: 5 off Axial fans operating at 72%. Day, evening or night.

Figure 9-12 presents graphical representation of the noise predictions for the surrounding areas for the worst-case modelled scenario 2 for the night time period.

Figure 9-10 VS01 – Southern Layout & Receivers

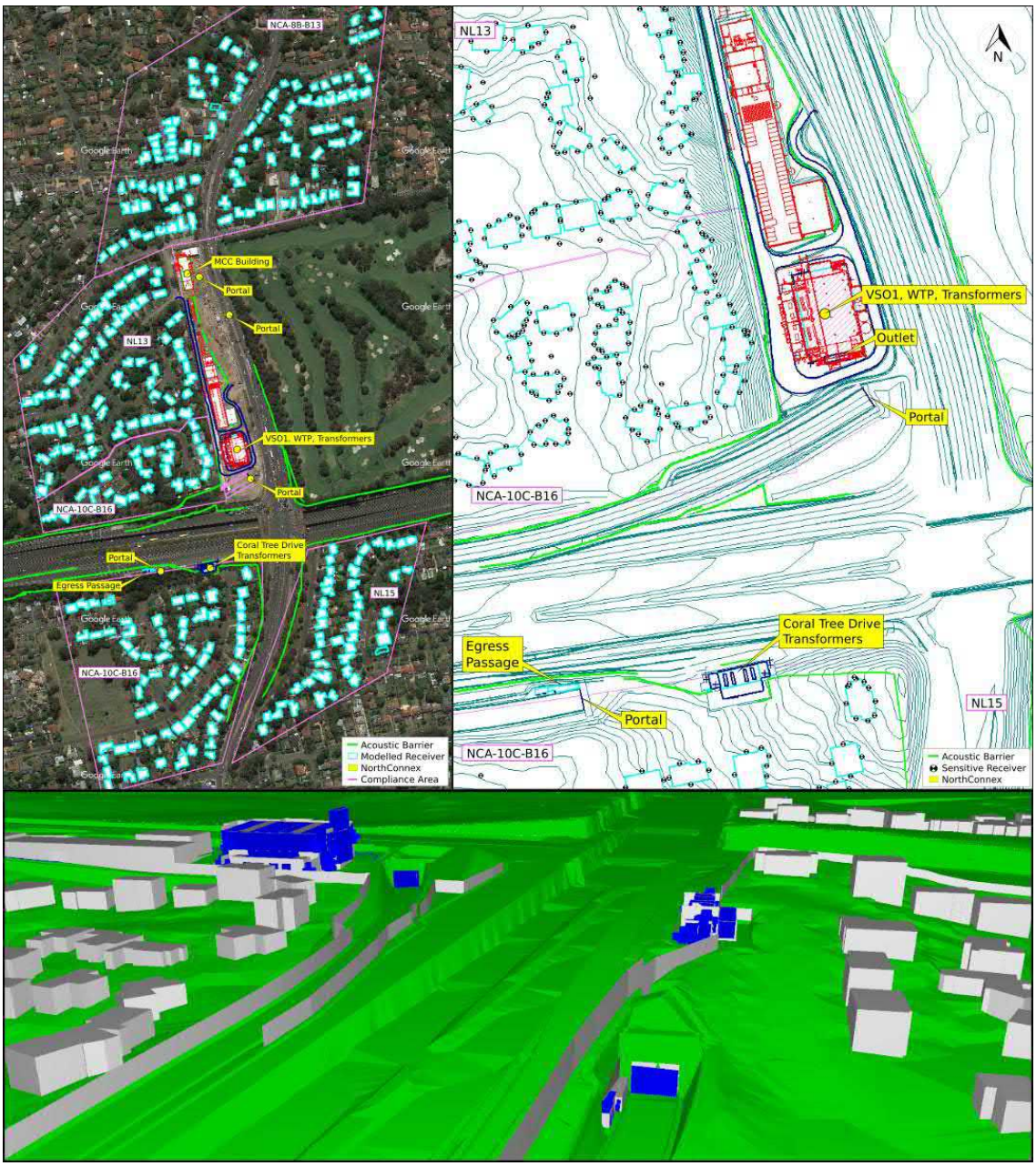


Figure 9-11 Recommended Noise Wall (in red) along the Western Boundary of the Southern Compound

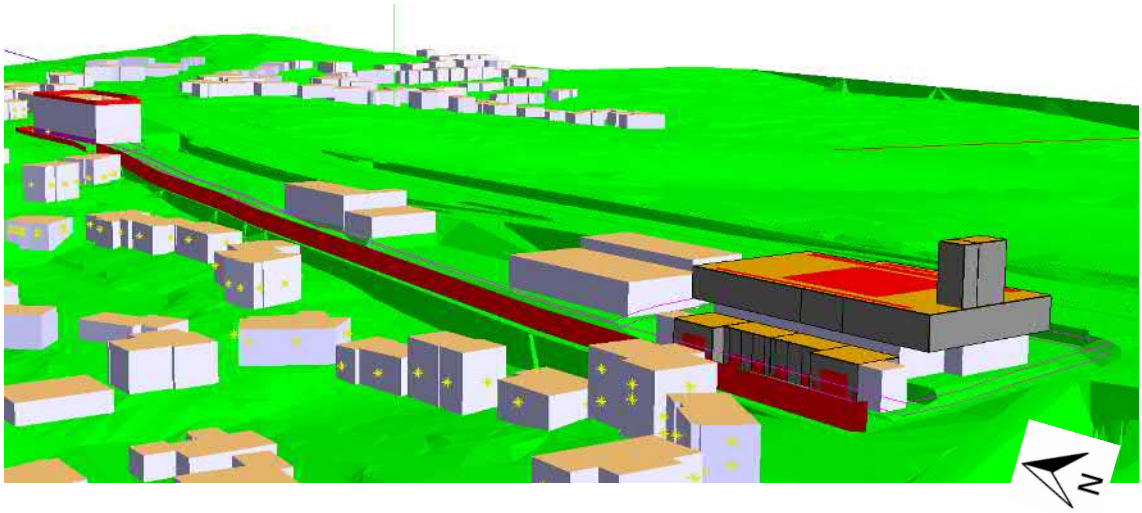
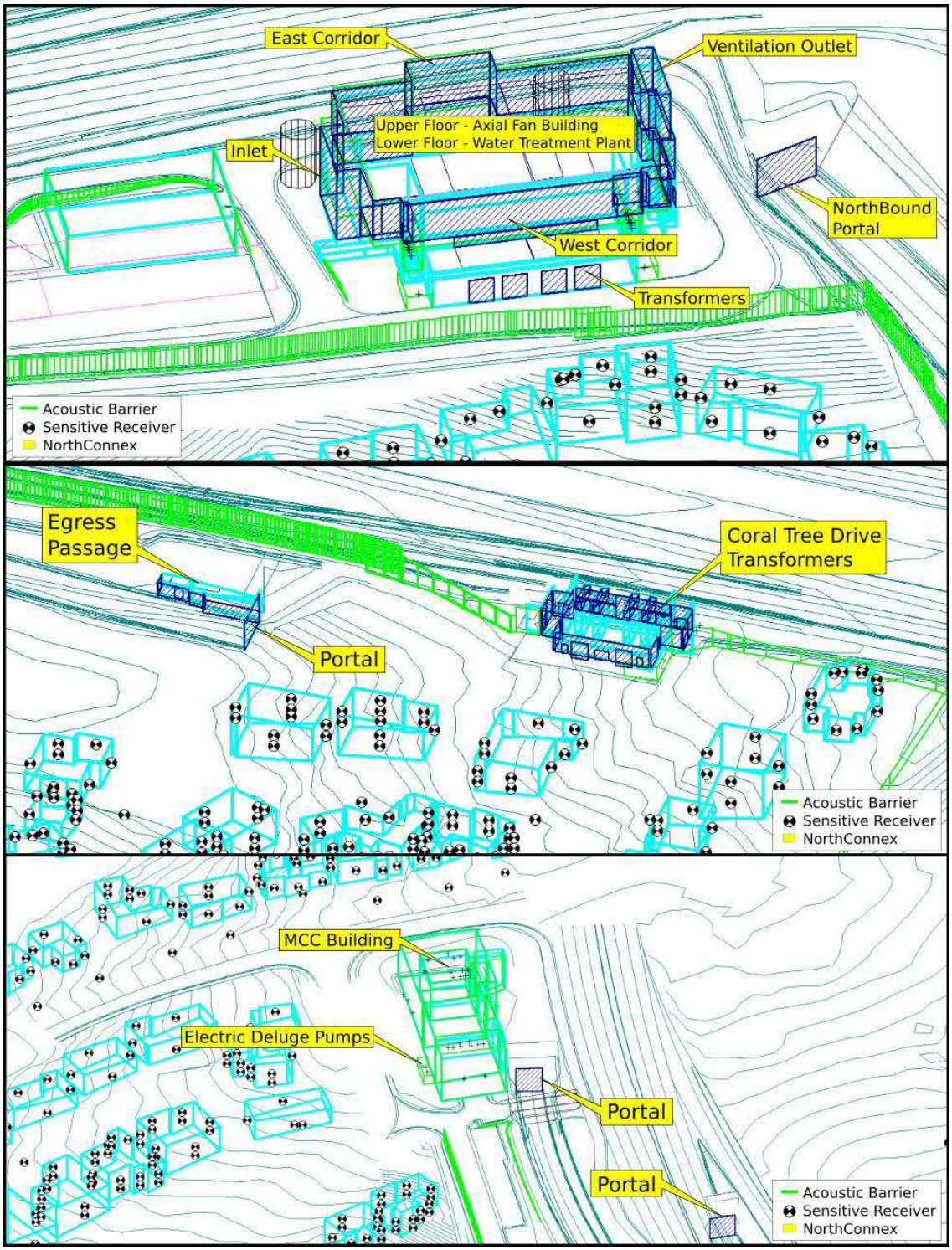


Figure 9-12 presents a 3-D wire-model prepared using the acoustic model to illustrate the relevant areas of the VSO1 building and nearest sensitive receptors.

Figure 9-12 **VSO1 3-D Model & Location of Nearest Sensitive Receptors**



The results indicate that the predicted receptor noise levels are within the adopted night time criteria for the majority of receivers (312 of 313), under all of the operating scenarios considered. It is noted that Scenario 1 is not proposed to occur outside daytime hours, however an early morning traffic congestion (before 7.00am) scenario has been reviewed against the night time criteria. Maintenance testing has been considered for daytime/evening periods only.

Review of the partial noise level results for detailed individual receiver analysis were conducted during the detailed design phase. This identifies the relative impact from each noise source, and assists in focusing design, location, mitigation, and overall optimisation of noise emissions from the project. The resulting predictions have aided in establishment of required barrier heights, silencers and attenuators, building materials, and selection of mechanical plant items.

The noise predictions for the final design indicate compliance with the assessment criteria for 312 of the 313 sensitive receiver buildings. The single predicted exceedance is for the northern facades of the property at 50 Coral Tree Drive.

It is noted that during the acoustic design process the objective was to achieve full compliance with the assessment criteria, including the 7dB risk factor. However, it was not considered reasonable or feasible to reduce the minor exceedances (up to 1.6dB) to the northern facades of the property at 50 Coral Tree Drive, and the option to provide "at receiver" acoustic treatment may be necessary to achieve a reasonable outcome. This residence was identified to receive "at receiver" mitigation treatment as a result of traffic noise.

It is also noted that this property currently overlooks the M2 Motorway and Cumberland Highway intersection and may experience higher overall ambient levels than those utilised in establishing the criteria, due to exposure to significant existing vehicular traffic noise.

The daytime and evening periods have criteria at least 5dBA higher than the night. Therefore, compliance is predicted for all areas and scenarios for these periods, including consideration of the maintenance testing of the electric deluge pumps at the MCC building, based on compliance for the night time.

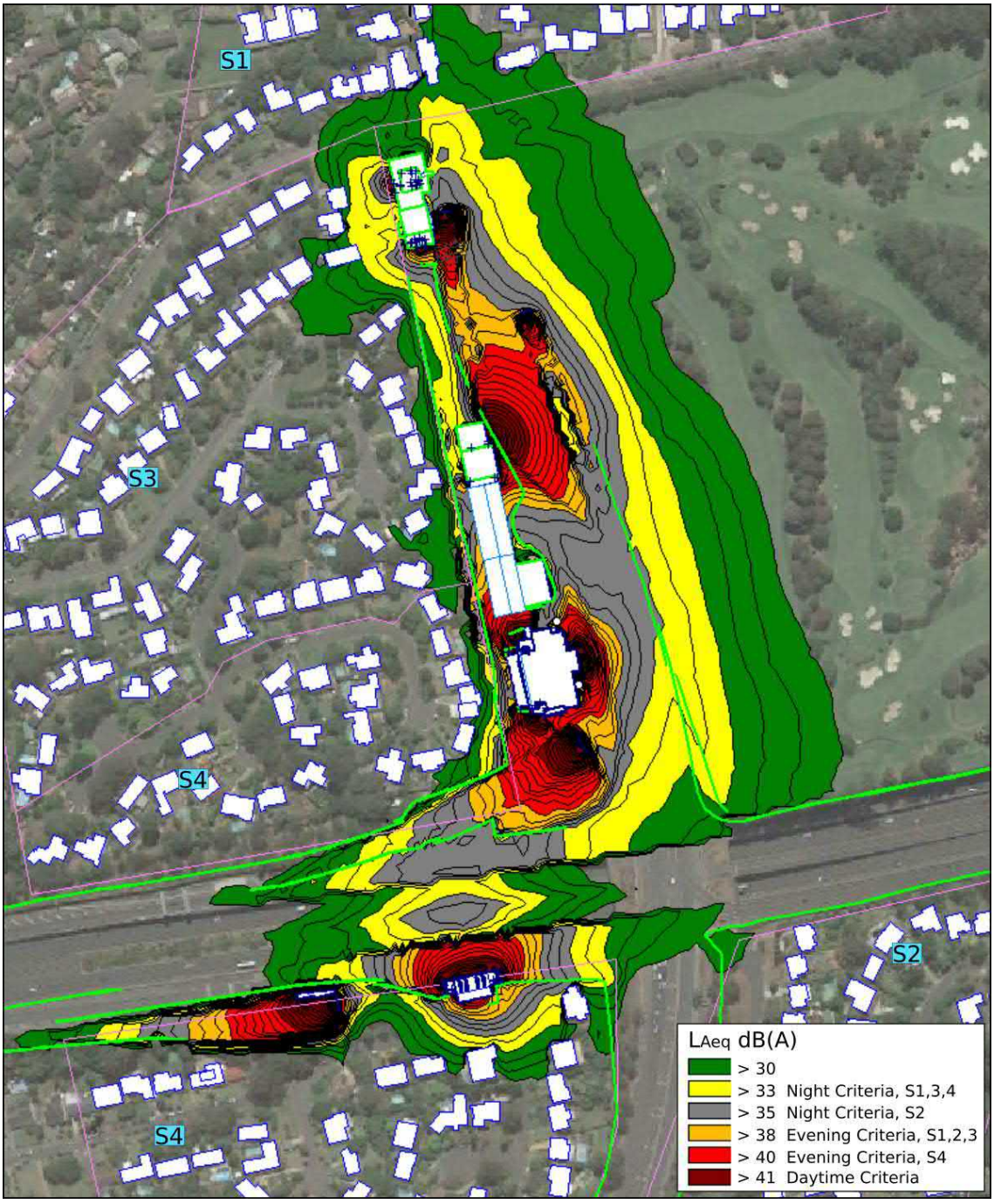
The predicted noise levels (Appendix K) are compared to the relevant acoustic criteria for the operational period. The predicted noise levels are L_{Aeq} and do not include a facade correction. This is in accordance with the requirements of the *INP* and allows direct comparison with the free field criteria adopted for the airborne noise assessment.

Compliance with the acoustic assessment criteria is predicted to the majority of sensitive receivers (312 of 313 residential buildings) in the surrounding area of VSO1, based on the following building design, equipment performance, and attenuator performance items in Appendix K.

For the evening and daytime criteria (38dBA and 41dBA respectively), full compliance is predicted to all sensitive receivers by a significant margin, inclusive of emergency testing of electric deluge pumps at the MCC.

Predicted receptor noise levels are within the adopted night time criteria for all receivers except for the northern facades of 50 Coral Tree Drive. These predicted exceedances are minor (no more than 1.6dB) and this property has received "at receiver"mitigation.

Figure 9-13 Noise Contour Plot – VSO1 (Southern), Scenario 2 - 5 off Axial fans operating at 80%. Day, evening or night



9.4.1 Other Operational Noise

Table 9-2 presents the operational scenarios used in the noise modelling for a typical worst-case 15-minute period during the normal operations of the compound.

Table 9-2 Operational Scenarios (15-minute period)

Time Period	Plant / Equipment Type	No. of Items
D/E	Light vehicle	5
N	Light vehicle	1
D/E/N	Truck mounted attenuator	1
D/E/N	Tilt tray truck	1

Table 9-3 presents a summary of the sound power levels (SWLs) utilised in the noise prediction model for the vehicle movements based on a speed of 20km/hr.

Table 9-3 Summary of SWLs used for Operational Activities – dBA

Item	Description	Sound Power Level
Light Vehicles / Utes	Manoeuvring	84
Tow Truck / Traffic Management Truck	Manoeuvring	99 each 103 L_{Amax}

9.4.2 Predicted Vehicular Noise Levels

All calculations have been undertaken under neutral weather conditions only. At the relatively small distances involved from all compounds to the most affected sensitive receivers (15m to 40m), adverse weather conditions such as temperature inversions and strong winds will not significantly affect the noise propagation and the received noise level.

The noise level has been assessed on each floor of the residence and also at 1.5m height above ground level at the most affected point within the property boundary.

Table 9-4 Predicted Night Time Compound Noise Levels at Residences in NCA10

ID WM	ID EIS	Address	Predicted Level
2041	3500	3 Eaton Road	37.1
2042	3508	5 Eaton Road	42.8
2043	3511	7 Eaton Road	41.1
2044	3478	2 Eaton Road	36.1
2045	3497	4 Eaton Road	33.8

2046	3521	2 Hillside Place	25.8
2047	3486	4 Hillside Place	31.3
2048	3487	6 Hillside Place	32.1
2049	3482	8 Hillside Place	34.3
2050	3479	10 Hillside Place	34.5
2051	3495	12 Hillside Place	32.9
3893		12 Gum Grove Place	35.1
2053	3494	14 Gum Grove Place	34.9
2106	3499	16 Gum Grove Place	32.4
2107	3490	18 Gum Grove Place	33.2
2108	3481	20 Gum Grove Place	45.7
2109	3504	22 Gum Grove Place	33.8

The 4.8m barrier on the western edge of the Southern compound sits above a retaining wall which varies in height along the western boundary by up to 6m. At the highest point, the combination of retaining wall and noise barrier is 11m high. We have reviewed in detail whether the barrier can be reduced in height and maintain a suitable level of amenity.

A review of the predicted noise levels indicated that resultant noise levels during normal operations are likely to comply with the PSNL at all residences south of the Eaton Road entrance, with the exception of one residential location. This property is a three-storey structure located at 20 Gum Grove Place, West Pennant Hills (ID 2108). Noise predictions indicate that this property would be exposed to noise levels above 44dBA.

Noise levels at other receivers in this area along the length of the barrier only just comply with or marginally exceed the nominated contribution noise limit of 33dBA, therefore further reduction in height of this barrier would result in additional residences requiring architectural treatment.

We have also considered that on a few nights per year higher noise levels will occur from the site whilst the scheduled tunnel maintenance is undertaken.

Consideration of the potential for sleep disturbance at night time from typical maximum noise levels associated with truck movements has also been considered. With the exception of 20 Gum Grove Place maximum noise levels are predicted as up to 60dBA, which meets the nominated criterion.

In order to control road traffic noise from Pennant Hills Road, operational noise from typical use of the Southern compound and the occasional night time use associated with tunnel maintenance (in relation to both intrusive noise and sleep disturbance) it is not recommended this barrier is lowered in height.

In order to achieve full compliance with the PSNL, the noise wall located on the eastern side of the property would need to be increased to approximately 8m high. As this is not a feasible and reasonable mitigation measure (given the urban design concerns regarding a 4.8m high barrier), architectural treatment at residence ID 2108 has been recommended.

An aerial view of the property is shown in Figure 9-14 whilst a street view is shown in Figure 9-15.

Figure 9-14 Aerial View Residence ID 2108 (20 Gum Grove Place, WPH)

Figure 9-15 Street View Residence ID 2108 (20 Gum Grove Place, WPH)

In the vicinity of the Eaton Road entrance there are five residences which are exposed to the compound entrance and also the car park associated with the Motorway Control Centre. Noise levels are predicted to exceed the 33dBA criterion at these locations, primarily as a result of a truck on the driveway escaping via the opening. Truck movements during normal operations at night time are expected to be occasional.

No further mitigation is possible to reduce this noise from the site and the noise contribution at

the residences are less from the site than the truck would generate once it has left the site and is driving on Eaton Road which is not included in the site noise assessment.

9.5 Northern Portal Jet Fan Emissions

Based on the portal jet fan data, and axial fan break-in noise to tunnel sections, portal noise emissions (based on jet fan and axial fan noise only – i.e. excluding consideration of vehicle noise) have been included in the modelling of potential impacts to surrounding sensitive receiver areas.

9.5.1 Fan Specifications

The final design includes jet fans proposed to be mounted in reversed pairs throughout the tunnel (one operating forward, the other reverse). The contribution of noise from the jet fans and axial fans (break-in to tunnels) has been considered to assess compliance with the *INP* criteria for portal noise emissions, as well as with respect to achieving an in-tunnel Noise Rating (NR) value of 85 or less.

Table 9-5 presents the jet fan data provided by Flaktwoods for the 160JMTS50 model of fan selected by LLBJV for the FDD.

Table 9-5 Jet Fan Spectral Data dB(Lin)

Fan Details	Direct.	Sound Power Level dB(Lin)								
		63	125	250	500	1K	2K	4K	8K	dB Total
Flaktwoods (160JMTS50-6-12)	Forward	91	96	95	89	93	88	85	80	101
	Reverse	90	98	98	89	92	88	85	80	102

9.5.2 Predicted Portal Noise at Wahroonga Interchange

Modelling to predict the jet fan noise portal emissions at the northern end of the project has been completed separately to the main facility modelling. These noise sources are remote from the ventilation facilities, hence analysis of cumulative impacts with these sources has not been completed for the vent station modelling.

Table 9-6 presents the modelled fan pairs along the ramps to/from the surface at the Wahroonga intersection, including their stationed position (STN), as well as the distance to the main-line tunnel or portal.

Modelling has considered all jet fans operating along the ramps, as well as the nearest cluster of fans in each direction within the mainline driven-tunnel.

Table 9-6 Modelled Jet Fan Locations

Location / Jet Fan ID	STN (m)	Spacing (m)
Pennant Hills Road – Off Ramp NB		
Portal	985	0
JFN715/716 (Reversible)	770	215
JFN713/714 (Reversible)	672	313
JFN711/712 (Reversible)	439	546
JFN709/710 (Reversible)	345	640
JFN707/708 (Reversible)	248	737
Northbound Mainline Tunnel Jet Fans Considered JFN 118-122 / 318-322 JFN 123-126 / 323-326	100	885 Distance to Ramp Connection 8 at > 1119m 8 at > 193m
Pennant Hills Road – On Ramp SB		
Portal	270	0
JFN813/814 (Reversible)	664	394
JFN811/812 (Reversible)	738	468
JFN809/810 (Reversible)	870	600
Northbound Mainline Tunnel Jet Fans Considered JFN 217-219 / 417-419 JFN 220 / 420 JFN 221-223 / 421-423	1110	840 Distance to Ramp Connection 6 at > 1451m 2 at 143m 6 at > 1063m

Table 9-7 presents the calculated sound pressure level at each portal entrance, based on the fan locations and separation distance. The noise modelling has assumed that the sound power level is radiated equally across the portal opening. It is noted that the predictions are conservative in assuming the noise level in the mainline and along the ramps have minimal absorption, and no corrections for bends or turns.

Table 9-7 Predicted Jet Fan Noise Levels at the Northern Portals

Details	Octave band centre frequency (Hz)									
	31.5	63	125	250	500	1000	2000	4000	8000	Total
SPL at Northbound Off Ramp Portal	75.6	75.4	82.0	80.3	71.6	75.3	69.6	63.4	58.6	86
SPL at Southbound On Ramp Portal	73.0	72.9	79.4	77.5	68.6	72.3	66.3	58.7	54.0	83

Figure 9-16 presents the modelled sensitive receiver buildings and a 3-D render prepared using the acoustic model to illustrate the cutting and partially covered entry/exit of the portals as

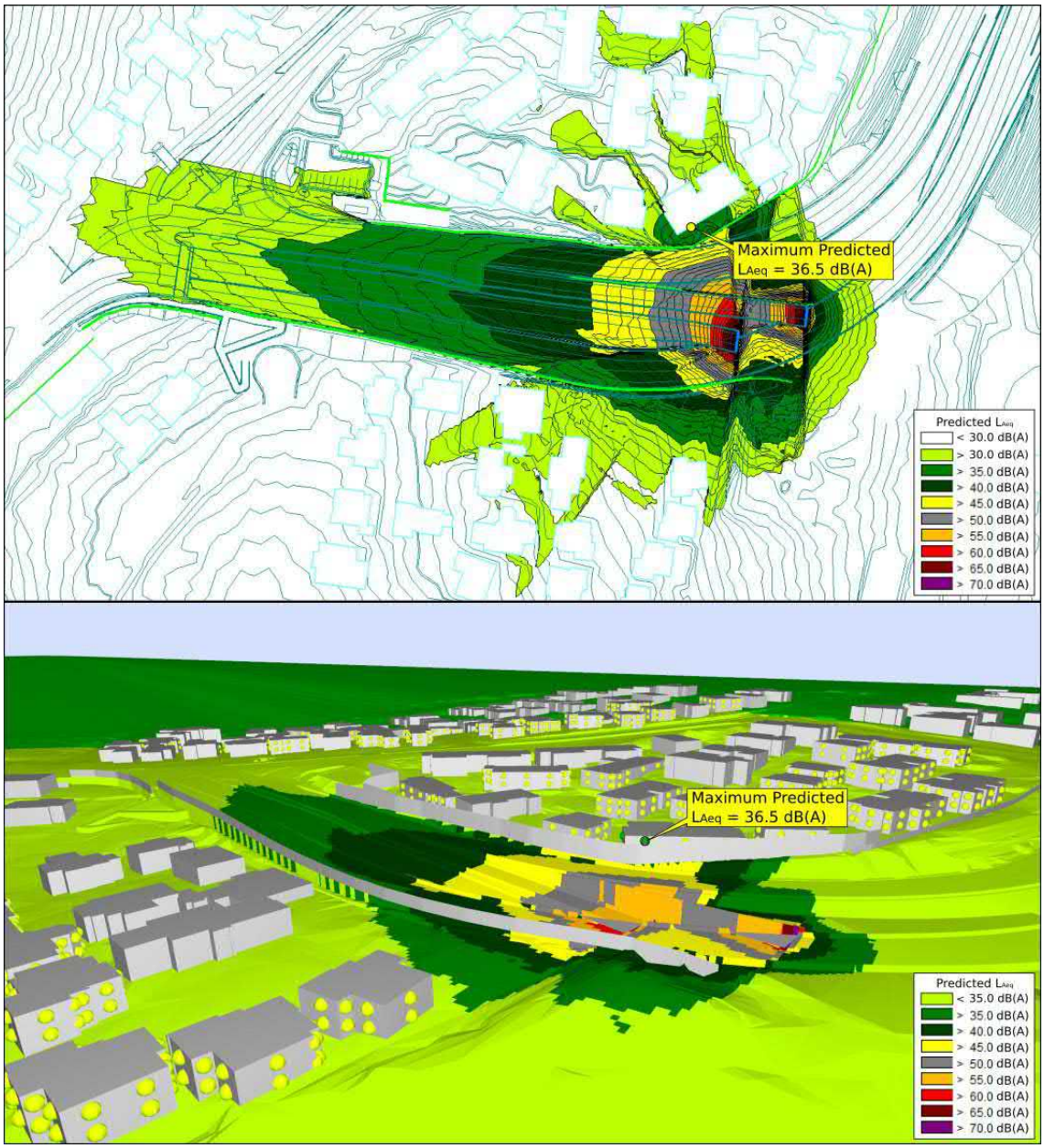
considered in the acoustic modelling. These features provide shielding to some of the sensitive receiver buildings. Modelling has predicted free-field noise levels for each facade and floor of the existing buildings.

The predicted free field L_{Aeq} noise levels for the receptors in the vicinity of the Northern Portals at Pennant Hills Road are presented in Figure 9-16. The noise contours presented are predicted for 4.5m above the modelled ground heights, representative of a second floor.

The predicted noise levels are compared to the relevant acoustic criteria for the night time operational period. Criteria for daytime and evening periods are higher, hence assessing against the night time criteria also results in compliance with the criteria for other time periods. All existing sensitive receivers surrounding the portals are predicted to comply with the adopted criteria of 38dBA (inclusive of 7dB risk factor). It is noted that, beyond the nearest sensitive receivers, the levels are well below the adopted project criteria, therefore data for these areas is not presented in detail.

It is also likely that the road traffic noise in this area will exceed the predicted contributions from the portal noise emissions.

Figure 9-16 Northern Portals Model Noise Contours, 2nd Storey[a]



[a] Based on Model: 4508_NorthernPortals_FDD_26April2018_V01.cna

10 CONCLUSION

This operational noise assessment has been prepared as part of the detailed design of the NorthConnex and M2 Integration Projects. This report has been undertaken in accordance with the NSW *Road Noise Policy* (*RNP*, 2011) and RMS *Environmental Noise Management Manual* (*ENMM*, 2001).

10.1 Road Traffic Noise

The operations assessment can be summarised as follows:

- All relevant information such as traffic volume and proportions of heavy vehicles; vehicle speed, road surface types; road gradient; topographical information along and surrounding the project area, and location of potentially affected receivers was implemented in SoundPLAN software (Version 7.4) – *CoRTN* Australia (NSW);
- Simultaneous traffic counts and long-term noise monitoring were carried out in order to calibrate the noise model;
- For NorthConnex Northern the model validation results are considered satisfactory as the difference between measured and predicted noise levels falls within the +/- 1dB range for both day and night time periods.
- For NorthConnex Southern and M2 Integration the model validation results are generally satisfactory for all noise monitoring locations as the difference between measured and predicted noise levels falls within the +/- 2dB range for both day and night time periods except at monitoring location NCA-10B-B15.
- Before optimisation of noise barriers, 68 residential receivers (116 units) in addition to the 2 non-residential receivers are eligible for consideration of noise mitigation for NorthConnex Northern.
- Before optimisation of noise barriers, 57 residential receivers (60 units) are eligible for consideration of noise mitigation for NorthConnex Southern and M2 Integration.
- Numerous design barriers and existing barriers were optimized in accordance with the procedures outlined in the ENMM.
- After optimisation of noise barriers, 64 residential receivers (112 units) in addition to 2 non-residential receivers are eligible for consideration for architectural treatment for NorthConnex Northern.
- After optimisation of noise barriers, 57 residential receivers (60 units) are eligible for consideration for architectural treatment for NorthConnex Southern and M2 Integration.
- Levels of treatment were classified as follows: Type 1 – exceedances up to 10dB and Type 2 – exceedances over 10dB.

10.2 Operational Noise

In addition, an operational noise assessment was carried out for operations of the permanent Southern, Wilson, Trelawney and Northern compounds in accordance with the EPA *Industrial Noise Policy* (*INP*, 2000).

10.2.1 Ventilation Stations (VSO1 & VSO4)

Noise modelling has been completed based on the Final Detailed Design for the mechanical and electrical services for the NorthConnex Tunnel, ventilation stations and tunnel support facilities. Predictions were based on supplier test data for the axial fans, jet fans, inlet and outlet attenuator performance (including regenerated noise), as well as building material specifications.

Overall, the final mechanical plant selection, attenuator design and architectural material selections are predicted to achieve compliance with the acoustic assessment criteria with the exception of the northern facades of 50 Coral Tree Drive, where "at receiver"mitigation treatment has been provided.

For VSO1 (Southern facility) the predicted noise levels at this receptor are predicted to be up to 1.6dBA above the adopted night time criteria, where an acoustic risk buffer/factor is included in the modelling. Where the risk/buffer factor is not included in the modelling, full compliance is predicted.

Based on the equipment Sound Power Levels and nominated mitigation measures, noise levels are predicted to comply with the PSNL at all receivers during normal operations expect the residence located at 20 Gum Grove Place, West Pennant Hills (ID 2108). Reasonable and feasible noise mitigation measures are recommended to reduce the noise impact at location ID 2108. Mitigation measures may include at receiver acoustic treatment which has been offered.

Noise from fire pumps operating in an emergency situation (and during routine testing) were designed to comply with the daytime and evening noise criteria for operation of the electric pumps, and daytime criteria for the diesel pumps inside the fire pump room (at VS04 Northern Facility). This is because noise testing of emergency plant is a routine requirement.

Modelling investigation of completing the routine testing during the night period has identified significant non-compliances, hence it is recommended that the operational procedures should avoid programming routine testing of this plant during the night and evening periods. In an emergency event operation of this plant could occur at night and may last for several hours. During such an event, receptor noise levels would exceed the acoustic criteria defined for normal operations.

10.2.2 Tunnel Support Facilities (VSO2 & VSO3)

In addition to consideration of the acoustic performance of the main ventilation stations, the VSO2 (Wilson) and VSO3 (Trelawney) facilities have been modelled. This has allowed determination of predicted noise impacts on surrounding sensitive receivers, as well as in-tunnel noise levels during emergency ventilation operations. Overall, the final mechanical plant selection, attenuator design and architectural material selections are predicted to achieve compliance with the acoustic assessment criteria, provided the external plant at the DRS building (Wilson) are shielded by a 2.2 m acoustic barrier, or otherwise mitigated to reduce their radiating noise level by 10 dB.

The noise predictions have been compared to the most stringent noise criteria and are inclusive of an acoustic risk buffer/factor (for external sensitive receivers).

The predicted internal noise levels, at the insertion points to the driven-tunnel and inclusive of jet fans operating within the tunnel, confirm full compliance with the NR85 criteria. The highest predicted in-tunnel noise level for VSO2 being NR78, and NR77 for VSO3. No risk buffer/factor are included in the NR predictions, as the 7 – 8 dB buffer provides an appropriate risk offset to allow for potential variations in production or as-installed acoustic performance.

10.2.3 Jet Fans

Noise modelling of the potential impacts from in-tunnel ventilation jet fans, has been completed to identify external noise impacts.

Modelling of VSO facilities has been considered a worst-case cumulative exercise, inclusive of emitted jet fan noise, axial fan noise, and miscellaneous auxiliary plant and equipment. Therefore, where compliance is predicted for the VSO facilities, compliance is also predicted for the jet fans.

Separate to the VSO facilities, modelling has been completed for jet fan noise emissions from the northern portals at the Pennant Hills interchange. Full compliance with the noise criteria, inclusive of a risk factor is predicted to the surrounding area.

APPENDIX A

SENSITIVE RECEIVER MAPPING & NOISE CATCHMENT AREAS

Residential Dwellings:

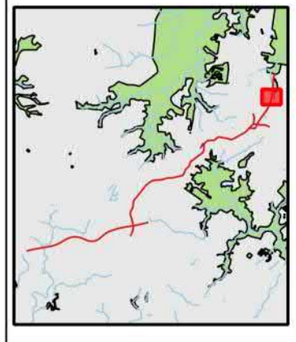
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 1 of 13

WILKINSON MURRAY

Residential Dwellings:

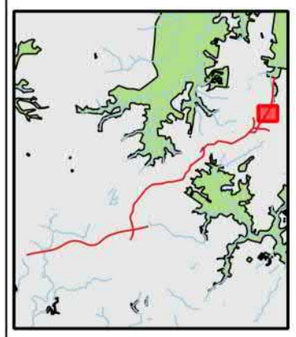
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

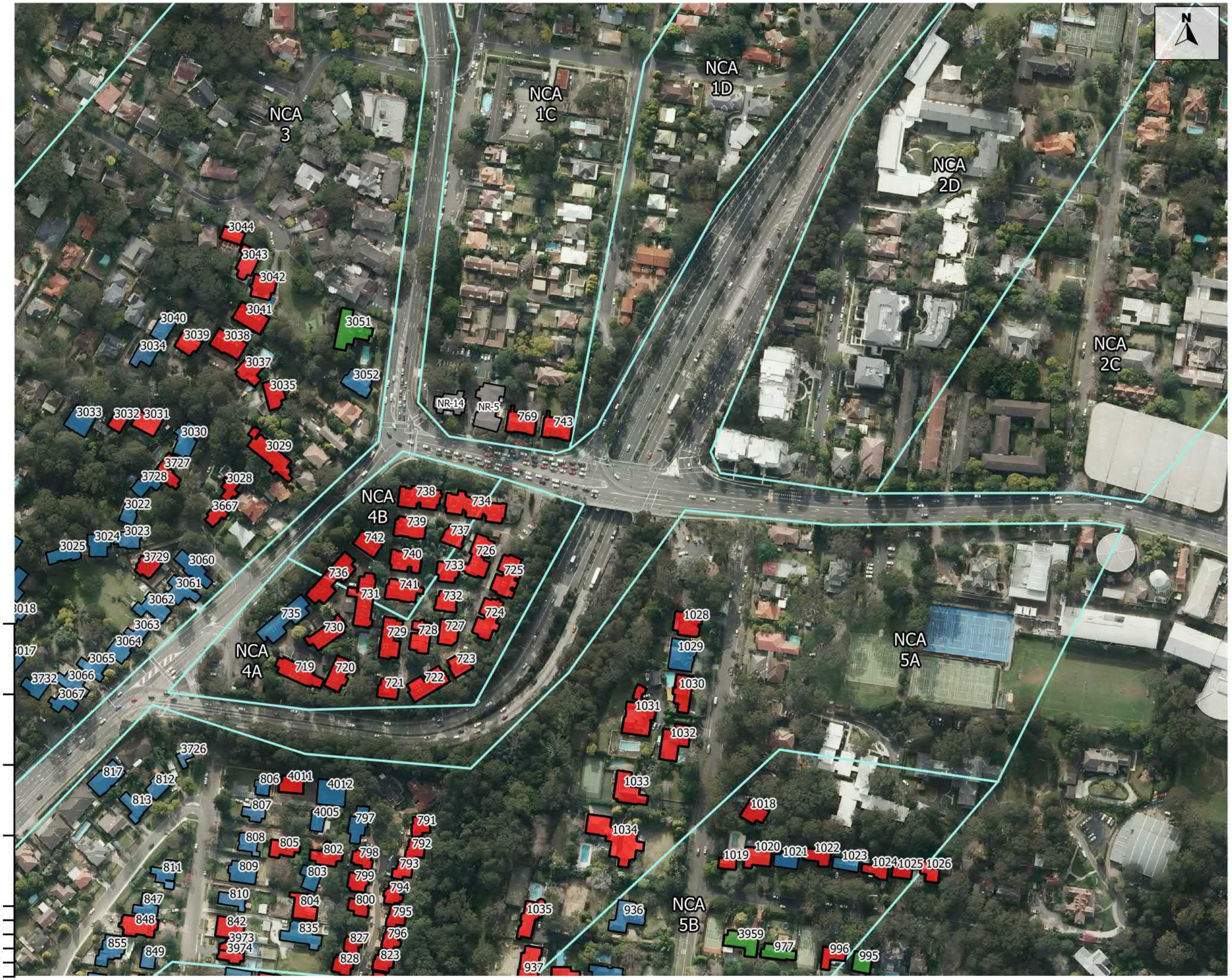
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 2 of 13

WILKINSON MURRAY



Residential Dwellings:

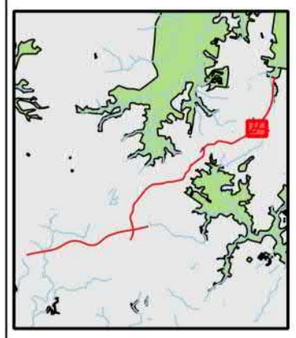
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

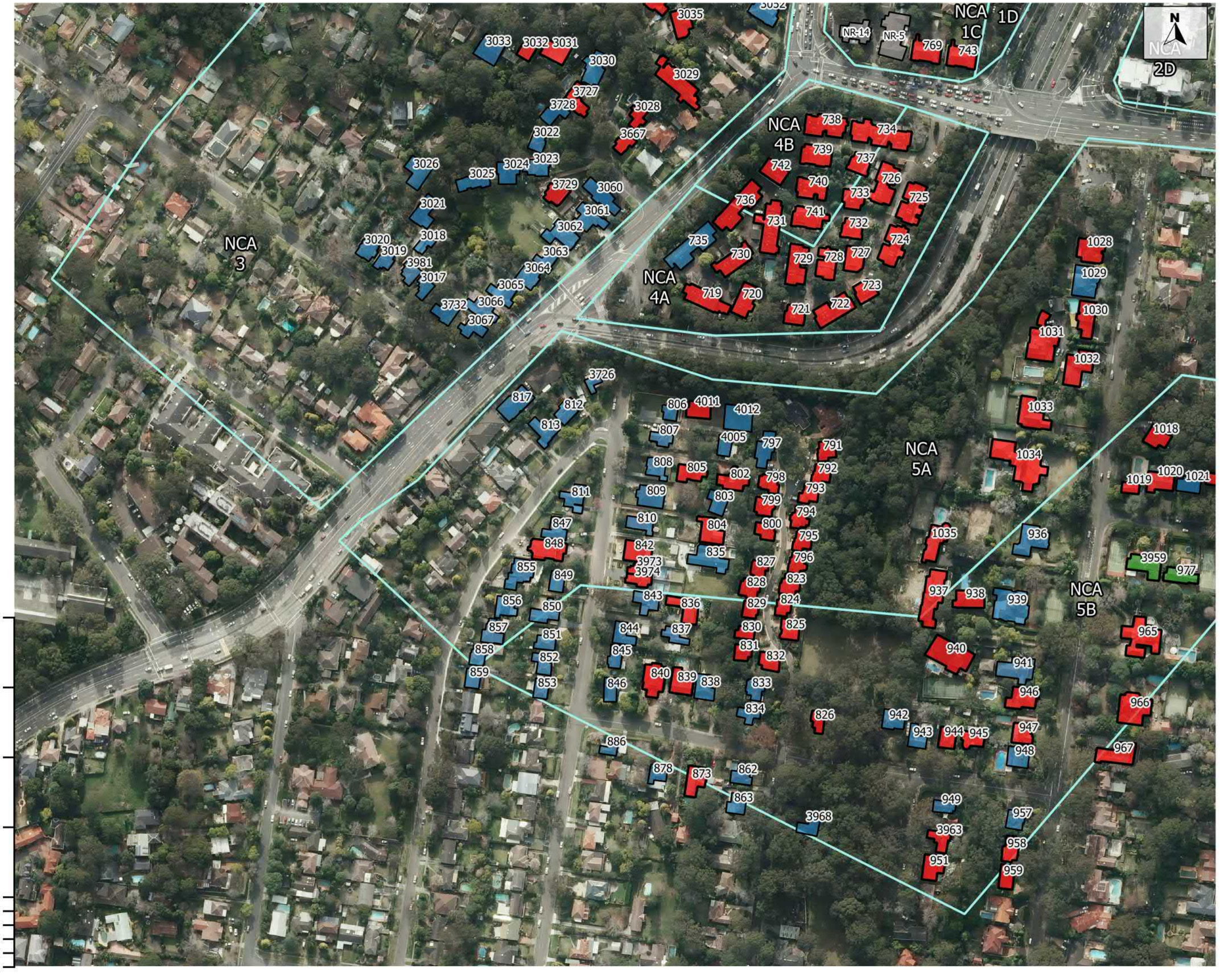
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 3 of 13

WILKINSON MURRAY



Residential Dwellings:

- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
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PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 4 of 13

WILKINSON MURRAY

Residential Dwellings:

- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 5 of 13

WILKINSON MURRAY

Residential Dwellings:

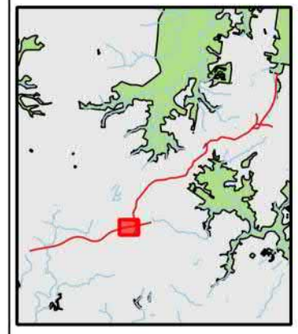
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 6 of 13

WILKINSON MURRAY

NCA 11A

NCA 10B

NCA 11B

NCA 10D

NR-117

NR-118

NR-119

NR-121

200 m
150
100
50
0
50

Residential Dwellings:

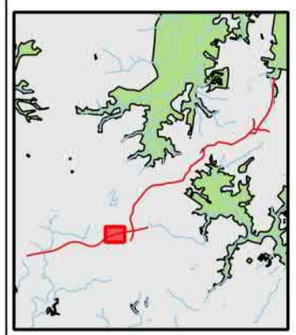
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 7 of 13

WILKINSON MURRAY

Residential Dwellings:

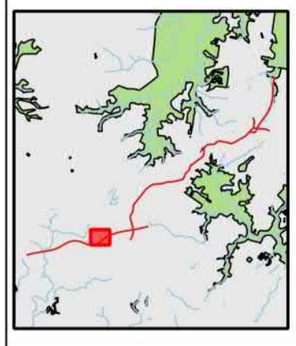
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 8 of 13

WILKINSON MURRAY

Residential Dwellings:

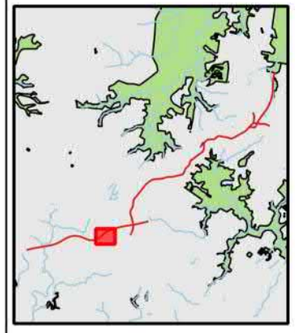
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 9 of 13

WILKINSON MURRAY

Residential Dwellings:

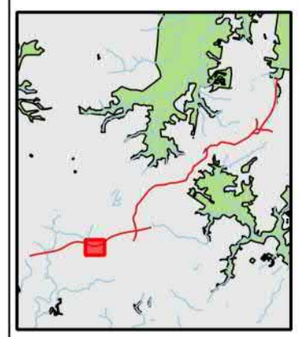
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

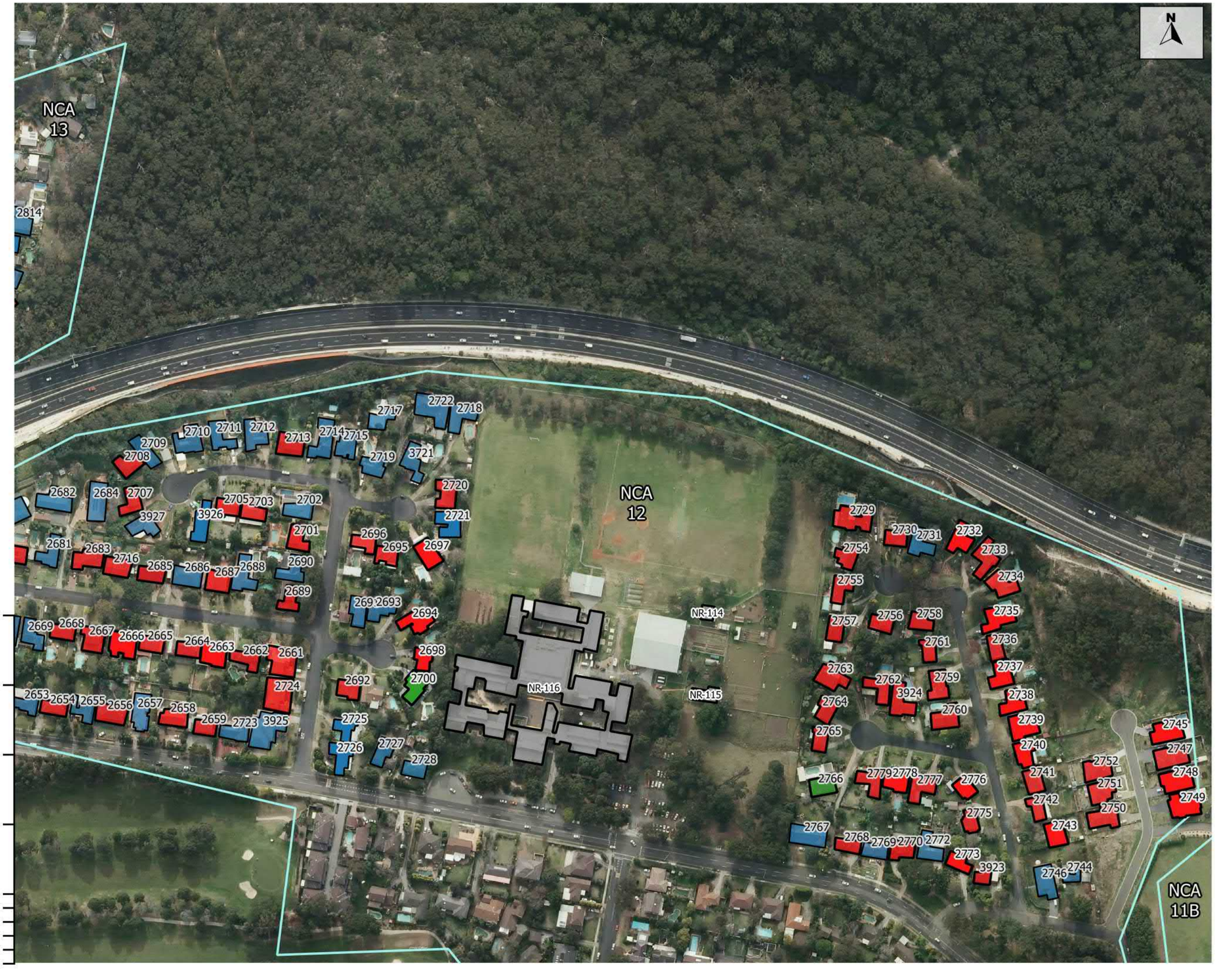
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 10 of 13

WILKINSON MURRAY



Residential Dwellings:

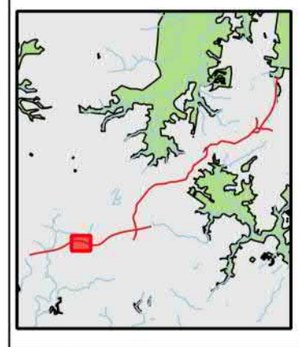
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 11 of 13

WILKINSON MURRAY

Residential Dwellings:

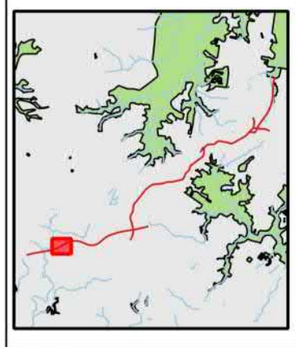
- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 12 of 13

WILKINSON MURRAY

Residential Dwellings:

- Single Storey
- Double Storey
- Greater Than Double Storey

Other Structures:

- Non-Residential

Other Features:

- Noise Catchment Area (NCA)

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Sensitive Receivers & Noise Catchment Areas (NCA's)

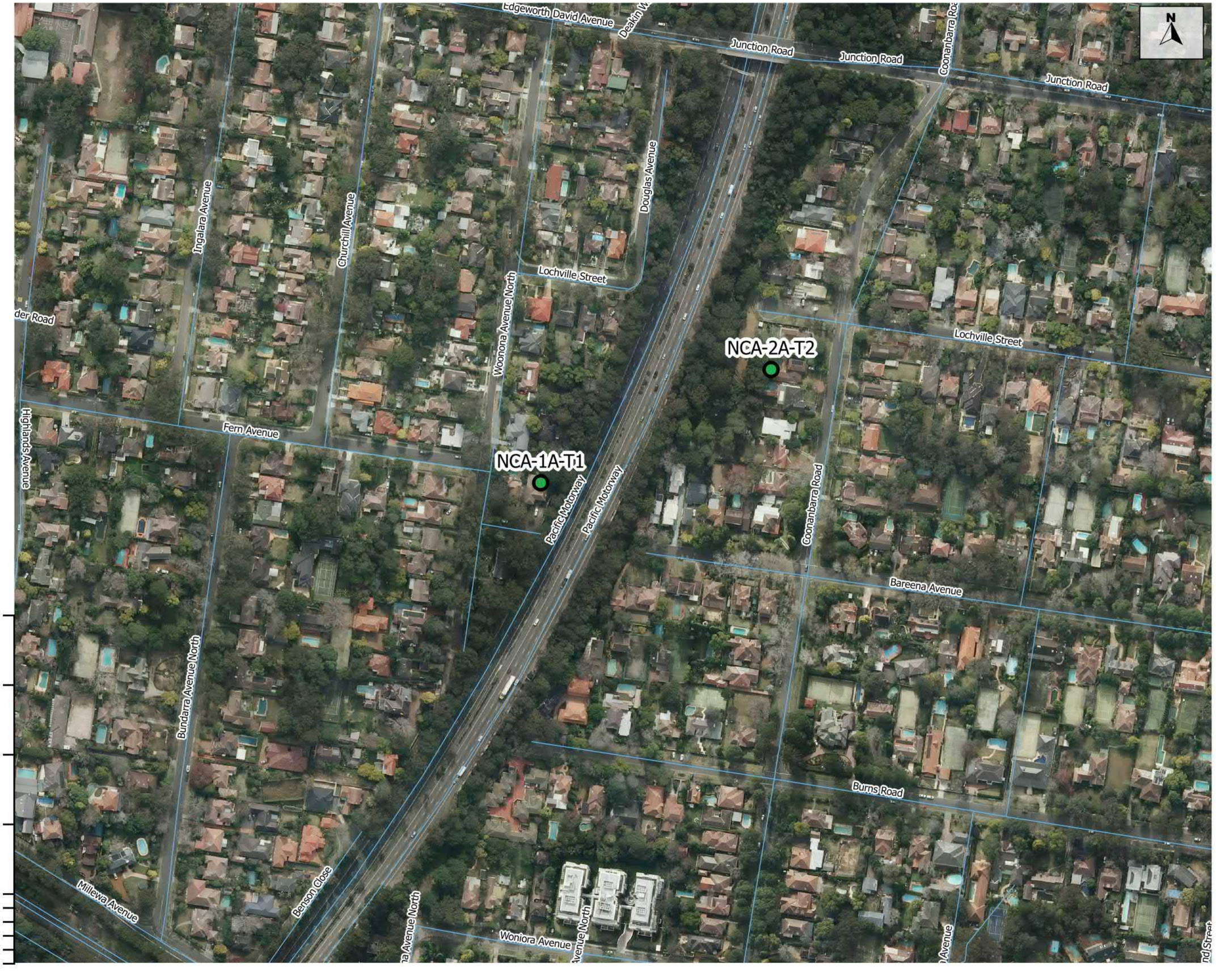
PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 13 of 13

WILKINSON MURRAY

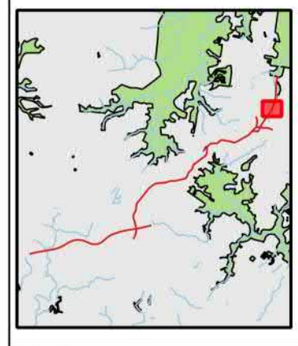
APPENDIX B

TRAFFIC NOISE MEASUREMENTS LOCATIONS



Features:

- Logger Location
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

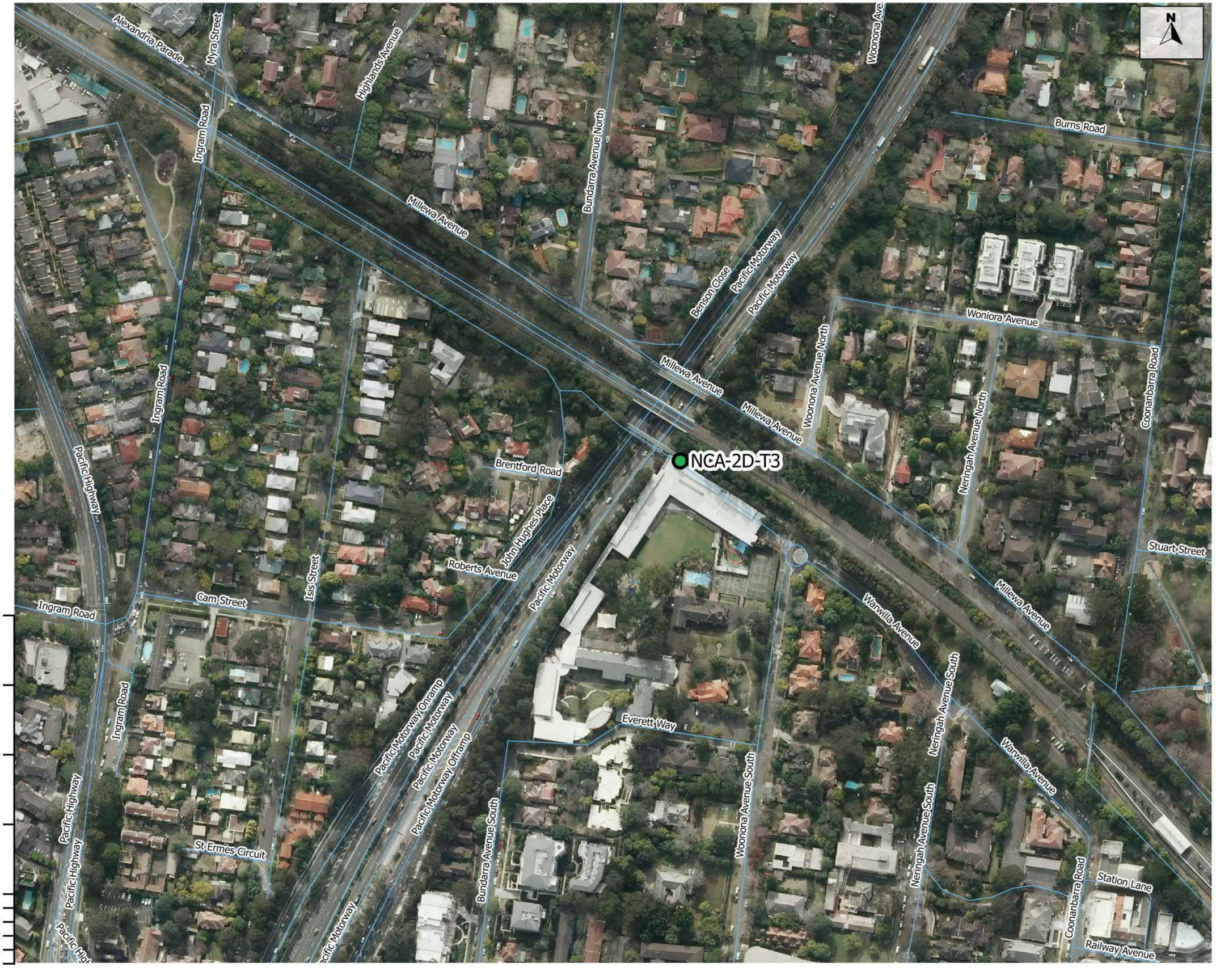
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Traffic Noise Logger Locations

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

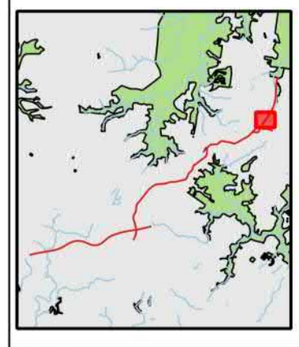
Drawing 1 of 5

WILKINSON MURRAY



Features:

- Logger Location
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

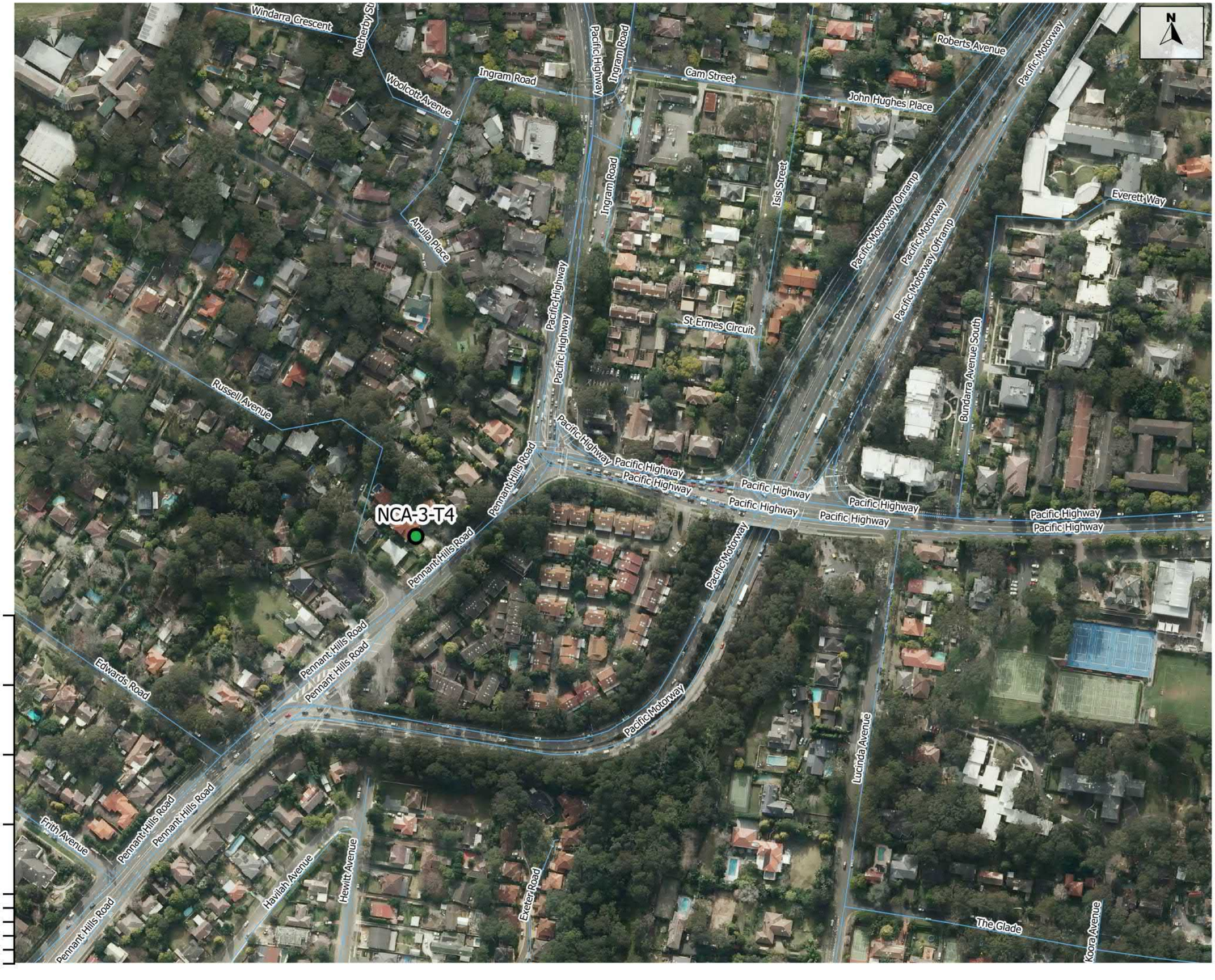
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Traffic Noise Logger Locations

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

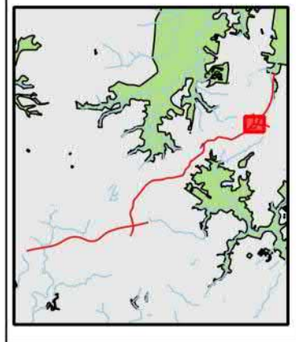
Drawing 2 of 5

WILKINSON MURRAY



Features:

- Logger Location
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Traffic Noise Logger Locations

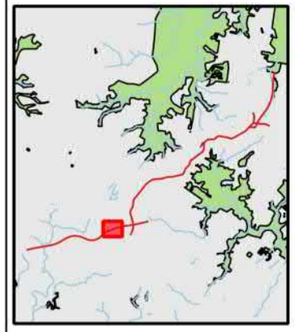
PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 3 of 5

WILKINSON MURRAY

Features:

- Logger Location
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

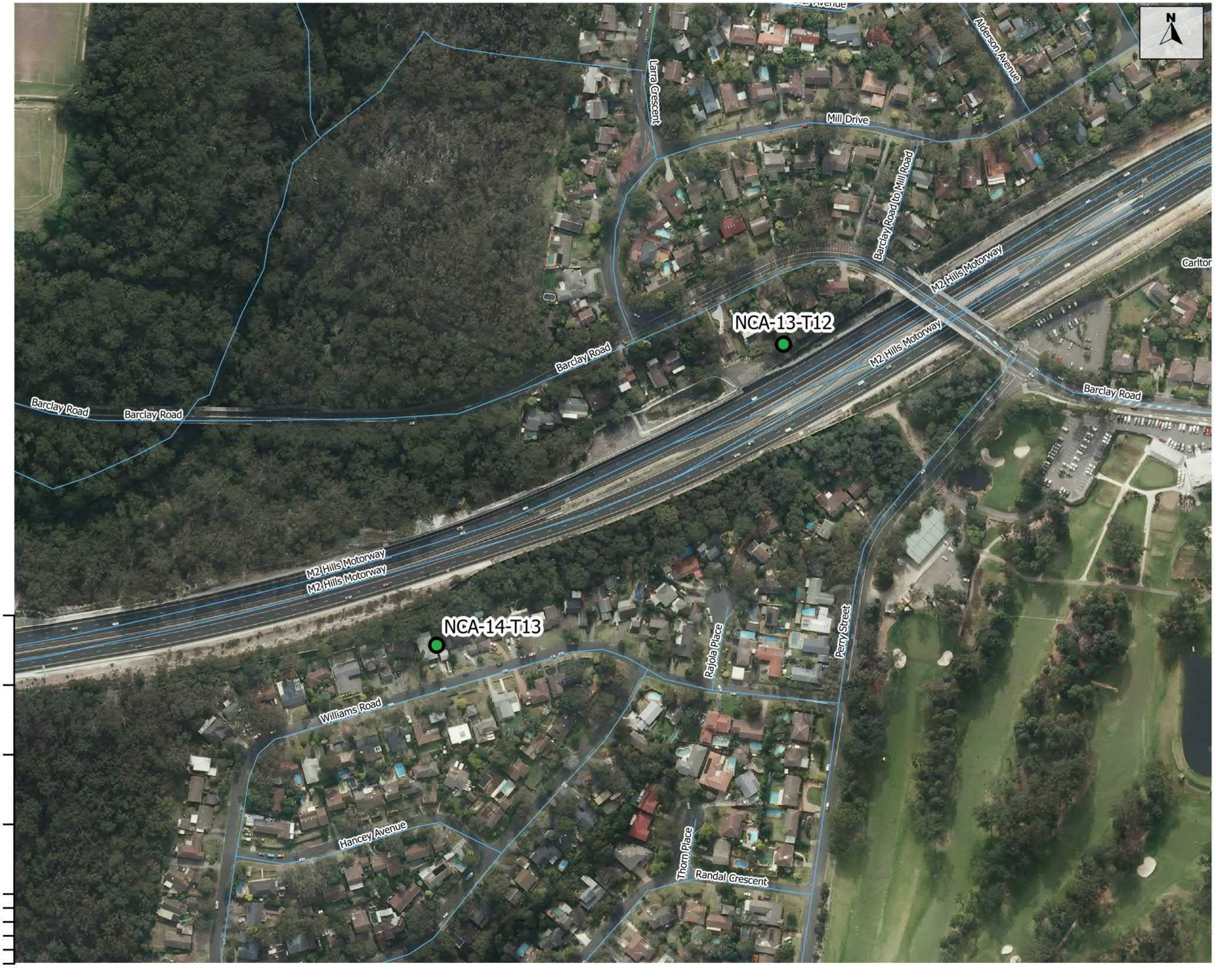
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Traffic Noise Logger Locations

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

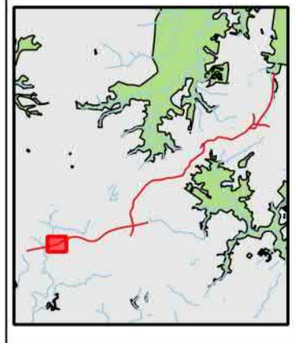
Drawing 4 of 5

WILKINSON MURRAY



Features:

- Logger Location
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Traffic Noise Logger Locations

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

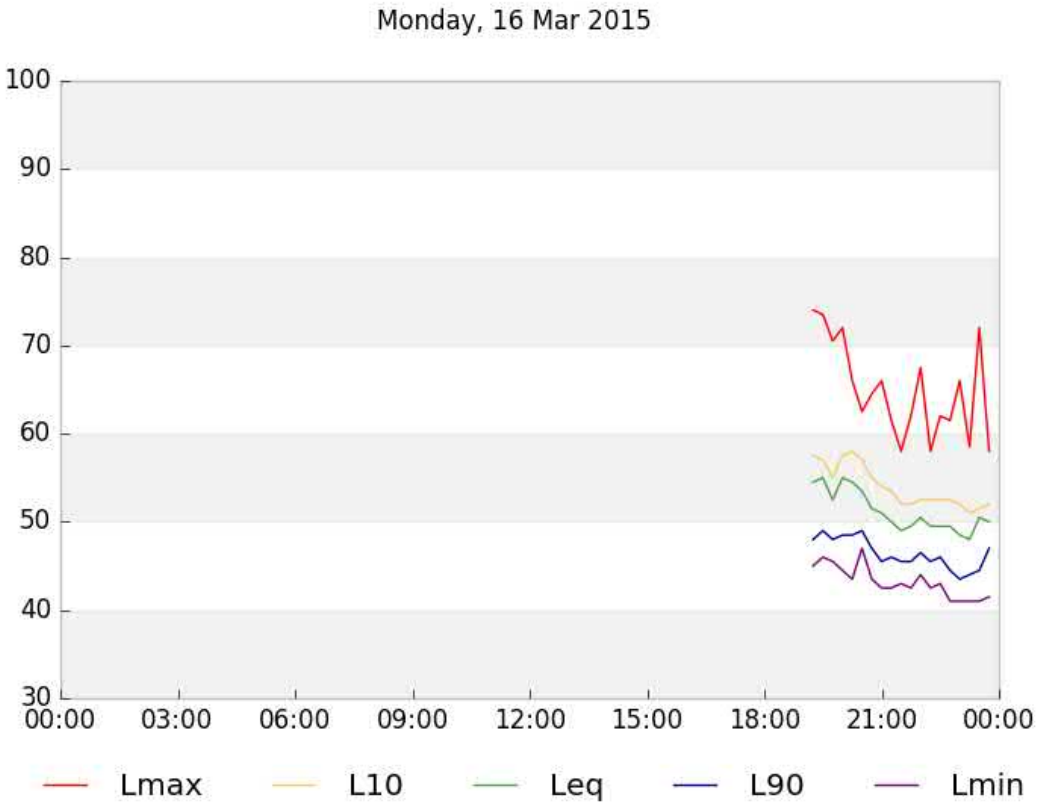
Drawing 5 of 5

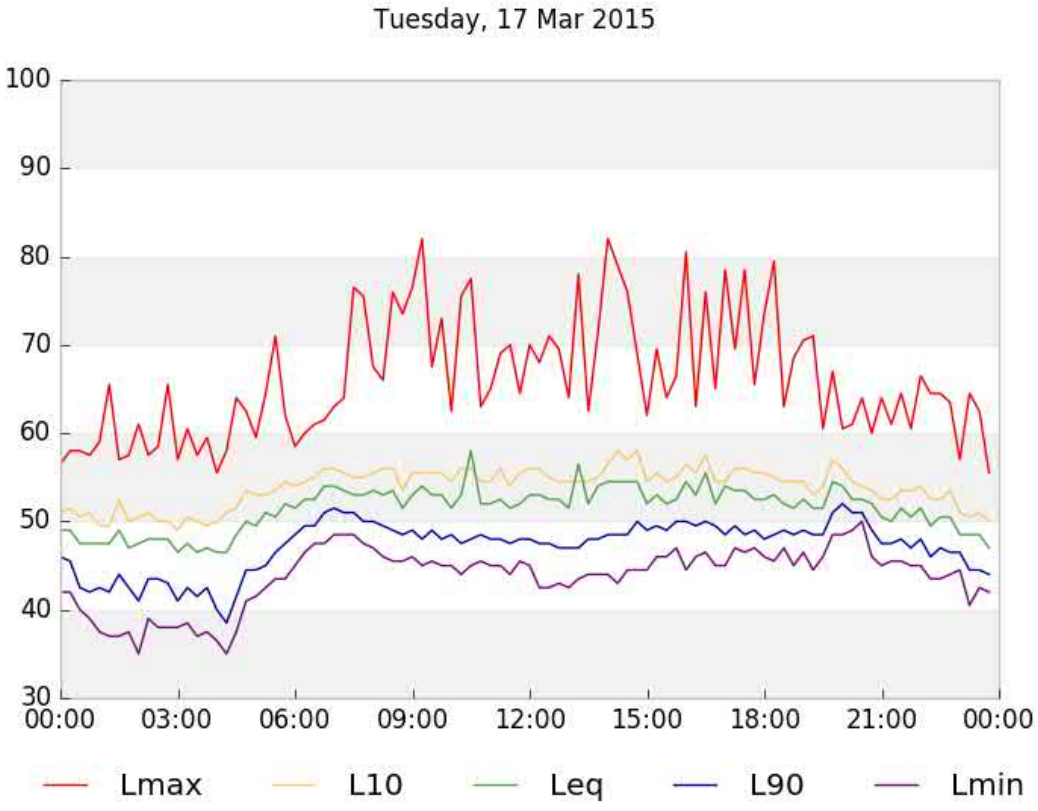
WILKINSON MURRAY

APPENDIX C

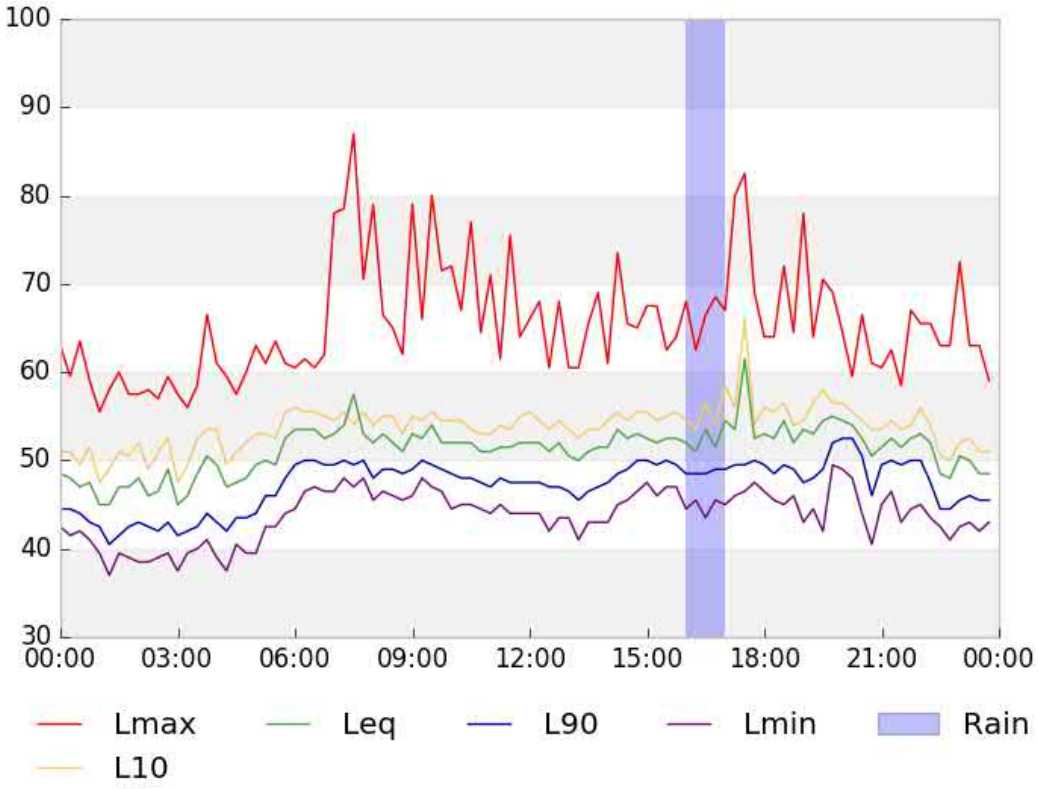
LOGGER CHARTS

MONITORING LOCATION NCA-10B-B15: 3 MUNDON PLACE, WEST PENNANT HILLS

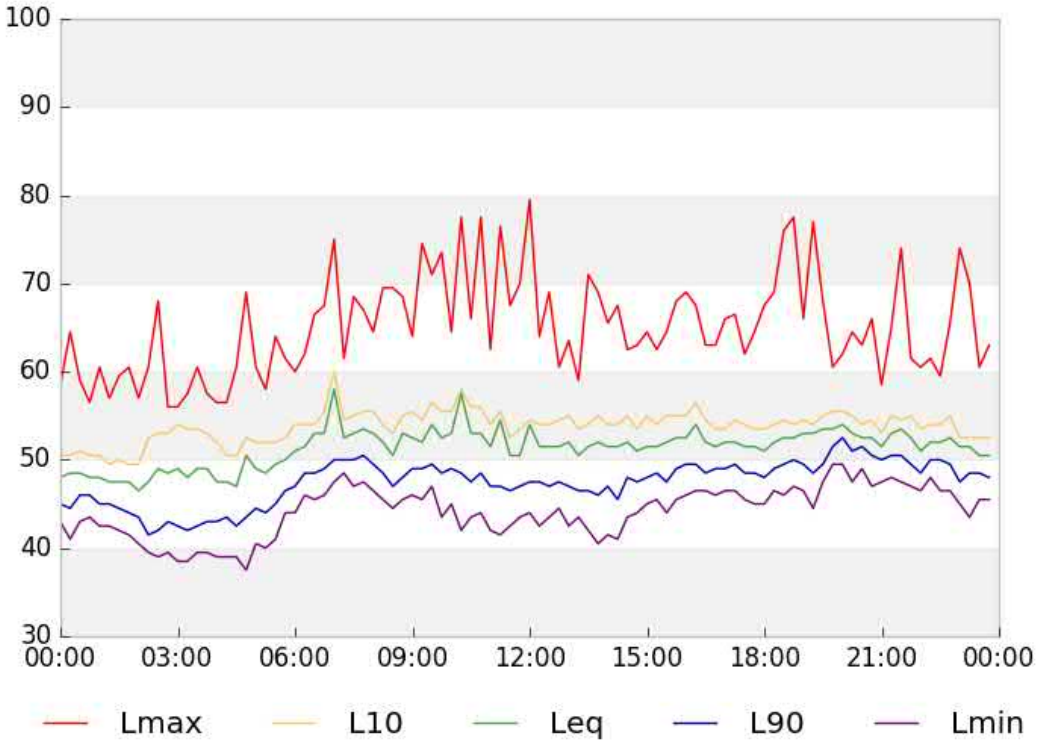




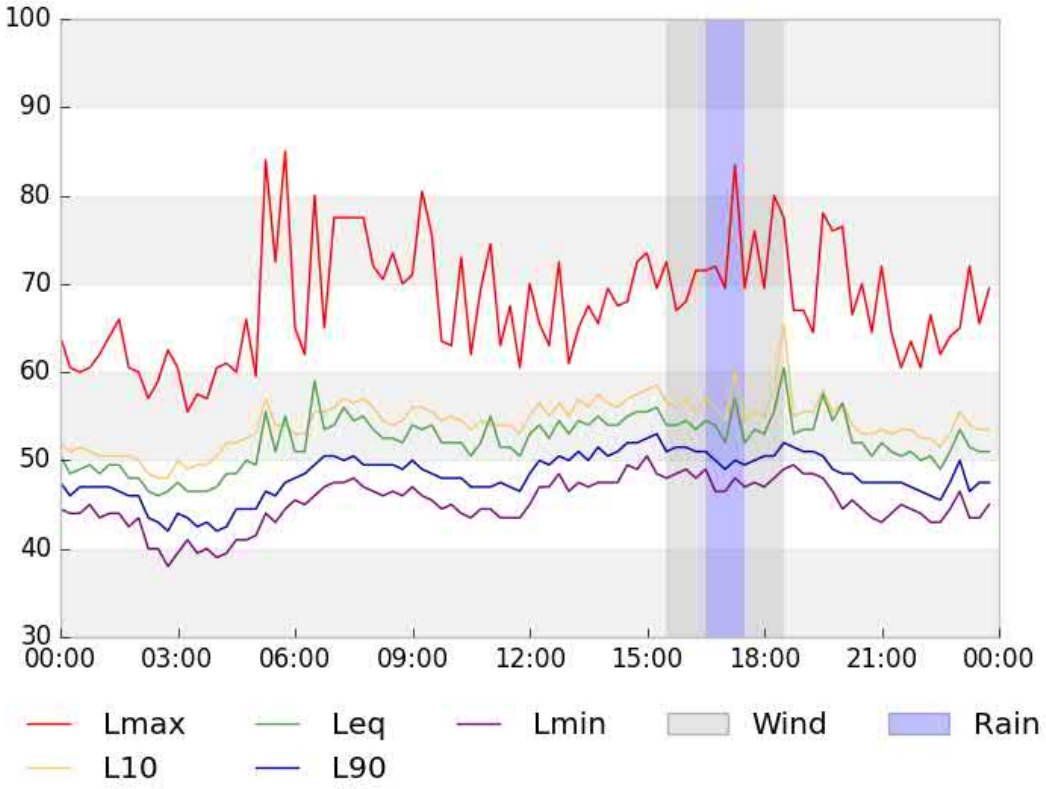
Wednesday, 18 Mar 2015



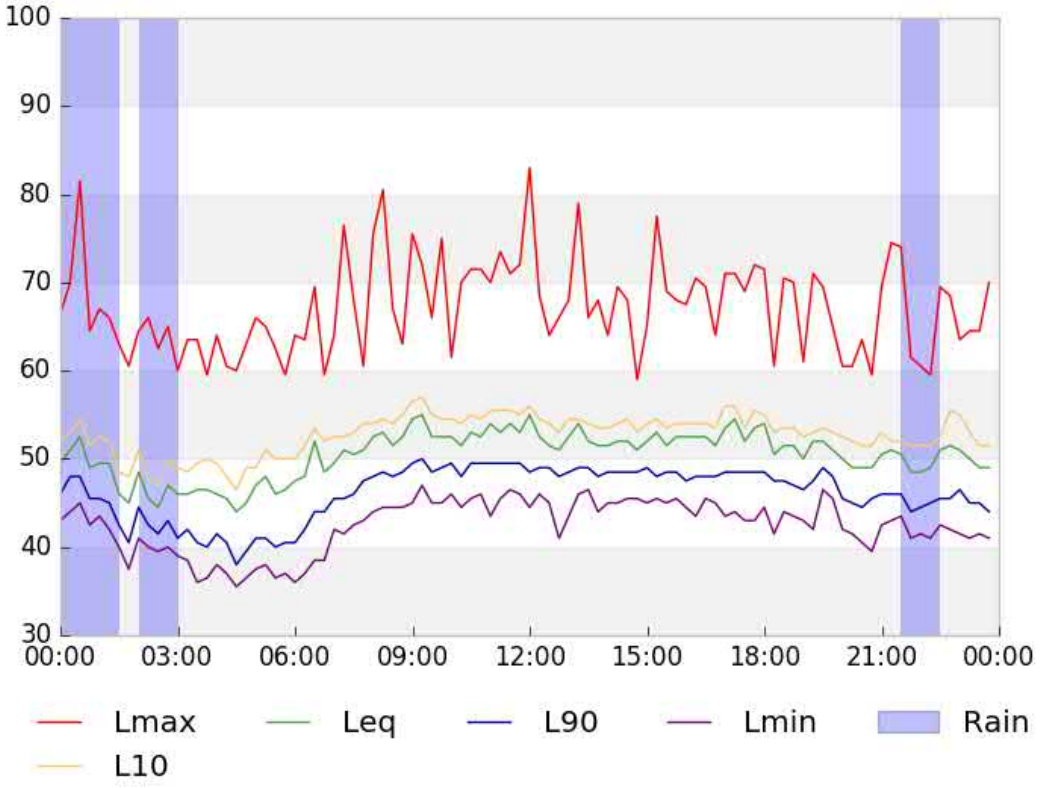
Thursday, 19 Mar 2015

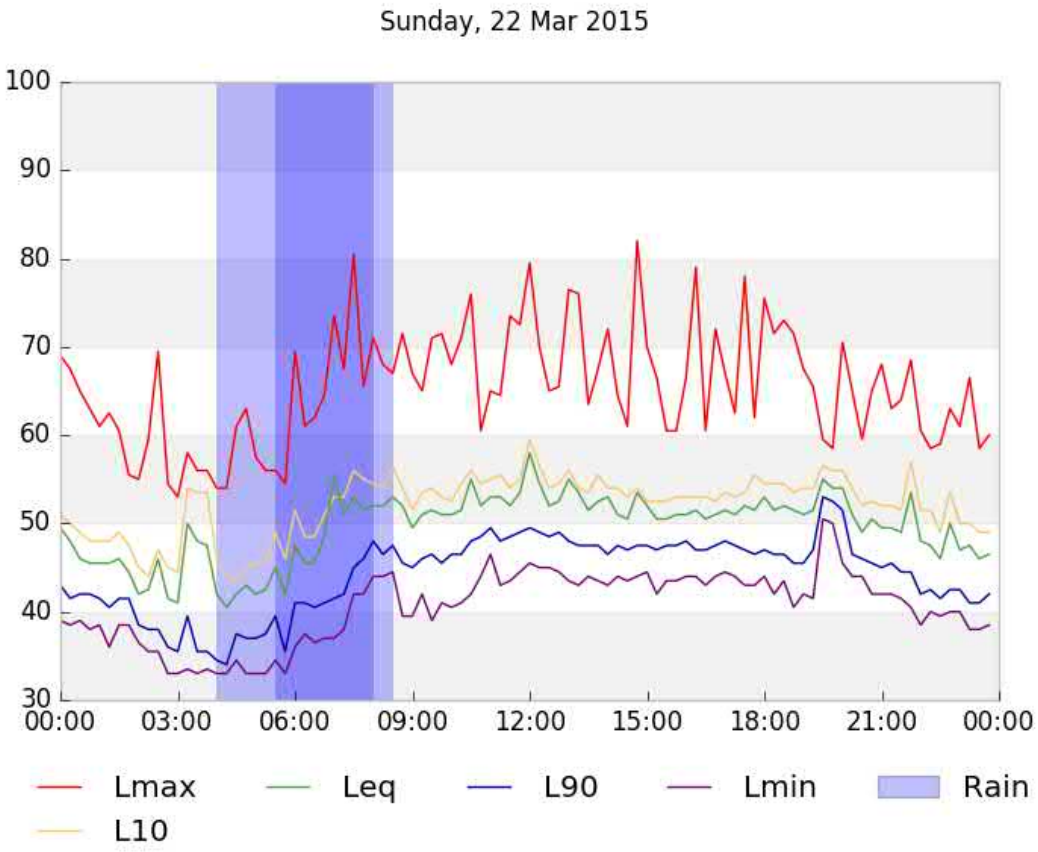


Friday, 20 Mar 2015



Saturday, 21 Mar 2015

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30
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12:00
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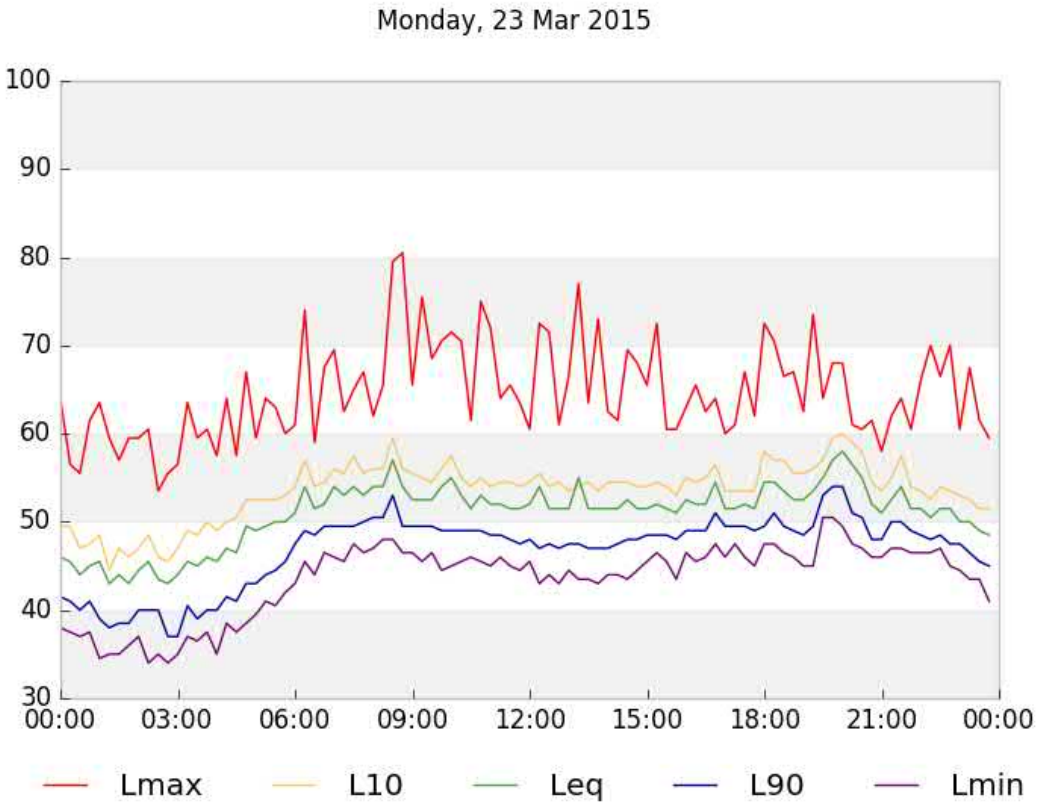
Lmax
Leq
L90
Lmin
Rain
L10


Monday, 23 Mar 2015
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00:00
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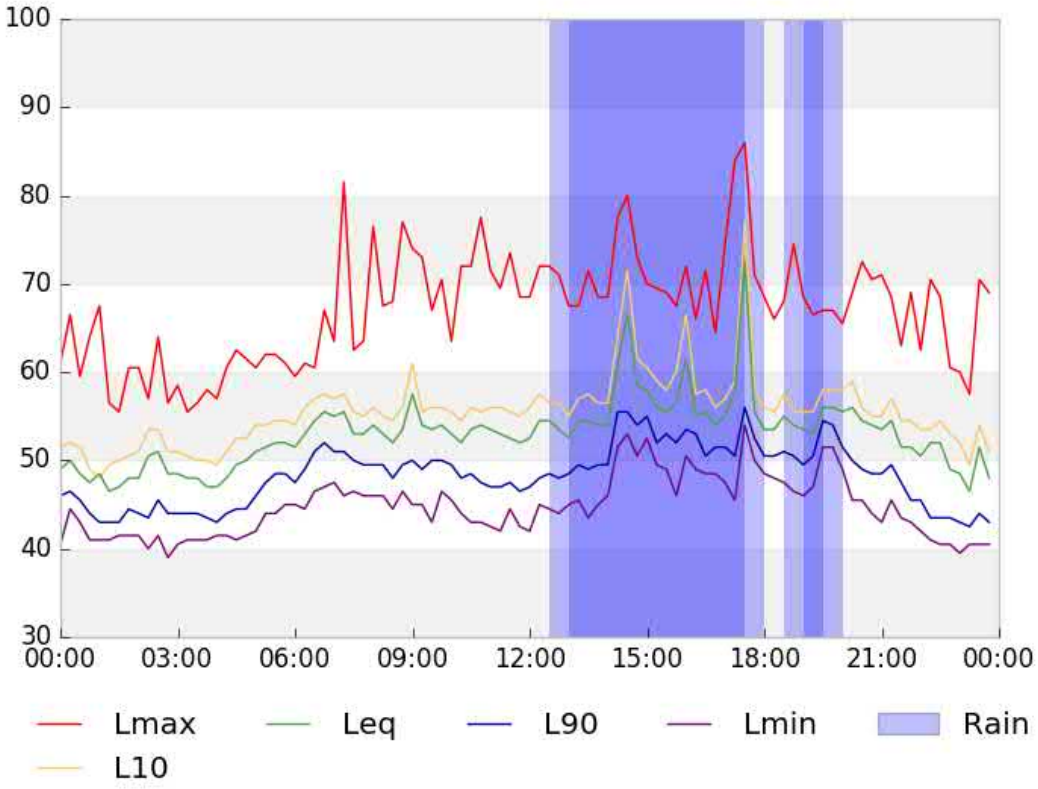
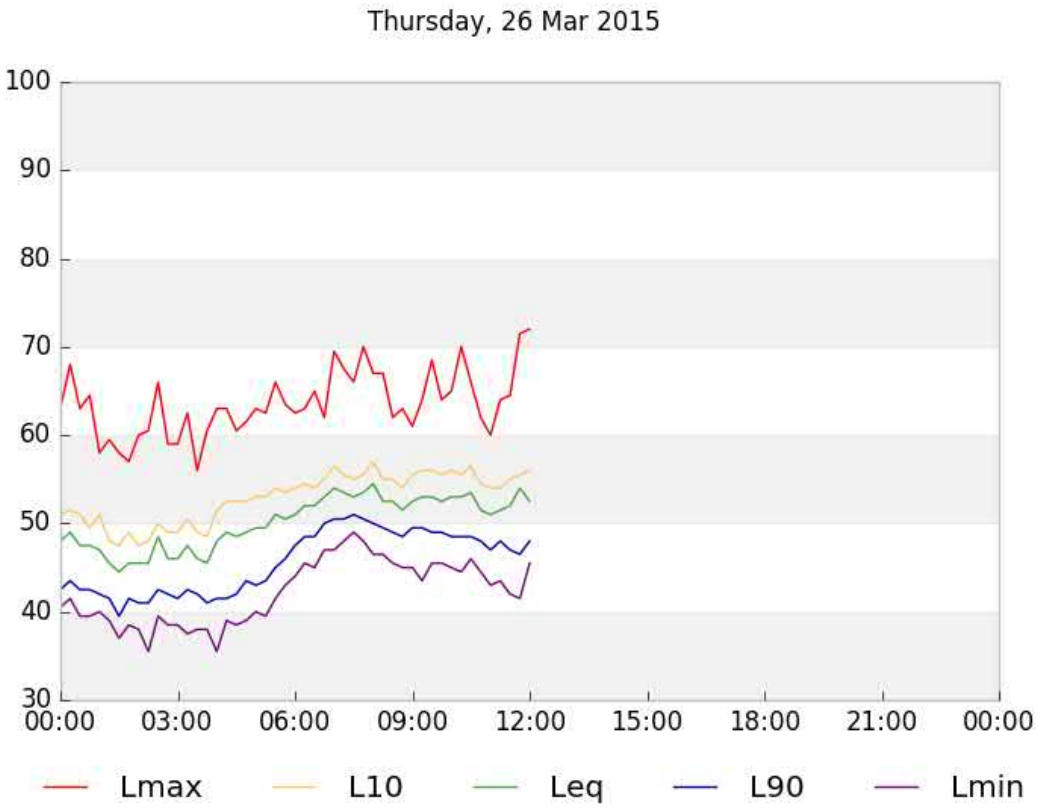
L10
Leq
L90
Lmin

Tuesday, 24 Mar 2015



Wednesday, 25 Mar 2015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00:00
03:00
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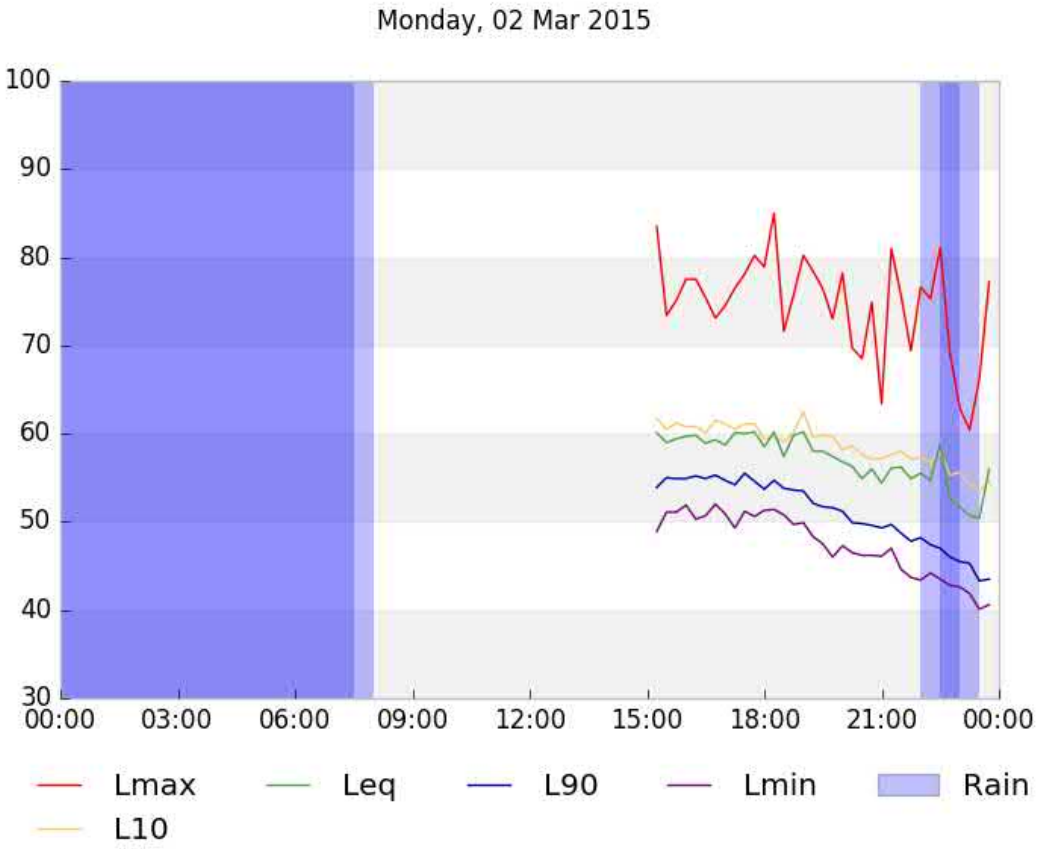
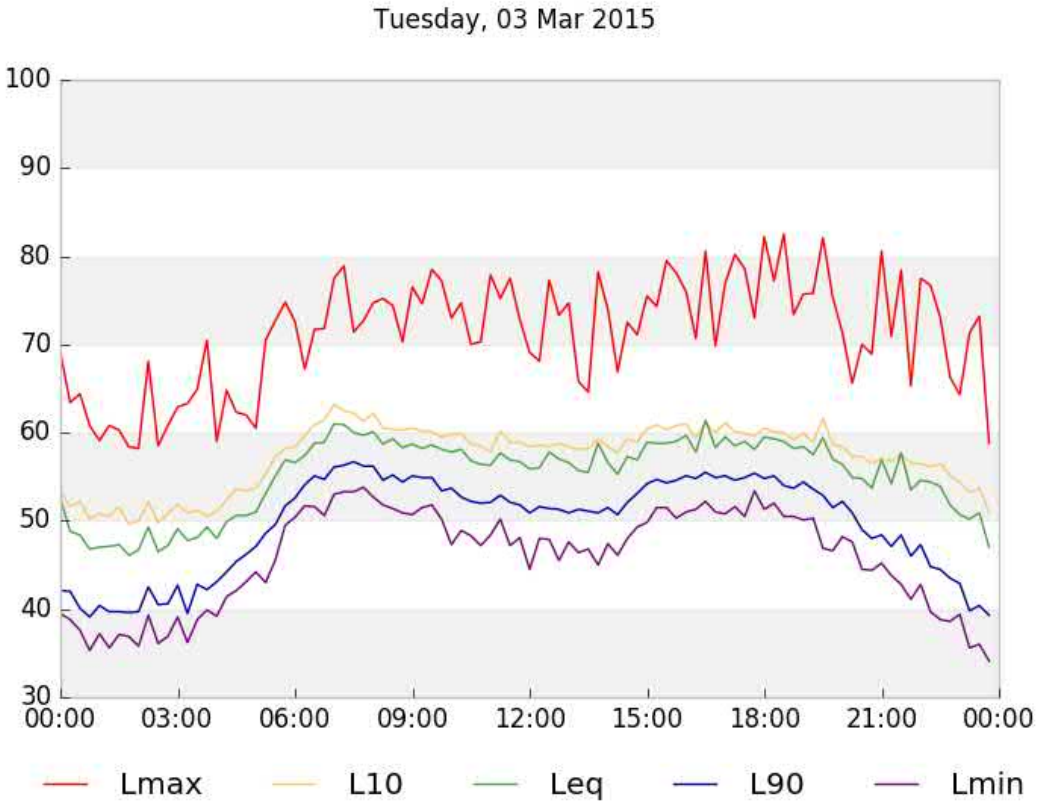
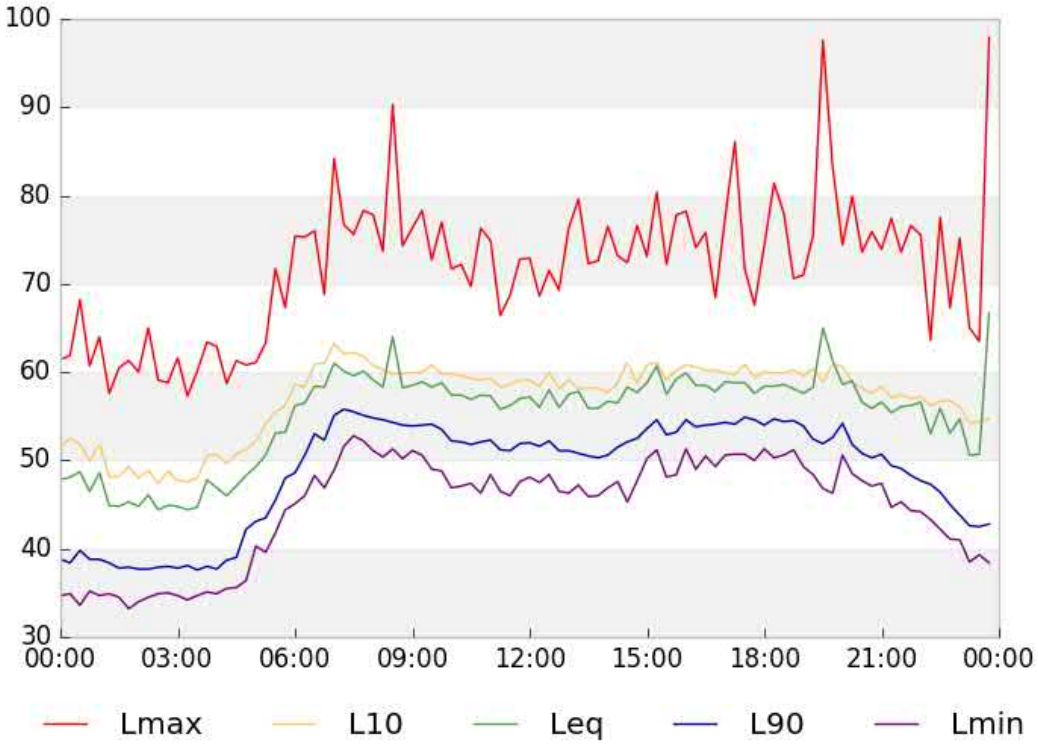
09:00
12:00
15:00
18:00
21:00
00:00
Lmax
L10
Leq
L90
Lmin

MONITORING LOCATION NCA-10D-B17: 58 OAKS ROAD, NORTH ROCKS

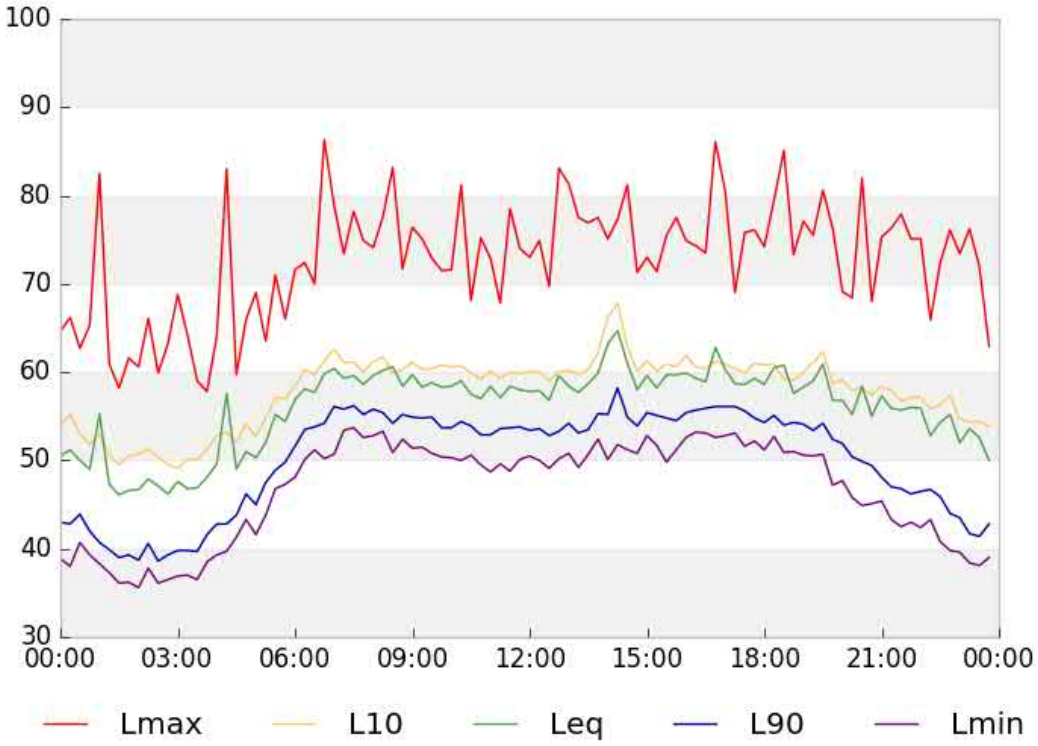




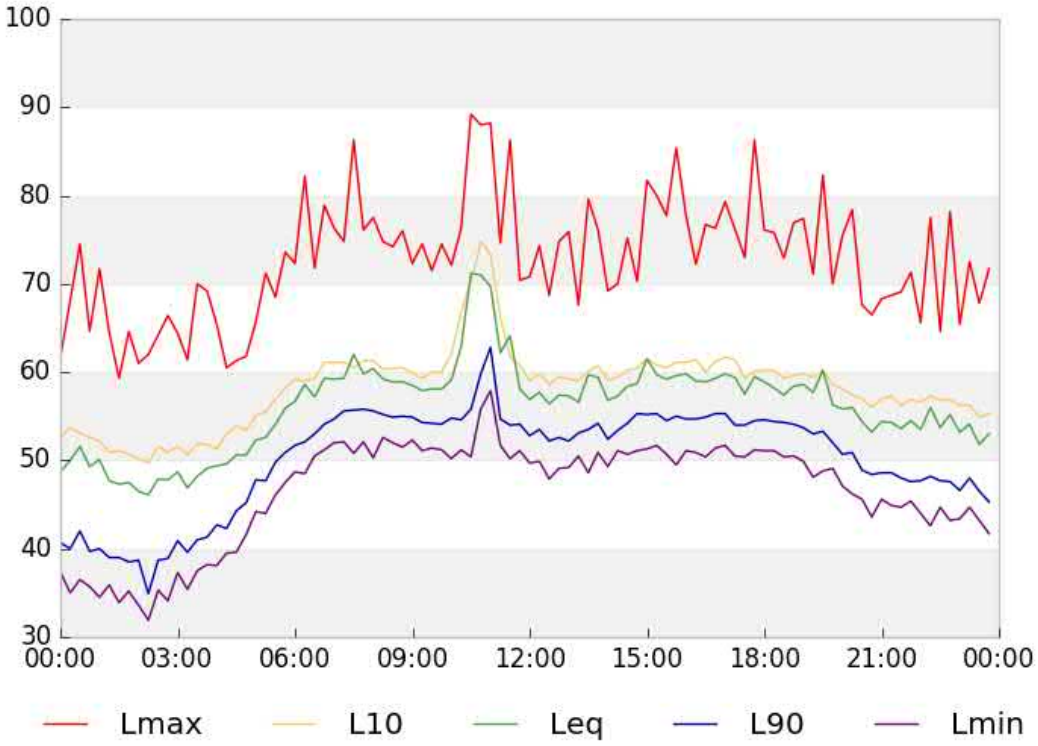
Wednesday, 04 Mar 2015



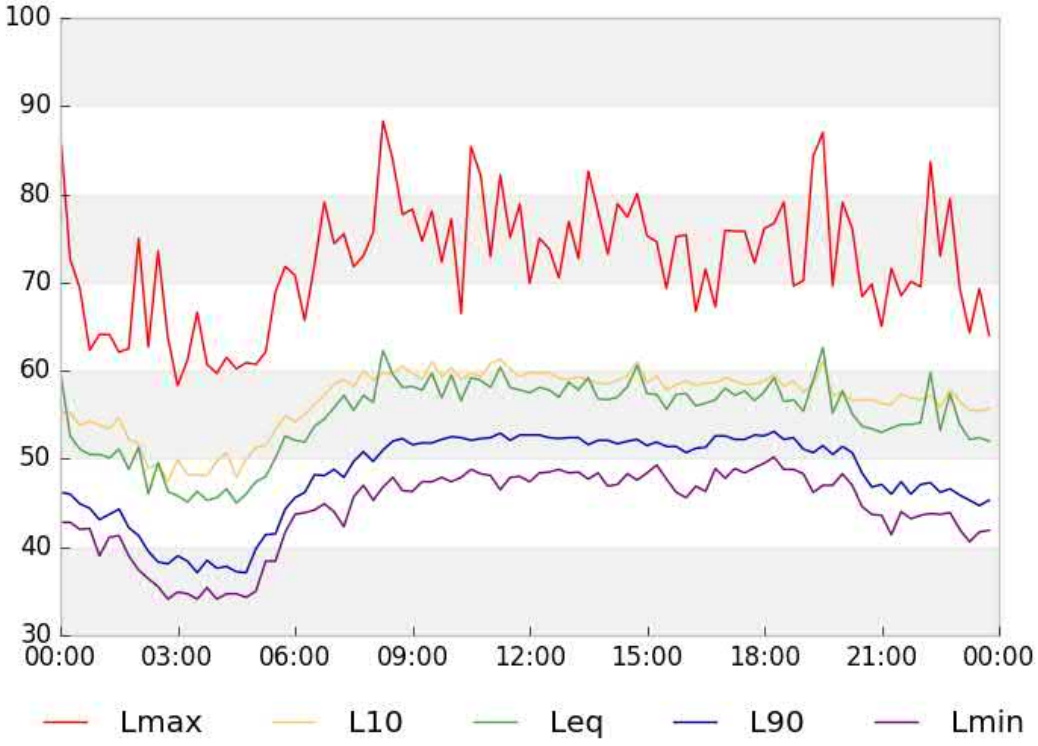
Thursday, 05 Mar 2015



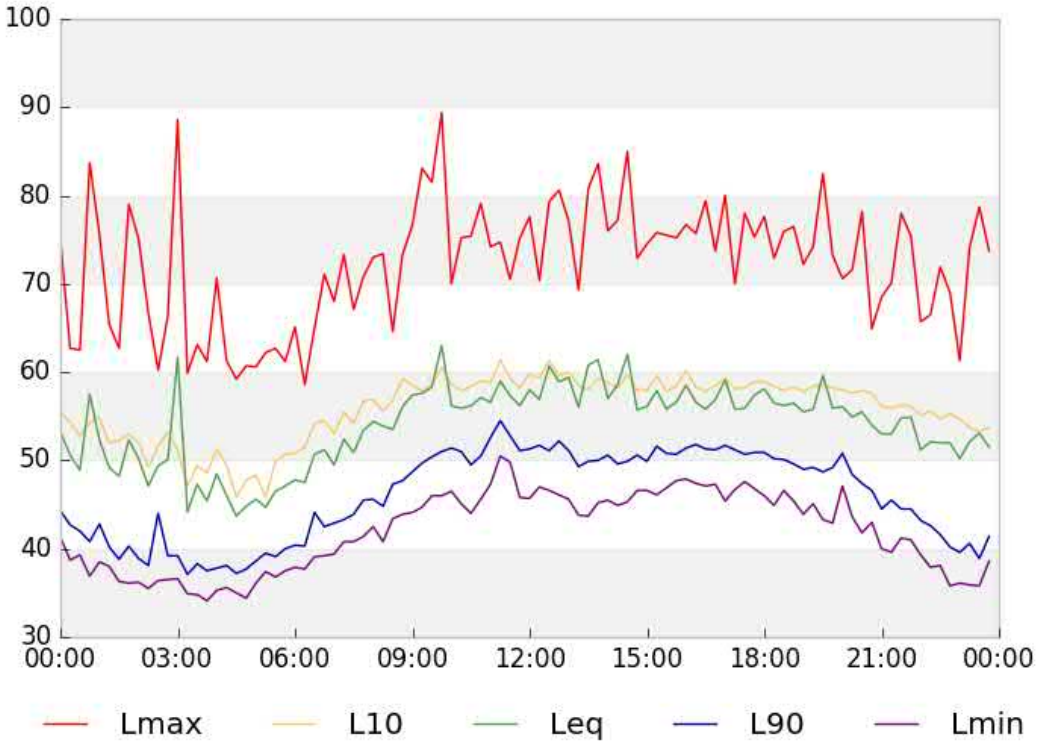
Friday, 06 Mar 2015



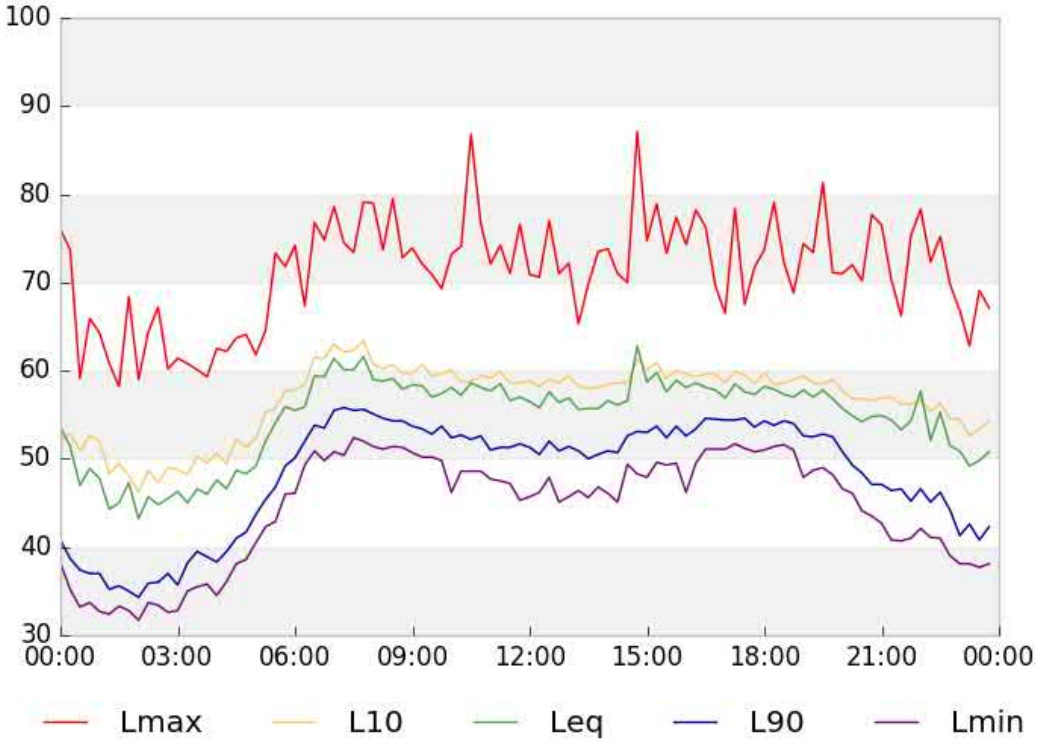
Saturday, 07 Mar 2015

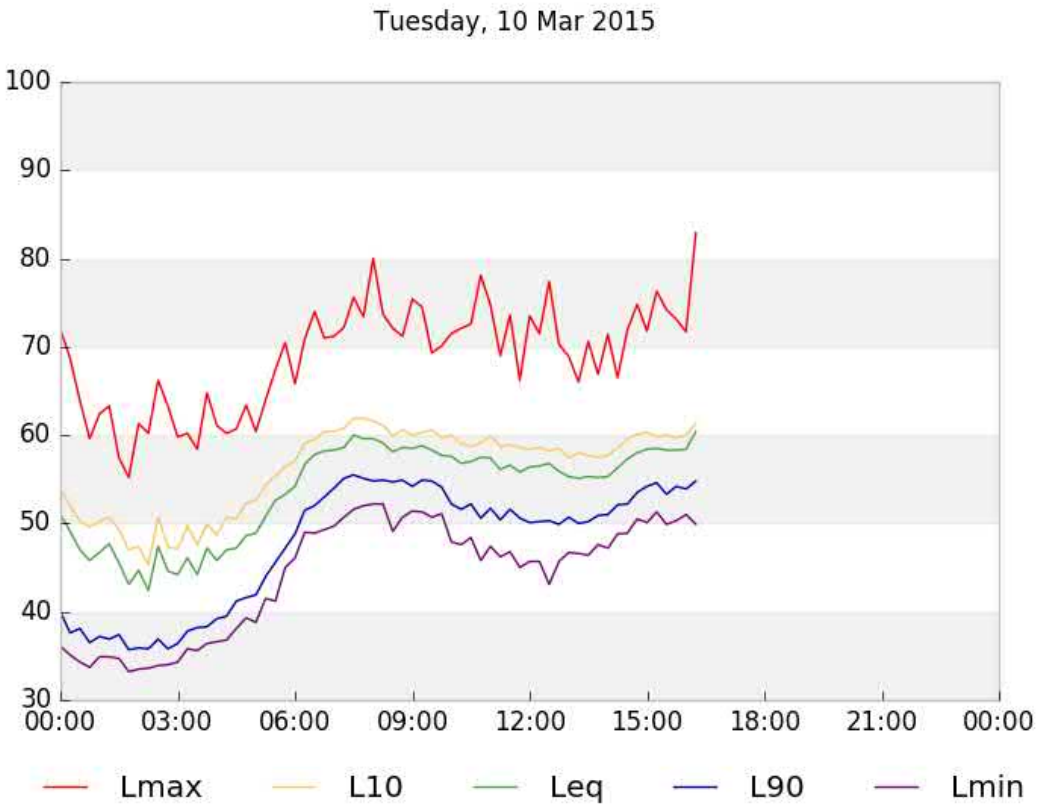


Sunday, 08 Mar 2015



Monday, 09 Mar 2015




Tuesday, 10 Mar 2015
100
90
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18:00
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Lmax
L10
Leq
L90
Lmin

APPENDIX D

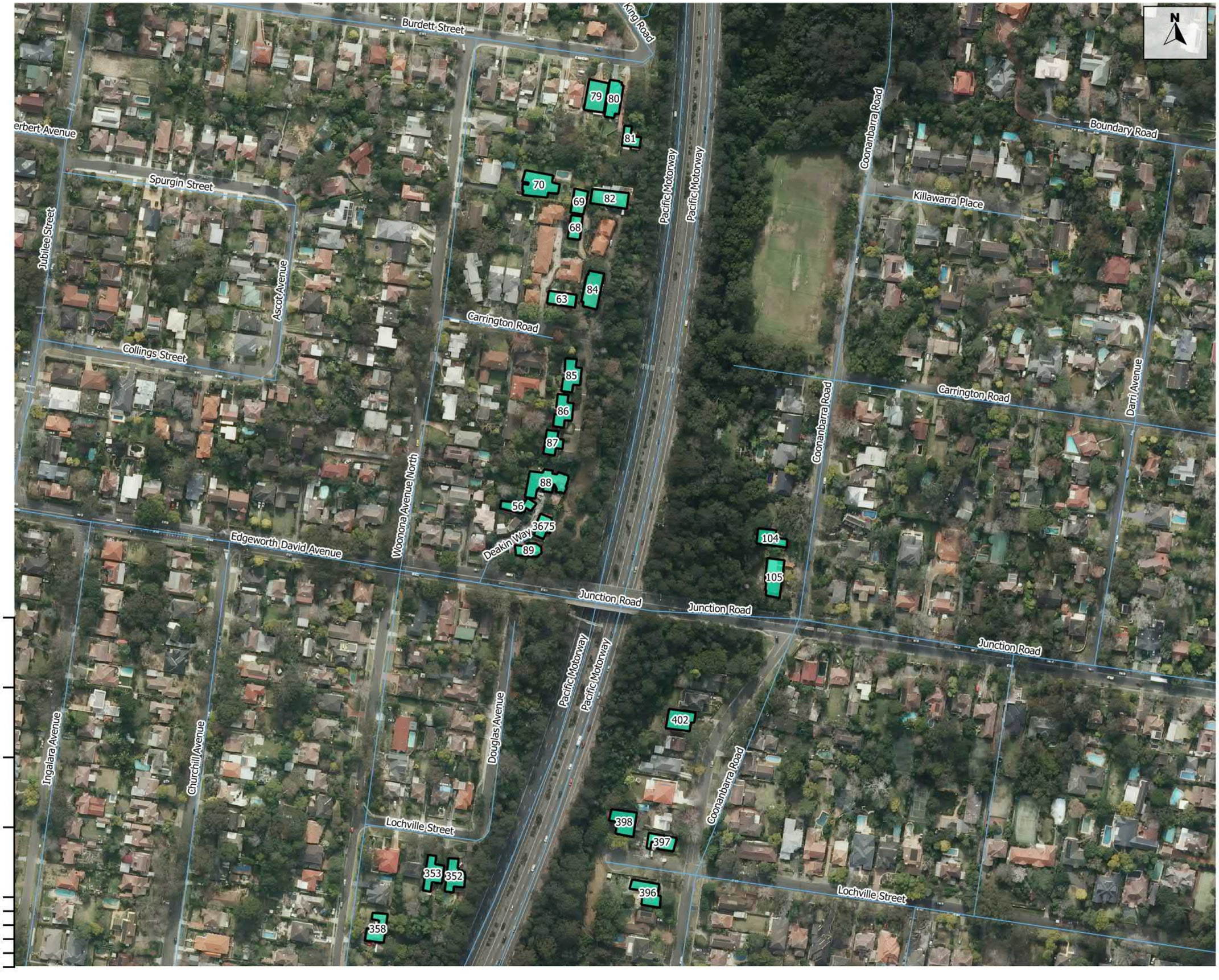
TRAFFIC VOLUMES

Year 2029	Direction	Day (7am-10pm)			Night (10pm-7am)			AADT
No Build Option		**Light Vehicles**	**Heavy Vehicles**	**HV %**	**Light Vehicles**	**Heavy Vehicles**	**HV %**	
NorthConnex Northern								
M1 underneath Pacific Highway	NB	17610	2962	14.4	2867	1096	27.7	24535
	SB	17230	3302	16.1	2804	1221	30.3	24557
M1 north of rail line	NB	37781	4161	9.9	6152	1539	20.0	49633
	SB	38831	5046	11.5	6322	1865	22.8	52064
PHR south of Edwards Road	NB	29227	3869	11.7	4758	1431	23.1	39285
	SB	30190	4551	13.1	4915	1683	25.5	41339
PHR between Edwards Road and Pacific Highway	NB	12657	957	7.0	2061	354	14.7	16029
	SB	14000	1301	8.5	2279	481	17.4	18061
NorthConnex Southern & M2 Integration								
M2 west of Pennant Hills Road including ramps	EB	41809	5088	10.8	6806	1882	21.7	55585
	WB	38926	5566	12.5	6337	2059	24.5	52888
M2 east of Pennant Hills Road including ramps	EB	38359	3608	8.6	6244	1334	17.6	49545
	WB	36301	4521	11.1	5911	1671	22.0	48404
PHR north of M2	NB	33454	5220	13.5	5446	1931	26.2	46051
	SB	36358	5246	12.6	5920	1941	24.7	49465
PHR south of M2	NB	25098	2344	8.5	4086	867	17.5	32395
	SB	29886	2915	8.9	4865	1078	18.1	38744

Year 2029	Direction	Day (7am-10pm)			Night (10pm-7am)			AADT
Build Option		**Light Vehicles**	**Heavy Vehicles**	**HV %**	**Light Vehicles**	**Heavy Vehicles**	**HV %**	
NorthConnex Northern								
M1 Northern Portals	NB	8905	3092	25.8	1450	1143	44.1	14590
	SB	9451	3367	26.3	1539	1246	44.7	15603
M2 Southern Portals	EB	3399	263	7.2	553	97	14.9	4312
	WB	3893	447	10.3	634	166	20.8	5140
M1 underneath Pacific Highway	NB	15681	1104	6.6	2551	409	13.8	19745
	SB	14167	728	4.9	2306	269	10.4	17470
M1 north of rail line excluding Northern Portals	NB	36891	2522	6.4	6004	932	13.4	46349
	SB	32409	2025	5.9	5276	749	12.4	40459
PHR south of Edwards Road	NB	30944	2180	6.6	5037	806	13.8	38967
	SB	24691	1853	7.0	4019	685	14.6	31248
PHR between Edwards Road and Pacific Highway	NB	19678	2042	9.4	3204	757	19.1	25681
	SB	14451	1906	11.7	2352	705	23.1	19414
NorthConnex Southern & M2 Integration								
M2 Northern Portals	NB	8270	1598	16.2	1346	592	30.5	11806
	SB	8797	2236	20.3	1432	827	36.6	13292
M2 Southern Portals	EB	4528	1941	30.0	737	718	49.3	7924
	WB	4053	1394	25.6	684	492	41.8	6623
M2 west of Pennant Hills Road including ramps but excluding M2 Southern Portals	EB	43550	3523	7.5	7089	1303	15.5	55465
	WB	40605	4224	9.4	6610	1562	19.1	53001
M2 east of Pennant Hills Road including ramps	EB	37495	2984	7.4	6104	1103	15.3	47686
	WB	36836	3707	9.1	5996	1372	18.6	47911
PHR north of M2 excluding M2 Northern Portals	NB	26351	2260	7.9	4290	836	16.3	33737
	SB	28747	2351	7.6	4680	869	15.7	36647
PHR south of M2	NB	17303	1525	8.1	2817	564	16.7	22209
	SB	31164	3037	8.9	5073	1123	18.1	40397

APPENDIX E

MAPPING SHOWING RECEIVERS ELIGIBLE FOR CONSIDERATION OF NOISE MITIGATION

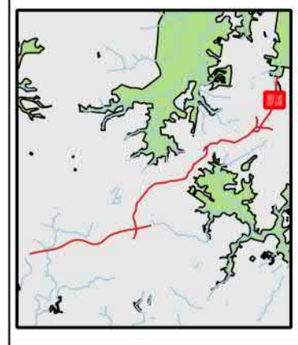


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

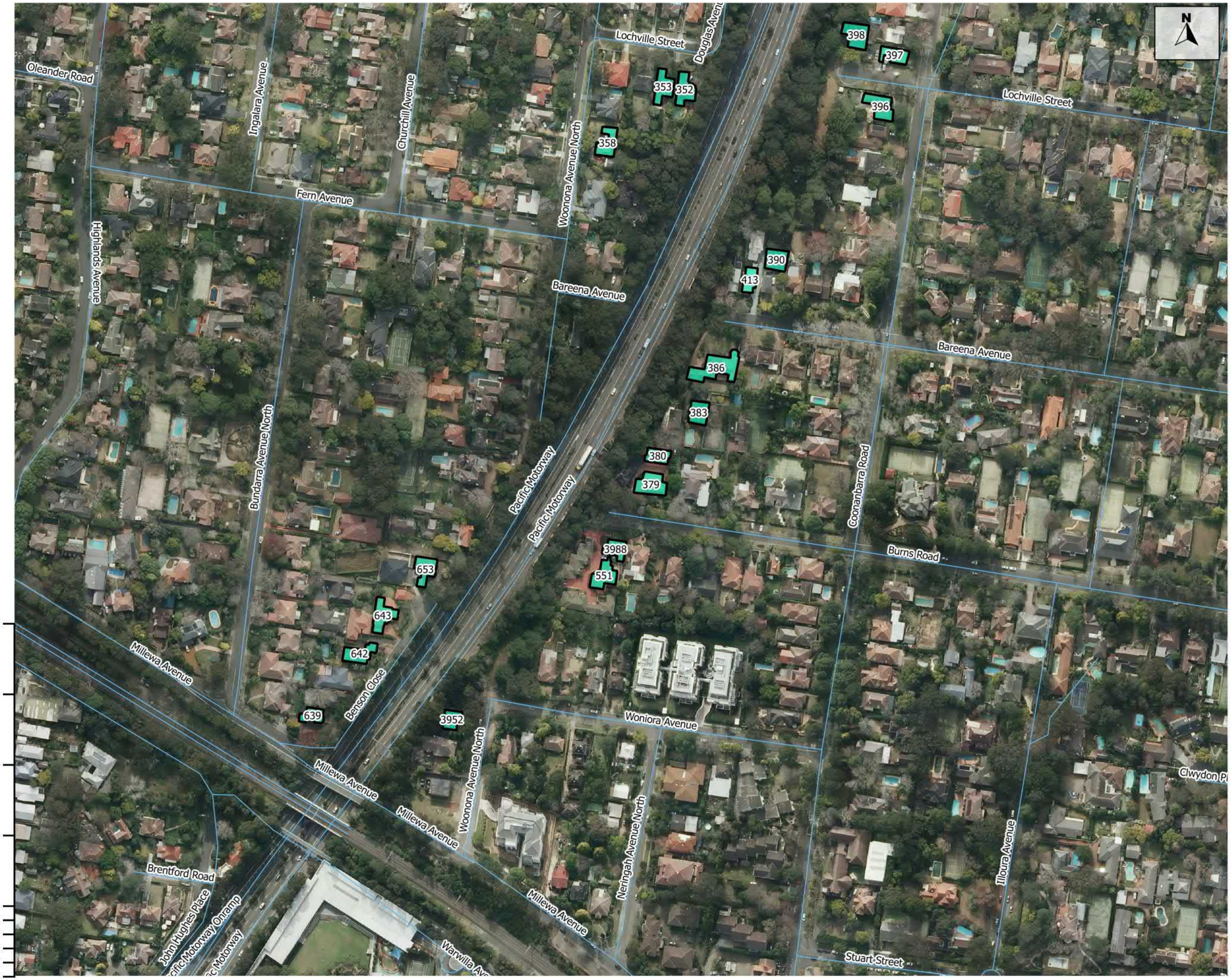
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 1 of 13

WILKINSON MURRAY

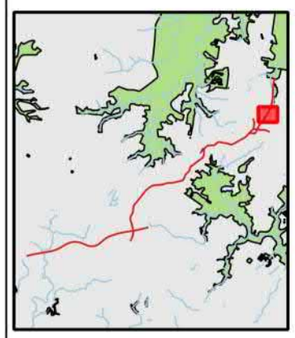


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

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EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 2 of 13

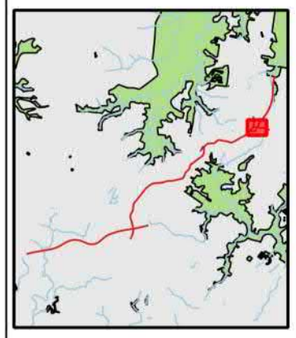
WILKINSON MURRAY

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

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LEND LEASE BOUYGUES JOINT VENTURE

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Receivers Eligible for Consideration of Noise Mitigation

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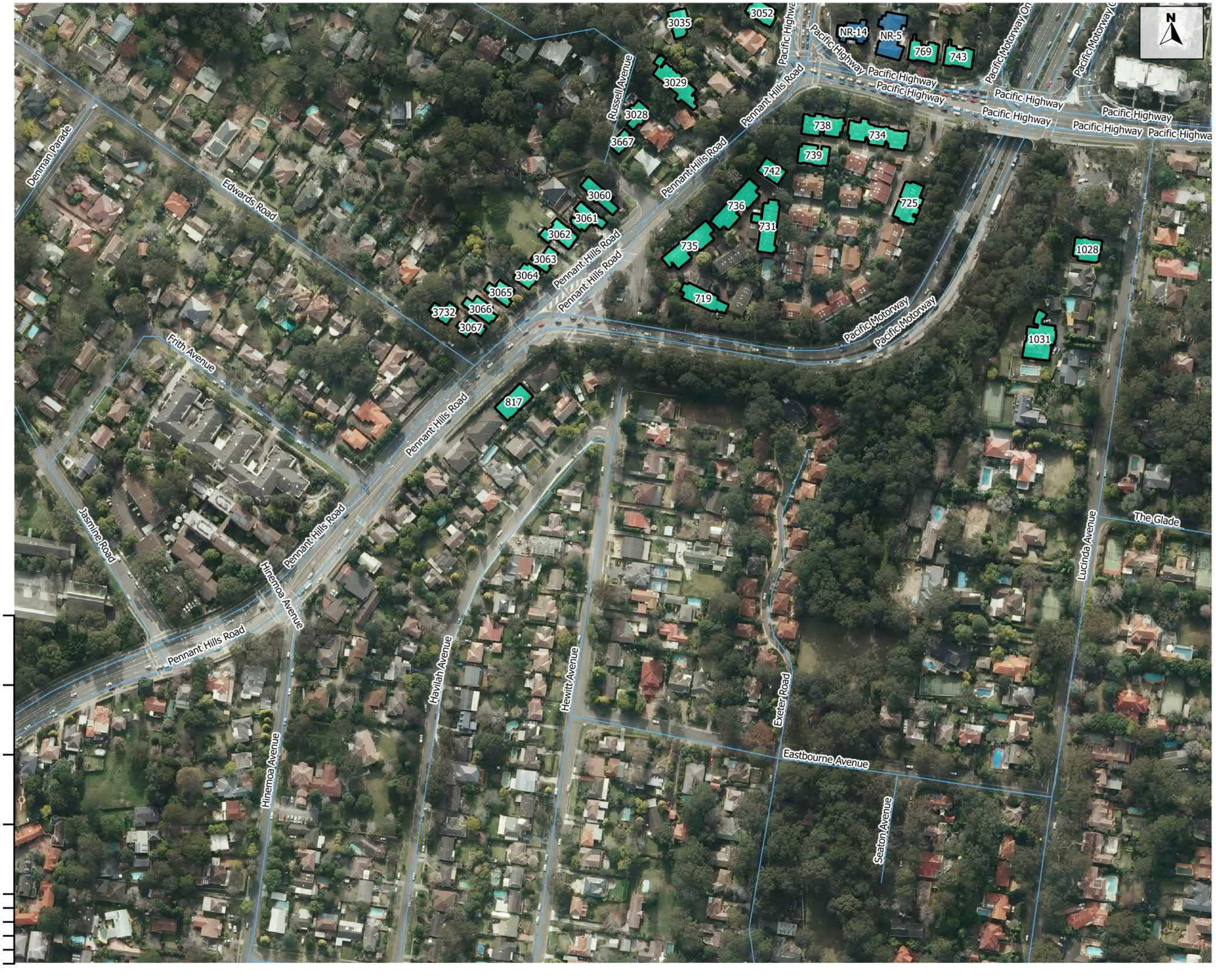
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 3 of 13

WILKINSON MURRAY

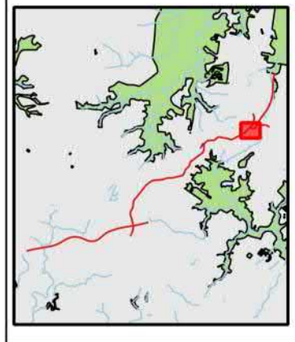


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



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NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 4 of 13

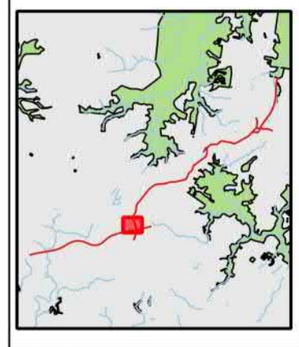
WILKINSON MURRAY

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

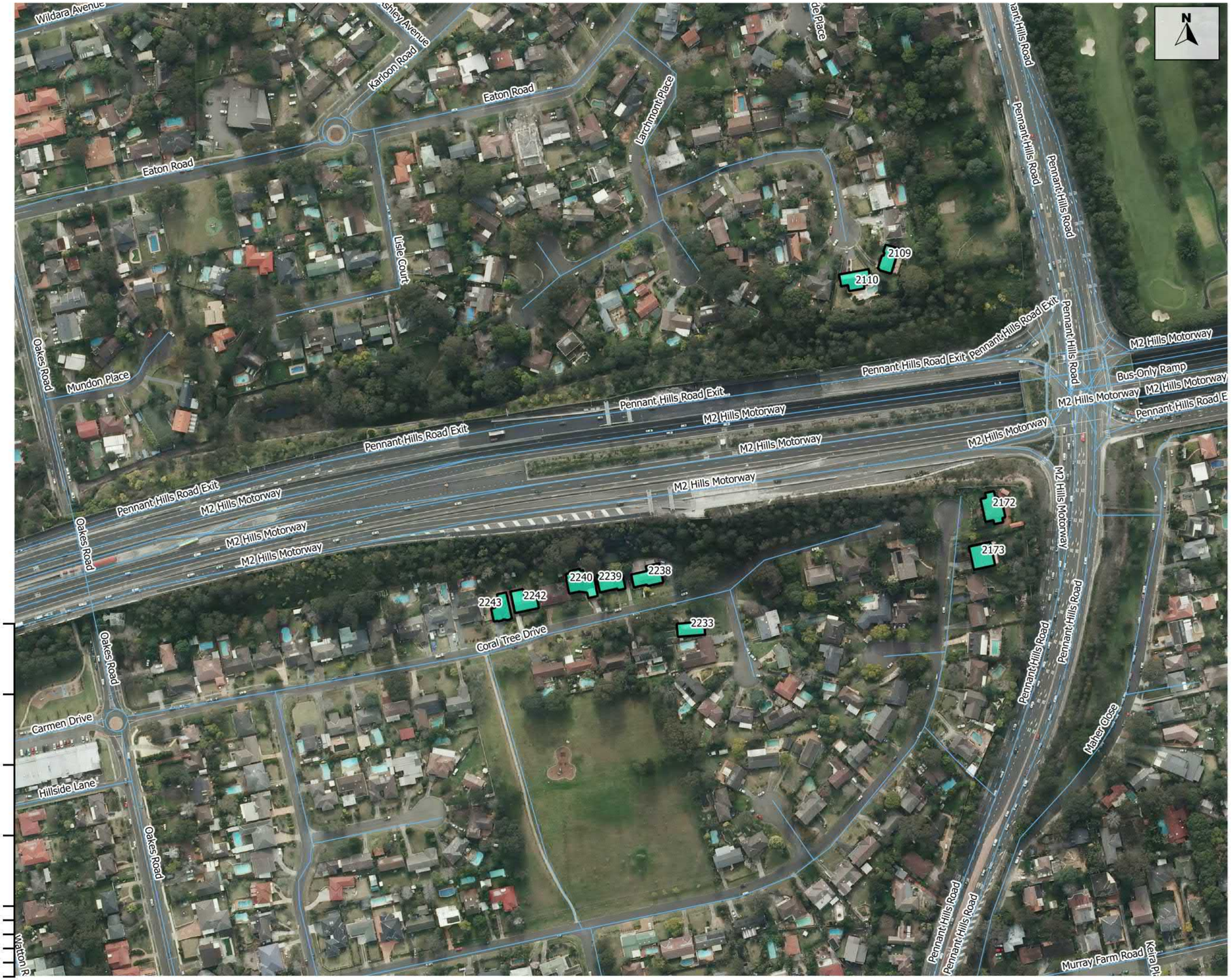
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.:	13245	REVISION:	E
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 5 of 13

WILKINSON MURRAY

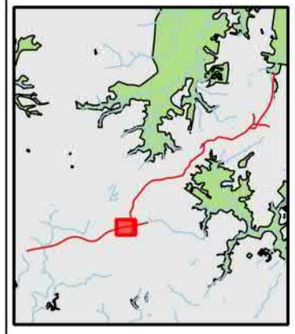


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
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PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.: 13245	REVISION: E
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EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 6 of 13

WILKINSON MURRAY

Leigh Place
Francis Oakes Way
Riley Avenue
Eaton Road
Eaton Road
Lisle Court
Oakes Road
Mundon Place
Betts Place
Westmore Drive
Gwen Place
Robyn Place
Pennant Hills Road Exit
M2 Hills Motorway
Oakes Road
Coral Tree Drive
2491
Hillside Lane
2504
2503
2502
2501
2505
2524
2522
2521
2520
2519
2526
2528
Carmen Drive
Sylvia Avenue
Watton Road
Oakes Road
Murray Farm Road
2243
N
200 m
150
100
50
0
50

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

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Receivers Eligible for Consideration of Noise Mitigation

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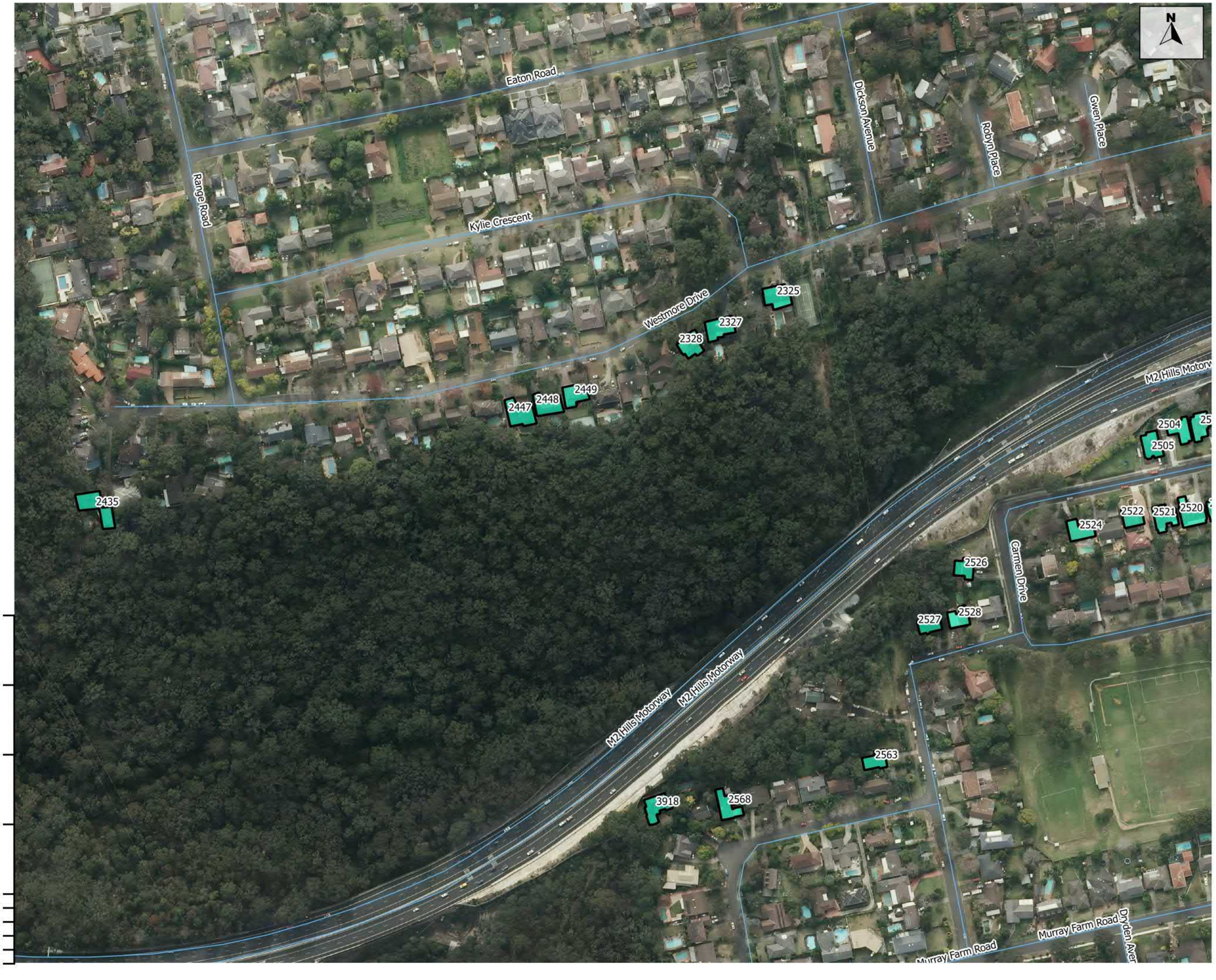
Drawing 7 of 13

WILKINSON MURRAY

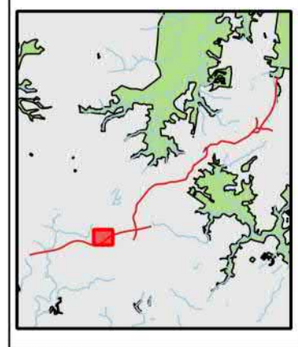


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



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TITLE:
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PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 8 of 13

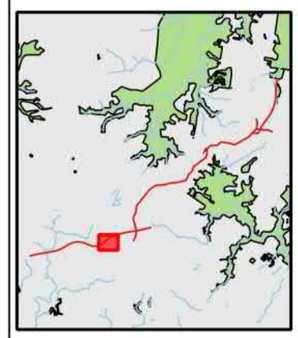
WILKINSON MURRAY

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 9 of 13

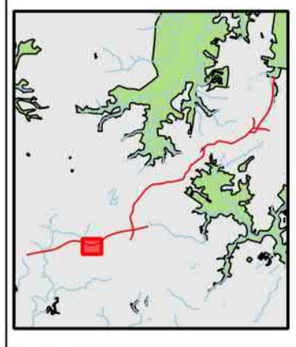
WILKINSON MURRAY

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
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PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

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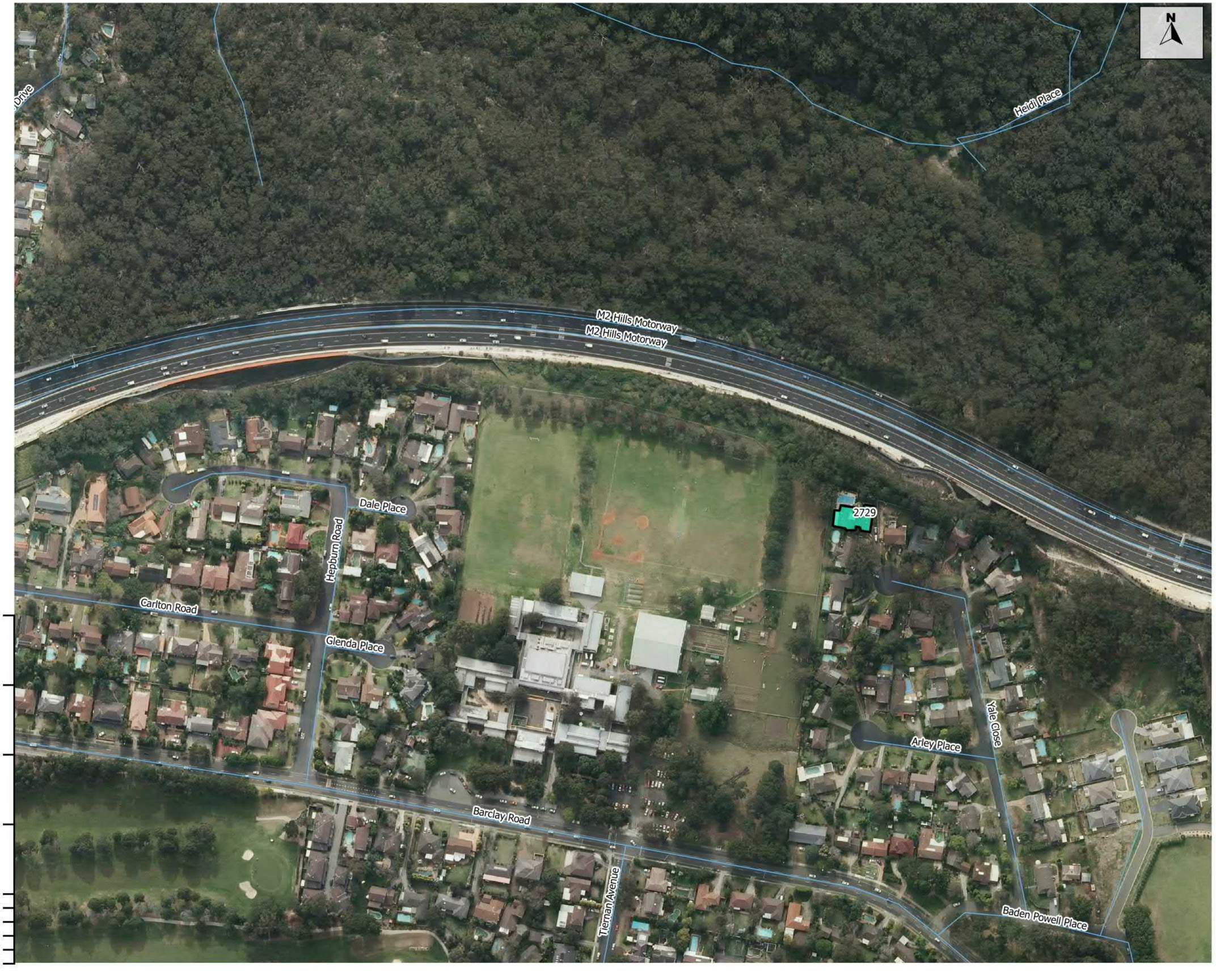
PREPARED:	FT	APPROVED:	RB
EXPORTED:	29/6/2016	SHEET SIZE:	A3

Drawing 10 of 13

WILKINSON MURRAY

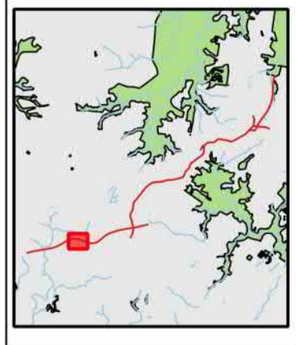


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

PROJECT No.: 13245	REVISION: E
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 11 of 13

WILKINSON MURRAY

N

Eather Avenue
Larra Crescent
Alderson Avenue
Raine Avenue
Mill Drive
Barclay Road to Mill Road
M2 Hills Motorway
Carlton Road
Barclay Road
Perry Street
Rajola Place
Williams Road
Hancey Avenue

3936
2860
2861
2862
2890
3934
2885
2887
2882
2883
2884
2880
2881
2878

200 m
150
100
50
0
50

Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

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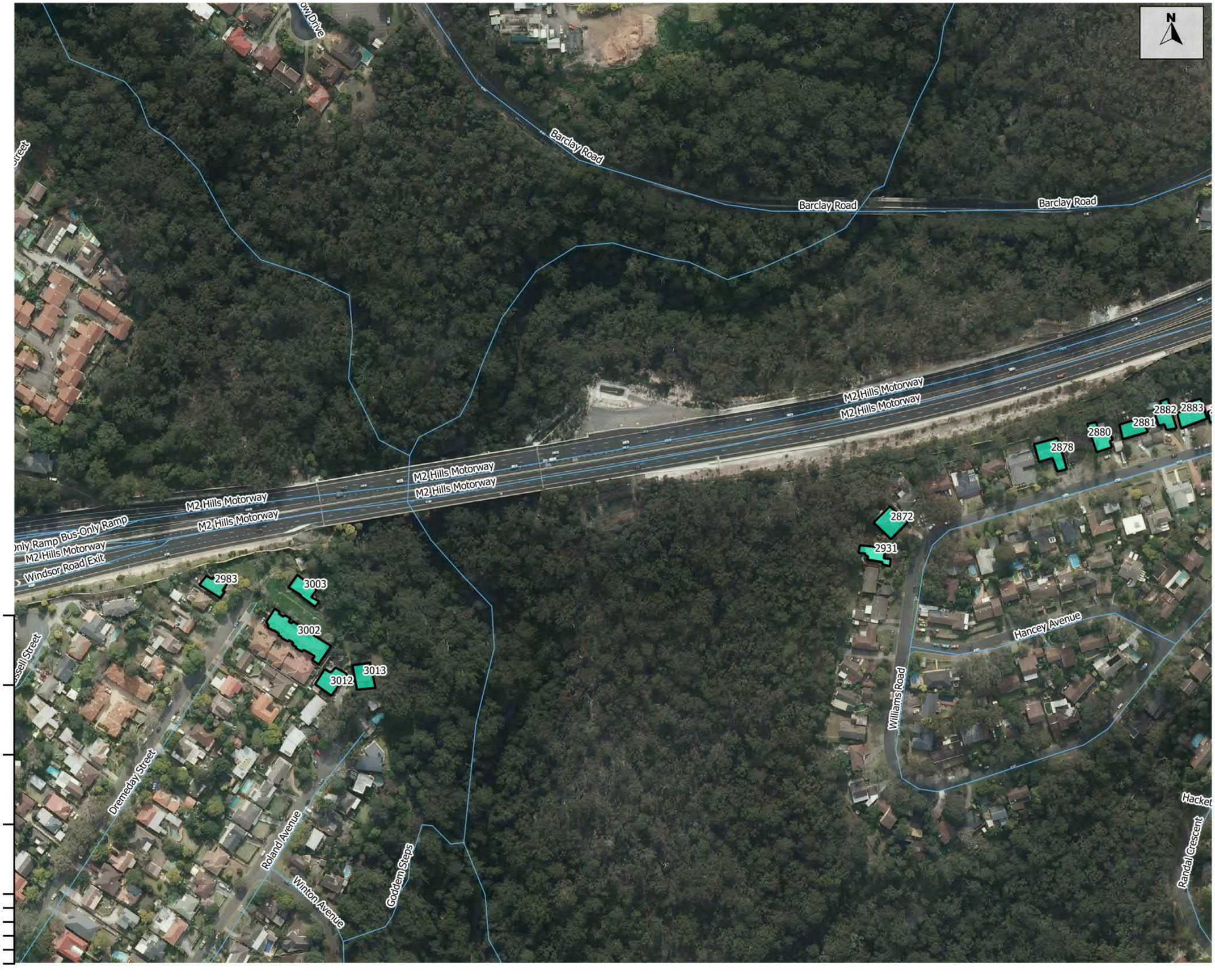
PREPARED: FT	APPROVED: RB
EXPORTED: 29/6/2016	SHEET SIZE: A3

Drawing 12 of 13

WILKINSON MURRAY

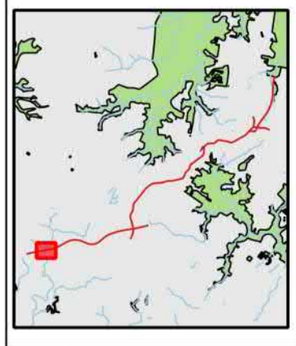


Locations for Consideration of Noise Mitigation

- Residential Dwelling
- Non-Residential Structure

Other Features:

- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

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LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Noise Mitigation

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Drawing 13 of 13

WILKINSON MURRAY

APPENDIX F

OPERATIONAL ROAD TRAFFIC NOISE RESULTS

NORTHCONNEX NORTHERN

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
40	204	1A	Residence	No	120 Burdett Street	60	55	59	55	60	56	N	Y	N	N	N	N	N	60	56	N	-
41	306	1A	Residence	No	2 Carrington Road	60	55	56	53	57	53	N	N	N	N	N	N	N	57	53	N	-
42	391	1A	Residence	No	39 Woonona Avenue North	60	55	53	49	53	50	N	N	N	N	N	N	N	54	50	N	-
43	370	1A	Residence	No	41 Woonona Avenue North	60	55	53	50	54	50	N	N	N	N	N	N	N	54	51	N	-
44	353	1A	Residence	No	1 Carrington Road	60	55	54	51	55	51	N	N	N	N	N	N	N	55	52	N	-
45	358	1A	Residence	No	3 Carrington Road	60	55	57	53	57	54	N	N	N	N	N	N	N	58	54	N	-
46	386	1A	Residence	No	1A Carrington Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	51	N	-
47	410	1A	Residence	No	39A Woonona Avenue North	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
49	432	1A	Residence	No	37 Woonona Avenue North	60	55	57	54	58	55	N	N	N	N	N	N	N	58	55	N	-
50	438	1A	Residence	No	35 Woonona Avenue North	60	55	56	52	57	53	N	N	N	N	N	N	N	57	53	N	-
51	444	1A	Residence	No	35 Woonona Avenue North	60	55	56	52	56	53	N	N	N	N	N	N	N	56	53	N	-
52	462	1A	Residence	No	125 Edgeworth David Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	53	49	N	-
53	481	1A	Residence	No	125 Edgeworth David Avenue	60	55	54	51	55	51	N	N	N	N	N	N	N	55	52	N	-
54	483	1A	Residence	No	123 Edgeworth David Avenue	60	55	53	49	53	50	N	N	N	N	N	N	N	54	50	N	-
55	475	1A	Residence	No	127 Edgeworth David Avenue	60	55	56	52	56	53	N	N	N	N	N	N	N	57	53	N	-
56	437	1A	Residence	Yes (1)	2 Deakin Way	60	55	61	58	64	61	Y	Y	Y	Y	N	Y	Y	64	60	Y	Type 1
57	392	1A	Residence	No	3A Carrington Road	60	55	59	55	59	56	N	Y	N	N	N	N	N	59	56	N	-
58	350	1A	Residence	No	5A Carrington Road	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	59	N	-
59	369	1A	Residence	No	5A Carrington Road	60	55	60	57	61	57	Y	Y	N	N	N	N	N	61	57	N	-
60	314	1A	Residence	No	6-8 Carrington Road	60	55	60	56	61	57	Y	Y	N	N	N	N	N	61	57	N	-
61	311	1A	Residence	No	4B Carrington Street	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
62	313	1A	Residence	No	4 Carrington Street	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
63	305	1A	Residence	Yes (2)	6-8 Carrington Road	60	55	67	63	68	64	Y	Y	N	N	Y	Y	Y	68	64	Y	Type 1
64	279	1A	Residence	No	4A Carrington Road	60	55	54	50	55	51	N	N	N	N	N	N	N	55	51	N	-
65	277	1A	Residence	No	45 Woonona Avenue North	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	56	N	-
66	289	1A	Residence	No	6-8 Carrington Road	60	55	57	53	57	53	N	N	N	N	N	N	N	58	54	N	-
68	269	1A	Residence	Yes (1)	10-12 Carrington Road	60	55	64	60	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
69	255	1A	Residence	Yes (1)	10-12 Carrington Road	60	55	67	63	68	64	Y	Y	N	N	Y	Y	Y	68	64	Y	Type 1
70	254	1A	Residence	No	45A Woonona Avenue South	60	55	64	60	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
71	252	1A	Residence	No	47 Woonona Avenue North	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	57	N	-
73	233	1A	Residence	No	51 Woonona Avenue North	60	55	54	50	54	50	N	N	N	N	N	N	N	55	51	N	-
74	229	1A	Residence	No	124A Burdett Street	60	55	56	53	57	53	N	N	N	N	N	N	N	57	53	N	-
75	208	1A	Residence	No	122 Burdett Street	60	55	60	57	61	58	Y	Y	N	N	N	N	N	61	58	N	-
76	202	1A	Residence	No	124 Burdett Street	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	56	N	-
77	201	1A	Residence	No	126 Burdett Street	60	55	60	57	61	58	Y	Y	N	N	N	N	N	61	58	N	-
78	199	1A	Residence	No	128 Burdett Street	60	55	60	56	61	57	Y	Y	N	N	N	N	N	61	57	N	-
79	197	1A	Residence	No	130 Burdett Street	60	55	64	60	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
80	196	1A	Residence	No	132 Burdett Street	60	55	68	65	69	65	Y	Y	N	N	Y	Y	Y	69	65	Y	Type 2
81	216	1A	Residence	No	134 Burdett Street	60	55	67	63	68	64	Y	Y	N	N	Y	Y	Y	68	64	Y	Type 1
82	248	1A	Residence	Yes (2)	10-12 Carrington Road	60	55	75	71	75	72	Y	Y	N	N	Y	Y	Y	75	72	Y	Type 2
83	270	1A	Residence	No	10-12 Carrington Road	60	55	61	57	62	58	Y	Y	N	N	N	N	N	62	58	N	-
84	299	1A	Residence	Yes (2)	10-12 Carrington Road	60	55	69	65	70	66	Y	Y	N	N	Y	Y	Y	70	66	Y	Type 2
85	346	1A	Residence	Yes (2)	7 Carrington Road	60	55	71	67	72	68	Y	Y	N	N	Y	Y	Y	72	68	Y	Type 2
86	371	1A	Residence	Yes (2)	7 Carrington Road	60	55	69	65	70	66	Y	Y	N	N	Y	Y	Y	70	66	Y	Type 2
87	396	1A	Residence	Yes (2)	7 Carrington Road	60	55	66	62	67	63	Y	Y	N	N	Y	Y	Y	67	63	Y	Type 1

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
88	424	1A	Residence	Yes (3)	4 Deakin Way	60	55	69	65	73	69	Y	Y	Y	Y	Y	Y	Y	72	69	Y	Type 2
89	468	1A	Residence	Yes (1)	7 Deakin Way	60	55	66	63	68	64	Y	Y	N	N	Y	Y	Y	68	64	Y	Type 1
90	384	2B	Residence	No	123 Coonanbarra Road	60	55	57	53	58	55	N	N	N	N	N	N	N	57	54	N	-
91	405	2B	Residence	No	121 Coonanbarra Road	60	55	56	52	57	54	N	N	N	N	N	N	N	57	53	N	-
92	420	2B	Residence	No	119 Coonanbarra Road	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	55	N	-
93	349	2B	Residence	No	127 Coonanbarra Road	60	55	56	52	57	54	N	N	N	N	N	N	N	56	53	N	-
94	339	2B	Residence	No	129 Coonanbarra Road	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	54	N	-
95	328	2B	Residence	No	131 Coonanbarra Road	60	55	57	53	58	55	N	N	N	N	N	N	N	57	54	N	-
96	320	2B	Residence	No	133 Coonanbarra Road	60	55	58	54	59	56	N	Y	N	N	N	N	N	58	55	N	-
97	256	2B	Residence	No	139 Coonanbarra Road	60	55	58	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
98	246	2B	Residence	No	141 Coonanbarra Road	60	55	59	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
99	236	2B	Residence	No	1 Killawarra Place	60	55	58	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
100	324	2A	Residence	No	152 Coonanbarra Road	60	55	57	54	58	55	N	N	N	N	N	N	N	57	54	N	-
101	340	2A	Residence	No	150 Coonanbarra Road	60	55	57	53	58	54	N	N	N	N	N	N	N	57	53	N	-
102	355	2A	Residence	No	148 Coonanbarra Road	60	55	58	54	59	56	N	Y	N	N	N	N	N	57	54	N	-
103	373	2A	Residence	No	146 Coonanbarra Road	60	55	57	53	58	55	N	N	N	N	N	N	N	56	53	N	-
104	411	2A	Residence	No	142 Coonanbarra Road	60	55	59	56	61	58	Y	Y	Y	N	N	N	Y	59	55	N	-
105	422	2A	Residence	No	140 Coonanbarra Road	60	55	59	55	61	57	Y	Y	Y	N	N	N	Y	58	55	N	-
143	237	1B	Residence	No	100 Burdett Street	60	55	53	49	53	50	N	N	N	N	N	N	N	53	50	N	-
144	224	1B	Residence	No	102 Burdett Street	60	55	52	49	53	49	N	N	N	N	N	N	N	53	50	N	-
145	223	1B	Residence	No	104 Burdett Street	60	55	52	49	53	50	N	N	N	N	N	N	N	53	50	N	-
146	228	1B	Residence	No	106 Burdett Street	60	55	53	49	53	50	N	N	N	N	N	N	N	53	50	N	-
147	227	1B	Residence	No	108 Burdett Street	60	55	54	50	54	51	N	N	N	N	N	N	N	54	51	N	-
148	213	1B	Residence	No	110 Burdett Street	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
149	331	1B	Residence	No	4 Spurgin Street	60	55	48	44	49	45	N	N	N	N	N	N	N	49	45	N	-
150	334	1B	Residence	No	6 Spurgin Street	60	55	48	44	48	45	N	N	N	N	N	N	N	49	45	N	-
151	330	1B	Residence	No	8 Spurgin Street	60	55	49	45	50	46	N	N	N	N	N	N	N	50	46	N	-
152	430	1B	Residence	No	1 Collings Street	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
153	427	1B	Residence	No	3 Collings Street	60	55	50	47	50	47	N	N	N	N	N	N	N	51	47	N	-
154	404	1B	Residence	No	5 Collings Street	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
155	393	1B	Residence	No	7 Collings Street	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
156	321	1B	Residence	No	11 Ascot Avenue	60	55	50	47	51	47	N	N	N	N	N	N	N	51	48	N	-
157	332	1B	Residence	No	9 Ascot Avenue	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
158	351	1B	Residence	No	7 Ascot Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	51	47	N	-
159	362	1B	Residence	No	5 Ascot Avenue	60	55	50	46	51	47	N	N	N	N	N	N	N	51	47	N	-
160	377	1B	Residence	No	3 Ascot Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
161	397	1B	Residence	No	1 Ascot Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
162	520	1B	Residence	No	99 Edgeworth David Avenue	60	55	50	47	50	46	N	N	N	N	N	N	N	50	46	N	-
163	472	1B	Residence	No	2 Collings Street	60	55	49	46	49	46	N	N	N	N	N	N	N	50	46	N	-
164	470	1B	Residence	No	4 Collings Street	60	55	49	45	49	45	N	N	N	N	N	N	N	50	46	N	-
165	460	1B	Residence	No	6 Collings Street	60	55	49	45	49	45	N	N	N	N	N	N	N	49	46	N	-
166	486	1B	Residence	No	6A Collings Street	60	55	50	46	50	46	N	N	N	N	N	N	N	50	47	N	-
167	485	1B	Residence	No	8A Collings Street	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
168	484	1B	Residence	No	10A Collings Street	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
169	453	1B	Residence	No	10 Collings Street	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
170	454	1B	Residence	No	12 Collings Street	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
171	445	1B	Residence	No	14 Collings Street	60	55	51	47	51	47	N	N	N	N	N	N	N	52	48	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
172	452	1B	Residence	No	115B Edgeworth David Avenue	60	55	51	47	51	48	N	N	N	N	N	N	N	52	48	N	-
173	450	1B	Residence	No	115C Edgeworth David Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
174	N/A	1B	Residence	No	2 Ascot Avenue	60	55	51	48	52	48	N	N	N	N	N	N	N	52	49	N	-
175	401	1B	Residence	No	4 Ascot Avenue	60	55	53	50	54	51	N	N	N	N	N	N	N	54	51	N	-
176	382	1B	Residence	No	6 Ascot Avenue	60	55	52	49	53	49	N	N	N	N	N	N	N	53	50	N	-
177	368	1B	Residence	No	8 Ascot Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	55	51	N	-
178	356	1B	Residence	No	10 Ascot Avenue	60	55	53	49	54	50	N	N	N	N	N	N	N	54	50	N	-
179	343	1B	Residence	No	12 Ascot Avenue	60	55	52	48	53	49	N	N	N	N	N	N	N	53	49	N	-
180	329	1B	Residence	No	14 Ascot Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	53	49	N	-
181	318	1B	Residence	No	16 Ascot Avenue	60	55	51	47	52	48	N	N	N	N	N	N	N	52	49	N	-
182	301	1B	Residence	No	18 Ascot Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
183	287	1B	Residence	No	20 Ascot Avenue	60	55	53	49	54	50	N	N	N	N	N	N	N	54	50	N	-
185	268	1B	Residence	No	15 Spurgin Street	60	55	53	50	54	51	N	N	N	N	N	N	N	54	51	N	-
186	272	1B	Residence	No	11 Spurgin Street	60	55	52	49	53	49	N	N	N	N	N	N	N	53	50	N	-
187	276	1B	Residence	No	9 Spurgin Street	60	55	50	47	51	48	N	N	N	N	N	N	N	51	48	N	-
188	278	1B	Residence	No	7 Spurgin Street	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
189	283	1B	Residence	No	5 Spurgin Street	60	55	51	47	52	48	N	N	N	N	N	N	N	52	48	N	-
190	262	1B	Residence	No	20A Ascot Avenue	60	55	53	49	54	50	N	N	N	N	N	N	N	54	50	N	-
191	235	1B	Residence	No	112A Burdett Street	60	55	50	46	50	47	N	N	N	N	N	N	N	51	47	N	-
192	206	1B	Residence	No	112 Burdett Street	60	55	54	51	55	51	N	N	N	N	N	N	N	55	52	N	-
193	209	1B	Residence	No	114 Burdett Street	60	55	55	51	55	52	N	N	N	N	N	N	N	55	52	N	-
194	205	1B	Residence	No	116 Burdett Street	60	55	55	52	56	52	N	N	N	N	N	N	N	56	53	N	-
195	207	1B	Residence	No	122 Woonona Avenue North	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
196	241	1B	Residence	No	120 Woonona Avenue North	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
197	251	1B	Residence	No	118 Woonona Avenue North	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
198	274	1B	Residence	No	114 Woonona Avenue North	60	55	57	53	58	54	N	N	N	N	N	N	N	57	54	N	-
199	288	1B	Residence	No	112 Woonona Avenue North	60	55	56	53	57	53	N	N	N	N	N	N	N	57	54	N	-
200	302	1A	Residence	No	110 Woonona Avenue North	60	55	55	52	56	52	N	N	N	N	N	N	N	56	53	N	-
202	310	1B	Residence	No	108 Woonona Avenue North	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
203	325	1B	Residence	No	106 Woonona Avenue North	60	55	56	52	57	53	N	N	N	N	N	N	N	57	54	N	-
204	337	1B	Residence	No	104 Woonona Avenue North	60	55	55	51	55	52	N	N	N	N	N	N	N	56	52	N	-
205	348	1B	Residence	No	102 Woonona Avenue North	60	55	56	52	57	53	N	N	N	N	N	N	N	57	53	N	-
206	359	1B	Residence	No	100 Woonona Avenue North	60	55	56	52	57	53	N	N	N	N	N	N	N	57	53	N	-
207	N/A	1B	Residence	No	98 Woonona Avenue North	60	55	55	52	56	53	N	N	N	N	N	N	N	56	53	N	-
208	388	1B	Residence	No	96 Woonona Avenue North	60	55	54	50	55	51	N	N	N	N	N	N	N	55	51	N	-
209	409	1B	Residence	No	94 Woonona Avenue North	60	55	52	49	53	49	N	N	N	N	N	N	N	53	50	N	-
210	431	1B	Residence	No	92 Woonona Avenue North	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
211	435	1B	Residence	No	90 Woonona Avenue North	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
212	N/A	1B	Residence	No	90 Woonona Avenue North	60	55	51	48	52	48	N	N	N	N	N	N	N	52	48	N	-
213	466	1B	Residence	No	88A Woonona Avenue North	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
214	457	1B	Residence	No	88 Woonona Avenue North	60	55	53	49	53	50	N	N	N	N	N	N	N	54	50	N	-
215	510	1B	Residence	No	103 Edgeworth David Avenue	60	55	48	44	48	45	N	N	N	N	N	N	N	49	45	N	-
216	507	1B	Residence	No	105 Edgeworth David Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
217	505	1B	Residence	No	107 Edgeworth David Avenue	60	55	49	45	49	46	N	N	N	N	N	N	N	50	46	N	-
218	501	1B	Residence	No	109 Edgeworth David Avenue	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
219	504	1B	Residence	No	111 Edgeworth David Avenue	60	55	50	46	50	47	N	N	N	N	N	N	N	51	47	N	-
221	495	1B	Residence	No	115 Edgeworth David Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-

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										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
222	494	1B	Residence	No	117 Edgeworth David Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
223	493	1B	Residence	No	119 Edgeworth David Avenue	60	55	51	47	51	48	N	N	N	N	N	N	N	52	48	N	-
224	488	1B	Residence	No	121A Edgeworth David Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
225	389	2B	Residence	No	22 Junction Road	60	55	54	50	54	51	N	N	N	N	N	N	N	55	51	N	-
226	406	2B	Residence	No	2 Darri Avenue	60	55	55	51	56	52	N	N	N	N	N	N	N	55	51	N	-
227	383	2B	Residence	No	24 Junction Road	60	55	55	51	56	52	N	N	N	N	N	N	N	55	52	N	-
228	363	2B	Residence	No	4 Darri Avenue	60	55	53	50	54	51	N	N	N	N	N	N	N	53	50	N	-
229	342	2B	Residence	No	6 Darri Avenue	60	55	55	52	57	53	N	N	N	N	N	N	N	55	52	N	-
230	326	2B	Residence	No	8 Darri Avenue	60	55	54	50	55	52	N	N	N	N	N	N	N	54	51	N	-
231	309	2B	Residence	No	10 Darri Avenue	60	55	55	51	55	52	N	N	N	N	N	N	N	55	52	N	-
232	298	2B	Residence	No	35 Carrington Road	60	55	53	50	54	51	N	N	N	N	N	N	N	54	51	N	-
233	267	2B	Residence	No	44 Carrington Road	60	55	55	52	57	53	N	N	N	N	N	N	N	56	52	N	-
234	271	2B	Residence	No	42 Carrington Road	60	55	56	52	57	54	N	N	N	N	N	N	N	56	52	N	-
235	250	2B	Residence	No	16 Darri Avenue	60	55	54	51	55	52	N	N	N	N	N	N	N	55	52	N	-
236	238	2B	Residence	No	18 Darri Avenue	60	55	57	54	58	55	N	N	N	N	N	N	N	58	54	N	-
237	214	2B	Residence	No	20 Darri Avenue	60	55	58	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
238	198	2B	Residence	No	22 Darri Avenue	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	55	N	-
239	175	2B	Residence	No	25 Boundary Road	60	55	58	54	59	55	N	Y	N	N	N	N	N	58	55	N	-
281	182	2B	Residence	No	23 Boundary Road	60	55	59	56	60	57	Y	Y	N	N	N	N	N	60	56	N	-
282	189	2B	Residence	No	2 Killawarra Place	60	55	59	56	60	57	Y	Y	N	N	N	N	N	60	56	N	-
283	190	2B	Residence	No	4 Killawarra Place	60	55	57	53	58	54	N	N	N	N	N	N	N	58	54	N	-
284	191	2B	Residence	No	6 Killawarra Place	60	55	59	55	60	57	N	Y	N	N	N	N	N	59	56	N	-
285	188	2B	Residence	No	8 Killawarra Place	60	55	59	56	60	57	Y	Y	N	N	N	N	N	60	56	N	-
286	185	2B	Residence	No	10 Killawarra Place	60	55	56	53	57	54	N	N	N	N	N	N	N	58	54	N	-
287	186	2B	Residence	No	12 Killawarra Place	60	55	56	52	57	53	N	N	N	N	N	N	N	57	53	N	-
288	194	2B	Residence	No	14 Killawarra Place	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
289	203	2B	Residence	No	11 Killawarra Place	60	55	55	52	56	53	N	N	N	N	N	N	N	56	53	N	-
290	219	2B	Residence	No	9 Killawarra Place	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	55	N	-
291	222	2B	Residence	No	7 Killawarra Place	60	55	59	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
292	226	2B	Residence	No	5 Killawarra Place	60	55	59	56	60	57	Y	Y	N	N	N	N	N	60	56	N	-
293	218	2B	Residence	No	3 Killawarra Place	60	55	59	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
294	243	2B	Residence	No	36A Carrington Road	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	54	N	-
295	249	2B	Residence	No	34A Carrington Road	60	55	59	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
296	275	2B	Residence	No	40 Carrington Road	60	55	56	53	58	54	N	N	N	N	N	N	N	57	54	N	-
297	280	2B	Residence	No	38 Carrington Road	60	55	58	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
298	284	2B	Residence	No	36 Carrington Road	60	55	58	54	59	56	N	Y	N	N	N	N	N	58	55	N	-
299	285	2B	Residence	No	34 Carrington Road	60	55	58	54	59	56	N	Y	N	N	N	N	N	59	55	N	-
300	387	2B	Residence	No	4A Junction Road	60	55	56	53	58	54	N	N	N	N	N	N	N	56	53	N	-
301	291	2B	Residence	No	135 Coonanbarra Road	60	55	58	55	60	56	N	Y	N	N	N	N	N	59	55	N	-
302	316	2B	Residence	No	31 Carrington Road	60	55	57	53	58	55	N	N	N	N	N	N	N	58	54	N	-
303	317	2B	Residence	No	29 Carrington Road	60	55	57	54	58	55	N	N	N	N	N	N	N	57	54	N	-
304	308	2B	Residence	No	27 Carrington Road	60	55	54	51	55	52	N	N	N	N	N	N	N	55	52	N	-
305	319	2B	Residence	No	25 Carrington Road	60	55	55	52	57	54	N	N	N	Y	N	N	N	56	52	N	-
306	341	2B	Residence	No	31A Carrington Road	60	55	57	53	58	55	N	N	N	N	N	N	N	57	54	N	-
307	366	2B	Residence	No	18 Junction Road	60	55	54	50	55	51	N	N	N	N	N	N	N	54	51	N	-
308	375	2B	Residence	No	8 Junction Road	60	55	55	51	55	52	N	N	N	N	N	N	N	55	51	N	-
309	407	2B	Residence	No	20 Junction Road	60	55	55	52	56	53	N	N	N	N	N	N	N	55	52	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
310	413	2B	Residence	No	6 Junction Road	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
311	417	2B	Residence	No	4 Junction Road	60	55	56	53	57	54	N	N	N	N	N	N	N	57	53	N	-
312	416	2B	Residence	No	2 Junction Road	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
313	939	1A	Residence	No	51 Bundarra Avenue North	60	55	54	51	52	48	N	N	N	N	N	N	N	52	48	N	-
314	537	1A	Residence	No	33 Woonona Avenue North	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
315	526	1A	Residence	No	33A Woonona Avenue North	60	55	54	50	54	51	N	N	N	N	N	N	N	55	51	N	-
316	513	1A	Residence	No	82 Edgeworth David Avenue	60	55	54	51	55	51	N	N	N	N	N	N	N	55	52	N	-
317	511	1A	Residence	No	84 Edgeworth David Avenue	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
318	509	1A	Residence	No	86 Edgeworth David Avenue	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
319	543	1A	Residence	No	2 Douglas Avenue	60	55	60	56	61	57	Y	Y	N	N	N	N	N	60	57	N	-
320	556	1A	Residence	No	4 Douglas Avenue	60	55	61	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
321	558	1A	Residence	No	31A Woonona Avenue North	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
322	571	1A	Residence	No	6 Douglas Avenue	60	55	62	58	63	59	Y	Y	N	N	N	N	N	62	59	N	-
323	586	1A	Residence	No	8 Douglas Avenue	60	55	60	57	61	58	Y	Y	N	N	N	N	N	61	57	N	-
324	585	1A	Residence	No	8A Douglas Avenue	60	55	56	53	57	53	N	N	N	N	N	N	N	57	54	N	-
325	588	1A	Residence	No	31 Woonona Avenue North	60	55	57	53	57	54	N	N	N	N	N	N	N	58	54	N	-
326	610	1A	Residence	No	29C Woonona Avenue North	60	55	60	57	61	58	Y	Y	N	N	N	N	N	61	58	N	-
327	626	1A	Residence	No	1 Lochville Street	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
328	621	1A	Residence	No	3 Lochville Street	60	55	60	56	60	57	Y	Y	N	N	N	N	N	60	57	N	-
329	622	1A	Residence	No	5 Lochville Street	60	55	60	56	60	57	Y	Y	N	N	N	N	N	61	57	N	-
330	615	1A	Residence	No	7 Lochville Street	60	55	63	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
331	970	1A	Residence	No	49A Bundarra Avenue North	60	55	55	51	53	49	N	N	N	N	N	N	N	53	49	N	-
332	893	1A	Residence	No	44B Woonona Avenue North	60	55	59	55	55	51	N	N	N	N	N	N	N	55	51	N	-
333	820	1A	Residence	No	10 Fern Avenue	60	55	54	50	53	49	N	N	N	N	N	N	N	54	50	N	-
334	832	1A	Residence	No	8 Fern Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	55	51	N	-
335	874	1A	Residence	No	55 Bundarra Avenue North	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
336	918	1A	Residence	No	53 Bundarra Avenue North	60	55	55	51	53	49	N	N	N	N	N	N	N	53	49	N	-
338	1018	1A	Residence	No	49 Bundarra Avenue North	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
339	581	1A	Residence	No	80 Woonona Avenue North	60	55	55	52	56	52	N	N	N	N	N	N	N	56	53	N	-
340	617	1A	Residence	No	76 Woonona Avenue North	60	55	56	52	56	53	N	N	N	N	N	N	N	56	53	N	-
341	599	1A	Residence	No	78 Woonona Avenue North	60	55	56	52	56	52	N	N	N	N	N	N	N	56	53	N	-
342	627	1A	Residence	No	74 Woonona Avenue North	60	55	56	53	57	53	N	N	N	N	N	N	N	57	53	N	-
343	641	1A	Residence	No	72 Woonona Avenue North	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
344	660	1A	Residence	No	70 Woonona Avenue North	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
345	675	1A	Residence	No	68 Woonona Avenue North	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	56	N	-
346	685	1A	Residence	No	66 Woonona Avenue North	60	55	57	53	57	53	N	N	N	N	N	N	N	57	54	N	-
347	690	1A	Residence	No	64 Woonona Avenue North	60	55	58	54	58	54	N	N	N	N	N	N	N	58	55	N	-
348	739	1A	Residence	No	62 Woonona Avenue North	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
349	753	1A	Residence	No	60 Woonona Avenue North	60	55	58	54	58	55	N	N	N	N	N	N	N	59	55	N	-
350	767	1A	Residence	No	11 Fern Avenue	60	55	55	51	54	51	N	N	N	N	N	N	N	55	51	N	-
351	763	1A	Residence	No	58 Woonona Avenue North	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
352	667	1A	Residence	No	8 Lochville Street	60	55	74	71	74	70	Y	Y	N	N	Y	Y	Y	74	70	Y	Type 2
353	669	1A	Residence	No	6 Lochville Street	60	55	64	61	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
355	672	1A	Residence	No	4 Lochville Street	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
356	665	1A	Residence	No	2 Lochville Street	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
357	683	1A	Residence	No	29 Woonona Avenue North	60	55	62	59	62	59	Y	Y	N	N	N	N	N	62	59	N	-
358	691	1A	Residence	No	27 Woonona Avenue North	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
359	737	1A	Residence	No	45A Bareena Avenue	60	55	62	59	62	59	Y	Y	N	N	N	N	N	62	59	N	-
360	746	1A	Residence	No	25 Woonona Avenue North	60	55	61	57	61	57	Y	Y	N	N	N	N	N	61	58	N	-
365	798	1A	Residence	No	56 Woonona Avenue North	60	55	58	54	59	55	N	N	N	N	N	N	N	59	55	N	-
366	815	1A	Residence	No	54 Woonona Avenue North	60	55	62	58	60	57	N	Y	N	N	N	N	N	60	57	N	-
367	830	1A	Residence	No	52 Woonona Avenue North	60	55	63	59	58	55	N	N	N	N	N	N	N	58	55	N	-
368	849	1A	Residence	No	50 Woonona Avenue North	60	55	64	61	58	55	N	N	N	N	N	N	N	58	55	N	-
369	859	1A	Residence	No	48 Woonona Avenue North	60	55	66	62	56	52	N	N	N	N	N	N	N	56	52	N	-
370	908	1A	Residence	No	44A Woonona Avenue North	60	55	68	65	58	54	N	N	N	N	N	N	N	57	53	N	-
371	917	1A	Residence	No	44 Woonona Avenue North	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
372	881	1A	Residence	No	46 Woonona Avenue North	60	55	68	65	58	54	N	N	N	N	N	N	N	57	53	N	-
374	936	1A	Residence	No	42 Woonona Avenue North	60	55	68	65	61	57	Y	Y	N	N	N	N	N	60	56	N	-
375	776	1A	Residence	No	9A Fern Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
376	852	2A	Residence	No	6 Burns Road	60	55	56	52	55	51	N	N	N	N	N	N	N	56	52	N	-
377	863	2A	Residence	No	4 Burns Road	60	55	56	52	56	52	N	N	N	N	N	N	N	58	54	N	-
379	872	2A	Residence	Yes (2)	2-3/2 Burns Road	60	55	60	56	62	59	Y	Y	Y	Y	N	N	Y	62	58	Y	Type 1
380	858	2A	Residence	Yes (2)	4-5/2 Burns Road	60	55	62	58	64	60	Y	Y	Y	Y	N	Y	Y	64	60	Y	Type 1
381	822	2A	Residence	No	4B Burns Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	54	N	-
383	821	2A	Residence	No	4A Burns Road	60	55	60	57	62	58	Y	Y	Y	N	N	N	Y	62	58	Y	Type 1
384	770	2A	Residence	No	24 Bareena Avenue	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
385	775	2A	Residence	No	26 Bareena Avenue	60	55	58	54	59	56	N	Y	N	N	N	N	N	59	55	N	-
386	785	2A	Residence	No	28 Bareena Avenue	60	55	60	57	63	59	Y	Y	Y	N	N	N	Y	62	58	Y	Type 1
387	727	2A	Residence	No	112 Coonanbarra Road	60	55	56	53	57	54	N	N	N	N	N	N	N	57	53	N	-
388	730	2A	Residence	No	31 Bareena Avenue	60	55	58	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
389	732	2A	Residence	No	33 Bareena Avenue	60	55	57	54	59	55	N	N	N	N	N	N	N	58	55	N	-
390	735	2A	Residence	No	37B Bareena Avenue	60	55	58	54	61	58	Y	Y	Y	Y	N	N	Y	61	57	Y	Type 1
391	722	2A	Residence	No	114 Coonanbarra Road	60	55	57	54	59	55	N	N	N	N	N	N	N	58	55	N	-
392	695	2B	Residence	No	116 Coonanbarra Road	60	55	57	53	58	54	N	N	N	N	N	N	N	58	54	N	-
393	689	2A	Residence	No	116A Coonanbarra Road	60	55	57	54	58	55	N	N	N	N	N	N	N	58	54	N	-
394	681	2A	Residence	No	118 Coonanbarra Road	60	55	58	55	60	57	N	Y	N	N	N	N	N	60	56	N	-
395	673	2A	Residence	No	118A Coonanbarra Road	60	55	59	55	60	57	Y	Y	N	N	N	N	N	60	56	N	-
396	650	2A	Residence	No	118B Coonanbarra Road	60	55	59	56	61	58	Y	Y	N	Y	N	N	Y	61	57	Y	Type 1
397	618	2A	Residence	No	120 Coonanbarra Road	60	55	57	54	59	56	N	Y	N	Y	N	N	Y	59	55	N	-
398	609	2A	Residence	No	21 Lochville Street	60	55	58	54	60	56	N	Y	N	Y	N	N	Y	59	56	Y	Type 1
399	584	2A	Residence	No	124 Coonanbarra Road	60	55	60	57	62	59	Y	Y	N	N	N	N	N	60	56	N	-
400	567	2A	Residence	No	126 Coonanbarra Road	60	55	59	55	60	57	Y	Y	N	N	N	N	N	58	54	N	-
401	552	2A	Residence	No	128 Coonanbarra Road	60	55	58	54	60	56	N	Y	N	N	N	N	N	57	53	N	-
402	541	2A	Residence	No	130 Coonanbarra Road	60	55	60	56	62	59	Y	Y	N	Y	N	N	Y	59	55	N	-
403	506	2A	Residence	No	132 Coonanbarra Road	60	55	59	56	61	57	Y	Y	N	N	N	N	N	58	54	N	-
404	498	2A	Residence	No	134 Coonanbarra Road	60	55	57	54	58	55	N	N	N	N	N	N	N	57	53	N	-
405	469	2B	Residence	No	117 Coonanbarra Road	60	55	58	54	59	56	N	Y	N	N	N	N	N	58	54	N	-
406	500	2A	Residence	No	113A Coonanbarra Road	60	55	58	54	59	55	N	Y	N	N	N	N	N	57	54	N	-
407	489	2B	Residence	No	115 Coonanbarra Road	60	55	58	54	59	55	N	Y	N	N	N	N	N	57	54	N	-
408	538	2B	Residence	No	111 Coonanbarra Road	60	55	56	53	57	54	N	N	N	N	N	N	N	56	53	N	-
409	557	2B	Residence	No	109 Coonanbarra Road	60	55	57	54	58	54	N	N	N	N	N	N	N	57	53	N	-
410	572	2B	Residence	No	107 Coonanbarra Road	60	55	57	53	58	54	N	N	N	N	N	N	N	57	53	N	-
411	590	2B	Residence	No	105 Coonanbarra Road	60	55	58	54	59	55	N	Y	N	N	N	N	N	58	54	N	-
413	743	2A	Residence	No	37A Bareena Avenue	60	55	59	55	64	60	Y	Y	Y	Y	N	Y	Y	63	60	Y	Type 1

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
415	804	2B	Residence	No	108 Coonanbarra Road	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
416	788	2B	Residence	No	110 Coonanbarra Road	60	55	56	52	56	52	N	N	N	N	N	N	N	56	53	N	-
417	755	2B	Residence	No	20 Bareena Avenue	60	55	58	55	59	55	N	N	N	N	N	N	N	58	55	N	-
418	762	2A	Residence	No	22 Bareena Avenue	60	55	55	52	56	53	N	N	N	N	N	N	N	56	53	N	-
419	522	1B	Residence	No	1 Ingalara Avenue	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
420	533	1B	Residence	No	3 Ingalara Avenue	60	55	48	44	48	45	N	N	N	N	N	N	N	49	45	N	-
421	549	1B	Residence	No	5 Ingalara Avenue	60	55	49	46	49	46	N	N	N	N	N	N	N	50	46	N	-
422	564	1B	Residence	No	7 Ingalara Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
423	583	1B	Residence	No	9 Ingalara Avenue	60	55	48	44	48	44	N	N	N	N	N	N	N	48	45	N	-
424	614	1B	Residence	No	15 Ingalara Avenue	60	55	50	47	50	46	N	N	N	N	N	N	N	51	47	N	-
425	598	1B	Residence	No	11 Ingalara Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
426	629	1B	Residence	No	17 Ingalara Avenue	60	55	49	46	49	45	N	N	N	N	N	N	N	50	46	N	-
427	646	1B	Residence	No	19 Ingalara Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	50	46	N	-
428	662	1B	Residence	No	21 Ingalara Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	50	46	N	-
429	677	1B	Residence	No	23 Ingalara Avenue	60	55	52	48	51	48	N	N	N	N	N	N	N	52	48	N	-
430	750	1B	Residence	No	25 Ingalara Avenue	60	55	50	46	49	45	N	N	N	N	N	N	N	50	46	N	-
431	757	1B	Residence	No	27 Ingalara Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
432	772	1B	Residence	No	29 Ingalara Avenue	60	55	50	47	50	46	N	N	N	N	N	N	N	50	46	N	-
433	796	1B	Residence	No	31-33 Ingalara Avenue	60	55	50	46	49	46	N	N	N	N	N	N	N	50	46	N	-
434	523	1B	Residence	No	2 Churchill Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
435	531	1B	Residence	No	4 Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	51	47	N	-
436	545	1B	Residence	No	6 Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	51	47	N	-
437	N/A	1B	Residence	No	8 Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	50	47	N	-
438	577	1B	Residence	No	10 Churchill Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
439	596	1B	Residence	No	12 Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	51	47	N	-
440	611	1B	Residence	No	14 Churchill Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	52	48	N	-
441	625	1B	Residence	No	16 Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	50	47	N	-
442	636	1B	Residence	No	18 Churchill Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
443	658	1B	Residence	No	20 Churchill Avenue	60	55	51	47	50	47	N	N	N	N	N	N	N	51	47	N	-
444	674	1B	Residence	No	22 Churchill Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
445	684	1B	Residence	No	24 Churchill Avenue	60	55	51	48	51	47	N	N	N	N	N	N	N	52	48	N	-
446	748	1B	Residence	No	26 Churchill Avenue	60	55	53	49	52	49	N	N	N	N	N	N	N	53	49	N	-
447	756	1B	Residence	No	28 Churchill Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	50	N	-
448	783	1B	Residence	No	32 Churchill Avenue	60	55	53	49	52	49	N	N	N	N	N	N	N	53	49	N	-
449	803	1B	Residence	No	34 Churchill Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	50	N	-
450	812	1B	Residence	No	5 Fern Avenue	60	55	52	49	52	48	N	N	N	N	N	N	N	52	48	N	-
451	817	1B	Residence	No	35 Ingalara Avenue	60	55	51	47	50	46	N	N	N	N	N	N	N	51	47	N	-
452	864	1B	Residence	No	64 Bundarra Avenue North	60	55	51	48	51	47	N	N	N	N	N	N	N	51	47	N	-
453	878	1B	Residence	No	62 Bundarra Avenue North	60	55	52	49	51	47	N	N	N	N	N	N	N	52	48	N	-
454	916	1B	Residence	No	58-60 Bundarra Avenue North	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
455	946	1B	Residence	No	56 Bundarra Avenue North	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
456	1014	1B	Residence	No	54 Bundarra Avenue North	60	55	53	49	51	48	N	N	N	N	N	N	N	52	48	N	-
457	1038	1B	Residence	No	50 Bundarra Avenue North	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
458	566	1A	Residence	No	82 Woonona Avenue North	60	55	55	51	55	52	N	N	N	N	N	N	N	56	52	N	-
459	547	1A	Residence	No	84 Woonona Avenue North	60	55	54	51	55	51	N	N	N	N	N	N	N	55	52	N	-
460	532	1A	Residence	No	86 Woonona Avenue North	60	55	53	49	53	49	N	N	N	N	N	N	N	53	50	N	-
461	525	1A	Residence	No	78 Edgeworth David Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
462	524	1B	Residence	No	76 Edgeworth David Avenue	60	55	50	46	50	47	N	N	N	N	N	N	N	51	47	N	-
463	515	1B	Residence	No	74 Edgeworth David Avenue	60	55	51	47	51	48	N	N	N	N	N	N	N	52	48	N	-
464	514	1B	Residence	No	72 Edgeworth David Avenue	60	55	49	46	50	46	N	N	N	N	N	N	N	50	47	N	-
465	518	1B	Residence	No	70 Edgeworth David Avenue	60	55	50	46	50	47	N	N	N	N	N	N	N	51	47	N	-
466	539	1B	Residence	No	1A Churchill Avenue	60	55	50	46	50	46	N	N	N	N	N	N	N	50	47	N	-
467	554	1B	Residence	No	1 Churchill Avenue	60	55	53	49	53	49	N	N	N	N	N	N	N	53	50	N	-
468	569	1B	Residence	No	3 Churchill Avenue	60	55	52	49	52	49	N	N	N	N	N	N	N	53	49	N	-
469	587	1B	Residence	No	5 Churchill Avenue	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
470	606	1B	Residence	No	7 Churchill Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
471	N/A	1B	Residence	No	9 Churchill Avenue	60	55	51	47	51	48	N	N	N	N	N	N	N	52	48	N	-
472	635	1B	Residence	No	11 Churchill Avenue	60	55	55	51	55	51	N	N	N	N	N	N	N	55	52	N	-
473	648	1B	Residence	No	15 Churchill Avenue	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
474	670	1B	Residence	No	17 Churchill Avenue	60	55	55	51	55	51	N	N	N	N	N	N	N	55	52	N	-
475	678	1B	Residence	No	19 Churchill Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	54	51	N	-
476	687	1B	Residence	No	21 Churchill Avenue	60	55	55	51	55	51	N	N	N	N	N	N	N	55	52	N	-
477	742	1B	Residence	No	23 Churchill Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	55	51	N	-
478	754	1B	Residence	No	25 Churchill Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	54	51	N	-
479	766	1B	Residence	No	27 Churchill Avenue	60	55	54	51	54	50	N	N	N	N	N	N	N	54	51	N	-
480	784	1B	Residence	No	29 Churchill Avenue	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
481	835	1A	Residence	No	6 Fern Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
482	838	1B	Residence	No	63 Bundarra Avenue North	60	55	52	49	52	48	N	N	N	N	N	N	N	52	49	N	-
483	853	1B	Residence	No	61 Bundarra Avenue North	60	55	54	51	53	49	N	N	N	N	N	N	N	53	50	N	-
484	867	1A	Residence	No	59 Bundarra Avenue North	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
485	885	1A	Residence	No	57A Bundarra Avenue North	60	55	53	49	52	48	N	N	N	N	N	N	N	52	48	N	-
486	901	1A	Residence	No	57 Bundarra Avenue North	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
487	945	1A	Residence	No	53 Bundarra Avenue North	60	55	54	50	52	49	N	N	N	N	N	N	N	52	48	N	-
488	699	2B	Residence	No	19 Bareena Avenue	60	55	55	52	56	52	N	N	N	N	N	N	N	56	52	N	-
489	793	2B	Residence	No	16A Burns Road	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
490	N/A	2B	Residence	No	16 Burns Road	60	55	53	49	53	49	N	N	N	N	N	N	N	53	50	N	-
491	752	2B	Residence	No	81 Coonanbarra Road	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
492	738	2B	Residence	No	83 Coonanbarra Road	60	55	53	49	54	50	N	N	N	N	N	N	N	54	50	N	-
493	734	2B	Residence	No	16A Bareena Avenue	60	55	54	51	55	51	N	N	N	N	N	N	N	55	51	N	-
494	712	2B	Residence	No	25 Bareena Avenue	60	55	55	51	56	53	N	N	N	N	N	N	N	56	52	N	-
495	702	1A	Residence	No	23 Bareena Avenue	60	55	55	52	56	53	N	N	N	N	N	N	N	56	52	N	-
496	696	2B	Residence	No	23A Bareena Avenue	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
497	657	2B	Residence	No	26 Lochville Street	60	55	57	54	58	55	N	N	N	N	N	N	N	58	54	N	-
498	654	2B	Residence	No	28 Lochville Street	60	55	57	53	58	55	N	N	N	N	N	N	N	57	53	N	-
499	653	2B	Residence	No	30 Lochville Street	60	55	56	52	57	54	N	N	N	N	N	N	N	56	53	N	-
500	601	2B	Residence	No	29 Lochville Street	60	55	54	50	54	51	N	N	N	N	N	N	N	55	51	N	-
501	595	2B	Residence	No	27 Lochville Street	60	55	53	50	54	50	N	N	N	N	N	N	N	53	50	N	-
502	597	2B	Residence	No	25 Lochville Street	60	55	57	54	58	55	N	N	N	N	N	N	N	57	54	N	-
504	448	2B	Residence	No	9 Junction Road	60	55	54	50	55	51	N	N	N	N	N	N	N	54	51	N	-
505	451	2B	Residence	No	7 Junction Road	60	55	57	53	58	54	N	N	N	N	N	N	N	57	53	N	-
506	458	2B	Residence	No	5 Junction Road	60	55	54	51	55	52	N	N	N	N	N	N	N	55	51	N	-
507	461	2B	Residence	No	3 Junction Road	60	55	54	50	55	52	N	N	N	N	N	N	N	54	51	N	-
508	499	2B	Residence	No	113 Coonanbarra Road	60	55	55	52	56	53	N	N	N	N	N	N	N	55	52	N	-
509	608	2B	Residence	No	23 Lochville Street	60	55	57	53	58	54	N	N	N	N	N	N	N	57	53	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
510	637	2B	Residence	No	22 Lochville Street	60	55	58	54	59	56	N	Y	N	N	N	N	N	58	55	N	-
511	655	2B	Residence	No	99 Coonanbarra Road	60	55	57	53	58	54	N	N	N	N	N	N	N	57	54	N	-
512	664	2B	Residence	No	97 Coonanbarra Road	60	55	59	55	60	57	Y	Y	N	N	N	N	N	60	56	N	-
513	679	2B	Residence	No	95 Coonanbarra Road	60	55	58	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
514	686	2B	Residence	No	93 Coonanbarra Road	60	55	57	54	58	55	N	N	N	N	N	N	N	58	54	N	-
515	694	2B	Residence	No	91 Coonanbarra Road	60	55	57	53	58	54	N	N	N	N	N	N	N	57	54	N	-
516	710	2B	Residence	No	89 Coonanbarra Road	60	55	56	53	57	54	N	N	N	N	N	N	N	57	54	N	-
517	711	2B	Residence	No	27 Bareena Avenue	60	55	56	53	57	54	N	N	N	N	N	N	N	57	53	N	-
518	747	2B	Residence	No	83 Coonanbarra Road	60	55	55	52	56	52	N	N	N	N	N	N	N	56	52	N	-
519	N/A	2B	Residence	No	81A Coonanbarra Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
520	N/A	2B	Residence	No	14 Burns Road	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
521	834	2B	Residence	No	12 Burns Road	60	55	56	52	55	51	N	N	N	N	N	N	N	55	52	N	-
522	847	2B	Residence	No	10 Burns Road	60	55	56	53	55	52	N	N	N	N	N	N	N	56	52	N	-
523	589	2B	Residence	No	33 Lochville Street	60	55	55	51	56	52	N	N	N	N	N	N	N	55	51	N	-
524	447	2B	Residence	No	15 Junction Road	60	55	56	53	57	54	N	N	N	N	N	N	N	56	53	N	-
525	449	2B	Residence	No	11 Junction Road	60	55	52	48	53	49	N	N	N	N	N	N	N	52	49	N	-
526	594	2B	Residence	No	31 Lochville Street	60	55	55	51	56	52	N	N	N	N	N	N	N	55	51	N	-
527	668	2B	Residence	No	32 Lochville Street	60	55	54	51	55	51	N	N	N	N	N	N	N	55	51	N	-
528	703	2B	Residence	No	21 Bareena Avenue	60	55	54	50	55	51	N	N	N	N	N	N	N	55	51	N	-
529	731	2B	Residence	No	16 Bareena Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
530	N/A	2B	Residence	No	16B Bareena Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	50	N	-
531	787	2B	Residence	No	18 Burns Road	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
545	1113	2A	Residence	No	28 Woonona Avenue North	60	55	59	56	58	54	N	N	N	N	N	N	N	58	54	N	-
546	1098	2A	Residence	No	28 Woonona Avenue North	60	55	60	57	59	55	N	N	N	N	N	N	N	59	55	N	-
547	1108	2A	Residence	No	37-41 Millewa Avenue	60	55	58	55	57	53	N	N	N	N	N	N	N	57	53	N	-
550	966	2A	Residence	No	1-3 Burns Road	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	58	N	-
551	951	2A	Residence	Yes (2)	1-3 Burns Road	60	55	59	55	61	58	Y	Y	Y	Y	N	N	Y	61	57	Y	Type 1
555	1074	2A	Residence	No	12 Woniora Avenue	60	55	55	51	53	49	N	N	N	N	N	N	N	53	49	N	-
556	1055	2A	Residence	No	12 Woniora Avenue	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
557	1037	2A	Residence	No	12 Woniora Avenue	60	55	58	54	57	53	N	N	N	N	N	N	N	57	53	N	-
560	976	2B	Residence	No	1-9 Woniora Avenue	60	55	58	55	57	54	N	N	N	N	N	N	N	58	54	N	-
561	902	2B	Residence	No	11 Burns Road	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
562	919	2A	Residence	No	9 Burns Road	60	55	56	53	55	52	N	N	N	N	N	N	N	56	52	N	-
586	1164	2B	Residence	No	35 Millewa Avenue	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
587	1019	2B	Residence	No	8 Woniora Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	54	51	N	-
588	1041	2B	Residence	No	8 Woniora Avenue	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
592	960	2B	Residence	No	67 Coonanbarra Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	51	N	-
594	927	2B	Residence	No	71 Coonanbarra Road	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
595	907	2B	Residence	No	73 Coonanbarra Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	51	N	-
596	892	2B	Residence	No	75 Coonanbarra Road	60	55	54	51	54	51	N	N	N	N	N	N	N	55	51	N	-
597	877	2B	Residence	No	75 Coonanbarra Road	60	55	55	51	54	51	N	N	N	N	N	N	N	55	51	N	-
599	854	2B	Residence	No	79 Coonanbarra Road	60	55	55	52	55	51	N	N	N	N	N	N	N	55	52	N	-
601	984	2B	Residence	No	86-90 Coonanbarra Road	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
602	968	2B	Residence	No	92 Coonanbarra Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
603	958	2B	Residence	No	94 Coonanbarra Road	60	55	52	48	51	47	N	N	N	N	N	N	N	51	48	N	-
604	947	2B	Residence	No	96 Coonanbarra Road	60	55	52	49	52	48	N	N	N	N	N	N	N	52	48	N	-
605	923	2B	Residence	No	98 Coonanbarra Road	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
606	909	2B	Residence	No	100 Coonanbarra Road	60	55	54	50	53	50	N	N	N	N	N	N	N	54	50	N	-
607	897	2B	Residence	No	102 Coonanbarra Road	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
608	888	2B	Residence	No	104 Coonanbarra Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
609	866	2B	Residence	No	106 Coonanbarra Road	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
610	900	2B	Residence	No	15 Burns Road	60	55	57	54	56	52	N	N	N	N	N	N	N	57	53	N	-
611	964	2B	Residence	No	1-9 Woniora Avenue	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
612	971	2B	Residence	No	1-9 Woniora Avenue	60	55	56	52	56	52	N	N	N	N	N	N	N	55	52	N	-
613	999	2B	Residence	No	2 Woniora Avenue	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
614	1011	2B	Residence	No	4-6 Woniora Avenue	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
615	1031	2B	Residence	No	23 Neringah Avenue North	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
616	1042	2B	Residence	No	21 Neringah Avenue North	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
617	1058	2B	Residence	No	17-19 Neringah Avenue North	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
618	1081	2B	Residence	No	25-29 Millewa Avenue	60	55	52	49	51	47	N	N	N	N	N	N	N	51	48	N	-
619	1170	2B	Residence	No	25-29 Millewa Avenue	60	55	51	48	51	47	N	N	N	N	N	N	N	51	47	N	-
620	1103	2B	Residence	No	25-29 Millewa Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
639	1161	1A	Residence	No	93 Alexandria Parade	60	55	66	63	64	60	Y	Y	N	N	N	Y	Y	63	59	Y	Type 1
640	1147	1A	Residence	No	1 Benson Close	60	55	62	59	60	56	Y	Y	N	N	N	N	N	60	56	N	-
641	1106	1A	Residence	No	3 Benson Close	60	55	62	58	60	56	Y	Y	N	N	N	N	N	60	56	N	-
642	1088	1A	Residence	No	3A Benson Close	60	55	65	62	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
643	1053	1A	Residence	No	5 Benson Close	60	55	65	61	64	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
644	1071	1A	Residence	No	3B Benson Close	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
645	1060	1A	Residence	No	43A Bundarra Avenue North	60	55	56	53	55	51	N	N	N	N	N	N	N	55	51	N	-
646	1079	1A	Residence	No	41A Bundarra Avenue North	60	55	56	52	54	50	N	N	N	N	N	N	N	55	51	N	-
647	1160	1A	Residence	No	91 Alexandria Parade	60	55	58	54	56	52	N	N	N	N	N	N	N	56	52	N	-
648	1145	1A	Residence	No	37 Bundarra Avenue North	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
649	1111	1A	Residence	No	39 Bundarra Avenue North	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
650	1096	1A	Residence	No	41 Bundarra Avenue North	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
651	1080	1A	Residence	No	43 Bundarra Avenue North	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
652	1026	1A	Residence	No	7 Benson Close	60	55	58	54	57	53	N	N	N	N	N	N	N	57	53	N	-
653	1017	1A	Residence	No	7A Benson Close	60	55	65	61	65	61	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
654	1039	1A	Residence	No	47 Bundarra Avenue North	60	55	56	53	55	51	N	N	N	N	N	N	N	55	51	N	-
655	1061	1A	Residence	No	45 Bundarra Avenue North	60	55	55	52	53	49	N	N	N	N	N	N	N	54	50	N	-
656	972	1A	Residence	No	9-11 Benson Close	60	55	63	60	62	58	Y	Y	N	N	N	N	N	61	57	N	-
657	1005	1A	Residence	No	9-11 Benson Close	60	55	60	56	57	53	N	N	N	N	N	N	N	57	53	N	-
658	1022	1A	Residence	No	47A Bundarra Avenue North	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
710	1155	1A	Residence	No	89 Alexandria Parade	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
711	1159	1A	Residence	No	87A Alexandria Parade	60	55	55	52	54	50	N	N	N	N	N	N	N	54	51	N	-
712	1132	1B	Residence	No	44 Bundarra Avenue North	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
713	1166	1B	Residence	No	85 Alexandria Parade	60	55	55	51	53	50	N	N	N	N	N	N	N	54	50	N	-
714	1158	1B	Residence	No	83 Alexandria Parade	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
715	1130	1B	Residence	No	87 Alexandria Parade	60	55	53	49	52	48	N	N	N	N	N	N	N	52	48	N	-
716	1104	1B	Residence	No	46A Bundarra Avenue North	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
717	1077	1B	Residence	No	48 Bundarra Avenue North	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
718	1097	1B	Residence	No	46 Bundarra Avenue North	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
719	1844	4A	Residence	Yes (1)	1 Aaron Place	60	55	65	61	64	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
720	1828	4A	Residence	No	1 Aaron Place	60	55	63	60	62	58	Y	Y	N	N	N	N	N	58	55	N	-
721	1787	4A	Residence	Yes (2)	37-38/1740 Pacific Highway	60	55	64	61	63	60	Y	Y	N	N	N	N	N	60	56	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
722	1777	4A	Residence	Yes (4)	39-42/1740 Pacific Highway	60	55	65	62	63	60	Y	Y	N	N	N	N	N	63	59	N	-
723	1754	4A	Residence	Yes (2)	43-44/1740 Pacific Highway	60	55	60	57	59	55	N	N	N	N	N	N	N	59	55	N	-
724	1654	4A	Residence	Yes (4)	45-48/1740 Pacific Highway	60	55	62	59	61	57	Y	Y	N	N	N	N	N	59	55	N	-
725	1622	4A	Residence	Yes (4)	49-52/1740 Pacific Highway	60	55	67	64	65	61	Y	Y	N	N	Y	Y	Y	59	56	Y	Type 1
726	1619	4A	Residence	Yes (4)	16-19/1740 Pacific Highway	60	55	61	57	61	57	Y	Y	N	N	N	N	N	60	56	N	-
727	1755	4A	Pool	No	1740 Pacific Highway	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
728	1778	4A	Residence	Yes (3)	34-36/1740 Pacific Highway	60	55	57	54	56	53	N	N	N	N	N	N	N	57	53	N	-
729	1784	4A	Residence	Yes (3)	30-33/1740 Pacific Highway	60	55	59	56	57	54	N	N	N	N	N	N	N	58	54	N	-
730	1839	4A	Residence	No	1 Aaron Place	60	55	62	59	61	58	Y	Y	N	N	N	N	N	61	58	N	-
731	1827	4B	Residence	Yes (6)	1 Aaron Place	60	55	65	62	66	62	Y	Y	N	N	Y	Y	Y	66	62	Y	Type 1
732	1657	4A	Residence	No	28-29/1740 Pacific Highway	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
733	1627	4A	Residence	Yes (2)	20-21/1740 Pacific Highway	60	55	56	52	55	52	N	N	N	N	N	N	N	55	52	N	-
734	1605	4B	Residence	Yes (6)	1-6/1740 Pacific Highway	60	55	71	67	71	67	Y	Y	N	N	Y	Y	Y	71	68	Y	Type 2
735	1856	4A	Residence	Yes (4)	1 Aaron Place	60	55	70	66	70	67	Y	Y	N	N	Y	Y	Y	70	67	Y	Type 2
736	1843	4B	Residence	Yes (4)	1 Aaron Place	60	55	68	65	69	66	Y	Y	N	N	Y	Y	Y	69	66	Y	Type 2
737	1614	4B	Residence	Yes (2)	14-15/1740 Pacific Highway	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
738	1606	4B	Residence	Yes (4)	7-10/1740 Pacific Highway	60	55	71	68	72	69	Y	Y	N	N	Y	Y	Y	72	69	Y	Type 2
739	1616	4B	Residence	Yes (3)	11-13/1740 Pacific Highway	60	55	66	62	67	64	Y	Y	N	N	Y	Y	Y	67	64	Y	Type 1
740	1780	4B	Residence	Yes (3)	22-24/1740 Pacific Highway	60	55	60	57	61	58	Y	Y	N	N	N	N	N	61	58	N	-
741	1783	4B	Residence	Yes (3)	25-27/1740 Pacific Highway	60	55	58	55	59	56	N	Y	N	N	N	N	N	60	56	N	-
742	1829	4B	Residence	Yes (3)	1 Aaron Place	60	55	71	67	72	68	Y	Y	N	N	Y	Y	Y	72	68	Y	Type 2
743	1575	1C	Residence	Yes (4)	1707 Pacific Highway	60	55	72	68	73	69	Y	Y	N	N	Y	Y	Y	73	69	Y	Type 2
769	1577	1C	Residence	Yes (4)	1709 Pacific Highway	60	55	72	67	73	69	Y	Y	N	N	Y	Y	Y	73	69	Y	Type 2
791	1781	5A	Residence	No	13 Kingsley Close	60	55	62	59	63	59	Y	Y	N	N	N	N	N	62	59	N	-
792	1782	5A	Residence	No	14 Kingsley Close	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	55	N	-
793	1786	5A	Residence	No	15 Kingsley Close	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
794	1790	5A	Residence	No	16 Kingsley Close	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
795	1789	5A	Residence	No	17 Kingsley Close	60	55	55	52	54	51	N	N	N	N	N	N	N	55	51	N	-
796	1791	5A	Residence	No	18 Kingsley Close	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
797	1800	5A	Residence	No	10 Kingsley Close	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	56	N	-
798	1801	5A	Residence	No	9 Kingsley Close	60	55	58	55	58	54	N	N	N	N	N	N	N	57	54	N	-
799	1817	5A	Residence	No	8 Kingsley Close	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
800	1816	5A	Residence	No	7 Kingsley Close	60	55	56	53	56	52	N	N	N	N	N	N	N	55	51	N	-
802	1819	5A	Residence	No	13A Hewitt Avenue	60	55	59	56	59	55	N	Y	N	N	N	N	N	58	55	N	-
803	1823	5A	Residence	No	15B Hewitt Avenue	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
804	1824	5A	Residence	No	17A Hewitt Avenue	60	55	57	54	56	52	N	N	N	N	N	N	N	55	52	N	-
805	1833	5A	Residence	No	13 Hewitt Avenue	60	55	59	56	58	54	N	N	N	N	N	N	N	57	53	N	-
806	1850	5A	Residence	No	9 Hewitt Avenue	60	55	59	56	57	53	N	N	N	N	N	N	N	56	52	N	-
807	1852	5A	Residence	No	11 Hewitt Avenue	60	55	59	56	57	53	N	N	N	N	N	N	N	56	52	N	-
808	1853	5A	Residence	No	15 Hewitt Avenue	60	55	57	54	55	52	N	N	N	N	N	N	N	55	51	N	-
809	1851	5A	Residence	No	17 Hewitt Avenue	60	55	57	54	55	52	N	N	N	N	N	N	N	55	51	N	-
810	1854	5A	Residence	No	19 Hewitt Avenue	60	55	56	53	55	51	N	N	N	N	N	N	N	54	50	N	-
811	2022	5A	Residence	No	1 Havilah Avenue	60	55	57	53	55	52	N	N	N	N	N	N	N	55	51	N	-
812	1986	5A	Residence	No	2 Havilah Avenue	60	55	61	58	61	58	Y	Y	N	N	N	N	N	59	55	N	-
813	1996	5A	Residence	No	4 Havilah Avenue	60	55	58	55	59	56	N	Y	N	N	N	N	N	56	53	N	-
817	1998	5A	Residence	Yes (2)	27 Pennant Hills Road	60	55	76	72	74	70	Y	Y	N	N	Y	Y	Y	73	70	Y	Type 2
823	1792	5A	Residence	No	19 Kingsley Close	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
824	1795	5B	Residence	No	20 Kingsley Close	60	55	54	50	53	49	N	N	N	N	N	N	N	54	50	N	-
825	1794	5B	Residence	No	21 Kingsley Close	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
826	1785	5B	Residence	No	15 Eastbourne Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	54	51	N	-
827	1818	5A	Residence	No	6 Kingsley Close	60	55	55	52	54	50	N	N	N	N	N	N	N	54	51	N	-
828	1814	5B	Residence	No	5 Kingsley Close	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
829	1812	5B	Residence	No	4 Kingsley Close	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
830	1813	5B	Residence	No	3 Kingsley Close	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
831	1805	5B	Residence	No	2 Kingsley Close	60	55	55	52	55	51	N	N	N	N	N	N	N	54	50	N	-
832	1815	5B	Residence	No	1 Kingsley Close	60	55	53	50	52	49	N	N	N	N	N	N	N	53	49	N	-
833	1809	5B	Residence	No	3 Exeter Road	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
834	1810	5B	Residence	No	5 Exeter Road	60	55	53	50	52	49	N	N	N	N	N	N	N	52	49	N	-
835	1821	5A	Residence	No	19A Hewitt Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
836	1825	5B	Residence	No	25A Hewitt Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
837	1826	5B	Residence	No	27A Hewitt Avenue	60	55	51	48	51	47	N	N	N	N	N	N	N	51	47	N	-
838	1811	5B	Residence	No	17 Eastbourne Avenue	60	55	51	48	51	47	N	N	N	N	N	N	N	51	47	N	-
839	1820	5B	Residence	No	19 Eastbourne Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	52	49	N	-
840	1831	5B	Residence	No	21 Eastbourne Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	52	49	N	-
842	1848	5A	Residence	No	21 Hewitt Avenue	60	55	56	53	55	52	N	N	N	N	N	N	N	54	51	N	-
843	1840	5B	Residence	No	25 Hewitt Avenue	60	55	51	48	50	47	N	N	N	N	N	N	N	51	47	N	-
844	2037	5B	Residence	No	27A Hewitt Avenue	60	55	54	50	52	49	N	N	N	N	N	N	N	52	48	N	-
845	2053	5B	Residence	No	29 Hewitt Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	52	48	N	-
846	2069	5B	Residence	No	23 Eastbourne Avenue	60	55	53	49	52	48	N	N	N	N	N	N	N	52	48	N	-
847	2033	5A	Residence	No	3 Havilah Avenue	60	55	58	55	57	53	N	N	N	N	N	N	N	56	52	N	-
848	2039	5A	Residence	No	5 Havilah Avenue	60	55	58	55	58	54	N	N	N	N	N	N	N	57	53	N	-
849	2047	5A	Residence	No	2 Hewitt Avenue	60	55	54	51	53	49	N	N	N	N	N	N	N	53	50	N	-
850	2063	5B	Residence	No	4 Hewitt Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
851	2077	5B	Residence	No	6 Hewitt Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
852	2112	5B	Residence	No	8 Hewitt Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	53	49	N	-
853	2125	5B	Residence	No	10 Hewitt Avenue	60	55	52	49	51	47	N	N	N	N	N	N	N	52	48	N	-
855	2066	5A	Residence	No	7 Havilah Avenue	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
856	2081	5A	Residence	No	9 Havilah Avenue	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
857	2118	5B	Residence	No	11 Havilah Avenue	60	55	55	52	55	51	N	N	N	N	N	N	N	54	50	N	-
858	2131	5B	Residence	No	15 Havilah Avenue	60	55	56	52	55	52	N	N	N	N	N	N	N	55	51	N	-
859	2140	5B	Residence	No	17 Havilah Avenue	60	55	56	53	54	51	N	N	N	N	N	N	N	54	51	N	-
862	1802	5B	Residence	No	9 Exeter Road	60	55	52	49	51	48	N	N	N	N	N	N	N	51	47	N	-
863	1804	5B	Residence	No	11 Exeter Road	60	55	50	46	49	45	N	N	N	N	N	N	N	49	46	N	-
873	1803	5B	Residence	No	2 Eastbourne Avenue	60	55	52	49	52	48	N	N	N	N	N	N	N	51	48	N	-
878	2124	5B	Residence	No	8 Eastbourne Avenue	60	55	50	47	49	46	N	N	N	N	N	N	N	50	46	N	-
886	2127	5B	Residence	No	35 Hewitt Avenue	60	55	52	49	51	48	N	N	N	N	N	N	N	51	47	N	-
936	1723	5B	Residence	No	25 Lucinda Avenue	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
937	1760	5B	Residence	No	33A Lucinda Avenue	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
938	1750	5B	Residence	No	33A Lucinda Avenue	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
939	1722	5B	Residence	No	33 Lucinda Avenue	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
940	1757	5B	Residence	No	33A Lucinda Avenue	60	55	56	53	56	52	N	N	N	N	N	N	N	55	52	N	-
941	1735	5B	Residence	No	37A Lucinda Avenue	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
942	1766	5B	Residence	No	7 Eastbourne Avenue	60	55	54	51	54	50	N	N	N	N	N	N	N	54	51	N	-
943	1772	5B	Residence	No	7 Eastbourne Avenue	60	55	52	49	52	48	N	N	N	N	N	N	N	52	48	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
944	1767	5B	Residence	No	1 Eastbourne Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
945	1759	5B	Residence	No	1 Eastbourne Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	52	49	N	-
946	1734	5B	Residence	No	39 Lucinda Avenue	60	55	54	50	53	49	N	N	N	N	N	N	N	53	50	N	-
947	1737	5B	Residence	No	41 Lucinda Avenue	60	55	53	50	52	48	N	N	N	N	N	N	N	51	48	N	-
948	1745	5B	Residence	No	43 Lucinda Avenue	60	55	50	47	49	45	N	N	N	N	N	N	N	49	45	N	-
949	1769	5B	Residence	No	2 Seaton Avenue	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
951	1771	5B	Residence	No	35 Lucinda Avenue	60	55	51	48	50	46	N	N	N	N	N	N	N	51	47	N	-
957	1749	5B	Residence	No	45 Lucinda Avenue	60	55	50	47	49	45	N	N	N	N	N	N	N	49	46	N	-
958	1753	5B	Residence	No	47 Lucinda Avenue	60	55	50	47	49	45	N	N	N	N	N	N	N	49	45	N	-
959	1758	5B	Residence	No	49 Lucinda Avenue	60	55	50	47	49	46	N	N	N	N	N	N	N	50	46	N	-
965	1694	5B	Residence	No	24 Lucinda Avenue	60	55	51	48	52	48	N	N	N	N	N	N	N	52	48	N	-
966	1691	5B	Residence	No	28 Lucinda Avenue	60	55	52	49	52	48	N	N	N	N	N	N	N	52	49	N	-
967	1696	5B	Residence	No	30 Lucinda Avenue	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
977	1703	5B	Residence	No	7 The Glade Walk	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
995	1693	5B	Residence	No	11 The Glade Walk	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
996	1719	5B	Residence	No	9 The Glade Walk	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
1018	1665	5B	Residence	No	22 Lucinda Avenue	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
1019	1705	5B	Residence	No	2 The Glade Walk	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
1020	1706	5B	Residence	No	4 The Glade Walk	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
1021	1704	5B	Residence	No	6 The Glade Walk	60	55	47	43	47	43	N	N	N	N	N	N	N	47	43	N	-
1022	1669	5B	Residence	No	8 The Glade Walk	60	55	48	44	48	44	N	N	N	N	N	N	N	48	44	N	-
1023	1667	5B	Residence	No	10 The Glade Walk	60	55	44	40	44	40	N	N	N	N	N	N	N	44	40	N	-
1024	1664	5B	Residence	No	12 The Glade Walk	60	55	48	44	48	44	N	N	N	N	N	N	N	48	44	N	-
1025	1662	5B	Residence	No	14 The Glade Walk	60	55	47	44	47	43	N	N	N	N	N	N	N	48	44	N	-
1026	1660	5B	Residence	No	16 The Glade Walk	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
1028	1617	5A	Residence	No	7 Lucinda Avenue	60	55	66	62	65	62	Y	Y	N	N	Y	Y	Y	66	62	Y	Type 1
1029	1626	5A	Residence	No	9 Lucinda Avenue	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
1030	1648	5A	Residence	No	11 Lucinda Avenue	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
1031	1656	5A	Residence	No	11A Lucinda Avenue	60	55	66	62	65	61	Y	Y	N	N	N	Y	Y	65	61	Y	Type 1
1032	1661	5A	Residence	No	15 Lucinda Avenue	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
1033	1725	5A	Residence	No	19 Lucinda Avenue	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
1034	1726	5A	Residence	No	21 Lucinda Avenue	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
1035	1752	5A	Residence	No	27 Lucinda Avenue	60	55	58	55	60	56	N	Y	N	N	N	N	N	59	56	N	-
3017	1990	T	Residence	No	2 Edwards Road	60	55	61	57	59	56	N	Y	N	N	N	N	N	60	56	N	-
3018	1980	3	Residence	No	4 Edwards Road	60	55	54	51	54	51	N	N	N	N	N	N	N	54	51	N	-
3019	1994	3	Residence	No	8 Edwards Road	60	55	56	53	55	52	N	N	N	N	N	N	N	56	52	N	-
3020	1993	3	Residence	No	8 Edwards Road	60	55	56	53	55	52	N	N	N	N	N	N	N	55	52	N	-
3021	1976	3	Residence	No	8A Edwards Road	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
3022	1915	3	Residence	No	46 Russell Avenue	60	55	53	50	56	53	N	N	Y	Y	N	N	N	56	53	N	-
3023	1920	3	Residence	No	50 Russell Avenue	60	55	55	52	58	55	N	N	Y	Y	N	N	N	58	55	N	-
3024	1930	3	Residence	No	50B Russell Avenue	60	55	56	52	55	51	N	N	N	N	N	N	N	56	52	N	-
3025	1972	3	Residence	No	50A Russell Avenue	60	55	55	52	55	51	N	N	N	N	N	N	N	56	52	N	-
3026	1955	3	Residence	No	8A Edwards Road	60	55	52	48	51	47	N	N	N	N	N	N	N	52	48	N	-
3028	1897	3	Residence	No	59 Russell Avenue	60	55	52	48	67	63	Y	Y	Y	Y	Y	Y	Y	67	63	Y	Type 1
3029	1908	3	Residence	No	55 Russell Avenue	60	55	61	58	69	66	Y	Y	Y	Y	Y	Y	Y	64	60	Y	Type 2
3030	1894	3	Residence	No	44 Russell Avenue	60	55	51	48	53	50	N	N	N	Y	N	N	N	53	50	N	-
3031	1880	3	Residence	No	42 Russell Avenue	60	55	55	52	54	51	N	N	N	N	N	N	N	55	51	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
3032	1913	3	Residence	No	42 Russell Avenue	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
3033	1929	3	Residence	No	38 Russell Avenue	60	55	54	50	53	50	N	N	N	N	N	N	N	54	50	N	-
3034	1889	3	Residence	No	45A Russell Avenue	60	55	53	50	54	50	N	N	N	N	N	N	N	54	51	N	-
3035	1899	3	Residence	No	53 Russell Avenue	60	55	55	51	60	56	N	Y	Y	Y	N	N	Y	60	57	Y	Type 1
3037	1898	3	Residence	No	51 Russell Avenue	60	55	56	52	57	53	N	N	N	N	N	N	N	57	53	N	-
3038	1902	3	Residence	No	49 Russell Avenue	60	55	56	53	56	53	N	N	N	N	N	N	N	57	53	N	-
3039	1884	3	Residence	No	47 Russell Avenue	60	55	56	52	56	53	N	N	N	N	N	N	N	56	53	N	-
3040	1888	3	Residence	No	45B Russell Avenue	60	55	51	47	52	49	N	N	N	N	N	N	N	53	49	N	-
3041	1901	3	Residence	No	49 Russell Avenue	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
3042	1903	3	Residence	No	6 Anulla Place	60	55	57	54	58	55	N	N	N	N	N	N	N	58	55	N	-
3043	1907	3	Residence	No	4 Anulla Place	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
3044	1878	3	Residence	No	2 Anulla Place	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
3051	1571	3	Residence	Yes (8)	5-7 Pacific Highway	60	55	72	68	71	68	Y	Y	N	N	Y	Y	Y	72	68	Y	Type 2
3052	1582	3	Residence	No	3 Pacific Highway	60	55	73	69	74	70	Y	Y	N	N	Y	Y	Y	74	70	Y	Type 2
3060	1892	3	Residence	No	52 Russell Avenue	60	55	71	68	74	71	Y	Y	Y	Y	Y	Y	Y	74	71	Y	Type 2
3061	1890	3	Residence	No	14 Pennant Hills Road	60	55	72	69	75	72	Y	Y	Y	Y	Y	Y	Y	75	72	Y	Type 2
3062	1914	3	Residence	No	16 Pennant Hills Road	60	55	72	69	74	70	Y	Y	N	N	Y	Y	Y	74	70	Y	Type 2
3063	1926	3	Residence	No	18 Pennant Hills Road	60	55	74	70	75	71	Y	Y	N	N	Y	Y	Y	75	71	Y	Type 2
3064	1931	3	Residence	No	20 Pennant Hills Road	60	55	75	71	75	72	Y	Y	N	N	Y	Y	Y	75	71	Y	Type 2
3065	1971	3	Residence	No	22 Pennant Hills Road	60	55	75	71	75	71	Y	Y	N	N	Y	Y	Y	75	71	Y	Type 2
3066	1982	3	Residence	No	24 Pennant Hills Road	60	55	75	72	75	71	Y	Y	N	N	Y	Y	Y	75	71	Y	Type 2
3067	1989	3	Residence	No	26 Pennant Hills Road	60	55	76	72	75	72	Y	Y	N	N	Y	Y	Y	76	72	Y	Type 2
3667	1896	3	Residence	No	61 Russell Avenue	60	55	63	60	68	65	Y	Y	Y	Y	Y	Y	Y	68	65	Y	Type 1
3670	921	2A	Residence	No	7 Burns Road	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
3672	925	2A	Residence	No	5 Burns Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
3674	605	2A	Residence	No	122 Coonanbarra Road	60	55	57	54	58	54	N	N	N	N	N	N	N	58	55	N	-
3675	443	1A	Residence	Yes (1)	6 Deakin Way	60	55	67	64	70	67	Y	Y	Y	Y	Y	Y	Y	70	66	Y	Type 2
3726	N/A	5A	Residence	No	2A Havilah Avenue	60	55	62	59	61	57	Y	Y	N	N	N	N	N	58	55	N	-
3727	1909	3	Residence	No	44A Russell Avenue	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
3728	1905	3	Residence	No	46 Russell Avenue	60	55	52	48	53	50	N	N	N	N	N	N	N	53	50	N	-
3729	1917	3	Residence	No	52A Russell Avenue	60	55	60	57	60	56	N	Y	N	N	N	N	N	60	57	N	-
3731	364	2B	Residence	No	125 Coonanbarra Road	60	55	55	52	57	53	N	N	N	N	N	N	N	56	53	N	-
3732	1992	3	Residence	No	2A Edwards Road	60	55	67	64	66	62	Y	Y	N	N	Y	Y	Y	66	62	Y	Type 1
3746	463	1B	Residence	No	8 Collings Street	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
3840	295	1A	Residence	No	6-8 Carrington Road	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	56	N	-
3849	265	1A	Residence	No	6-8 Carrington Road	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
3882	456	1A	Residence	Yes (1)	1 Deakin Way	60	55	55	51	56	52	N	N	N	N	N	N	N	56	52	N	-
3894	242	1A	Residence	No	49 Woonona Avenue North	60	55	56	52	56	52	N	N	N	N	N	N	N	56	53	N	-
3910	257	1B	Residence	No	116 Woonona Avenue North	60	55	57	54	58	54	N	N	N	N	N	N	N	58	55	N	-
3946	478	1B	Residence	No	115A Edgeworth David Avenue	60	55	50	46	50	47	N	N	N	N	N	N	N	51	47	N	-
3949	327	2B	Residence	No	33 Carrington Road	60	55	57	54	58	55	N	N	N	N	N	N	N	58	54	N	-
3952	1084	2A	Residence	No	30 Woonona Avenue	60	55	68	65	66	62	Y	Y	N	N	Y	Y	Y	65	61	Y	Type 1
3954	521	1B	Residence	No	101 Edgeworth David Avenue	60	55	49	45	49	46	N	N	N	N	N	N	N	50	46	N	-
3959	1702	5B	Residence	No	3 The Glade Walk	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
3963	1768	5B	Residence	No	4 Seaton Avenue	60	55	52	49	51	48	N	N	N	N	N	N	N	51	47	N	-
3968	N/A	5B	Residence	No	8 Exeter Road	60	55	53	50	52	49	N	N	N	N	N	N	N	52	48	N	-
3970	312	2B	Residence	No	23 Carrington Road	60	55	57	54	59	55	N	Y	N	N	N	N	N	59	55	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
3973	1849	5A	Residence	No	23 Hewitt Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
3974	1846	5A	Residence	No	23A Hewitt Avenue	60	55	55	51	54	50	N	N	N	N	N	N	N	53	49	N	-
3975	957	1A	Residence	No	51 Bundarra Avenue North	60	55	55	52	53	49	N	N	N	N	N	N	N	53	49	N	-
3981	1988	3	Residence	No	4 Edwards Road	60	55	59	56	58	54	N	N	N	N	N	N	N	58	54	N	-
3988	929	2A	Residence	Yes (1)	1-3 Burns Road	60	55	59	56	62	58	Y	Y	Y	Y	N	N	Y	62	58	Y	Type 1
4004	497	1B	Residence	No	113 Edgeworth David Avenue	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
4005	1822	5A	Residence	No	11A Hewitt Avenue	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
4007	273	1B	Residence	No	17 Spurgin Street	60	55	54	50	54	51	N	N	N	N	N	N	N	55	51	N	-
4011	N/A	5A	Residence	No	9 Hewitt Ave, Wahroonga	60	55	61	58	60	56	N	Y	N	N	N	N	N	59	56	N	-
4012	N/A	5A	Residence	No	10 Kingsley Cl, Wahroonga	60	55	59	56	57	53	N	N	N	N	N	N	N	57	53	N	-
NR-5	1574	1C	School	No	1711 Pacific Highway	50	-	72	68	73	69	Y	N	N	N	Y	N	Y	73	69	Y	Type 2
NR-14	1580	5C	Place of Worship	No	1711 Pacific Highway	50	50	72	68	73	69	Y	Y	N	N	Y	Y	Y	73	69	Y	Type 2

NORTHCONNEX SOUTHERN & M2 INTEGRATION

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$	Day	Night	Day	Night	Day	Night		Day $L_{Aeq,15hr}$	Night $L_{Aeq,9hr}$		
1687	3663	10A	Residence	No	15 Karloon Road	60	55	53	49	52	49	N	N	N	N	N	N	N	52	49	N	-
1688	3687	10A	Residence	No	17 Karloon Road	60	55	52	49	52	48	N	N	N	N	N	N	N	52	49	N	-
1689	3704	10A	Residence	No	19 Karloon Road	60	55	53	50	52	49	N	N	N	N	N	N	N	53	49	N	-
1690	3729	10A	Residence	No	21 Karloon Road	60	55	53	49	52	49	N	N	N	N	N	N	N	53	49	N	-
1691	3747	10A	Residence	No	23 Karloon Road	60	55	54	51	52	49	N	N	N	N	N	N	N	52	49	N	-
1692	3767	10A	Residence	No	25 Karloon Road	60	55	53	50	53	49	N	N	N	N	N	N	N	53	50	N	-
1693	3779	10A	Residence	No	27 Karloon Road	60	55	54	51	52	49	N	N	N	N	N	N	N	53	49	N	-
1694	3791	10A	Residence	No	29 Karloon Road	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
1695	3814	10B	Residence	No	31 Karloon Road	60	55	54	50	53	50	N	N	N	N	N	N	N	53	50	N	-
1706	3828	10B	Residence	No	3 Ashley Avenue	60	55	54	51	53	50	N	N	N	N	N	N	N	54	50	N	-
1770	3903	10B	Residence	No	8 Ashley Avenue	60	55	53	49	51	48	N	N	N	N	N	N	N	51	48	N	-
1771	3885	10B	Residence	No	6 Ashley Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	52	48	N	-
1772	3869	10B	Residence	No	4 Ashley Avenue	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
1773	3852	10B	Residence	No	33 Karloon Road	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
1774	3866	10B	Residence	No	35 Karloon Road	60	55	56	52	54	51	N	N	N	N	N	N	N	54	51	N	-
1775	3888	10B	Residence	No	37 Karloon Road	60	55	54	51	53	50	N	N	N	N	N	N	N	53	49	N	-
1776	3904	10B	Residence	No	39A Eaton Road	60	55	54	51	53	50	N	N	N	N	N	N	N	53	49	N	-
1778	3929	10B	Residence	No	10A Ashley Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	52	48	N	-
1783	3982	10B	Residence	No	11 Wildara Avenue	60	55	52	49	51	48	N	N	N	N	N	N	N	51	48	N	-
1784	3983	10B	Residence	No	45 Eaton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2041	3500	10A	Residence	No	3 Eaton Road	60	55	54	51	53	50	N	N	N	N	N	N	N	54	50	N	-
2042	3508	10A	Residence	No	5 Eaton Road	60	55	62	59	56	52	N	N	N	N	N	N	N	57	54	N	-
2043	3511	10A	Residence	No	7 Eaton Road	60	55	61	58	55	51	N	N	N	N	N	N	N	56	53	N	-
2044	3478	10A	Residence	No	2 Eaton Road	60	55	66	63	63	60	Y	Y	N	N	N	Y	Y	57	53	Y	Type 1
2045	3497	10A	Residence	No	4 Eaton Road	60	55	64	61	59	55	N	Y	N	N	N	N	N	59	55	N	-
2046	3521	10A	Residence	No	2 Hillside Place	60	55	55	51	53	50	N	N	N	N	N	N	N	54	50	N	-
2047	3486	10A	Residence	No	4 Hillside Place	60	55	55	51	54	50	N	N	N	N	N	N	N	54	51	N	-
2048	3487	10A	Residence	No	6 Hillside Place	60	55	57	54	55	51	N	N	N	N	N	N	N	54	51	N	-
2049	3482	10A	Residence	No	8 Hillside Place	60	55	60	57	55	52	N	N	N	N	N	N	N	56	52	N	-
2050	3479	10A	Residence	No	10 Hillside Place	60	55	60	57	55	51	N	N	N	N	N	N	N	55	51	N	-
2051	3495	10A	Residence	No	12 Hillside Place	60	55	62	59	57	53	N	N	N	N	N	N	N	55	52	N	-
2053	3494	10A	Residence	No	14 Gum Grove Place	60	55	55	51	54	50	N	N	N	N	N	N	N	53	50	N	-
2054	3569	10A	Residence	No	5 Hillside Place	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
2055	3549	10A	Residence	No	3 Hillside Place	60	55	55	52	53	50	N	N	N	N	N	N	N	53	50	N	-
2056	3578	10A	Residence	No	1 Hillside Place	60	55	55	52	53	50	N	N	N	N	N	N	N	53	50	N	-
2057	3606	10A	Residence	No	6 Eaton Road	60	55	55	52	53	50	N	N	N	N	N	N	N	53	50	N	-
2058	3642	10A	Residence	No	8 Eaton Road	60	55	57	54	55	51	N	N	N	N	N	N	N	54	51	N	-
2059	3623	10A	Residence	No	4 Larchmont Place	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2060	3566	10A	Residence	No	7 Hillside Place	60	55	57	54	54	51	N	N	N	N	N	N	N	54	51	N	-
2061	3542	10A	Residence	No	10 Gum Grove Place	60	55	57	54	54	51	N	N	N	N	N	N	N	54	51	N	-
2062	3572	10A	Residence	No	8 Gum Grove Place	60	55	55	52	53	50	N	N	N	N	N	N	N	53	49	N	-
2063	3596	10A	Residence	No	6 Gum Grove Place	60	55	56	53	54	51	N	N	N	N	N	N	N	54	50	N	-
2064	3624	10A	Residence	No	4 Gum Grove Place	60	55	56	53	54	50	N	N	N	N	N	N	N	54	50	N	-
2065	3654	10A	Residence	No	2 Gum Grove Place	60	55	55	51	53	49	N	N	N	N	N	N	N	53	49	N	-
2066	3795	10A	Residence	No	11 Savoy Court	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2067	3683	10A	Residence	No	10 Eaton Road	60	55	54	51	53	49	N	N	N	N	N	N	N	52	49	N	-
2068	3677	10A	Residence	No	3 Larchmont Place	60	55	55	52	52	49	N	N	N	N	N	N	N	52	49	N	-
2069	3711	10A	Residence	No	12 Eaton Road	60	55	57	54	54	51	N	N	N	N	N	N	N	54	51	N	-
2070	3707	10A	Residence	No	5 Larchmont Place	60	55	56	53	54	51	N	N	N	N	N	N	N	54	50	N	-
2071	3706	10A	Residence	No	1 Savoy Court	60	55	55	52	53	50	N	N	N	N	N	N	N	53	50	N	-
2072	3736	10A	Residence	No	3 Savoy Court	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2073	3757	10A	Residence	No	5 Savoy Court	60	55	54	51	53	49	N	N	N	N	N	N	N	52	49	N	-
2074	3742	10A	Residence	No	14 Eaton Road	60	55	54	51	52	49	N	N	N	N	N	N	N	52	49	N	-
2075	3761	10A	Residence	No	16 Eaton Road	60	55	56	53	55	51	N	N	N	N	N	N	N	54	51	N	-
2076	3782	10A	Residence	No	18 Eaton Road	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2077	3776	10A	Residence	No	7 Savoy Court	60	55	55	52	53	50	N	N	N	N	N	N	N	53	50	N	-
2078	3802	10A	Residence	No	9 Savoy Court	60	55	55	51	53	49	N	N	N	N	N	N	N	52	49	N	-
2079	3805	10A	Residence	No	20 Eaton Road	60	55	56	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2080	3537	10A	Residence	No	4 Karloon Road	60	55	56	53	54	50	N	N	N	N	N	N	N	54	50	N	-
2081	3544	10A	Residence	No	9 Eaton Road	60	55	60	57	55	52	N	N	N	N	N	N	N	56	53	N	-
2082	3559	10A	Residence	No	6 Karloon Road	60	55	55	52	52	48	N	N	N	N	N	N	N	52	48	N	-
2084	3585	10A	Residence	No	8 Karloon Road	60	55	54	50	51	48	N	N	N	N	N	N	N	51	47	N	-
2085	3563	10A	Residence	No	11 Karloon Road	60	55	60	57	55	52	N	N	N	N	N	N	N	55	52	N	-
2086	3614	10A	Residence	No	10 Karloon Road	60	55	53	50	51	47	N	N	N	N	N	N	N	51	47	N	-
2087	3630	10A	Residence	No	12 Karloon Road	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2088	3612	10A	Residence	No	15 Eaton Road	60	55	59	56	54	51	N	N	N	N	N	N	N	55	51	N	-
2089	3649	10A	Residence	No	14 Karloon Road	60	55	53	50	52	48	N	N	N	N	N	N	N	51	48	N	-
2090	3628	10A	Residence	No	17 Eaton Road	60	55	59	56	55	51	N	N	N	N	N	N	N	55	51	N	-
2091	3650	10A	Residence	No	19 Eaton Road	60	55	58	55	55	52	N	N	N	N	N	N	N	55	52	N	-
2092	3669	10A	Residence	No	16 Karloon Road	60	55	53	50	52	49	N	N	N	N	N	N	N	53	49	N	-
2093	3680	10A	Residence	No	18 Karloon Road	60	55	55	52	54	51	N	N	N	N	N	N	N	54	51	N	-
2094	3668	10A	Residence	No	21 Eaton Road	60	55	55	52	52	49	N	N	N	N	N	N	N	52	49	N	-
2095	3679	10A	Residence	No	23 Eaton Road	60	55	56	53	53	50	N	N	N	N	N	N	N	53	50	N	-
2096	3698	10A	Residence	No	20 Karloon Road	60	55	55	52	53	50	N	N	N	N	N	N	N	53	49	N	-
2097	3697	10A	Residence	No	25 Eaton Road	60	55	57	54	54	50	N	N	N	N	N	N	N	54	50	N	-
2098	3723	10A	Residence	No	22 Karloon Road	60	55	55	52	54	51	N	N	N	N	N	N	N	54	51	N	-
2099	3715	10A	Residence	No	27 Eaton Road	60	55	57	54	55	51	N	N	N	N	N	N	N	55	51	N	-
2100	3738	10A	Residence	No	24 Karloon Road	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2101	3745	10A	Residence	No	29 Eaton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2102	3762	10A	Residence	No	26 Karloon Road	60	55	55	51	53	49	N	N	N	N	N	N	N	53	49	N	-
2103	3768	10A	Residence	No	31 Eaton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2104	3788	10A	Residence	No	33 Eaton Road	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2105	3808	10A	Residence	No	35 Eaton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2106	3499	10A	Residence	No	16 Gum Grove Place	60	55	58	55	55	52	N	N	N	N	N	N	N	54	50	N	-
2107	3490	10A	Residence	No	18 Gum Grove Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	51	N	-
2108	3481	10A	Residence	No	20 Gum Grove Place	60	55	59	56	59	56	N	Y	N	N	N	N	Y	55	52	Y*	Type 1
2109	3504	10A	Residence	No	22 Gum Grove Place	60	55	58	55	61	57	Y	Y	Y	Y	N	N	Y	58	55	Y	Type 1
2110	3533	10A	Residence	No	13 Gum Grove Place	60	55	59	56	62	59	Y	Y	Y	Y	N	N	Y	62	59	Y	Type 1
2111	3557	10A	Residence	No	11 Gum Grove Place	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2112	3579	10A	Residence	No	9 Gum Grove Place	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2113	3565	10A	Residence	No	7 Gum Grove Place	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2114	3562	10A	Residence	No	5 Gum Grove Place	60	55	54	51	52	49	N	N	N	N	N	N	N	52	49	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2116	3600	10A	Residence	No	3 Gum Grove Place	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2117	3635	10A	Residence	No	10 Larchmont Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2118	3625	10A	Residence	No	12 Larchmont Place	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2119	3627	10A	Residence	No	14 Larchmont Place	60	55	56	52	54	51	N	N	N	N	N	N	N	54	51	N	-
2120	3660	10A	Residence	No	15 Larchmont Place	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2121	3681	10A	Residence	No	13 Larchmont Place	60	55	56	53	55	52	N	N	N	N	N	N	N	55	52	N	-
2122	3693	10A	Residence	No	11 Larchmont Place	60	55	55	52	53	49	N	N	N	N	N	N	N	53	49	N	-
2123	3701	10A	Residence	No	2 Savoy Court	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2124	3732	10A	Residence	No	4 Savoy Court	60	55	56	53	54	51	N	N	N	N	N	N	N	54	51	N	-
2125	3751	10A	Residence	No	6 Savoy Court	60	55	54	51	52	49	N	N	N	N	N	N	N	52	49	N	-
2126	3766	10A	Residence	No	8 Savoy Court	60	55	55	51	53	50	N	N	N	N	N	N	N	53	49	N	-
2127	3785	10A	Residence	No	10 Savoy Court	60	55	54	51	52	48	N	N	N	N	N	N	N	52	48	N	-
2128	3811	10A	Residence	No	12 Savoy Court	60	55	54	51	52	48	N	N	N	N	N	N	N	52	48	N	-
2130	3816	10A	Residence	No	13 Savoy Court	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
2131	3820	10B	Residence	No	14 Savoy Court	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2132	3826	10B	Residence	No	22 Eaton Road	60	55	56	53	55	51	N	N	N	N	N	N	N	54	51	N	-
2133	3838	10B	Residence	No	4 Lisle Court	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2134	3832	10B	Residence	No	6 Lisle Court	60	55	55	51	54	50	N	N	N	N	N	N	N	53	50	N	-
2135	3834	10B	Residence	No	8 Lisle Court	60	55	56	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2136	3843	10B	Residence	No	2 Lisle Court	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2137	3841	10B	Residence	No	10 Lisle Court	60	55	55	52	54	50	N	N	N	N	N	N	N	53	50	N	-
2138	3831	10B	Residence	No	37 Eaton Road	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-
2139	3862	10B	Residence	No	12 Lisle Court	60	55	54	51	53	50	N	N	N	N	N	N	N	53	49	N	-
2140	3884	10B	Residence	No	14 Lisle Court	60	55	55	51	53	50	N	N	N	N	N	N	N	53	49	N	-
2141	3895	10B	Residence	No	16 Lisle Court	60	55	55	51	54	50	N	N	N	N	N	N	N	53	49	N	-
2142	3917	10B	Residence	No	18 Lisle Court	60	55	55	51	54	50	N	N	N	N	N	N	N	53	49	N	-
2143	3941	10B	Residence	No	20 Lisle Court	60	55	55	52	54	51	N	N	N	N	N	N	N	53	50	N	-
2144	3962	10B	Residence	No	22 Lisle Court	60	55	56	53	55	52	N	N	N	N	N	N	N	54	51	N	-
2145	3980	10B	Residence	No	24 Lisle Court	60	55	56	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2146	3981	10B	Residence	No	15 Lisle Court	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-
2147	3974	10B	Residence	No	13 Lisle Court	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-
2148	3944	10B	Residence	No	11 Lisle Court	60	55	55	52	55	51	N	N	N	N	N	N	N	54	50	N	-
2149	3926	10B	Residence	No	9 Lisle Court	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2150	3906	10B	Residence	No	7 Lisle Court	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2151	3882	10B	Residence	No	5 Lisle Court	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2152	3879	10B	Residence	No	3 Lisle Court	60	55	56	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2153	3887	10B	Residence	No	1 Lisle Court	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2154	3907	10B	Residence	No	26 Eaton Road	60	55	56	52	54	51	N	N	N	N	N	N	N	54	51	N	-
2155	3925	10B	Residence	No	28 Eaton Road	60	55	57	54	56	52	N	N	N	N	N	N	N	55	52	N	-
2156	3942	10B	Residence	No	30 Eaton Road	60	55	56	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2157	4010	10B	Residence	No	5 Mundon Place	60	55	56	52	56	52	N	N	N	N	N	N	N	55	51	N	-
2158	4004	10B	Residence	No	7 Mundon Place	60	55	55	51	54	51	N	N	N	N	N	N	N	54	50	N	-
2159	4077	10B	Residence	No	3 Mundon Place	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2160	4100	10B	Residence	No	1 Mundon Place	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2161	4062	10B	Residence	No	4 Mundon Place	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2162	4095	10B	Residence	No	2 Mundon Place	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2163	4046	10B	Residence	No	6 Mundon Place	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2164	4019	10B	Residence	No	10 Mundon Place	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2165	4093	10B	Residence	No	34 Oakes Road	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2166	4094	10B	Residence	No	32 Oakes Road	60	55	55	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2167	4096	10B	Residence	No	30 Oakes Road	60	55	56	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2168	4098	10B	Residence	No	28 Oakes Road	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-
2169	4063	10B	Residence	No	38 Eaton Road	60	55	54	51	54	50	N	N	N	N	N	N	N	53	50	N	-
2170	4031	10B	Residence	No	36 Eaton Road	60	55	56	53	55	52	N	N	N	N	N	N	N	55	51	N	-
2171	4007	10B	Residence	No	34 Eaton Road	60	55	55	52	54	51	N	N	N	N	N	N	N	54	50	N	-
2172	3468	10C	Residence	No	50A Coral Tree Drive	60	55	69	66	68	65	Y	Y	N	N	Y	Y	Y	68	65	Y	Type 1
2173	3477	10C	Residence	No	56 Coral Tree Drive	60	55	64	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2174	3488	10C	Residence	No	58 Coral Tree Drive	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2175	3485	10C	Residence	No	60 Coral Tree Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2176	3498	10C	Residence	No	62 Coral Tree Drive	60	55	55	52	55	51	N	N	N	N	N	N	N	55	52	N	-
2177	3510	10C	Residence	No	64 Coral Tree Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2178	3519	10C	Residence	No	66 Coral Tree Drive	60	55	62	58	61	58	Y	Y	N	N	N	N	N	62	58	N	-
2179	3532	10C	Residence	No	68 Coral Tree Drive	60	55	60	56	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2188	3541	10C	Residence	No	39 Coral Tree Drive	60	55	60	56	60	57	N	Y	N	N	N	N	N	60	57	N	-
2189	3587	10C	Residence	No	35 Coral Tree Drive	60	55	60	56	60	57	N	Y	N	N	N	N	N	60	57	N	-
2190	3621	10C	Residence	No	33 Coral Tree Drive	60	55	58	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2191	3547	10C	Residence	No	1 Kirriford Way	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2192	3576	10C	Residence	No	3 Kirriford Way	60	55	55	52	55	52	N	N	N	N	N	N	N	55	51	N	-
2193	3620	10C	Residence	No	5 Kirriford Way	60	55	56	53	56	52	N	N	N	N	N	N	N	55	52	N	-
2194	3664	10C	Residence	No	4 Kerribee Place	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2195	3626	10C	Residence	No	6 Kirriford Way	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2196	3661	10C	Residence	No	6 Kerribee Place	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2197	3574	10C	Residence	No	43 Coral Tree Drive	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2198	3616	10C	Residence	No	4 Kirriford Way	60	55	60	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2199	3662	10C	Residence	No	8 Kerribee Place	60	55	58	55	57	54	N	N	N	N	N	N	N	57	54	N	-
2200	3597	10C	Residence	No	45 Coral Tree Drive	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2201	3619	10C	Residence	No	47 Coral Tree Drive	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2202	3645	10C	Residence	No	49 Coral Tree Drive	60	55	59	56	58	55	N	N	N	N	N	N	N	58	55	N	-
2221	3665	10C	Residence	No	10 Kerribee Place	60	55	59	56	58	55	N	N	N	N	N	N	N	58	54	N	-
2222	3656	10C	Residence	No	3 Runnymede Way	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
2223	3667	10C	Residence	No	51 Coral Tree Drive	60	55	59	56	58	54	N	N	N	N	N	N	N	58	55	N	-
2224	3712	10C	Residence	No	53 Coral Tree Drive	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2225	3740	10C	Residence	No	55 Coral Tree Drive	60	55	55	52	55	52	N	N	N	N	N	N	N	55	51	N	-
2226	3735	10C	Residence	No	4 Runnymede Way	60	55	58	55	57	54	N	N	N	N	N	N	N	57	54	N	-
2227	3717	10C	Residence	No	6 Runnymede Way	60	55	58	55	57	53	N	N	N	N	N	N	N	57	54	N	-
2228	3691	10C	Residence	No	5 Runnymede Way	60	55	57	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2229	3700	10C	Residence	No	13 Kerribee Place	60	55	59	55	58	54	N	N	N	N	N	N	N	57	54	N	-
2230	3725	10C	Residence	No	11 Kerribee Place	60	55	58	55	56	53	N	N	N	N	N	N	N	56	53	N	-
2231	3733	10C	Residence	No	9 Kerribee Place	60	55	57	54	58	54	N	N	N	N	N	N	N	57	54	N	-
2232	3722	10C	Residence	No	7 Kerribee Place	60	55	59	55	59	55	N	N	N	N	N	N	N	58	55	N	-
2233	3727	10C	Residence	No	29 Coral Tree Drive	60	55	58	55	59	56	Y	Y	Y	Y	N	N	Y	59	55	Y	Type 1
2234	3759	10C	Residence	No	27 Coral Tree Drive	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2235	3777	10C	Residence	No	25 Coral Tree Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2236	3793	10C	Residence	No	23 Coral Tree Drive	60	55	60	57	61	57	Y	Y	N	N	N	N	N	60	57	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2237	3823	10D	Residence	No	21 Coral Tree Drive	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	57	N	-
2238	3748	10C	Residence	No	32 Coral Tree Drive	60	55	57	54	61	58	Y	Y	Y	Y	N	N	Y	61	57	Y	Type 1
2239	3769	10C	Residence	No	30 Coral Tree Drive	60	55	56	53	60	57	Y	Y	Y	Y	N	N	Y	58	55	Y	Type 1
2240	3787	10C	Residence	No	28 Coral Tree Drive	60	55	57	54	62	59	Y	Y	Y	Y	N	N	Y	60	57	Y	Type 1
2241	3801	10C	Residence	No	26 Coral Tree Drive	60	55	58	55	60	57	N	Y	N	N	N	N	N	60	57	N	-
2242	3825	10D	Residence	No	24 Coral Tree Drive	60	55	59	56	61	58	Y	Y	Y	N	N	N	Y	61	58	Y	Type 1
2243	3842	10D	Residence	No	22 Coral Tree Drive	60	55	61	57	64	61	Y	Y	Y	Y	N	N	Y	63	60	Y	Type 1
2244	3860	10D	Residence	No	20 Coral Tree Drive	60	55	61	58	65	61	Y	Y	N	N	N	N	N	64	60	N	-
2245	3883	10D	Residence	No	18 Coral Tree Drive	60	55	62	59	65	61	Y	Y	N	N	N	N	N	64	60	N	-
2246	3902	10D	Residence	No	16 Coral Tree Drive	60	55	60	57	61	57	N	Y	N	N	N	N	N	60	57	N	-
2247	3915	10D	Residence	No	14 Coral Tree Drive	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	56	N	-
2248	3936	10D	Residence	No	12 Coral Tree Drive	60	55	60	56	60	56	N	N	N	N	N	N	N	59	56	N	-
2249	3954	10D	Residence	No	10 Coral Tree Drive	60	55	60	57	60	56	N	N	N	N	N	N	N	59	56	N	-
2250	3976	10D	Residence	No	8 Coral Tree Drive	60	55	59	56	59	55	N	N	N	N	N	N	N	58	55	N	-
2251	3993	10D	Residence	No	6 Coral Tree Drive	60	55	59	56	59	55	N	N	N	N	N	N	N	59	55	N	-
2252	4009	10D	Residence	No	4 Coral Tree Drive	60	55	60	57	59	56	N	N	N	N	N	N	N	59	55	N	-
2253	4037	10D	Residence	No	2 Coral Tree Drive	60	55	60	57	60	56	N	Y	N	N	N	N	N	59	56	N	-
2256	3878	10D	Residence	No	15 Coral Tree Drive	60	55	60	57	61	57	N	Y	N	N	N	N	N	60	57	N	-
2257	3901	10D	Residence	No	13 Coral Tree Drive	60	55	62	59	62	59	Y	Y	N	N	N	N	N	62	58	N	-
2258	3919	10D	Residence	No	11 Coral Tree Drive	60	55	62	59	62	59	Y	Y	N	N	N	N	N	62	58	N	-
2259	3937	10D	Residence	No	9 Coral Tree Drive	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	57	N	-
2260	3955	10D	Residence	No	7 Coral Tree Drive	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	56	N	-
2261	3978	10D	Residence	No	5 Coral Tree Drive	60	55	61	58	61	58	N	Y	N	N	N	N	N	61	58	N	-
2262	3977	10D	Residence	No	2 Pepperina Place	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	57	N	-
2263	3957	10D	Residence	No	4 Pepperina Place	60	55	58	55	58	55	N	N	N	N	N	N	N	58	54	N	-
2264	3940	10D	Residence	No	6 Pepperina Place	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2265	3921	10D	Residence	No	8 Pepperina Place	60	55	58	55	57	54	N	N	N	N	N	N	N	57	54	N	-
2266	3898	10D	Residence	No	10 Pepperina Place	60	55	60	57	60	56	N	Y	N	N	N	N	N	59	56	N	-
2267	3881	10D	Residence	No	12 Pepperina Place	60	55	58	55	58	54	N	N	N	N	N	N	N	57	54	N	-
2268	3886	10D	Residence	No	9 Pepperina Place	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2269	3899	10D	Residence	No	7 Pepperina Place	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2270	3923	10D	Residence	No	5 Pepperina Place	60	55	55	51	54	51	N	N	N	N	N	N	N	54	50	N	-
2271	3943	10D	Residence	No	3 Pepperina Place	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2272	3970	10D	Residence	No	1 Pepperina Place	60	55	55	51	55	51	N	N	N	N	N	N	N	54	51	N	-
2273	3979	10D	Residence	No	8 Moorilla Avenue	60	55	54	51	54	51	N	N	N	N	N	N	N	54	50	N	-
2274	3875	10D	Residence	No	22 Moorilla Avenue	60	55	53	50	52	48	N	N	N	N	N	N	N	52	48	N	-
2275	3900	10D	Residence	No	20 Moorilla Avenue	60	55	53	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2276	3913	10D	Residence	No	18 Moorilla Avenue	60	55	53	50	52	49	N	N	N	N	N	N	N	52	49	N	-
2277	3931	10D	Residence	No	16 Moorilla Avenue	60	55	51	48	51	47	N	N	N	N	N	N	N	51	47	N	-
2278	3949	10D	Residence	No	14 Moorilla Avenue	60	55	54	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2279	3971	10D	Residence	No	12 Moorilla Avenue	60	55	54	50	53	50	N	N	N	N	N	N	N	53	49	N	-
2280	3994	10D	Residence	No	10 Moorilla Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2281	4011	10D	Residence	No	3 Coral Tree Drive	60	55	63	60	63	60	Y	Y	N	N	N	N	N	63	59	N	-
2282	4015	10D	Residence	No	3 Moorilla Avenue	60	55	59	55	58	54	N	N	N	N	N	N	N	58	55	N	-
2283	4013	10D	Residence	No	5 Moorilla Avenue	60	55	58	55	57	53	N	N	N	N	N	N	N	57	54	N	-
2284	4016	10D	Residence	No	7 Moorilla Avenue	60	55	59	55	57	53	N	N	N	N	N	N	N	58	54	N	-
2285	4025	10D	Residence	No	9 Moorilla Avenue	60	55	58	55	58	54	N	N	N	N	N	N	N	58	55	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2286	4026	10D	Residence	No	11 Moorilla Avenue	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2287	4030	10D	Residence	No	13 Moorilla Avenue	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2288	4042	10D	Residence	No	15 Moorilla Avenue	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2290	4067	10D	Residence	No	62 Oakes Road	60	55	60	56	57	54	N	Y	N	N	N	N	N	59	56	N	-
2291	4068	10D	Residence	No	64 Oakes Road	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2292	4064	10D	Residence	No	66 Oakes Road	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2293	4070	10D	Residence	No	68 Oakes Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2294	4105	10D	Residence	No	70 Oakes Road	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2295	4108	10D	Residence	No	72 Oakes Road	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2296	4147	11A	Residence	No	12A Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2297	4164	11A	Residence	No	12B Westmore Drive	60	55	56	53	57	53	N	N	N	N	N	N	N	56	53	N	-
2298	4185	11A	Residence	No	14 Westmore Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2299	4199	11A	Residence	No	16 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	54	N	-
2300	4220	11A	Residence	No	18 Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2301	4236	11A	Residence	No	20 Westmore Drive	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2302	4253	11A	Residence	No	22 Westmore Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2303	4277	11A	Residence	No	24 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2304	4297	11A	Residence	No	26 Westmore Drive	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2305	4321	11A	Residence	No	28 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2306	4337	11A	Residence	No	30 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	59	55	N	-
2307	4351	11A	Residence	No	32 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2308	4373	11A	Residence	No	34 Westmore Drive	60	55	59	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
2309	4396	11A	Residence	No	36 Westmore Drive	60	55	58	55	59	55	N	N	N	N	N	N	N	58	55	N	-
2310	4414	11A	Residence	No	38 Westmore Drive	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
2311	4422	11A	Residence	No	40 Westmore Drive	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2312	4446	11A	Residence	No	42 Westmore Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2313	4461	11A	Residence	No	44 Westmore Drive	60	55	58	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
2314	4476	11A	Residence	No	46 Westmore Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2315	4487	11A	Residence	No	48 Westmore Drive	60	55	59	56	60	57	N	Y	N	N	N	N	N	59	56	N	-
2316	4503	11A	Residence	No	50 Westmore Drive	60	55	58	55	59	56	N	Y	N	N	N	N	N	58	55	N	-
2317	4514	11A	Residence	No	52 Westmore Drive	60	55	57	54	59	55	N	Y	N	N	N	N	N	58	54	N	-
2318	4522	11A	Residence	No	54 Westmore Drive	60	55	58	54	59	55	N	Y	N	N	N	N	N	58	54	N	-
2319	4534	11A	Residence	No	56 Westmore Drive	60	55	59	55	60	56	N	Y	N	N	N	N	N	58	55	N	-
2320	4551	11A	Residence	No	58 Westmore Drive	60	55	59	56	60	57	N	Y	N	N	N	N	N	58	55	N	-
2321	4560	11A	Residence	No	60 Westmore Drive	60	55	58	55	59	56	N	Y	N	N	N	N	N	57	54	N	-
2322	4573	11A	Residence	No	62 Westmore Drive	60	55	60	57	61	58	Y	Y	N	N	N	N	N	59	56	N	-
2323	4592	11A	Residence	No	64 Westmore Drive	60	55	60	57	62	58	Y	Y	N	N	N	N	N	59	56	N	-
2324	4602	11A	Residence	No	66 Westmore Drive	60	55	61	58	62	59	Y	Y	N	N	N	N	N	60	56	N	-
2325	4631	11A	Residence	No	70 Westmore Drive	60	55	63	59	64	60	Y	Y	N	N	N	Y	Y	62	58	Y	Type 1
2326	4641	11A	Residence	No	72 Westmore Drive	60	55	62	59	63	60	Y	Y	N	N	N	N	N	62	58	N	-
2327	4668	11A	Residence	No	74 Westmore Drive	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	63	59	Y	Type 1
2328	4681	11A	Residence	No	76 Westmore Drive	60	55	64	60	64	61	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
2330	4717	11A	Residence	No	78 Westmore Drive	60	55	63	60	63	60	Y	Y	N	N	N	N	N	63	59	N	-
2331	4730	11A	Residence	No	78 Westmore Drive	60	55	62	59	63	59	Y	Y	N	N	N	N	N	62	59	N	-
2332	4152	11A	Residence	No	12 Westmore Drive	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2333	4217	11A	Residence	No	9 Westmore Drive	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2334	4241	11A	Residence	No	11 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2335	4251	11A	Residence	No	13 Westmore Drive	60	55	58	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
2336	4292	11A	Residence	No	19 Westmore Drive	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2337	4312	11A	Residence	No	21 Westmore Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2338	4327	11A	Residence	No	25 Westmore Drive	60	55	59	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
2339	4357	11A	Residence	No	27 Westmore Drive	60	55	58	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
2340	4376	11A	Residence	No	29 Westmore Drive	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	56	N	-
2341	4419	11A	Residence	No	31 Westmore Drive	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2342	4464	11A	Residence	No	1 Gwen Place	60	55	58	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
2343	4490	11A	Residence	No	35 Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2344	4501	11A	Residence	No	37 Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
2345	4532	11A	Residence	No	39 Westmore Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	56	53	N	-
2346	4557	11A	Residence	No	41 Westmore Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	58	55	N	-
2347	4591	11A	Residence	No	9 Dickson Avenue	60	55	57	53	57	53	N	N	N	N	N	N	N	56	53	N	-
2348	4612	11A	Residence	No	47 Westmore Drive	60	55	59	56	59	56	N	Y	N	N	N	N	N	58	55	N	-
2349	4626	11A	Residence	No	49 Westmore Drive	60	55	60	56	61	57	Y	Y	N	N	N	N	N	59	55	N	-
2350	4680	11A	Residence	No	51 Westmore Drive	60	55	60	56	60	56	N	Y	N	N	N	N	N	59	55	N	-
2351	4703	11A	Residence	No	53 Westmore Drive	60	55	59	55	58	55	N	N	N	N	N	N	N	59	55	N	-
2352	4718	11A	Residence	No	55 Westmore Drive	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2353	4143	11A	Residence	No	37 Oakes Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2354	4159	11A	Residence	No	10 Westmore Drive	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2355	4139	11A	Residence	No	35 Oakes Road	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2356	4167	11A	Residence	No	8 Westmore Drive	60	55	58	55	57	54	N	N	N	N	N	N	N	57	54	N	-
2357	4141	11A	Residence	No	33 Oakes Road	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
2358	4163	11A	Residence	No	6 Westmore Drive	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2359	4142	11A	Residence	No	31 Oakes Road	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2360	4162	11A	Residence	No	4 Westmore Drive	60	55	57	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2361	4138	11A	Residence	No	29 Oakes Road	60	55	56	53	55	52	N	N	N	N	N	N	N	55	52	N	-
2362	4161	11A	Residence	No	2 Westmore Drive	60	55	57	54	56	53	N	N	N	N	N	N	N	56	52	N	-
2363	4135	11A	Residence	No	42 Eaton Road	60	55	58	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2364	4150	11A	Residence	No	44 Eaton Road	60	55	58	55	57	54	N	N	N	N	N	N	N	57	53	N	-
2365	4219	11A	Residence	No	7 Westmore Drive	60	55	55	52	55	51	N	N	N	N	N	N	N	55	52	N	-
2366	4205	11A	Residence	No	5 Westmore Drive	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2367	4204	11A	Residence	No	3 Westmore Drive	60	55	57	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2368	4202	11A	Residence	No	1 Westmore Drive	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2369	4245	11A	Residence	No	15 Westmore Drive	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2370	4235	11A	Residence	No	48 Eaton Road	60	55	58	55	57	54	N	N	N	N	N	N	N	57	54	N	-
2371	4252	11A	Residence	No	50 Eaton Road	60	55	58	55	58	54	N	N	N	N	N	N	N	57	54	N	-
2372	4289	11A	Residence	No	17 Westmore Drive	60	55	59	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2373	4287	11A	Residence	No	54 Eaton Road	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2374	4279	11A	Residence	No	52 Eaton Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2375	4333	11A	Residence	No	23 Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2376	4315	11A	Residence	No	58 Eaton Road	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2377	4320	11A	Residence	No	60 Eaton Road	60	55	58	55	58	54	N	N	N	N	N	N	N	57	54	N	-
2378	4371	11A	Residence	No	2 Betts Place	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2379	4372	11A	Residence	No	3 Betts Place	60	55	59	56	59	55	N	Y	N	N	N	N	N	58	55	N	-
2380	4325	11A	Residence	No	62 Eaton Road	60	55	56	53	56	52	N	N	N	N	N	N	N	56	53	N	-
2381	4343	11A	Residence	No	64 Eaton Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	53	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2382	4370	11A	Residence	No	66 Eaton Road	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2383	4386	11A	Residence	No	68 Eaton Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2384	4408	11A	Residence	No	4 Betts Place	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2385	4404	11A	Residence	No	70 Eaton Road	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2386	4424	11A	Residence	No	6 Betts Place	60	55	55	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2387	4425	11A	Residence	No	5 Betts Place	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2388	4421	11A	Residence	No	72 Eaton Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2389	4450	11A	Residence	No	2 Gwen Place	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2390	4452	11A	Residence	No	3 Gwen Place	60	55	58	55	58	55	N	N	N	N	N	N	N	58	54	N	-
2391	4447	11A	Residence	No	74 Eaton Road	60	55	58	55	58	55	N	N	N	N	N	N	N	57	54	N	-
2392	4469	11A	Residence	No	4 Gwen Place	60	55	57	54	58	54	N	N	N	N	N	N	N	57	53	N	-
2393	4466	11A	Residence	No	76 Eaton Road	60	55	58	55	58	55	N	N	N	N	N	N	N	57	54	N	-
2394	4488	11A	Residence	No	6 Gwen Place	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
2395	4484	11A	Residence	No	5 Gwen Place	60	55	57	54	58	54	N	N	N	N	N	N	N	57	54	N	-
2396	4478	11A	Residence	No	78 Eaton Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2397	4497	11A	Residence	No	2 Robyne Place	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2398	4498	11A	Residence	No	3 Robyne Place	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2399	4496	11A	Residence	No	80 Eaton Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2400	4495	11A	Residence	No	82 Eaton Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2401	4499	11A	Residence	No	4 Robyne Place	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2402	4530	11A	Residence	No	6 Robyne Place	60	55	57	54	58	54	N	N	N	N	N	N	N	57	53	N	-
2403	4523	11A	Residence	No	5 Robyne Place	60	55	54	51	55	52	N	N	N	N	N	N	N	55	51	N	-
2404	4500	11A	Residence	No	84 Eaton Road	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2405	4521	11A	Residence	No	86 Eaton Road	60	55	56	53	57	53	N	N	N	N	N	N	N	56	52	N	-
2406	4553	11A	Residence	No	8 Dickson Avenue	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2407	4549	11A	Residence	No	6 Dickson Avenue	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
2408	4538	11A	Residence	No	4 Dickson Avenue	60	55	57	53	57	53	N	N	N	N	N	N	N	56	52	N	-
2409	4537	11A	Residence	No	2 Dickson Avenue	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2410	4584	11A	Residence	No	7 Dickson Avenue	60	55	58	55	58	55	N	N	N	N	N	N	N	57	54	N	-
2411	4576	11A	Residence	No	5 Dickson Avenue	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
2412	4569	11A	Residence	No	3 Dickson Avenue	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2413	4562	11A	Residence	No	1 Dickson Avenue	60	55	58	55	58	55	N	N	N	N	N	N	N	57	53	N	-
2414	4607	11A	Residence	No	45 Westmore Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2415	4599	11A	Residence	No	92 Eaton Road	60	55	58	55	58	55	N	N	N	N	N	N	N	57	53	N	-
2416	4615	11A	Residence	No	3 Kylie Crescent	60	55	58	55	58	55	N	N	N	N	N	N	N	57	54	N	-
2417	4624	11A	Residence	No	5 Kylie Crescent	60	55	58	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2418	4609	11A	Residence	No	94 Eaton Road	60	55	57	53	57	54	N	N	N	N	N	N	N	56	52	N	-
2419	4613	11A	Residence	No	96 Eaton Road	60	55	57	54	58	54	N	N	N	N	N	N	N	56	53	N	-
2420	4629	11A	Residence	No	98 Eaton Road	60	55	58	55	58	55	N	N	N	N	N	N	N	57	54	N	-
2421	4644	11A	Residence	No	9 Kylie Crescent	60	55	58	55	59	55	N	N	N	N	N	N	N	57	54	N	-
2422	4662	11A	Residence	No	11 Kylie Crescent	60	55	59	55	59	55	N	Y	N	N	N	N	N	58	54	N	-
2423	4672	11A	Residence	No	13 Kylie Crescent	60	55	58	55	58	54	N	N	N	N	N	N	N	57	54	N	-
2424	4621	11A	Residence	No	100 Eaton Road	60	55	57	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2425	4636	11A	Residence	No	100 Eaton Road	60	55	57	54	57	53	N	N	N	N	N	N	N	56	53	N	-
2426	4648	11A	Residence	No	102 Eaton Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2427	4663	11A	Residence	No	104 Eaton Road	60	55	55	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2428	4665	11A	Residence	No	2 Kylie Crescent	60	55	60	56	60	56	N	Y	N	N	N	N	N	59	56	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2429	4675	11A	Residence	No	4 Kylie Crescent	60	55	51	47	51	48	N	N	N	N	N	N	N	52	48	N	-
2430	4690	11A	Residence	No	6 Kylie Crescent	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2431	5015	11A	Residence	No	2 Virginia Place	60	55	61	57	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2432	5029	11A	Residence	No	8 Virginia Place	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2433	5039	11A	Residence	No	10 Virginia Place	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2434	5052	11A	Residence	No	16 Virginia Place	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2435	5048	11A	Residence	No	14 Virginia Place	60	55	64	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2436	5038	11A	Residence	No	12 Virginia Place	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2437	5027	11A	Residence	No	6 Virginia Place	60	55	63	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2438	5014	11A	Residence	No	2A Virginia Place	60	55	63	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2439	4998	11A	Residence	No	106 Westmore Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2440	4980	11A	Residence	No	106 Westmore Drive	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2441	4970	11A	Residence	No	106 Westmore Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2442	4958	11A	Residence	No	78-106 Westmore Drive	60	55	63	60	64	60	Y	Y	N	N	N	N	N	64	60	N	-
2443	4948	11A	Residence	No	78-106 Westmore Drive	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2444	4938	11A	Residence	No	78-106 Westmore Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2445	4928	11A	Residence	No	78-106 Westmore Drive	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2446	4920	11A	Residence	No	78-106 Westmore Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2447	4912	11A	Residence	No	88 Westmore Drive	60	55	64	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2448	4910	11A	Residence	No	86 Westmore Drive	60	55	64	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2449	4740	11A	Residence	No	84 Wstmore Drive	60	55	64	61	65	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
2450	4935	11A	Residence	No	21-23 Kylie Crescent	60	55	57	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2452	4982	11A	Residence	No	31 Kylie Crescent	60	55	56	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2454	4993	11A	Residence	No	33 Kylie Crescent	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2455	5026	11A	Residence	No	10 Range Road	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2456	5033	11A	Residence	No	3 Virginia Place	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2457	5060	11A	Residence	No	9 Virginia Place	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2458	5023	11A	Residence	No	8 Range Road	60	55	55	51	55	52	N	N	N	N	N	N	N	55	52	N	-
2459	5004	11A	Residence	No	7 Range Road	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2460	4989	11A	Residence	No	26 Kylie Crescent	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2461	4973	11A	Residence	No	24 Kylie Crescent	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2462	4961	11A	Residence	No	22 Kylie Crescent	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2463	4951	11A	Residence	No	20 Kylie Crescent	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2464	4939	11A	Residence	No	18 Kylie Crescent	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2465	4931	11A	Residence	No	16 Kylie Crescent	60	55	58	54	57	54	N	N	N	N	N	N	N	58	54	N	-
2466	4921	11A	Residence	No	14 Kylie Crescent	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2467	4731	11A	Residence	No	12 Kylie Crescent	60	55	59	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2468	4719	11A	Residence	No	10 Kylie Crescent	60	55	59	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2469	4709	11A	Residence	No	8 Kylie Crescent	60	55	59	55	59	55	N	N	N	N	N	N	N	58	55	N	-
2470	4728	11A	Residence	No	57 Westmore Drive	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2471	4741	11A	Residence	No	59 Westmore Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2472	4915	11A	Residence	No	61 Westmore Drive	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2474	4934	11A	Residence	No	65 Westmore Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2476	4955	11A	Residence	No	69 Westmore Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2477	4968	11A	Residence	No	71 Westmore Drive	60	55	56	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2478	4978	11A	Residence	No	73 Westmore Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2479	4988	11A	Residence	No	75 Westmore Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2480	5000	11A	Residence	No	77 Westmore Drive	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
2481	5024	11A	Residence	No	1 Virginia Place	60	55	60	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2482	5035	11A	Residence	No	5 Virginia Place	60	55	58	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2483	5053	11A	Residence	No	7 Virginia Place	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2484	5058	11A	Residence	No	11 Virginia Place	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2485	4691	11A	Residence	No	15 Kylie Crescent	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2486	4705	11A	Residence	No	17 Kylie Crescent	60	55	56	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2487	4716	11A	Residence	No	19A Kylie Crescent	60	55	58	54	57	54	N	N	N	N	N	N	N	57	53	N	-
2488	4923	11A	Residence	No	19 Kylie Crescent	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2490	4224	11B	Residence	No	1 Carmen Drive	60	55	63	60	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2491	4237	11B	Residence	No	5 Carmen Drive	60	55	65	61	63	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
2492	4257	11B	Residence	No	7 Carmen Drive	60	55	64	60	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2493	4282	11B	Residence	No	9 Carmen Drive	60	55	61	58	60	56	Y	Y	N	N	N	N	N	60	56	N	-
2494	4306	11B	Residence	No	11 Carmen Drive	60	55	63	59	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2495	4330	11B	Residence	No	13 Carmen Drive	60	55	59	56	58	54	N	Y	N	N	N	N	N	58	54	N	-
2496	4350	11B	Residence	No	15 Carmen Drive	60	55	59	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2497	4374	11B	Residence	No	17 Carmen Drive	60	55	60	57	60	56	N	Y	N	N	N	N	N	59	56	N	-
2498	4393	11B	Residence	No	19 Carmen Drive	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	55	N	-
2499	4410	11B	Residence	No	21 Carmen Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	61	58	N	-
2500	4423	11B	Residence	No	23 Carmen Drive	60	55	61	57	62	58	Y	Y	N	N	N	N	N	61	58	N	-
2501	4444	11B	Residence	No	25 Carmen Drive	60	55	63	59	64	61	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
2502	4459	11B	Residence	No	27 Carmen Drive	60	55	68	65	69	66	Y	Y	N	N	Y	Y	Y	69	66	Y	Type 2
2503	4475	11B	Residence	No	29 Carmen Drive	60	55	67	64	69	65	Y	Y	N	N	Y	Y	Y	68	65	Y	Type 2
2504	4483	11B	Residence	No	31 Carmen Drive	60	55	68	64	69	65	Y	Y	N	N	Y	Y	Y	69	65	Y	Type 2
2505	4518	11B	Residence	No	33 Carmen Drive	60	55	73	70	74	71	Y	Y	N	N	Y	Y	Y	74	71	Y	Type 2
2507	4233	11B	Residence	No	22 Carmen Drive	60	55	60	57	60	56	Y	Y	N	N	N	N	N	60	56	N	-
2508	4263	11B	Residence	No	24 Carmen Drive	60	55	60	57	60	56	Y	Y	N	N	N	N	N	60	56	N	-
2509	4283	11B	Residence	No	26 Carmen Drive	60	55	60	56	59	56	N	Y	N	N	N	N	N	59	55	N	-
2510	4303	11B	Residence	No	28 Carmen Drive	60	55	60	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2511	4342	11B	Residence	No	30 Carmen Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2512	4365	11B	Residence	No	32 Carmen Drive	60	55	60	57	61	57	Y	Y	N	N	N	N	N	60	57	N	-
2513	4380	11B	Residence	No	34 Carmen Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2514	4400	11B	Residence	No	36 Carmen Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2515	4417	11B	Residence	No	38 Carmen Drive	60	55	60	57	61	57	Y	Y	N	N	N	N	N	60	57	N	-
2516	4431	11B	Residence	No	40 Carmen Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	61	58	N	-
2517	4448	11B	Residence	No	42 Carmen Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2518	4467	11B	Residence	No	44 Carmen Drive	60	55	62	59	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2519	4477	11B	Residence	No	46 Carmen Drive	60	55	63	60	64	61	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2520	4515	11B	Residence	No	48 Carmen Drive	60	55	64	60	65	61	Y	Y	N	N	N	Y	Y	65	61	Y	Type 1
2521	4529	11B	Residence	No	50 Carmen Drive	60	55	64	61	65	61	Y	Y	N	N	N	Y	Y	65	61	Y	Type 1
2522	4540	11B	Residence	No	52A Carmen Drive	60	55	64	61	65	61	Y	Y	N	N	Y	Y	Y	65	62	Y	Type 1
2523	4555	11B	Residence	No	54 Carmen Drive	60	55	62	59	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2524	4565	11B	Residence	No	56 Carmen Drive	60	55	63	59	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2525	4581	11B	Residence	No	58 Carmen Drive	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2526	4628	11B	Residence	No	53 Carmen Drive	60	55	67	63	67	63	Y	Y	N	N	Y	Y	Y	67	63	Y	Type 1
2527	4656	11B	Residence	No	2 Morton Avenue	60	55	64	61	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2528	4642	11B	Residence	No	4 Morton Avenue	60	55	65	61	65	61	Y	Y	N	N	N	Y	Y	65	61	Y	Type 1

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2529	4630	11B	Residence	No	6 Morton Avenue	60	55	63	60	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2530	4586	11B	Residence	No	60 Carmen Drive	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2531	4590	11B	Residence	No	62 Carmen Drive	60	55	58	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2532	4598	11B	Residence	No	64 Carmen Drive	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2533	4582	11B	Residence	No	64 Carmen Drive	60	55	61	57	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2534	4567	11B	Residence	No	66 Carmen Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2535	4554	11B	Residence	No	68 Carmen Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	58	N	-
2536	4541	11B	Residence	No	70 Carmen Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2537	4525	11B	Residence	No	72 Carmen Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2538	4480	11B	Residence	No	74 Carmen Drive	60	55	61	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2539	4473	11B	Residence	No	76 Carmen Drive	60	55	61	57	61	58	Y	Y	N	N	N	N	N	61	57	N	-
2540	N/A	11B	Residence	No	78 Carmen Drive	60	55	55	51	56	52	N	N	N	N	N	N	N	56	53	N	-
2541	4428	11B	Residence	No	80 Carmen Drive	60	55	60	57	61	57	Y	Y	N	N	N	N	N	60	57	N	-
2542	4407	11B	Residence	No	82 Carmen Drive	60	55	58	55	58	54	N	Y	N	N	N	N	N	58	54	N	-
2543	4378	11B	Residence	No	84 Carmen Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
2544	4353	11B	Residence	No	86 Carmen Drive	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2545	4326	11B	Residence	No	88 Carmen Drive	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2546	4288	11B	Residence	No	90 Carmen Drive	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2547	4264	11B	Residence	No	92 Carmen Drive	60	55	56	53	56	53	N	N	N	N	N	N	N	56	52	N	-
2548	4234	11B	Residence	No	22 Watton Road	60	55	61	57	61	57	Y	Y	N	N	N	N	N	60	56	N	-
2549	4239	11B	Residence	No	94 Carmen Drive	60	55	58	54	56	52	N	N	N	N	N	N	N	57	53	N	-
2552	4192	11B	Residence	No	31 Watton Road	60	55	60	57	59	55	N	Y	N	N	N	N	N	59	55	N	-
2553	4151	11B	Residence	No	49 Oakes Road	60	55	59	56	57	54	N	Y	N	N	N	N	N	58	55	N	-
2554	4153	11B	Residence	No	51 Oakes Road	60	55	57	54	56	52	N	N	N	N	N	N	N	56	53	N	-
2555	4191	11B	Residence	No	29 Watton Road	60	55	55	52	54	51	N	N	N	N	N	N	N	55	51	N	-
2557	4652	11B	Residence	No	3 Morton Avenue	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	57	N	-
2559	4678	11B	Residence	No	103 Murray Farm Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2560	4682	11B	Residence	No	101 Murray Farm Road	60	55	59	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2561	4684	11B	Residence	No	99 Murray Farm Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2562	4688	11B	Residence	No	97 Murray Farm Road	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2563	4720	11B	Residence	No	100 Murray Farm Road	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2564	4739	11B	Residence	No	3 Wilshire Avenue	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2565	4745	11B	Residence	No	5 Wilshire Avenue	60	55	63	59	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2566	4753	11B	Residence	No	7 Wilshire Avenue	60	55	63	59	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2567	4762	11B	Residence	No	9 Wilshire Avenue	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2568	4770	11B	Residence	No	11 Wilshire Avenue	60	55	64	60	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
2569	4889	11B	Residence	No	11 Wilshire Avenue	60	55	60	56	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2571	4885	11B	Residence	No	17 Wilshire Avenue	60	55	60	57	60	57	Y	Y	N	N	N	N	N	61	57	N	-
2572	4883	11B	Residence	No	19 Wilshire Avenue	60	55	61	57	61	58	Y	Y	N	N	N	N	N	62	58	N	-
2573	4887	11B	Residence	No	21 Wilshire Avenue	60	55	60	56	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2574	4778	11B	Residence	No	25 Wilshire Avenue	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	57	N	-
2575	4779	11B	Residence	No	25 Wilshire Avenue	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2576	4780	11B	Residence	No	27 Wilshire Avenue	60	55	58	54	58	55	N	N	N	N	N	N	N	58	55	N	-
2577	4772	11B	Residence	No	10 Wilshire Avenue	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2578	4761	11B	Residence	No	8 Wilshire Avenue	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2579	4747	11B	Residence	No	6 Wilshire Avenue	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2580	4736	11B	Residence	No	2B Wilshire Avenue	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2583	4742	11B	Residence	No	92 Murray Farm Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2584	4743	11B	Residence	No	90 Murray Farm Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2585	4746	11B	Residence	No	88 Murray Farm Road	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2586	4752	11B	Residence	No	4 Wilshire Avenue	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2587	4763	11B	Residence	No	4A Wilshire Avenue	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2588	4766	11B	Residence	No	5 Haines Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	53	49	N	-
2589	4758	11B	Residence	No	3 Haines Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2590	4776	11B	Residence	No	12 Wilshire Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2591	4777	11B	Residence	No	14 Wilshire Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
2592	4781	11B	Residence	No	7 Haines Avenue	60	55	51	48	51	48	N	N	N	N	N	N	N	52	48	N	-
2593	4693	11B	Residence	No	95 Murray Farm Road	60	55	56	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2594	4704	11B	Residence	No	93 Murray Farm Road	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2595	4714	11B	Residence	No	91 Murray Farm Road	60	55	55	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2596	4940	11B	Residence	No	13 Gossell Grove	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2597	4954	11B	Residence	No	17 Gossell Grove	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2598	4971	11B	Residence	No	20 Gossell Grove	60	55	53	50	54	51	N	N	N	N	N	N	N	54	50	N	-
2599	4967	11B	Residence	No	18 Gossell Grove	60	55	53	49	53	49	N	N	N	N	N	N	N	53	50	N	-
2600	4960	11B	Residence	No	16 Gossell Grove	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2601	4943	11B	Residence	No	15 Gossell Grove	60	55	51	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2602	4926	11B	Residence	No	11 Gossell Grove	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2603	4919	11B	Residence	No	13 Haines Avenue	60	55	48	44	48	45	N	N	N	N	N	N	N	48	45	N	-
2604	4941	11B	Residence	No	9 Gossell Grove	60	55	50	47	51	47	N	N	N	N	N	N	N	51	48	N	-
2605	4936	11B	Residence	No	7 Gossell Grove	60	55	49	45	49	46	N	N	N	N	N	N	N	50	46	N	-
2606	4959	11B	Residence	No	14 Gossell Grove	60	55	51	47	51	48	N	N	N	N	N	N	N	51	48	N	-
2607	4953	11B	Residence	No	12 Gossell Grove	60	55	50	46	50	47	N	N	N	N	N	N	N	50	47	N	-
2608	4950	11B	Residence	No	10 Gossell Grove	60	55	49	46	49	46	N	N	N	N	N	N	N	50	46	N	-
2609	N/A	11B	Residence	No	5 Gossell Grove	60	55	48	44	48	45	N	N	N	N	N	N	N	49	45	N	-
2610	N/A	11B	Residence	No	15 Haines Avenue	60	55	47	44	47	44	N	N	N	N	N	N	N	48	44	N	-
2611	4895	11B	Residence	No	26 Haines Avenue	60	55	47	43	47	44	N	N	N	N	N	N	N	47	44	N	-
2612	4893	11B	Residence	No	24 Haines Avenue	60	55	47	44	47	44	N	N	N	N	N	N	N	47	44	N	-
2613	4843	11B	Residence	No	22 Haines Avenue	60	55	47	43	47	43	N	N	N	N	N	N	N	47	44	N	-
2614	4810	11B	Residence	No	20 Haines Avenue	60	55	48	45	48	45	N	N	N	N	N	N	N	49	45	N	-
2615	4809	11B	Residence	No	18 Haines Avenue	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2616	4813	11B	Residence	No	16 Haines Avenue	60	55	50	47	50	47	N	N	N	N	N	N	N	51	47	N	-
2617	4832	11B	Residence	No	14 Haines Avenue	60	55	53	50	53	50	N	N	N	N	N	N	N	54	50	N	-
2618	4798	11B	Residence	No	12 Haines Avenue	60	55	49	46	49	46	N	N	N	N	N	N	N	50	46	N	-
2619	4708	11B	Residence	No	89 Murray Farm Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2620	4687	11B	Residence	No	87 Murray Farm Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2621	4657	11B	Residence	No	83 Murray Farm Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2622	4647	11B	Residence	No	81 Murray Farm Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2623	4603	11B	Residence	No	77 Murray Farm Road	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2624	4594	11B	Residence	No	75 Murray Farm Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2625	4577	11B	Residence	No	73 Murray Farm Road	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2626	4546	11B	Residence	No	69 Murray Farm Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2627	4531	11B	Residence	No	67 Murray Farm Road	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2628	4437	11B	Residence	No	2 Sylvia Avenue	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2629	4460	11B	Residence	No	65 Murray Farm Road	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2630	4443	11B	Residence	No	4 Sylvia Avenue	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2631	4440	11B	Residence	No	6 Sylvia Avenue	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2632	4441	11B	Residence	No	8 Sylvia Avenue	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2633	4436	11B	Residence	No	10 Sylvia Avenue	60	55	59	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2634	4434	11B	Residence	No	12 Sylvia Avenue	60	55	59	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
2635	4432	11B	Residence	No	14 Sylvia Avenue	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	55	N	-
2638	4392	11B	Residence	No	11 Sylvia Avenue	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	55	N	-
2639	4358	11B	Residence	No	61 Carmen Drive	60	55	58	55	59	55	N	N	N	N	N	N	N	58	55	N	-
2640	4338	11B	Residence	No	63 Carmen Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	57	53	N	-
2641	4301	11B	Residence	No	65 Carmen Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	56	53	N	-
2642	4285	11B	Residence	No	67 Carmen Drive	60	55	56	53	57	53	N	N	N	N	N	N	N	56	52	N	-
2643	4250	11B	Residence	No	69 Carmen Drive	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2644	4198	11B	Residence	No	27 Watton Road	60	55	55	51	54	51	N	N	N	N	N	N	N	54	50	N	-
2645	4157	11B	Residence	No	53 Oakes Road	60	55	55	52	54	50	N	N	N	N	N	N	N	55	51	N	-
2646	5465	12	Residence	No	53 Barclay Road	60	55	60	56	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2648	5438	12	Residence	No	49 Barclay Road	60	55	59	56	59	56	N	Y	N	N	N	N	N	60	56	N	-
2649	5431	12	Residence	No	47 Barclay Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2650	5421	12	Residence	No	45 Barclay Road	60	55	58	54	57	54	N	N	N	N	N	N	N	58	54	N	-
2651	5412	12	Residence	No	43 Barclay Road	60	55	57	54	57	53	N	N	N	N	N	N	N	57	54	N	-
2652	5385	12	Residence	No	39 Barclay Road	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2653	5377	12	Residence	No	37 Barclay Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2654	5364	12	Residence	No	35 Barclay Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2655	5356	12	Residence	No	33 Barclay Road	60	55	52	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2656	5348	12	Residence	No	31 Barclay Road	60	55	53	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2657	5334	12	Residence	No	29 Barclay Road	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
2658	5319	12	Residence	No	27 Barclay Road	60	55	53	49	51	48	N	N	N	N	N	N	N	52	48	N	-
2659	5312	12	Residence	No	25 Barclay Road	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
2661	5264	12	Residence	No	6 Hepburn Road	60	55	55	51	53	50	N	N	N	N	N	N	N	54	50	N	-
2662	5289	12	Residence	No	4 Carlton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	54	51	N	-
2663	5298	12	Residence	No	6 Carlton Road	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2664	5308	12	Residence	No	8 Carlton Road	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2665	5317	12	Residence	No	10 Carlton Road	60	55	54	51	53	50	N	N	N	N	N	N	N	53	49	N	-
2666	5330	12	Residence	No	12 Carlton Road	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
2667	5342	12	Residence	No	14 Carlton Road	60	55	55	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2668	5353	12	Residence	No	16 Carlton Road	60	55	55	51	53	50	N	N	N	N	N	N	N	54	50	N	-
2669	5361	12	Residence	No	18 Carlton Road	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2670	5374	12	Residence	No	20 Carlton Road	60	55	53	50	53	49	N	N	N	N	N	N	N	53	49	N	-
2671	5394	12	Residence	No	41 Barclay Road	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2672	5393	12	Residence	No	24 Carlton Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2673	5400	12	Residence	No	26 Carlton Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2674	5419	12	Residence	No	28 Carlton Road	60	55	54	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2675	5430	12	Residence	No	30 Carlton Road	60	55	58	55	59	55	N	Y	N	N	N	N	N	59	55	N	-
2676	5435	12	Residence	No	32 Carlton Road	60	55	62	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2677	5371	12	Residence	No	27 Carlton Road	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2678	5384	12	Residence	No	27 Carlton Road	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2681	5345	12	Residence	No	19 Carlton Road	60	55	56	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2682	5331	12	Residence	No	23 Carlton Road	60	55	59	55	58	54	N	N	N	N	N	N	N	58	54	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2683	5327	12	Residence	No	13 Carlton Road	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
2684	5316	12	Residence	No	15 Carlton Road	60	55	57	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2685	5307	12	Residence	No	9 Carlton Road	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2686	5294	12	Residence	No	7 Carlton Road	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2687	5284	12	Residence	No	5 Carlton Road	60	55	56	53	54	51	N	N	N	N	N	N	N	55	51	N	-
2688	5277	12	Residence	No	3 Carlton Road	60	55	56	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2689	5263	12	Residence	No	1 Carlton Road	60	55	56	53	55	51	N	N	N	N	N	N	N	55	51	N	-
2690	5262	12	Residence	No	10 Hepburn Road	60	55	54	51	53	49	N	N	N	N	N	N	N	53	49	N	-
2691	5248	12	Residence	No	1 Glenda Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2692	5251	12	Residence	No	2 Glenda Place	60	55	53	50	52	49	N	N	N	N	N	N	N	52	48	N	-
2693	5239	12	Residence	No	3 Glenda Place	60	55	55	51	53	50	N	N	N	N	N	N	N	53	50	N	-
2694	5229	12	Residence	No	7 Glenda Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2695	5237	12	Residence	No	4 Dale Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2696	5243	12	Residence	No	2 Dale Place	60	55	56	52	55	51	N	N	N	N	N	N	N	54	51	N	-
2697	5224	12	Residence	No	6 Dale Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2698	5228	12	Residence	No	7 Glenda Place	60	55	53	49	52	48	N	N	N	N	N	N	N	52	48	N	-
2700	5231	12	Residence	No	6 Glenda Place	60	55	53	50	52	49	N	N	N	N	N	N	N	52	49	N	-
2701	5259	12	Residence	No	12 Hepburn Road	60	55	57	53	55	52	N	N	N	N	N	N	N	55	52	N	-
2702	5258	12	Residence	No	14 Hepburn Road	60	55	56	53	55	51	N	N	N	N	N	N	N	55	51	N	-
2703	5267	12	Residence	No	16 Hepburn Road	60	55	58	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2705	5275	12	Residence	No	18 Hepburn Road	60	55	57	54	56	52	N	N	N	N	N	N	N	56	52	N	-
2707	5305	12	Residence	No	24 Hepburn Road	60	55	58	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2708	5300	12	Residence	No	26 Hepburn Road	60	55	62	58	60	57	N	Y	N	N	N	N	N	60	57	N	-
2709	5292	12	Residence	No	25 Hepburn Road	60	55	60	57	58	55	N	N	N	N	N	N	N	58	55	N	-
2710	5279	12	Residence	No	23 Hepburn Road	60	55	59	56	58	55	N	N	N	N	N	N	N	58	55	N	-
2711	5268	12	Residence	No	21 Hepburn Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2712	5265	12	Residence	No	19 Hepburn Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2713	5257	12	Residence	No	17 Hepburn Road	60	55	59	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2714	5253	12	Residence	No	15 Hepburn Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2715	5247	12	Residence	No	13 Hepburn Road	60	55	57	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2716	5318	12	Residence	No	11 Carlton Road	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2717	5233	12	Residence	No	3 Dale Place	60	55	58	54	57	53	N	N	N	N	N	N	N	57	53	N	-
2718	5215	12	Residence	No	9 Dale Place	60	55	59	56	58	55	N	N	N	N	N	N	N	58	55	N	-
2719	5238	12	Residence	No	1 Dale Place	60	55	56	53	55	52	N	N	N	N	N	N	N	55	52	N	-
2720	5218	12	Residence	No	11 Dale Place	60	55	57	54	56	53	N	N	N	N	N	N	N	56	53	N	-
2721	5219	12	Residence	No	8 Dale Place	60	55	55	52	54	50	N	N	N	N	N	N	N	54	50	N	-
2722	5221	12	Residence	No	5 Dale Place	60	55	59	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2723	5301	12	Residence	No	23 Barclay Road	60	55	51	48	50	46	N	N	N	N	N	N	N	50	46	N	-
2724	5280	12	Residence	No	4 Hepburn Road	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
2725	5252	12	Residence	No	3 Hepburn Road	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
2726	5255	12	Residence	No	1 Hepburn Road	60	55	52	49	51	47	N	N	N	N	N	N	N	51	47	N	-
2727	5242	12	Residence	No	17 Barclay Road	60	55	52	49	51	48	N	N	N	N	N	N	N	51	47	N	-
2728	5232	12	Residence	No	15 Barclay Road	60	55	52	48	51	47	N	N	N	N	N	N	N	51	47	N	-
2729	5155	12	Residence	No	24 Yale Close	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2730	5138	12	Residence	No	29 Yale Close	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2731	5129	12	Residence	No	27 Yale Close	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2732	5116	12	Residence	No	25 Yale Close	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2733	5110	12	Residence	No	23 Yale Close	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2734	5105	12	Residence	No	21 Yale Close	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2735	5107	12	Residence	No	19 Yale Close	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2736	5108	12	Residence	No	17 Yale Close	60	55	55	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2737	5106	12	Residence	No	15 Yale Close	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2738	5104	12	Residence	No	13 Yale Close	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2739	5100	12	Residence	No	11 Yale Close	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2740	5099	12	Residence	No	9 Yale Close	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2741	5096	12	Residence	No	7 Yale Close	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2742	5095	12	Residence	No	5 Yale Close	60	55	50	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2743	5090	12	Residence	No	3 Yale Close	60	55	51	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2744	5089	12	Residence	No	11 Baden Powell Place	60	55	49	46	50	47	N	N	N	N	N	N	N	50	47	N	-
2745	5076	12	Residence	No	7 Duncan Place	60	55	59	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2746	5094	12	Residence	No	1 Yale Close	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2747	5079	12	Residence	No	5 Duncan Place	60	55	57	53	57	53	N	N	N	N	N	N	N	57	54	N	-
2748	5078	12	Residence	No	3 Duncan Place	60	55	56	52	56	53	N	N	N	N	N	N	N	56	53	N	-
2749	5077	12	Residence	No	1 Duncan Place	60	55	56	52	56	52	N	N	N	N	N	N	N	56	53	N	-
2750	5082	12	Residence	No	4 Duncan Place	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2751	5084	12	Residence	No	6 Duncan Place	60	55	52	49	52	48	N	N	N	N	N	N	N	52	48	N	-
2752	5085	12	Residence	No	8 Duncan Place	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2754	5158	12	Residence	No	22 Yale Close	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	59	N	-
2755	5159	12	Residence	No	20 Yale Close	60	55	59	55	59	56	N	Y	N	N	N	N	N	59	56	N	-
2756	5147	12	Residence	No	16 Yale Close	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2757	5162	12	Residence	No	18 Yale Close	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2758	5131	12	Residence	No	14 Yale Close	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2759	5128	12	Residence	No	10 Yale Close	60	55	52	49	52	49	N	N	N	N	N	N	N	53	49	N	-
2760	5125	12	Residence	No	8 Yale Close	60	55	52	49	52	49	N	N	N	N	N	N	N	53	49	N	-
2761	5136	12	Residence	No	12 Yale Close	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2762	5148	12	Residence	No	5 Arley Place	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2763	5163	12	Residence	No	7 Arley Place	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2764	5167	12	Residence	No	9 Arley Place	60	55	52	49	52	48	N	N	N	N	N	N	N	52	49	N	-
2765	5168	12	Residence	No	11 Arley Place	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
2766	5169	12	Residence	No	10 Arley Place	60	55	54	50	54	50	N	N	N	N	N	N	N	53	50	N	-
2767	5172	12	Residence	No	7 Barclay Road	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2768	5161	12	Residence	No	5 Barclay Road	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2769	5151	12	Residence	No	1 Barclay Road	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2770	5142	12	Residence	No	1 Baden Powell Place	60	55	51	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2772	5134	12	Residence	No	3 Baden Powell Place	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2773	5123	12	Residence	No	5 Baden Powell Place	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2775	5119	12	Residence	No	4 Yale Close	60	55	50	47	50	47	N	N	N	N	N	N	N	51	47	N	-
2776	5121	12	Residence	No	6 Yale Close	60	55	51	47	51	47	N	N	N	N	N	N	N	51	48	N	-
2777	5135	12	Residence	No	4 Arley Place	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2778	5144	12	Residence	No	6 Arley Place	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2779	5152	12	Residence	No	8 Arley Place	60	55	51	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2780	5632	13	Residence	No	10 Mill Drive	60	55	57	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2781	5641	13	Residence	No	8 Mill Drive	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2782	5646	13	Residence	No	6 Mill Drive	60	55	60	57	60	56	N	Y	N	N	N	N	N	60	56	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2784	5578	13	Residence	No	18 Mill Drive	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2785	5572	13	Residence	No	20 Mill Drive	60	55	54	50	54	50	N	N	N	N	N	N	N	54	51	N	-
2786	5561	13	Residence	No	22 Mill Drive	60	55	56	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2787	5550	13	Residence	No	24 Mill Drive	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2788	5537	13	Residence	No	26 Mill Drive	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2789	5526	13	Residence	No	28 Mill Drive	60	55	54	51	54	51	N	N	N	N	N	N	N	54	50	N	-
2790	5510	13	Residence	No	30 Mill Drive	60	55	54	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2791	5503	13	Residence	No	32 Mill Drive	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
2793	5476	13	Residence	No	21 Alderson Avenue	60	55	56	52	56	53	N	N	N	N	N	N	N	56	53	N	-
2794	5493	13	Residence	No	34 Mill Drive	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2795	5478	13	Residence	No	36 Mill Drive	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
2796	5439	13	Residence	No	38 Mill Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2798	5437	13	Residence	No	30 Alderson Avenue	60	55	54	50	54	51	N	N	N	N	N	N	N	54	51	N	-
2799	5427	13	Residence	No	40 Mill Drive	60	55	54	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2800	5418	13	Residence	No	49 Larra Crescent	60	55	51	47	51	48	N	N	N	N	N	N	N	51	47	N	-
2802	5415	13	Residence	No	42 Mill Drive	60	55	54	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2804	5391	13	Residence	No	62 Larra Crescent	60	55	50	47	50	47	N	N	N	N	N	N	N	50	47	N	-
2805	5392	13	Residence	No	44 Mill Drive	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2807	5378	13	Residence	No	46 Mill Drive	60	55	52	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2808	5373	13	Residence	No	6 Raine Avenue	60	55	49	45	49	46	N	N	N	N	N	N	N	49	46	N	-
2810	5368	13	Residence	No	2 Raine Avenue	60	55	52	48	52	49	N	N	N	N	N	N	N	52	48	N	-
2812	5329	13	Residence	No	52 Mill Drive	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2813	5337	13	Residence	No	50 Mill Drive	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2814	5302	13	Residence	No	63 Mill Drive	60	55	55	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2815	5310	13	Residence	No	61 Mill Drive	60	55	56	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2816	5313	13	Residence	No	59 Mill Drive	60	55	56	53	56	52	N	N	N	N	N	N	N	56	53	N	-
2817	5325	13	Residence	No	57 Mill Drive	60	55	58	55	58	54	N	N	N	N	N	N	N	58	55	N	-
2818	5336	13	Residence	No	55 Mill Drive	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2819	5351	13	Residence	No	53 Mill Drive	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
2820	5357	13	Residence	No	51 Mill Drive	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2821	5370	13	Residence	No	49 Mill Drive	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2822	5383	13	Residence	No	47 Mill Drive	60	55	54	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2823	5395	13	Residence	No	45 Mill Drive	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2824	5411	13	Residence	No	43 Mill Drive	60	55	54	51	55	51	N	N	N	N	N	N	N	55	51	N	-
2825	5416	13	Residence	No	41 Mill Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2826	5426	13	Residence	No	39 Mill Drive	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2827	5434	13	Residence	No	37 Mill Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
2828	5456	13	Residence	No	35 Mill Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
2829	5463	13	Residence	No	33 Mill Drive	60	55	58	54	58	54	N	N	N	N	N	N	N	58	55	N	-
2830	5480	13	Residence	No	31 Mill Drive	60	55	60	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2831	5492	13	Residence	No	29 Mill Drive	60	55	60	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2832	5502	13	Residence	No	27 Mill Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2833	5511	13	Residence	No	25 Mill Drive	60	55	56	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2834	5518	13	Residence	No	23 Mill Drive	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	56	N	-
2835	5533	13	Residence	No	21 Mill Drive	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2836	5542	13	Residence	No	19 Mill Drive	60	55	58	55	59	55	N	N	N	N	N	N	N	58	55	N	-
2837	5555	13	Residence	No	17 Mill Drive	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2838	5565	13	Residence	No	15 Mill Drive	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2839	5576	13	Residence	No	13 Mill Drive	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2840	5585	13	Residence	No	11 Mill Drive	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2841	5596	13	Residence	No	9 Mill Drive	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2844	5620	13	Residence	No	3 Mill Drive	60	55	61	57	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2846	5649	13	Residence	No	4 Mill Drive	60	55	63	60	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2849	5650	13	Residence	No	2 Mill Drive	60	55	63	60	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2851	5608	13	Residence	No	87 Barclay Road	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	57	N	-
2852	5600	13	Residence	No	85 Barclay Road	60	55	60	57	60	57	N	Y	N	N	N	N	N	60	57	N	-
2853	5591	13	Residence	No	83 Barclay Road	60	55	59	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2854	5579	13	Residence	No	81 Barclay Road	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2855	5567	13	Residence	No	79 Barclay Road	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2856	5562	13	Residence	No	77 Barclay Road	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2857	5553	13	Residence	No	75 Barclay Road	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2858	5535	13	Residence	No	73 Barclay Road	60	55	59	56	59	56	N	Y	N	N	N	N	N	59	56	N	-
2859	5524	13	Residence	No	71 Barclay Road	60	55	60	56	59	55	N	N	N	N	N	N	N	59	55	N	-
2860	5564	13	Residence	No	114-116 Barclay Road	60	55	65	61	65	61	Y	Y	N	N	N	Y	Y	65	61	Y	Type 1
2861	5574	13	Residence	No	118 Barclay Road	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
2862	5587	13	Residence	No	120 Barclay Road	60	55	63	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2863	5597	13	Residence	No	122 Barclay Road	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2864	5607	13	Residence	No	124 Barclay Road	60	55	63	60	63	59	Y	Y	N	N	N	N	N	63	59	N	-
2865	5616	13	Residence	No	126 Barclay Road	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2866	5627	13	Residence	No	128 Barclay Road	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
2867	5631	13	Residence	No	130 Barclay Road	60	55	61	58	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2868	5643	13	Residence	No	132 Barclay Road	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2869	5658	13	Residence	No	134 Barclay Road	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2870	5664	13	Residence	No	136 Barclay Road	60	55	61	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2871	5701	13	Residence	No	138 Barclay Road	60	55	62	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2872	5830	14	Residence	No	41 Williams Road	60	55	65	61	65	61	Y	Y	N	N	Y	Y	Y	65	62	Y	Type 1
2873	5826	14	Residence	No	39 Williams Road	60	55	63	59	63	59	Y	Y	N	N	N	N	N	64	60	N	-
2874	5815	14	Residence	No	37 Williams Road	60	55	59	55	59	56	N	Y	N	N	N	N	N	60	57	N	-
2875	5811	14	Residence	No	35 Williams Road	60	55	61	57	61	57	Y	Y	N	N	N	N	N	62	58	N	-
2876	5804	14	Residence	No	33 Williams Road	60	55	60	57	61	57	Y	Y	N	N	N	N	N	62	58	N	-
2877	5796	14	Residence	No	31 Williams Road	60	55	62	58	62	58	Y	Y	N	N	N	N	N	63	59	N	-
2878	5790	14	Residence	No	29 Williams Road	60	55	67	63	67	63	Y	Y	N	N	Y	Y	Y	68	64	Y	Type 1
2879	5777	14	Residence	No	27 Williams Road	60	55	60	57	60	56	N	Y	N	N	N	N	N	61	57	N	-
2880	5770	14	Residence	No	25 Williams Road	60	55	67	63	67	63	Y	Y	N	N	Y	Y	Y	67	64	Y	Type 1
2881	5754	14	Residence	No	23 Williams Road	60	55	66	62	65	62	Y	Y	N	N	Y	Y	Y	65	62	Y	Type 1
2882	5743	14	Residence	No	21 Williams Road	60	55	71	67	70	66	Y	Y	N	N	Y	Y	Y	70	67	Y	Type 2
2883	5731	14	Residence	No	19 Williams Road	60	55	66	63	65	62	Y	Y	N	N	Y	Y	Y	65	62	Y	Type 1
2884	5720	14	Residence	No	17 Williams Road	60	55	65	62	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2885	5706	14	Residence	No	15 Williams Road	60	55	67	63	66	62	Y	Y	N	N	Y	Y	Y	66	62	Y	Type 1
2886	5698	14	Residence	No	13 Williams Road	60	55	64	61	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2887	5692	14	Residence	No	11 Williams Road	60	55	64	61	63	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
2888	5661	14	Residence	No	4 Rajola Place	60	55	61	58	61	57	Y	Y	N	N	N	N	N	61	57	N	-
2889	5647	14	Residence	No	6 Rajola Place	60	55	64	60	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2890	5638	14	Residence	No	8 Rajola Place	60	55	67	64	67	63	Y	Y	N	N	Y	Y	Y	67	63	Y	Type 1

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2892	5617	14	Residence	No	10 Rajola Place	60	55	64	60	63	59	Y	Y	N	N	N	N	N	63	60	N	-
2893	5594	14	Residence	No	3 Perry Street	60	55	62	59	61	58	Y	Y	N	N	N	N	N	62	58	N	-
2894	5582	14	Residence	No	1 Perry Street	60	55	59	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2895	5601	14	Residence	No	5 Perry Street	60	55	62	58	61	58	Y	Y	N	N	N	N	N	61	58	N	-
2896	5606	14	Residence	No	7 Perry Street	60	55	59	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2897	5609	14	Residence	No	9 Perry Street	60	55	59	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2898	5612	14	Residence	No	11 Perry Street	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
2899	5615	14	Residence	No	13 Perry Street	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
2900	5622	14	Residence	No	15 Perry Street	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
2901	5630	14	Residence	No	2 Williams Road	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2902	5651	14	Residence	No	6 Williams Road	60	55	52	49	52	49	N	N	N	N	N	N	N	52	49	N	-
2903	5659	14	Residence	No	8 Williams Road	60	55	55	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2904	5633	14	Residence	No	3 Williams Road	60	55	56	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2905	5640	14	Residence	No	5 Williams Road	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2906	5628	14	Residence	No	3 Rajola Place	60	55	59	56	58	55	N	N	N	N	N	N	N	58	55	N	-
2907	5624	14	Residence	No	5 Rajola Place	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2908	5660	14	Residence	No	7 Williams Road	60	55	59	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2909	5670	14	Residence	No	7 Williams Road	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2910	5672	14	Residence	No	10 Williams Road	60	55	55	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2911	5686	14	Residence	No	8 Thorn Place	60	55	52	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2912	5667	14	Residence	No	7 Thorn Place	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
2913	5688	14	Residence	No	2 Sophia Crescent	60	55	55	51	54	51	N	N	N	N	N	N	N	54	51	N	-
2914	5700	14	Residence	No	6 Thorn Place	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
2915	5705	14	Residence	No	6 Sophia Crescent	60	55	52	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2916	5715	14	Residence	No	8 Sophia Crescent	60	55	52	48	52	48	N	N	N	N	N	N	N	51	48	N	-
2917	5714	14	Residence	No	1 Sophia Crescent	60	55	56	52	55	52	N	N	N	N	N	N	N	55	52	N	-
2918	5721	14	Residence	No	14 Williams Road	60	55	60	56	59	55	N	Y	N	N	N	N	N	59	55	N	-
2919	5735	14	Residence	No	16 Williams Road	60	55	58	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2920	5744	14	Residence	No	18 Williams Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2921	5757	14	Residence	No	20 Williams Road	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
2923	5778	14	Residence	No	24 Williams Road	60	55	55	52	56	52	N	N	N	N	N	N	N	56	52	N	-
2924	5791	14	Residence	No	26 Williams Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2925	5797	14	Residence	No	28 Williams Road	60	55	55	52	56	52	N	N	N	N	N	N	N	55	52	N	-
2926	5803	14	Residence	No	30 Williams Road	60	55	54	50	54	51	N	N	N	N	N	N	N	55	51	N	-
2927	5814	14	Residence	No	34 Williams Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2928	5810	14	Residence	No	32 Williams Road	60	55	56	53	56	53	N	N	N	N	N	N	N	56	53	N	-
2929	5822	14	Residence	No	36 Williams Road	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2930	5824	14	Residence	No	15 Hancey Avenue	60	55	51	48	51	48	N	N	N	N	N	N	N	51	48	N	-
2931	5836	14	Residence	No	43 Williams Road	60	55	64	60	64	60	Y	Y	N	N	N	Y	Y	64	60	Y	Type 1
2932	5842	14	Residence	No	45 Williams Road	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2933	5846	14	Residence	No	49 Williams Road	60	55	60	56	60	56	N	Y	N	N	N	N	N	60	56	N	-
2934	5852	14	Residence	No	44 Sophia Crescent	60	55	58	55	58	55	N	N	N	N	N	N	N	58	55	N	-
2935	5829	14	Residence	No	12 Hancey Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2936	5812	14	Residence	No	13 Hancey Avenue	60	55	52	49	52	49	N	N	N	N	N	N	N	53	49	N	-
2937	5807	14	Residence	No	11 Hancey Avenue	60	55	53	49	53	49	N	N	N	N	N	N	N	53	50	N	-
2938	5800	14	Residence	No	9 Hancey Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2939	5795	14	Residence	No	7 Hancey Avenue	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-

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						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
2940	5781	14	Residence	No	5 Hancey Avenue	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2941	5775	14	Residence	No	3 Hancey Avenue	60	55	51	47	51	47	N	N	N	N	N	N	N	51	47	N	-
2943	5749	14	Residence	No	7 Sophia Crescent	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2944	5737	14	Residence	No	5 Sophia Crescent	60	55	54	50	53	50	N	N	N	N	N	N	N	53	50	N	-
2945	5761	14	Residence	No	9 Sophia Crescent	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
2946	5764	14	Residence	No	1 Hancey Avenue	60	55	50	46	50	47	N	N	N	N	N	N	N	50	47	N	-
2947	5794	14	Residence	No	2 Hancey Avenue	60	55	48	44	48	45	N	N	N	N	N	N	N	48	45	N	-
2948	5799	14	Residence	No	4 Hancey Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
2949	5806	14	Residence	No	6 Hancey Avenue	60	55	49	46	49	46	N	N	N	N	N	N	N	49	46	N	-
2950	5813	14	Residence	No	8 Hancey Avenue	60	55	49	45	49	45	N	N	N	N	N	N	N	49	45	N	-
2951	5819	14	Residence	No	10 Hancey Avenue	60	55	50	47	50	47	N	N	N	N	N	N	N	50	47	N	-
2983	5910	15B	Residence	No	41 Dremeday Street	60	55	66	63	67	63	Y	Y	N	N	Y	Y	Y	67	63	Y	Type 1
2984	5917	15B	Residence	No	39 Dremeday Street	60	55	63	60	63	60	Y	Y	N	N	N	N	N	63	60	N	-
2985	5924	15B	Residence	No	37 Dremeday Street	60	55	62	58	62	58	Y	Y	N	N	N	N	N	62	58	N	-
2986	5943	15B	Residence	No	35 Dremeday Street	60	55	59	55	59	55	N	N	N	N	N	N	N	59	55	N	-
2987	5952	15B	Residence	No	33 Dremeday Street	60	55	55	51	55	51	N	N	N	N	N	N	N	55	52	N	-
2988	5997	15B	Residence	No	27-31 Dremeday Street	60	55	56	53	54	51	N	N	N	N	N	N	N	54	51	N	-
2989	5967	15B	Residence	No	27-31 Dremeday Street	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
2990	5987	15B	Residence	No	27-31 Dremeday Street	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2992	6005	15B	Residence	No	25 Dremeday Street	60	55	52	49	50	47	N	N	N	N	N	N	N	50	47	N	-
2993	6024	15B	Residence	No	23 Dremeday Street	60	55	53	49	51	47	N	N	N	N	N	N	N	51	47	N	-
2994	6033	15B	Residence	No	21 Dremeday Street	60	55	52	48	50	46	N	N	N	N	N	N	N	50	46	N	-
2998	5922	15B	Residence	No	36 Dremeday Street	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
2999	5916	15B	Residence	No	38 Dremeday Street	60	55	54	50	53	50	N	N	N	N	N	N	N	53	50	N	-
3000	5909	15B	Residence	No	40 Dremeday Street	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
3001	5893	15B	Residence	No	42-44 Dremeday Street	60	55	63	59	63	59	Y	Y	N	N	N	N	N	63	59	N	-
3002	5888	15B	Residence	Yes (4)	42-44 Dremeday Street	60	55	67	63	67	63	Y	Y	N	N	Y	Y	Y	67	63	Y	Type 1
3003	5882	15B	Residence	No	48 Dremeday Street	60	55	69	65	69	66	Y	Y	N	N	Y	Y	Y	69	66	Y	Type 2
3004	5895	15B	Residence	No	40A Dremeday Street	60	55	51	47	51	47	N	N	N	N	N	N	N	50	47	N	-
3005	5904	15B	Residence	No	38A Dremeday Street	60	55	55	52	55	51	N	N	N	N	N	N	N	55	51	N	-
3006	5921	15B	Residence	No	34 Dremeday Street	60	55	56	53	56	52	N	N	N	N	N	N	N	56	52	N	-
3007	5948	15B	Residence	No	30 Dremeday Street	60	55	53	49	52	49	N	N	N	N	N	N	N	52	48	N	-
3008	5915	15B	Residence	No	38 Roland Avenue	60	55	53	49	53	49	N	N	N	N	N	N	N	53	49	N	-
3009	5911	15B	Residence	No	40 Roland Avenue	60	55	53	50	53	50	N	N	N	N	N	N	N	53	50	N	-
3010	5897	15B	Residence	No	42 Roland Avenue	60	55	55	52	55	52	N	N	N	N	N	N	N	55	51	N	-
3011	5891	15B	Residence	No	44 Roland Avenue	60	55	54	50	54	50	N	N	N	N	N	N	N	53	49	N	-
3012	5884	15B	Residence	No	46 Roland Avenue	60	55	65	61	65	62	Y	Y	N	N	Y	Y	Y	65	61	Y	Type 1
3013	5876	15B	Residence	No	48 Roland Avenue	60	55	65	61	65	62	Y	Y	N	N	Y	Y	Y	65	61	Y	Type 1
3015	5879	15B	Residence	No	33 Roland Avenue	60	55	62	58	62	58	Y	Y	N	N	N	N	N	61	58	N	-
3016	5885	15B	Residence	No	31 Roland Avenue	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	55	N	-
3720	4965	11B	Residence	No	22 Gossell Grove	60	55	53	49	53	50	N	N	N	N	N	N	N	53	50	N	-
3721	5226	12	Residence	No	7 Dale Place	60	55	57	53	56	52	N	N	N	N	N	N	N	56	52	N	-
3893	3509	10A	Residence	No	12 Gum Grove Place	60	55	56	53	54	51	N	N	N	N	N	N	N	54	51	N	-
3897	3538	10A	Residence	No	9 Hillside Place	60	55	54	51	53	50	N	N	N	N	N	N	N	53	50	N	-
3898	3636	10A	Residence	No	1 Gum Grove Place	60	55	54	51	52	49	N	N	N	N	N	N	N	52	49	N	-
3899	3589	10A	Residence	No	13 Eaton Road	60	55	60	57	55	51	N	N	N	N	N	N	N	55	52	N	-
3901	4072	10D	Residence	No	56 Oakes Road	60	55	61	57	60	56	N	Y	N	N	N	N	N	60	56	N	-

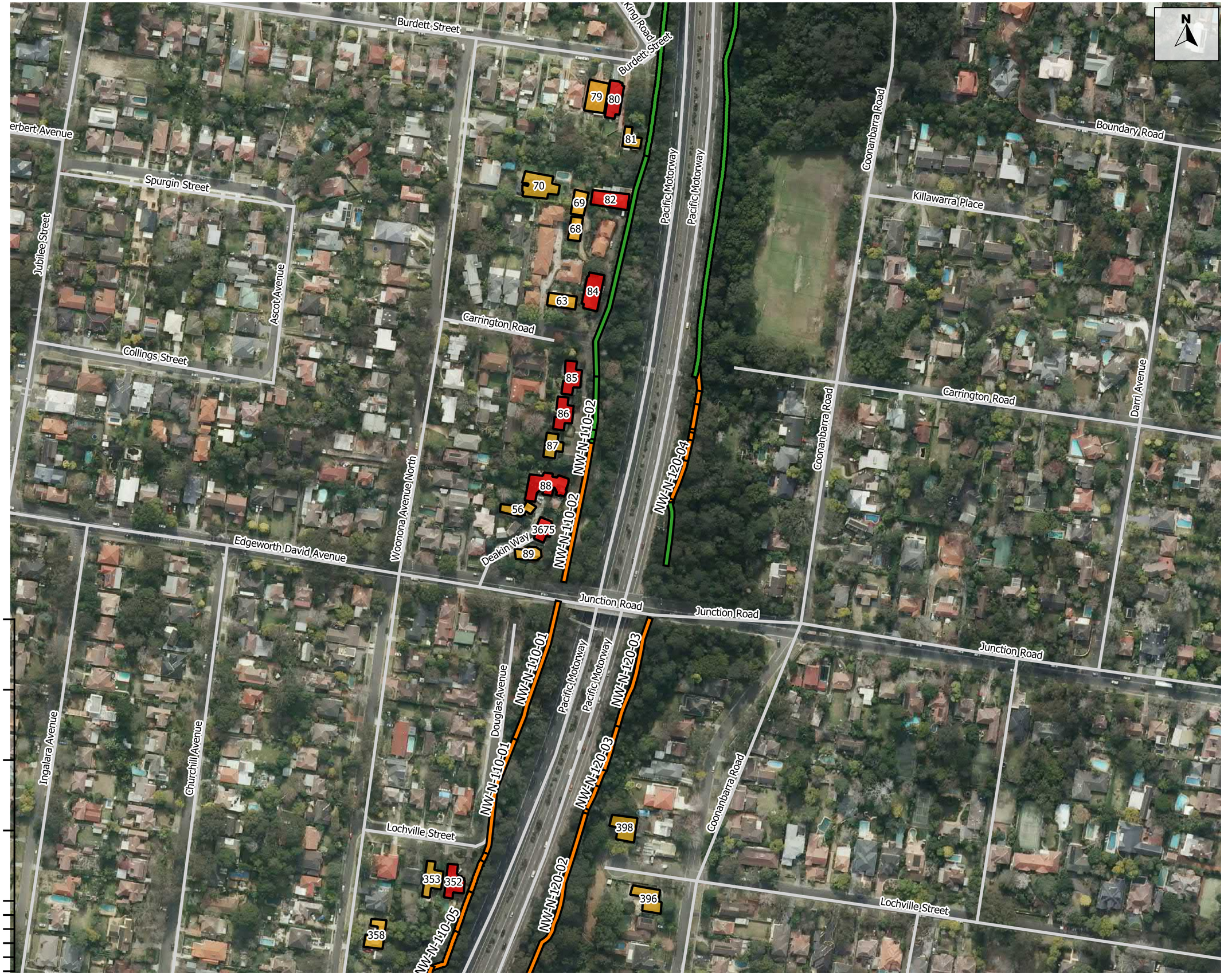
ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation									Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
3903	4149	11B	Residence	No	47 Oakes Road	60	55	61	58	61	57	Y	Y	N	N	N	N	N	61	57	N	-
3904	4189	11B	Residence	No	33 Watton Road	60	55	59	56	59	55	N	Y	N	N	N	N	N	58	55	N	-
3905	4389	11B	Residence	No	13 Sylvia Avenue	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	56	N	-
3906	4442	11B	Residence	No	63 Murray Farm Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	54	N	-
3907	4439	11B	Residence	No	57 Carmen Drive	60	55	59	55	59	55	N	Y	N	N	N	N	N	58	55	N	-
3908	4635	11B	Residence	No	79 Murray Farm Road	60	55	58	54	58	54	N	N	N	N	N	N	N	58	54	N	-
3909	4673	11B	Residence	No	85 Murray Farm Road	60	55	57	54	57	54	N	N	N	N	N	N	N	57	53	N	-
3911	4674	11B	Residence	No	105 Murray Farm Road	60	55	61	57	61	57	Y	Y	N	N	N	N	N	61	58	N	-
3912	4738	11B	Residence	No	94 Murray Farm Road	60	55	57	53	57	53	N	N	N	N	N	N	N	57	53	N	-
3913	4723	11B	Residence	No	1 Wilshire Avenue	60	55	59	55	59	56	N	Y	N	N	N	N	N	59	55	N	-
3914	4771	11B	Residence	No	1 Christel Avenue	60	55	53	50	54	50	N	N	N	N	N	N	N	54	50	N	-
3915	4801	11B	Residence	No	6 Haines Avenue	60	55	55	51	55	52	N	N	N	N	N	N	N	55	52	N	-
3916	4799	11B	Residence	No	8 Haines Avenue	60	55	55	51	56	52	N	N	N	N	N	N	N	55	52	N	-
3917	4800	11B	Residence	No	10 Haines Avenue	60	55	54	51	55	52	N	N	N	N	N	N	N	55	51	N	-
3918	4884	11B	Residence	No	15 Wilshire Avenue	60	55	70	67	70	67	Y	Y	N	N	Y	Y	Y	70	67	Y	Type 2
3919	4898	11B	Residence	No	28 Haines Avenue	60	55	47	44	48	44	N	N	N	N	N	N	N	48	44	N	-
3920	N/A	11B	Residence	No	17 Haines Avenue	60	55	48	44	48	45	N	N	N	N	N	N	N	48	45	N	-
3921	5007	11A	Residence	No	9 Range Road	60	55	54	51	54	50	N	N	N	N	N	N	N	54	50	N	-
3922	5044	11A	Residence	No	12 Range Road	60	55	57	53	57	54	N	N	N	N	N	N	N	57	54	N	-
3923	5113	12	Residence	No	7 Baden Powell Place	60	55	50	46	50	46	N	N	N	N	N	N	N	50	47	N	-
3924	5140	12	Residence	No	3 Arley Place	60	55	52	48	52	48	N	N	N	N	N	N	N	52	49	N	-
3925	5290	12	Residence	No	21 Barclay Road	60	55	51	47	50	46	N	N	N	N	N	N	N	50	46	N	-
3926	5281	12	Residence	No	20 Hepburn Road	60	55	56	52	55	51	N	N	N	N	N	N	N	55	51	N	-
3927	5303	12	Residence	No	22 Hepburn Road	60	55	56	53	55	51	N	N	N	N	N	N	N	55	51	N	-
3928	5359	12	Residence	No	21 Carlton Road	60	55	57	54	57	53	N	N	N	N	N	N	N	57	53	N	-
3929	5354	12	Residence	No	25 Carlton Road	60	55	58	55	58	54	N	N	N	N	N	N	N	58	54	N	-
3930	5367	13	Residence	No	4 Raine Avenue	60	55	49	46	50	46	N	N	N	N	N	N	N	50	46	N	-
3931	5457	12	Residence	No	51 Barclay Road	60	55	59	55	58	55	N	N	N	N	N	N	N	59	55	N	-
3932	5637	14	Residence	No	19 Perry Street	60	55	51	47	50	47	N	N	N	N	N	N	N	50	47	N	-
3933	5642	14	Residence	No	21 Perry Street	60	55	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
3934	5623	14	Residence	No	7 Rajola Place	60	55	64	61	64	61	Y	Y	N	N	N	Y	Y	64	61	Y	Type 1
3935	5604	13	Residence	No	7 Mill Drive	60	55	56	52	55	52	N	N	N	N	N	N	N	56	52	N	-
3936	5621	13	Residence	No	1 Mill Drive	60	55	63	60	63	60	Y	Y	N	N	N	Y	Y	63	60	Y	Type 1
3937	5726	14	Residence	No	3 Sophia Crescent	60	55	51	47	51	48	N	N	N	N	N	N	N	51	48	N	-
3938	5840	14	Residence	No	47 Williams Road	60	55	60	57	60	57	Y	Y	N	N	N	N	N	60	57	N	-
3939	5939	15B	Residence	No	32 Dremeday Street	60	55	55	51	55	51	N	N	N	N	N	N	N	55	51	N	-
3940	5949	15B	Residence	No	32A Dremeday Street	60	55	52	48	52	48	N	N	N	N	N	N	N	52	48	N	-
3976	4449	11B	Residence	No	78 Carmen Drive	60	55	62	58	62	59	Y	Y	N	N	N	N	N	62	59	N	-
3980	4544	11B	Residence	No	52B Carmen Drive	60	55	59	56	60	56	N	Y	N	N	N	N	N	59	56	N	-
NR-101	3935	10B	Church	No	41-43 Eaton Road	50	50	55	51	54	50	Y	Y	N	N	N	N	N	54	50	N	-
NR-102	5055	11B	School: RIDBC	No	365 North Rocks Road	50	-	51	48	51	48	Y	N	N	N	N	N	N	51	48	N	-
NR-103	5072	11B	School: RIDBC	No	365 North Rocks Road	50	-	51	47	50	47	Y	N	N	N	N	N	N	50	47	N	-
NR-104	5057	11B	School: RIDBC	No	365 North Rocks Road	50	-	50	47	50	47	N	N	N	N	N	N	N	50	47	N	-
NR-105	5073	11B	School: RIDBC	No	365 North Rocks Road	50	-	49	46	49	46	N	N	N	N	N	N	N	49	46	N	-
NR-106	5071	11B	School: RIDBC	No	365 North Rocks Road	50	-	52	49	52	48	Y	N	N	N	N	N	N	52	48	N	-
NR-107	5031	11B	School: RIDBC	No	365 North Rocks Road	50	-	52	48	52	48	Y	N	N	N	N	N	N	52	48	N	-
NR-108	5025	11B	School: RIDBC	No	365 North Rocks Road	50	-	52	49	52	49	Y	N	N	N	N	N	N	52	49	N	-

ID WM	ID EIS	NCA	Type	Strata (Units)	Address	Noise Goal		"No Build" 2029		Prior to Optimisation								Post Optimisation			
										"Build" 2029		"Build" 2029 Noise Levels Exceed Noise Goals?		Is Difference in Noise Levels between "Build" and "No Build" 2029 Greater than 2 dB?		Are "Build" 2029 Noise Levels Acute?		Eligible for Consideration of Noise Mitigation?	"Build" 2029		Eligible for Consideration of Architectural Treatment?	Architectural Treatment Type
						Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		Day	Night		
								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$								$L_{Aeq,15hr}$	$L_{Aeq,9hr}$		
NR-109	4999	11B	School: RIDBC	No	365 North Rocks Road	50	-	49	46	49	45	N	N	N	N	N	N	N	49	45	N	-
NR-110	4911	11B	School: RIDBC	No	365 North Rocks Road	50	-	50	46	50	46	N	N	N	N	N	N	N	50	46	N	-
NR-111	4911	11B	School: RIDBC	No	365 North Rocks Road	50	-	51	48	52	48	Y	N	N	N	N	N	N	51	48	N	-
NR-112	5006	11B	School: RIDBC	No	365 North Rocks Road	50	-	61	57	61	58	Y	N	N	N	N	N	N	61	58	N	-
NR-113	4987	11B	School: RIDBC	No	365 North Rocks Road	50	-	51	48	51	48	Y	N	N	N	N	N	N	51	48	N	-
NR-114	5183	12	Muirfield High School	No	9-13 Barclay Road	50	-	55	51	54	51	Y	N	N	N	N	N	N	54	51	N	-
NR-115	5184	12	Muirfield High School	No	9-13 Barclay Road	50	-	54	51	55	51	Y	N	N	N	N	N	N	55	51	N	-
NR-116	5205	12	Muirfield High School	No	9-13 Barclay Road	50	-	56	52	55	51	Y	N	N	N	N	N	N	56	52	N	-
NR-117	4165	11B	Commercial	No	2-12 Carmen Drive	-	-	62	58	61	58	N	N	N	N	N	N	N	61	57	N	-
NR-118	4069	10D	Dental Surgery (Commercial)	No	60 Oakes Road	-	-	66	62	65	61	N	N	N	N	N	Y	N	65	62	N	-
NR-119	4058	10D	Dental Surgery (Commercial)	No	58 Oakes Road	-	-	60	56	59	55	N	N	N	N	N	N	N	59	56	N	-
NR-120	4194	11B	Doctor Surgery (Commercial)	No	1 Carmen Drive	-	-	62	59	62	58	N	N	N	N	N	N	N	61	57	N	-
NR-121	4165	11B	Commercial	No	14-20 Carmen Drive	-	-	61	58	61	58	N	N	N	N	N	N	N	61	57	N	-
NR-122	4611	11B	Active:Murray Farm Reserve	No	Murray Farm Road	60	-	57	54	58	54	N	N	N	N	N	N	N	57	54	N	-

*Architectural Treatment is required due to operational noise from the Southern Compound

APPENDIX G

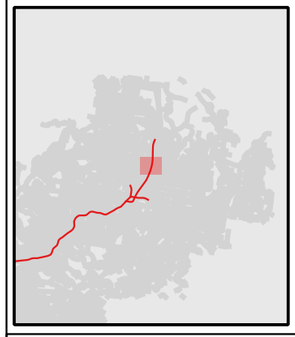
RECEIVERS ELIGIBLE FOR CONSIDERATION OF ARCHITECTURAL TREATMENT & RECOMMENDED NOISE BARRIERS



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

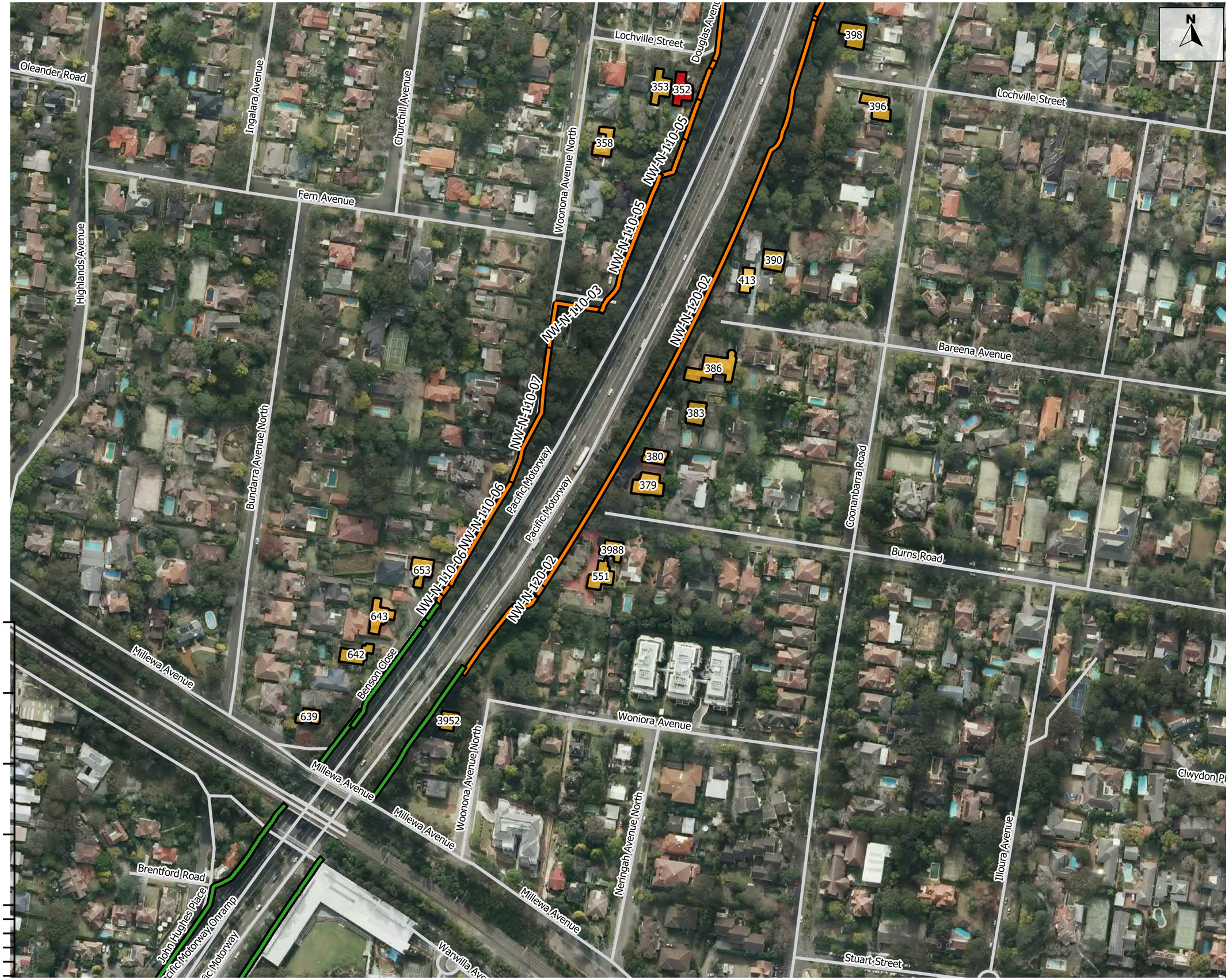
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 1 of 13

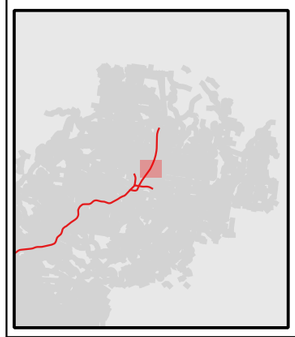
WILKINSON MURRAY



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 2 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.:	REVISION:
13245	G
PREPARED:	APPROVED:
BJM	BG
EXPORTED:	SHEET SIZE:
3/4/2019	A3

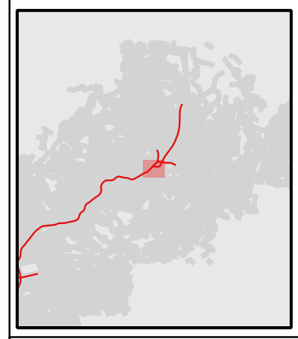
Drawing 3 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

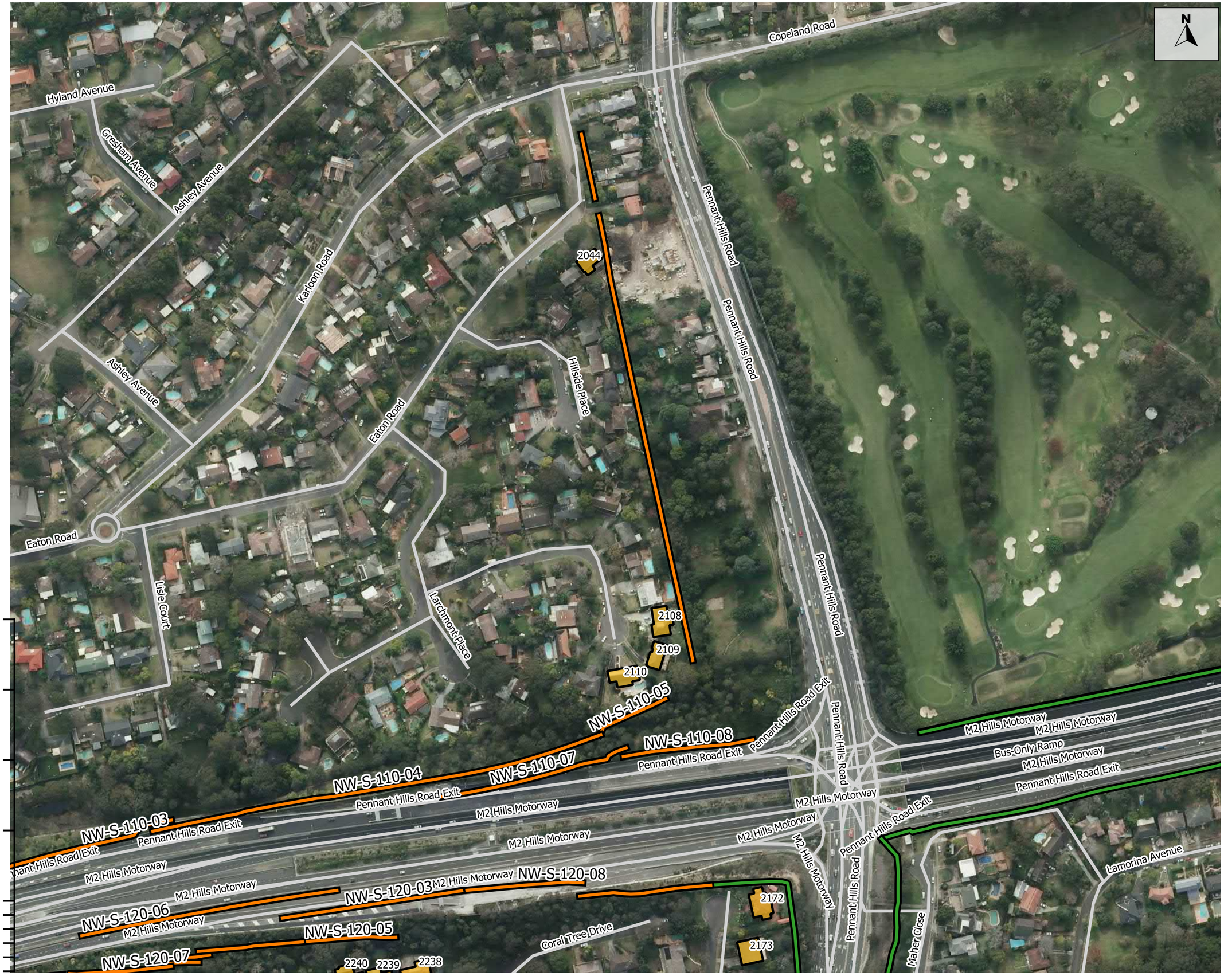
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 4 of 13

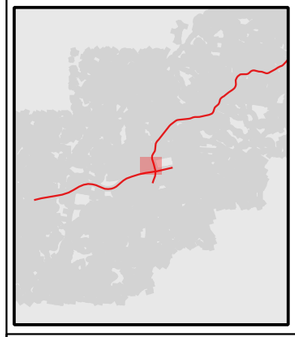
WILKINSON MURRAY



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

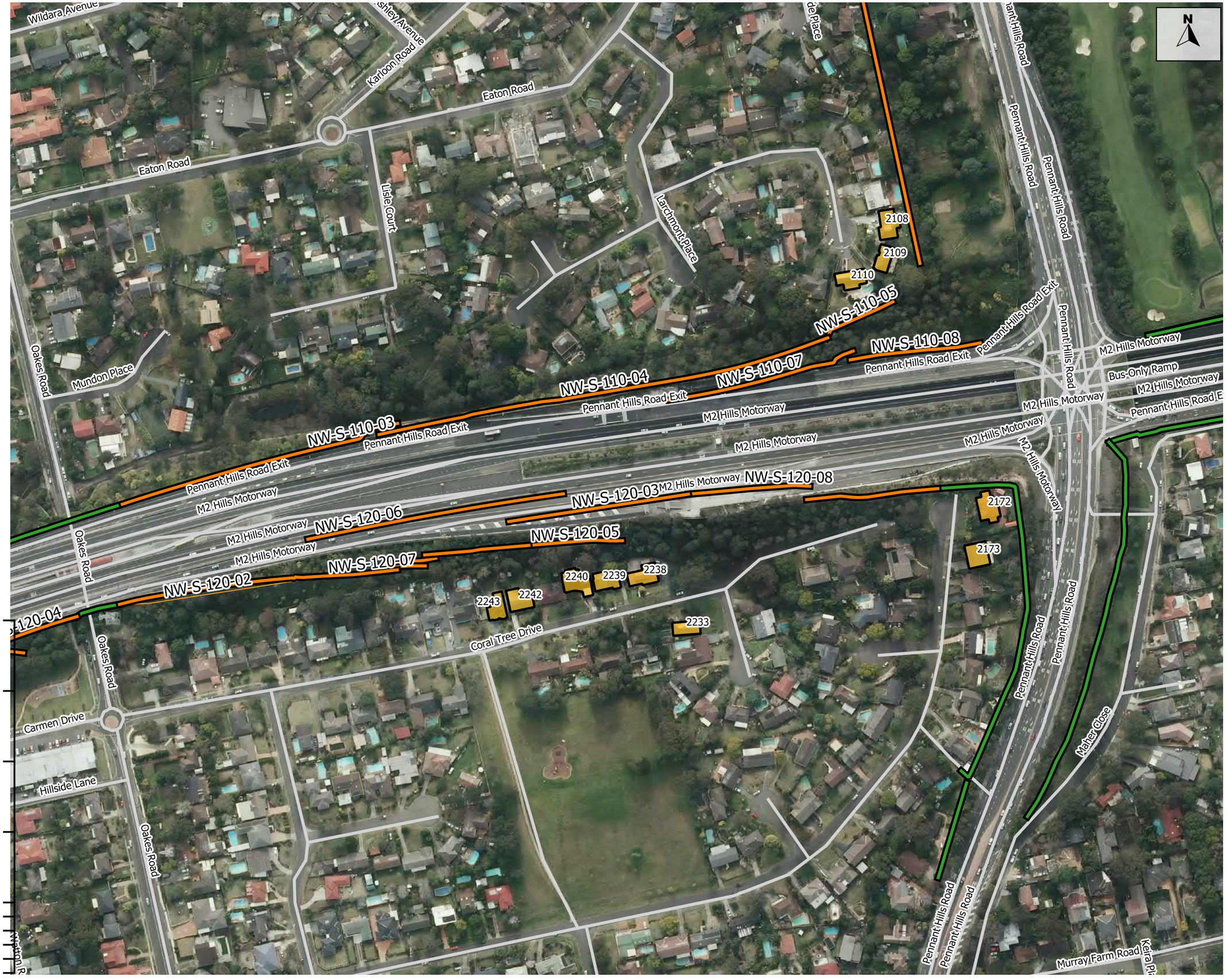
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: NG
EXPORTED: 15/7/2019	SHEET SIZE: A3

Drawing 5 of 13

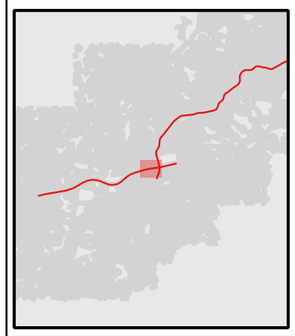
WILKINSON MURRAY



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 6 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

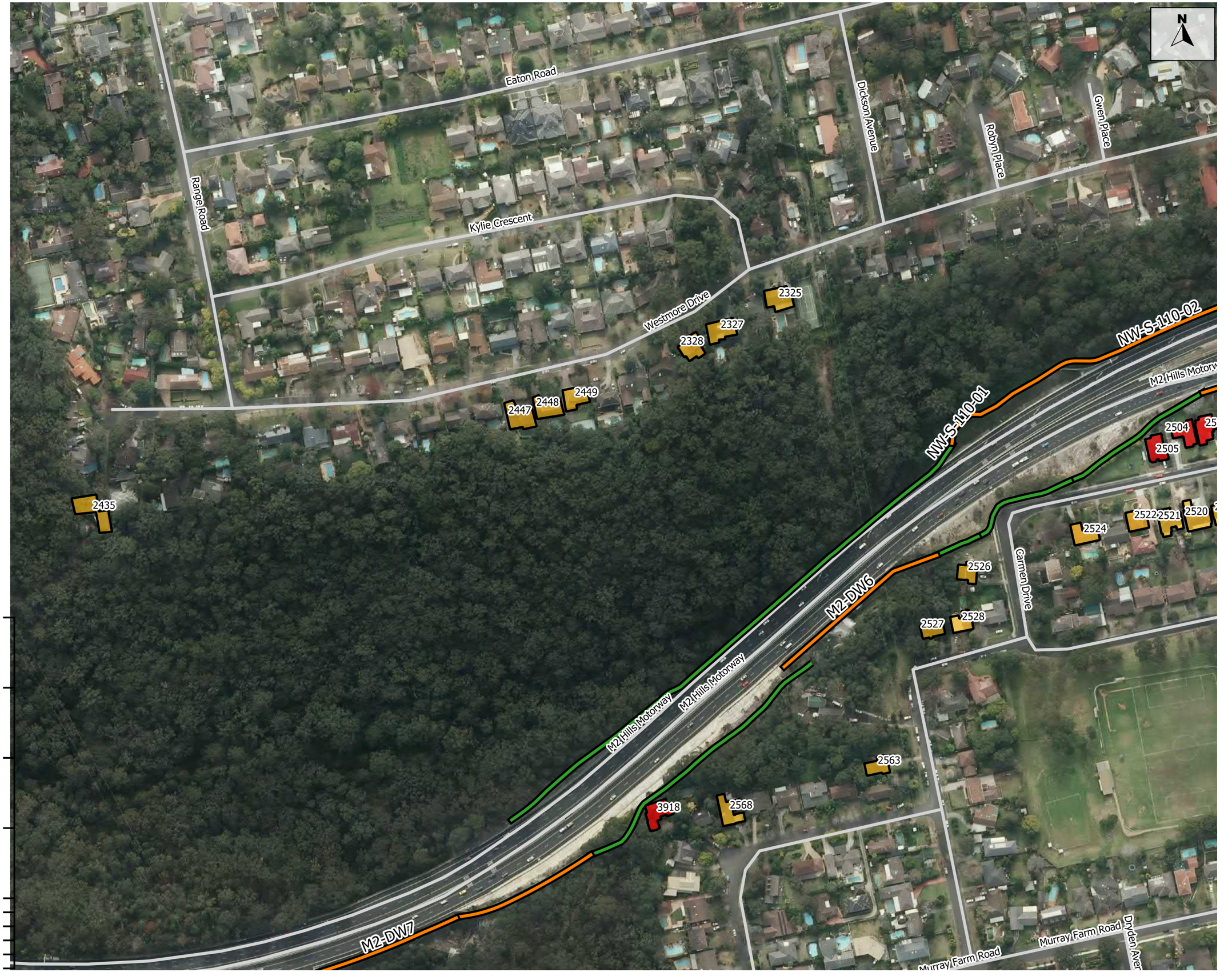
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 7 of 13

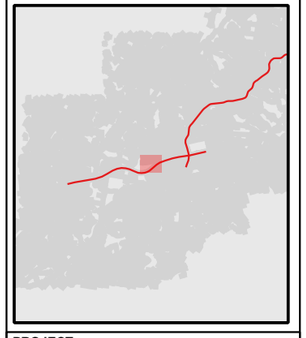
WILKINSON MURRAY



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

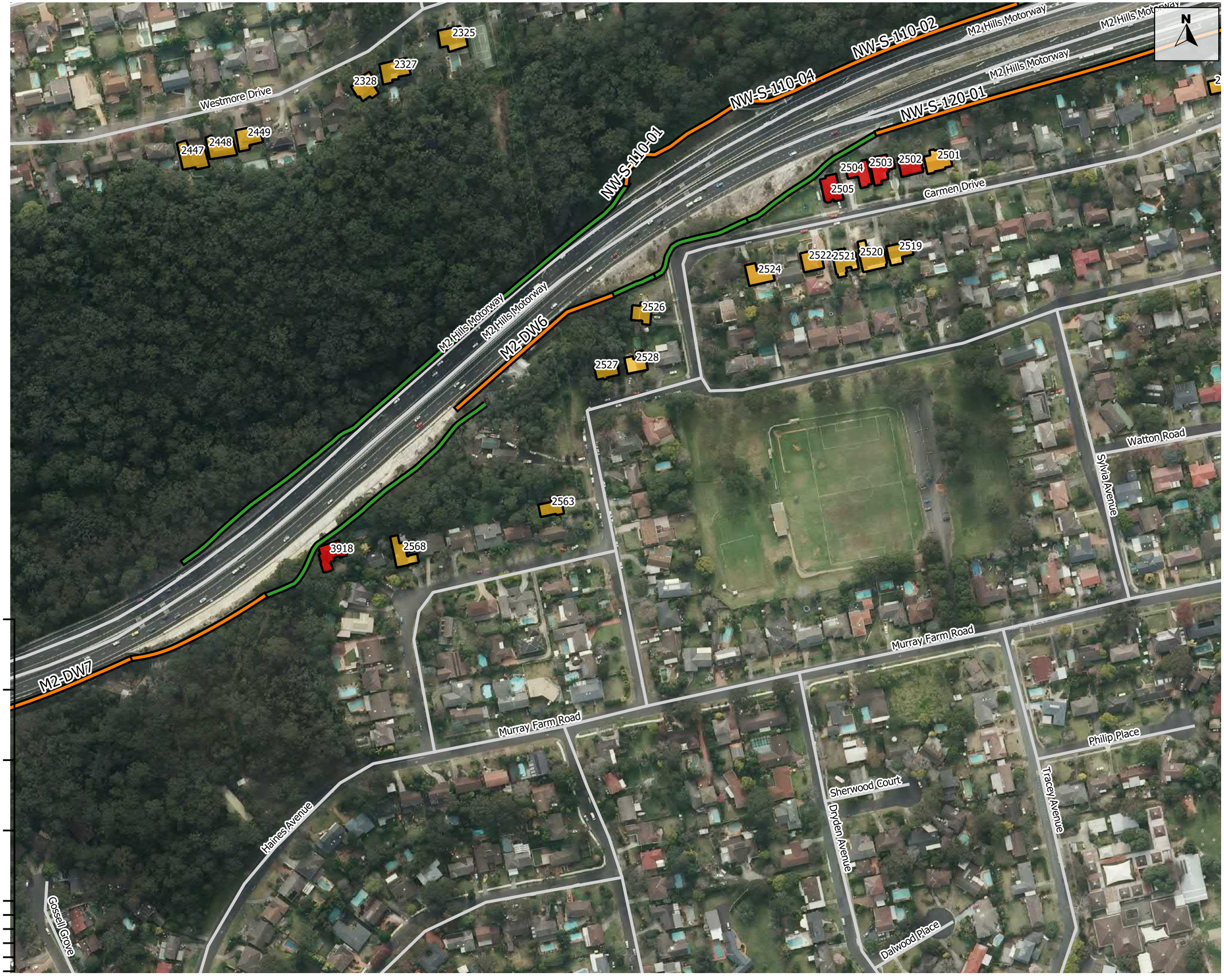
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.:	13245
REVISION:	G
PREPARED:	BJM
APPROVED:	BG
EXPORTED:	3/4/2019
SHEET SIZE:	A3

Drawing 8 of 13

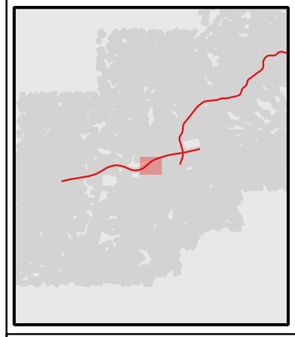
WILKINSON MURRAY



Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

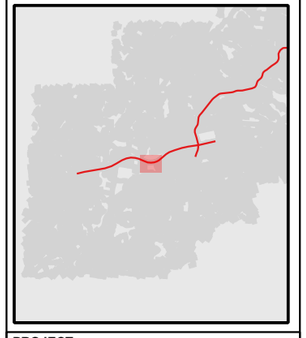
Drawing 9 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

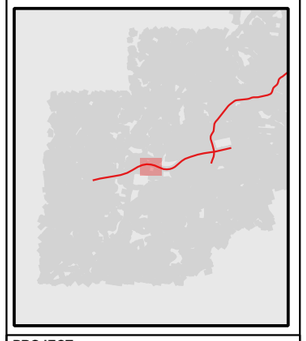
Drawing 10 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

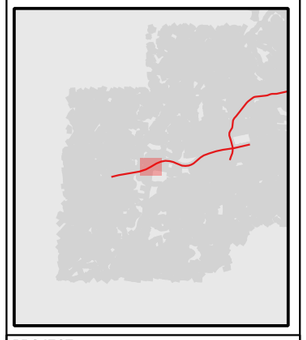
Drawing 11 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: BG
EXPORTED: 3/4/2019	SHEET SIZE: A3

Drawing 12 of 13

WILKINSON MURRAY

Architectural Treatment:
- Type 1
- Type 2

Noise Barriers:
- Existing Barrier
- Design Barrier

Other Features:
- Roads

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Receivers Eligible for Consideration of Architectural Treatment & Recommended Noise Barriers

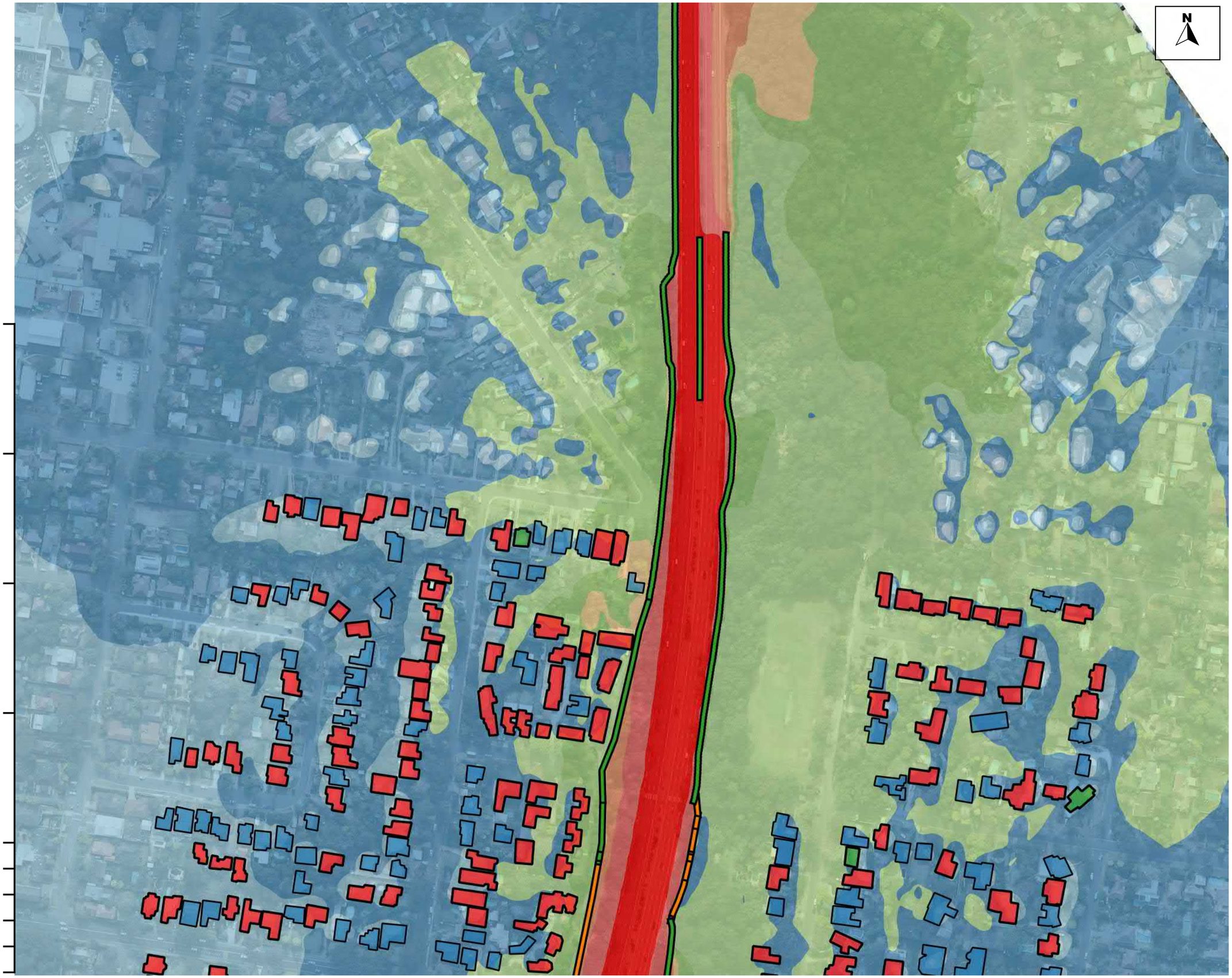
PROJECT No.: 13245	REVISION: G
PREPARED: BJM	APPROVED: NG
EXPORTED: 16/7/2019	SHEET SIZE: A3

Drawing 13 of 13

WILKINSON MURRAY

APPENDIX H

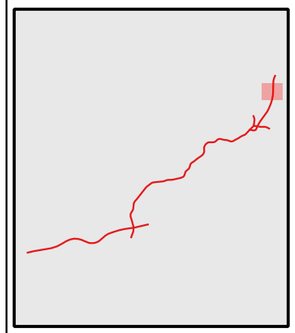
NOISE CONTOURS



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
11/4/2019	A3

Drawing 1 of 12

WILKINSON MURRAY

400 m

300

200

100

0

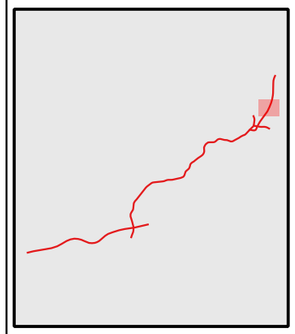
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
11/4/2019	A3

Drawing 2 of 12

WILKINSON MURRAY

400 m

300

200

100

0

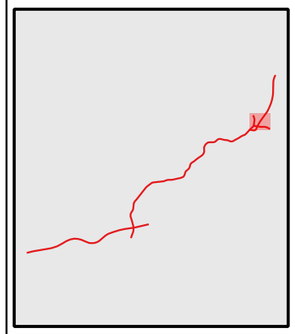
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

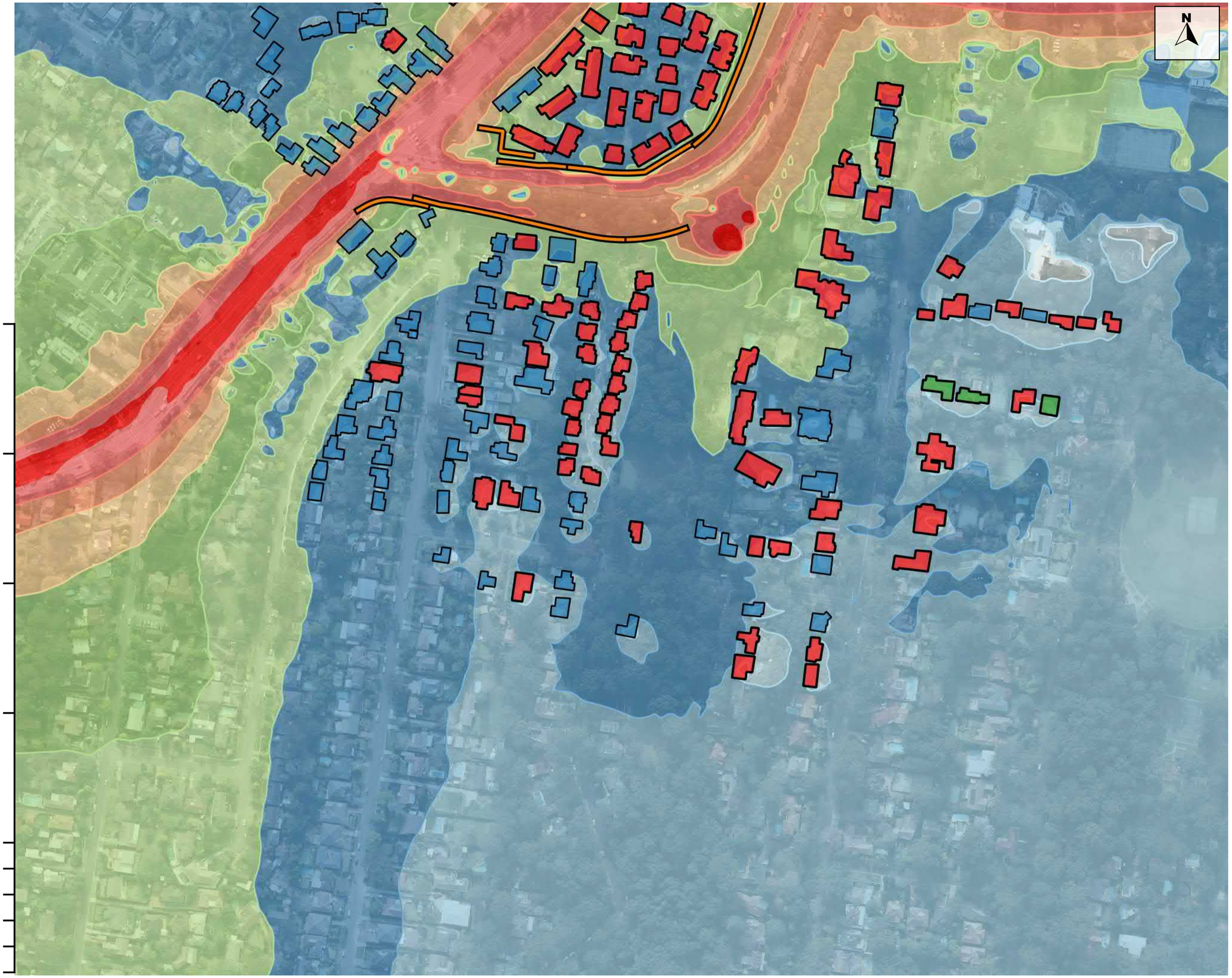
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
11/4/2019	A3

Drawing 3 of 12

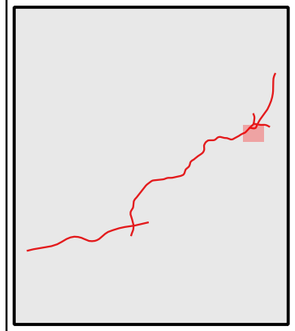
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
11/4/2019	A3

Drawing 4 of 12

WILKINSON MURRAY

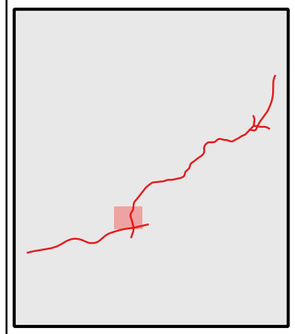
400 m
300
200
100
0
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

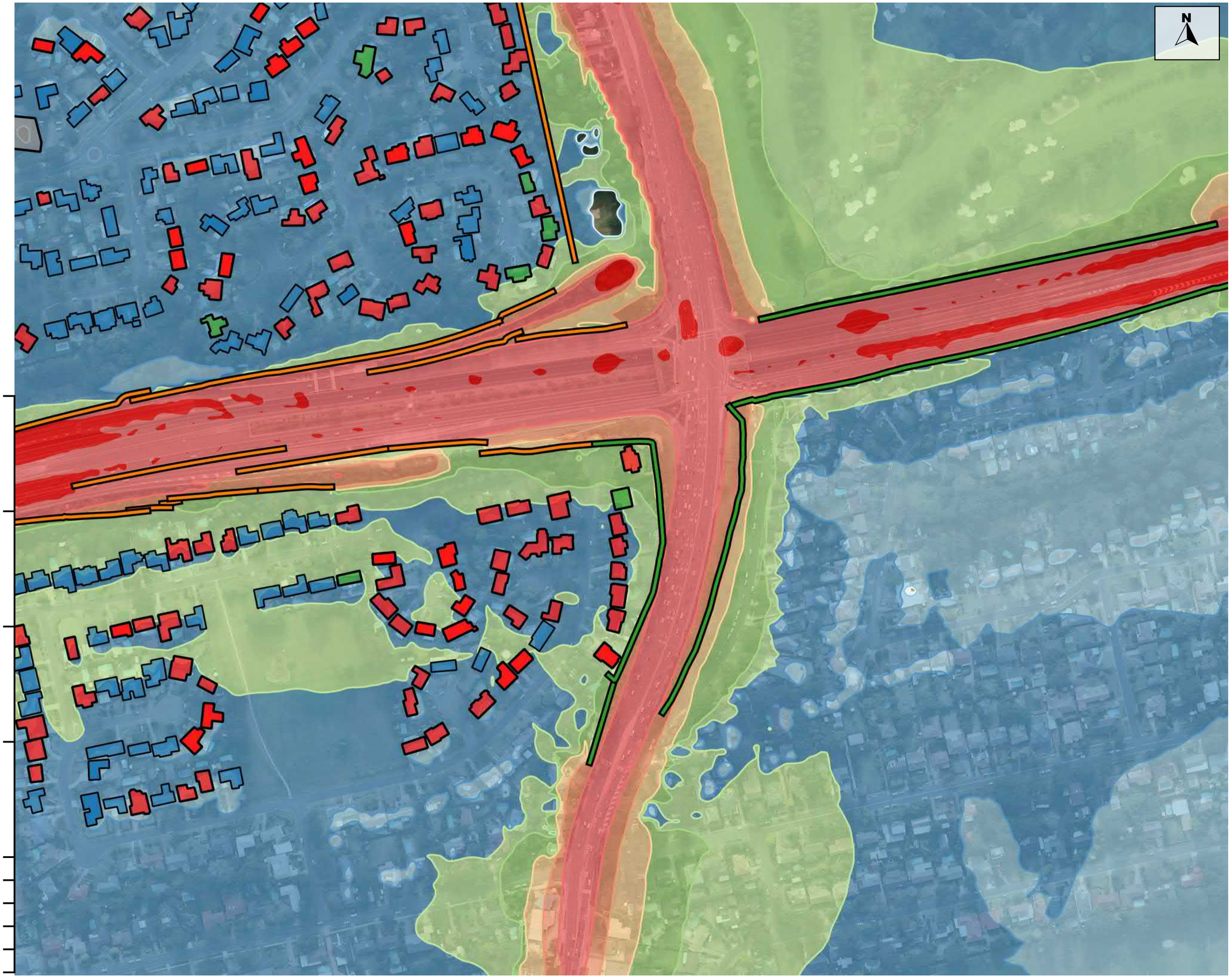
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
15/7/2019	A3

Drawing 5 of 12

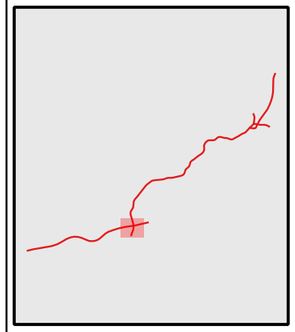
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 6 of 12

WILKINSON MURRAY

400 m

300

200

100

0

100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 7 of 12

WILKINSON MURRAY

400 m

300

200

100

0

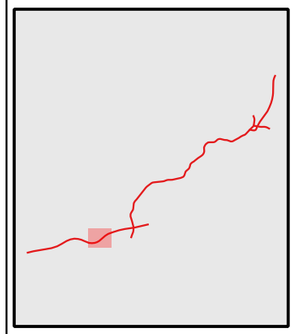
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

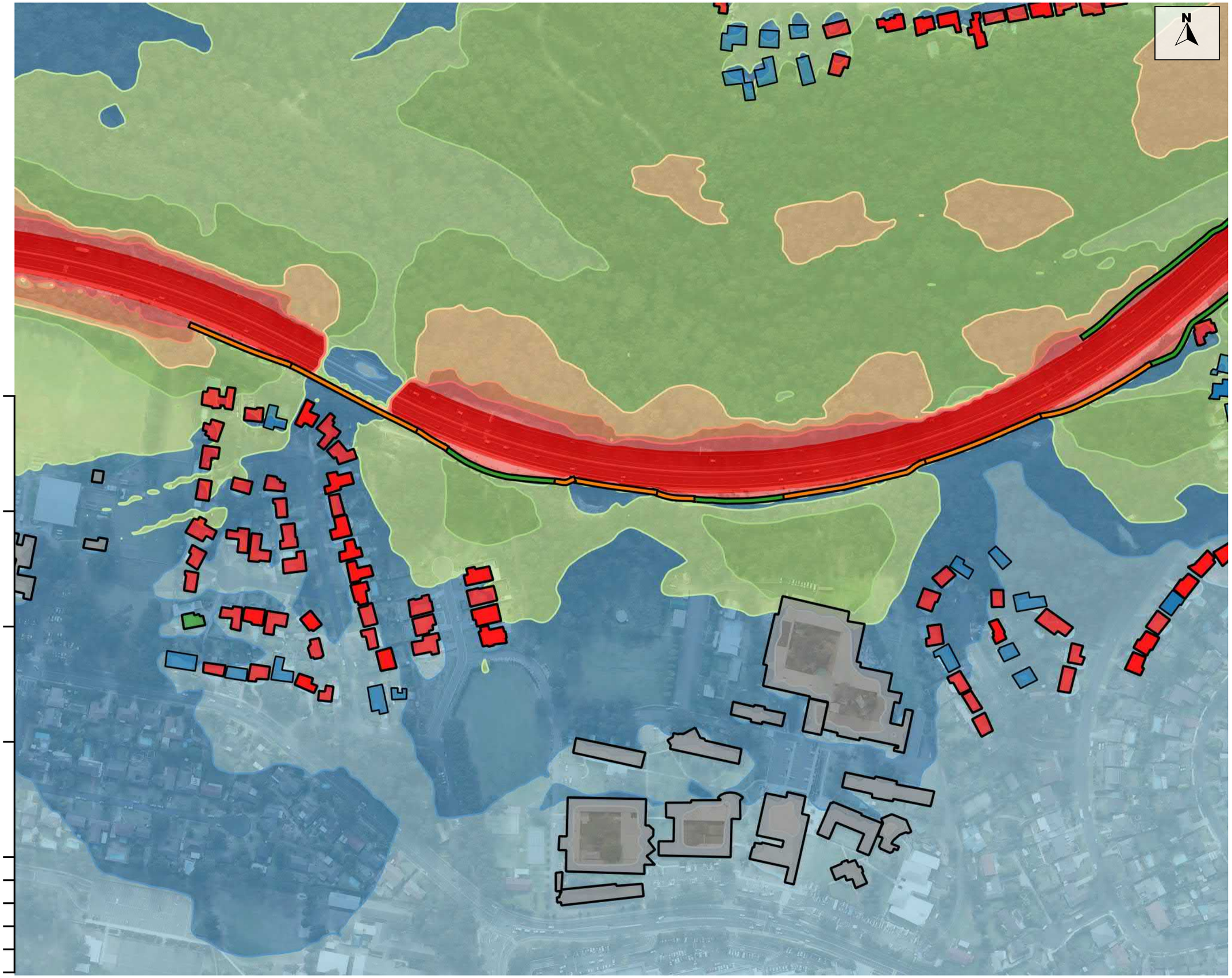
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 8 of 12

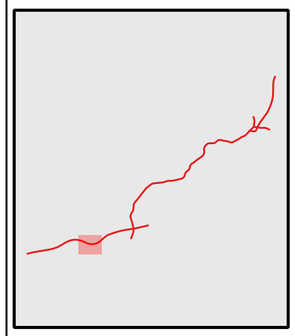
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
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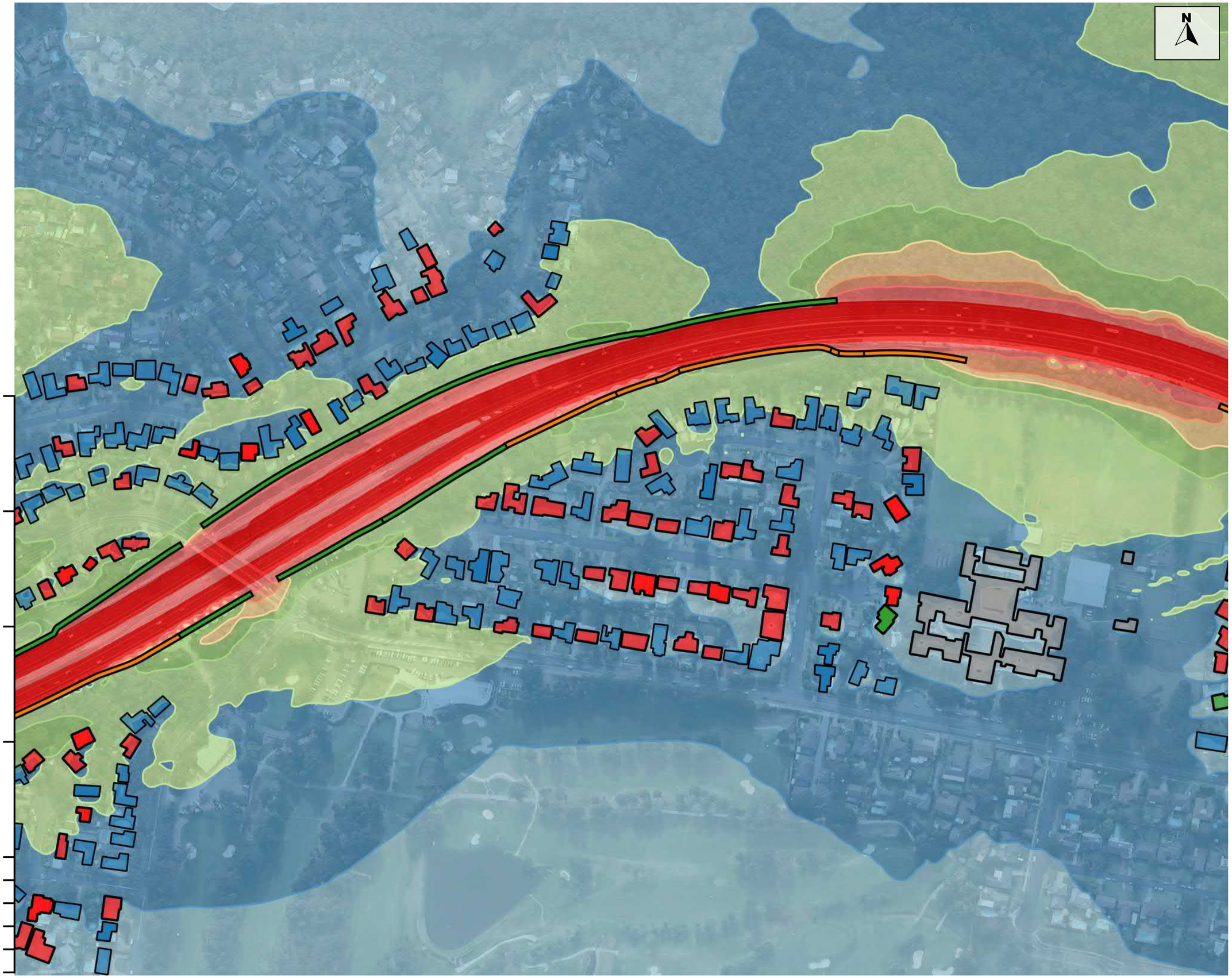
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 9 of 12

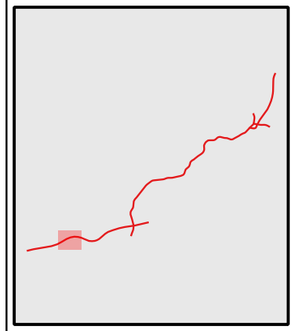
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

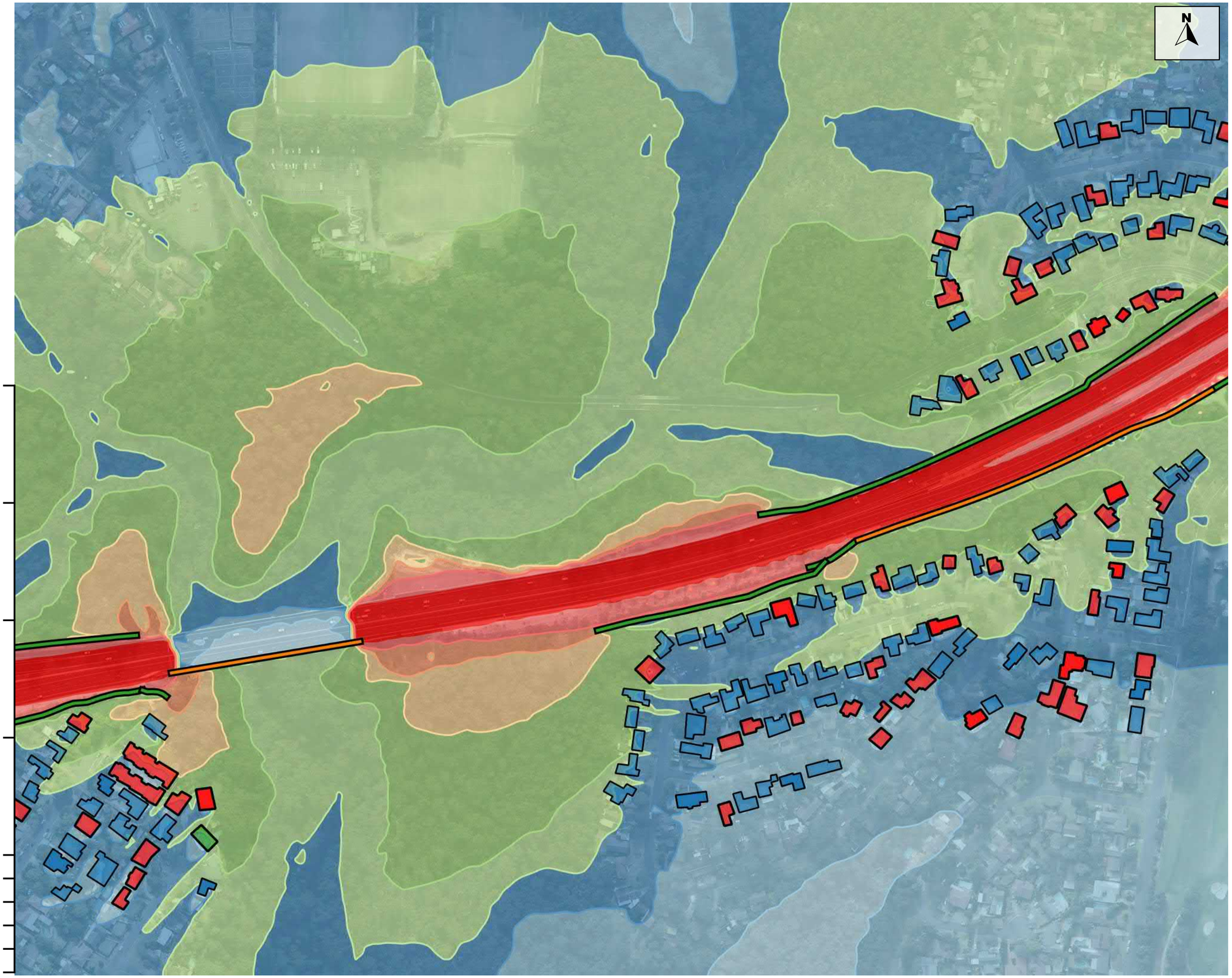
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 10 of 12

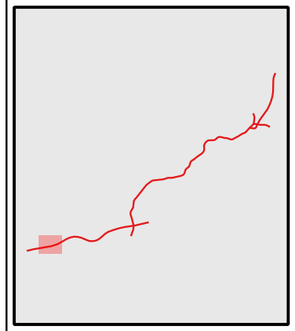
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
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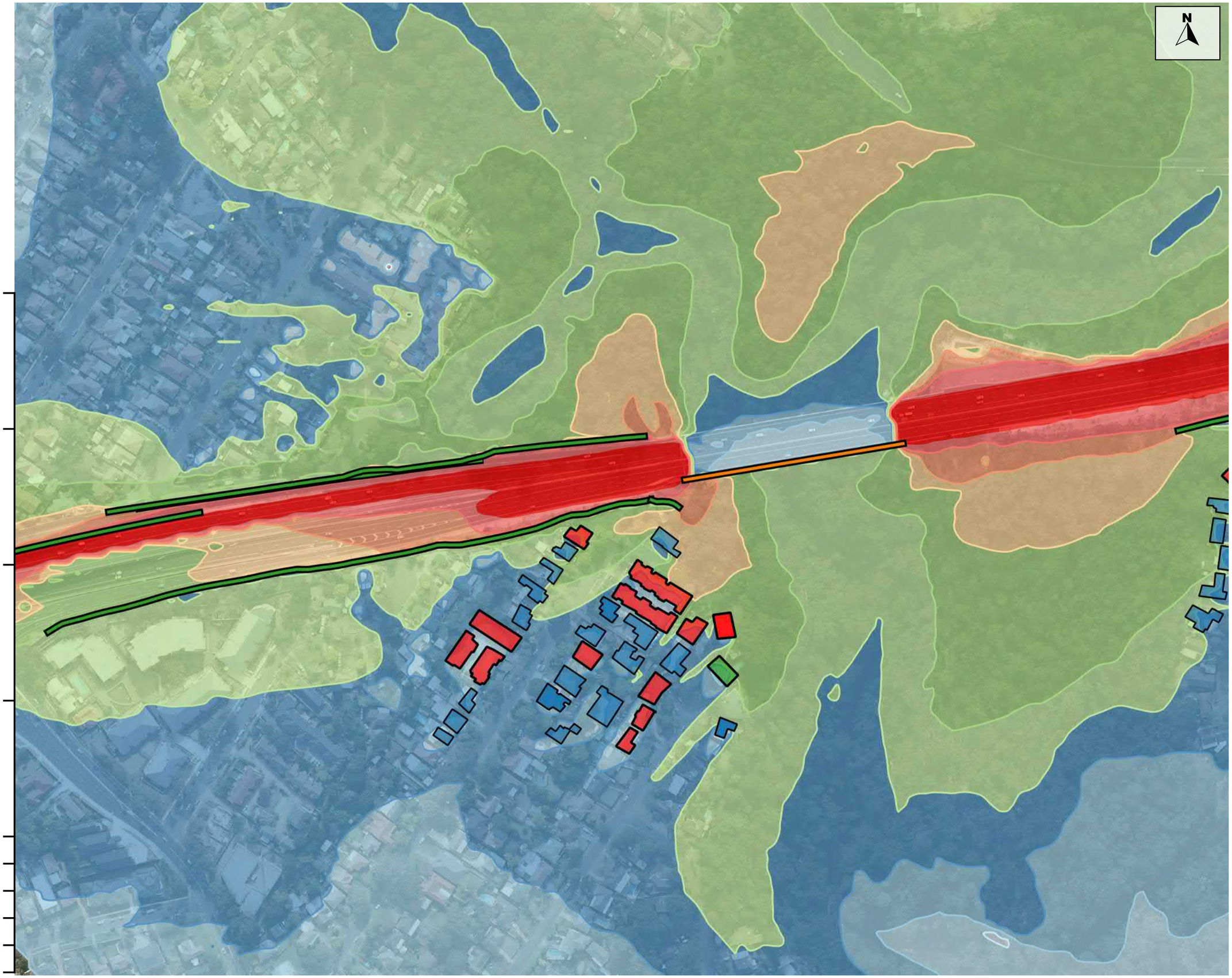
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
16/7/2019	A3

Drawing 11 of 12

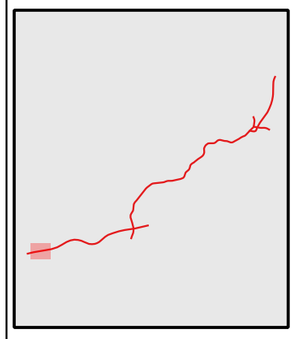
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

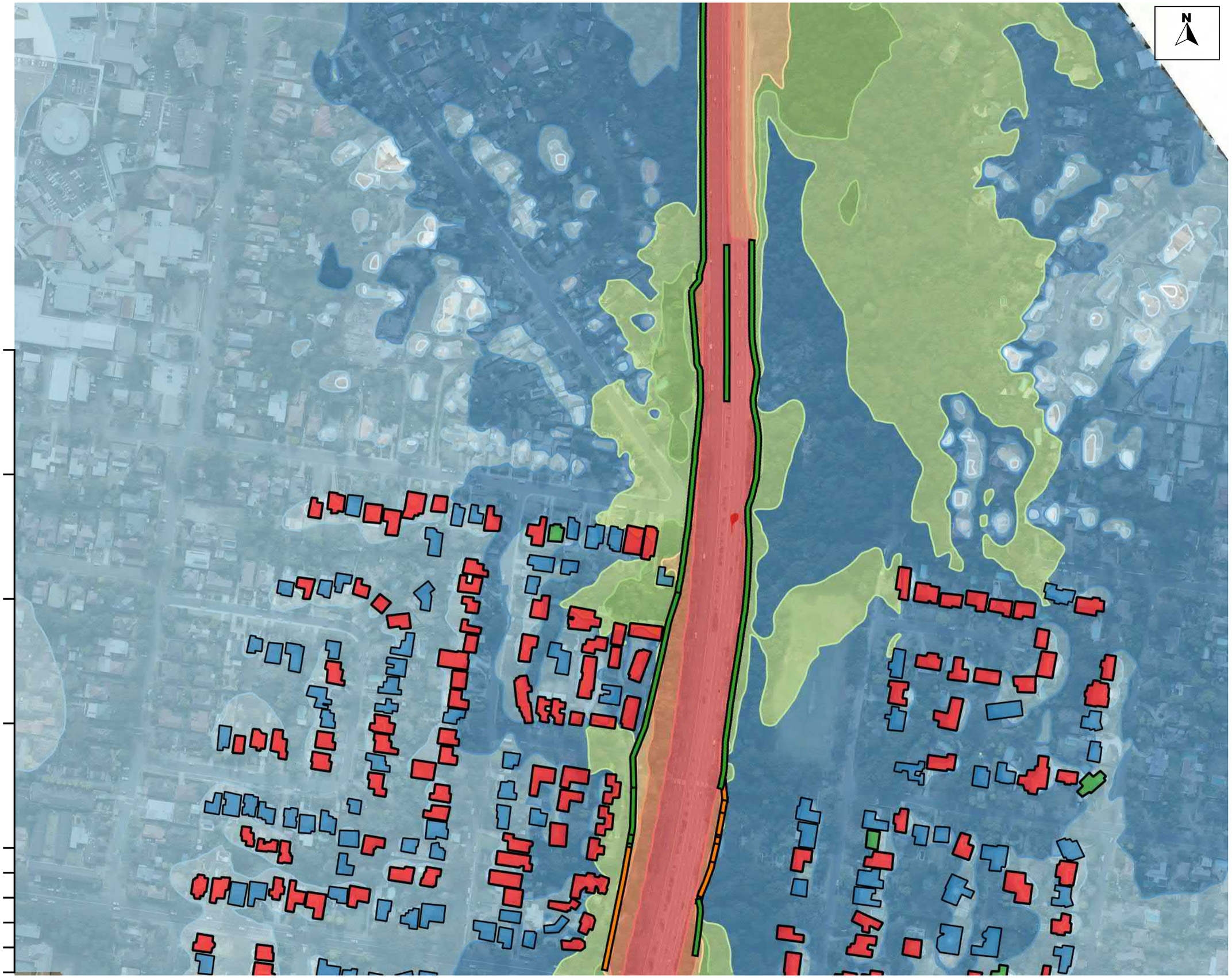
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Day
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
16/7/2019	A3

Drawing 12 of 12

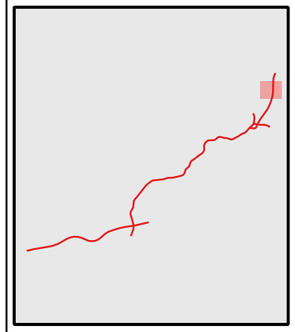
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 1 of 12

WILKINSON MURRAY

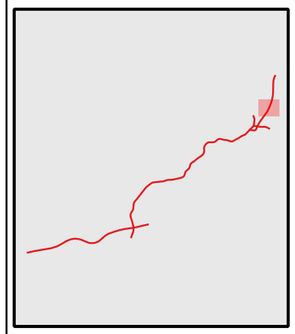
400 m
300
200
100
0
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 2 of 12

WILKINSON MURRAY

400 m

300

200

100

0

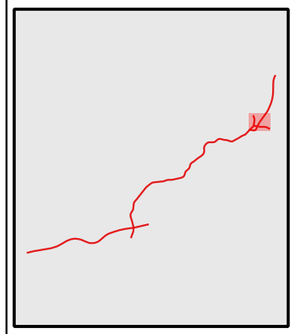
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 3 of 12

WILKINSON MURRAY

400 m

300

200

100

0

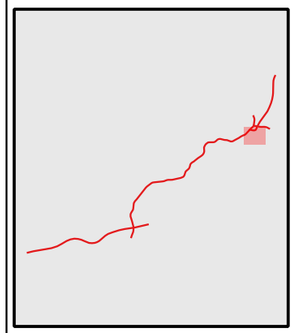
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

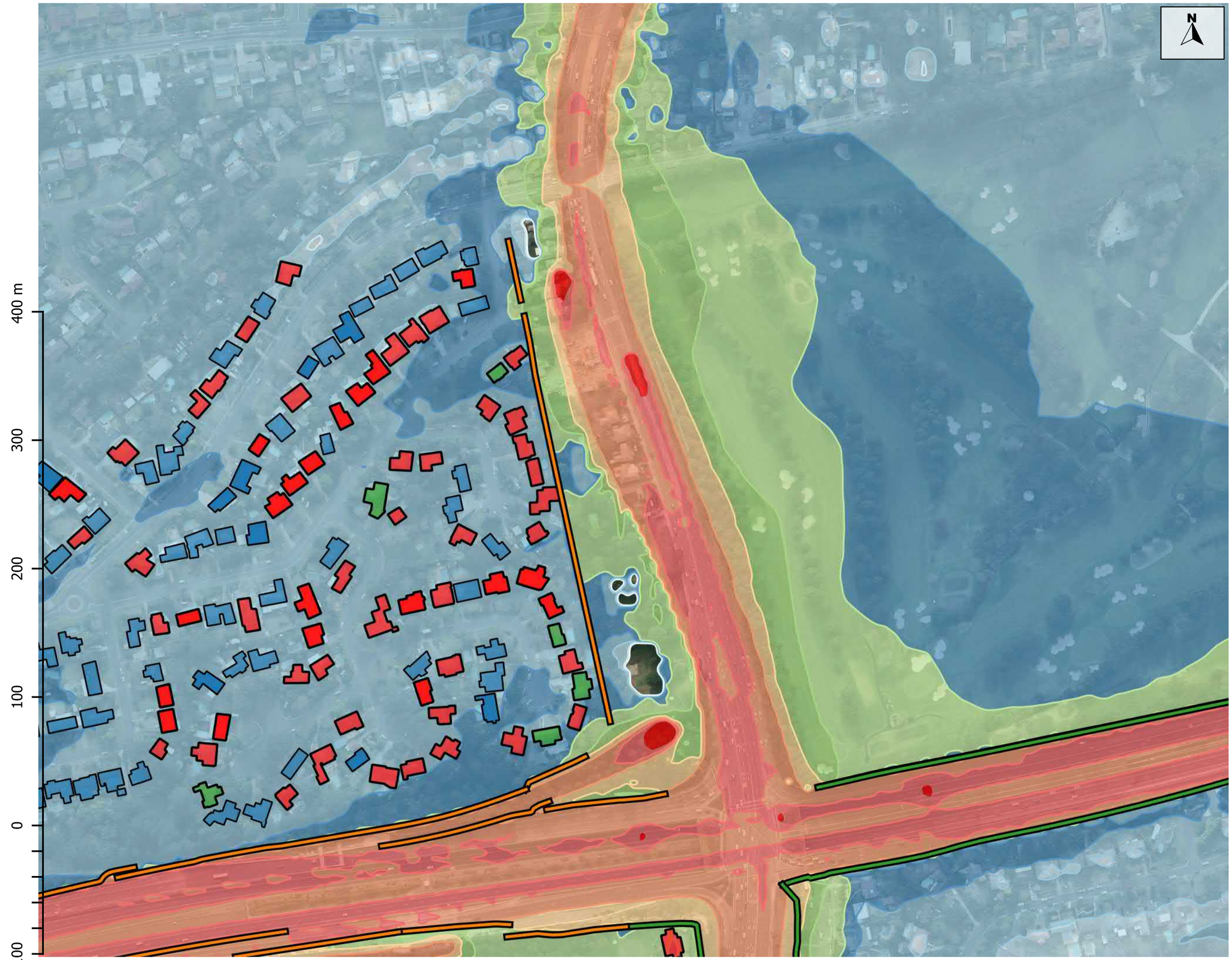
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 4 of 12

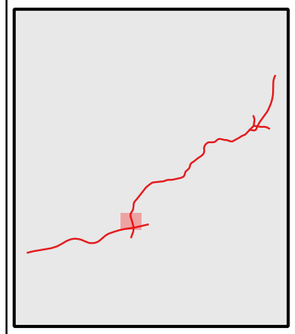
WILKINSON MURRAY



LAeq, 9 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residentia

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
15/7/2019	A3

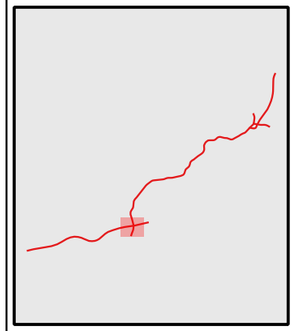
Drawing 5 of 12

WILKINSON MURRAY

LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.: 13245	REVISION: H
PREPARED: BM	APPROVED: NG
EXPORTED: 12/4/2019	SHEET SIZE: A3

Drawing 6 of 12

WILKINSON MURRAY

400 m

300

200

100

0

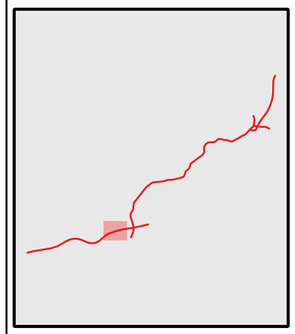
100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 7 of 12

WILKINSON MURRAY

400 m

300

200

100

0

100

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

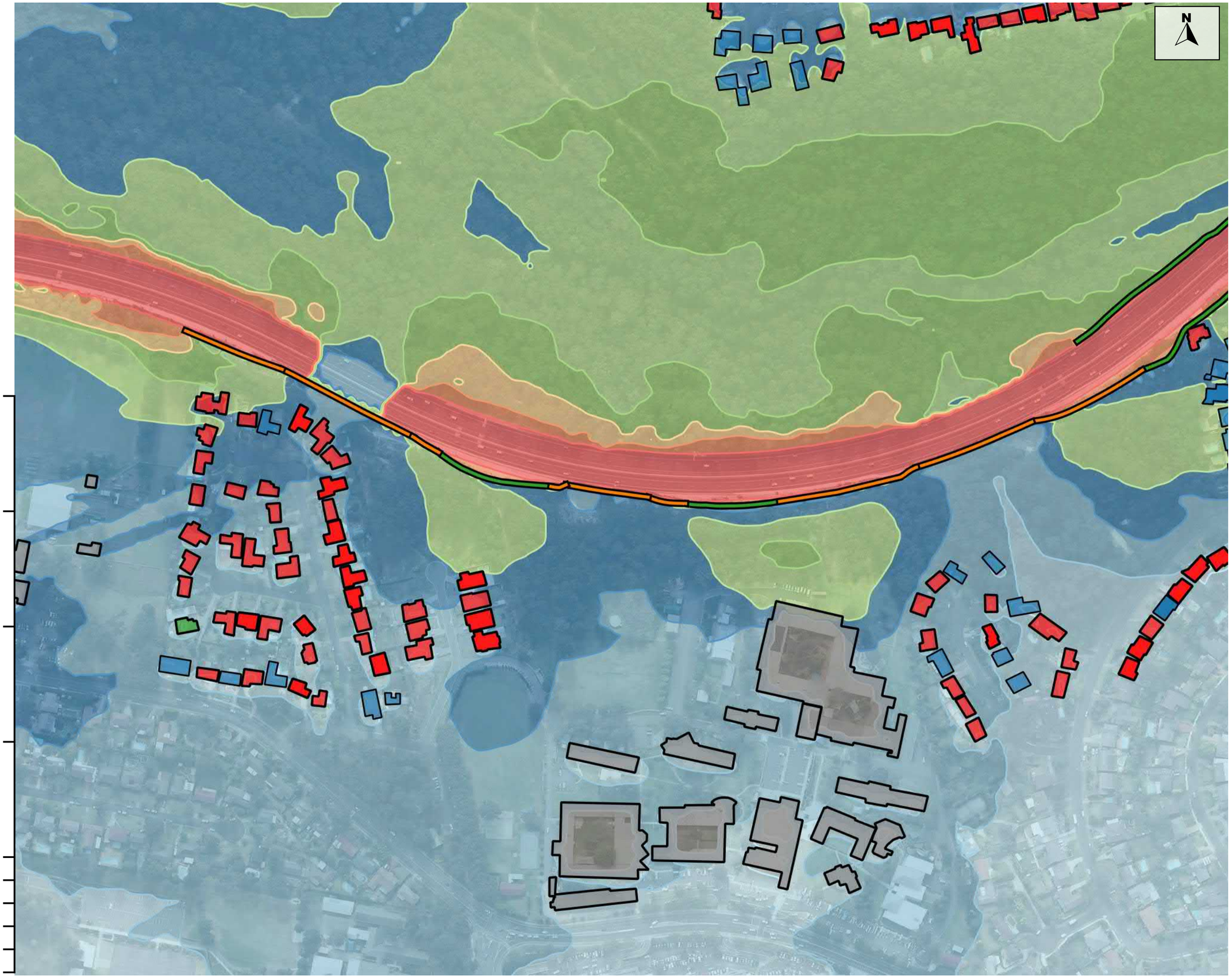
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 8 of 12

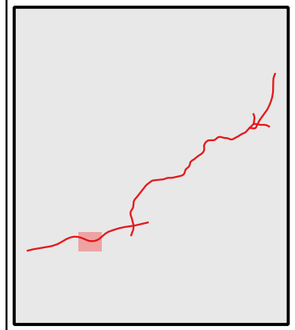
WILKINSON MURRAY



LAeq, 15 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residential

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 9 of 12

WILKINSON MURRAY

400 m

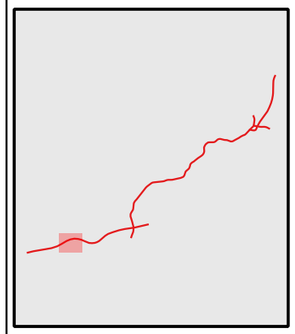
100
0
100
200
300

N

LAeq, 15 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residential

Noise Barriers:
Existing Barrier
Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

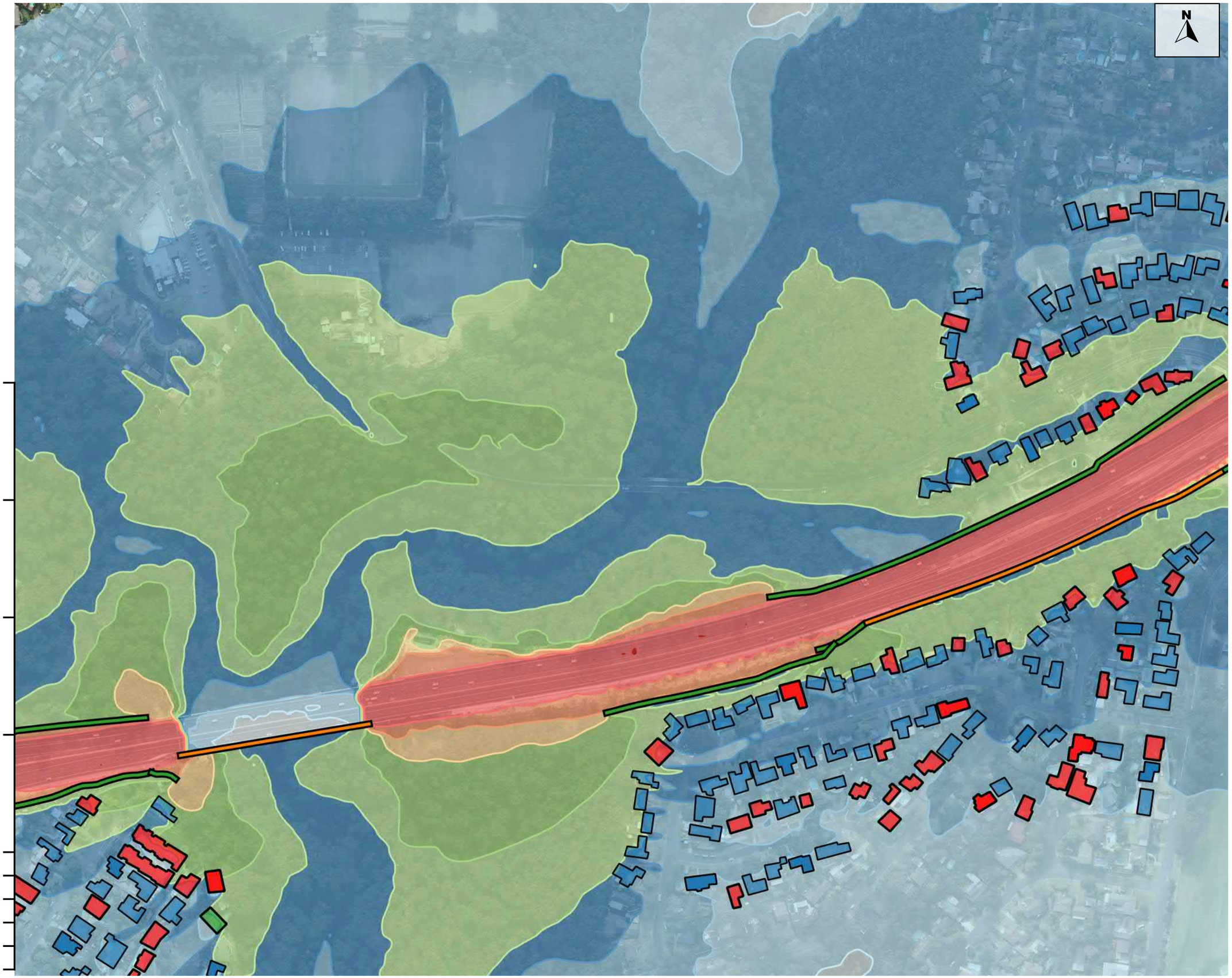
PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
12/4/2019	A3

Drawing 10 of 12

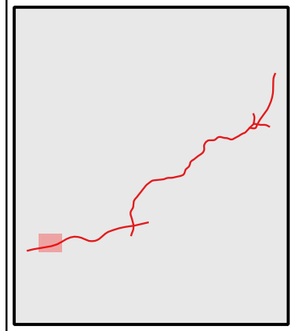
WILKINSON MURRAY



LAeq, 9 hour dBA
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85

- Single Storey
- Double Storey
- Greater Than Double Storey
- Non-Residentia

Noise Barriers:
- Existing Barrier
- Design Barrier



PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.: 13245	REVISION: H
PREPARED: BM	APPROVED: NG
EXPORTED: 16/7/2019	SHEET SIZE: A3

Drawing 11 of 12

WILKINSON MURRAY

400 m

300

200

100

0

100

N

LAeq, 9 hour dBA
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85

Single Storey
Double Storey
Greater Than Double Storey
Non-Residentia

Noise Barriers:
Existing Barrier
Design Barrier

PROJECT:
NORTHCONNEX & M2 INTEGRATION PROJECTS

PREPARED FOR:
LEND LEASE BOUYGUES JOINT VENTURE

TITLE:
Noise Contours
Build Option 2029 - Night
Height above ground = 1.5m
Refer to Table 5-1

PROJECT No.:	REVISION:
13245	H
PREPARED:	APPROVED:
BM	NG
EXPORTED:	SHEET SIZE:
16/7/2019	A3

Drawing 12 of 12

WILKINSON MURRAY

APPENDIX I

STRATA GROUPS


1740 Pacific highway
ID 738
ID 734
10
9
8
7
6
5
4
3
2
1
1 Aaron Place
ID 742
11
12
13
ID 739
20
21
19
ID 736
22
23
24
25
ID 735
18
17
16
15
14
13
ID 725
52
51
50
49
26
27
28
29
ID 731
ID 719 - domolished
3 Aaron Place
N


Units:
L1; 1,2,3
L2; 4,5,6
L3; 7,8
5-7 Pacific highway
ID 3051
ID 769
ID 743
3
4
1
2
3
4
1
2
1709 Pacific highway
1707 pacific highway
N


2B Burns road
ID 382
-demolished
ID 383
4A Burns road
ID 380
demolished
2 Burns road
5
4
2
3
ID 379
1-3 Burns road
ID 3988
9
7
6
ID 551
N


ID 85
ID 86
ID 87
ID 88
7 Carrington road
1-7 Deakin way
1
2
3
4
5
6
7
N


ID 69
ID 82
ID 68
10-12 Carrington road
ID 84
ID 63
8 Carrington St
6
5
8
7
2
1
2
3
N


27 Pennant Hills Road
demolished
ID 817
3
4
N


42-44 Dremeday Street
ID 3002
1
2
3
4
N

APPENDIX J

BACKGROUND & AMBIENT NOISE MEASUREMENT LOCATIONS & AREAS COVERED BY PSNL

APPENDIX K

VENTILATION PLANT & EQUIPMENT
DETAILED NOISE ASSESSMENT

K.1 Building Details

Details of the FDD stage building materials including doors and louvres are provided in reference drawings:

- **South**
  - NCX-CM+-03-3210-AG-DG-5140.05.IFC
  - NCX-CM+-03-3210-AG-DG-6001.04.FA
  - NCX-CM+-03-3210-AG-DG-6002.04.FA
  - NCX-CM+-03-3260-AG-DG-6001.03A.FA (Coral Tree Drive)
  - NCX-MEA-08-2840-ME-DG-3200.04 (Egress Passage Facility)
- **Wilson**
  - NCX-CM+-04-3230-AGDG-5A_DRAFT.pdf
  - NCX-CM+-04-3230-AG-DG-6001, 6002 (Doors)
  - NCX-CM+-04-3230-AG-DG-6011, 6012 (Louvres)
- **Trelawney**
  - NCX-CM+-04-3230-AGDG-5A_DRAFT.pdf
  - NCX-CM+-05-3240-AG-DG-1001.pdf
  - NCX-CM+-04-3230-AG-DG-6001, 6002 (Doors)
  - NCX-CM+-04-3230-AG-DG-6011, 6012 (Louvres)
- **North**
  - NCX-CM+-06-3250-AG-DG-COMBINED.05.FA.pdf
  - NCX-CM+-03-3250-AG-DG-6001.05.FA
  - NCX-CM+-03-3250-AG-DG-6002.05.FA
  - NCX-CM+-03-3250-AG-DG-6031.05.FA (Louvres)

K.2 VS04 Northern

K.2.1 Model Scenarios

The FDD noise modelling for the Northern VSO (VSO4) has been completed for the following scenarios:

- Axial fan rooms, 3 Scenarios:
  - Scenario 1: 4 off Axial fans operating at 100%. Daytime and evening criteria.
  - Scenario 2: 5 off Axial fans operating at 80%. Day, evening and night time criteria.
  - Scenario 3: 5 off Axial fans operating at 72%. Day, evening and night time criteria.

- Maintenance and emergency services period testing, 3 Scenarios:
    - Scenario M1: 4 off Axial fans operating at 100% including all auxiliary plant, except the pump system. Day and evening criteria.
    - Scenario M2: 5 off Axial fans operating at 80% including all auxiliary plant, except the diesel deluge pump system. Day, evening, and night time criteria.
    - Scenario M3: 4 off Axial fans operating at 100% including all auxiliary plant, including the diesel deluge pump system. Daytime criteria only.

The following assumptions have been included in the modelling:

- Outlet noise emissions modelled at a height of RL 200.8m, including a 'stack emission' directivity profile based on a chimney emission profile.
- Consideration of acoustically caulked joints to pre-cast panels (R_W >45 Fire Rated Caulking) with a 1cm^2 gap to main facades (west / east)
- Iterative design review identified compliant construction material requirements, final detailed design review based on:
    - Roof assumed Bondek slab with insulation and panels.
    - Building facade schedules as per identified drawing packages;
        - **NCX-CM+-06-3250-AG-DG-COMBINED.05.FA.pdf**
- All doors remain closed during normal operation.
- Transformers and associated A/C plant operating.
- Jet and axial fan noise emissions from portals (based on Attenuator and Jet Fan supplier data) included in predictions, discussed in detail in Section K.2.1.
- Bends in ducting of noise:
    - Mitred bend from axial fan building into intake exhaust plenum, and
    - Mitred bend from axial fan building into ventilation outlet.

During the design phase, various design constraints to achieve predicted compliance were identified, and have also been included in the FDD modelling assumptions as follows:

- Condenser plant deck upgraded to include an acoustic balustrade to western edge, to provide additional mitigation.
- Significant review of the material compositions to achieve a high level of attenuation (transmission loss) at low frequencies, through the roof and wall facades, as well as the ventilation outlet structure.
- Identification of ability to meet compliance through mitigation or management (operating hours) with regard to scheduled testing of the electrical and diesel deluge pump systems.

A number of iterative models to optimise the internal and external wall selection, and the roof design were also undertaken for all buildings. With the change from 2500N jet fans, to the FDD utilisation of 2000N jet fans, the contribution from portal noise is minimal. As a result, no significant acoustic treatment of portal openings is predicted to be necessary to achieve external compliance from these sources.

K.2.2 Axial Fans & Attenuators Sound Power Levels

Table K-1 presents the test sound power level data for the axial fan from the supplier Witt & Sohn. It is noted that the modelling considers operation of 4-5 fans operating simultaneously. Table K-2 presents the assumed attenuator inlet and outlet performance.

Table K-1 Axial Fans Sound Power Level for VSO4 – North (dB(Lin)) – per fan

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Witt & Sohn – Axial Fans									
4 off fans at 100% Inlet / Outlet	115[a]	115	125	122	121	118	114	109	105
5 off fans at 80% Inlet / Outlet	113[a]	113	122	119	118	114	110	105	101
5 off fans at 72% Inlet / Outlet	112[a]	112	121	117	115	112	107	103	98

[a] Extrapolated, with conservative assumption of 0dB correction relative to 63Hz octave data.

Table K-2 Attenuator Transmission Loss (dB(Lin)) Inlet & Outlet VSO4

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Modelled: Attenuator (Inlet / Outlet)									
ATT071 (Inlet)	2[a]	12	31	44	49	53	51	34	21
ATT072 (Outlet)	8[a]	18	36	45	51	52	49	40	29
ATT073 (Inlet)	2[a]	12	31	44	49	53	51	34	21
ATT074 (Outlet)	8[a]	18	36	45	51	52	49	40	24

[a] Extrapolated, with conservative assumption of -10dB relative to 63Hz octave data.

Table K-3 presents the FDD test data provided by the supplier (Sound Control) for regenerated noise from the attenuators.

As for VS01, the regenerated noise through the VSO facility has been modelled to consider in-flow regenerated noise from flow velocities of 14.8 – 16.5 m/s (72% and 80% scenarios) based on element contributions described in the Marshall Day paper for the assumed flow speed.

Table K-3 VSO4 Regenerated Noise Data for – In-Flow and Attenuator Tender Design (dB)

	Octave Band Centre Frequency (Hz) dB								Total (Lin)
	63	125	250	500	1k	2k	4k	8k	
Regenerated Noise from Attenuator (based on supplier test data: Regenerated face value (0.72m²)									
ATT071 (Inlet Upper)	59	57	54	55	54	52	49	47	64
ATT072 (Outlet Upper)	62	60	57	58	57	55	52	50	67
ATT073 (Inlet Lower)	56	54	51	52	51	49	46	44	61
ATT074 (Outlet Lower)	58	56	53	54	53	51	48	46	63
Regenerated Noise through System									
In-Flow Regenerated (80%)[a]	71	69	62	60	48	51	54	57	75
In-Flow Regenerated (72%)	69	67	60	58	46	49	52	55	73

[a] Modelling of 100 % operation results in the same air-flow speeds as the 80% scenario.

K.2.3 VSO4 General Noise Sources Sound Power Levels

The same approach as adopted for VS01 for consideration of ancillary noise sources has been adopted for VS04, to allow prediction of the worst-case cumulative impacts from fixed mechanical and electrical plant noise sources.

Table K-4 presents a summary of the noise levels for the additional ancillary noise sources in the modelling.

Table K-4 VSO4 Ancillary Noise Sources FDD (dB) (SWL)

Sources	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									dBA
				31.5	63	125	250	500	1K	2K	4K	8K	
Transformers													
4.5 MVA Transformer	TRX172 / TRX272	2	2	96	84	86	78	73	63	57	52	47	75
1 MVA Transformer	TRX173 / TRX273	2	2	87	75	77	69	64	54	48	43	38	66
Fire Pump Room													
Diesel Deluge Pump	DDP0701	1	1	107	97	96	98	101	103	106	103	99	110
Diesel Deluge Pump Exhaust	DDP0701_Exhaust	1	1	140	130	124	112	108	105	106	104	96	114
Electric Deluge Pump	EDP0701 / EDP0702	2	1	83	84	85	87	87	90	87	83	77	96
Electric Hydrant Pump	EHP0701 / EHP0702	2	1	80	81	82	84	84	87	84	80	74	93
Deluge Pressure Maintenance Pump	FMP0701 / FMP0702	2	1	67	68	69	71	71	74	71	67	61	78

Sources	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									dBA
				31.5	63	125	250	500	1K	2K	4K	8K	
Hydrant Pressure Maintenance Pump	FMP0703 / FMP0704	2	1	67	68	69	71	71	74	71	67	61	78
Ventilation													
Fire Pump Room Exhaust Fans	EAF0701_03	3	3	82	82	88	84	85	85	83	80	74	90
ER75 Supply Fan Air	SAF1751	1	1	87	87	84	91	95	94	92	86	79	98
Unallocated Space Supply Air Fan	SAF0704	1	1	80	80	90	90	88	83	79	76	73	86
LV Room Condenser	ACU0705_0710	6	4	70	70	70	67	71	68	65	64	64	74
HV Room Condenser	ACU0701_0704	4	2	76	76	76	73	68	66	61	54	54	71
Outlet Air Monitoring Room	ACU0711_0712	2	1	70	70	70	56	55	53	48	41	41	77
Outlet Air Monitoring Room	FCU0711_0712	2	1	44	44	41	45	42	39	38	38	78	67
ER75 Condenser	ECU1751_1752	2	1	83	83	83	76	76	71	66	63	63	77
Upper Level Access Corridor Supply Air Fan	SAF0705	1	1	69	69	79	84	85	83	76	69	58	87
Stair Pressurisation Fan Inlet	EPF1751_1752_IN	2	1	87	87	84	91	95	94	92	86	79	98
Stair Pressurisation Fan Outlet	EPF1751_1752_OUT	2	1	89	89	85	90	94	94	92	86	78	98
Transformer Bay A	FCU0701_02	2	1	70	70	70	67	71	68	65	64	64	73
Transformer Bay B	FCU0703_04	2	1	70	70	70	67	71	68	65	64	64	73
LVA Room SU1	FCU0705_07	3	2	86	86	86	79	79	74	69	66	66	80
LVB Room SU2	FCU0708_10	3	2	86	86	86	79	79	74	69	66	66	80
ER_75_Conc	EFU1751_52	2	1	70	70	70	69	69	69	67	64	64	74
Battery Exhaust Supply	SAF0711_0712	2	2	81	81	79	75	72	63	65	64	54	74
Battery Exhaust Inlet Side	EAF0711_0714_IN	4	2	64	64	75	76	74	72	69	63	49	77
Battery Exhaust Outlet Side	EAF0711_0714_OUT	4	2	73	73	73	77	72	70	68	64	52	76

Table K-5 presents a summary of the noise reductions for the attenuators for the auxiliary mechanical plant sources in the modelling.

Table K-5 VSO4 Ancillary Noise Sources – Attenuators FDD (dB)

Details	Octave Band Centre Frequency (Hz) dB									R_w
	31.5	63	125	250	500	1k	2k	4k	8k	
ATT0703	0[a]	8	16	30	47	50	50	47	39	39
ATT0706/10/11/12	0[a]	5	10	19	33	39	34	27	22	30
ATT0707/08/09	0[a]	5	10	19	31	39	35	27	21	31
ATT1751/52	0[a]	8	11	18	27	28	27	23	19	27
ATT1753	0[a]	3	7	13	19	25	17	10	7	20
Type 1 Louvre	0[a]	5	4	5	6	9	13	14	13	10
Acoustic Louvre	0[a]	5	13	13	15	20	23	23	23	20

[a] Extrapolated, with conservative assumption relative to 63Hz octave data.

The modelled scenarios for VS04 are discussed in Section K.2.1.

K.2.4 Maintenance & Emergency Operations – VSO4 North

During the iterative design process, modelling for normal worst-case operations including maintenance and emergency operations identified the main contributing noise sources at each location. Review of the modelling predictions indicated that the predicted levels are compliant with the adopted daytime criteria for all receivers for both the maintenance and emergency testing operating scenarios for the industrial silencer considered for the FDD stage, as identified in Table K-6.

Non-compliance is predicted for operation of the diesel deluge pump during evening and night time periods. Therefore, operation of the diesel deluge pump for maintenance purposes should be limited to the daytime.

Table K-6 Diesel Deluge Pump Exhaust Attenuator Minimum Required Transmission Loss (dB)

Attenuation (dB)	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
FDD Selection (Industrial Silencer) *Predicted to achieve daytime compliance*	5	15	20	18	16	15	14	13	13

Review of contributions from other maintenance activity sources, including the electric deluge pumps indicate compliance with the daytime and evening criteria. Where the electric deluge pumps are operated, compliance is predicted with the night time criteria.

The modelled scenarios for VS04 inclusive of maintenance and emergency operations are discussed in Section K.2.1.

K.2.5 VSO4 Building Materials

The relevant FDD drawings of the proposed facade materials are included in the **NCX-CM+-06-3250-AG-DG-COMBINED.05.FA.pdf** construction schedule package. These materials have been selected based on an iterative design process completed in conjunction with the LLBJV Architectural design team.

During the iterative design modelling process, material options were identified that were suitable for achieving predicted acoustic compliance for typical and worst-case operations. The analysis included consideration of the potential for access to corridors during operation (opening of doors), as well as potential deficiencies in construction (small gaps assumed < $1cm^2$ per $100m^2$). This analysis confirmed that the internal corridor walls forming an air lock are critical to reducing breakout of axial fan noise.

It should be noted that the acoustic performance of building materials (both the concrete composite facade, and caulking products) at low frequencies are largely unknown. This poses a high risk in terms of achieving the overall performance requirements for the facade. Inclusion of the corridor walls matching the height of the axial fan room, rather than the walls of axial fan room directly radiating noise externally, results in a degree of redundancy and will improve the overall performance of the building.

Based on the acoustic assessment and iterative design reviews of the various building material options, a preferred design has been developed in liaison with the LLBJV Architectural team. As for VS01, this has provided for including floor to ceiling pre-cast concrete partitions for internal and external walls.

As part of the iterative design process material selections were varied to improve the acoustic performance relative to the initial design This included improvements to access doors, acoustic louvre specification, provision of an acoustic screen to the external condenser platform, barrier height and location, changes to building facade and roof materials.

Table K-7 and Table K-8 present the proposed construction materials and the minimum transmission loss (TL) performance ratings assumed in the modelling for the FDD for the Northern VSO4 axial fan building. These materials are predicted to achieve the required external noise reductions. It is noted that the ventilation inlet walls were identified to be over-designed with regard to noise performance, however this specification was required to achieve the loading requirements of the structure. A composite construction similar to the ventilation outlet may be sufficient to achieve acoustic compliance.

The acoustic modelling may be slightly conservative, as not all facade elements were utilised in the noise modelling. For example, retaining walls and some internal wall elements were not included in the model, hence are not included in Table K-8.

Table K-7 FDD Construction Materials VSO4 North

ID	Description
W1.1	Structure: PCC1 180mm thick supported off structural steel framing
W1.5	Internal: CMP2 – ribs in horizontal alignment + 76mm MSF + 2 x 13mm PBD2 + 75mm sound insulation Structure: PCC1 180mm thick supported off structural steel framing
W3.1	PCC2 MIN. 180mm thick moulded decorative 3D finish supported off structural steel framing
W5.1	Structure: 200mm thick reinforced concrete wall (COF1)
W9.1	Internal: 78mm IWP2 vertical panel with manufacturer's angle fixing galvanised steel sheet finishes
W10.3	Internal: 13mm PBD2 (direct stick) structure: 190 mm blockwork
W10.6	Internal:100mm IWP1

ID	Description
W10.7	External: CMC 30mm + 35mm TH + VPB + 6mm FCS structure: 200mm Steel GIRT
W10.8	External: 6mm FCS Structure: 150mm MSF external: 6mm FCS + 13mm PBD + 35mm TH + CMC on 30mm
W11.10	External: 9mm FCC supported off 35mm FRC Structure: structural steel framing external: CMP2 – RIBS IN VERTICAL ALIGNMENT
W20.1	Structure: 190mm CBP
W38.0	External: steel mesh wall – MSS3
W40.1	Structure: concrete retaining wall (refer to ENG'S details)
W50.1	Internal: 100mm IWP1 structure: supported off structural steel column internal: 100mm IWP1
W52.4	Internal: CMP2 – ribs in horizontal alignment + 2 x 13mm PBD2 structure: 75mm MSF
W52.5	Internal: CMP2 – ribs in vertical alignment Substructure: 200mm GIRT system
Floor Slab, Corridor Roof	MFD1 Bondek (152mm)
VSO4 Roof	152mm Bondeck slab, composite with a Z purlin and cleat system with isolation mount, 75mm Fibreglass (22 kg/m^3). 60mm insulated roof sheet system.
Transformer Room Roof Slab	152mm Bondeck slab or Minimum 200mm Light Weight Concrete
Pump Room Roof	60mm Metecnospan insulated roof (R_w 24), with 13mm Plasterboard
Stair Pressurisation Room Roof	60mm Metecnospan insulated roof (R_w 24)
R_w / STC 55 Doors	Axial Fan room and Transformer room doors, R_w / STC 55dBA
R_w / STC 50 Doors	Axial Fan room and Transformer room doors, R_w / STC 50dBA
Solid Core Doors	Solid Hardwood 35 – 40mm, General doors, R_w / STC 30dBA
Access Hatch	0.55 Galvanised Steel Sheet
Acoustic Caulk	Fire rated caulking, R_w 45
Laminated Glass	10.38mm Laminated Glazing

Table K10-8 FDD Construction Materials – Modelled Transmission Loss Performance VSO4 North

ID	Octave Band Centre Frequency (Hz) dB									R_w
	31.5[a]	63	125	250	500	1k	2k	4k	8k	
W1.1	33	43	44	45	53	60	66	71	71	57
W1.5	27	37	57	61	69	77	83	88	88	73
W3.1	33	43	44	45	53	60	66	71	71	57
W5.1	34	44	44	47	54	62	67	72	72	59
W9.1	12	22	26	29	28	30	39	48	48	32
W10.3	27	37	38	35	41	49	55	60	60	46
W10.6	4	14	17	21	23	20	31	43	43	25
W9.1 / W10.7 Composite	12	22	38	38	56	67	73	78	78	54
W20.1	32	42	42	43	51	58	63	68	68	55
W50.1	1	11	30	36	39	29	48	76	76	36
W1.1 / W52.4 Composite	33	50	66	62	70	77	83	99	89	74
W3.1 / W52.4 Composite	33	50	66	62	70	77	83	99	89	74
Floor Slab / Corridor Roof	30	41	42	35	43	51	59	66	66	47
VSO4 Roof	25	35	53	49	56	63	75	104	104	60
Transformer Room Roof	29	39	41	39	47	55	60	66	66	51
Pump Room Roof	5	10	25	31	35	40	38	35	35	38
Stair Pressurisation Room Roof	4	14	18	22	26	25	23	54	54	25
Rw / STC 55 Doors	12	22	45	49	51	54	60	52	52	55
Rw / STC 50 Doors	12	22	29	44	51	54	51	59	59	50
Solid Core Doors	3	13	17	21	26	29	31	34	32	30
Roller Doors	0	3	8	14	20	23	26	27	35	23
Acoustic Caulk	0	13	28	37	43	46	47	42	32	45
Laminated Glass	6	16	26	27	34	35	39	45	45	36

[a] Extrapolated, with conservative assumption relative to 63Hz octave data.

The door and louvre schedule for the VSO4 facility and associated buildings are provided in the following plans:

- **NCX-CM+-03-3250-AG-DG-6001.05.FA**
- **NCX-CM+-03-3250-AG-DG-6002.05.FA**
- **NCX-CM+-03-3250-AG-DG-6031.05.FA (Louvres)**

It should be noted that doors with leaf thickness 35mm or more are considered 'solid core doors'. These are likely to be suitable to achieve STC 30 provided they include acoustic frames and seals.

The assumed performance for specific ventilation louvres and doors not covered by these documents are identified in Table K-9.

Table K-9 FDD Construction Materials – Louvres & Additional Doors

ID	Detail	Requirement
L1_L3 – Pump Room	LVR2 (1100 x 2390mm)	Basic acoustic louvre (R_W 10)
L5 – SAF01751 (Supply Fan, Daytime Only)	LVR2 (650 x 800mm)	Acran 100 (R_W 20)
L6_L7 – Stair Pressurisation Room	LVR1 (1500 x 2400mm)	Acran 100 (R_W 20)
L8 – SAF0705 (Intake Air Breakout)	LVR 2 (435 x 775mm)	Basic acoustic louvre (R_W 10)

K.2.6 VSO4 Acoustic Barriers

Various aspects of the project such as road traffic noise, visual amenity etc, have resulted in the provision of acoustic barriers to various areas surrounding the facilities and sensitive receiver areas. Therefore, the FDD compliance modelling has considered all proposed and existing acoustic barriers as per the drawing packages below:

- Structural Noise Walls – Northbound (M1 Intersection)
  - **GEN-LLB-10079-07-1490-08_Combined.pdf**
- Structural Noise Walls – Northbound (Facility)
  - **GEN-LLB-10079-07-1491-05_Combined.pdf**

K.3 VS02 Wilson

K.3.1 Model Scenarios

The FDD noise modelling for the Wilson VSO (VSO2) has been completed based on the following assumptions:

- Axial fan rooms, 2 Scenarios:
  - Scenario 1: 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night.
  - Scenario 2: 3 x Axial fans operating at 100%, in forward mode. Emergency only.

- Consideration of a 1cm^2 gap on each facade to eaves of roof (north/south/east/west).
- Iterative design review identified compliant attenuator and construction material requirements, final detailed design review based on:
    - 24mm CFC panel to internal walls of fan rooms,
    - acoustic louvres to head-house facility, and
    - acoustic barrier (2.2m) to external plant of the DRS building.
    - Building facade schedule as per drawing package;
        - **NCX-CM+-04-3230-AG-DG-5A_DRAFT.pdf**
- All doors remain closed during normal operation.
- Associated mechanical plant and A/C plant operating.
- Jet and axial fan noise emissions within the driven tunnel (based on Attenuator and Jet Fan).
- supplier data) included in predictions, discussed in detail in K.3.2.
- Effective bends in ducting of noise (accounting for cross sectional size);
    - 1 Mitred bends, and 1 radiused bend between axial fan building and main insertion point to driven tunnel.
    - 1 Mitred bend between axial fan building and second insertion point to driven tunnel.

A number of iterative models to optimise the attenuators and internal walls of axial fan rooms were also undertaken and are documented in a separate review[24]. These calculations were considered in developing the acoustic design for the FDD, as presented in this report.

It is noted that the final attenuators were specified and constructed prior to the final design changes, and as a result, the overall perform of the attenuators is significantly above the required levels for compliance both external (nearest sensitive receivers) and internal (within driven tunnel to meet NR85, as per Appendix K).

K.3.2 VSO2 Axial Fans & Attenuators Sound Power Levels

Table K-10 below presents the test sound power level data for the axial fans from the supplier Witt & Sohn. It is noted that the modelling considers operation of 2-3 fans operating simultaneously.

Table K-11 presents the assumed attenuator (Inlet & Outlet) performance, based on Option B provided by Sound Control.

Table K-10 Axial Fans Sound Power Level for VSO2 - Wilson (dB(Lin)) – per fan

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Witt & Sohn – Axial Fans									
3 off fans at 100% Forward	116[a]	116	122	131	127	126	122	118	113

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Witt & Sohn – Axial Fans									
(Smoke Extraction) Inlet / Outlet									
2 off fans at 76% Reverse (Fresh Air Supply) Inlet / Outlet	112[a]	112	116	124	119	116	112	108	103

[a] Extrapolated, with conservative assumption of 0dB correction relative to 63Hz octave data.

Table K-11 Attenuator Transmission Loss (dB(Lin)) Inlet and Outlet VSO2

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Attenuator (Inlet / Outlet)									
ATT031_032 (Inlet)	18[a]	28	40	50	54	62	65	61	40
ATT033_034 (Outlet)	14[a]	24	40	47	51	58	57	46	31

[a] Extrapolated, with conservative assumption of -10dB relative to 63Hz octave data.

Table K-12 presents the FDD test data provided by the supplier (Sound Control) for regenerated noise from the attenuators. In addition, regenerated noise through the VSO facility has been modelled to consider in-flow regenerated noise from flow velocities of 0.8 – 1.6m/s (76% and 100% scenarios) based on element contributions described in the Marshall Day paper11 for the assumed flow speed.

Table K-12 VSO2 Regenerated Noise Data for In-Flow and Attenuator Tender Design (dB)

	Octave Band Centre Frequency (Hz) dB								
	63	125	250	500	1k	2k	4k	8k	Total (Lin)
Regenerated Noise from Attenuator (based on supplier test data: Regenerated face value (0.72m^2)									
ATT031_032 (Inlet Attenuator)	69	67	64	65	64	62	59	57	75
ATT033_034 (Outlet Attenuator)	69	67	64	65	64	62	59	57	75
Regenerated Noise through System									
In-Flow Regenerated (76%)[a]	21	19	12	10	0	1	4	7	25
In-Flow Regenerated (100%)	36	34	27	25	13	16	19	22	40

[a] Modelling of 100% operation results in the same air-flow speeds as the 80% scenario.

Table K-13 presents the product data specification for regenerated noise from a representative acoustic louvre with performance R_W 21. Results are presented for face velocities of 1m/s and 2m/s, as expected for the fresh air, and smoke extraction modes respectively.

Table K-13 VSO2 Regenerated Noise Data for Louvres of Head-House (dB)

	Octave Band Centre Frequency (Hz) dB								
	63	125	250	500	1k	2k	4k	8k	Total (Lin)
Regenerated Noise from Louvres (based on supplier test data)									
Regenerated SWL @ 1m/s	50	44	39	34	30	26	17	12	54
Regenerated SWL @ 2m/s	70	60	55	52	49	49	43	35	73

K.3.3 VSO2 General Noise Sources Sound Power Levels

In addition to the axial fans, there will be various ancillary mechanical plant and equipment contributing to the noise impacts on the area surrounding the VSO2 facility. The proposed ancillary plant and equipment have been included in the computational modelling and are assumed to operate simultaneously with the main axial fan sources. Therefore, the worst-case cumulative impacts from fixed mechanical and electrical plant noise sources have been predicted. Where supplier data is unavailable noise, source data for fixed plant are based on equations presented in Engineering Noise Control[13].

Table K-14 presents a summary of the ancillary noise sources included in the modelling.

Table K-14 VSO2 Ancillary Noise Sources FDD (dB) (SWL)

Source	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									
				31.5	63	125	250	500	1K	2K	4K	8K	dBA
DRS Building													
DRS FCU ISD	FCU0311_0312	2	1	70	70	70	69	69	69	67	64	64	74
DRS FCU CRAC	FCU0313_0315	3	2	71	71	78	81	79	79	80	78	70	85
ACU Temperzone OSD194	ACU0311_0312	2	1	79	79	79	70	67	65	60	55	55	71
ACU Stulz RC54C-EC-R410A	ACU0313_0315	3	2	72	76	77	76	78	80	75	68	57	83
Toilet Exhaust Fan	EAF0302	1	1	60	60	60	64	73	66	67	62	55	74

During the design phase it was identified that the external plant items required mitigation to achieve predicted compliance to the nearest sensitive receivers. As such, the following mitigation solution was implemented:

- 2.2 m acoustic barrier around the external plant on the northern side of the facility
    - the acoustic barrier should have a minimum mass density of 12kg/m^2, be continuous and relatively gap free along the length and at the base.

The modelled scenarios for VS02 are discussed in Section K.3.1.

K.3.4 VSO2 Building Materials

The relevant FDD drawings present the proposed facade materials from the **NCX-CM+-04-3230-AGDG-5A_DRAFT.pdf** construction schedule package. These materials have been selected based on an iterative design process completed in conjunction with the LLBJV Architectural design team.

During the iterative design modelling process, material options were identified that were suitable for achieving predicted acoustic compliance for typical and worst-case operations. The analysis included consideration of the head-house structure, louvred sections, access doors, and the DRS Building. Modelling has assumed the doors to both facilities remain closed the majority of the time.

It should be noted that the acoustic performance of some of the selected building materials at low frequencies are largely unknown. This poses a high risk in terms of achieving the overall performance requirements for the facade. For this reason, a high standard of construction is recommended focusing on acoustic performance (e.g. filling gaps and using dampened fasteners).

The low frequency content should be reduced at the source (axial fan selection, and attenuators) as far as practicable.

Based on the acoustic assessment and iterative design process, a preferred design has been developed in liaison with the Architectural team.

As part of the iterative design process, materials with improved acoustic performance were identified for various building components so that compliance with the acoustic assessment criteria was predicted. This included amending the specification of doors, acoustic louvres, location of external plant, barrier height (2.2m around external plant at the DRS building) and location, reviews of building facades and roof materials.

Table K-15 and Table K-16 present the construction materials and the minimum transmission loss (TL) performance ratings assumed in the modelling for the Wilson VSO2 axial fan building. This design is predicted to achieve the appropriate external noise reductions (where appropriate treatment to the plant and equipment external to the DRS building are incorporated). It is noted that the final constructed attenuators performance was identified to be over-designed with regard to acoustic performance as a result of late design changes to the axial fan facility.

The acoustic modelling may be slightly conservative, as not all facade elements were utilised in the noise modelling. For example, retaining walls and some internal wall elements were not included in the model, hence are not included in Table K-15 and Table K-16.

Table K-15 FDD Construction Materials VSO2 Wilson

ID	Description
W60.1	Internal: 6mm FCS Structure: LLBF 138mm External: 6mm FCS
W12.1	Internal: 13mm Plasterboard (PBD1) Structure: 150mm MSG + R2.7 90mm Insulation External: 9mm FCC OFF 35mm TH + Vapour Barrier
Roof Head-House	Colorbond, Trapezoid profiled sheet (0.6mm) 7800kg/m^3
DRS Building Roof	Colorbond, Trapezoid profiled sheet (0.6mm) 7800kg/m^3
Slab between Axial Fan Room Levels	W1.1 180mm Precast Concrete (R_W 57). *Note – architectural drawings identify R_W 59, value above provided based on INSUL software*
Wall Panels to Fan Levels (inlet and outlet)	24mm CFC Panel
Louvres	Head-House facility louvred facades, R_W 20 or better
R_W / STC 50 Doors	Axial Fan room and Transformer room doors, R_W / STC 50dBA
Solid Core Doors	Solid Hardwood 35 – 40mm, General doors, R_W / STC 30dBA

Table K-16 FDD Construction Materials – Modelled Transmission Loss Performance VSO2 Wilson

ID	Octave Band Centre Frequency (Hz) dB									R_W
	31.5[a]	63	125	250	500	1K	2K	4K	8K	
W60.1	6	11	18	33	43	50	57	50	50	42
W12.1	5	13	28	44	54	59	61	55	55	52
Roof Head-House	0	9	12	13	14	17	21	24	24	18
DRS Building Roof	0	9	12	13	14	17	21	24	24	18
Slab between Axial Fan Room Levels	33	43	44	45	53	60	66	71	71	57
Wall Panels to Fan Levels (inlet and outlet)	15	26	30	34	38	34	38	47	47	38
Doors R_W / STC 50 Acoustic	12	22	29	44	51	54	51	59	59	50
Doors R_W / STC 30 Solid Core	3	13	17	21	26	29	31	34	32	30
Louvres Acran A200 Acraflow	0	4	14	13	17	27	30	22	22	23
Acoustic Caulk	0	13	28	37	43	46	47	42	32	45
Laminated Glass	6	16	26	27	34	35	39	45	45	36

[a] Extrapolated, with conservative assumption of 0dB correction relative to 63Hz octave data.

The door and louvre schedules for the VSO2 facility including DRS Building are provided in the following plans:

- **NCX-CM+-04-3230-AG-DG-6001, 6002** (Doors)
- **NCX-CM+-04-3230-AG-DG-6001, 6012** (Louvres)

It should be noted that doors with leaf thickness of 35 mm or more are considered 'solid core doors'.

K.3.5 VSO2 Wilson – Model Scenarios

K.4 Trelawny

K.4.1 Model Scenarios

The FDD noise modelling for the Trelawney VSO (VSO3) has been completed based on the following assumptions:

- Axial fan rooms, 2 Scenarios:
  - Scenario 1: 2 x Axial fans operating at 76%, in reverse mode. Day, evening or night.
  - Scenario 2: 3 x Axial fans operating at 100%, in forward mode. Emergency only.
- Consideration of a 1cm^2 gap on each facade to eaves of roof (north/south/east/west).
- Iterative design review identified compliant attenuator and construction material requirements, final detailed design review based on:
  - 24 mm CFC panel to internal walls of fan rooms,
  - acoustic louvres to head-house facility, and
  - Building facade schedule as per drawing package;
    - **NCX-CM+-04-3230-AG-DG-5A_DRAFT.pdf**
  - VSO3 facility is a mirrored layout (doors, fin wall) of the VSO2 layout
    - **NCX-CM+-05-3240-AG-DG-1001.pdf (VSO3 facility orientation)**
- All doors remain closed during normal operation.
- Associated mechanical plant and A/C plant operating.
- Jet and axial fan noise emissions within the driven tunnel (based on Attenuator and Jet Fan supplier data) included in predictions, discussed in detail in Section K.4.2.
- Effective bends in ducting of noise (accounting for cross sectional size);
  - 1 Mitred bends, and 1 radiused bend between axial fan building and main insertion point to driven tunnel.
  - 1 Mitred bend between axial fan building and second insertion point to driven tunnel.

A number of iterative models to optimise the attenuators and internal walls of axial fan rooms were also undertaken and have been separately documented. These calculations were considered in developing the acoustic design for the FDD, as presented in this report.

It is noted that the final attenuators were specified and constructed prior to final design changes, and overall perform significantly above the required levels for compliance with both external acoustic criteria (at nearest sensitive receivers) and internal acoustic goals (within driven tunnel to meet NR85, as per Section K).

K.4.2 VSO3 Axial Fans & Attenuators Sound Power Levels

Table K-17 presents the test sound power level data for the axial fans from the supplier Witt & Sohn. It is noted that the modelling considers operation of 2-3 fans operating simultaneously.

Table K-18 presents the assumed attenuator (Inlet & Outlet) performance, based on Option B provided by Sound Control.

Table K-17 Axial Fans Sound Power Level for VSO3 – Trelawney (dB(Lin)) – per fan

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Witt & Sohn – Axial Fans									
3 off fans at 100% Forward (Smoke Extraction) Inlet / Outlet	116[a]	116	122	131	127	126	122	118	113
2 off fans at 76% Reverse (Fresh Air Supply) Inlet / Outlet	112[a]	112	116	124	119	116	112	108	103

[a] Extrapolated, with conservative assumption of 0dB correction relative to 63Hz octave data.

Table K-18 Attenuator Transmission Loss (dB(Lin)) Inlet and Outlet VSO3

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	63	125	250	500	1k	2k	4k	8k
Attenuator (Inlet / Outlet)									
ATT051_052 (Inlet)	18[a]	28	40	50	54	62	65	61	40
ATT053_054 (Outlet)	14[a]	24	40	47	51	58	57	46	31

[a] Extrapolated, with conservative assumption of -10dB relative to 63Hz octave data.

Table K-19 presents the FDD test data provided by the supplier (Sound Control) for regenerated noise from the attenuators. In addition, regenerated noise through the VSO facility has been modelled to consider in-flow regenerated noise from flow velocities of 0.8 – 1.6m/s (76% and 100% scenarios) based on element contributions described in the Marshall Day paper for the assumed flow speed.

Table K-19 VSO3 Regenerated Noise Data for In-Flow and Attenuator Tender Design (dB)

	Octave Band Centre Frequency (Hz) dB								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Total (Lin)**
Regenerated Noise from Attenuator (based on supplier test data: Regenerated face value (0.72m²)									
ATT031_032 (Inlet Attenuator)	69	67	64	65	64	62	59	57	75
ATT033_034 (Outlet Attenuator)	69	67	64	65	64	62	59	57	75
Regenerated Noise through System									
In-Flow Regenerated (76%)[a]	21	19	12	10	0	1	4	7	25
In-Flow Regenerated (100%)	36	34	27	25	13	16	19	22	40

[a] Modelling of 100% operation results in the same air-flow speeds as the 80% scenario.

Table K-20 presents the product data specification for regenerated noise from a representative acoustic louvre with performance R_W 21. Results are presented for face velocities of 1m/s and 2m/s, as expected for the fresh air, and smoke extraction modes respectively.

Table K-20 VSO3 Regenerated Noise Data for Louvres of Head-House (dB)

	Octave Band Centre Frequency (Hz) dB								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Total (Lin)**
Regenerated Noise from Louvres (based on supplier test data)									
Regenerated SWL @ 1m/s	50	44	39	34	30	26	17	12	54
Regenerated SWL @ 2m/s	70	60	55	52	49	49	43	35	73

K.4.3 VSO3 Building Materials

The relevant FDD drawings present the proposed facade materials from the **NCX-CM+-04-3230-AGDG-5A_DRAFT.pdf** construction schedule package (mirrored and reoriented as per **NCX-CM+-05-3240-AG-DG-1001.pdf**). These materials have been selected based on an iterative design process completed in conjunction with the LLBJV Architectural design team.

During the iterative design modelling process, material options were identified that were suitable for achieving predicted acoustic compliance for typical and worst-case operations. The analysis included consideration of the head-house structure, louvred sections, access doors, and the DRS Building. Modelling has assumed the doors to both facilities remain closed the majority of the time.

It should be noted that the acoustic performance of some of the selected building materials at low frequencies are largely unknown. This poses a risk in terms of achieving the overall performance requirements for the facade. This performance will be verified during commissioning and later during the Operational Noise monitoring required under CoA E26".

The low frequency content should be reduced at the source (axial fan selection, and attenuators) as far as practicable.

Based on the acoustic assessment and iterative design process, a preferred design has been developed in liaison with the Architectural team.

As part of the iterative design process, materials with improved acoustic performance were identified for various building components so that compliance with the acoustic assessment criteria was predicted. This included amending the specification of doors, acoustic louvres, location of external plant, barrier height and location, reviews of building facades and roof materials.

Table K-21 and Table K-22 present the construction materials and the minimum transmission loss (TL) performance ratings assumed in the modelling for the Trelawney VSO3 axial fan building. This design is predicted to achieve the appropriate external noise reductions. It is noted that the acoustic performance of the as-constructed attenuators was identified to be over-designed, as a result of late design changes to the axial fan facility.

The acoustic modelling may be slightly conservative, as not all facade elements were utilised in the noise modelling. For example, retaining walls and some internal wall elements were not included in the model, hence are not included in Table K-21 and Table K-22.

Table K-21 FDD Construction Materials VSO3 Trelawney

ID	Description
W60.1	Internal: 6mm FCS Structure: LLBF 138mm External: 6mm FCS
W12.1	Internal: 13mm Plasterboard (PBD1) Structure: 150mm MSG + R2.7 90mm Insulation External: 9mm FCC OFF 35mm TH + Vapour Barrier
Roof Head-House	Colorbond, Trapezoid profiled sheet (0.6mm) 7800kg/m^3
Slab between Axial Fan Room Levels	W1.1 180mm Precast Concrete (R_W 57). *Note – architectural drawings identify R_W 59, value above provided based on INSUL software*
Wall Panels to Fan Levels (inlet and outlet)	24mm CFC Panel
Louvres	Head-House facility louvred facades, R_W 20 or better
R_W / STC 50 Doors	Axial Fan room and Transformer room doors, R_W / STC 50 dBA

Table K-22 FDD Construction Materials – Modelled Transmission Loss Performance VSO3 Trelawney

ID	Octave Band Centre Frequency (Hz) dB									R_W
	31.5[a]	63	125	250	500	1K	2K	4K	8K	
W60.1	6	11	18	33	43	50	57	50	50	42
W12.1	5	13	28	44	54	59	61	55	55	52
Roof Head-House	0	9	12	13	14	17	21	24	24	18
DRS Building Roof	0	9	12	13	14	17	21	24	24	18
Slab between Axial Fan Room Levels	33	43	44	45	53	60	66	71	71	57
Wall Panels to Fan Levels (inlet and outlet)	15	26	30	34	38	34	38	47	47	38
Doors R_W / STC 50 Acoustic	12	22	29	44	51	54	51	59	59	50
Doors R_W / STC 30 Solid Core	3	13	17	21	26	29	31	34	32	30
Louvres Acran A200 Acraflow	0	4	14	13	17	27	30	22	22	23
Acoustic Caulk	0	13	28	37	43	46	47	42	32	45
Laminated Glass	6	16	26	27	34	35	39	45	45	36

[a] Extrapolated, with conservative assumption of 0dB correction relative to 63Hz octave data.

The door and louvre schedules for the VSO3 facility including DRS Building are provided in the following plans (reoriented in accordance with NCX-CM+-05-3240-AG-DG-1001.pdf):

- **NCX-CM+-04-3230-AG-DG-6001, 6002** (Doors)
- **NCX-CM+-04-3230-AG-DG-6011, 6012** (Louvres)

It should be noted that doors with leaf thickness of 35mm or more are considered 'solid core doors'. This door system is capable of achieving an STC 30, provided they include acoustic frames and seals.

K.5 VS01 Southern

K.5.1 Model Scenarios

The FDD noise modelling for the Southern VSO (VSO1) has been completed based on the following assumptions:

- Axial fan rooms, 3 Scenarios:
  - Scenario 1: 4 off Axial fans operating at 100%. Daytime and evening only.
  - Scenario 2: 5 off Axial fans operating at 80%. Day, evening or night.
  - Scenario 3: 5 off Axial fans operating at 72%. Day, evening or night.
- Maintenance and emergency services period testing, 1 Scenario:
  - Worst-case axial fan scenario combined with maintenance of emergency plant (electric deluge pumps at the MCC building). Daytime and evening criteria.
- Outlet noise emissions modelled at a height of RL 147.0m, including a 'stack emission' directivity profile

based on a chimney emission profile.

- Consideration of acoustically caulked joints to pre-cast panels (R_W >45 Fire Rated Caulking) with a 1cm^2 gap to main facades (west/east).
- Iterative design review identified compliant construction material requirements, final detailed design review based on:
    - Roof assumed Bondek slab with insulation and panels.
    - Building facade schedule as per drawing package;
        - **NCX-CM+-03-3210-AG-DG-0001.04.FA.pdf**
- All doors remain closed during normal operation.
- Transformers and associated A/C plant operating.
- Jet and axial fan noise emissions from portals (based on Attenuator and Jet Fan supplier data) included in predictions, discussed in detail in Appendix K
- All WTP plant operating with doors closed, and no noise breakout via opening of doors considered, however considering the eastern roller doors as partially perforated materials.
- Bends in ducting of noise;
    - 2 mitred bends, and 1 radiused bend between axial fan building and driven tunnel, and
    - Mitred bend from axial fan building into ventilation outlet.

During the design phase, various design constraints to achieve predicted compliance were identified, and have also been included in the FDD modelling assumptions as follows:

- Condenser plant to transformer rooms relocated to either end of the building, to provide additional mitigation via additional shielding.
- Inclusion of access doors (solid core) to the southern end of the hallway directly below the axial fan room (where noise breaks in from axial fan room above).
- Western external corridor walls running from floor to ceiling of axial fan room to reduce noise breakout to surrounding area.
- Removal of windowed facades to axial fan building hallways.
- Cowl/ducting provided to ACU0105-0108 units to reduce radiated noise from outlets.

A number of iterative models to optimise the internal and external wall selection were also undertaken and have been separately reported. These calculations were considered in developing the acoustic design for the FDD, as presented in this report.

In relation to the change from 2500N jet fans to the FDD utilisation of 2000N jet fans, the contribution from portal noise is minimal. As a result, no significant acoustic treatment of portal openings is predicted to be necessary to achieve external compliance from these sources.

K.5.2 VSO1 Axial Fans and Attenuators Sound Power Levels

Table K-23 below presents the test sound power level data for the axial fans from the supplier Witt & Sohn. It is noted that the modelling considers operation of 4 - 5 fans operating simultaneously. Table K-24 presents the assumed attenuator (Inlet & Outlet) performance.

Table K-23 Axial Fans Sound Power Level for VSO1 - South (dB(Lin)) – per fan

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Witt & Sohn – Axial Fans									
4 off fans at 100% Inlet / Outlet	116[a]	116	126	123	123	120	116	111	107
5 off fans at 80% Inlet / Outlet	115[a]	115	124	121	120	117	113	108	104
5 off fans at 72% Inlet / Outlet	114[a]	114	123	119	118	115	110	106	101

[a] Extrapolated, with conservative assumption of 0 dB correction relative to 63 Hz octave data

Table K-24 Attenuator Transmission Loss (dB(Lin)) Inlet and Outlet VSO1

Details	Octave Band Centre Frequency (Hz) dB								
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Attenuator (Inlet / Outlet)									
ATT011 (Inlet)	2[a]	12	31	44	49	53	51	34	21
ATT012 (Outlet)	8[a]	18	36	45	51	52	49	40	29

[a] Extrapolated, with conservative assumption of -10 dB relative to 63 Hz octave data

Table K-25 presents the FDD test data provided by the supplier (Sound Control) for regenerated noise from the attenuators. In addition regenerated noise through the VSO facility has been modelled to consider in-flow regenerated noise from flow velocities of 14.8 – 16.5 m/s (72 % and 80 % scenarios) based on element contributions described in the Marshall Day paper for the assumed flow speed.

Table K-25 VSO1 Regenerated Noise Data for In-Flow and Attenuator Tender Design (dB)

	Octave Band Centre Frequency (Hz) dB								Total (Lin)
	63	125	250	500	1k	2k	4k	8k	
Regenerated Noise From Attenuator (based on supplier test data: Regenerated face value (0.72 m^2)									
ATT011 (Inlet Attenuator)	55	53	50	51	50	48	45	43	60
ATT012 (Outlet Attenuator)	61	59	56	57	56	54	51	49	66
Regenerated Noise through System									
In-Flow Regenerated (80%)[a]	71	69	62	60	48	51	54	57	76
In-Flow Regenerated (72%)	68	66	59	57	45	48	51	54	74

[a] Modelling of 100 % operation results in the same air-flow speeds as the 80 % scenario

K.5.3 VSO1 General Noise Sources Sound Power Levels

In addition to the axial fans, there will be various ancillary mechanical plant and equipment contributing to the noise impacts on the area surrounding the VSO1 facility. Modelling of the proposed ancillary plant and equipment have been included in the computational modelling and are assumed to operate simultaneously with the main axial fan sources. Therefore, calculation of the worst-case cumulative impacts from fixed mechanical and electrical plant noise sources has been predicted.

Where supplier data is unavailable noise source data for fixed plant are based on equations in *Engineering Noise Control*.

Table K-26 presents a summary of the adopted ancillary noise sources included in the modelling.

Table K-26 VSO1 Ancillary Noise Sources FDD (dB) (SWL)

Source	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									dBA
				31.5	63	125	250	500	1K	2K	4K	8K	
Transformers													
4.5 MVA Transformer	TRX112 / TRX212	2	2	96	84	86	78	73	63	57	52	47	75
2.5 MVA Transformer	TRX113 / TRX213	2	2	92	80	83	74	69	60	54	49	44	72
CTD Transformer Room A/B	TRX101 / 201	2	2	96	82	101	70	56	55	48	48	52	85
Ventilation													
HVA Room FCU	FCU0101-FCU0102	2	1	70	70	70	67	71	68	65	64	64	74
HVB Room FCU	FCU0103-FCU0104	2	1	70	70	70	67	71	68	65	64	64	74
LVA Room FCU	FCU0105-FCU0107	3	2	86	86	86	79	79	74	69	66	66	80
LVB Room FCU	FCU0108-FCU0110	3	2	86	86	86	79	79	74	69	66	66	80
Air Conditioning Condensers	ACU0101_104	4	2	76	76	76	73	68	66	61	54	54	71
Air Conditioning Condensers	ACU0105_110	6	4	84	84	84	83	78	75	67	61	61	80
Western Corridor Supply Air	SAF0104	1	1	63	63	73	75	67	67	63	56	43	72
Eastern Corridor Supply Air	SAF0105	1	1	69	69	79	84	85	83	76	69	58	87
Battery Exhaust, Supply Air	SAF0111	1	1	81	81	79	75	72	63	65	64	54	74
LV Room Battery Exhaust Fans	EAF0111_0114_Inlet	4	2	64	64	75	76	74	72	69	63	49	77

Source	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									dBA
				31.5	63	125	250	500	1K	2K	4K	8K	
LV Room Battery Exhaust Fans	EAF0111_0114_Outlet	4	2	73	73	73	77	72	70	68	64	52	76
Maintenance Yard													
Toilet Exhaust Fan	RC_01	1	1	60	60	60	64	73	66	67	62	55	74
Toilet Exhaust Fan	RC_02	2	2	72	72	82	73	70	69	66	64	62	75
Condenser Unit	CU_G01	1	1	88	88	88	88	87	83	78	74	74	88
Condenser Unit	CU_G02	1	1	73	73	79	71	64	63	61	59	54	69
Condenser Unit	CU_G03	1	1	70	70	72	70	68	63	58	50	42	68
Outlet Exhaust Fan	OAF_GO1	1	1	75	75	68	67	64	61	58	56	47	67
MCC Building													
Condenser Unit	CU_R07_R10	4	4	81	81	81	74	73	67	61	57	57	74
Condenser Unit	CU_R01,R03,R04	3	3	76	76	76	73	68	66	61	54	54	71
Computer Room A/C	CU_R11_R14	4	4	60	60	60	63	69	74	74	69	60	79
Condenser Unit	CU_R02	1	1	84	84	84	83	78	75	67	61	61	80
Condenser Unit	CU_R05_R06	1	1	80	80	80	79	74	71	63	57	57	76
Air Handling Unit	AHU_R01_R02	2	2	81	81	81	67	68	67	61	51	51	72
Air Handling Unit	AHU_R03	1	1	85	85	85	77	75	74	68	60	60	78
Air Handling Unit	AHU_R04	1	1	80	80	80	73	68	68	62	60	60	73
Toilet Exhaust Fan	TEF_R01	1	1	66	66	76	79	72	72	67	61	54	76
General Extract Fan	GEF_R01	1	1	65	65	72	75	67	68	63	54	42	72
Return/Relief Air Fan	RAF_R01	1	1	73	73	73	68	69	70	69	66	60	75
Return/Relief Air Fan	RAF_R02	1	1	78	78	74	72	71	71	68	65	59	75
Outside Air Fan, Intake	OAF_B01	1	1	52	52	50	57	57	56	52	44	37	60
Outside Air Fan, Fresh Air	OAF_B02	1	1	60	60	55	68	64	63	62	58	48	69
Outside Air Fan, Relief Air	OAF_B03	1	1	54	54	57	50	47	43	45	44	38	52
Exhaust Air Fan	EAF_G01_04	4	4	66	66	72	70	63	57	54	57	38	66
Electric Hydrant Pump	EHP_0701_0702	2	2	80	81	82	84	84	87	84	80	74	91
CTD and Egress Passage													
CTD_Battery Exhaust Fans	EAF1001_1004_Inlet	4	2	61	61	63	69	64	61	58	51	41	67
CTD_Battery Exhaust Fans	EAF1001_1004_Outlet	4	2	66	66	65	69	61	59	58	54	49	66
CTD_ACU Condensers	ACU1001_1004	4	2	76	76	76	73	68	66	61	54	54	71
CTD_ACU Condensers	ACU1005_1008	4	2	76	76	76	73	68	66	61	54	54	71
CTD_LV Room FCU	FCU1001_1004	4	2	70	70	70	67	71	68	65	64	64	74
CTD_Switchroom FCU	FCU1005_1008	4	2	70	70	70	67	71	68	65	64	64	74
Egress Passage_Inlet	EPF2011_2012 Inlet	2	1	94	94	90	92	98	98	94	87	80	101
Egress Passage_Outlet	EPF2011_2012 Outlet	2	1	96	96	91	91	97	97	93	87	80	100
WTP													
Flocculation Feed Pumps	2	2	2	107	95	86	81	75	75	71	67	63	81
DAF Filtrate Pumps	11	2	1	97	85	76	71	65	65	61	57	53	71
DAF Recycle Pumps	14	2	1	97	85	76	71	65	65	61	57	53	71
DAF Sludge Pumps	15	2	1	97	85	76	71	65	65	61	57	53	71
UF Train A	17	1	1	111	98	90	83	78	72	68	62	55	81
UF Train B	17	1	1	111	98	90	83	78	72	68	62	55	81
RO Train A	23	1	1	111	98	90	83	78	72	68	62	55	81
RO Train B	24	1	1	111	98	90	83	78	72	68	62	55	81

Source	Supplier / Item Number	Total	Operating	Octave Band Frequency (Hz)									dBA
				31.5	63	125	250	500	1K	2K	4K	8K	
Centrifuge Feed Pump	25	1	1	97	85	76	71	65	65	61	57	53	71

Table K-27 presents a summary of the adopted attenuators to the auxiliary mechanical plant sources in the modelling.

Table K-27 VSO1 Ancillary Noise Sources Attenuators FDD (dB)

Details	Octave Band Centre Frequency (Hz) dB									R_w
	31.5	63	125	250	500	1k	2k	4k	8k	
ATT0101 - 0104	0[a]	8	16	30	47	50	50	47	39	39
ATT0105 - 0106	0[a]	6	11	16	28	34	31	28	20	28
CTD Roof Ridge Ventilation (Airocle 3sv.1500 EAV1001 - 1004)	5	8	8	11	16	20	21	20	19	19
Egress Passage ATT2011	0[a]	4	10	20	33	36	27	17	12	28
Egress Passage ATT2012	0[a]	4	11	23	34	38	26	16	10	29
Type 1 Louvre	0[a]	5	4	5	6	9	13	14	13	10
Acoustic Louvre[b]	0[a]	5	13	13	15	20	23	23	23	20

[a] Extrapolated, with conservative assumption relative to 63Hz octave data.
[b] Based on Acran A100 Acraflow.

The modelled scenarios for VS01 are discussed in Section K.5.1.

K.6 VSO1 Building Materials

The relevant FDD drawings present the proposed facade materials from the **NCX-CM+-03-3210-AG-DG-0001.04.FA.pdf** construction schedule package. These materials have been selected based on an iterative design process completed in conjunction with the LLBJV Architectural design team.

During the iterative design modelling process, material options were identified that were suitable for achieving predicted acoustic compliance for typical and worst case operations. The analysis included consideration of the potential for access to corridors during operation (opening of doors), as well as potential deficiencies in construction (small gaps assumed < 1 cm^2 per 100 m^2). This analysis confirmed that the internal corridor walls forming an air lock are critical to reducing breakout of axial fan noise.

It should be noted that the acoustic performance of some of the selected building materials (both the concrete composite facade, and caulking products) at low frequencies are largely unknown. This poses a high risk in terms of achieving the overall performance requirements for the facade. Inclusion of the corridor walls matching the height of the axial fan room, rather than the walls of the axial fan room directly radiating noise externally, results in a degree of redundancy and will improve the overall performance of the building.

Based on the acoustic assessment and iterative design process, a preferred design has been developed in liaison with the Architectural team. This has included architectural detailing for floor to ceiling corridor spaces, and the selection of pre-cast concrete partitions for internal and external walls.

As part of the iterative design process, materials with improved acoustic performance were identified for

various building components so that compliance with the acoustic assessment criteria was predicted. This included amending the specification of doors, acoustic louvres, location of external plant, barrier height and location, changes to building facade and roof materials.

Table K-28 and Table K-29 present the construction materials and the minimum transmission loss (TL) performance ratings assumed in the modelling for the Southern VSO1 axial fan building. This design is predicted to achieve the appropriate external noise reductions. It is noted that the ventilation inlet walls were identified to be over-designed with regard to acoustic performance, however this specification was necessary to achieve the loading requirements of the structure. A composite construction similar to the ventilation outlet may be sufficient to achieve predicted compliance from an acoustic perspective.

The acoustic modelling may be slightly conservative, as not all facade elements were utilised in the noise modelling. For example, retaining walls and some internal wall elements were not included in the model, hence are not included in Table K-29.

Table K-28 FDD Construction Materials VSO1 South

ID	Description
W1.1	Structure: PCC1 180 mm thick supported off structural steel framing
W1.5	Internal: CMP2 – Ribs in horizontal alignment + 76 mm MSF + 2 x 13 mm PBD2 + 75 mm Sound insulation Structure: PCC1 180 mm thick supported off structural steel framing
W1.9 (CTD)	PCC1 200 mm thick – reinforced precast concrete panel (RW 50)(COF2)
W3.1	PCC2 MIN. 180 mm thick moulded decorative 3D finish supported off structural steel framing
W5.3 (CTD)	Structure: 250 mm reinforced concrete wall (COF1)
W9.1	Internal: 78 mm IWP2 vertical panel with manufacturer's angle fixing galvanised steel sheet finishes
W10.3	Internal: 13 mm PBD2 (direct stick) structure: 190 mm blockwork
W10.6	Internal:100 mm IWP1
W10.7	External: CMC 30 mm + 35 mm TH + VPB + 6mm FCS Structure:200 mm steel GIRT
W12.1 (CTD)	External: 9 mm FCC + 35 mm top hat + vapour barrier + 2 X 16 mm.PBD3 (RW 50) Structure: GIRT system /truss internal: 2 x 16 mm PBD3 + 75 mm insulation
W20.1	Structure: 190 mm CBP
W38.0	External: steel mesh wall - MSS3
W40.2 (CTD)	Structure : 220 mm concrete retaining wall
W50.1	Internal: 100 mm IWP1 structure: supported off structural steel column internal: 100 mm IWP1
W52.4	Internal : CMP2- ribs in horizontal alignment + 2 x 13 mm PBD2 Structure: 75 mm MSF
W55.1 (CTD)	150 mm auto claved aerated concrete panel
Floor Slab, Corridor Roof	MFD1 Bondek (152 mm)
VSO1 Roof	152 mm Bondeck slab, composite with a Z purlin and cleat system with isolation mount, 75 mm Fibreglass (22kg/m^3). 60 mm insulated roof sheet system.
Transformer Room Roof	190 mm Blockwork – Hollow Blockwork (760 kg/m3) or Minimum 200 mm Light Weight Concrete
CTD Main Roof	1 x 13mm fire rated plasterboard + 1 x 16 mm fire rated plasterboard + 120 mm acoustic insulation R3.0 + 60 mm MetecnoSpan insulated roof
CTD Other Roof	60 mm Metecnospan insulated roof (Rw 24)
CTD Roof Ridge Ventilator	LRVA HC 1000 (Rw19)
Egress Passage Roof	Structure: 250 mm reinforced concrete wall (COF1)
Egress Passage Walls	190 mm Blockwork – Hollow Blockwork (760 kg/m3)

ID	Description
Rw/STC 50 Doors	Axial Fan room and Transformer room doors, Rw / STC 50 dBA
Solid Core Doors	Solid Hardwood 35 – 40 mm, General doors, Rw / STC 30 dBA
Roller Doors	0.55 Galvanised Steel Sheet
Acoustic Caulk	Fire rated caulking, Rw 45
Laminated Glass	10.38 mm Laminated Glazing

[a] Applicable to Coral Tree Drive facility only

Table K-29 FDD Construction Materials - Modelled Transmission Loss Performance VSO1 South

ID	Octave Band Centre Frequency (Hz) dB									R_w
	31.5[a]	63	125	250	500	1k	2k	4k	8k	
W1.1	33	43	44	45	53	60	66	71	71	57
W1.5	27	37	57	61	69	77	83	88	88	73
W1.9 (CTD)	29	39	41	39	47	55	60	66	66	51
W3.1	33	43	44	45	53	60	66	71	71	57
W5.1	34	44	44	47	54	62	67	72	72	59
W5.3 (CTD)	36	46	46	50	58	65	69	74	74	62
W9.1	12	22	26	29	28	30	39	48	48	32
W10.3	27	37	38	35	41	49	55	60	60	46
W10.6	4	14	17	21	23	20	31	43	43	25
W9.1 / W10.7 Composite	12	22	38	38	56	67	73	78	78	54
W12.11 (CTD)	8	18	26	44	52	56	53	61	61	50
W20.1	32	42	42	43	51	58	63	68	68	55
W50.1	1	11	30	36	39	29	48	76	76	36
W1.1 / W52.4 Composite	33	50	66	62	70	77	83	99	89	74
W3.1 / W52.4 Composite	33	50	66	62	70	77	83	99	89	74
Floor Slab / Corridor Roof	30	41	42	35	43	51	59	66	66	47
VSO1 Roof	21	35	53	49	56	63	75	104	104	60
Transformer Room Roof	29	39	41	39	47	55	60	66	66	51
CTD Transformer	1	11	30	39	51	57	58	68	68	51

ID	Octave Band Centre Frequency (Hz) dB									R_w
	31.5[a]	63	125	250	500	1k	2k	4k	8k	
Room Roof										
CTD Other Roof	4	14	17	22	25	24	21	53	53	24
CTD Roof Ridge Ventilator	5	8	8	11	15	20	21	20	19	19
Doors Rw/STC 50 Acoustic	12	22	29	44	51	54	51	59	59	50
Doors Rw/STC 30 Solid Core	3	13	17	21	26	29	31	34	32	30
Roller Doors	0	3	8	14	20	23	26	27	35	23
Acoustic Caulk	0	13	28	37	43	46	47	42	32	45
Laminated Glass	6	16	26	27	34	35	39	45	45	36

[a] Extrapolated, with conservative assumption relative to 63Hz octave data

The door and louvre schedules for the VSO1 facility and Coral Tree Drive facilities are provided in the following plans:

- **NCX-CM+-03-3210-AG-DG-5140.05.IFC**
- **NCX-CM+-03-3210-AG-DG-6001.04.FA**
- **NCX-CM+-03-3210-AG-DG-6002.04.FA**
- **NCX-CM+-03-3260-AG-DG-6001.03A.FA** (Coral Tree Drive)
- **NCX-MEA-08-2840-ME-DG-3200.03A.FA** (Egress Passage Facility)

It should be noted that doors with leaf thickness of 35 mm or more are considered 'solid core doors'. These are likely to be suitable to achieve STC 30 provided they include acoustic frames and seals.

The assumed performance for specific ventilation louvres and doors not covered by these documents are identified in Table K-30 (including those of the Egress Passage Ventilation building) below.

Table K-30 FDD Construction Materials – Louvres and Additional Doors

ID	Detail	Requirement
VSO1 Southern Facilities Buildings		
L5 - SS01 LVA Southern End	LVR (300 x 250)	Standard Grille
L6 - SS01 LVB Northern End	LVR (300 x 250)	Standard Grille
Ductwork[a] - ACU0105 – 0108	Duct/cowl, minimum 0.5m above fans	Minimum 1.6 Gauge steel
Coral Tree Drive Transformer Station		
LN05 - LVA Room	Door Grille (750W x 250H)	Standard Louvre
LN06 - LVB Room	Door Grille (750W x 250H)	Standard Louvre
Egress Passage Ventilation System		
Western Weatherproof Intake Louvre	Acoustic Louvre	Acran 100 (R_W 20)
Clear Door and Removable Barrier	Solid Core Door	STC 30
Fire Damper / Pressure Relief Damper	Roller Door	Typical R_W 23
Egress Passage Door	Solid Core Door	STC 30

[a] reduction of the ACU0105 – 0108 condenser units is required to achieve predicted compliance. Sheet steel ductwork a minimum height of 0.5m above the outlet of the units is predicted to achieve suitable reduction.

K.7 VSO1 Acoustic Barriers

Various aspects of the project such as road traffic noise, visual amenity etc, have resulted in the provision of acoustic barriers to various areas surrounding the facilities and sensitive receiver areas. Therefore, the FDD compliance modelling has considered all proposed and existing acoustic barriers as per the drawing packages below:

- Southern Facilities Zone – Civil Works
  - **GEN-LLB-10079-03-1270-06_Combined.pdf**
- Structural Noise Walls – Eastbound
  - **GEN-LLB-10079-02-1240-07_Combined.pdf**
- Structural Noise Walls – Westbound
  - **GEN-LLB-10079-02-1241-06_Combined.pdf**