RP2J Project OOHW application form

Out of hours work approval request form			
No:	**Notification date:**	**Approval date:**	**Project:**
022	**16/08/2021**		**RP2J – Southern Utilities**
A. Contact details	**Name**	**Mobile number**	**Email**
Contractor Environmental Site Representative	Richard Lipar	[redacted]	[redacted]
Contractor Project Manager	Mike Billington	[redacted]	[redacted]
Contractor Foreman	Daniel Tregeagle	[redacted]	[redacted]
Contractor Project Engineer	Ian Harris	[redacted]	[redacted]

B. Details of work: Include a map showing location of work extent and nearest sensitive receivers	
Location / chainages:	Lookout Road Median (refer to Appendix for location Map)
NCA/s:	NCA-13
Description of works – also include a brief description of the sequence of activities:	**Roadworks activities for removal and reinstatement of Lookout Rd Median:** Works involve the realignment of Lookout Road northbound and southbound carriageways, demolition and removal of the existing median island, excavation and construction of new asphalt median infill pavement, realignment of the southbound carriageway on to completed pavement and installation of temporary concrete traffic barriers for following works. Refer to **Appendix A** for more detailed summary of planned shifts, activities and plant.
Machinery/ plant to be used	Refer to **Appendix A** for detailed summary of machinery / plant that will be used and corresponding shifts.
Traffic control measures required:	Lookout Road Northbound and Southbound Lane Closures
Lighting required:	The area is well lit by street lighting, however, two additional lighting towers will be provided in median to highlight road works zone for motorists, and battery operated task lighting will be provided at specific locations.
Proposed dates:	30/08/2021 & 31/08/21 (2 Nights) ----------*Respite*---------- 08/09/2021 (1 Night) ----------*Respite*---------- 13/09/2021 – 16/09/21 (3 Nights) ----------*Respite*---------- 20/09/2021 & 22/09/21 (2 Nights)
Proposed times:	Start 1900 – Finish 0500 on each shift

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Justification – why does work need to occur outside of standard construction hours?: (attach support information as required)	Work needs to be carried out under lane closure of Lookout Road for the safety of workers whilst in the median. This cannot happen during the day as TfNSW - Road Access Management (RAM) will not issue a Road Occupancy Licence (ROL) for daytime lane closures on Lookout Road in both directions.
C. Risk assessment	
NML (refer Table 3-2 of OOHW protocol)	Evening: 54 dB(A). Night: 38 dB(A)
Is the work highly noise intensive? (above 75dB(A) $L_{Aeq\ (15\ minute)}$)	No
Risk factor category (refer section 4.3 of OOHW protocol):	Low Risk. Maximum worst case cumulative predicted noise level ($L_{Aeq\ 15\ min.}$) = 59-63dB(A) for seven residents during asphalting activities. This is >25dB(A) above RBL (33dB(A)). These receivers have been consulted and 6 of the 7 (>80%) have agreed to adjusted noise modelling and the application of appropriate mitigation measures. The other receiver has not responded to multiple attempts to contact.

D. Details of noise or vibration assessment completed:

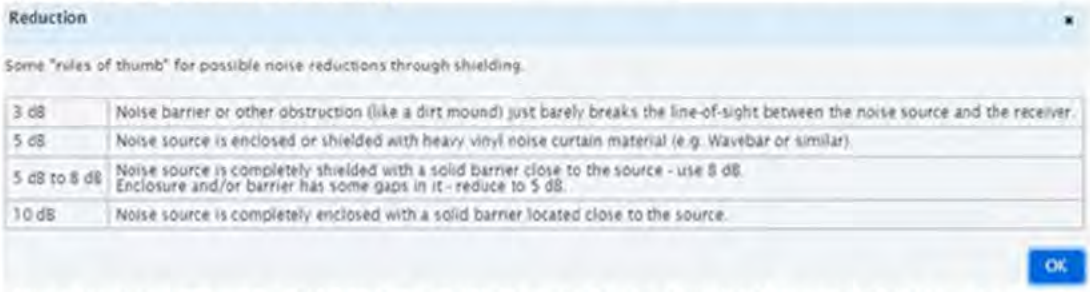
Detailed noise assessments were completed using noise modelling program named *KNOWnoise: Minor Works* which is developed and owned by Hutchison Weller. This program, and it's more advanced version *KNOWnoise*, are used on many large-scale infrastructure projects to determine and model likely noise impacts on sensitive receivers.

As works are predicted to carry over the Evening and Night OOHW Periods, a detailed noise assessment was completed to determine predicted noise impacts for each period (refer **Appendix B**). Respective detailed noise assessment reports are attached to this OOHW Application. Reports include a map of predicted impacts on sensitive receivers, and predicted noise levels at each receiver's address.

Whilst most activities are carried out over the entire length of the median, assessments were separated into 3 zones corresponding to 3 discrete clusters of sensitive receivers as follows:

- Middle – Adjacent to the cluster of houses in the middle of the work area on Lookout Rd (117-121)
- North – In proximity of the cluster of houses north of McCaffery Drive
- South – In proximity of the cluster of houses south of Grandview Road

These areas were treated separately in order to model the additional mitigation measures proposed for the sensitive receivers in the middle area i.e. noise blankets. Where noise reductions such as noise blankets are applied to the noise assessments it is detailed in the table in **Appendix B** of the noise assessments. The reductions applied are in line with the following:



All applicable data was added to the model, including but not limited to, specific information on the proposed activity, project adopted RBLs and NMLs, extent of works, plant and equipment to be used, proposed mitigation measures etc. Using this data, and data within the program, detailed noise assessment reports were produced

giving accurate predicted noise impacts for the period assessed. Specific assessment methodology is described on Page 3 of each report.

Predicted impacts:

The noise assessment considers four (4) separate blocks of work with the Night period being the worst case in all instances, impacts are summarised as follows:

Block 1 – Line Removal and Line Marking (Starting 30/08/21)

The predicted maximum worst case cumulative noise level (LAeq, 15 min) is 62dB(A).

There are five receivers that will be 'Moderately impacted' (16-25 dB(A) above NML)

There are 14 receivers for which the works will be Clearly Audible (6-15 dB(A) above NML).

Refer to the following detailed Noise Assessments in **Appendix B**:

1 - Middle Zone Evening Period

2 - Middle Zone Night Period

7 - North Zone Evening Period

8 - North Zone Night Period

15 - South Zone Evening Period

16 - South Zone Night Period

Block 2 – Excavating and Placing Select Backfill at McCaffery Intersection (Starting 08/09/21)

The predicted maximum worst case cumulative noise level (LAeq, 15 min) is 60dB(A).

There are eight receivers that will be 'Moderately impacted' (16-25 dB(A) above NML)

There are 39 receivers for which the works will be Clearly Audible (6-15 dB(A) above NML).

Refer to the following detailed Noise Assessments in **Appendix B**:

9 - North Zone Evening Period

10 - North Zone Night Period

Block 3 – Asphalt Works (Starting 13/09/21)

The predicted maximum worst case cumulative noise level (LAeq, 15 min) is 63dB(A).

There are 11 receivers that will be 'Moderately impacted' (16-25 dB(A) above NML)

There are 153 receivers for which the works will be Clearly Audible (6-15 dB(A) above NML). A large proportion of the 153 receivers are located on the opposite side of a ridge from the location of the works and will be unlikely to hear any noise, however due to the limitations of the noise model, this is not considered.

During the evening and night periods in the middle section of works noise blankets will be set up on site at the start of works parallel to the below properties.

- 117 Lookout Rd, New Lambton Heights
- 121A Lookout Rd, New Lambton Heights
- 121B Lookout Rd, New Lambton Heights
- 121C Lookout Rd, New Lambton Heights
- 119 Lookout Rd, New Lambton Heights

Refer to the following detailed Noise Assessments in **Appendix B**:

3 - Middle Zone Evening Period

4 - Middle Zone Night Period

11 - North Zone Evening Period

12 - North Zone Night Period

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17 - South Zone Evening Period
18 - South Zone Night Period

Block 4 – Line marking and Barrier Works (Starting 20/09/21)

The predicted maximum worst case cumulative noise level (LAeq, 15 min) is 62dB(A).
There are six receivers that will be 'Moderately impacted' (16-25 dB(A) above NML)
There are 12 receivers for which the works will be Clearly Audible (6-15 dB(A) above NML)

Refer to the following detailed Noise Assessments in **Appendix B**:
5 - Middle Zone Evening Period
6 - Middle Zone Night Period
13 - North Zone Evening Period
14- North Zone Night Period
19 - South Zone Evening Period
20 - South Zone Night Period

Predicted Vibration Impacts:

No vibration impacts are predicted as a result of these works. No plant or equipment will encroach within the minimum safe working distance (18m).
The activity is not considered to encroach into either "human comfort" or "structural damage" vibration criteria, based on distance, and equipment and methodology used (rubber tyred plant completing non-vibratory activities).

E. Proposed mitigation measures, including respite

Traffic staging has been developed to enable some access to the median during the day, to carry out work during a limited daytime window. Some highly intrusive work such as sawcuting and concrete demolition will be carried out during these times to mitigate the amount of intrusive works at night. In addition, the works have been planned in short blocks to provide respite to the affected receivers. Work and respite periods proposed are as follows:

Work Block 30/8/21 – 2 nights
Respite – 7 Nights
Work Block 8/9/21 – 1 night
Respite – 4 Nights
Work Block 13/9/21 – 3 nights
Respite – 4 Nights
Work Block 20/9/21 – 2 nights

The following mitigation measures were proposed based on those identified in the *OOHW Protocol – Section 5.1* and *Table 5-1: Hierarchy for application of additional mitigation for airborne noise.*

Standard Mitigation Measures (OOHW Protocol):

- Modifying behavioural practices on site
- Equipment selection / maintaining and monitoring plant
- Use and siting of plant and hoardings
- Site inductions
- Use of non-tonal reversing alarms
- Stakeholder notification
- Planning noisier work to be carried out earlier in the period.

NVMP Mitigation measures:

- Noise blankets to be set up outside of five (5) properties along Lookout Rd to reduce the noise impacts during OOH Block 3 (Asphalting).
- Reduction of machinery usage outside these properties during the night period is also noted.
- Where practical, operating machines at low speed / power and switching them off when not in use rather than leaving them idling for prolonged periods;
- Minimising the reversing of machines;
- All employees, contractors and subcontractors are to receive an environmental induction.
- No swearing or unnecessary shouting or loud stereos/radios on site.
- Limit compression braking at night in residential areas.
- No dropping of materials from height, throwing of metal items and slamming of doors.

Additional Mitigation Measures (OOHW Protocol):

For Residents 5-15 dB(A) above NML

- Notification
- Verification
- Duration Respite

For Residents 15-25 dB(A) above NML

- Phone Call / Individual Briefing
- Duration Respite
- Respite offer period 2
- Verification

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F. Community consultation

Outline consultation undertaken for the proposed OOHW:

Individual briefings (phone calls) have been carried out for the residential properties identified in the 'Moderately Intrusive' classification (15-25 dB(A) above NML). This briefing included gaining approval from the six of the seven properties that exceeded 25 dB(A) above the RBL as follows:

121B LOOKOUT ROAD NEW LAMBTON HEIGHTS [redacted]
121C LOOKOUT ROAD NEW LAMBTON HEIGHTS
85 LOOKOUT ROAD NEW LAMBTON HEIGHTS
119 LOOKOUT ROAD NEW LAMBTON HEIGHTS
83 LOOKOUT ROAD NEW LAMBTON HEIGHTS
117 LOOKOUT ROAD NEW LAMBTON HEIGHTS
138 LOOKOUT ROAD NEW LAMBTON HEIGHTS

The properties identified in Appendix A, B, C, D E & F of the Noise Impact Assessments will be provided a written notification describing the upcoming OOH works and likely impacts. Refer to **Appendix D** for draft notification letters to be delivered no more than 5 days prior to undertaking the works.

Has respite periods for OOHW been identified with the affected community on a monthly basis and a three-month schedule of likely OOHW provided (refer CoA E29)?

Yes, likely OOHW identified in 3 monthly look-ahead notification which covers likely OOHW. Notification was delivered to community on 11th August. Additional notifications were delivered on 17/08/21 to cover the residents identified in the noise modelling that were not within the original delivery area.

Respite has been taken into account as works have been spread out in order to grant extensive respite to impacted properties.

Has the outcome of community consultation, the identified respite periods and scheduling of likely OOHW been provided to the ER, EPA and Planning Secretary?

The schedule of OOHW is provided to the ER, EPA and the Planning Secretary on a monthly basis. Transport for NSW also provides further detail on the community consultation and respite to the ER and Planning Secretary through the OOHW application process when relevant to OOHW, and when approval is sought. The EPA will be provided with relevant information through the six-monthly compliance reporting process by Transport.

G. Respite framework

Outline any previous respite within the last month and the status of community agreements (where relevant)?

Previous OOHW scheduled on 16th August providing 2 weeks respite before this activity.

Have cumulative impacts from OOHW permitted by an EPL been considered during the development appropriate respite?

N/A

H. Details of non-residential receivers (if any) and corresponding NMLs

Comments:

Using the current noise assessment software it is noted that noise at the nearby sensitive receiver of John Hunter Hospital will not exceed the NML of 38db(A) during the planned works.

I. Are there any properties at risk of exceeding the screening criteria for cosmetic damage?

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Comments: No – All properties are >18m from works.			
I. Review/ Endorsements			
Contractor Community Liaison Representative	Individual briefings have been carried out for 12 most affected residents as detailed above		Date: 12 Aug 2021
	The affected sensitive receivers will be notified no later than 5 days prior to start of work via letter		
	Have the works been reviewed and endorsed?		Yes
	Name:	Signature:	Date:
	Nikki Taylor	[redacted]	12/08/21
	Comments:		
Transport for NSW Environmental Manager (or delegate)	Agreed mitigation measures:		
	Have the works been reviewed and endorsed? Have the works been approved where neither low or high risk?		Yes / ~~No~~ ~~Yes~~ / No
	Name:	Signature:	Date:
	Andrew Grainger	[redacted]	23/08/2021
	Comments:		
Transport for NSW Project Manager	Have the works been reviewed and endorsed? Have the works been approved where neither low or high risk?		Yes / ~~No~~ ~~Yes~~ / No
	Name:	Signature:	Date:
	Brett Kendall	[redacted]	24/08/2021
	Comments: Works to suit contractor's methodology		
ER approval (low risk activities)	Are the works approved?		Yes / No
	Name:	Signature:	Date:
	Simon Williams	[redacted]	24/08/2021
	Comments:		
Planning Secretary approval (high risk activities)	Are the works approved?		Yes / No
	Name:	Signature:	Date:
	Comments:		

Appendix A – Detailed Schedule of Activities

SHIFT NO.	PLANNED DATE	LOCATION	ACTIVITIES & SEQUENCE	PLANT USED	REF. NOISE ASSESSMENTS
1	**Mon, 30 Aug 21**	Lookout Rd - NB & SB Carriageways CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Complete Edge Line Removal for NB and SB Traffic Switch 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Linemarking Ginding Unit Road Sweeper	1 - Middle Zone Evening Period 2 - Middle Zone Night Period 7 - North Zone Evening Period 8 - North Zone Night Period 15 - South Zone Evening Period 16 - South Zone Night Period
2	**Tue, 31 Aug 21**	Lookout Rd - NB & SB Carriageways CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Complete Lane Line Removal and Linemarking for NB and SB Traffic Switch 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Linemarking truck Linemarking Ginding Unit Road Sweeper	1 - Middle Zone Evening Period 2 - Middle Zone Night Period 7 - North Zone Evening Period 8 - North Zone Night Period 15 - South Zone Evening Period 16 - South Zone Night Period
			RESPITE PERIOD		
3	**Wed, 8 Sep 21**	Lookout Rd - Median CH7360 to 7685	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Excavate out and place select backfill material at Northern intersection. 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 13T Excavator Positrack Loader Bogie Tippers x 2 8T Roller	9 - North Zone Evening Period 10 - North Zone Night Period
			RESPITE PERIOD		
4	**Mon, 13 Sep 21**	Lookout Rd - Entire Median CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Place and Compact Asphalt Pavement Layers including: AC20 Layer 1 & 2 in Soutern Zone AC20 Layer 1 at McCaffery Intersection 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Asphalt Paver Asphalt Delivery Trucks x 2 Smooth Drum Roller Multi Tyred Roller Emulsion Truck Bobcat	3 - Middle Zone Evening Period 4 - Middle Zone Night Period 11 - North Zone Evening Period 12 - North Zone Night Period 17 - South Zone Evening Period 18 - South Zone Night Period
5	**Tue, 14 Sep 21**	Lookout Rd - Entire Median CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Place and Compact Asphalt Pavement (AC20) Intermediate Layer 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Asphalt Paver Asphalt Delivery Trucks x 2 Smooth Drum Roller Multi Tyred Roller Emulsion Truck Bobcat	3 - Middle Zone Evening Period 4 - Middle Zone Night Period 11 - North Zone Evening Period 12 - North Zone Night Period 17 - South Zone Evening Period 18 - South Zone Night Period
6	**Wed, 15 Sep 21**	Lookout Rd - Entire Median CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Profile 150mm Keys into existing asphalt pavement Place and Compact Asphalt Pavement (AC14) Wearing Course 0345 - 0415: Clean up, reinstate bollards and barrier boards and de-mobilise from median 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Asphalt Paver Asphalt Delivery Trucks x 2 Smooth Drum Roller Multi Tyred Roller Emulsion Truck Bobcat	3 - Middle Zone Evening Period 4 - Middle Zone Night Period 11 - North Zone Evening Period 12 - North Zone Night Period 17 - South Zone Evening Period 18 - South Zone Night Period
			RESPITE PERIOD		
7	**Mon, 20 Sep 21**	Lookout Rd - Entire Median CH7220 to 7700	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Line Removal and Linemarking for SB Traffic Switch. Placement of Temp Concrete Barriers on SB Shoulder (220LM) CH 7480 to CH7700 0345 - 0415: Clean up, de-mobilise from road 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Linemarking truck Linemarking Ginding Unit Road Sweeper Semi-trailer Trucks x 2 17T Wheeled Excavator	5 - Middle Zone Evening Period 6 - Middle Zone Night Period 13 - North Zone Evening Period 14 - North Zone Night Period 19 - South Zone Evening Period 20 - South Zone Night Period
8	**Tue, 21 Sep 21**	Lookout Rd CH7220 to 7460	1900 - 1930: Complete pre-start briefing with project team at compound 1930 - 1945: Set up traffic control and close northbound and southbound lanes 2015 - 2030: Mobilise equipment to the work area 2030 - 0400: Placement of Temp Concrete Barriers on SB Shoulder (220LM) CH 7240 to CH7460 0345 - 0415: Clean up, de-mobilise from road 0415 – 0500: Remove traffic control and reopen lanes to traffic	Lighting Towers x 2 Semi-trailer Trucks x 2 17T Wheeled Excavator	5 - Middle Zone Evening Period 6 - Middle Zone Night Period 13 - North Zone Evening Period 14 - North Zone Night Period 19 - South Zone Evening Period 20 - South Zone Night Period

Appendix B - RP2J - Southern Utilities - Noise Impact Assessments

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	69 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	0
10 – 20 dB above NML	4
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	1
Clearly audible	6 – 15 dB above NML	4
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 3 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

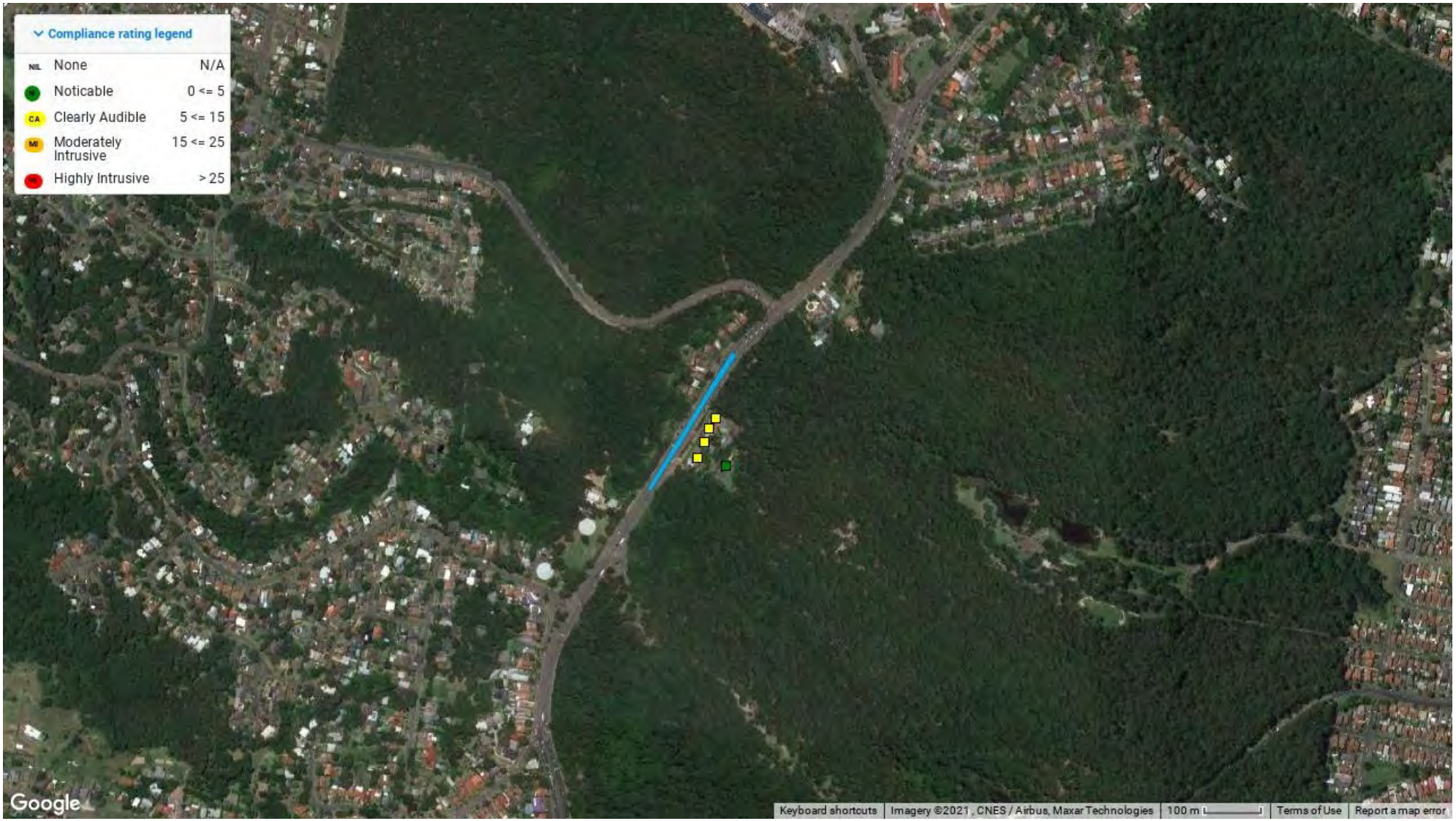
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	5	95
Line Marking Removal Plant	1	30 %	5	90
Line Marking Plant	1	30 %	5	83
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 99

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	68	14	**Clearly Audible**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	64	10	**Clearly Audible**
	517656	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	66	12	**Clearly Audible**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	69	15	**Clearly Audible**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	62 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	6
10 – 20 dB above NML	1
20+ dB above NML	3

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	2
Moderately impacted	16 – 25 dB above NML	4
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

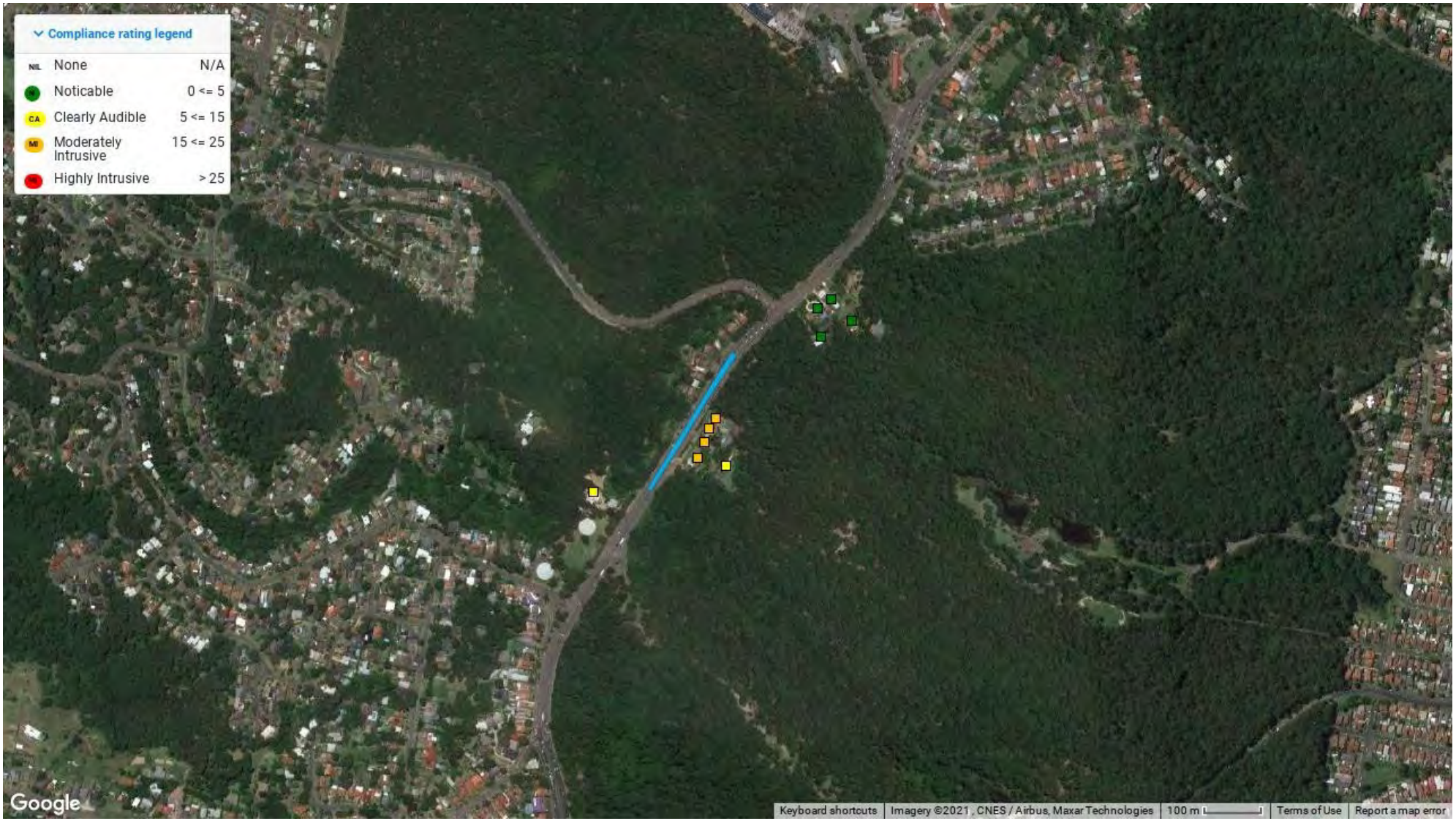
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	5	95
Line Marking Removal Plant	1	30 %	5	90
Line Marking Plant	1	30 %	5	83
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 99

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	61	23	**Moderately Intrusive**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	58	20	**Moderately Intrusive**
	517657	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517656	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	**Moderately Intrusive**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	62	24	**Moderately Intrusive**
	517525	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517523	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517517	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517503	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
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- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	69 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	0
10 – 20 dB above NML	4
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	1
Clearly audible	6 – 15 dB above NML	4
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 3 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

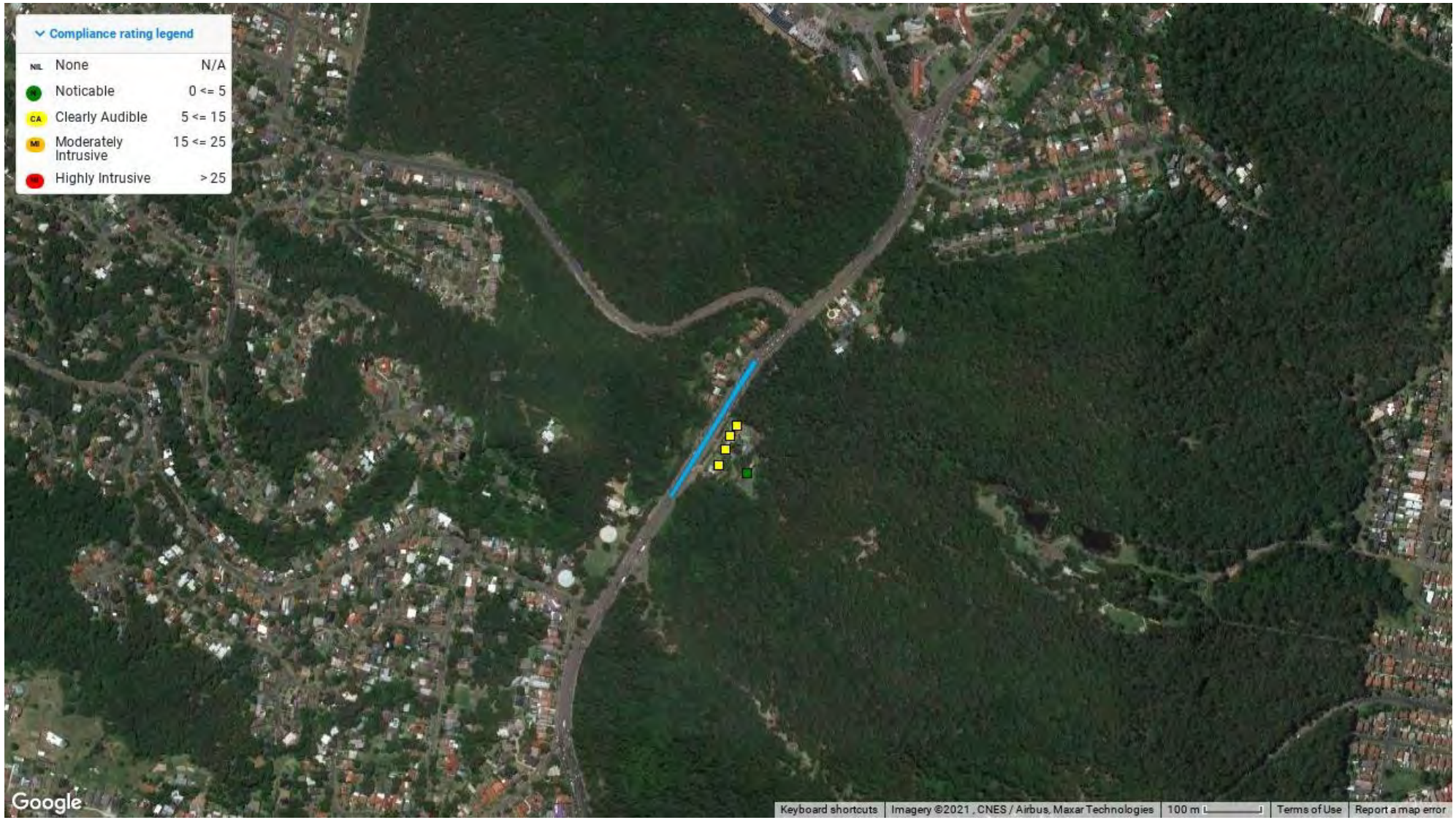
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Paving Machine	1	40 %	5	103
Bitumen Spray Truck	1	30 %	5	90
Vibratory Roller (10 tonne)*	1	10 %	5	95
Bobcat / skidsteer large	1	30 %	5	99
Truck (12-15 tonne)	2	20 %	5	97
Daymakers / Lighting plant	2	100 %	5	91

Activity Sound Power Level: 106

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	68	14	**Clearly Audible**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	64	10	**Clearly Audible**
	517656	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	66	12	**Clearly Audible**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	69	15	**Clearly Audible**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	63 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	5
10 – 20 dB above NML	1
20+ dB above NML	4

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	6
Clearly audible	6 – 15 dB above NML	2
Moderately impacted	16 – 25 dB above NML	4
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

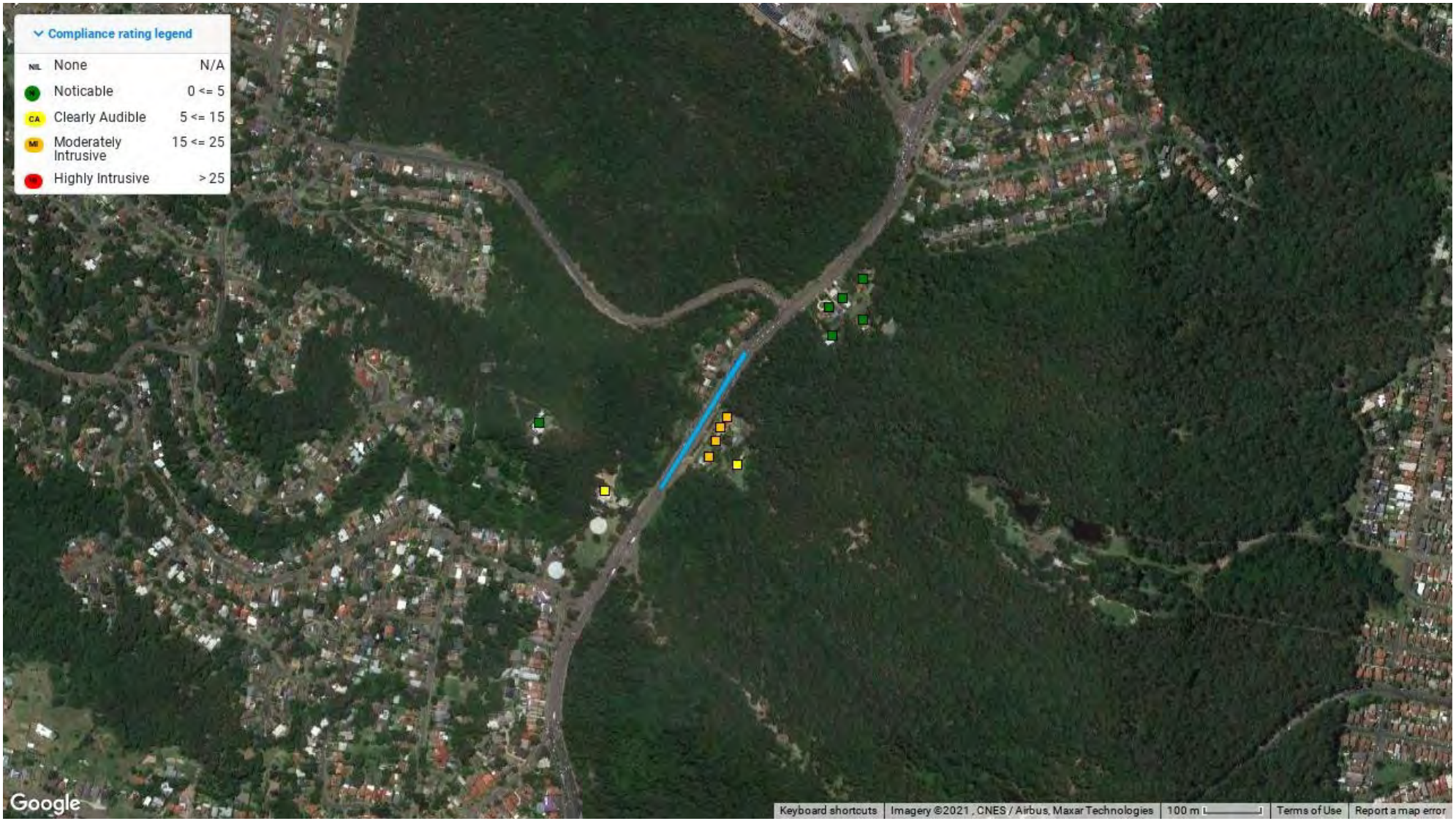
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Paving Machine	1	5 %	5	94
Bitumen Spray Truck	1	10 %	5	85
Vibratory Roller (10 tonne)*	1	5 %	5	92
Bobcat / skidsteer large	1	10 %	5	94
Truck (12-15 tonne)	2	5 %	5	91
Daymakers / Lighting plant	2	100 %	5	91

Activity Sound Power Level: 100

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	62	24	**Moderately Intrusive**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	58	20	**Moderately Intrusive**
	517657	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	517656	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	**Moderately Intrusive**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	63	25	**Moderately Intrusive**
	517606	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517525	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517523	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517521	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517517	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	517503	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	65 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	3
10 – 20 dB above NML	1
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	0
Clearly audible	6 – 15 dB above NML	4
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

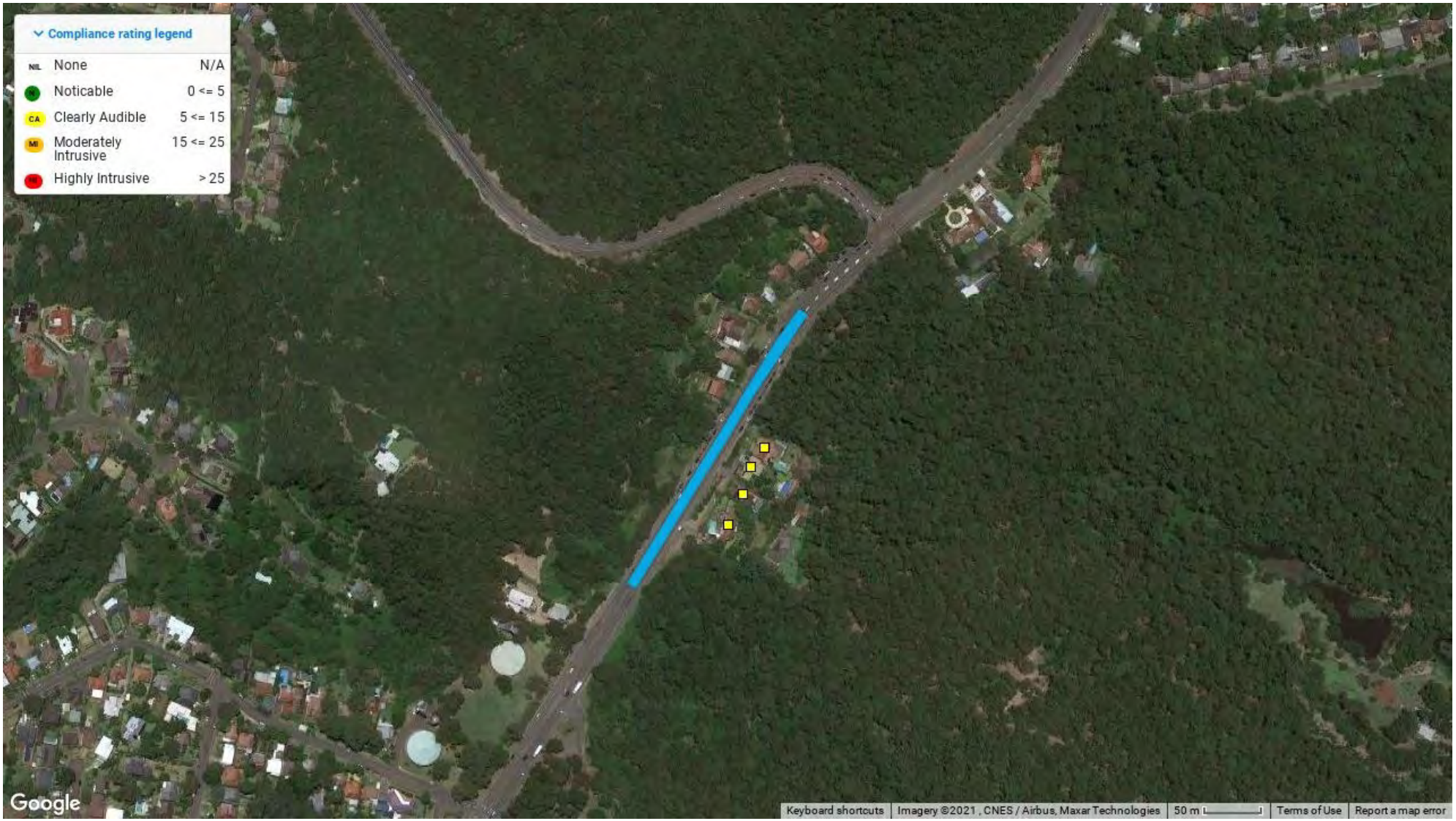
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	5	95
Line Marking Plant	1	30 %	5	83
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	30 %	0	99

Activity Sound Power Level: 102

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	64	10	**Clearly Audible**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	60	6	**Clearly Audible**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	61	7	**Clearly Audible**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	65	11	**Clearly Audible**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP21 Median		
Proponent	Quickway		
Assessment Date	12/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	62 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	6
10 – 20 dB above NML	1
20+ dB above NML	3

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	2
Moderately impacted	16 – 25 dB above NML	4
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

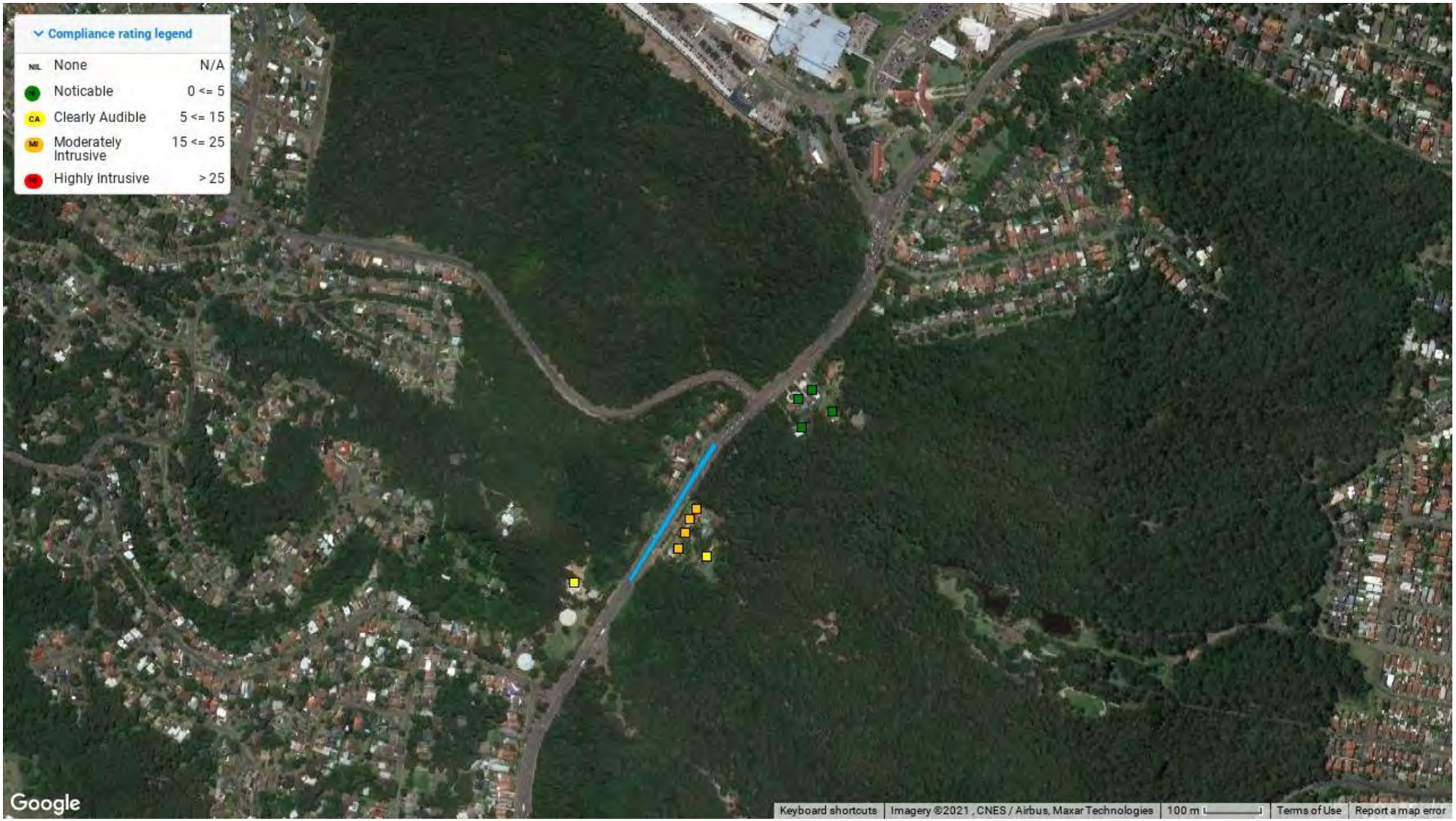
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	5	95
Line Marking Plant	1	30 %	5	83
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	30 %	0	99

Activity Sound Power Level: 102

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP21 Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517664	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	61	23	**Moderately Intrusive**
	517663	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	58	20	**Moderately Intrusive**
	517657	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517656	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517654	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	**Moderately Intrusive**
	517653	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	62	24	**Moderately Intrusive**
	517525	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517523	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517517	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517503	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	52 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	0
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	0
Clearly audible	6 – 15 dB above NML	0
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

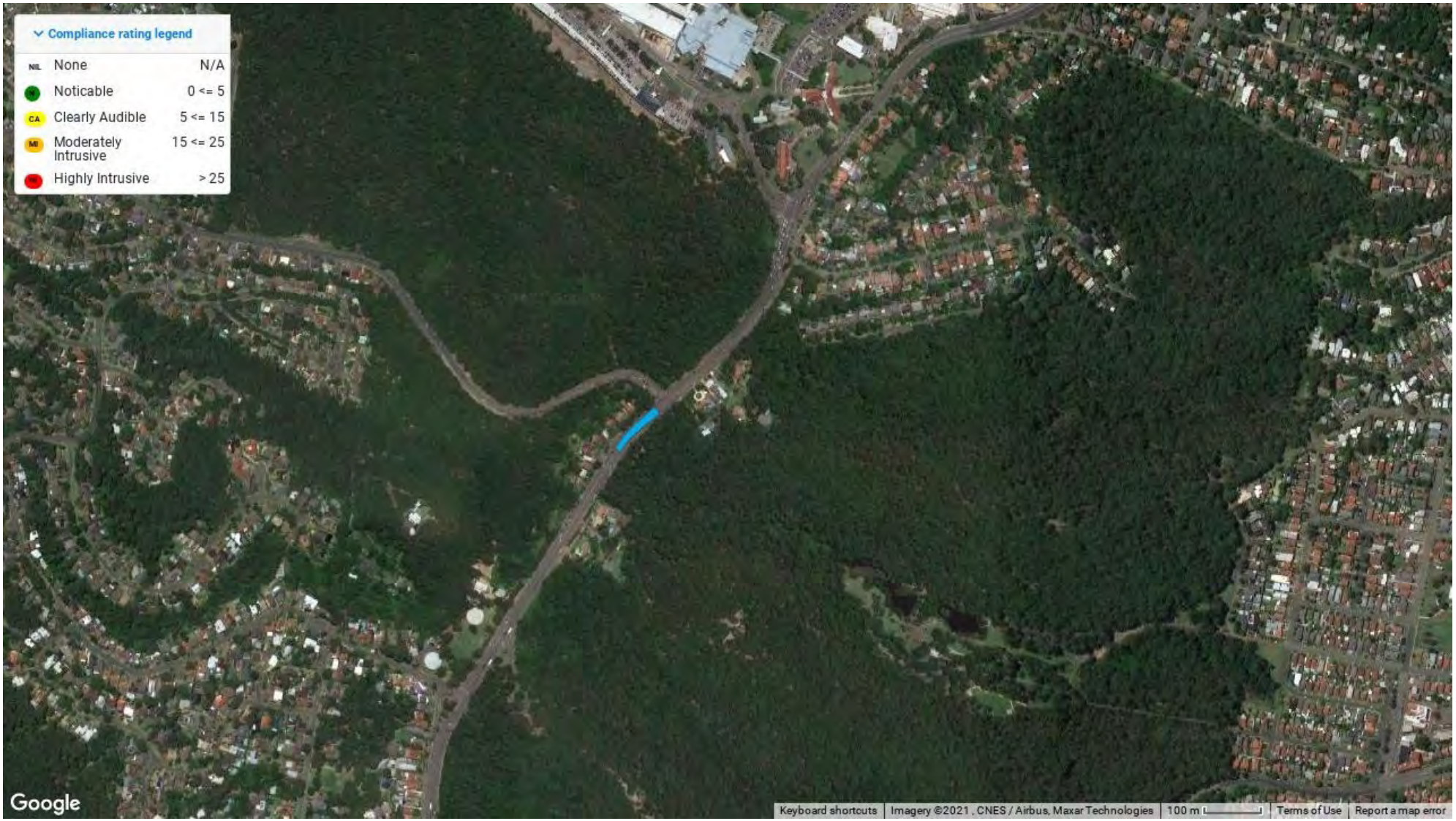
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Removal Plant	1	40 %	0	96
Line Marking Plant	1	40 %	0	89
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
«TableStart:ComplianceItems» «NcaFriendlyName»	«ReceiverId»	«AddressFriendlyName»	«LandUse»	«NML»	«PredictedCumulativeLAEq»	«NMLExceedence»	**«ImpactClass»** «TableEnd:ComplianceItems»

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	52 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	10
10 – 20 dB above NML	4
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	7
Clearly audible	6 – 15 dB above NML	10
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

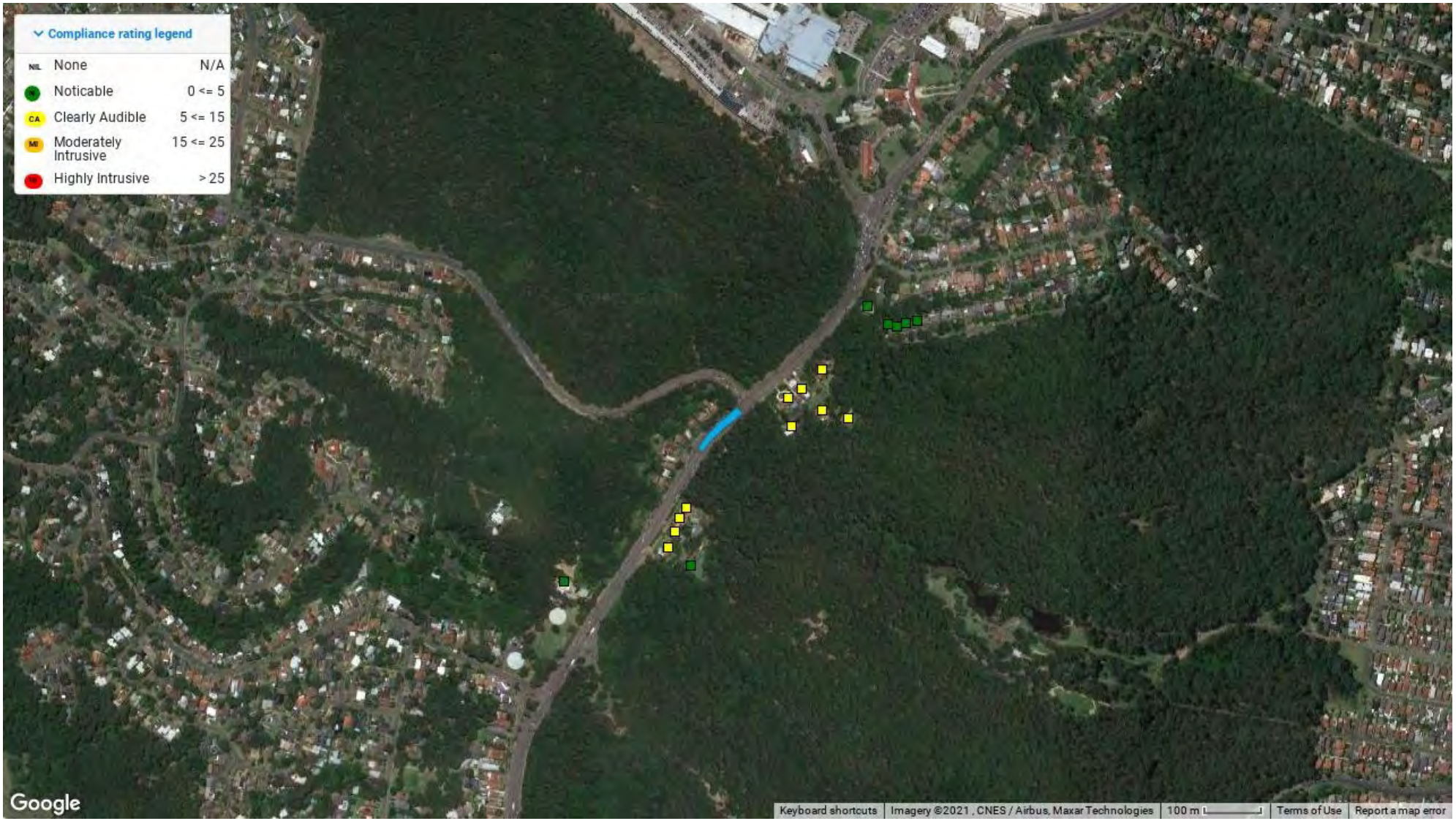
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Removal Plant	1	40 %	0	96
Line Marking Plant	1	40 %	0	89
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	517781	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517775	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517772	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517771	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517770	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517728	38 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517727	34 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517712	32 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517708	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517707	79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	517701	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517697	36 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	517687	71 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 08/09/2021 and would be completed by 09/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
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Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
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IB = Individual briefings
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RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

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Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

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Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	58 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	2
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	0
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

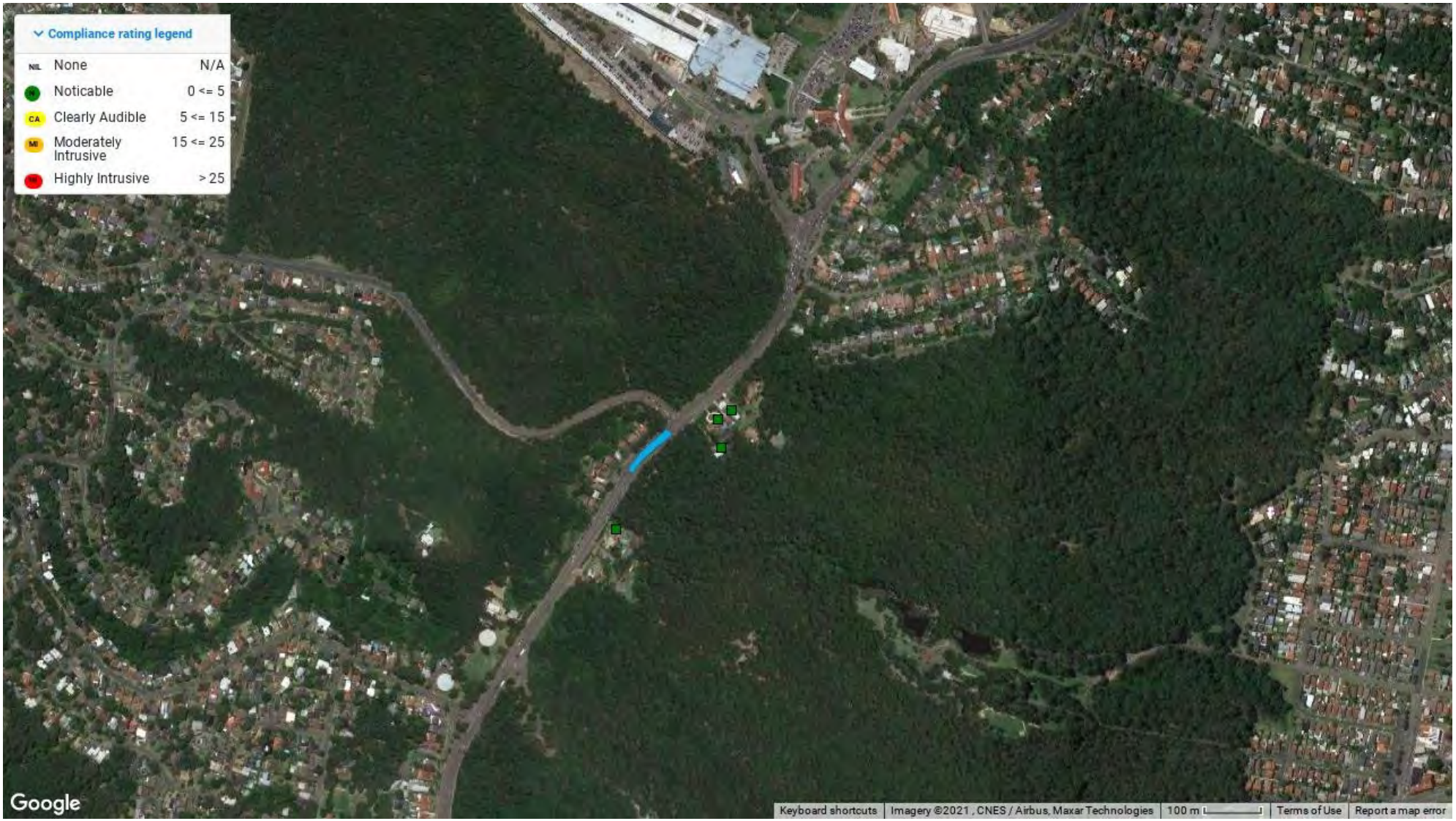
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Excavation

Equipment	Quantity	Usage	Reduction	SWL
Bobcat / skidsteer large	1	30 %	0	104
Vibratory Roller (10 tonne)*	1	10 %	0	100
Excavator (12 tonne)	1	40 %	0	100
Truck (12-15 tonne)	2	30 %	0	104
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 109

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	57	3	**Noticable**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	58	4	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

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Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 08/09/2021 and would be completed by 09/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	60 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	55
10 – 20 dB above NML	9
20+ dB above NML	2

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	19
Clearly audible	6 – 15 dB above NML	39
Moderately impacted	16 – 25 dB above NML	8
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

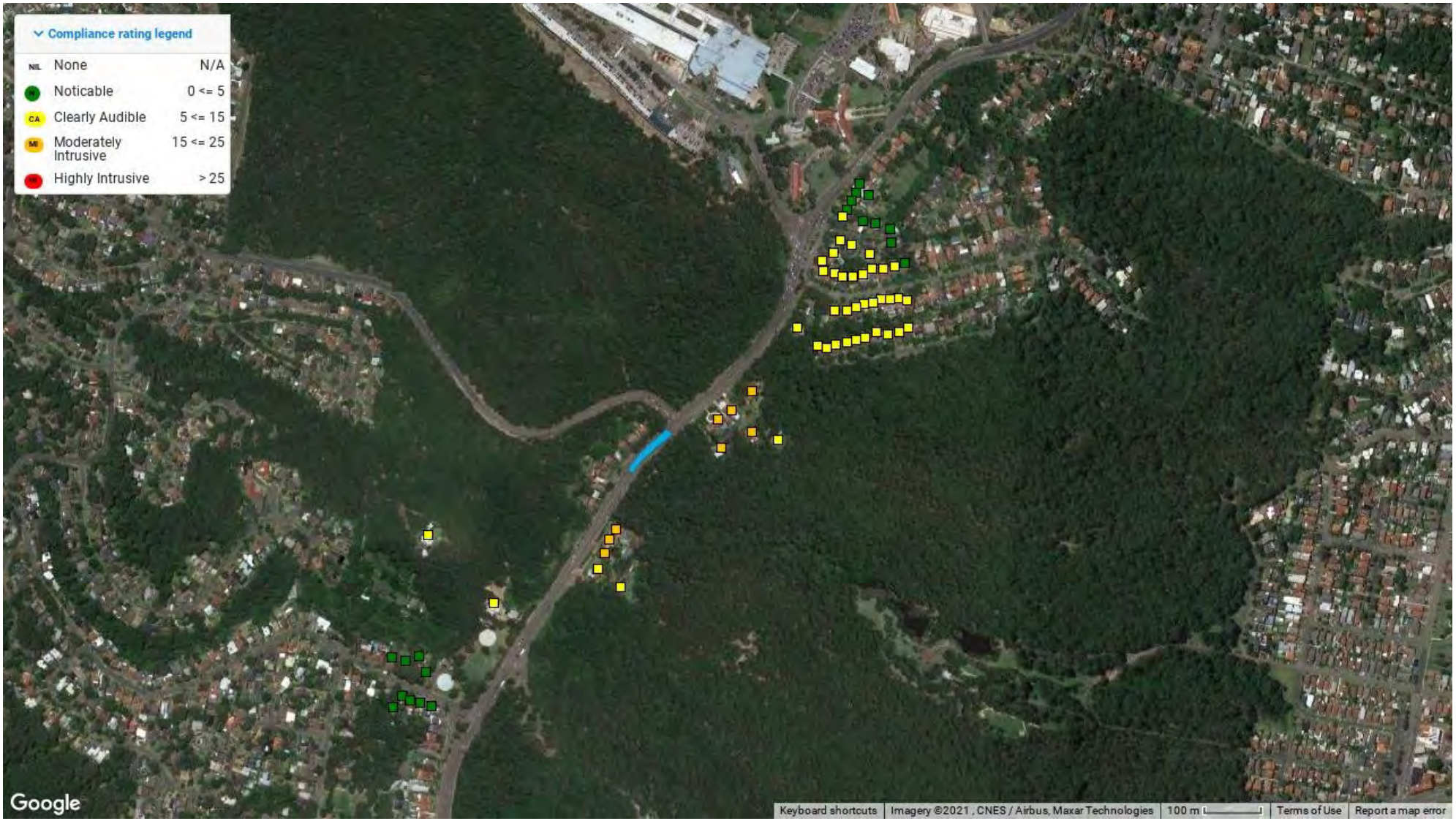
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Excavation

Equipment	Quantity	Usage	Reduction	SWL
Bobcat / skidsteer large	1	30 %	0	104
Vibratory Roller (10 tonne)*	1	10 %	0	100
Excavator (12 tonne)	1	40 %	0	100
Truck (12-15 tonne)	2	30 %	0	104
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 109

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	57	19	**Moderately Intrusive**
	517781	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**
	517775	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517772	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	**Moderately Intrusive**
	517771	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	55	17	**Moderately Intrusive**
	517770	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	517764	7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517761	10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517758	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517757	14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517756	5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517753	9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	517752	12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517750	160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	42	4	**Noticable**
	517749	3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517748	16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517741	1 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	NONE	38	44	6	**Clearly Audible**
	517734	14 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517733	13 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517730	6 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517728	38 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517727	34 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517725	10 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517723	18 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517718	30 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517717	5 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517716	12 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517715	5 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517714	8 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517713	20 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517712	32 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517711	4 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517710	6 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517709	53 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517708	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	517707	79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	**Moderately Intrusive**
	517705	51 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517704	16 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517703	26 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517702	9 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517701	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	517699	3 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517698	15 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517697	36 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	57	19	**Moderately Intrusive**
	517695	2 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517694	1 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517693	24 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517692	4 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517691	45B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517690	61 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	45	7	**Clearly Audible**
	517689	3 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517688	22 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517687	71 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	517685	47 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517684	7 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517683	11 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517682	2 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517681	59 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517679	UNIT 1/ 7 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517678	28 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517677	49 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517676	1A RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517675	8 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	60	22	**Moderately Intrusive**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
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IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
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Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	60 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	5
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	5
Clearly audible	6 – 15 dB above NML	1
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

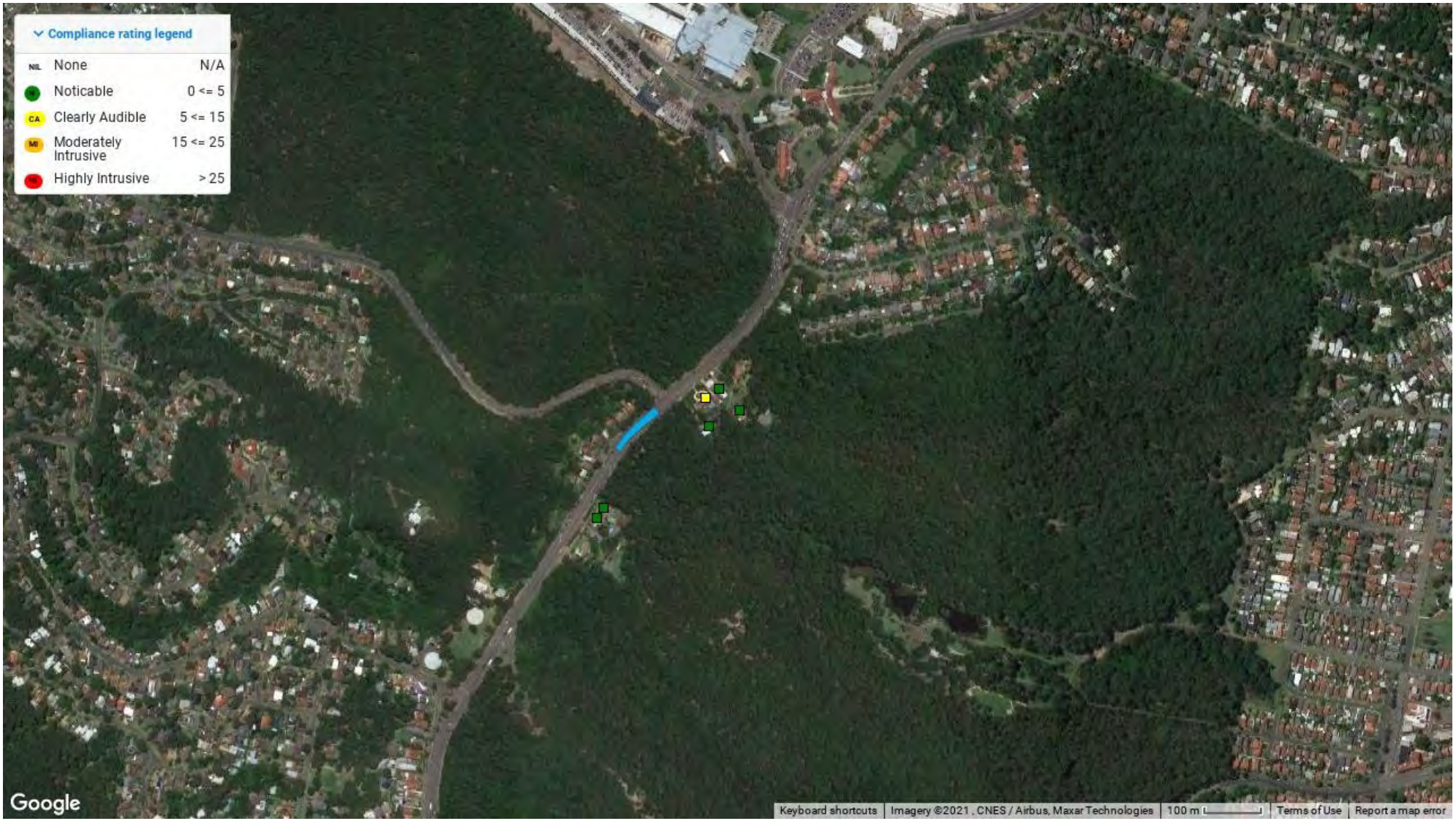
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Vibratory Roller (10 tonne)*	1	10 %	0	100
Truck (12-15 tonne)	2	20 %	0	102
Paving Machine	1	40 %	0	108
Bobcat / skidsteer large	1	30 %	0	104
Bitumen Spray Truck	1	30 %	0	95
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 111

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	57	3	**Noticable**
	517771	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	517708	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	59	5	**Noticable**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	57	3	**Noticable**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	60	6	**Clearly Audible**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	60 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	55
10 – 20 dB above NML	9
20+ dB above NML	2

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	19
Clearly audible	6 – 15 dB above NML	39
Moderately impacted	16 – 25 dB above NML	8
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact

Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Vibratory Roller (10 tonne)*	1	10 %	0	100
Truck (12-15 tonne)	2	20 %	0	102
Paving Machine	1	40 %	0	108
Bobcat / skidsteer large	1	30 %	0	104
Bitumen Spray Truck	1	30 %	0	95
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 111

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	57	19	**Moderately Intrusive**
	517781	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**
	517775	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517772	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	**Moderately Intrusive**
	517771	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	55	17	**Moderately Intrusive**
	517770	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	517764	7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517761	10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517758	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517757	14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517756	5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517753	9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	517752	12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517750	160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	42	4	**Noticable**
	517749	3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517748	16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517741	1 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	NONE	38	44	6	**Clearly Audible**
	517734	14 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517733	13 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517730	6 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517728	38 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517727	34 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517725	10 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517723	18 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517718	30 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517717	5 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517716	12 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517715	5 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517714	8 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517713	20 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517712	32 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517711	4 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517710	6 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517709	53 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517708	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	517707	79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	**Moderately Intrusive**
	517705	51 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517704	16 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517703	26 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517702	9 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517701	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	517699	3 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517698	15 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517697	36 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	57	19	**Moderately Intrusive**
	517695	2 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517694	1 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517693	24 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517692	4 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517691	45B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517690	61 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	45	7	**Clearly Audible**
	517689	3 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517688	22 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517687	71 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	517685	47 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	517684	7 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517683	11 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517682	2 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517681	59 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517679	UNIT 1/ 7 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517678	28 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517677	49 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	517676	1A RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	517675	8 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	60	22	**Moderately Intrusive**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	58 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	2
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	0
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

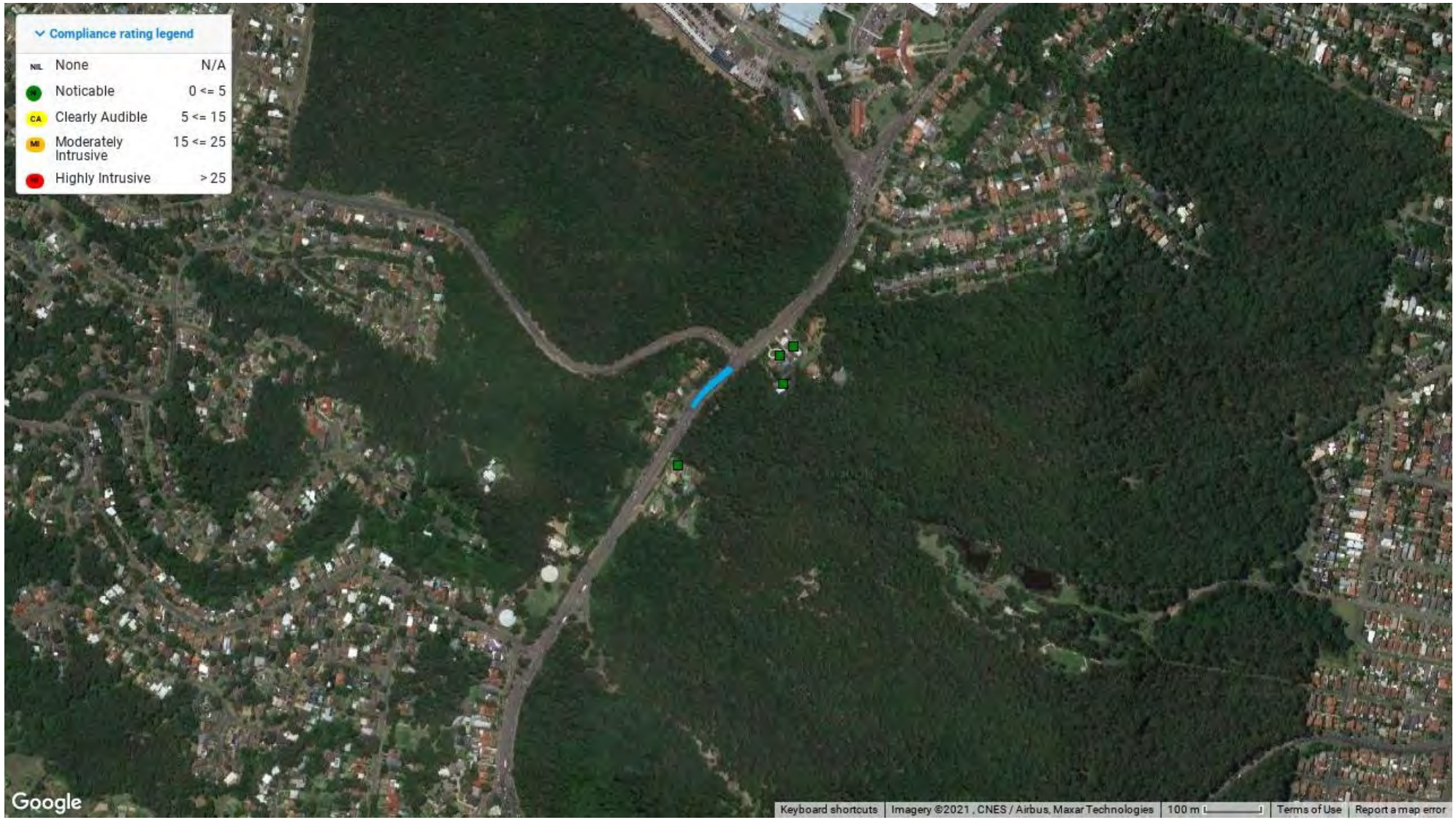
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Plant	1	40 %	0	89
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	30 %	0	99

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	57	3	**Noticable**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	58	4	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	11/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median North Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	53 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	11
10 – 20 dB above NML	4
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	11
Clearly audible	6 – 15 dB above NML	10
Moderately impacted	16 – 25 dB above NML	1
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

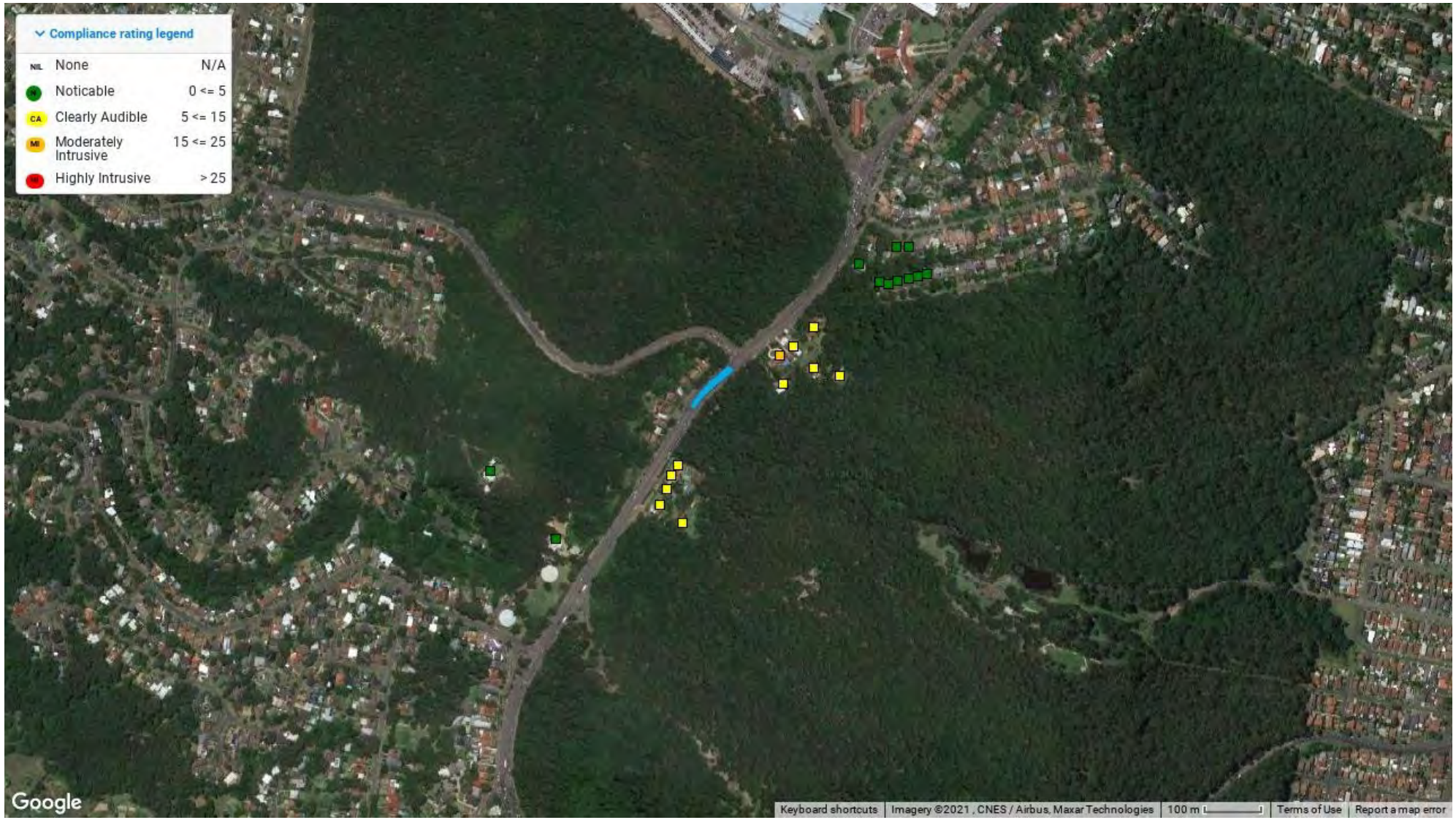
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Plant	1	40 %	0	89
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	30 %	0	99

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	517782	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	517781	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517775	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517772	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517771	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	517770	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	517758	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517728	38 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517727	34 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517718	30 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517712	32 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517708	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	517707	79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	517706	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	52	14	**Clearly Audible**
	517701	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	517697	36 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	517696	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	517694	1 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	517687	71 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	517678	28 FLORALIA CLOSE NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517676	1A RIDGEWAY ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	517674	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	**Moderately Intrusive**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	62 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	3
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	1
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

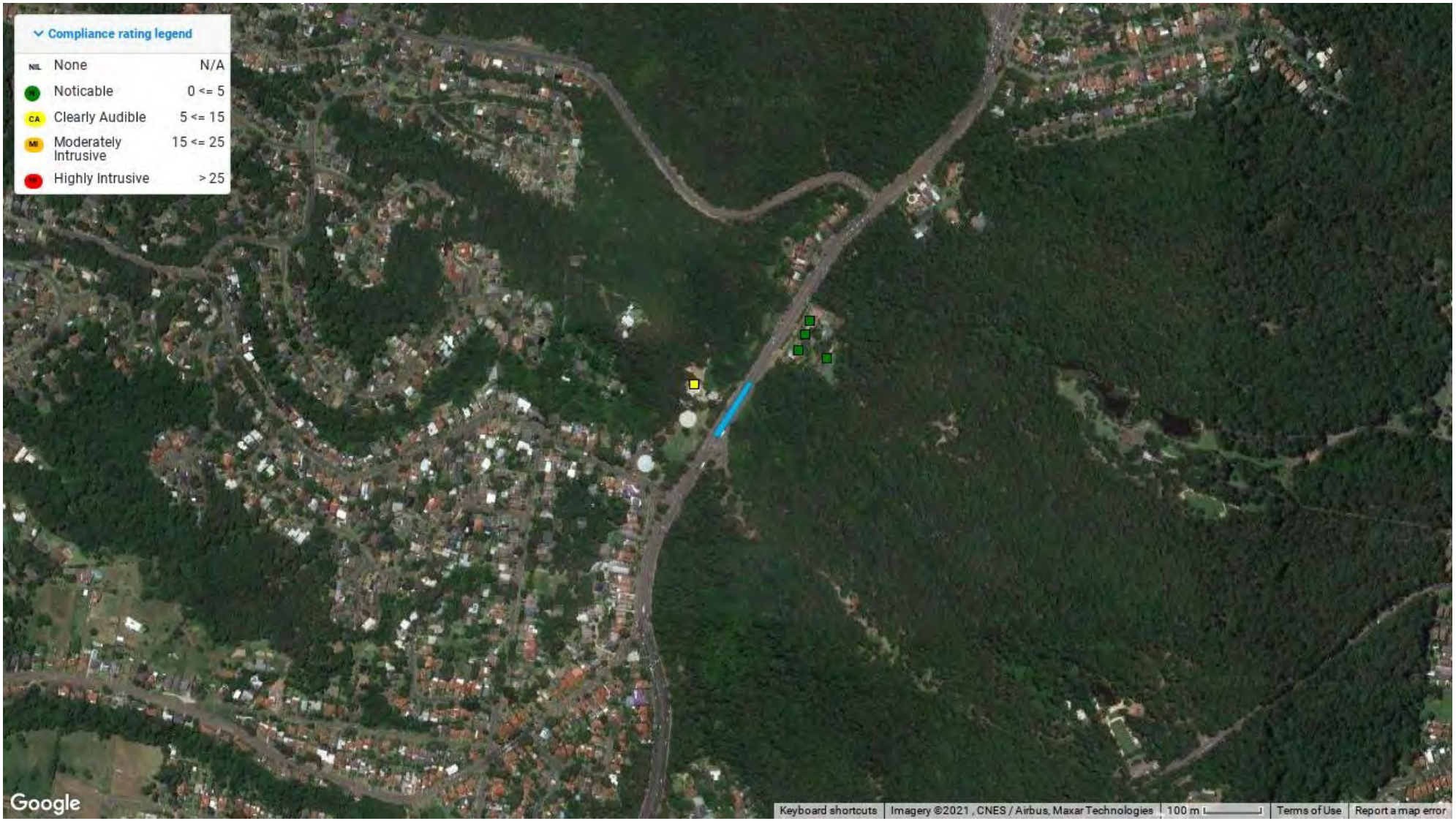
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Removal Plant	1	30 %	0	95
Line Marking Plant	1	30 %	0	88
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 102

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516937	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	59	5	**Noticable**
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	62	8	**Clearly Audible**
	516930	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	516928	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	56	2	**Noticable**
	516927	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 30/08/2021 and would be completed by 31/08/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	54 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	35
10 – 20 dB above NML	2
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	37
Clearly audible	6 – 15 dB above NML	11
Moderately impacted	16 – 25 dB above NML	1
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

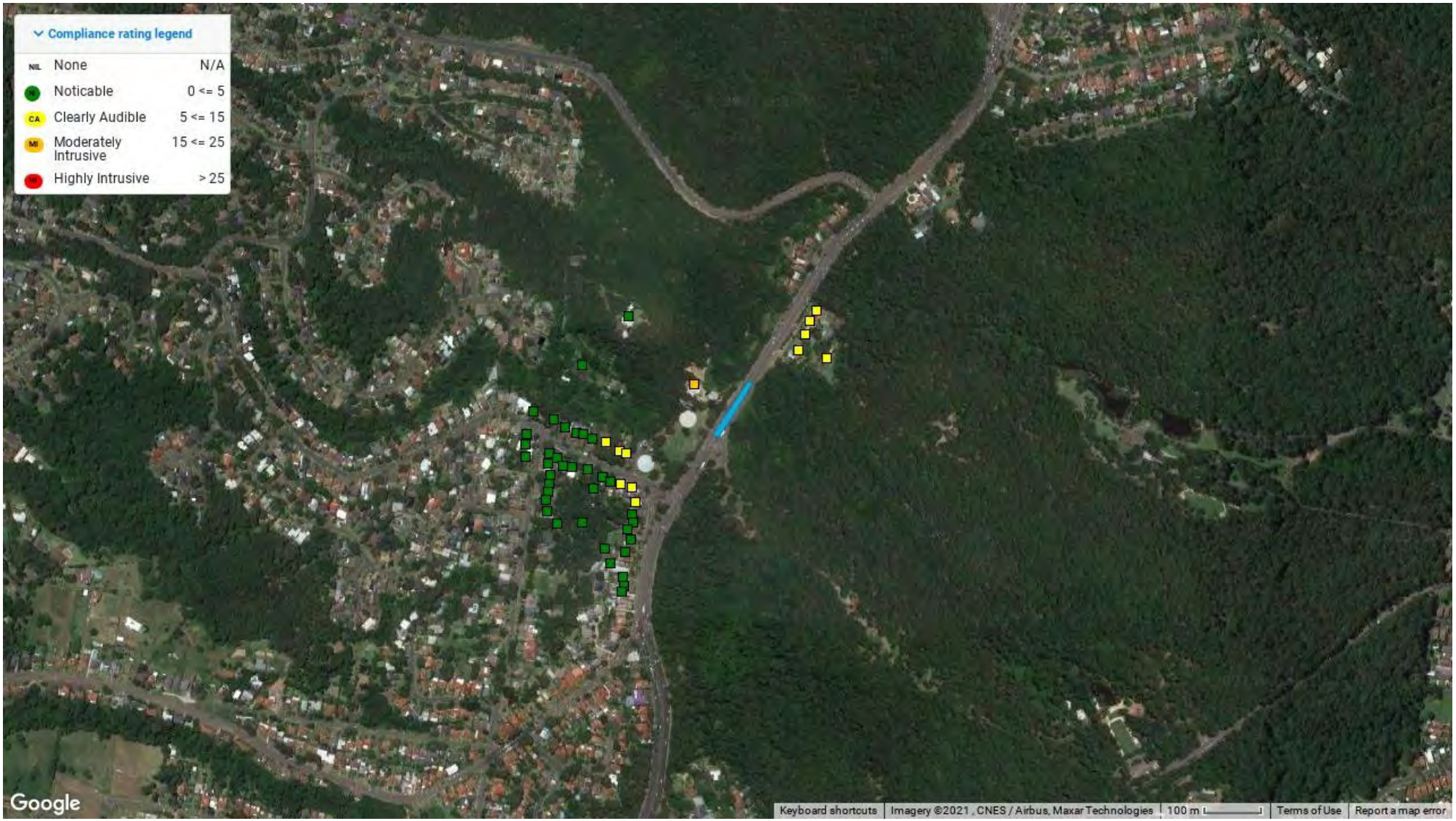
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Removal Plant	1	30 %	0	95
Line Marking Plant	1	30 %	0	88
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 102

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516938	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516937	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	516930	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516928	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516927	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516910	11 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516900	7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516898	12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516891	20 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516890	10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516888	3 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516884	9A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516866	172 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516862	11 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516857	21 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516855	17 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516852	1B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516849	9 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516848	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516847	180 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516841	14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516838	164 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516837	5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516835	18 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516824	24 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516820	168 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516819	2 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516814	19 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516809	2B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516799	7 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516798	9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516795	182 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516794	26 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516793	174A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516790	5A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516789	174 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516781	15 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516780	23 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516777	5 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516776	1 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516770	166 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516769	160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	44	6	**Clearly Audible**
	516768	170 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516765	3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516763	22 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516759	178 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516758	16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516756	NEW LAMBTON HEIGHTS INFANTS SC 176 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	39	1	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	62 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	3
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	4
Clearly audible	6 – 15 dB above NML	1
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

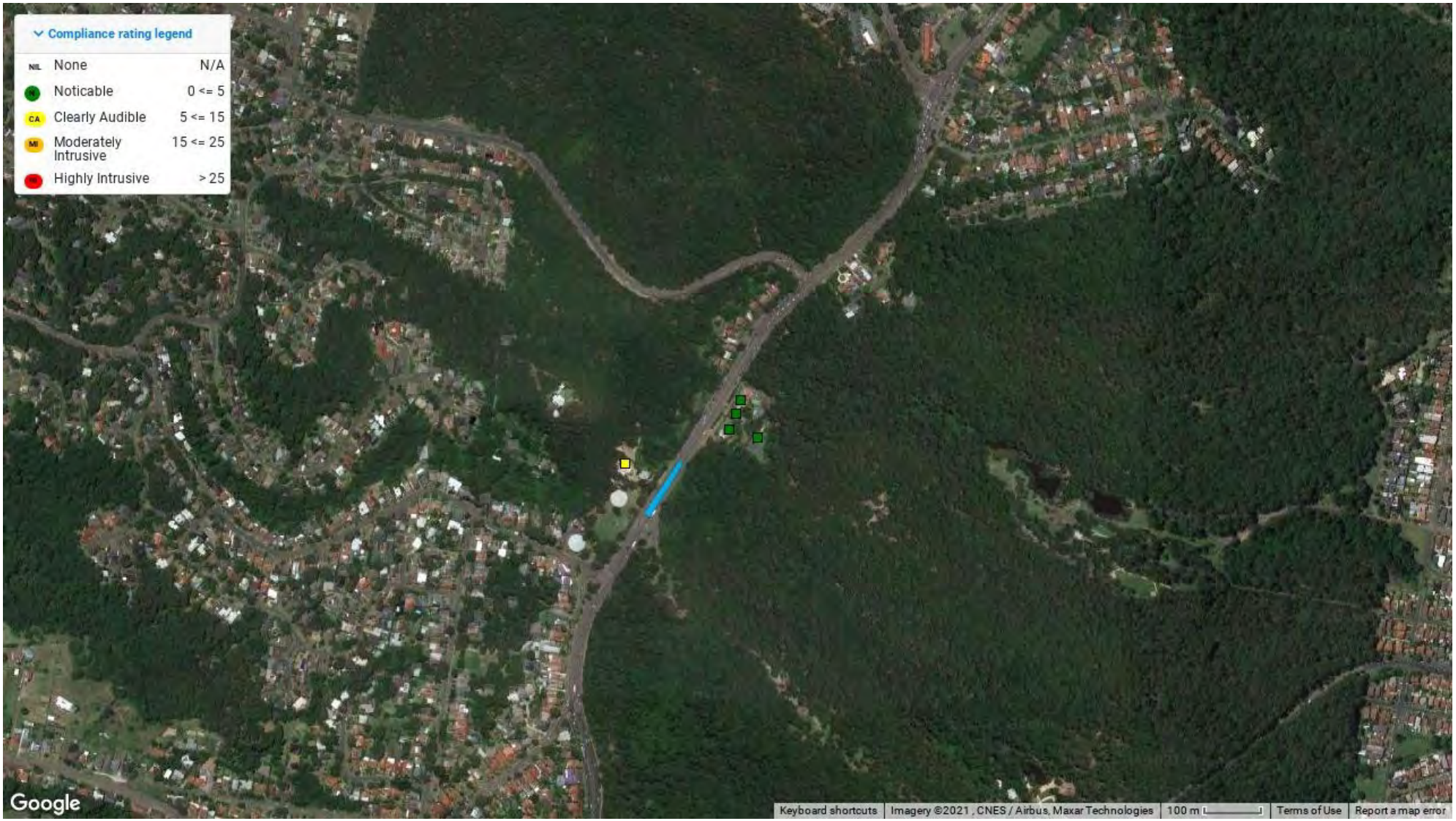
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Vibratory Roller (10 tonne)*	1	10 %	0	100
Truck (12-15 tonne)	2	20 %	0	102
Paving Machine	1	40 %	0	108
Bobcat / skidsteer large	1	30 %	0	104
Bitumen Spray Truck	1	30 %	0	95
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 111

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516937	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	59	5	**Noticable**
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	62	8	**Clearly Audible**
	516930	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	55	1	**Noticable**
	516928	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	56	2	**Noticable**
	516927	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 13/09/2021 and would be completed by 14/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	62 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	133
10 – 20 dB above NML	27
20+ dB above NML	2

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	33
Clearly audible	6 – 15 dB above NML	123
Moderately impacted	16 – 25 dB above NML	6
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

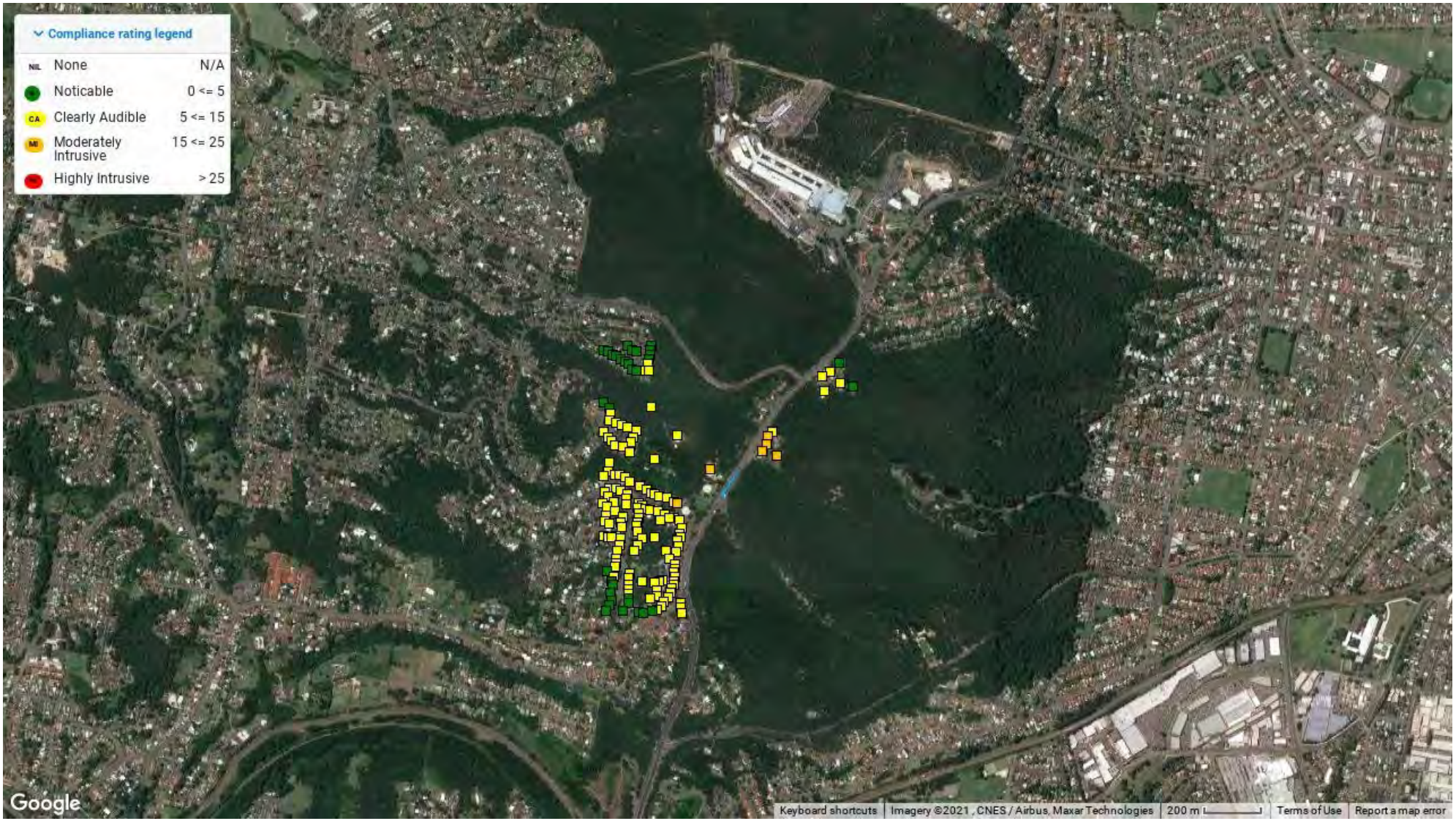
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Asphalting

Equipment	Quantity	Usage	Reduction	SWL
Vibratory Roller (10 tonne)*	1	10 %	0	100
Truck (12-15 tonne)	2	20 %	0	102
Paving Machine	1	40 %	0	108
Bobcat / skidsteer large	1	30 %	0	104
Bitumen Spray Truck	1	30 %	0	95
Daymakers / Lighting plant	2	100 %	0	96

Activity Sound Power Level: 111

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516938	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	Clearly Audible
	516937	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	59	21	Moderately Intrusive
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	62	24	Moderately Intrusive
	516930	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	55	17	Moderately Intrusive
	516928	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	56	18	Moderately Intrusive
	516927	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	Moderately Intrusive
	516910	11 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	Clearly Audible
	516901	27 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516900	7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	Clearly Audible
	516899	16 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	Noticable
	516898	12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	Clearly Audible
	516897	42 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	42	4	Noticable
	516895	31 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516894	41 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	42	4	Noticable
	516891	20 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	Clearly Audible
	516890	10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	53	15	Moderately Intrusive
	516889	13 PRESIDENT PLACE NEW LAMBTON HEIGHTS	RES	38	44	6	Clearly Audible
	516888	3 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	Clearly Audible
	516887	53 ATHERTON CLOSE RANKIN PARK	RES	38	44	6	Clearly Audible
	516884	9A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	48	10	Clearly Audible
	516883	18 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	Noticable
	516882	60 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516881	30 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	Clearly Audible
	516879	72 ATHERTON CLOSE RANKIN PARK	RES	38	44	6	Clearly Audible
	516878	4 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	Clearly Audible
	516876	32 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	Clearly Audible
	516875	2 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516874	36 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	Noticable
	516873	6 CARDIFF ROAD NEW LAMBTON HEIGHTS	NONE	38	45	7	Clearly Audible
	516872	10 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516871	34 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	Noticable
	516870	27 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	Clearly Audible
	516867	24 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	Clearly Audible
	516866	172 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	Clearly Audible
	516864	32 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible
	516862	11 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	Clearly Audible
	516859	6 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	Clearly Audible
	516858	UNIT 7/ 6 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	Clearly Audible

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516857	21 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516856	65 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516855	17 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516854	29A GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516853	30 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516852	1B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516851	188 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516850	UNIT 6/ 6 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516849	9 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516848	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	516847	180 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516846	20 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516845	3 VICTORIA CRESCENT NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516844	70 ATHERTON CLOSE RANKIN PARK	RES	38	44	6	**Clearly Audible**
	516843	67 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516842	186 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516841	14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	516840	51 ATHERTON CLOSE RANKIN PARK	RES	38	44	6	**Clearly Audible**
	516839	8 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516838	164 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	516837	5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	516836	25 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516835	18 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516834	12 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516833	UNIT 2/ 6 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516832	29 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516831	68 ATHERTON CLOSE RANKIN PARK	RES	38	43	5	**Clearly Audible**
	516830	UNIT 3/ 6 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516829	9 PRESIDENT PLACE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516828	12A CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516827	59 ATHERTON CLOSE RANKIN PARK	RES	38	46	8	**Clearly Audible**
	516826	74 ATHERTON CLOSE RANKIN PARK	RES	38	45	7	**Clearly Audible**
	516825	8 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516824	24 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516823	69 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516820	168 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516819	2 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516818	14 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516817	10 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516816	6 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516815	37 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516814	19 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516813	76 ATHERTON CLOSE RANKIN PARK	RES	38	45	7	**Clearly Audible**
	516812	44 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516811	4 BOND CLOSE RANKIN PARK	RES	38	43	5	**Clearly Audible**
	516810	57 ATHERTON CLOSE RANKIN PARK	RES	38	45	7	**Clearly Audible**
	516809	2B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516807	2A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516806	36A GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516805	29 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516804	2 BOND CLOSE RANKIN PARK	RES	38	43	5	**Clearly Audible**
	516803	4 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516802	15 PRESIDENT PLACE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516801	2 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	NONE	38	44	6	**Clearly Audible**
	516800	4 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516799	7 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516798	9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	516797	61 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516796	15 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516795	182 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516794	26 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516793	174A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516792	11 PRESIDENT PLACE NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516791	UNIT 4/ 6 CARDIFF ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516790	5A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	516789	174 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516788	28 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516787	34 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516786	184 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516785	18 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516784	17 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516783	27A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516782	40 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516781	15 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	49	11	**Clearly Audible**
	516780	23 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516777	5 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516776	1 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516774	63 MOUNTAIN VIEW PARADE NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516773	78 ATHERTON CLOSE RANKIN PARK	RES	38	46	8	**Clearly Audible**
	516772	36 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516771	26 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516770	166 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	516769	160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	52	14	**Clearly Audible**
	516768	170 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516767	55 ATHERTON CLOSE RANKIN PARK	RES	38	45	7	**Clearly Audible**
	516766	28 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516765	3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	51	13	**Clearly Audible**
	516764	25 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516763	22 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516762	31 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516761	35 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516760	61 ATHERTON CLOSE RANKIN PARK	RES	38	46	8	**Clearly Audible**
	516759	178 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516758	16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516757	33 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516756	NEW LAMBTON HEIGHTS INFANTS SC 176 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	47	9	**Clearly Audible**
	516747	79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516746	79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516745	85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516744	79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516742	81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516739	83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516735	43 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Noticable**
	516734	57 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Noticable**
	516733	47 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Noticable**
	516732	49 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Clearly Audible**
	516731	1A MARSHALL STREET NEW LAMBTON HEIGHTS	NONE	38	45	7	**Clearly Audible**
	516730	61 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516729	24 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516728	59 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516727	41 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516726	22 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516725	51 KINGSWAY AVENUE RANKIN PARK	RES	38	44	6	**Clearly Audible**
	516724	45 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Noticable**
	516723	69 KINGSWAY AVENUE RANKIN PARK	RES	38	41	3	**Noticable**
	516722	26 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516721	8 BOND CLOSE RANKIN PARK	RES	38	42	4	**Noticable**
	516720	55 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Noticable**
	516719	6 BOND CLOSE RANKIN PARK	RES	38	43	5	**Noticable**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516718	65 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516717	63 KINGSWAY AVENUE RANKIN PARK	RES	38	42	4	**Noticable**
	516716	67 KINGSWAY AVENUE RANKIN PARK	RES	38	41	3	**Noticable**
	516715	53 KINGSWAY AVENUE RANKIN PARK	RES	38	43	5	**Clearly Audible**
	516714	71 KINGSWAY AVENUE RANKIN PARK	RES	38	41	3	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Evening period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Evening period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	54 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	0
10 – 20 dB above NML	0
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Evening period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	1
Clearly audible	6 – 15 dB above NML	0
Moderately impacted	16 – 25 dB above NML	0
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Evening period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

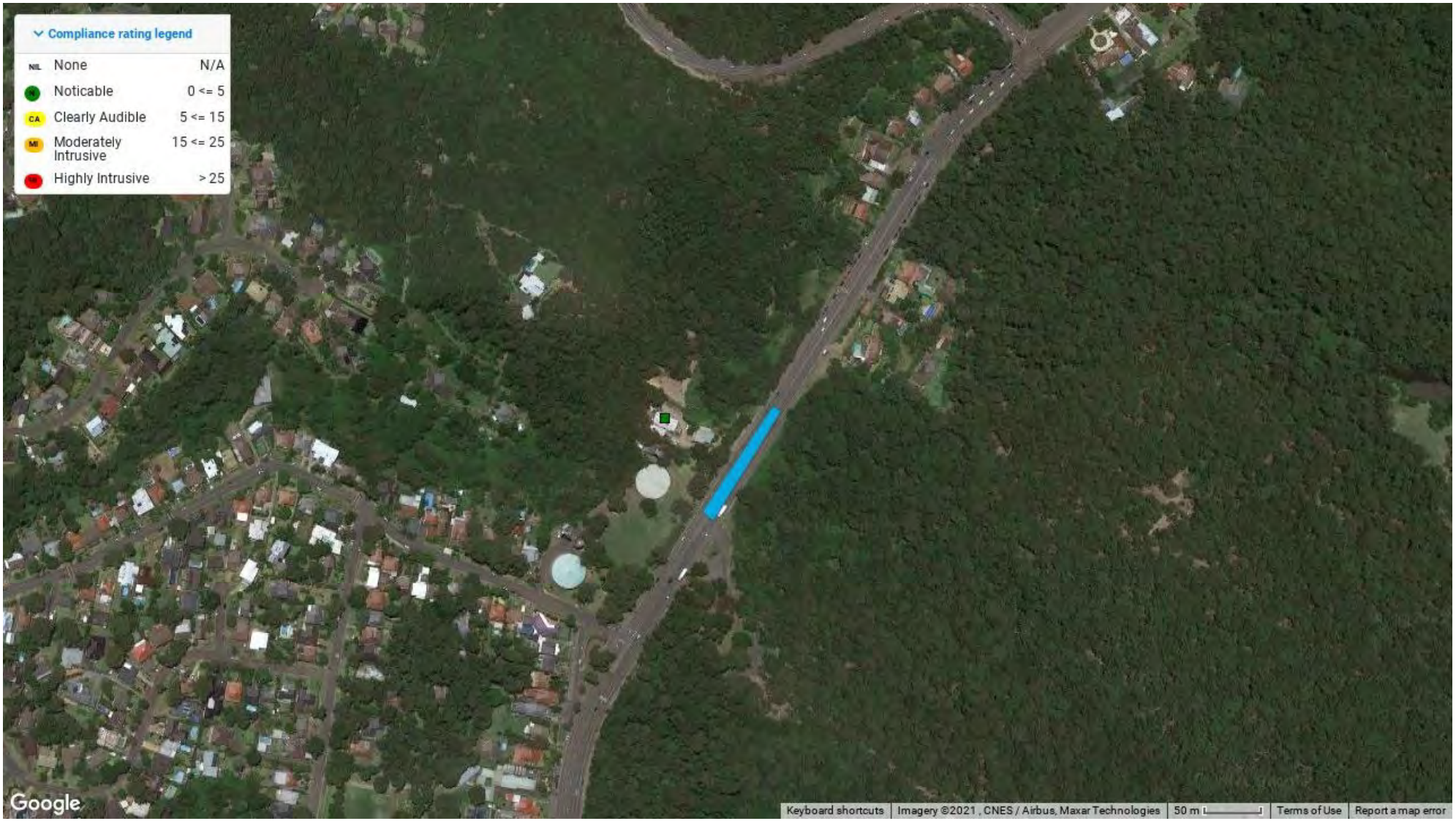
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Plant	1	30 %	0	88
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	20 %	0	97

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Evening	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	54	54	0	**Noticable**

Construction noise impact assessment

RP2J Median

Proposed works	Copy of RP2J Median		
Proponent	Quickway		
Assessment Date	09/08/2021		
Prepared by	Quickway	**Assessment Id**	OOH21

Introduction

This report has been prepared using the construction noise self-assessment platform KNOWnoise: *Minor Works* and presents an assessment of the likely noise impacts related to proposed works associated with the above project. Where possible, these works would be completed during standard construction hours; however, there may be a need to work outside these hours due to technical, community or access limitations. The location of the proposed works is illustrated in Appendix A.

Planned works

A description of the proposed works is as follows.

Median Middle Construction

Proposed activities and equipment for the works are summarised in Appendix B.

Though subject to change, the works are expected to commence around 20/09/2021 and would be completed by 21/09/2021.

Assessment criteria and mitigation requirements

The Interim Construction Noise Guideline (ICNG) (DECC 2009) describes noise more than the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a LAeq, 15 minute noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures including alternative accommodation in the night period.

Outside standard construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). Table 2 presents NMLs from the ICNG for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Table 1 Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML ($L_{Aeq,15min}$)
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, would be implemented where reasonable and feasible. However, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 2. Further details of specific additional mitigation measures are described in the CNVG.

Table 2 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Additional mitigation measures**
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
PC = Phone calls
V = verification
IB = Individual briefings
N= Notification
AA = Alternative accommodation
SN = Specific notifications
RO = Respite offer
R1 = Respite period 1
R2 = Respite period 2
DR = Duration respite
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Existing environment and noise management levels

The proposed works would be undertaken in a predominantly Suburban/ Urban, characterised as:

Areas with low density transportation.

Typically local traffic, light vehicles, intermittent traffic flow

Background noise levels adopted for the project area and associated noise management levels (NMLs) are summarised in Table 3. NMLs have been established in line with the ICNG.

Table 3 Construction NMLs

Land use	Suburban/ Urban		Using custom background noise data?		Yes
Criterion	Day	Weekend Day	Evening	Night	Sleep
RBL	56	56	49	33	
NML	66	61	54	38	48

Sleep disturbance

The ICNG recommends where construction works are planned to extend over more than two consecutive nights, the maximum noise level should be considered for the purposes of establishing the likelihood of sleep disturbance. The Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this, a sleep awakening criterion of 55 dB(A) (internal) is typically adopted for works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

Assessment methodology

Based on the nominated works area (illustrated in Appendix A), proposed equipment and the minimum distance from the works to each sensitive receiver, noise levels were calculated based on CONCAWE (1981) P*ropagation of noise from petroleum and petrochemical complexes to neighboring communities.*

This method considers geometric spreading, atmospheric absorption, ground effects and is valid for meteorological conditions of a gentle breeze from source to receiver and stable atmosphere (temperature inversion).

KNOWnoise: Minor works is a 2-Dimensional assessment platform and does not consider terrain effects (e.g. hills, valleys) or the presence of solid structures such as homes or noise barriers. This will result in a conservative prediction, suitable for the project being assessed.

Considering the nature of the works and the type of surrounding land uses, sensitive receivers up to a radius of 600 metres from the works have been included in the assessment.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where the activity is further away from receivers or less equipment is used the predicted levels will decrease.

Sound power levels for plant and equipment expected to be used for each activity has been estimated based on guidance in the following standards and guidelines as well as typical measured noise levels for specific equipment.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites
- Construction Noise and Vibration Strategy 7TP-ST-157/2.0 (CNVS), (TfNSW, 2018)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites

- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites

Construction noise sources and associated sound power levels are listed in Appendix B. The maximum predicted LAeq noise level within the work area was identified for each receiver.

Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels in comparison with ICNG assessment criteria for the Night period is presented in Table 4.

Table 4 Summary of predicted noise levels with comparison against ICNG criteria for the Night period.

Criterion	Predicted number of receivers
Maximum cumulative predicted $L_{Aeq,\ 15\ minute}$ noise level	54 dB(A)
Number of highly noise affected receivers (>75 dB)	0
1 – 10 dB above NML	35
10 – 20 dB above NML	2
20+ dB above NML	0

For works outside standard hours, up to 0 receivers are predicted to be classified as Highly Impacted during the Night period. A summary of the number of receivers in each class is presented in Table 5.

Table 5 Summary of predicted noise levels with comparison against CNVG criteria

Impact class	Predicted noise level	Predicted number of receivers
Noticeable	1 – 5 dB above NML	37
Clearly audible	6 – 15 dB above NML	11
Moderately impacted	16 – 25 dB above NML	1
Highly Impacted	> 25 dB above NML	0

Predicted impact classes for the Night period are illustrated graphically in Appendix C. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

Sleep disturbance

In the event works are planned for more than two consecutive nights, up to 0 are expected to exceed the sleep awakening criteria. Where any exceedances if the awakening criteria are predicted, additional care should be taken and mitigation measures implemented in the with the CNVG.

Proposed noise mitigation measures

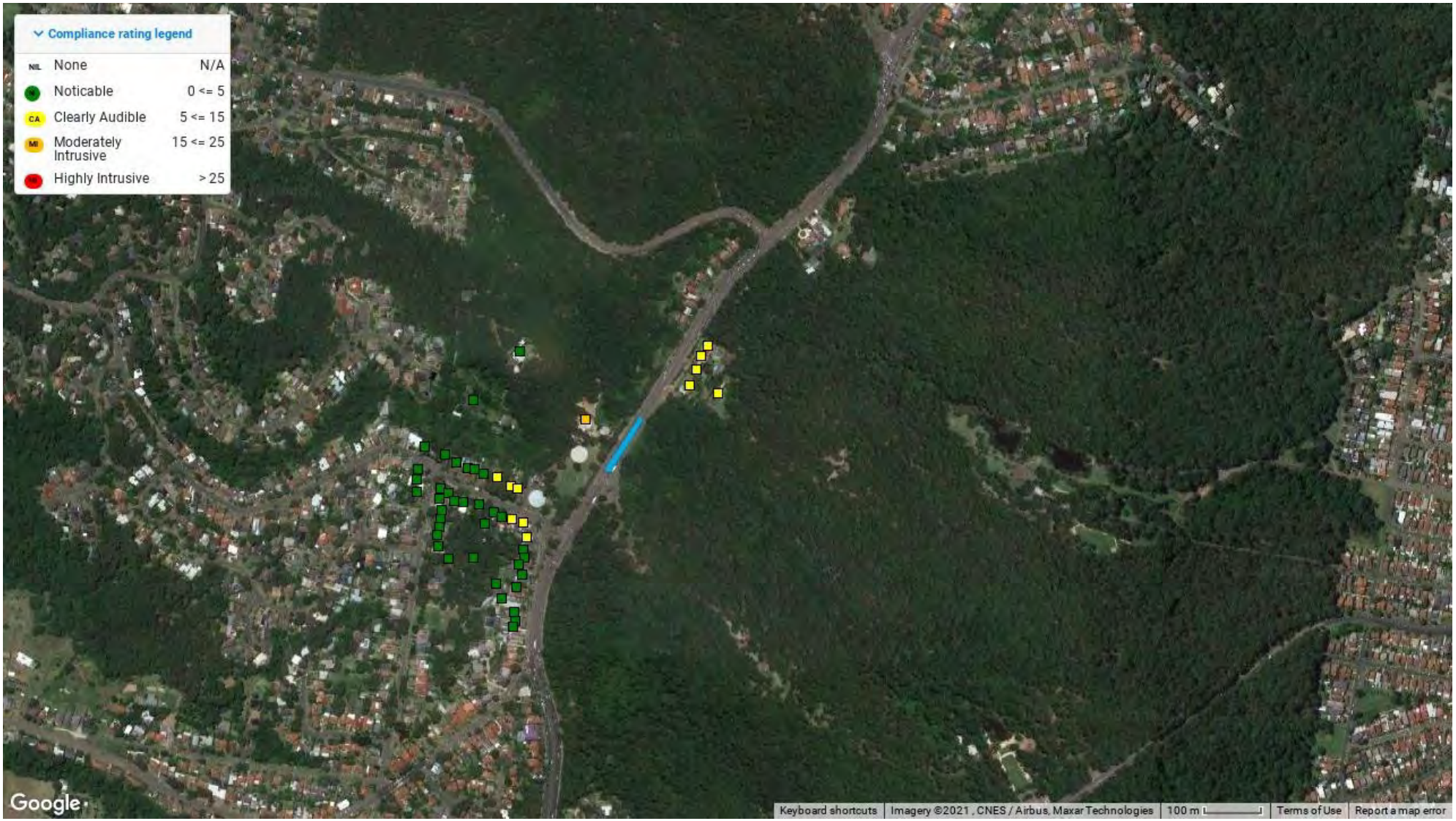
The safeguards and controls listed in Table 6 will be implemented where reasonable and feasible with the intention of achieving the project noise criteria and to maintain noise impacts at a practical minimum.

Table 6 Safeguards and controls

Action	Description
Community consultation or notification	Notify the affected community. The notification will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction would at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures
Behaviour	No swearing or unnecessary shouting or loud stereos/radios on site. Limit compression braking at night in residential areas. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Where indicated in Appendix C, a noise verification program would be undertaken for the duration of the works.
Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Respite for out-of-hours works	Respite would be scheduled as indicated in Appendix C and described in the CNVG.
Equipment selection	Use quieter construction methods where feasible and reasonable. Ensure plant including the silencer is well maintained. Plant noise levels will have an operating noise emission level compliant with Appendix F of the CNVG
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.

Action	Description
Plan worksites and activities to minimise noise and vibration.	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters.
Non-tonal reverse alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Shield stationary noise sources such as pumps, generators, and compressors	These should be enclosed or shielded where reasonable and feasible.
Implement any project specific mitigation measures	
1	None

Appendix A Project location and predicted level of impact



Appendix B Proposed activities and equipment

Line Marking

Equipment	Quantity	Usage	Reduction	SWL
Road Sweeper	1	10 %	0	100
Line Marking Plant	1	30 %	0	88
Daymakers / Lighting plant	2	100 %	0	96
Excavator (12 tonne)	1	20 %	0	97

Activity Sound Power Level: 103

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516938	117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516937	121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	50	12	**Clearly Audible**
	516931	138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	54	16	**Moderately Intrusive**
	516930	121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	47	9	**Clearly Audible**
	516928	121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	48	10	**Clearly Audible**
	516927	119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	46	8	**Clearly Audible**
	516910	11 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516900	7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516898	12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	44	6	**Clearly Audible**
	516891	20 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516890	10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	45	7	**Clearly Audible**
	516888	3 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516884	9A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516866	172 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516862	11 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516857	21 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516855	17 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516852	1B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516849	9 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516848	3A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516847	180 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516841	14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516838	164 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516837	5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Noticable**
	516835	18 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516824	24 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516820	168 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516819	2 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516814	19 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516809	2B MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516799	7 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516798	9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516795	182 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516794	26 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516793	174A LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516790	5A MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516789	174 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516781	15 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**

Appendix C Detailed noise predicted for each receiver and activity

Assessment: Copy of RP2J Median				Night	Results summary		
NCA	ID	Address	Land use	NML	Cumulative Predicted LAeq, 15 minute noise level	Exceedance of NML, dB	Impact classification
	516780	23 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	38	0	**Noticable**
	516777	5 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516776	1 MARSHALL STREET NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516770	166 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516769	160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	44	6	**Clearly Audible**
	516768	170 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	41	3	**Noticable**
	516765	3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	43	5	**Clearly Audible**
	516763	22 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	40	2	**Noticable**
	516759	178 LOOKOUT ROAD NEW LAMBTON HEIGHTS	RES	38	39	1	**Noticable**
	516758	16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	RES	38	42	4	**Noticable**
	516756	NEW LAMBTON HEIGHTS INFANTS SC 176 LOOKOUT ROAD NEW LAMBTON HEIGHTS	NONE	38	39	1	**Noticable**

Appendix C – 3 Month Look Ahead Notification Letter

August 2021

Out of hours early work at New Lambton Heights from August to December 2021

The NSW Government is funding early work for the Newcastle Inner City Bypass between Rankin Park and Jesmond.

Transport for NSW has awarded a contract to Quickway to relocate major utilities at the southern end of the Rankin Park to Jesmond project to help prepare for the main construction of the bypass. This early work will be continuing in August.

We will be carrying out essential night work on Lookout Road and surrounding areas. Work is required outside normal project hours for the safety of workers and road users, and to minimise traffic delays.

Work hours will be **7pm** to **6am** between **Monday** and **Friday**, weather permitting. High impact noisy work will be done **before 11pm**. If wet weather prevents the work occurring as planned it will be rescheduled and you will be notified.

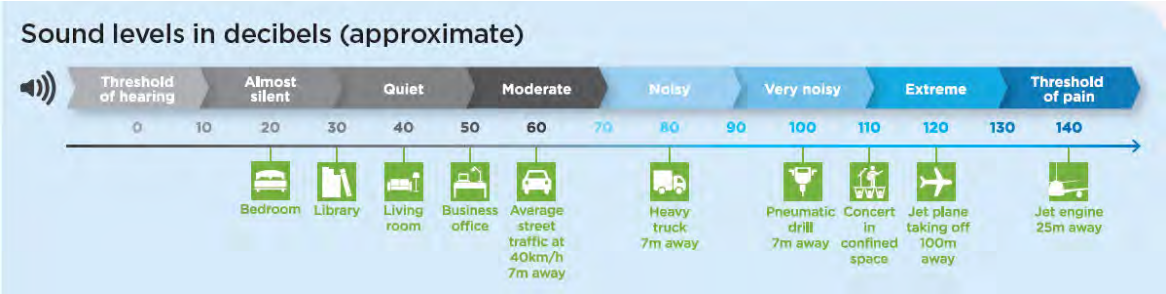
Date	Work Activity	Equipment
Mid-August	Utility services and Pavement Investigations **Expected duration – two shifts**	Traffic control, trucks, excavator, sucker truck, lighting towers.
From late August	Median island removal and pavement infill on Lookout Road **Expected duration – six shifts over four weeks**	Traffic control, excavators, trucks, lighting towers, compaction rollers, road saw, asphalt profiler, asphalt paver, concrete agitator trucks.
September	Trenched Utility Crossings across Lookout Road and Grandview Drive **Expected duration – eight shifts over three weeks**	Traffic control, excavators, trucks, lighting towers, compaction rollers, road saw, asphalt profiler, asphalt paver, concrete agitator trucks.
October - November	Overhead powerline cut-overs to new poles on Lookout Road and McCaffery Drive **Expected duration – four shifts over two weeks**	Traffic control, trucks, excavator, elevated working platforms, lighting towers.

How will the work affect you?

The work will involve the use of machinery which generates noise, light and vibration. We will make every effort to minimise these impacts with our equipment selection, positioning of machines and noise blankets, turning off vehicles when not in use and using non-tonal reversing alarms.

Appropriate respite periods for the night work will be provided in consultation with the community at each affected location. This may include limiting the number of consecutive nights and extending the duration of work, or increasing the number of consecutive nights and shortening the duration of night work.

Noise levels will vary between moderate to noisy, the diagram on the next page provides a guide to the noise you can expect. Directly affected residents will be contacted and advised of the likely impact and what we are doing to minimise disruption during the work.



Bus Stop Closure

The bus stop outside 121 Lookout Rd (Stop ID 2305150) will be closed temporarily while the median island removal works are carried out. The nearest alternative stop is 250m to the south on Lookout Road opposite Grandview Road (Stop ID 2305151).

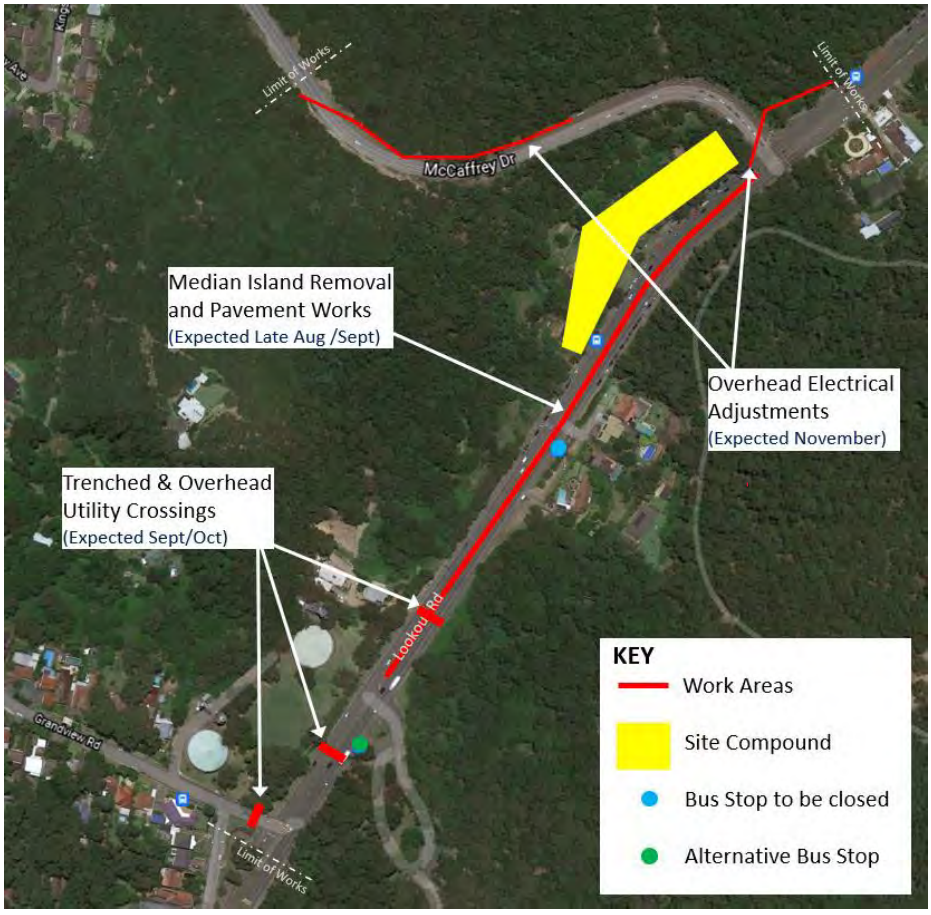
Traffic changes

There will be some temporary traffic changes to ensure the work zone is safe including removal of parking on both sides of Lookout Road, realignment of travel lanes and a 60km/h speed limit between McCaffrey Drive and Grandview Road. A 40km/h speed limit will apply during temporary lane closures. Travel times will be affected. Please keep to speed limits and follow the direction of traffic controllers and signs. For the latest traffic updates, you can call 132 701, visit livetraffic.com or download the Live Traffic NSW App.

Contact

If you would like to provide feedback, or have any questions about this work, please contact our project team on 1800 818 433 (24 hours – select option 2) or email southern.utilities.RP2J@quickway.com.au. For more information about the Newcastle Inner City Bypass between Rankin Park and Jesmond, visit nswroads.work/rp2j. Thank you for your patience during this important work.

Location of work



Appendix D

- **Approved Notification Letter for Work Blocks 1 & 2**
- **Draft Notification Letter for Work Blocks 3 & 4**

August 2021

Out of hours early work at New Lambton Heights from 30 August 2021

The NSW Government is funding early work for the Newcastle Inner City Bypass between Rankin Park and Jesmond.

Transport for NSW has awarded a contract to Quickway to relocate major utilities at the southern end of the Rankin Park to Jesmond project to help prepare for the main construction of the bypass. This early work will be continuing in August and September.

We will be carrying out essential night work on Lookout Road between McCaffrey Drive and Grandview Drive. Work will include:

- removing existing line marking
- installing new line marking
- removing the concrete median on Lookout Road and replacing with road surface.

Work is required outside normal project hours for the safety of workers and road users, and to minimise traffic delays.

We will be working from **7pm** to **5am** on **Monday 30 August**, **Tuesday 31 August** and **Wednesday 8 September**, weather permitting. High impact noisy work will be done **before 11pm**. If wet weather prevents the work occurring as planned, it will be rescheduled and you will be notified.

How will the work affect you?

The work will involve the use of machinery which generates noise, light and vibration. We will make every effort to minimise these impacts with our equipment selection, positioning of machines and noise blankets, turning off vehicles when not in use and using non-tonal reversing alarms.

Traffic changes

There will be some temporary traffic changes to ensure the work zone is safe including realignment of travel lanes and a 60km/h speed limit between McCaffrey Drive and Grandview Road. A 40km/h speed limit will apply during temporary lane closures. Travel times will be affected. Please keep to speed limits and follow the direction of traffic controllers and signs. For the latest traffic updates, you can call 132 701, visit livetraffic.com or download the Live Traffic NSW App.

Contact

If you would like to provide feedback, have any questions about this work or would like to provide your contact details for future notices, please contact or Community Relations Manager on 1800 818 433 (24 hours – select option 2) or email southern.utilities.RP2J@quickway.com.au.

For more information about the Newcastle Inner City Bypass between Rankin Park and Jesmond, visit nswroads.work/rp2j. Thank you for your patience during this important work.

September 2021

Out of hours early work at New Lambton Heights from 13 September 2021

The NSW Government is funding early work for the Newcastle Inner City Bypass between Rankin Park and Jesmond.

Transport for NSW has awarded a contract to Quickway to relocate major utilities at the southern end of the Rankin Park to Jesmond project to help prepare for the main construction of the bypass. This early work will be continuing in August and September.

We will be carrying out essential night work on Lookout Road between McCaffrey Drive and Grandview Drive. Work will include:

- Asphalting new median road surface
- removing existing line marking
- installing new line marking
- installing safety barriers

Work is required outside normal project hours for the safety of workers and road users, and to minimise traffic delays.

We will be working from **7pm** to **5am** on **Monday 13 September**, **Tuesday 14 September**, **Wednesday 15 September**, **Monday 20 September** and **Tuesday 21 September**, weather permitting. High impact noisy work will be done **before 11pm**. If wet weather prevents the work occurring as planned, it will be rescheduled and you will be notified.

How will the work affect you?

The work will involve the use of machinery which generates noise, light and vibration. We will make every effort to minimise these impacts with our equipment selection, positioning of machines and noise blankets, turning off vehicles when not in use and using non-tonal reversing alarms.

Traffic changes

There will be some temporary traffic changes to ensure the work zone is safe including realignment of travel lanes and a 60km/h speed limit between McCaffrey Drive and Grandview Road. A 40km/h speed limit will apply during temporary lane closures. Travel times will be affected. Please keep to speed limits and follow the direction of traffic controllers and signs. For the latest traffic updates, you can call 132 701, visit livetraffic.com or download the Live Traffic NSW App.

Contact

If you would like to provide feedback, have any questions about this work or would like to provide your contact details for future notices, please contact or Community Relations Manager on 1800 818 433 (24 hours – select option 2) or email southern.utilities.RP2J@quickway.com.au.

For more information about the Newcastle Inner City Bypass between Rankin Park and Jesmond, visit nswroads.work/rp2j. Thank you for your patience during this important work.

Appendix E – Consultation Record

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	1	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
1 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
1 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
10 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
11 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
12 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
14 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
20 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
22 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
26 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
28 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
3 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
3 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
30 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
34 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
61 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
9 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
119 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	Middle	3	Night	38	63	25	30	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
117 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	Middle	3	Night	38	62	24	29	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
16 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	[redacted]
18 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
47 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
49 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
51 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
53 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
7 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
138 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	62	24	29	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
121B LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	Middle	3	Night	38	60	22	27	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
83 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	60	22	27	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
15 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
1A RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
24 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
32 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
36 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
38 FLORALIA CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
4 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
5 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
5 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
59 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
6 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
71 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
79B LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	52	14	19	Low	Clearly Audible	N, V	TBA	Notification Letter	
8 RIDGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 1/ 7 R DGEWAY ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
121C LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	59	21	26	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
85 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	2	Night	38	59	21	26	Low	Moderately Intrusive	V, IB, N	16/08/2021	Request to Contact letter	
81 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	57	19	24	Low	Moderately Intrusive	V, IB, N	16/08/2021	Notification Letter	
4 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
45B LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
6 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
8 BUSHLANDS CLOSE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
1 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
10 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
10 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
11 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
11 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	

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11 PRES DENT PLACE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	[redacted]
12 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
12 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	53	15	20	Low	Clearly Audible	N, V	TBA	Notification Letter	
12A CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
13 PRES DENT PLACE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
14 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	51	13	18	Low	Clearly Audible	N, V	TBA	Notification Letter	
15 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
15 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
15 PRES DENT PLACE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
16 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
160 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	52	14	19	Low	Clearly Audible	N, V	TBA	Notification Letter	
164 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	51	13	18	Low	Clearly Audible	N, V	TBA	Notification Letter	
166 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	51	13	18	Low	Clearly Audible	N, V	TBA	Notification Letter	
168 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
17 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
17 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
170 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
172 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
174 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	

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174A LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
178 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
18 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
18 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
180 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
182 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
184 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
186 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
188 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
19 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
1A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
1B MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 BOND CLOSE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 CARDIFF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
2 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
20 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
20 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
21 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
22 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
23 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
24 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
24 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
25 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
25 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
26 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
26 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
27 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
27 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
27A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
28 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
28 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
29 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
29 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
29A GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
2A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
2B MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
3 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	51	13	18	Low	Clearly Audible	N, V	TBA	Notification Letter	

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
3 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	[redacted]
30 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
31 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
31 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
32 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
33 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
34 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
36 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
36A GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
3A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
4 BOND CLOSE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
4 CARDIFF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
4 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
4 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
49 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
5 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	51	13	18	Low	Clearly Audible	N, V	TBA	Notification Letter	
5 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
51 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
51 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	

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53 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
53 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
55 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
57 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
59 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
5A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
6 CARDIFF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
6 CHARLESTOWN ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
6 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
60 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
61 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
61 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
63 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
65 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
67 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
68 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Clearly Audible	N, V	TBA	Notification Letter	
69 MOUNTA N V EW PARADE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
7 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	50	12	17	Low	Clearly Audible	N, V	TBA	Notification Letter	
7 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	

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70 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	[redacted]
72 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
74 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
76 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
78 ATHERTON CLOSE RANKIN PARK	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
8 CARDIFF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
8 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
9 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	49	11	16	Low	Clearly Audible	N, V	TBA	Notification Letter	
9 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	46	8	13	Low	Clearly Audible	N, V	TBA	Notification Letter	
9 PRESIDENT PLACE NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
9A MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	48	10	15	Low	Clearly Audible	N, V	TBA	Notification Letter	
NEW LAMBTON HEIGHTS INFANTS SC 176 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	47	9	14	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 2/ 6 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 3/ 6 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 4/ 6 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	44	6	11	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 6/ 6 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
UNIT 7/ 6 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	45	7	12	Low	Clearly Audible	N, V	TBA	Notification Letter	
121A LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	55	17	22	Low	Moderately Intrusive	V, IB, N	12/08/2021	Email and phone call	
79A LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	54	16	21	Low	Moderately Intrusive	V, IB, N	16/08/2021	Notification Letter	

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10 GRANDVIEW ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	53	15	20	Low	Moderately Intrusive	V, IB, N	16/08/2021	Phone call	
79 LOOKOUT ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	North	3	Night	38	53	15	20	Low	Moderately Intrusive	V, IB, N	12/08/2021	Notification Letter	
14 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
16 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
18 CARD FF ROAD NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
22 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
24 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
26 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
3 VICTORIA CRESCENT NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	41	3	8	Low	Noticable	N	TBA	Notification Letter	
30 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
34 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
36 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
37 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
40 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
41 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
41 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
42 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
43 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
44 MARSHALL STREET NEW LAMBTON HEIGHTS	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	

Address	NCA	Land Use	Work Location	Work Area	Work Block	Work Period	NML (RBL +5 dB(A))	Predicted Noise Level at reciever	Exceedance of NML	Exceedance of RBL	OOH Protocol Risk Rating (high/low)	Impact Classification	Mitigation Measures (PC, V, IB, N, AA, SN, RO, R1, R2, DR)	Date Notification completed / sent	Notification type (SMS / Email / Phone Call / Notification Letter / Door knock)	Written Agreement to all OoHW
45 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	[redacted]
47 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
55 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
57 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
59 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
6 BOND CLOSE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	43	5	10	Low	Noticable	N	TBA	Notification Letter	
61 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
63 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
65 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	
67 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	41	3	8	Low	Noticable	N	TBA	Notification Letter	
69 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	41	3	8	Low	Noticable	N	TBA	Notification Letter	
71 KINGSWAY AVENUE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	41	3	8	Low	Noticable	N	TBA	Notification Letter	
8 BOND CLOSE RANK N PARK	13	Residential	Lookout Road, Median	South	3	Night	38	42	4	9	Low	Noticable	N	TBA	Notification Letter	