

Great Western Highway Blackheath to Little Hartley

Appendix G Noise and vibration (part 1)

Great Western Highway Blackheath to Little Hartley

Appendix G - Technical report - Noise and vibration

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18-Jan-2023

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Executive summary

The Great Western Highway is the key east-west road freight and transport route between Sydney and Central West New South Wales (NSW). Together, the Australian Government and the NSW Government are investing more than \$4.5 billion towards upgrading the Great Western Highway between Katoomba and Lithgow (the Upgrade Program). Once upgraded, over 95 kilometres of the Great Western Highway would be two lanes in each direction between Emu Plains and Wallerawang.

The Upgrade Program comprises the following components:

- Great Western Highway Upgrade Medlow Bath (Medlow Bath Upgrade): upgrade and duplication
 of the existing surface road corridor with intersection improvements and a new pedestrian bridge
 (approved)
- Great Western Highway East Katoomba to Blackheath (Katoomba to Blackheath Upgrade): upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway east of Blackheath (approved)
- Great Western Highway Upgrade Program Little Hartley to Lithgow (West Section) (Little Hartley to Lithgow Upgrade): upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway at Little Hartley (approved)
- Great Western Highway Blackheath to Little Hartley: construction and operation of a twin tunnel bypass of Blackheath and Mount Victoria and surface road works for tie-ins to the east and west of the tunnel (the project).

Transport for NSW (Transport) is seeking approval under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) to upgrade the Great Western Highway between Blackheath and Little Hartley (the project).

The project would comprise the construction and operation of new twin tunnels around 11 kilometres in length between Blackheath and Little Hartley, and associated surface road upgrade work for tie-ins to the east and west of the proposed tunnel portals.

The project would be located around 90 kilometres northwest of the Sydney CBD and located within the Blue Mountains and Lithgow Local Government Areas (LGA).

The majority of the project would be located below ground generally along or adjacent to the west of the existing Great Western Highway between around Blackheath and Little Hartley.

This technical paper provides a detailed assessment of potential noise and vibration impacts from both the construction and operational phases of the project. Relevant guidelines and assessment procedures have been followed to ensure all applicable state requirements have been considered. The Secretary's Environmental Assessment Requirements (SEARs) for the project and agency comments have also been considered in developing the assessment.

Construction impacts

A construction noise assessment has been conducted in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) and *Construction Noise and Vibration Guideline (for Road and Maritime Works)* (Transport, 2022). Reasonable worst case construction scenarios have been assessed. Construction of the project would occur both within and outside of standard construction hours.

The assessment of noise associated with the construction of the project indicates some exceedances of the *Interim Construction Noise Guideline* (DECC, 2009) noise management levels (NMLs) at the most affected sensitive receivers, around Blackheath. The magnitude and number of exceedances are detailed in Chapter 4.0. Exceedances of the noise management levels occur during the day and at night-time at the most affected sensitive receivers during certain activities.

Tunnelling and associated works are predicted to result in the greatest number of exceedances of the daytime and night-time NMLs, around the construction sites. Effective noise mitigation and management measures would need to be developed by the contractor to minimise the potential noise

impacts from these works. The magnitude of these impacts is comparable with other major projects and highlights the need for effective noise mitigation and management planning.

Measures have been recommended to mitigate construction noise impacts on nearby sensitive receivers. The final number, degree and nature of these measures would ultimately depend on the construction strategy and work undertaken. Specific noise management and mitigation measures would be detailed in the contractor's Construction Noise and Vibration Management Plan. The recommended management and mitigation measures considered in the plan include:

- effective community consultation
- training of construction workers
- use of noise barriers
- noise monitoring
- appropriate selection and maintenance of equipment
- scheduling of work for less sensitive time periods
- situating plant in less noise sensitive locations
- construction traffic management
- respite periods.

Minimum working distances for vibration intensive construction works have been presented. Equipment size would be selected by the contractor taking into account the minimum working distances and the distance between the area of construction and the most affected sensitive receiver. If works need to be undertaken within minimum working distances, vibration monitoring would be undertaken.

Construction traffic would increase road traffic noise levels in some areas, but increases would be less than 2 dB(A) during the daytime and night-time periods except for two sections of the proposed access roads (Great Western Highway directly east and west of Coxs River Road) associated with the night-time peak construction traffic volume scenario. An increase of 2 dB(A) or less is compliant with the traffic noise increase criterion in the *Road Noise Policy* (DECCW, 2011). As the peak construction traffic volumes are a worst-case scenario indicative of peak activities occurring at the same time, which is highly unlikely in practice, the actual noise impact of construction traffic would likely be somewhere between the predicted relative increases associated with average construction volumes and peak construction volumes.

A large number of receivers are predicted to experience ground-borne noise levels which would exceed relevant criteria due to tunnelling activities. The receivers are all located in Blackheath, between Evans Lookout Road and Radiance Avenue. These exceedances are due to the shallower tunnel depth near the tunnel portals just south of Blackheath. These exceedances are temporary in nature and would occur for a few days at each identified receiver as tunnelling progresses at a rate of 70 to 90 metres per week. The human comfort vibration criteria would also be exceeded at a number of receivers around Blackheath. The structural damage criteria would not be exceeded by the tunnelling activities.

Cumulative construction noise impacts may occur as a result of construction works for the project occurring simultaneously with those for other major projects, such as the adjacent Great Western Highway Upgrade projects. Consultation and coordination between the projects would occur to minimise potential impacts where feasible and reasonable.

Operational impacts

An operational road traffic noise assessment has been completed in accordance with the Environment Protection Authority's *NSW Road Noise Policy* (DECCW, 2011) and Transport's *Road Noise Criteria Guideline* (Transport, 2022a) and *Road Noise Mitigation Guideline* (Transport, 2022).

Exceedances of the applicable noise criteria have been identified close to the western portal. These exceedances are of the cumulative noise limit. Appropriate noise mitigation has been recommended to minimise adverse impacts on the community as a result of the project, in accordance with the *Road*

Noise Mitigation Guideline (Transport, 2022) and the draft At-Receiver Noise Treatment Guideline (RMS, 2017).

At-receiver architectural treatments have been recommended at two sensitive receivers that were found eligible for the consideration of noise mitigation. These requirements would be clarified during ongoing design development. Road traffic noise levels would be reduced at about 2,000 noise sensitive receivers adjacent to the bypassed sections of the Great Western Highway.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels that were predicted during design development, consideration of additional feasible and reasonable mitigation measures would occur.

An assessment of operational fixed facilities was undertaken in accordance with the Environment Protection Authority's *Noise Policy for Industry* (EPA, 2017). Options for portal ventilation, and dedicated ventilation outlets have been considered. The assessment found that noise levels from the operational fixed facilities, would lead to minor exceedances (1-2 dB) during the most stringent night-time period for normal traffic and low-flow traffic conditions at Blackheath. With the current indicative equipment selections emergency operations would lead to exceedances of up to 5 dB at Blackheath for both ventilation options. There is scope to reduce noise levels using noise mitigation measures which would be confirmed during ongoing design development. No exceedances in the noise criteria are expected for receivers located near Little Hartley. Further assessment would be undertaken during ongoing design development to confirm the noise source assumptions and the required attenuation to meet the applicable noise criteria.

1.0 Introduction

1.1 **Project context and overview**

The Great Western Highway is the key east-west road freight and transport route between Sydney and Central West New South Wales (NSW). Together, the Australian Government and the NSW Government are investing more than \$4.5 billion towards upgrading the Great Western Highway between Katoomba and Lithgow (the Upgrade Program). Once upgraded, over 95 kilometres of the Great Western Highway would be two lanes in each direction between Emu Plains and Wallerawang.

The Upgrade Program comprises the following components:

- Great Western Highway Upgrade Medlow Bath (Medlow Bath Upgrade): upgrade and duplication
 of the existing surface road corridor with intersection improvements and a new pedestrian bridge
 (approved)
- Great Western Highway East Katoomba to Blackheath (Katoomba to Blackheath Upgrade): upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway east of Blackheath (approved)
- Great Western Highway Upgrade Program Little Hartley to Lithgow (West Section) (Little Hartley to Lithgow Upgrade): upgrade, duplication and widening of the existing surface road corridor, with connections to the existing Great Western Highway at Little Hartley (approved)
- Great Western Highway Blackheath to Little Hartley: construction and operation of a twin tunnel bypass of Blackheath and Mount Victoria and surface road works for tie-ins to the east and west of the tunnel (the project).

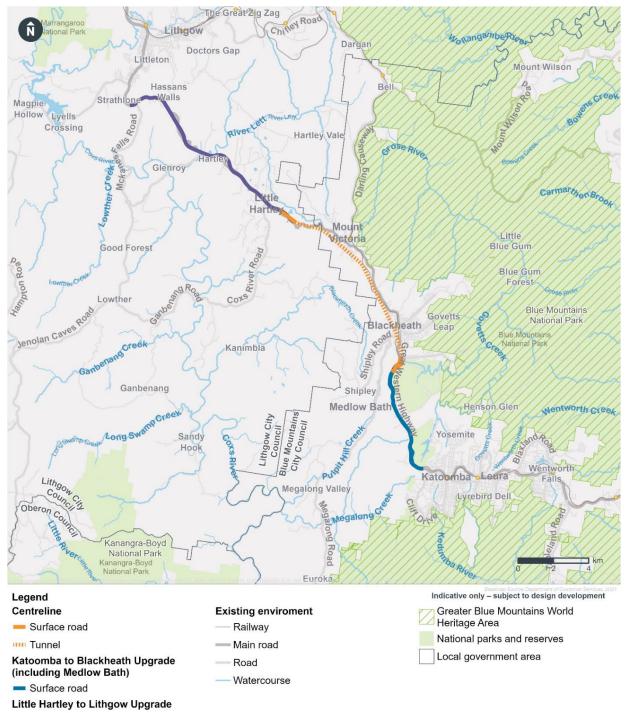
The components of the Upgrade Program are shown in Figure 1-1.

Transport for NSW (Transport) is seeking approval under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) to upgrade the Great Western Highway between Blackheath and Little Hartley (the project).

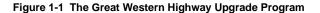
The project would comprise the construction and operation of new twin tunnels around 11 kilometres in length between Blackheath and Little Hartley, and associated surface road upgrade work for tie-ins to the east and west of the proposed tunnel portals.

The project would be located around 90 kilometres northwest of the Sydney CBD and located within the Blue Mountains and Lithgow Local Government Areas (LGA).

The majority of the project would be located below ground generally along or adjacent to the west of the existing Great Western Highway between around Blackheath and Little Hartley.



Surface road



1.2 The project

1.2.1 Key components of the project

The project would comprise new twin tunnels between Blackheath and Little Hartley and forms part of the broader upgrade of the Great Western Highway between Katoomba and Lithgow to a four lane carriageway (the Upgrade Program).

Key components of the project are summarised in Table 1-1 and shown in Figure 1-2. These components are described in more detail in Chapter 4 (Project description) of the environmental impact statement (EIS).

The indicative operational configuration of the surface road network at Blackheath and Little Hartley is shown in Figure 1-3 and Figure 1-4.

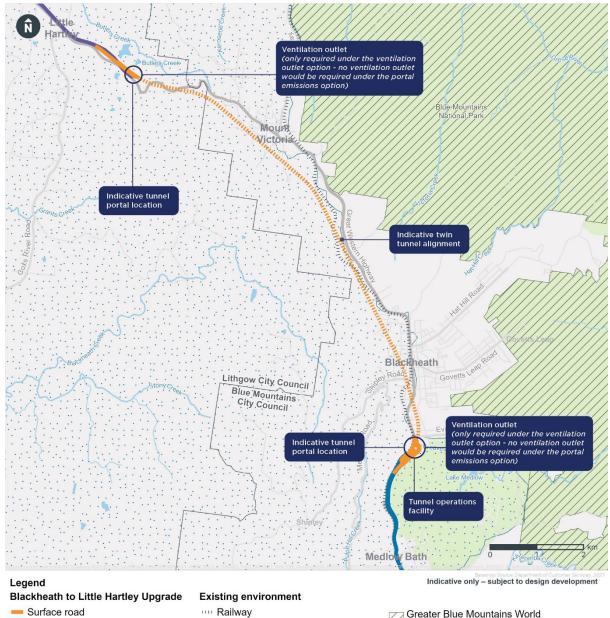
The existing Great Western Highway would be retained between Blackheath and Little Hartley and would continue to function as an alternative route for local and tourist traffic and be an alternative route should there be planned or unplanned shutdowns of the tunnels.

Subject to approval, the project is anticipated to be open to traffic in 2030.

 Table 1-1
 Key components of the project

Key project component	Summary
Tunnels	Twin tunnels around 11 kilometres in length between Blackheath and Little Hartley, connecting to the upgraded Great Western Highway at both ends. Each tunnel would include two lanes of traffic and road shoulders and would range in depth from just below the surface near the tunnel portals, to up to around 200 metres underground at Mount Victoria.
Surface work	 Surface road upgrade work would be required to connect the tunnels and surface road networks south of Blackheath and at Little Hartley. The twin tunnels would connect to the surface road network via: mainline carriage ways and on- and off-ramps at the Blackheath portal, located adjacent to the existing Great Western Highway and south of Evans Lookout Road mainline carriageways at the Little Hartley portal, located adjacent to the existing Great Western Highway at the base of the western escarpment below Victoria Pass and southwest of Butlers Creek.
Operational infrastructure	 Operational infrastructure that would be provided by the project include: a tunnel operations facility adjacent to the Blackheath portal in-tunnel ventilation systems including jet fans and ventilation ducts connecting to the ventilation facilities one of two potential options for tunnel ventilation currently being investigated, being: ventilation design to support emissions via ventilation outlets; or ventilation design to support emissions via portals water quality infrastructure including sediment and water quality basins, an onsite detention tank at Blackheath and a water treatment plant at Little Hartley fire and life safety systems, emergency evacuation and ventilation infrastructure and Closed Circuit Television lighting and signage including variable message signs and associated infrastructure such as overhead gantries

Key project component	Summary
Utilities	 Key utilities required for the project would include: a new electricity substation at Little Hartley to facilitate construction and operational power supply a new pipeline between Little Hartley and Lithgow to facilitate construction and operation water supply other utility connections and modifications, including electricity substations in the tunnel
Other project elements	 The project would also include: integrated urban design initiatives landscape planting.



uu Tunnel

Little Hartley to Lithgow Upgrade Surface road

Katoomba to Blackheath Upgrade (including Medlow Bath)

Surface road

···· Railway

- Main road
- Road
- Watercourse
- National Parks and Reserves
- Greater Blue Mountains World
- Heritage Area
 - Sydney Drinking Water Catchment
 - Local government area

Figure 1-2 Overview of the project





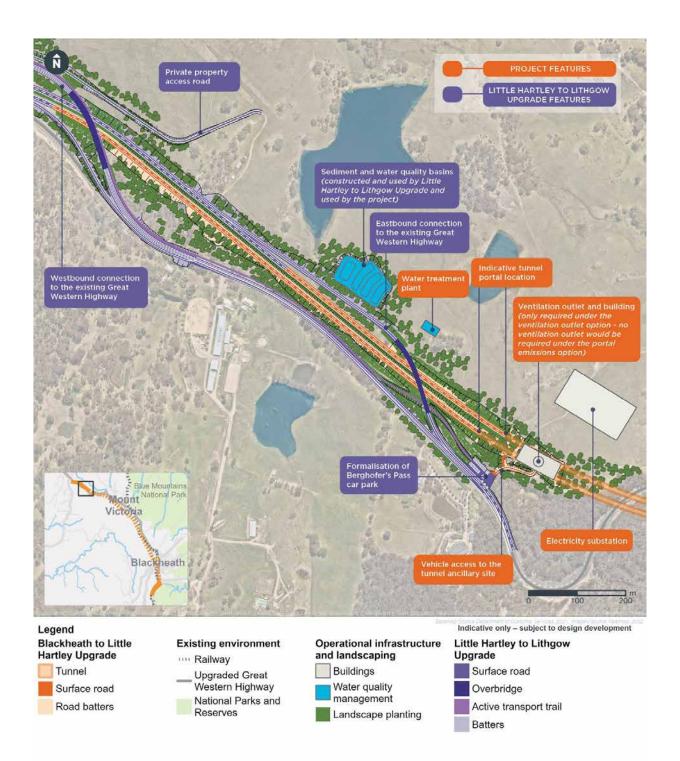


Figure 1-4 Indicative operational configuration at Little Hartley

1.2.2 Project construction

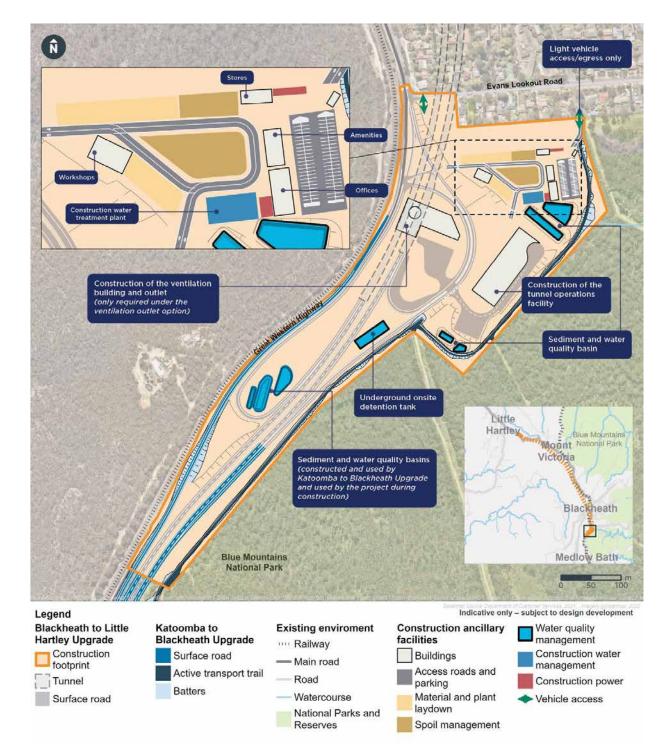
Construction of the project would include:

- site establishment and enabling works
- tunnel portal construction
- tunnelling and associated works
- surface road upgrade works
- operational infrastructure construction and fit-out, including construction of operational environmental controls
- finishing works, testing, and commissioning.

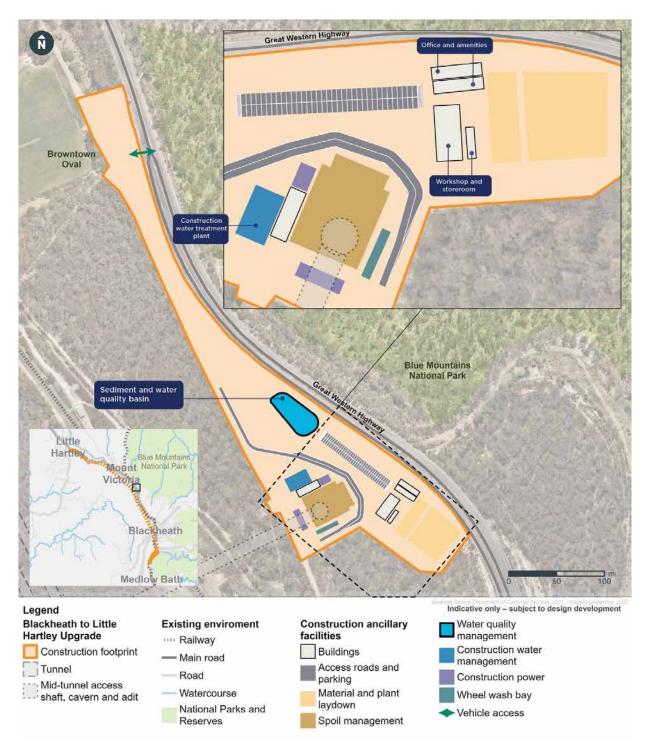
These activities are described in more detail in Chapter 5 (Construction) of the EIS.

The indicative construction footprint for the project is shown on Figure 1-5 to Figure 1-7, including construction site layout and access arrangements.

Construction of the project is expected to take around eight years. Subject to planning approval, construction is planned to commence in 2024 and be completed by late 2031; however, the project would be open to traffic by 2030. Further details in relation to specific construction scenarios that have been assumed for the purposes of this assessment are included in Section 4.1.









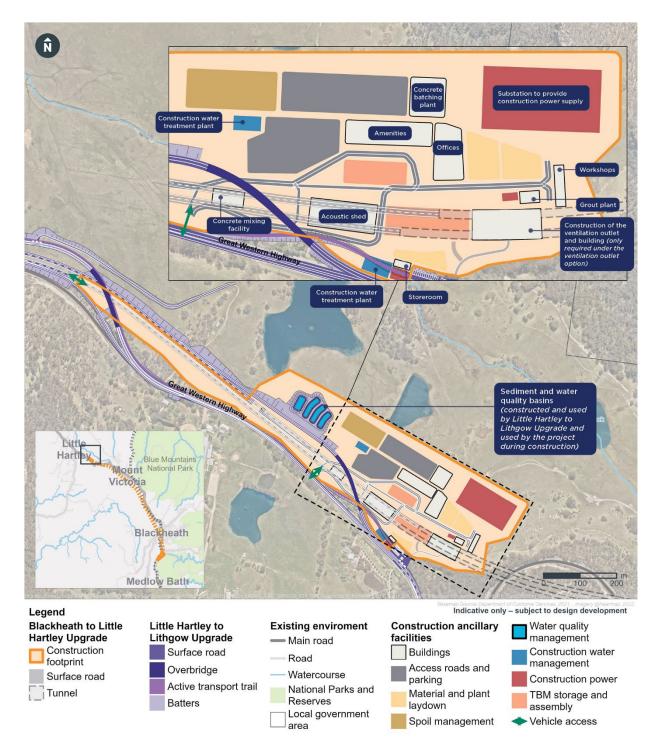


Figure 1-7 Indicative construction footprint at Little Hartley

1.2.3 Baseline environment

The Katoomba to Blackheath and Little Hartley to Lithgow Upgrades adjoining the project to the east and west respectively would be under construction when construction of the project commences (refer to Figure 1-8). To minimise environmental impacts, parts of the Katoomba to Blackheath Upgrade and Little Hartley to Lithgow Upgrade construction footprints would be used to support construction of the project. As a result, the following activities will be undertaken at the construction sites as part of the Katoomba to Blackheath and Little Hartley to Lithgow Upgrades:

- vegetation would be cleared
- topsoil would be levelled and compacted
- site access tracks would be established
- water quality controls such as water quality and sediment basins would be installed.

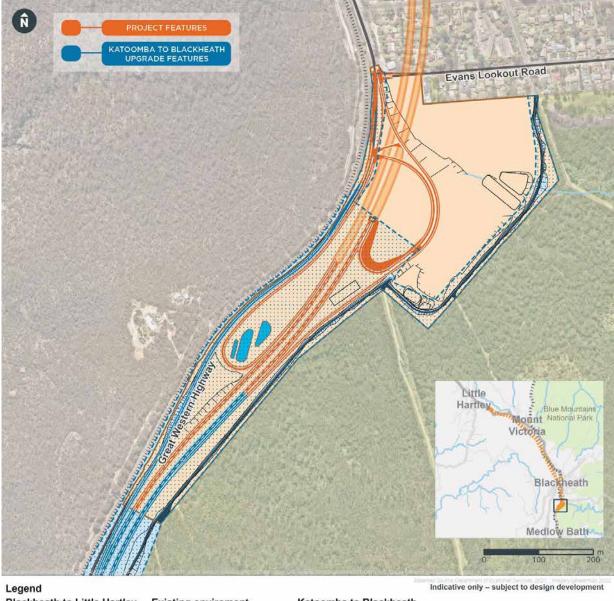
The environmental impacts associated with these works have been assessed as part of the Katoomba to Blackheath Upgrade and the Little Hartley to Lithgow Upgrade.

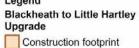
The construction footprints for these projects are shown in Figure 1-5 and Figure 1-7 and form the baseline environment considered at Blackheath and Little Hartley for this EIS.

No work is proposed at Soldiers Pinch as part of the Katoomba to Blackheath Upgrade or the Little Hartley to Lithgow Upgrade and therefore the existing environment forms the baseline environment for this EIS.



Figure 1-8 Great Western Highway Upgrade Program construction







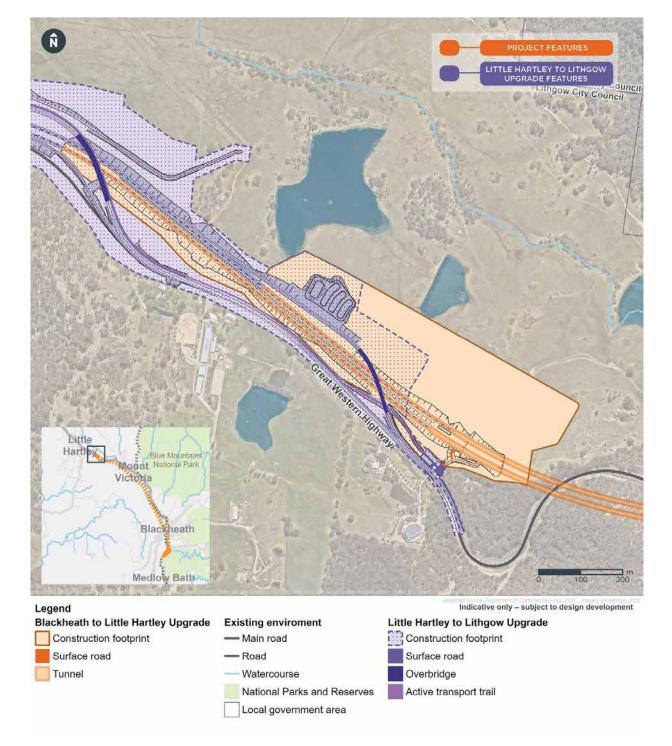
Existing enviroment

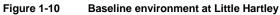
- ranway
- Main road
 - Watercourse
 - National Parks and
 - Reserves



Katoomba to Blackheath Upgrade

- Construction footprint
 - Surface road
 - Active transport trail
 - Water quality management





1.3 Purpose of this report

This noise and vibration technical report is one of the technical documents that forms part of the EIS. The purpose of this technical report is to provide a noise and vibration impact assessment which addresses the requirements outlined in Section 1.3.1. This technical report provides an assessment of the noise and vibration impacts associated with the construction and operation of the project.

1.3.1 Assessment requirements

The Secretary's environmental assessment requirements (SEARs) relating to the potential construction and operational noise and vibration impacts of the project and where these requirements are addressed in this technical report are outlined in Table 1-2.

Table 1-2	Secretary's environmental assessment requirements - noise and vibration	n
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SEARs 10. Noise and Vibration - Amenity				
Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity, and adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. Increases in noise emissions and vibration affecting nearby properties	ruction noise and for (including airborne ground-borne noise lasting) are effectively ged to minimise se impacts on ttic amenity, and se impacts on the ural integrity of ngs and items ing Aboriginal places nvironmental ge.1.Construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines, including how the measures in the guidelines would be implemented and their effect on reducing the level and impact of noise and vibration. The assessment must take into consideration and address the redistribution of traffic (including on local feeder roads) and operational plant and equipment and take into account the characteristics of noise and vibration (for example, low frequency noise). It must consider the impacts to sensitive receivers, including the potential for sleep disturbance (in terms of noise levels andre	Section 3.1 Section 4.0 Section 5.0.		
and other sensitive receivers during operation of the project are effectively	2. The assessment of construction noise and vibration must			
managed to protect the amenity and well-being of the community. Increases in noise emissions and vibration affecting environmental	 a) describe the nature of construction activities and related noise characteristics (including vehicle noise, tonal or impulsive noise- generating works) using typical and worst-case scenarios and highlight high noise generating activities; 	Section 1.2 Section 4.0.		
heritage as defined in the <i>Heritage Act 1977</i> during operation of the project are effectively managed.	 b) detail the intensity and duration of noise (both air and ground borne) and vibration impacts. This must include consideration of high noise generating activities and extended construction impacts associated with ancillary facilities (and the like) and construction fatigue; 	Section 4.0.		
	c) identify the nature and location of sensitive receivers;	Section 2.3.		
	 describe the nature and level of the impact and the sensitivity of receivers, including for out of hours work; 	Section 4.0.		

SEARs				
10. Noise and Vibration -	Ameni	ty		
Desired performance outcome	Rec	quirement	Section where addressed in report	
	e)	identify factors that may influence the timing and duration of noisy and vibration generating construction activities;	Section 7.2.5 Section 4.2.	
	f)	 identify and document the potential for works outside standard construction hours (including utility works and works associated with the proposed development including those undertaken under another assessment and approval pathway, including but not limited to – justification for the activity(s) in terms of the Interim Construction Noise Guideline (DECC, 2009) location of the activity(s) predicted noise and vibration levels, and exceedances, number of potentially affected receivers, and timing and duration of the activity(s) 	Section 4.2.	
	g)	include a cumulative noise and vibration assessment inclusive of impacts from the project (including concurrent project construction activities) and the construction of other relevant development in the vicinity of the project;	Section 4.5.4 Section 6.0.	
	h)	assess the potential for sleep disturbance (including noise-awakening events);	Section 3.2.4.	
	i)	provide details and analysis of the predicted effectiveness of temporary or permanent mitigation measures to adequately manage identified impacts;	Section 7.6	
	j)	describe any potential residual noise and vibration impacts following application of mitigation measures; and	Section 7.9	
	k)	include a description of how sensitive receiver feedback received during the preparation of the EIS has been taken into account (and would be taken into account post exhibition of the EIS) in the design of mitigation measures, including any tailored mitigation, management and communication strategies for sensitive receivers.	Section 7.2.2 Chapter 7 (Community and stakeholder engagement) of the EIS.	
	3.	The assessment of construction and operational traffic noise must include:		
	a)	justification for the predictive model used in accordance with Road Noise Policy Appendix B4 and Appendix B5	Section 5.1.1.	

SEARs							
10. Noise and Vibration - Amenity							
Desired performance outcome	Requirement	Section where addressed in report					
	b) consideration of how maximum noise levels on the potential for sleep disturbance has informed the project design and mitigation measures	Section 5.1.1.					
	 consideration of the effects of road gradient on acceleration (tyre and engine noise), deceleration (engine braking and compression braking); and 	Section 5.1.1.					
	d) consideration of meteorological conditions by noting any wind or temperature inversion conditions and discussing their effects on traffic noise.	Section 5.1.1.					
	4. If blasting is required, demonstration that blast impacts can comply with current guidelines.	Section 4.9.					
	5. The process for community engagement should be included or referenced in the noise and vibration assessment as part of the mitigation strategy and assessment.	Section 7.2.2.					

1.3.2 Agency engagement

During preparation of the EIS meetings were held with DPE, the EPA and NSW Health in relation to the approach to assessing the noise and vibration impacts of the project, including:

- on 8 April 2022, an initial briefing on the project, the existing acoustic environment and proposed noise and vibration assessment methodology
- at that meeting the EPA provided general advice regarding the operational noise and construction noise impact assessment and presentation of the likely impacts.

Further details of engagement with agencies are provided in Chapter 7 (Community and stakeholder engagement) of the EIS.

2.0 Existing environment

2.1 Overview

The project would affect the suburbs of Blackheath, Mount Victoria, Kanimbla and Little Hartley in the Blue Mountains and Lithgow LGAs.

The noise and vibration impact assessment has considered two study areas:

- construction noise assessment study area which comprises a number of noise catchment areas (NCA) as detailed in Section 2.3.
- operational road traffic noise study area which extends to where noise levels are dominated by other roads that are not being assessed as part of this project, as detailed in the *Road Noise Criteria Guideline* (Transport, 2022). This is up to a maximum distance of 600 metres from the centre line of the outermost traffic lane on each side of the road under consideration.

The study areas include a mixture of receivers sensitive to noise and vibration such as residential properties, educational establishments, recreational areas, commercial and industrial properties.

Existing key sources of noise within the study areas include transport infrastructure, such as the existing Great Western Highway, the sub-arterial and local road network, Blue Mountains railway line and industrial/commercial properties.

2.2 Summary of existing noise environment

The existing noise environment surrounding the project is generally dominated by traffic on the Great Western Highway. The adjacent Blue Mountains railway line is also a key source of intermittent noise for receivers in the area.

Around the eastern end of the project in Blackheath, the noise environment is dominated by road traffic noise from the Great Western Highway, with more localised contributions from Brightlands Avenue, Station Street, Prince George Street and Wentworth Street. The Blue Mountains railway line lies adjacent to and west of the Great Western Highway, noise from use of the line is intermittent but is not considered a dominant source of noise within Blackheath. Land use in this area is predominantly residential and commercial associated with Blackheath township. Blackheath also provides a mix of hotels and other short term accommodation, public spaces and recreational areas. The Blackheath railway station is located in the centre of the village, to the north of land that would be directly affected by the project. The existing noise environment is characteristic of a quiet village setting for receivers located away from the Great Western Highway, with higher existing noise levels experienced by receivers along the highway (refer to Section 2.6 for background noise monitoring results).

Around the centre of the project, at Soldiers Pinch, the existing noise environment is also dominated by traffic noise from the Great Western Highway with intermittent rail noise. This area is well to the south of Mount Victoria and includes a few isolated receivers. The closest recreational site, Browntown Oval, is several hundred metres to the north and affected by noise from the adjacent highway. Mount Victoria includes a mix of residential and commercial receivers, hotels and short term accommodation, and places of worship. As with Blackheath, the existing acoustic environment of Mount Victoria transitions from road noise affected to a quiet village setting with increasing distance from the Great Western Highway and the adjacent railway line.

Around the western end of the project in Little Hartley, there are relatively few receivers with scattered commercial developments along the Great Western Highway and isolated rural residential properties. The relatively flat topography and few intervening structures in this area means that the effects of traffic noise from the existing Great Western Highway are generally experienced at a greater distance from the highway than in Mount Victoria or Blackheath.

Existing noise levels in all three areas are generally higher in the daytime, and in some areas during the evening. Night-time noise levels are relatively low, as outlined in Section 2.6.

2.3 Noise sensitive receivers and catchment areas

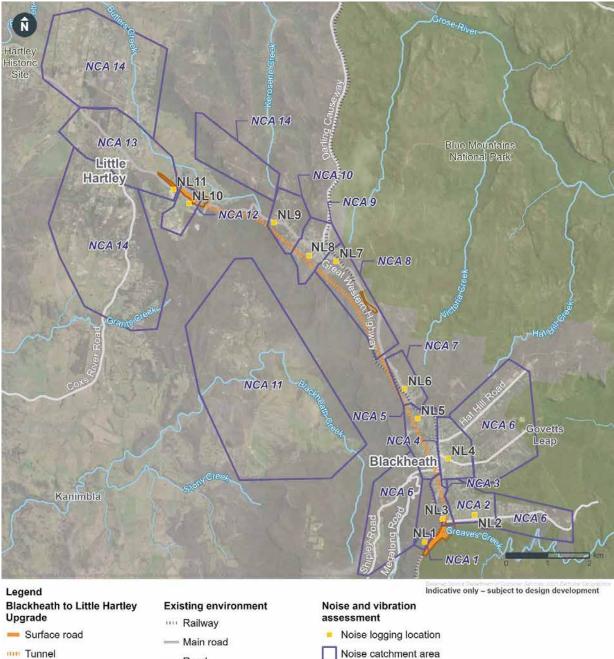
Noise sensitive receivers around the project have been identified using aerial photography, and the occupational uses of buildings have been determined through site survey. This, combined with cadastral and land use zoning information, has been used to classify receivers as residential, commercial, industrial, educational, recreational and other uses (unoccupied sheds and the like).

NCAs have been identified around project noise sources, taking into account the nature and distribution of noise sensitive receivers, existing noise conditions and the anticipated level of impact that may occur during construction and operation of the project. The NCAs have been determined to represent areas of broadly similar existing noise and receiver conditions. The 14 NCAs identified around the project are presented in detail in Annexure A and shown in summary in Figure 2-1.

Noise sensitive receivers other than residential receivers are listed in Table 2-1 and shown in the figures in Annexure A.

Receiver	Address	Receiver type	
Blue Gum Montessori Children's House	95 Wentworth St, Blackheath	Childcare centre	
Possum's Patch Child Care Centre	107 Great Western Hwy, Mount Victoria	Childcare centre	
Mount Victoria Public School	105-107 Great Western Highway, Mount Victoria	Education	
Blackheath Public School	208 Great Western Highway, Blackheath	Education	
Mountains Christian College	60 Thirroul Ave, Blackheath	Education	
OneSchool Global	84 Great Western Hwy, Mount Victoria	Education	
Blackheath Uniting Church	43 Govetts Leap Rd, Blackheath	Place of worship	
Blackheath Presbyterian Church	123-125 Wentworth St, Blackheath	Place of worship	
Blackheath Baptist Church	6 Bundarra St, Blackheath	Place of worship	
St Aidan's Anglican Church	2 Hat Hill Rd, Blackheath	Place of worship	
Sacred Heart Catholic Church	18 Inconstant St, Blackheath	Place of worship	
Saint Peter's Anglican Church	79 Great Western Hwy, Mount Victoria	Place of worship	
St Paul's Catholic Church	65 Great Western Hwy, Mount Victoria	Place of worship	
Sutton Park	113 Great Western Hwy, Blackheath	Active recreation	
Whitley Park	66 Wentworth St, Blackheath	Active recreation	
Neate Park	Great Western Highway, Blackheath	Active recreation	
Blackheath Memorial Park	Gardiner Crescent, Blackheath	Active recreation	
Rotunda Park	17A Station St, Mount Victoria	Active recreation	
Mount Victoria Memorial Park	2-14 Station St, Mount Victoria	Active recreation	
Fairy Bower Reserve	10 Great Western Hwy, Mount Victoria	Active recreation	
Blackheath Cemetery	317 Great Western Highway, Blackheath	Passive recreation	
Blackheath Area Neighbourhood Centre	41 Gardiner Cres, Blackheath	Community	

Table 2-1 Sensitive receivers (non-residential)

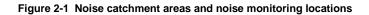


Construction footprint

Watercourse National parks and reserves

Road

Noise catchment area



2.4 Heritage and other sensitive structures

Heritage and other sensitive structures (including those with Aboriginal significance) have the potential to be more sensitive to vibration than standard buildings. Table 2-2 presents the heritage items within 60 metres of the construction footprint.

Table 2-2 Heritage items within 60 metres of the project footprint

Heritage item	Address	Heritage list and identifier
Blackheath Stockade and the Western Road – archaeological sites	Blackheath	Blue Mountains LEP, BH034
St Mounts (BH052)	1A and 3 Abbott Street and 194-196 Great Western Highway, Blackheath	Blue Mountains LEP, BH052
Gwandoban (BH096)	24 Lookout Street, Blackheath	Blue Mountains LEP, BH096
Blackheath West Heritage Conservation Area (BH214)	Blackheath	Blue Mountains LEP, BH214
Guinness Lodge/Evanville (BH059)	1-5 Waragil Street, Blackheath	Blue Mountains LEP, BH059
Tree Tops and garden (BH065)	16 Clyde Avenue, Blackheath	Blue Mountains LEP BH065
Ban Tigh, Brewery site and Garden (BH060)	26-34 Waragil Street, Blackheath	Blue Mountains LEP BH060
Osborne Cottage (site only) (BH039)	52-106 Thirroul Avenue, Blackheath	Blue Mountains LEP, BH039
Montana	37 Ada Road, Blackheath	Blue Mountains LEP, BH071
Victoria Pass	Great Western Highway, Mount Victoria	Lithgow LEP, A183
Berghofer's Pass	Berghofer Drive and 2-4 Great Western Highway, Mount Victoria	Blue Mountains LEP, MY001
Rosedale	Great Western Highway, Little Hartley	Lithgow LEP, I024
Nioka	2209 Great Western Highway, Little Hartley	Lithgow LEP, 1025

2.5 Ambient noise measurements

Noise measurements (noise logging) were taken at 11 locations along the length of the project to establish the existing ambient noise environment. These noise measurements were undertaken from Thursday 9 December 2021 to Tuesday 21 December 2021, concurrently with traffic counts. Noise logging and traffic count locations were identified through examination of aerial photography and site inspections, with the aim of providing good spatial coverage of the project corridor and the identified NCAs along it. Attended noise measurements were also undertaken at each logging location during the daytime, to determine the nature of the local noise environment and confirm the controlling noise source (ie road traffic for logging locations used in the validation of the operational noise model).

The noise logging locations are shown on Figure 2-1, and noise measurement results are provided graphically in Annexure B. Road traffic noise logging locations, identified in Table 2-3, were selected to cover the range of traffic noise conditions along the length of the project. This included where the road was on an incline and where it was located in relatively flat areas, it also included suburban areas where there were buildings on both sides of the road and rural areas where there were fields on both sides. Most loggers were placed in the open, however one logger was located in front of a building facade. The existing road surface was the same for the entire project length. At all road traffic noise logging locations the noise environment was dominated by road traffic noise.

A noise logger measures the noise level over a 15 minute sample period and then determines L_{A1}, L_{A10}, L_{A90}, L_{Amax} and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1 %, 10 % and 90 % of the sample period respectively. The L_{Amax} level is the maximum

noise levels due to individual noise events. The L_{A90} level is taken as the background noise level. The L_{Aeq} level is the energy averaged noise level over the 15 minute period.

The results of the noise monitoring have been processed in accordance with the procedures contained in the *NSW Road Noise Policy* (DECCW, 2011) and the *Noise Policy for Industry* (EPA, 2017). Weather data recorded during the noise monitoring survey periods was obtained from the Bureau of Meteorology weather station, located at Mount Boyce (ID063292). Periods which were affected by noise from extraneous wind and rain were omitted from the results, as indicated in Annexure B.

Details of each noise logging location and the purpose of each noise logger are provided in Table 2-3 below. The noise logging locations were at varying distances from roads, particularly the existing Great Western Highway, to allow the accuracy of the road traffic noise model for the project to be confirmed over the extent of the project corridor.

Table 2-3	Noise logging locations and purpose
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		Purpose			
Logger ID	Address	Construction	Operational traffic	Operational fixed facilities	
NL1	82 Station Street, Blackheath	\checkmark	\checkmark	\checkmark	
NL2	69A Brightlands Avenue, Blackheath	\checkmark	-	\checkmark	
NL3	89 Great Western Highway, Blackheath	\checkmark	\checkmark	\checkmark	
NL4	56 Govetts Leap Road, Blackheath	\checkmark	-	-	
NL5	28 Kanimbla Road, Blackheath	✓	-	-	
NL6	355 Great Western Highway, Blackheath	-	\checkmark	-	
NL7	149 Great Western Highway, Mount Victoria	-	\checkmark	-	
NL8	21 Kanimbla Valley Road, Mount Victoria	\checkmark	-	\checkmark	
NL9	9 Great Western Highway, Mount Victoria	-	\checkmark	-	
NL10	2133 Great Western Highway, Little Hartley	-	\checkmark	-	
NL11	2187 Great Western Highway, Little Hartley	-	\checkmark	-	

Noise measurements and traffic count data have been used to validate the operational road traffic noise model. Noise logging data has also been used to establish construction noise management levels (NMLs) and operational noise criteria for the project, consistent with applicable guidelines (refer to Section 3.0).

2.6 Unattended background noise monitoring results

Table 2-4 presents the representative L_{Aeq} ambient noise levels and the L_{A90} rating background noise levels for the existing environment at each noise logging location during the day, evening and night-time periods. The representative L_{Aeq} noise levels were determined by logarithmically averaging noise measurements in each time period for the entire duration of noise logging. It is noted that higher background noise levels were measured closer to the Great Western Highway.

Noise logging	Ambient noise levels (L _{Aeq}), dB(A)			Rating back dB(A)	Rating background noise levels (L _{A90}), dB(A)			
location	Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹		
NL1	53	52	51	46	38	30 (29) ²		
NL2	49	48	43	35 (29) ²	30 (25) ²	30 (22) ²		
NL3	61	59	58	49	35	30 (24) ²		
NL4	59	56	52	40	35	32		
NL5	49	49	47	39	37	30 (25) ²		
NL6	73	70	69	50	37	30 (26) ²		
NL7	68	65	64	48	42	40		
NL8	48	46	43	36	36	30 (25) ²		
NL9	64	60	61	45	37	30 (29) ²		
NL10	60	58	58	47	42	33		
NL11	65	61	62	48	41	35		

Table 2-4 Existing ambient (LAeq) and rating background (LA90) noise levels

Notes:

1. Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.

Where the rating background level is found to be less than 35 dB(A) during the daytime then it is set to 35 dB(A). Where it is found to be less than 30 dB(A) during evening or night-time then it is set to 30 dB(A) in accordance with NSW Noise Policy for Industry (EPA, 2017).

2.7 Road noise monitoring results

Table 2-5 provides the logarithmically averaged existing road traffic noise levels measured at each of the noise logging locations used for the assessment of road traffic noise. Noise logging data from these locations have been used to validate the road traffic noise model for the project.

These measured road traffic noise levels have been compared to the predicted noise levels from the validation noise model. The good correlation that has been identified between these measured noise levels and the predicted noise levels in the validation model provides confidence that the future road traffic noise levels can be accurately predicted for the operational noise assessment. Further information on the noise modelling and validation of noise model outputs is provided in Section 5.0.

Noise logging location	Ambient road traffic noise level, dB(A)			
Noise logging location	Day ¹ (L _{Aeq,15 hr})	Night ¹ (L _{Aeq,9 hr})		
NL1	53	51		
NL3	61	58		
NL6	72	69		
NL7	67	64		
NL9	63	61		
NL10	60	58		
NL11	64	62		

Table 2-5 Existing road traffic noise levels

Notes:

1. Day is defined as 7:00 am to 10:00 pm. Night is defined as 10:00pm to 7:00am.

2.8 Road traffic counts

Table 2-6 provides the traffic counts undertaken during the noise monitoring period.

Table 2-6 Existing road traffic volumes (2021), heavy vehicle ratio and average vehicle speed (daytime and night-time)

	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Vehicle
Location	Traffic volume	Heavy vehicle ratio	Traffic volume	Heavy vehicle ratio	speed, km/h
Great Western Highway, Station Street, Medlow Bath - Westbound	8,988	9.8%	1,032	33%	69
Great Western Highway, Station Street, Medlow Bath - Eastbound	9,310	13.1%	924	26%	70
Great Western Highway, Browntown Oval Intersection - Northbound	6,504	19.0%	874	46%	83
Great Western Highway, Browntown Oval Intersection - Southbound	6,776	20.3%	624	43%	77
Great Western Highway, Mount York Road - Eastbound	5,772	20.3%	707	36%	59
Great Western Highway, Mount York Road - Westbound	5,338	18.0%	924	33%	59
Great Western Highway Eastbound - West of Coxs River Road	5,802	18.0%	678	37%	79
Great Western Highway Westbound - West of Coxs River Road	5,652	18.8%	803	45%	78
Great Western Highway Westbound - East of Evans Lookout Road	9,013	15.4%	1,076	36%	76
Great Western Highway Eastbound - East of Evans Lookout Road	8,927	14.2%	832	32%	76
Great Western Highway Westbound - West of Evans Lookout Road	6,647	14.3%	965	34%	71
Great Western Highway Eastbound - West of Evans Lookout Road	6,793	16.9%	689	40%	71
Great Western Highway Eastbound - East of The Grange	5,962	18.8%	638	44%	78

	Daytime (7am – 10pm)		Night-time (10pm – 7am)		Vehicle
Location	Traffic volume	Heavy vehicle ratio	Traffic volume	Heavy vehicle ratio	speed, km/h
Great Western Highway Westbound - East of The Grange	5,629	20.8%	761	51%	81
Great Western Highway Eastbound - East of Coxs River Road	6,482	13.6%	862	42%	58
Great Western Highway Westbound - East of Coxs River Road	6,715	19.2%	708	42%	61

3.0 Assessment methodology

3.1 Relevant guidelines and policies

The following guidelines have been used for the noise and vibration assessment:

- Construction noise:
 - Construction Noise and Vibration Guideline (for Road and Maritime Works) (CNVG) (Transport, 2022)
 - Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- Construction vibration:
 - Assessing Vibration: a technical guideline (DEC, 2006)
 - Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (Australian and New Zealand Environment Council (ANZEC), 1990)
 - British Standard 7385: Part 2 1993 Evaluation and Measurement of Vibration in Buildings, 1993
 - British Standard 6472: Part 1 2008 Evaluation of Human Exposure to Vibration in Buildings, 2008
 - British Standard 5228: Part 1 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise
 - DIN 4150:Part 3-1999 Structural vibration Effects of vibration on structures (*Deutsches Institut für Normung* 1999)
 - Evaluation and Measurement for Vibration in Buildings Part 2, (British Standard (BS) 7385:Part 2-1993) (BS 7385)
 - Explosives Storage and Use Part 2: Use of Explosives (Australian Standard (AS) 2187:Part 2-2006) (AS 2187.2)
 - Mechanical vibration Ground-borne noise and vibration arising from rail systems (International Standard 14837-1:2005 (ISO14837)
- Operational traffic noise:
 - NSW Road Noise Policy (RNP) (DECCW, 2011)
 - Road Noise Criteria Guideline (RNCG) (Transport, 2022)
 - Road Noise Mitigation Guideline (RNMG) (Transport, 2022)
 - Model Validation Guideline (RMS, 2016)
 - Application Notes Road Noise Criteria Guideline (Transport, 2022)
 - Environmental Noise Management Manual (RTA, 2001)
 - Procedure for Preparing an Operational Noise and Vibration Assessment (RMS, 2011b)
 - Draft At-Receiver Treatment Guideline (ARTG) (RMS, 2017)
 - Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999)

- Noise from operational ancillary facilities:
 - Noise Policy for Industry (NPfI) (EPA, 2017)
- Sleep disturbance during construction and operation:
 - NSW Road Noise Policy (RNP) (DECCW, 2011)
 - Noise Policy for Industry (NPfI) (EPA, 2017)

The policies and guidelines listed above are detailed further in the following sections, including how they have been employed for the purposes of this assessment.

3.2 Construction noise

The potential risk of adverse impact of construction noise on a receiver is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

The *Interim Construction Noise Guideline* (DECC, 2009) is a NSW Government document that identifies ways to manage impacts of construction noise on residences and other sensitive land uses. It is the principal guideline for the assessment and management of construction noise in NSW and is used to establish construction NMLs.

As the proposed works are expected to continue for a period of more than three weeks and are within relatively close proximity to noise sensitive receivers, a quantitative assessment, based on 'reasonable' worst case construction scenarios, has been carried out for these works. Noise levels resulting from construction activities are predicted at nearby noise sensitive receivers using environmental noise modelling software and compared to the noise management levels, derived in accordance with the *Interim Construction Noise Guideline* (DECC, 2009).

Where an exceedance of the noise management levels is predicted, the *Interim Construction Noise Guideline* (DECC, 2009) advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as provide contact details to facilitate feedback from affected residents during construction.

Where construction noise levels at a receiver reach 75 dB(A), residential receivers are considered to be 'highly noise affected' and the proponent should, in consultation with the community, consider restrictions to the hours of construction to provide respite periods.

The *Interim Construction Noise Guideline* (DECC, 2009) defines what is considered to be feasible and reasonable as follows:

- Feasible a work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements
- Reasonable selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.

Additionally, the *Interim Construction Noise Guideline* (DECC, 2009) notes that strong justification is required for work that is proposed outside of standard working hours.

The applicable construction NMLs for residential and other sensitive land uses around the project are detailed below.

3.2.1 Residential receivers

The *Interim Construction Noise Guideline* provides the guidance in Table 3-1 for setting construction NMLs for residential receivers.

Table 3-1 Construction noise management levels – residential receivers

Time of day	NML (L _{Aeq(15min)}), dB(A) ¹	Application	
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB(A)	 The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured L_{Aeq (15 min}) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. 	
	Highly noise affected ≥75 dB(A)	 The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. 	
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	 A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the <i>Interim Construction Noise Guideline</i>. 	

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

The Construction Noise and Vibration Guideline (for Road and Maritime Works) (Transport, 2022) sets out community perceptions of construction noise dependent upon the level of exceedance of the rating background level and noise management levels. These are presented in Table 3-2.

 Table 3-2
 Community perception of construction noise

Perception	dB(A) above rating background level	dB(A) above noise management level – Standard hours	dB(A) above noise management level – Out of hours
Noticeable	5-10	0	0-5
Clearly audible	11-20	0-10	6-15

Perception	dB(A) above rating background level		dB(A) above noise management level – Out of hours
Moderately intrusive	21-30	11-20	16-25
Highly intrusive	>30	>20	>25

3.2.2 Noise catchment areas

The area along and around the project corridor has been divided into 14 distinct NCAs as shown in Figure 2-1. The NCAs have been identified based on the similarity of the existing noise environment for the sensitive receivers in the NCA, based on unattended background noise monitoring results (refer to Section 2.6).

The rating background noise levels, applicable construction NMLs and highly noise affected levels for residential receivers in each NCA are summarised in Table 3-3.

Table 3-3	Construction noise management levels – residential receivers
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Noise catchment area	Representative noise logger location ¹	Period	Rating background noise levels (L _{A90}), dB(A)	Noise management levels (L _{Aeq(15min})), dB(A) ^{2,3,4}	Highly noise affected level (L _{Aeq(15min)}), dB(A)
NCA1	NL1	Day	46	56 (51)	75
Blackheath		Evening	38	43	
		Night	30	35	
NCA2	NL2	Day	35	45 (40)	
Blackheath		Evening	30	35	
		Night	30	35	
NCA3	NL3	Day	49	59 (54)	
Blackheath		Evening	35	40	
		Night	30	35	
NCA4	NL4	Day	40	50 (45)	
Blackheath		Evening	35	40	
		Night	32	37	
NCA5	NL5	Day	39	49 (44)	
Blackheath		Evening	37	42	
		Night	30	45	
NCA6	NL2	Day	35	45 (40)	
Blackheath		Evening	30	35	
		Night	30	35	
NCA7	NL5	Day	39	49 (44)	
Blackheath		Evening	37	42	
		Night	30	45	
	NL8	Day	36	46 (41)	
		Evening	36	41	

Noise catchment area	Representative noise logger location ¹	Period	Rating background noise levels (L _{A90}), dB(A)	Noise management levels (L _{Aeq(15min)}), dB(A) ^{2,3,4}	Highly noise affected level (L _{Aeq(15min)}), dB(A)
NCA8 Mount Victoria		Night	30	35	
NCA9	NL8	Day	36	46 (41)	
Mount Victoria		Evening	36	41	
		Night	30	35	
NCA10	NL8	Day	36	46 (41)	
Mount Victoria		Evening	36	41	
Viotoria		Night	30	35	
NCA11 NL2 Kanimbla	NL2	Day	35	45 (40)	
		Evening	30	35	
		Night	30	35	
NCA12	NL8	Day	36	46 (41)	
Little Hartley		Evening	36	41	
Thankiey		Night	30	35	
NCA13	NL8	Day	36	46 (41)	
Little Hartley		Evening	36	41	
i lai lioy		Night	30	35	
NCA14	NL2	Day	35	45 (40)	
Little Hartley		Evening	30	35	
. iai ioy		Night	30	35	

Notes:

1 The noise logger most representative of the noise environment of each noise catchment area was adopted from those used for construction noise (see Table 2-3) with consideration of distance to the Great Western Highway and shielding

2 Day time noise management levels = RBL + 10 dB(A)

3 Evening/night-time noise management levels = RBL + 5 dB(A)

4 Day time Out of Hours noise management level given in brackets = RBL + 5 dB(A)

3.2.3 Non-residential criteria

NMLs recommended by the *Interim Construction Noise Guideline* (DECC, 2009) for non-residential sensitive land uses, such as schools, hospitals or places of worship are provided in Table 3-4. Noise management levels for commercial and industrial premises are provided in Table 3-5.

Table 3-4 Construction noise management levels - non-residential sensitive land uses

Land use	Noise management level, L _{Aeq(15 min)}
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate	External noise level 65 dB(A)

Land use	Noise management level, L _{Aeq(15 min)}
their own noise or focus for participants, making them less sensitive to external noise intrusion)	
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended "maximum" internal levels in AS2107 for specific uses.

Table 3-5 Construction noise management levels – commercial and industrial land uses

Land use	Noise management level, L _{Aeq(15min)}
Industrial premises	External noise level 75 dB(A)
Offices, retail outlets	External noise level 70 dB(A)

3.2.4 Sleep disturbance

The Interim Construction Noise Guideline (DECC, 2009) requires a sleep disturbance assessment to be undertaken where construction works are planned to extend over more than two consecutive nights. The Interim Construction Noise Guideline (DECC, 2009) makes reference to the EPA's NSW Environment Criteria for Road Traffic Noise (EPA, 1999), now superseded by the NSW Road Noise Policy (DECCW, 2011), for assessment of sleep disturbance. The Road Noise Policy (DECCW, 2011) references the recommendations in the Environment Criteria for Road Traffic Noise (EPA, 1999) as providing the most appropriate assessment guidance.

The guidance provided in the *Road Noise Policy* (DECCW, 2011) for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10pm to 7am), the L_{A1(1 min)} noise level outside a bedroom window should not exceed the L_{A90(15 min)} background noise level by more than 15 dB(A). The EPA considers it appropriate to use this metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded, then a more detailed analysis must be undertaken that should include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The *Road Noise Policy* (DECCW, 2011) contains a review of research into sleep disturbance which represents NSW EPA guidance on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, 'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'. Therefore, given that an open window provides around 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Table 3-6 presents the sleep disturbance screening and sleep disturbance awakening reaction criteria for the NCAs along and around the project corridor.

Noise catchment area	Rating background noise levels (L _{A90}), dB(A)	Sleep disturbance screening criteria (L _{A1(1min)}), dB(A)	Sleep disturbance awakening reaction criterion (L _{A1(1min)}), dB(A)
NCA1 Blackheath	30	45	65
NCA2 Blackheath	30	45	
NCA3 Blackheath	30	45	

Table 3-6 Construction noise sleep disturbance criteria – residential receivers

Noise catchment area	Rating background noise levels (L _{A90}), dB(A)	Sleep disturbance screening criteria (L _{A1(1min)}), dB(A)	Sleep disturbance awakening reaction criterion (L _{A1(1min)}), dB(A)
NCA4 Blackheath	32	47	
NCA5 Blackheath	30	45	
NCA6 Blackheath	30	45	
NCA7 Blackheath	30	45	
NCA8 Mount Victoria	30	45	
NCA9 Mount Victoria	30	45	
NCA10 Mount Victoria	30	45	
NCA11 Kanimbla	30	45	
NCA12 Little Hartley	30	45	
NCA13 Little Hartley	30	45	
NCA14 Little Hartley	30	45	

3.2.5 Construction traffic noise

Noise from construction traffic on public roads is not covered by the *Interim Construction Noise Guideline* (DECC, 2009). However, the *Interim Construction Noise Guideline* (DECC, 2009) does refer to the *Environmental Criteria for Road Traffic Noise* (EPA, 1999), which is now superseded by the *Road Noise Policy* (DECCW, 2011), for the assessment of noise arising from construction traffic on public roads.

To assess noise impacts from construction traffic, an initial screening test has been undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A) as a result of the project. Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion, then noise mitigation should be considered for those receivers affected. The *Road Noise Policy* (DECCW, 2011) does not require assessment of noise impact to commercial or industrial receivers.

3.3 Construction vibration criteria

The relevant standards/guidelines for the assessment of construction vibration are summarised in Table 3-7.

Item	Standard/guideline
Structural damage	Heritage structures – German Standard <i>DIN 4150 – Part 3 – Structural</i> <i>Vibration in Buildings – Effects on Structures</i> (DIN 4150) Non-heritage structures – <i>Evaluation and Measurement for Vibration in</i> <i>Buildings</i> Part 2, (British Standard (BS) 7385:Part 2-1993) (BS 7385)
Human comfort (tactile vibration)	Assessing Vibration: A Technical Guideline (DEC, 2006)) ¹
Human comfort (ground-borne noise)	Interim Construction Noise Guideline (DECC, 2009)

Table 3-7 Standards/guidelines used for assessing construction vibration

Notes:

1 This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities for example, a tunnel boring machine
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with a duration of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

3.3.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration. DIN 4150 and BS 7385-2 provide recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 3-8 and Table 3-9. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage. Structural damage criteria for heritage items have been taken from DIN 4150, while criteria for commercial/residential items have been taken from BS 7385.

Group	Type of structure	At foundation – less than 10 Hz	At foundation – 10 Hz to 50 Hz	At foundation – 50 Hz to 100 Hz ¹	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Table 3-8 Structural damage criteria (DIN 4150) for building vibration (Peak particle velocity)

Notes:

1. At frequencies above 100 Hz, the values given in this column may be used as minimum values

Group	Type of building	Peak component particle velocity in frequency range of predominant pulse		
		4 Hz to 15 Hz	15 Hz and above	
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above		
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above	

Table 3-9 BS 7385-2: Transient vibration guide values for cosmetic damage

3.3.2 Human comfort

Humans are sensitive to vibration such that they can detect vibration levels well below those required to cause any risk of damage to a building or its contents. Criteria to avoid annoyance are therefore more stringent than those to prevent structural damage.

3.3.2.1 Intermittent vibration

The assessment of intermittent vibration outlined in *Assessing Vibration: a technical guideline* (DEC, 2006) is based on vibration dose values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 3-10. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Location	Daytime		Night-time	
	Preferred	Max	Preferred	Max
Critical areas ¹	0.10	0.20	0.10	0.20
Residences ²	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Table 3-10 Preferred and maximum vibration dose values for intermittent vibration (m/s^{1.75})

Notes:

1 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria.

2 Criteria for residences are lower than schools as people expect to be able to relax/sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.

3.3.2.2 Continuous and impulsive vibration

Acceptable levels of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. *Assessing Vibration: a technical guideline* (DEC, 2006) provides the preferred values for continuous and impulsive vibration. These are presented in Table 3-11.

There is low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values in Table 3-11. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short duration. Vibration levels above those indicated in Table 3-11 may be dealt with through negotiation with the regulator of the affected community.

Location	Assessment period	Preferred	Maximum
Continuous vibration	•		
Critical areas ¹	When in use	0.14	0.28
Residences ²	Day Night	0.28 0.20	0.56 0.40
Offices, schools, educational institutions and places of worship	When in use	0.56	1.10
Workshops	When in use	1.10	2.20
Impulsive vibration			
Critical areas ¹	When in use	0.14	0.28
Residences ²	Day Night	8.60 2.80	17.0 5.60
Offices, schools, educational institutions and places of worship	When in use	18.0	36.0
Workshops	When in use	18.0	36.0

Table 3-11 Peak particle velocity for continuous and impulsive vibration (mm/s)

Notes:

1 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria.

2 Criteria for residences are lower than schools as people expect to be able to relax/sleep in their homes without annoyance and are generally more concerned about structural damage than would be the case within schools and offices.

3.4 Ground-borne noise

Vibration generated by activities such as tunnelling may enter buildings via the ground. This may cause the floors, walls and ceilings to vibrate and to radiate noise. This noise is commonly referred to as ground-borne noise. Ground-borne noise is typically low frequency and if audible, is perceived as a 'rumble'.

In general, ground-borne noise level values are relevant only where they are higher than the airborne noise levels. Ground-borne noise from construction activities is typically masked by higher airborne noise levels associated with surface construction activities and/or traffic.

The magnitude of ground-borne noise experienced by receivers located close to tunnelling activities is influenced by factors including:

- the tunnel construction technique
- the depth of tunnelling work
- geological ground conditions
- the timing and duration of construction activities.

The ground-borne noise goals as outlined in the *Interim Construction Noise Guideline* (DECC, 2009) have been adopted and are presented in Table 3-12. These levels are applicable during the evening and night-time periods only in residential properties, as the objective is to protect the amenity and sleep of people when they are at home. In addition, it is noted that ground-borne noise is usually not a significant disturbance to building occupants during daytime periods due to higher ambient levels which mask the audibility of ground-borne noise emissions. During the night-time ambient levels are often much lower and ground-borne noise can become more prominent. Therefore, only vibration criteria apply to the daytime period.

Time	Ground-borne noise goals
Evening (6pm to 10pm)	40 dB(A) L _{Aeq(15 min)}
Night-time (10pm to 7am)	35 dB(A) LAeq(15 min)

Table 3-12 Recommended ground-borne noise goals for construction activities

3.5 Blasting

Construction blasting can result in airblast and ground vibration, which may cause human discomfort and potentially cause damage to structures, architectural elements and services.

The Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (Australian and New Zealand Environment and Conservation Council (ANZEC), 1990) by the NSW EPA as the basis for comfort criteria to minimise annoyance and discomfort to persons at noise sensitive sites (e.g. residences, hospitals, schools etc.) as a result of blasting. The guidelines are not intended to provide structural damage criteria, but provide a conservative approach to the assessment of potential impacts on structures as minimising human annoyance and comfort would inherently minimise structural damage.

Explosives – Storage and Use – Part 2: Use of Explosives (Australian Standard (AS) 2187:Part 2-2006) (AS 2187.2) recommends ground vibration limits which are consistent with the ANZEC guidelines but provides more detail with respect to criteria for human comfort and structural damage. This includes consideration of different types of structures such as more sensitive masonry and plasterboard buildings and less sensitive reinforced concrete buildings. AS 2187.2 notes that damage (even of a cosmetic nature) has not been found to occur at airblast levels below 133 dB (linear peak).

3.5.1 Blasting criteria

In relation to airblast overpressure, the following criteria have been adopted:

- less than or equal to 115 dB (linear) peak for 95 per cent of total blasts over 12 months
- less than 120 dB (linear) peak for any blasts.

For the purposes of this project, the AS 2187.2 ground vibration criteria have been considered and are summarised in Table 3-13. AS 2187.2 recommends that if the prescribed limits in Table 3-13 cannot be achieved, an agreement may be reached with the landowner permitting higher levels.

The blast vibration criteria identified in the ANZEC guidelines are conservative and were originally developed to protect communities exposed to long-term blasting operations such as at mining sites. For projects such as this, where residents are affected on a short term basis, a higher vibration criterion may be reasonable.

Subject to the ground conditions encountered blasting may be required to support the excavation of tunnel cross passages. As cross passages are located at discrete locations along the tunnel, blasting during tunnel construction would move along the alignment such that any one receiver would be affected for no more than a short period of time. Table J4.5(A) in Appendix H of AS 2187.2 presents vibration limits designed to safeguard human comfort in relation to blasting that have been used by some authorities, as it defines clearer vibration limits which are dependent on the specific duration of the project. Based on the limitations of the ANZEC guidelines and further guidance in AS 2187.2, a human comfort vibration limit of 10 millimetres per second (peak particle velocity) for blasting operations lasting less than 12 months has been adopted for the project.

These requirements do not cover high rise buildings, buildings with long span floors, specialist structures such as reservoirs, dams and hospitals, or buildings housing scientific equipment sensitive to vibration. These require special considerations, which may necessitate taking additional measurements on the structure itself. Particular attention needs to be given to the response of suspended floors.

Receiver type	Human comfort	Structural damage ¹
Sensitive structures (e.g. residential, theatres, schools etc.)	5 mm/s for 95 per cent blasts per year, and 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply ² .	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Occupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturer's specifications or levels that can be shown to adversely affect the equipment operation.	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply.
Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (e.g. factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturer's specifications or levels that can be shown to adversely affect the equipment operation.	15 mm/s at 4 Hz, increasing to 20 mm/s at 15 Hz, and increasing to 50 mm/s at 40 Hz and above.
Unoccupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises)	N/A	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply.
Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction	N/A	15 mm/s at 4 Hz, increasing to 20 mm/s at 15 Hz, and increasing to 50 mm/s at 40 Hz and above.
Services structures, such as pipelines, power lines and cables	N/A	Limit to be determined by structural design methodology. Special consideration may be required for high pressure gas pipelines.

Notes:

1. The values above are less stringent than those in DIN 4150. This is because DIN 4150 considers resonance in buildings from continuous vibration. Due to the short duration of blasting events the propensity for resonance within buildings is minimal, giving rise to higher criteria.

2. The blast vibration criteria identified in the ANZEC guidelines are conservative and were originally developed to protect communities exposed to long-term blasting operations such as mining sites. For projects such as this, with a shorter duration of blasting of two months or less, a higher vibration criterion may be reasonable. For this project, the location of the blast moves along the alignment such that any one receiver is affected for short period of time. Table J4.5(A) in Appendix H of AS 2187 presents vibration limits designed to safeguard human comfort in relation to blasting that have been used by some authorities, as it defines clearer vibration limits which are dependent on the specific duration of the project. Based on the limitations of the ANZEC guidelines and further guidance in AS 2187, a human comfort vibration limit of 10 mm/s (peak particle velocity) for blasting operations lasing less than 12 months has been adopted for this project.

3.5.2 Recommended hours and frequency of blasting activities

The ANZEC guidelines recommend that:

- Blasting should generally only be permitted from 9am to 5pm Monday to Saturday. Blasting should not take place on Sundays or public holidays
- Blasting should generally take place no more than once per day.

The recommended restrictions on times and frequency of blasting do not apply in cases where the effects of the blasting are not perceived at noise sensitive receivers. Similarly, the recommendation that blasting take place no more than once per day is taken to mean no one sensitive receiver should not be affected by blasting more than once per day.

3.6 Operational assessment criteria

3.6.1 Operational road traffic noise criteria

Noise criteria are assigned to sensitive receivers using Transport's *Road Noise Criteria Guideline* (Transport, 2022). The *Road Noise Criteria Guideline* (Transport, 2022) provides guidance on how to apply the *Road Noise Policy* (DECCW, 2011).

The *Road Noise Policy* (DECCW, 2011) requires the consideration of two scenarios, 'without project' and 'with project'. The 'without project' scenario assumes the project would not proceed. The 'with project' assumes the project would proceed. Each of these scenarios must be considered at two points in time, the year of opening and the design year, typically ten years after opening. For this project, the year 2030 has been assessed as the year of opening, and 2040 has been assessed as the design year.

The operational road traffic noise study area extends to where noise levels are dominated by other roads that are not being assessed as part of this project, as detailed in the *Road Noise Criteria Guideline* (Transport, 2022). For suburban areas this is up to a maximum distance of 600 metres from the project works.

3.6.1.1 Residential sensitive receiver criteria

Depending on the type of road project residential receivers may be assigned new, redeveloped, transition zone or relative increase criteria. The criteria applicable to each noise sensitive receiver were determined in accordance with the Road Noise Criteria Guideline (Transport, 2022) and are shown graphically in Annexure C. Criteria are based on the road development type which is affecting the residential receiver. For each façade of a residential receiver the most stringent applicable criteria are used in the assessment. Table 3-13 presents the applicable road traffic criteria.

	Assessment criteria, dB(A)		
Type of project/land use	Day (7 am – 10 pm)	, Night (10 pm – 7 am)	
New road development	LAeq(15 hr)	LAeq(9 hr)	
Existing residences affected by noise from new freeways/arterial/sub-arterial road corridors	55 dB(A) (external)	50 dB(A) (external)	
Road redevelopment	L _{Aeq(15 hr)}	L _{Aeq(9 hr)}	
Existing residences affected by noise from redevelopment of existing freeways/arterial/sub-arterial roads	60 dB(A) (external)	55 dB(A) (external)	
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments			
Existing residences affected by noise from existing freeway/arterial/sub- arterial roads where no redevelopment is taking place			
Transition zones	LAeq(15 hr)	LAeq(9 hr)	
Existing residences affected by both new roads and the redevelopment of existing freeway/arterial/sub-arterial roads in a Transition Zone ¹	Between 55 and 60 dB(A) (external)	Between 50 and 55 dB(A) (external)	
Relative increase	LAeq(15 hr)	LAeq(15 hr)	
Existing residences affected by increases in traffic noise of 12 dB(A) or more from new freeway/arterial/sub- arterial roads ²	Between 42 and 55 dB(A) (external)	Between 42 and 50 dB(A) (external)	

Table 3-14 Road traffic noise assessment criteria - freeway/arterial/sub-arterial road - residential receivers

Notes:

1. The criteria assigned to a façade depend on the proportion of noise coming from the existing road. Refer to the Road Noise Criteria Guideline for further information.

2. The criteria at each façade are determined from the existing traffic noise level plus 12 dB(A).

3.6.1.2 Transition zone noise criteria

The *Road Noise Criteria Guideline* (Transport, 2022) provides guidance on transition zones. Transition zones are areas where a graduation between the redeveloped and new road noise criteria applies. They ensure that a gradual change in criteria is applied to noise sensitive receivers, rather than a step change.

To determine the applicable transition zone noise criteria, the contribution from the new road segments and the redeveloped road segments are calculated at individual noise sensitive receivers. The difference in contribution defines the applicable transition zone noise criteria. Provided below in Table 3-15 is a summary of the applicable transition zone noise criteria.

Contribution difference dB(A)	Total noise level, dB(A)		
New road segments minus redeveloped road segments	Daytime criteria	Night-time criteria	
Contribution difference \geq +3.0	55	50	
+3.0 > Contribution difference \geq +1.5	56	51	
+1.5 > Contribution difference \ge +0.0	57	52	
+0.0 > Contribution difference \geq -1.5	58	53	
-1.5 > Contribution difference \ge -3.0	59	54	
-3.0 > Contribution difference	60	55	

Table 3-15 Transition zone noise criteria

Noise contours have been used to calculate the transition zones in accordance with the *Road Noise Criteria Guideline* (Transport, 2022). The transition zone noise contours are provided in Annexure C. These contours identify the relevant road noise criteria that applies to each sensitive receiver.

3.6.2 Non-residential sensitive receiver criteria

The criteria for other sensitive receivers are presented in Table 3-16. For schools, places of worship and childcare facilities, the *Road Noise Criteria Guideline* (Transport, 2022) criteria are based on internal noise levels. A conservative minimum outside-to-inside attenuation of 10 dB(A), on the basis of open windows for natural ventilation, has been assumed to allow for an external noise assessment at the other sensitive receivers. As details are not currently available to allow the building-specific façade noise reduction to be identified, it is recommended that this should be investigated further during the ongoing design development.

Assessment criteria dB(A)		Additional considerations		
Day (7 am – 10 pm)	Night (10 pm – 7 am)			
School classro	oms			
L _{Aeq(1 hr)} 40 dB(A) (internal)	-	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000)		
Hospital wards	Hospital wards			
L _{Aeq(1 hr)} 35 dB(A) (internal)	L _{Aeq(1 hr)} 35 dB(A) (internal)	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000)		

Assessment cr	iteria dB(A)	Additional considerations
Day (7 am –	Night (10 pm	
10 pm)	– 7 am)	
Places of wors	hip	
L _{Aeq(1 hr)} 40 dB(A) (internal)	L _{Aeq(1 hr)} 40 dB(A) (internal)	The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas
		are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (refer to 'Open space (passive use)' in this table) may be applied.
Open space (ad	tive use)	
L _{Aeq(15 hr)} 60 dB(A)	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open
		space may also be used as a buffer zone for more sensitive land uses.
Open space (pa	assive use)	
L _{Aeq(15 hr)} 55 dB(A)	-	-

Assessment criteria dB(A)		Additional considerations			
Day (7 am – 10 pm)	Night (10 pm – 7 am)				
Childcare facili	ties				
Sleeping rooms	-	Multi-purpose spaces, e.g. shared indoor play/sleeping rooms should meet the lower of the respective criteria.			
L _{Aeq(1 hr)} 35 dB(A)		Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not			
Indoor play areas		known, during the highest hourly traffic noise level during the opening hours of the facility.			
L _{Aeq(1 hr)}					
40 dB(A) (internal)					
Outdoor play areas					
LAeq(1 hr)					
55 dB(A) (external)					
Aged care facili	Aged care facilities				
-	-	Residential land use noise assessment criteria should be applied to these facilities.			

3.6.3 Guidance for the evaluation of feasible and reasonable noise mitigation measures

Where the *Road Noise Criteria Guideline* (Transport, 2022) criteria are exceeded, Transport's *Road Noise Mitigation Guideline* (Transport, 2022) provides guidance where the provision of additional controls would be considered 'feasible and reasonable'.

The hierarchy of noise mitigation is firstly to consider at-source noise mitigation measures such as road design and traffic management, then the use of quieter pavements. If these measures cannot be designed to meet the noise criteria the use of 'in corridor' mitigation measures should be considered, which are generally noise barriers and mounds. Finally, if the applicable noise criteria cannot be met by using a combination of all these methods, at-receiver mitigation measures can be considered such as architectural treatments and property boundary walls.

The *Road Noise Mitigation Guideline* (Transport, 2022) provides guidance on managing and controlling road traffic generated noise and describes the principles to be applied when reviewing noise mitigation options. The *Road Noise Mitigation Guideline* (Transport, 2022) recognises that the criteria recommended by the *Road Noise Criteria Guideline* (Transport, 2022) are not always practicable and that is it not always feasible and/or reasonable to expect that they should be achieved.

The *Road Noise Mitigation Guideline* (Transport, 2022) provides three triggers where a receiver may qualify for consideration of noise mitigation (beyond the adoption of road design and traffic management measures). These are:

- the predicted 'with project' noise level exceeds the *Road Noise Criteria Guideline* (Transport, 2022) controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the 'with project' minus the 'without project') is greater than 2.0 dB(A), or
- the predicted 'with project' noise level is 5 dB(A) or more above the criteria (meets or exceeds the cumulative limit) and the receiver is significantly influenced by road noise, regardless of the incremental impact of the project. The cumulative limit is 5 dB(A) above the *Road Noise Criteria Guideline* (Transport, 2022) criteria. The purpose of the cumulative limit is to prevent a receiver

with an existing high noise level from remaining well above the criterion if the noise level did not increase significantly relative to the 'without project' scenario, or

• the predicted 'with project' noise level increase due to the project (i.e. the noise predictions for the 'with project' minus the 'without project') is 12.0 dB(A) or more.

In addition, if the noise level contribution from the road project is acute (daytime $L_{Aeq(15 hr)} 65 dB(A)$ or higher, night-time $L_{Aeq(9 hr)} 60 dB(A)$ or higher) then it qualifies for consideration of noise mitigation even if noise levels are dominated by another road.

3.6.4 Maximum noise levels

Maximum noise levels generated by road traffic noise have the potential to cause disturbance to sleep. Although maximum noise goals are not provided in the *Road Noise Policy* (DECCW, 2011), it does include a review of internal sleep arousal research. It concludes that there appears to be insufficient evidence to set new indicators for potential sleep disturbance due to road traffic noise. Nevertheless, Transport recognises the potential impacts and requires an assessment of maximum noise levels be made where impacts may occur during the night.

Guidance for assessing maximum noise levels are provided in Practice Note iii of the *Environmental Noise Management Manual*. The maximum noise assessment should be used as a tool to help prioritise and rank mitigation strategies, but should not be used as a decisive criterion in itself and should not be used to aid in designing the degree of mitigation required.

The assessment considers the following:

- calculation of maximum noise levels
- the extent to which the maximum noise levels for individual vehicle pass-bys exceed the L_{Aeq} noise level for each hour of the night (i.e. L_{Amax} noise levels greater than 65 dB(A) where L_{Amax} L_{Aeq(1hr)} ≥ 15 dB(A))
- the number of times the maximum noise levels for individual vehicle pass-bys exceed the L_{Aeq} noise level for each hour of the night.

3.6.5 Operational facilities noise criteria

The *Noise Policy for Industry* (EPA, 2017) provides noise criteria for assessing the potential impact of noise from industry and includes a framework for considering feasible and reasonable noise mitigation measures. The *Noise Policy for Industry* applies to all noise emissions from the permanent operational ancillary facilities ('fixed' facilities) for the project. The assessment procedure for industrial noise sources has two components that must be considered:

- controlling intrusive noise impacts in the short term for residences
- maintaining noise level amenity for residences and other land uses.

3.6.5.1 Intrusive noise impacts

The *Noise Policy for Industry* states that the intrusiveness of a noise source may generally be considered acceptable if the level of noise from the source (L_{Aeq} level), measured over a 15 minute period, does not exceed the measured background noise level (the rating background level (RBL)) by more than 5 dB.

The RBLs and intrusive noise criteria for the 14 NCAs (refer to Figure 2-1) potentially affected by the operation of project's fixed facilities (such as the tunnel operations facility and ventilation outlets) are presented in Table 3-17.

Table 3-17 Intrusive criteria

Noise catchment area (receivers)	Period	RBL (L _{A90}), dB(A)	Intrusive criteria (RBL+5), dB(A)
	Day ¹	46	51
NCA1 Blackheath (residential receivers)	Evening ²	38	43
	Night ³	30	35
	Day ¹	35	40
NCA2 Blackheath (residential receivers)	Evening ²	30	35
	Night ³	30	35
	Day ¹	49	54
NCA3 Blackheath (residential receivers)	Evening ²	35	40
	Night ³	30	35
	Day ¹	35	40
NCA12 Little Hartley (residential receivers)	Evening ²	30	35
	Night ³	30	35
	Day ¹	35	40
NCA13 Little Hartley (residential receivers)	Evening ²	30	35
	Night ³	30	35

Notes:

1 Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays

2 Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays

3 Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

3.6.5.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level resulting from all industrial noise sources in an area should not normally exceed the acceptable noise levels specified in the *Noise Policy for Industry*. As per the definitions of receiver types within the *Noise Policy for Industry*, residential receivers potentially affected by noise from the project's fixed facilities are classified as 'suburban'.

Table 3-18 summarises the amenity criteria for different noise sensitive receiver types.

The project amenity noise level is equal to the recommended amenity noise level minus 5 dB(A). However, if cumulative industrial noise is not a necessary consideration at a certain receiver location, as no other industries are present or likely to be introduced, then the recommended amenity noise level from Table 3-18 is assigned as the project amenity noise level.

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level. If all the conditions below are satisfied, the project amenity noise level becomes $L_{Aeq,traffic}$ minus 15 dB(A):

- the road traffic noise is the dominant noise source
- the existing noise is 10 dB(A) or more above the recommended amenity noise level
- it is highly unlikely the road traffic noise levels would reduce in the near future.

The project amenity noise level is then converted to a 15 minute period by adding 3 dB(A).

Table 3-18 Amenity criteria

Type of receiver	Time of day	Recommended amenity noise level, dB(A)	Project amenity noise level, dB(A)	
		L _{Aeq} (period)	L _{Aeq (period)}	L _{Aeq} (15 minute)
	Day ¹	55	50	53
NCA1 Blackheath (residential receivers)	Evening ²	45	40	43
	Night ³	40	364	39
	Day ¹	55	50	53
NCA2 Blackheath (residential receivers)	Evening ²	45	40	43
	Night ³	40	35	38
	Day ¹	55	50	53
NCA3 Blackheath (residential receivers)	Evening ²	45	44 ⁴	47
	Night ³	40	43 ⁴	46
	Day ¹	55	50	53
NCA12 Little Hartley (residential receivers)	Evening ²	45	40	43
	Night ³	40	35	38
	Day ¹	55	50	53
NCA13 Little Hartley (residential receivers)	Evening ²	45	40	43
	Night ³	40	35	38
School classroom	Noisiest one-hour period when in use	45 ⁵	45	48
Place of worship	When in use	50 ⁵	50	53
Active recreation area	When in use	55	55	58
Commercial premises	When in use	65	65	68

Notes:

1 Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays

2 Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays

3 Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

4 The area is dominated by road traffic noise

5 External noise levels are based upon a 10 dB(A) reduction from outside to inside through an open window.

3.6.5.3 Summary of project specific noise criteria (fixed facilities)

A summary of the project specific noise criteria for NCAs directly affected by fixed facility noise is presented in Table 3-19. These criteria apply to environmental noise emissions from any plant installed as part of the project, and for residential receivers represent the lower of the intrusive and amenity criteria.

Table 3-19	Summary of	f project specif	ic noise criteria	(fixed facilities)
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Location/ receiver type	Time of day	Project specific noise criteria L _{Aeq} , dB(A)
NCA1 Blackheath	Day ¹	51
(residential receivers)	Evening ²	43
	Night ³	35
NCA2 Blackheath	Day ¹	40
(residential receivers)	Evening ²	35
	Night ³	35
NCA3 Blackheath	Day ¹	53
(residential receivers)	Evening ²	40
	Night ³	35
NCA12 Little Hartley	Day ¹	40
(residential receivers)	Evening ²	35
	Night ³	35
NCA13 Little Hartley	Day ¹	40
(residential receivers)	Evening ²	35
	Night ³	35
School classroom	Noisiest one-hour period when in use	48
Place of worship	When in use	53
Active recreation area	When in use	58
Commercial premises	When in use	68

Notes:

1. Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays

2 Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays

3 Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

3.6.5.4 Tonality and modifying factors

The *Noise Policy for Industry* (EPA, 2017) provides additional guidance and criteria for assessing noise emissions from sources with "annoying characteristics" such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. Penalties of up to a maximum of 10 dB(A) may be applied where the subject noise has such characteristics at the receiver.

4.0 Assessment of construction impacts

4.1 Construction scenarios and equipment

Table 4-1 summarises the proposed construction scenarios and locations each of these construction scenarios would apply.

Table 4-1 Construction scenarios and locations

Construction scenarios	Location of works
Site establishment and enabling works	 Construction footprints at: Blackheath Soldiers Pinch Little Hartley
Tunnel portal construction	 Tunnel portals (limited area within the construction footprint) at: Blackheath Little Hartley
Tunnelling and associated works	 Within tunnel Limited area within the construction footprint at: Blackheath (standard hours only) Soldiers Pinch (standard hours only) Little Hartley
Surface road upgrade works	 Construction footprints at: Blackheath Little Hartley
Operational infrastructure construction and fit-out, including construction of operational environmental controls	 Construction footprints at: Blackheath Soldiers Pinch Little Hartley Within tunnel
Finishing works, testing and commissioning	 Construction footprints at: Blackheath Soldiers Pinch Little Hartley Within tunnel

Construction scenarios and associated activities are provided in Table 4-2.

Table 4-2	Assessed construction scenarios and activities
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Construction scenario ¹	Activities	Work hours
Site establishment and enabling works	 preliminary site investigations (such as archaeological, geotechnical and contamination) preparatory works (such as remediation, heritage salvage) where required utility relocation, adjustment and protection where the project may affect existing utilities, including relocation of the Sydney Trains 66 kV line near Evans Lookout Road at Blackheath intersection upgrades to establish safe access to construction footprints including: permanent upgrade of the Great Western Highway/Evans Lookout Road to access the Blackheath construction footprint permanent upgrade of the Great Western Highway/Browntown Oval access road to access the Soldiers Pinch construction footprint establishment of a temporary intersection on the Great Western Highway at Little Hartley to access the Little Hartley construction footprint vegetation clearance and minor earthworks to provide access to access to Soldiers Pinch construction footprint in preparation for use formalisation of an access track to provide access to Soldiers Pinch construction footprint establishment of scienter footprint establishment of construction water treatment equipment including sediment basins and water treatment plants establishment of temporary environmental and safety controls (including hoardings, noise attenuation measures and erosion and sediment controls where required) delivery of construction plant, equipment and materials establishment of traffic management controls, including adjustments to road signage where required (showing adjustments to road signage where required (showing adjustments to road signage where required linein) 	Standard construction hours
Tunnel portal construction	 changes to traffic movements and speed limits). excavation stabilisation and excavation support (retention systems) such as bored pile walls, soil nailing and rock anchoring piling works construction of pile capping beams installation of roof slabs installation of permanent struts and form, reinforcement and pouring of horizontal beams used for bracing and support waterproofing and dewatering finishing works. 	Standard construction hours

Construction scenario ¹	Activities	Work hours
Tunnelling, tunnelling support activities, and associated works	 excavation of tunnel boring machine (TBM) launch and retrieval sites bored tunnel excavation and installation of segment lining excavation using road headers and structural lining of cross-passages and substations underground excavation of mid-tunnel access shaft, adit and caverns within tunnel civil finishing works and fit-out within tunnel testing and commissioning. temporary storage of tunnel lining segments concrete batching plant and mixing facilities spoil handling and stockpiling areas within an acoustic shed operation and maintenance of the water treatment plant and other water quality controls installation and operation of fresh air ventilation (fresh air ventilation fans would operate 24 hours per day, seven days per week during tunnelling) workforce amenities, offices and parking. 	24 hours per day, seven days per week
Surface road upgrade works	 earthworks construction of stormwater drainage road pavement works construction of road furniture and line marking, lighting, signage and noise barriers, if required surface finishing works (e.g., revegetation and landscaping). 	Standard construction hours
Operational infrastructure	 Construction of the tunnel operations facility east of Blackheath Construction of the tunnel ventilation facilities Construction of the tunnel fire suppression facilities Assembly of operational water treatment plant using prefabricated components Construction of the electrical substations at Little Hartley and Blackheath 	Standard construction hours
Finishing works, testing and commissioning	 installation of ITS devices (VMS, VSLS, IPLs, moveable medians, tunnel closure system, over height detection gantries) line marking of new road pavement installation of directional signage and other roadside furniture including lighting and electronic and static signage, including tunnel protection plant e.g., overheight warning devices landscaping and revegetation work removal of construction footprints site demobilisation and rehabilitation work. 	Standard construction hours

Notes:

1. The assessment of the proposed water supply connection has been undertaken qualitatively and is presented in Section 4.10.

Spoil haulage from tunnelling is proposed to also occur 24 hours per day, seven days per week to support efficient operation of the TBMs. The impact of daytime and night-time spoil haulage has been addressed in the construction traffic assessment in Section 4.6.

The twin tunnels would be constructed using two TBMs launched from the Little Hartley portal, tunnelling eastbound on an uphill gradient at an average rate of around 70 to 90 metres per week with TBM retrieval proposed within the construction footprint at Blackheath. The indicative TBM tunnelling strategy is illustrated in Figure 4-1. The benefits associated with this tunnelling strategy compared to other tunnel construction options are described in Chapter 4 (Project alternatives and options) of the EIS.

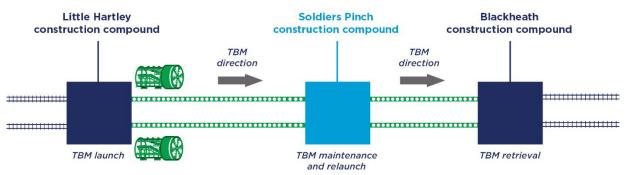


Figure 4-1 Indicative TBM tunnelling strategy

Enlarged tunnel caverns would be constructed at around the mid-point of the tunnels (mid-tunnel caverns) to support TBM refurbishment, including cutterhead maintenance or replacement. The mid-tunnel caverns would be constructed prior to the arrival of the TBMs.

The depth of the tunnels below ground level would vary according to localised geological conditions, with the deepest point of the tunnel crown (top of the tunnels) located around 200 metres below ground level near Mount Victoria, with shallower sections near the tunnel portals at Blackheath and Little Hartley. Indicative depth of the tunnels is shown in Chapter 4 (Project description) of the EIS. The TBMs cutter face would crush the rock as the tunnel is constructed.

Cross-passages linking the two mainline tunnels would be excavated using either roadheaders, excavators or drill and blast. Cross-passages would be located at around 120 metre intervals through the tunnel. Roadheaders or excavators fitted with rock hammers would likely be used to construct the mid-tunnel access shaft located at Soldiers Pinch, to allow development of the mid-tunnel cavern enlargements. Roadheaders would be used to excavate the access adit from the base of the shaft to the caverns (around 260 metres long) and the caverns themselves.

4.2 Construction hours

The project is seeking to manage the balance between the duration of overall construction activities and minimising potential construction impacts, including construction noise and traffic related impacts. The proposed construction hours have been developed in this context.

Most construction activities would be carried out where possible, during the recommended standard construction hours as defined by the *Interim Construction Noise Guideline* (DECC, 2009):

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturdays
- no work on Sundays or public holidays.

Underground tunnelling activities, associated spoil handling and transport activities and other below ground construction activities would generally take place 24 hours per day, seven days per week. This would include access to the tunnel via the Little Hartley portal and the Soldiers Pinch mid-tunnel access shaft (once the TBMs have tunnelled past the mid-point of the tunnel), as well as material deliveries at these locations. Further details of the proposed construction hours for the project are outlined in Table 4-3.

Table 4-3 Proposed construction hours

Work hours	Activity
24 hours a day, up to seven days a week	 underground construction, including TBM and roadheader tunnelling methodology and construction of roads within tunnels spoil handling within the tunnels and acoustic shed spoil haulage tunnel fit-out including mechanical and electrical fit-out mechanical and electrical fit-out of operational buildings emergency work, if required.
Standard construction hours	 general construction activities at construction footprints surface work including earthworks, stormwater drainage, road pavement and finishing work construction of surface operational infrastructure cut-and-cover construction equipment delivery and waste removal.
Any time	 The following activities may also be undertaken outside standard construction hours where required, provided the local community has been notified of the work: utility installations or relocations to minimise utility downtime or to prevent adverse impacts to the relevant utility, utility user or road network activities as directed by a relevant authority the occasional delivery of materials via oversized transport as required by the NSW Police or other authorities (including Transport) for safety reasons work determined to comply with the relevant noise management level at the nearest sensitive receiver activities agreed with potentially affected receivers.

Tunnelling and associated works would be undertaken 24 hours per day, seven days a week as TBMs would typically operate continuously once commissioned. To support TBM tunnelling, support infrastructure (grout plants, ventilation, water treatment plant, spoil sheds, etc), logistics support and material delivery would also be required to operate on a 24 hour per day basis.

The lining of the tunnels would be assembled from precast concrete segments, delivered to site and installed progressively as the TBM moves forward. Delivery of the tunnel segments and other materials to Little Hartley construction site would be required 24 hours per day to ensure progressive installation can be maintained during TBM operations.

Excavation of portals and cross tunnels by road header would also need to operate on a 24 hour per day basis to enable efficient portal excavation and progressive fit out of the tunnel.

Benefits of carrying out tunnelling and associated works 24 hours per day, seven days a week basis include minimising the duration of the project and associated construction impacts for local residents. It would also reduce the ongoing impacts to freight and light vehicles utilising the existing Great Western Highway by reducing heavy vehicle movements on the road network during the AM and PM peaks.

4.3 Construction equipment

Construction equipment and associated sound power levels typically used for these construction scenarios are identified in Table 4-4. The listed sound power levels are typical values taken from data provided in:

- Construction Noise and Vibration Guideline (for Road and Maritime Works) (Transport, 2022)
- Australian Standard AS 2436-2010, Guide to noise control on construction, demolition and maintenance sites
- British Standard BS 5228: Part 1 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise.

It has been assumed that all equipment is modern and in good working order. Noise measurements undertaken by AECOM and data provided in BS 5228 indicate that L_{A1} sound power levels are typically up to 8 dB(A) above L_{Aeq} sound power levels for construction works.

During the ongoing design development local site conditions and changes in work practices may cause some variation in the equipment used. While the equipment may vary, other major infrastructure projects have shown that due to the conservative approach to noise predictions, actual noise levels are unlikely to be appreciably higher than those predicted in this assessment.

This approach is used at this point in the assessment to ensure that identified impacts are not underpredicted and adequate noise management and mitigation measures are considered early in the project.

Construction component ¹	Indicative plant/equipment	L _{Aeq} , SWL	Activity total L _{Aeq} SWL, dB(A)	Activity total L _{A1} SWL, dB(A)
Site	Excavator with rock hammer ²	118	118	126
establishment and enabling works	Bulldozer	109		
	Backhoe	102		
	Chainsaw	110		
	Hand tools	94		
	Day maker lighting tower	77		
	Franna crane	93		
	Trucks	98		
	Vibratory roller ²	112		
	Water cart	100		
	Dump trucks	105		

Table 4-4 Indicative construction plant/equipment and associated sound power levels

Construction component ¹	Indicative plant/equipment	L _{Aeq} , SWL	Activity total L _{Aeq} SWL, dB(A)	Activity total L _{A1} SWL, dB(A)
Tunnel portal	Excavator with rock hammer ²	118	121	124
construction	Backhoe	102		
	Hand tools	94		
	Crane	98		
	Franna crane	93		
	Forklift	93		
	Piling rig ²	116		
	Drilling rig ²	107		
	Shotcrete rig	106		
	Roadheader ²	112		
	Water trucks	104		
	Concrete vibrator	97		
	Grout mixer and pump ²	108		
	Concrete saw ²	110		
	Concrete pump	106		
	Tipper Truck	105		
Tunnelling and	Excavator ²	118	119	126
associated works	Backhoe	102		
	Light vehicles	90		
	Dump trucks	105		
	Trucks ²	98		
	Ventilation fan	90		
	Front end loader	108		
	Water treatment plant	84		
	Tunnel boring machine	_4		
	Grout mixer and pump ³	108		
	Concrete batching plant	108		

Construction component ¹	Indicative plant/equipment	L _{Aeq} , SWL	Activity total L _{Aeq} SWL, dB(A)	Activity total L _{A1} SWL, dB(A)		
Surface road	Excavator with rock hammer ²	118	120	126		
upgrade works	Backhoe	102				
	Hand tools	94				
	Elevated working platform	87				
	Daymaker lighting tower	77				
	Crane	98				
	Franna crane	93				
	Dump trucks	105				
	Trucks ²	98				
	Line marking truck	103				
	Asphalt paver	106				
	Vibratory roller ²	112				
	Generator	101				
	Compressor	109				
	Jackhammer ²	108				
	Concrete saw ²	110	-			
	Concrete pump	106	-			
	Piling rig ²	116	-			
	Drilling rig ²	107	-			
	Shotcrete rig ²	106	-			
	Dust scrubber	94				
	Water trucks	104				
	Grout mixer and pump	108				
	Forklift	93				
Operational	Elevated working platform	87	112	116		
ancillary facilities	Daymaker lighting tower	77				
	Dump trucks ²	105				
	Trucks ²	98				
	Concrete pump	106				
	Shotcrete rig ²	106				
	Dust scrubber	94]			
	Water trucks	104				
	Grout mixer and pump	108				
	Forklift	93				

Construction component ¹	Indicative plant/equipment	L _{Aeq} , SWL	Activity total L _{Aeq} SWL, dB(A)	Activity total L _{A1} SWL, dB(A)		
Finishing works,	Elevated working platform	87	110	113		
testing and commissioning	Daymaker lighting tower	77				
, second s	Crane	98				
	Franna crane	93				
	Light vehicles	90				
	Dump trucks ²	105				
	Trucks ¹	98				
	Line marking truck	103				
	Dust scrubber	94				
	Water trucks	104				
	Road sweeper	101				

Notes:

1. The assessment of the proposed water supply connection has been undertaken and is presented in Section 4.10.

2. Time corrections have been applied to calculate the activity total L_{Aeq} SWL

3. Grout plant

4. TBM and roadheader operate underground and are assessed in the ground borne noise section of this report

4.4 Construction noise modelling methodology

Modelling of the proposed construction scenarios was completed using SoundPLAN version 8.2 noise modelling software. Standard weather conditions were applied. The modelling used the CONCAWE algorithm and included ground topography, buildings and structures and representative construction noise sources. Free field point receivers at 1.5 metres high were assumed, source heights are dependent on the equipment.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to localised fixed building structures would also vary as the construction equipment moves around the construction footprint.

4.5 Predicted construction noise impacts

4.5.1 Residential receivers

Table 4-5 presents the construction noise modelling results for residential properties and shows the number of properties where the NMLs are likely to be exceeded during the day and night-time for airborne construction noise. The tables also present the number of receivers who are predicted to exceed the highly affected level (75 dB(A)) for each NCA. The community perception of noise ('noticeable', 'clearly audible', 'moderately intrusive' and 'highly intrusive') as defined in Table 3-2 is also included in Table 4-5. Construction noise contours are presented in Annexure D. Ground-borne noise to residential receivers is addressed in Section 4.8

This assessment is representative of the worst case 15 minute period of construction activity, while the construction equipment is at the nearest location to each sensitive receiver location. The assessed scenario does not therefore represent the ongoing day to day noise impact at noise sensitive receivers for an extended period of time.

Particularly noisy activities, such as rock hammering and use of concrete saws, are likely to persist for only a fraction of the overall construction period. In addition, the predictions use the shortest separation distance to each sensitive receiver, however in reality separation distances would vary between plant and sensitive receivers. For linear works (works that move along the road alignment, rather than works located at a discrete location) noise exposure at each receiver would reduce due to increases in distance loss as the works progress along the alignment. Typical noise levels could be 5 to 10 dB(A) lower dependent on the site and nature of works.

The Interim Construction Noise Guideline (DECC, 2009) states that where a construction noise impact level of greater than 75 dB(A) is predicted, a receiver is considered to be 'highly noise affected' and afforded additional consideration for mitigation. The receivers where noise levels exceed 75 dB(A) can be identified on the noise contour maps provided in Annexure D. The potential for highly noise affected receivers would be confirmed during detailed construction planning. These receivers would receive additional consultation regarding the specific timing and impacts of construction works. Respite periods would also be considered for these receivers in accordance with the Interim Construction Noise Guideline (DECC, 2009).

Given the large separation distances between each of the three construction sites it is unlikely that any one receiver would be affected by construction noise from more than one construction site.

Feasible and reasonable mitigation measures would be detailed in the Construction Noise and Vibration Management Plan (refer to Section 7.2.1)

Table 4-5	Number of residential receivers where noise levels may exceed NMLs for all construction scenarios
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	Number of residential buildings where noise levels may exceed NML across the study area									
Scenario	Exceedance of NMLs during standard construction hours			Exceeda standard		Highly affected				
	1-10 dB ¹	11-20 dB ²	> 20 dB ³	1-5 dB4	6-15 dB ¹	16-25 dB ²	> 25 dB ³	> 75 dB(A)		
NCA1 (Blackheath)									
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	1	0	0	-	-	-	-	0		
Tunnelling and associated works	2	2	0	-	-	-	-	0		
Surface roadworks	1	3	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	2	0	0	-	-	-	-	0		
NCA2 (Blackheath)									
Site establishment	60	12	2	-	-	-	-	0		
Tunnel portal construction	59	0	0	-	-	-	-	0		
Tunnelling and associated works	94	18	4	-	-	-	-	2		
Surface roadworks	112	19	5	-	-	-	-	2		
Operational facilities	32	5	1	-	-	-	-	0		
Finishing works	19	3	2	-	-	-	-	1		

	Number of residential buildings where noise levels may exceed NML across the study area									
Scenario	Exceedance of NMLs during standard construction hours			Exceeda standard	(night)	Highly affected > 75				
	1-10 dB ¹	11-20 dB ²	> 20 dB ³	1-5 dB4	6-15 dB ¹	16-25 dB ²	> 25 dB ³	dB(A)		
NCA3 (Blackheath)	-								
Site establishment	14	6	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	12	8	10	-	-	-	-	12		
Surface roadworks	12	9	10	-	-	-	-	13		
Operational facilities	8	2	0	-	-	-	-	0		
Finishing works	9	9	1	-	-	-	-	3		
NCA4 (Blackheath)	T	T	T	T	T	T			
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	0	0	0	-	-	-	-	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		
NCA5 (Blackheath)	1	T	1	1	1	1	1		
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	0	0	0	-	-	-	-	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		

	Number of residential buildings where noise levels may exceed NML									
Scenario	across the study area Exceedance of NMLs during standard construction hours			Exceeda standarc	(night)	Highly affected > 75				
	1-10 dB ¹	11-20 dB ²	> 20 dB ³	1-5 dB4	6-15 dB ¹	16-25 dB ²	> 25 dB ³	dB(A)		
NCA6 (Blackheath)									
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	0	0	0	-	-	-	-	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		
NCA7 (Blackheath)	T	T	T	T	T	T	1		
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	0	0	0	-	-	-	-	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		
NCA8 (Mount Vict	oria)	T	T	T	T	T	T	1		
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	5	0	0	-	-	-	-	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		

	Number of residential buildings where noise levels may exceed NML across the study area								
Scenario	Exceedance of NMLs during standard construction hours			Exceeda standarc		Highly affected			
	1-10 dB ¹	11-20 dB ²	> 20 dB ³	1-5 dB4	6-15 dB ¹	16-25 dB ²	> 25 dB ³	> 75 dB(A)	
NCA9 (Mount Vict	oria)								
Site establishment	0	0	0	-	-	-	-	0	
Tunnel portal construction	0	0	0	-	-	-	-	0	
Tunnelling and associated works	0	0	0	-	-	-	-	0	
Surface roadworks	0	0	0	-	-	-	-	0	
Operational facilities	0	0	0	-	-	-	-	0	
Finishing works	0	0	0	-	-	-	-	0	
NCA10 (Mount Vic	toria)	1	1	1	1	1	1	1	
Site establishment	0	0	0	-	-	-	-	0	
Tunnel portal construction	0	0	0	-	-	-	-	0	
Tunnelling and associated works	0	0	0	-	-	-	-	0	
Surface roadworks	0	0	0	-	-	-	-	0	
Operational facilities	0	0	0	-	-	-	-	0	
Finishing works	0	0	0	-	-	-	-	0	
NCA11 (Kanimbla))	1	1	1	1	1	1	1	
Site establishment	0	0	0	-	-	-	-	0	
Tunnel portal construction	0	0	0	-	-	-	-	0	
Tunnelling and associated works	0	0	0	-	-	-	-	0	
Surface roadworks	0	0	0	-	-	-	-	0	
Operational facilities	0	0	0	-	-	-	-	0	
Finishing works	0	0	0	-	-	-	-	0	

	Number of residential buildings where noise levels may exceed NML									
Scenario	across the study area Exceedance of NMLs during standard construction hours			Exceeda standarc		Highly affected > 75				
	1-10 dB ¹	11-20 dB ²	> 20 dB ³	1-5 dB⁴	6-15 dB ¹	16-25 dB ²	> 25 dB ³	dB(A)		
NCA12 (Little Hart	ley)									
Site establishment	2	2	1	-	-	-	-	0		
Tunnel portal construction	4	2	1	-	-	-	-	0		
Tunnelling and associated works	0	2	1	8	2	1	2	1		
Surface roadworks	10	0	3	-	-	-	-	1		
Operational facilities	1	0	3	-	-	-	-	1		
Finishing works NCA13 (Little Hart	0 (lev)	2	1	-	-	-	-	1		
Site establishment	11	0	0	-	-	-	-	0		
Tunnel portal construction	8	0	0	-	-	-	-	0		
Tunnelling and associated works	6	6	0	10	3	10	1	0		
Surface roadworks	12	5	7	-	-	-	-	1		
Operational facilities	1	0	0	-	-	-	-	0		
Finishing works	5	6	1	-	-	-	-	0		
NCA14 (Little Hart	ley)		T	T	T	T	T			
Site establishment	0	0	0	-	-	-	-	0		
Tunnel portal construction	0	0	0	-	-	-	-	0		
Tunnelling and associated works	0	0	0	0	0	0	0	0		
Surface roadworks	0	0	0	-	-	-	-	0		
Operational facilities	0	0	0	-	-	-	-	0		
Finishing works	0	0	0	-	-	-	-	0		

 FINIShing Works

 Notes:

 1.
 Clearly audible

 2.
 Moderately intrusive

 3.
 Highly intrusive

 4.
 Noticeable

Generally receivers in NCA2 would be the most affected by works around Blackheath and receivers in NCA13 the most affected by works around Little Hartley. Figure 6-1 and Figure 6-2 present the expected total durations of each construction scenario.

Up to 171 receivers would be noise affected at Blackheath during standard construction hours and up to 15 would be highly noise affected (refer to Table 4-5). Construction scenarios resulting in exceedances of the highly noise affected criteria in Blackheath include tunnelling and associated works, surface roadworks and finishing works.

Works associated with these scenarios are linear in nature and would be carried out progressively such that the duration of noise impacts experienced at any individual receiver would be substantially smaller than the total construction durations identified for each scenario. Further, these impacts are considered conservative as they are representative of the worst case 15 minute period of construction activity, while the construction equipment is at the nearest location to each sensitive receiver location. The assessment scenario does not therefore represent the ongoing day to day noise impact at noise sensitive receivers for an extended period of time. No receivers at Blackheath would be noise affected outside of standard construction hours.

Up to five receivers would be noise affected at Mount Victoria during standard construction hours, no receives would be highly noise affected.

No receivers would be affected at Kanimbla.

Up to 37 receivers would be noise affected at Little Hartley during standard construction hours and up to two would be highly noise affected. Up to 34 receivers would be noise affected outside of standard construction hours.

Site establishment and enabling works

Receivers near to the site establishment and enabling works would experience elevated noise levels during these works. Approximately 110 receivers during works in standard construction hours may experience noise levels above the associated NMLs. No receivers are expected to be highly noise affected.

Noise levels would be moderately intrusive at up to 20 receivers and highly intrusive at up to three receivers across the project area in the daytime.

As noted in Table 4-3 utility installations or relocations may be required out of hours to minimise utility downtime or to prevent adverse impacts to the relevant utility, utility user or road network. Construction equipment may include the following: backhoe, front end loader, jackhammer, dump truck, diamond saw, concrete truck, low loader, compressor, generator, vacuum truck, excavator and rock breaker. Specific locations and requirements for utility installations and relocations would be determined as part of further design development. Generally, receivers within around 460 metres of utilities requiring relocation are likely to experience moderately intrusive noise levels whilst the works are ongoing during the out of hours period (up to two weeks for discrete works and up to eight weeks for progressive linear works).

Tunnel portal construction

Receivers near to the tunnel portals would experience elevated noise levels during these works. Approximately 75 receivers during works in standard construction hours may experience noise levels above the associated NMLs. There are 19 receivers expected to be highly noise affected.

Noise levels would be moderately intrusive at up to two receivers and highly intrusive at one receiver during standard construction hours. As surface road upgrade works are expected to be staged therefore the actual number of affected receivers would be limited at any single point in time.

Tunnelling and associated works

The majority of tunnelling works would take place underground, however there are a number of activities above ground which support the tunnelling works which are considered in this section. Ground-borne noise from tunnelling activities is addressed in section 4.7.1.

As tunnelling and associated works are the only works proposed for 24 hours, seven days per week, these activities are predicted to generate the greatest number of exceedances for night-time NMLs.

Receivers near locations where above ground tunnelling and associated works are proposed would experience elevated noise levels during these works. Approximately 170 receivers during works in standard construction hours and 37 receivers during works outside of standard construction hours across the project area may experience noise levels above the associated NMLs. Noting that night-time surface works would occur at the Little Hartley construction site only. There are 15 receivers expected to be highly noise affected.

Noise levels would be moderately intrusive at up to 36 receivers and highly intrusive at up to 15 receivers across the project area during standard construction hours. Night-time mitigation measures would be required for approximately 19 receivers with perceptions ranging from 'clearly audible' to 'highly intrusive'. Approximately 18 receivers would require notification of night-time works, at these receivers construction noise may be 'noticeable'. The supporting activities include the operation of various plant to facilitate tunnelling works and are generally located at the construction sites and/or the TBM dive site. It is expected during the ongoing design development that there would be further consideration into hoarding and noise barriers surrounding construction footprints and particularly noisy plant.

Surface road upgrade works

Receivers near to the surface road upgrade works would experience elevated noise levels during these works. Approximately 208 receivers during works in standard construction hours across the project area may experience noise levels above the associated NMLs. There are 17 receivers expected to be highly noise affected.

Noise levels would be moderately intrusive at up to 36 receivers and highly intrusive at up to 25 receivers across the project area during standard construction hours. As surface road upgrade works are expected to be staged therefore the actual number of affected receivers would be limited at any single point in time.

Operational ancillary facilities works

Approximately 69 receivers during works in standard construction hours may experience noise levels above the associated NMLs. There are seven receivers expected to be highly noise affected.

Noise levels would be moderately intrusive at up to 27 receivers and highly intrusive at up to six receivers across the project area during standard construction hours. As the operational ancillary facilities works are expected to be staged, therefore the actual number of affected receivers would be limited at any single point in time.

Finishing works, testing and commissioning

Receivers near to the finishing works would experience elevated noise levels during these works. Approximately 60 receivers during works in standard construction hours may experience noise levels above the associated NMLs. Five receivers may be highly noise affected.

Noise levels would be moderately intrusive at up to 20 receivers and highly intrusive at up to five receivers across the project area in the daytime. As finishing works would commence following the completion of other construction activities which are expected to be progressive and staged, respectively, the actual number of affected receivers at any single point in time would be minimal.

4.5.2 Sleep disturbance

To ensure worker safety and to minimise traffic disruptions, a portion of works would be required to be undertaken outside of standard construction hours. The *Interim Construction Noise Guideline* (DECC, 2009) states that public infrastructure works are one of the five categories of works that may need to be carried out outside the recommended standard hours.

Sleep disturbance is assessed using an $L_{A1(1 \text{ min})}$ parameter, which is considered to be the maximum noise level excluding extraneous noise events. A sleep disturbance assessment has been undertaken for the proposed night works with the construction information available to date. The noise modelling results are provided in Table 4-6 with the number of residential buildings where noise levels are predicted to exceed the sleep disturbance screening criteria and the awakening reaction criteria.

A number of exceedances of the sleep disturbance screening criteria have been predicted due to the night-time tunnelling and support works associated with the project. In addition, noise associated with

this construction scenario may exceed the awakening reaction screening criterion at some receivers. The exceedances are attributed to the close proximity of the construction portals and ancillary sites to some residences. It is difficult to predict the number of times the sleep awakening reaction criterion would be exceeded; however the impacts are considered to be consistent with other similar projects and indicate the need for effective noise mitigation and management planning.

As there are construction activities programmed to take place outside of standard hours, an effective communication plan and noise management measures would need to be developed during the ongoing design development to minimise the impacts upon affected sensitive receivers.

Location	Number of residential buildings where noise levels may exceed the sleep disturbance screening level and/or the awakening reaction level			
	Sleep disturbance screening level L _{A1(1 minute)} , dB(A)	Awakening reaction level L _{A1(1 minute)} , dB(A)		
NCA12 Little Hartley	5	2		
NCA13 Little Hartley	14	1		
NCA14 Little Hartley	0	0		

Table 4-6 Number of residential buildings where noise levels may exceed sleep disturbance criteria for night works (Tunnelling and associated works scenario)

Noise levels at approximately 19 residential receivers in total for the project are predicted to exceed the sleep disturbance screening level for the tunnelling and associated works during the construction period. A total of three awakening reactions may be expected to occur. The highest impacts are expected during excavator activities. These impacts are expected at receivers within NCA12 and NCA13. The exceedances are due to the close proximity of the works and the high L_{A1} sound power level of excavator movements.

4.5.3 Other receivers

Construction noise is not expected to exceed the NMLs at any non-residential receivers.

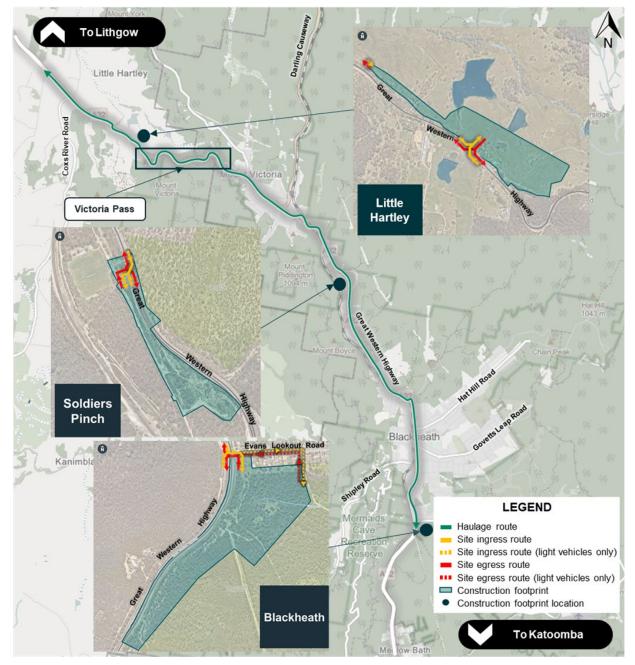
4.5.4 Overlapping construction activities

While most construction activities are expected to occur at distinct scheduled times and at different locations, it is possible that noisy construction activities for the project may occur at the same time in close proximity to each other. In these cases, it is possible that an increase of up to 3 dB(A) of the highest noise level predicted for any construction stage may occur (assuming that at any one location equal noise levels from two stages of works are experienced). Given the large separation distances between each of the three construction sites it is unlikely that any one receiver would be affected by construction noise from more than one construction site.

4.6 Construction road traffic noise

This section relates to construction traffic movements on the road network external to the construction areas. Access for light and heavy vehicles would be required throughout the project area. The standard of access along the project footprint would be sufficient to permit passage of excavators, spoil haulage trucks, concrete trucks, low loaders and mobile cranes. The estimated vehicle movements required for construction are outlined in Table 4-7 and Table 4-8 which represent peak and average construction vehicle volumes respectively. The peak construction vehicle scenario assumes peak activities across the project to occur at the same time (worst-case) whereas average construction vehicles would be indicative of day-to-day construction traffic.

The numbers outlined would be typical. Construction is expected to result in about 1,180 light vehicles and 900 heavy vehicles per day, during peak construction periods and about 460 light vehicles and 320 heavy vehicles per day, during average construction periods across the project. The final number of work crews, materials and vehicle movements would be determined during further design development and construction planning.



The construction traffic noise screening criterion is detailed in Section 3.2.5.

Figure 4-2 Indicative construction access and haulage route

Location		Direction	Daytime (7am-10pm)		Night-time (10pm-6am)		Total daily	
			LV	HV	LV	HV	LV	HV
Blackheath	Great Western	EB	650	35	231	10	881	45
	Highway east of Blackheath access	WB	231	35	650	10	881	45
	Great Western	EB	566	104	247	19	813	122
	Highway between Blackheath access and mid-point access	WB	247	104	566	19	813	122
Soldiers	Great Western Highway between mid- point access and Mount Victoria	EB	505	169	262	43	767	212
Pinch, Mount Victoria		WB	262	169	505	43	767	212
	Great Western Highway between Mount Victoria and Little Hartley access	EB	505	169	262	43	767	212
		WB	262	169	505	43	767	212
Little Hartley	Great Western	EB	77	671	217	184	294	855
	Highway west of Little Hartley access	WB	217	671	77	184	294	855

Table 4-7	Summary of construction vehicle movements – peak construction vehicles
	ouninary of construction vehicle movements – peak construction vehicles

Table 4-8	Summary of	construction vehicle n	novements – average	construction vehicles

Location		Direction	Daytime (7am-10pm)		Night-time (10pm-6am)		Total daily	
			LV	HV	LV	HV	LV	HV
Blackheath	Great Western	EB	252	13	93	3	345	16
	Highway east of Blackheath access	WB	93	13	252	3	345	16
	Great Western	EB	211	34	96	5	306	39
	Highway between Blackheath access and mid-point access	WB	96	34	211	5	306	39
Soldiers	Great Western Highway between mid- point access and Mount Victoria	EB	205	45	97	9	301	55
Pinch, Mount Victoria		WB	97	45	205	9	301	55
	Great Western	EB	205	45	97	9	301	55
	Highway between Mount Victoria and Little Hartley access	WB	97	45	205	9	301	55
Little	Great Western	EB	31	245	84	59	115	304
Hartley	Highway west of Little Hartley access	WB	84	245	31	59	115	304

Construction road traffic noise would be generated by vehicles associated with the construction of the project, including heavy vehicles transporting spoil and light vehicle movements generated by construction workers.

4.6.1 **Daytime movements**

Table 4-9 and Table 4-10 presents a summary of the base 2026 traffic flow, forecast additional traffic flow and the resultant noise increases for daytime construction traffic movements for peak and average construction periods respectively. The daytime period comprises the hours between 7am and 10 pm. In the tables below the 2026 traffic refers to future base case traffic numbers and the approximate additional traffic refers to traffic generated by construction of the project.

	on road traffic noise during peak o			Approxi	mate	
Construction footprint	Route/direction	2026 traffic (hourly)		additional traffic (hourly)		Relative increase,
		Light	Heavy	Light	Heavy	dB(A)
Blackheath	Great Western Highway east of Evans Lookout Road	507	65	43	2	0.3
	Great Western Highway west of Ridgewell Road	870	129	53	9	0.3
Soldiers Pinch, Mount Victoria	Great Western Highway east of Harley Avenue	761	129	50	18	0.5
	Great Western Highway west of Mount York Road	670	120	51	23	0.6
	Great Western Highway east of Coxs River Road	605	114	23	56	1.2
Little Hartley	Great Western	294	56	14	45	1.7

Table 4-10 Construction road traffic noise during average construction 2026 - daytime

Highway west of Coxs

River Road

Construction footprint	Route/direction	2026 traffic (hourly)		Approximate additional traffic (hourly)		Relative increase, dB(A)	
		Light	Heavy	Light	Heavy		
Blackheath	Great Western Highway east of Evans Lookout Road	507	65	17	1	0.1	
	Great Western Highway west of Ridgewell Road	870	129	20	3	0.1	
Soldiers Pinch, Mount Victoria	Great Western Highway east of Harley Avenue	761	129	20	5	0.1	
	Great Western Highway west of Mount York Road	670	120	20	6	0.2	
Little Hartley	Great Western Highway east of Coxs River Road	605	114	9	19	0.5	
	Great Western Highway west of Coxs River Road	294	56	6	16	0.7	

It is noted that there are no relative increases of 2 dB or more for either the peak or average daytime construction traffic scenarios. As such, construction traffic is expected to be barely or not perceptible to all noise sensitive receivers during the daytime period.

4.6.2 Night-time movements

Table 4-11 and Table 4-12 presents a summary of the base 2026 traffic flow, forecast additional traffic flow and the resultant noise increases for night-time construction traffic movements for peak and average construction periods respectively. The night-time period comprises the hours between 10pm and 7am. In the tables below the 2026 traffic refers to future base case traffic numbers and the approximate additional traffic refers to traffic generated by construction of the project.

Construction footprint	Route/direction	2026 traffic (hourly)		Approximate additional traffic (hourly)		Relative increase,	
		Light	Heavy	Light	Heavy	dB(A)	
Blackheath	Great Western Highway east of Evans Lookout Road	34	15	15	1	0.6	
	Great Western Highway west of Ridgewell Road	58	29	60	2	1.1	
Soldiers Pinch,	Great Western Highway east of Harley Avenue	51	29	55	4	1.2	
Mount Victoria	Great Western Highway west of Mount York Road	45	27	51	6	1.3	
Little Hartley	Great Western Highway east of Coxs River Road	40	26	48	15	2.2	
	Great Western Highway west of Coxs River Road	20	13	5	12	2.6	

Table 4-11 Construction road traffic noise during peak construction 2026 – night-time

Construction footprint	Route/direction	2026 traffic (hourly)		Approximate additional traffic (hourly)		Relative increase,	
		Light	Heavy	Light	Heavy	dB(A)	
Blackheath	Great Western Highway east of Evans Lookout Road	34	15	6	0	0.2	
	Great Western Highway west of Ridgewell Road	58	29	23	1	0.4	
Soldiers Pinch,	Great Western Highway east of Harley Avenue	51	29	20	1	0.4	
Mount Victoria	Great Western Highway west of Mount York Road	45	27	20	1	0.4	
Little Hartley	Great Western Highway east of Coxs River Road	40	26	19	5	0.9	
	Great Western Highway west of Coxs River Road	20	13	2	4	1.0	

It is noted that there are no relative increases of 2 dB or more for the average night-time construction traffic scenario.

Increases in road traffic noise of greater than 2 dB(A) have been identified at two sections of the proposed access roads for the night-time peak construction traffic volume scenario. These two sections are located along the Great Western Highway, east and west of Coxs River Road. Both these sections

are associated with traffic movements to/from the Little Harley site. As previously noted, the peak construction traffic volumes are a worst-case scenario indicative of peak activities occurring at the same time which is highly unlikely. In the unlikely event that peak construction activities occur at the same time, it is anticipated that it would be for a short duration. The overall noise impact of construction traffic would be somewhere between the predicted relative increases associated with average construction volumes and peak construction volumes. Additionally, there is a limited number of receivers likely to be affected by this relative noise increase due to the low density of receivers located along the Great Western Highway near to the Little Hartley construction support site.

For the purposes of the construction road traffic noise assessment, the following assumptions have been made:

- all construction sites would be operational at the same time
- all construction vehicles would be on the road network at the same time (presenting a worst-case impact)
- the base traffic flows are based on forecast 2026 traffic flows prior to the project being constructed.

As a result, this assessment has assumed a worst-case scenario.

4.7 Construction vibration

4.7.1 Surface works

Construction vibration may be generated due to the use of vibration intensive equipment during some stages of work. The minimum working distances for these items of equipment from off-site receivers are shown in Table 4-13.

		Minimum working distance			
Plant item	Rating/Description	Cosmetic damage (BS 7385) Light-framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guideline)	
	< 50 kN (Typically 1-2 t)	5 m	14 m	15 m to 20 m	
	< 100 kN (Typically 2-4 t)	6 m	16 m	20 m	
	< 200 kN (Typically 4-6 t)	12 m	33 m	40 m	
Vibratory roller	< 300 kN (Typically 7-13 t)	15 m	41 m	100 m	
	> 300 kN (Typically 13-18 t)	20 m	54 m	100 m	
	> 300 kN (> 18 t)	25 m	68 m	100 m	
Small hydraulic hammer	(300 kg - 5 to 12 t excavator)	2 m	5 m	7 m	
Medium hydraulic hammer	(900 kg – 12 to 18 t excavator)	7 m	19 m	23 m	
Large hydraulic Hammer	(1600 kg – 18 to 34 t excavator)	22 m	60 m	73 m	
Vibratory pile driver	Sheet piles	20 m	50 m	100 m	
Pile boring	≤ 800 mm	2 m (nominal)	4 m	4 m	
Jackhammer	Hand held	1 m (nominal)	2 m	2 m	

Table 4-13 Recommended minimum working	distances for vibration intensive plant
Table 4-15 Recommended minimum working	

These minimum working distances are based on the *Construction Noise and Vibration Guideline (for Road and Maritime Works)* (Transport, 2022) and relevant standards. Where these minimum working distances are complied with, no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. Equipment size would be selected by the construction contractor and would take into account the minimum working distances and the distance between the area of construction and the nearest receiver. If vibration intensive works are required within these minimum working distances, mitigation measures to control excessive vibration would be implemented as outlined in Section 7.4.

To provide an indication of the potential for vibration impacts associated with construction vibration, the minimum working distances for structural damage to heritage items are provided graphically in Annexure E.

Using a large hydraulic hammer at the nearest point to sensitive receiver locations has identified approximately eight residential receivers and four sheds where vibration could exceed the cosmetic damage criteria, and a further 30 residential buildings and five sheds where the human comfort criteria could be exceeded. The noise catchment areas that these receivers fall into are presented in Table 4-14.

NCA	Cosmetic damage	Human response
NCA1 Blackheath	-	-
NCA2 Blackheath	1	4
NCA3 Blackheath	6	19
NCA4 Blackheath	-	-
NCA5 Blackheath	-	-
NCA6 Blackheath	-	-
NCA7 Blackheath	-	-
NCA8 Mount Victoria	-	-
NCA9 Mount Victoria	-	-
NCA10 Mount Victoria	1 (4 sheds)	3 (4 sheds)
NCA11 Kanimbla	-	4 (1 shed)
NCA12 Little Hartley	-	-
NCA13 Little Hartley	-	-
NCA14 Little Hartley	-	-

Table 4-14 Number of buildings within minimum working distances

It should be noted that these impacts are presented based on distances to receivers from the closest point of the construction site based on use of a particular piece of plant/ equipment. During detailed construction planning, the contractor would be required to select appropriate equipment based on the works location, nature of the required work and proximity to sensitive receivers to meet required vibration thresholds at receivers.

4.7.2 Tunnelling

Potential vibration levels associated with the use of TBMs has been calculated for properties located above the main tunnel alignments. This assessment is based on two TBMs operating concurrently. The number of receivers where the criteria is exceeded is provided in Table 4-15. The results are also provided graphically in Annexure F.

This assessment relates to human comfort levels. The structural damage criteria outlined in Section 3.3.1 would not be exceeded by the tunnelling activities.

Criteria	Human comfor velocity criteria			Number of receivers where criteria are exceeded		
	Evening	Night-time	Evening	Night-time		
Preferred	0.28 mm/s	0.2 mm/s	76	149		
Maximum	0.56 mm/s	0.4 mm/s	18	32		

Table 4-15 Vibration - number of receivers where criteria are exceeded

The preferred and maximum criteria relate to how sensitive people may be to the vibration generated. Through adoption of measures such as informing potentially affected receivers and providing complaint hotlines, the impact of vibration can be managed.

Tunnelling is proposed to progress at a rate of around 70 to 90 metres per week. It is likely that vibration would be discernible for up to five days at each affected receiver with exceedances occurring for up to two days. Tunnelling advance rates would reduce around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the vibration levels experienced would increase and decrease respectively.

4.8 Construction ground-borne noise

The ground-borne noise experienced in any building would be dependent on the generation and propagation of vibration associated with tunnelling activities. For this project ground-borne noise associated with vibration would be generated during tunnelling from the operation of TBMs. As detailed in section 4.1 Roadheaders may be used to construct cross passages between the tunnels. It is noted that less vibration is generated by roadheaders than TBMs, therefore ground-borne noise levels would also be lower.

From the source, vibration propagates through the ground and decreases over distance. The rate at which vibration decreases is highly variable and dependent on factors such as the soil or rock type, the consistency of the medium (such as the presence of voids), and the water table. These factors affect the speed of wave propagation and the vibration damping of the ground. As the vibration excites a building, it is also subject to a coupling loss changing from one medium (the rock and soil) to another (the building foundations which are typically concrete). The vibration would then be transmitted throughout the building, with further losses as it moves up between floors. The excitation of the walls and ceiling of a room results in the generation of low-frequency noise, which can be audible if the vibration levels are great enough. The noise generated is often described as a low rumble.

The noise that is generated within a building is highly dependent on the soil and rock strata, the distance to the source and the construction of the building. The prediction of ground-borne noise for this project has been based on previous measurements of tunnelling activities from tunnel-boring machines in Sydney, using methods in accordance with ISO14837: *Mechanical vibration - Ground-borne noise and vibration arising from rail systems*, where relevant. The measurements demonstrate an exponential relationship between velocity and distance from the vibration generating source.

The results of the ground-borne noise assessment indicating where the criteria would be exceeded within residential properties are provided in Table 4-16 and Annexure G.

A large number of receivers are predicted to experience ground-borne noise levels which exceed the ground-borne noise criteria. The receivers are all located in vicinity of Blackheath (between Evans Lookout Road and Radiance Avenue) except for one receiver near Little Hartley. These exceedances are due to the small slant distance between the tunnel and receivers, with these receivers being near the proposed shallow end point of the tunnel just south of Blackheath and at Little Hartley.

Ground-borne noise criteria	Exceedance of criteria, dB				
	<10	10-20	>20		
Evening 40 dB(A)	109	18	0		
Night-time 35 dB(A)	259	35	0		

Table 4-16 Ground-borne noise- number of receivers where criteria are exceeded

Tunnelling is proposed to progress at a rate of 70 to 90 metres per week. It is likely that ground-borne noise would be discernible for up to five days at each affected receiver with the exceedance occurring for up to two days. Tunnelling advance rates would reduce around the portals, which may increase the duration of exposure for receivers in these areas. As tunnelling moves towards and away from each receiver the noise levels experienced would increase and decrease respectively.

It is noted that there is no daytime criterion for ground-borne noise. However, noise levels during the daytime would be consistent with predicted levels at evening and night-time. Ground-borne noise is likely to be masked during the daytime due to higher levels of ambient airborne noise.

4.9 Blasting

Controlled blasting may be undertaken (if required) along the length of the alignment where cross passages are proposed during the excavation of the tunnel, at depths greater than 25 metres, where the geology is suitable (i.e. not soft ground). Blasting methods can significantly reduce exposure to noise and vibration for residents and businesses above the tunnels. Blasting can also shorten excavation timeframes.

Impacts created by blasting are largely dependent on the blast methodology. The size of the charge, spaces between charge and timing between charges results in a large variability in the vibration generated by a blast. This variability necessitates the use of a specialised blast consultant to design blasts to achieve compliance with the applicable vibration criteria.

Using the equation J7.3 provided in AS 2187.2, the maximum effective charge mass per delay to achieve compliance with the vibration criteria is calculated for a number of typical locations and depths as shown in Figures 4.5 to 4.11 of Chapter 4 (Project description) of the EIS. The exact location and depths of blasting would be confirmed as part of ongoing design development. The maximum charge sizes are presented in Table 4-17 and are based on site and rock property constants as determined during blasting of the northern section of the Sydney Harbour Tunnel (WestConnex M4 East Project – *Noise and Vibration Impact Assessment*, Report Number 610.13569-R2 dated 4 September 2015). Geotechnical conditions at the Sydney Harbour Tunnel site included sandstone rock which is considered comparable to the worst case conditions for any blasting on this project. Therefore maximum charge predictions are considered conservative to comply with the criteria.

The maximum charge sizes have been calculated to meet the human comfort criterion for sensitive structures (e.g. residential theatres, schools etc) of 10 mm/s PPV as set out in the *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZEC Guideline).* As a conservative approach the calculations have been based on receiver locations directly above the cross passages. Prior to blasting activities, a certified blast engineer would carry out small-scale controlled trial blasts to confirm how the local ground conditions respond to controlled blasting. Following this a Controlled Blast Management Plan would be prepared. The blasts would be designed to meet the blast criteria specified in Section 3.5.1.

				Predic	ted PPV ((mm/s)		
Site location ¹	Indicative depth (m)	1 kg charge	5 kg charge	10 kg charge	15 kg charge	20 kg charge	30 kg charge	60 kg charge
Evans Lookout Road	25	9.3	33.6	58.5	81.0	101.9	141.0	245.4
Sutton Park	30	6.9	25.1	43.7	60.5	76.1	105.3	183.3
Blackheath	70	1.8	6.5	11.3	15.6	19.6	27.1	47.3
Blackheath Station	65	2.0	7.3	12.7	17.6	22.1	30.6	53.2
Ridgewell Road	65	2.0	7.3	12.7	17.6	22.1	30.6	53.2
Mount Boyce	85	1.3	4.7	8.3	11.4	14.4	19.9	34.6
Mount Victoria Rest Area	130	0.7	2.4	4.2	5.8	7.3	10.1	17.6
Browntown Oval	100	1.0	3.7	6.4	8.8	11.1	15.3	26.7
Mount Victoria	195	0.3	1.3	2.2	3.0	3.8	5.3	9.2
Mount Victoria Memorial Park	170	0.4	1.6	2.7	3.8	4.7	6.6	11.4
Mount York Road	105	0.9	3.4	5.9	8.1	10.3	14.2	24.7
Victoria Pass	60	2.3	8.3	14.4	20.0	25.1	34.7	60.5

Table 4-17 Blasting – maximum	charge size based on indicative	blasting locations and depths

Notes:

1. Site locations based on typical depths as illustrated in Chapter 4 (Project description) of the EIS

2. Bold fonts indicate exceedances of PPV criteria

It is noted that even if the criteria are met it is likely that some nearby residents may experience ground borne noise and vibration for around 15 seconds during each blast. The ranges of human perception to vibration from blasting activities is presented in Table 4-18. The criteria for structural vibration limits are presented in Table 3-13 and are higher than the 10 mm/s PPV human comfort limit adopted for sensitive structures.

Table 4-18 Human perception of vibration from blasting activities¹

Peak particle velocity range, m	Effect			
Lower	Upper	LIIGO		
0	0.5	Imperceptible		
0.5	1.0	Barely noticeable		
1.0	5.0	Easily noticeable		
5.0	10.0	Distinctly noticeable		
>10		Strongly noticeable		

4.10 Water supply pipeline

The preferred EIS option for water supply for the project includes a new pipeline (around 14 km in length) that would be constructed between the Lithgow City Council water supply system at Lithgow and the Little Hartley construction footprint. The new pipeline would supply water to the Little Hartley construction footprint to support construction activities including operation of the tunnel boring

¹ Blast Assessment – Great Western Highway, Little Hartley to Lithgow Upgrade, (2022) Heilig & Partners Pty Ltd.

machines, and operational water supply for the project at Little Hartley (noting that use of recycled water sourced from the project would be prioritised).

The pipeline would be wholly located within the following:

- road reserve of the existing Great Western Highway or the upgraded Great Western Highway (as part of the Little Hartley to Lithgow Upgrade)
- the Little Hartley to Lithgow Upgrade construction footprint.

The construction footprint for the Little Hartley to Lithgow Upgrade exists entirely within the existing or new Great Western Highway road reserve or the Little Hartley to Lithgow Upgrade construction footprint which is considered a "disturbed environment". Noise sensitive receivers are located along the length of the proposed construction footprint and background noise levels would generally be controlled by road traffic noise depending on the receivers' proximity to the Great Western Highway.

If identified as the preferred option, construction of the water supply pipeline would take up to around 18 months and would occur during standard working hours, however there may be some situations where out of hours work would be required (for example where partial or full road closures may be required to support construction activities for short periods). Where out of hours work is required, the out of hours works procedure developed as part of the Construction Noise and Vibration Management Plan would be followed. Construction equipment may include the following: backhoe, front end loader, jackhammer, dump truck, diamond saw, concrete truck, low loader, compressor, generator, vacuum truck, excavator and rock breaker. Sound power levels for this equipment are presented in Table 4-4 and result in an overall sound power level of 120 dB(A).

Construction may occur concurrently at several locations along the route and construction activities would move progressively along the pipeline route (not staying in one location for an extended period of time). Key construction activities would include:

- excavation of the pipeline trench and installation of pipeline, including backfill and rehabilitation
- concrete foundation and/or encasements works and thrust blocks
- connection to Lithgow water supply.

Construction would be staged where possible to occur in conjunction with activities being carried out for the Little Hartley to Lithgow Upgrade.

An impact assessment has been undertaken using Transport's *Construction and Maintenance Noise Estimator Tool* to determine distance buffers for additional noise mitigation measures.

Noise sensitive receivers have been considered to be generally located in two areas. These are presented in Table 4-19, along with the relevant rating background levels and construction noise management levels.

Poosiver tune	Rating backgrou (L _{A90}), dB(A)	Ind noise level	Construction noise management Level, L _{Aeq(15min)} ,dB(A)		
Receiver type	Standard hours	Out of hours (Night-time)	Standard hours	Out of hours (Night-time)	
Rural (based on NL8)	36	30	46	35	
Suburban (based on NL3)	49	30	59	35	

Table 4-19 Water supply connection construction noise management levels

Where additional noise mitigation measures are proposed, this represents an exceedance of the construction noise management levels identified in Table 4-19. Table 4-20 presents the additional mitigation measures recommended by the construction and maintenance noise estimator and the typical distances from the works where they should be applied. It also presents the receiver perception at those distances. Further details of the mitigation measures are presented in Section 7.3.5.

Receiver type	Distance from works	Perception	Additional mitigation measure type ²	
Standard hours				
Rural ¹ (based on NL8)	<240 m	Moderately intrusive	Ν	
Suburban ¹ (based on NL3)	<90 m	Moderately intrusive	Ν	
Out of hours (nig	ght-time)			
Rural ¹	810 - 1,090 m	Noticeable	Ν	
(based on NL8)	360 - 810 m	Clearly audible	V, N, R2, DR	
	180 – 360 m	Moderately intrusive	V, IB, N, PC, SN, R2, DR	
	<180 m	Highly intrusive	AA, V, IB, N, PC, SN, R2, DR	
Suburban	460 - 690 m	Noticeable	Ν	
(based on NL3)	210 – 460 m	Clearly audible	V, N, R2, DR	
	80 - 210 m	Moderately intrusive	V, IB, N, PC, SN, R2, DR	
	<80 m	Highly intrusive	AA, V, IB, N, PC, SN, R2, DR	

Table 4-20 Water supply connection – additional mitigation buffer distances

Notes:

1. Assumes line of sight between construction works and receivers

2. Additional mitigation measure types are described in detail in Section 7.3.5.1. (N = notification (letterbox drop or equivalent), SN = specific notifications, PC = phone calls, IB = individual briefings, RO = respite offer, R1 = respite period 1, R2 = respite period 2, DR = duration respite, AA = alternative accommodation, V = verification

The distances and additional mitigation measures are presented in Annexure D.A more detailed noise assessment may be required during ongoing design development, particularly if out of hours works are proposed for the water supply connection.

Vibration impacts to nearby residential receivers are expected to be minimal provided that the minimum working distances for surface works provided in in this report are maintained.

5.0 Assessment of operational impacts

5.1 Road traffic noise assessment

The assessment of road traffic noise has been completed in accordance with the NSW *Road Noise Policy* (DECCW, 2011), the *Road Noise Criteria Guideline* (Transport, 2022) and the *Road Noise Mitigation Guideline* (Transport, 2022). The *Road Noise Criteria Guideline* (Transport, 2022) and the *Road Noise Mitigation Guideline* (Transport, 2022) provide details of the practical application of the criteria presented in the *Road Noise Policy* (DECCW, 2011). The assessment method takes into consideration both the infrastructure that would carry vehicles and any additional traffic generated by the project. Two future years (2030 – year of opening and 2040 – design year) have been assessed.

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

- existing road traffic noise levels have been modelled with existing road traffic volumes. This model has been validated with noise measurements and road traffic surveys. This is discussed further in Section 5.1.2 with methodology further explained in Section 3.6
- future road traffic noise levels have been modelled for the 'without project' scenario, and the 'with project' scenario for the year of opening (2030) and design year (2040). This is discussed further in Section 5.1.1 and Section 3.6, with results presented in Section 5.1.5.

5.1.1 Road traffic noise modelling methodology

Road traffic noise levels were calculated using SoundPLAN v8.2 software, which implements the CoRTN algorithm. The UK Department of Transport devised the CoRTN algorithm and with suitable corrections, this method has been shown to give accurate predictions of road traffic noise under Australian conditions.

The road traffic noise impact assessments completed for the other stages of the Great Western Highway upgrade (East: Katoomba to Blackheath and West: Mount Victoria to Lithgow) have both used the Calculation of Road Traffic Noise (CoRTN) algorithm. To maintain consistency, especially from the community's point of view, the CoRTN algorithm has also be used for this assessment.

CoRTN is the most widely used algorithm for the prediction of road traffic noise within Australia and is an accepted algorithm under the EPA's *Road Noise Policy* (DECCW, 2011) (Appendix B4). It is the only algorithm at this point in time which has been evaluated under Australian conditions. Recently in NSW, adjustments have been made to CoRTN predictions to improve accuracy. This includes the use of three source heights for trucks (tyres, engines and exhausts) and the application of a heavy vehicle mix correction to account for the larger heavy vehicle fleet in Australia compared with the UK, where CoRTN was developed.

Where road gradients affect road emissions and speed of vehicles, posted speeds are modelled within CoRTN, which are higher than actual speeds on the road gradient, thereby representing conservative approach. Given that this is a motorway project with optimised grades, there are no locations where grades of significance have any bearing on predicted noise levels.

While road traffic noise levels at receivers may vary at times due to changes in weather conditions such as wind speed and direction and temperature inversions, it is noted that the *Road Noise Policy* (DECCW, 2011) does not require road traffic noise criteria to be met under adverse meteorological conditions.

As noted in the *Model Validation Guideline* the objective of model validation is to demonstrate that the noise model is an accurate representation of the real world within the limitations of the algorithm. Validation of the existing noise model is presented in Section 5.1.2.

The modelling parameters which are included in the model are detailed below in Table 5-1.

Table 5-1 Noise modelling inputs

Item	Description					
Calculation method	Calculation of Road Traffic	Calculation of Road Traffic Noise (1988) with NSW adjustments				
Calculation search radius	2,000 metres	2,000 metres				
Assessment area	600 metres					
Source heights and corrections	Four noise source heights Source Light vehicles engine and tyres Heavy vehicles tyres Heavy vehicles engine Heavy vehicles exhaust	were used Height (m 0.5 0.5 1.5 3.6		s follows: Correction (dB) 0.0 -5.4 -2.4 -8.5		
Existing road alignment	The existing roads were m	nodelled us	ing satellite ima	igery.		
Road gradient	The road gradient was cal (ELVIS) data.	culated bas	sed on elevatior	n information system		
Existing pavement	The road pavements mode DGA pavement correction		as dense grade	asphalt (DGA).		
Calibration corrections	Day: 0.0 dB		Night: 0.0 dB			
Façade reflection	+2.5 dB correction for faça	ade reflecte	d receivers.			
L ₁₀ to L _{eq}	-3 dB correction					
Receiver heights	1.5 metres for single store	y and 4.5 n	netres for doub	le storey.		
Receiver locations	1 metre from the façade o	f receivers.				
Buildings, structures and walls	All buildings and structure	s were incl	uded where acc	oustically relevant.		
Ground absorption	A ground absorption facto heavily wooded areas and					
Topography	2 metre interval data up to	1 kilometro	e either side of	the project.		
Vehicle speeds	For model validation, the speed measured during the traffic counting at the time of the noise monitoring was used. Wherever speed changes occurred between measurement locations, the posted speeds were used.					
Traffic volumes	For model validation, the t monitoring was used. Pred and for the design year (20 by AECOM. In accordance with the Au considered to be Class 1 a	dicted traffie 040) were s stroads vel	c volumes for the sourced from transition transition that the sourced from transition to the source of the source	ne year of opening (2030) affic modelling completed on, light vehicles are		

Item	Description
Temperature and vehicle classification	Corrections were applied to account for the vehicle classification and temperature in accordance with Peng et al. 2017, <i>Evaluation of Calculation of Road Traffic Noise in Australia</i> .

5.1.2 Validation noise model

An existing road traffic noise model was developed incorporating the existing traffic flows and alignment for validation with road traffic noise measurements. The traffic flows used in the model were provided by tube counts that were deployed concurrently with noise logging for the project.

The model was validated in accordance with the *Model Validation Guideline* (RMS,2016). The Model Validation Guideline (MVG) provides guidance and procedures for validating operational road traffic noise models. The guideline discusses error, which is the difference between measured and predicted noise levels, principles to be applied when completing monitoring and modelling to minimise error and use of calibration adjustments.

The seven loggers which were located close to the existing Great Western Highway were included in the validation process and after an iterative review process of the measured and modelled noise levels, it was found that calibration factors were not required to achieve acceptable accuracy while maintaining a conservative modelling methodology.

Table 5-2 presents the measured existing traffic noise levels at the logger locations and the validation of the model.

Approx.		Daytime	Daytime L _{Aeq,15hr} , dB(A)			Night-time L _{Aeq,9hr} , dB(A)		
Logger ID	Address	distance to Great Western Highway	Predicted	Measured	Difference	Predicted	Measured	Difference
NL1	82 Station Street, Blackheath	100	53.0	53.2	-0.2	51.1	51.1	0.0
NL3	89 Great Western Highway, Blackheath	30	62.1	60.8	1.3	60.3	58.4	1.9
NL6	355 Great Western Highway, Blackheath	15	73.0	72.2	0.8	69.0	69.0	0.0
NL7	149 Great Western Highway, Mount Victoria	20	65.3	67.0	-1.7	62.6	64.0	-1.4
NL9 ^{1,2}	9 Great Western Highway, Mount Victoria	20	62.4	63.1	-0.7	60.2	60.5	-0.3
NL10 ¹	2133 Great Western Highway, Little Hartley	45	61.2	59.7	1.5	59.4	57.5	1.9

Table 5-2 Noise model validation results for loggers

Logger ID Address		Approx. distance	Daytime L _{Aeq,15hr} , dB(A)			Night-time L _{Aeq,9hr} , dB(A)		
	Address	to Great Western Highway	Predicted	Measured	Difference	Predicted	Measured	Difference
NL11	2187 Great Western Highway, Little Hartley	30	65.3	64.2	1.1	63.6	61.8	1.8
			Median difference		0.8	Median difference		0.0
			Standard deviation		1.2	Standard	deviation	1.3

Notes:

1. Steep incline/decline close to this logger location

2. Logger location behind property fence

It can be seen from Table 5-2 that the median difference is 0.8 and 0.0 dB(A) for daytime and night-time respectively. Therefore, the model is predicting road traffic noise levels with acceptable accuracy and is slightly conservative overall, predicting slightly higher noise levels than those measured for the daytime.

5.1.3 Noise modelling scenarios

As previously noted, the *Road Noise Policy* (DECCW, 2011) requires the assessment of road traffic noise at the year of opening and at the design year. To determine the appropriate noise mitigation, only results from the more stringent year (for each receiver) have been discussed within this report. For each result presented, the applicable period is also provided. In Annexure H the predicted road traffic noise levels with the recommended noise mitigation have been presented for all operational scenarios.

Noise levels for both the daytime and night-time periods have been assessed. The assessed situations are:

'without project' –This scenario is assessed for both the year of opening (2030) and the design year (2040) and incorporates the existing alignment and traffic flows for the applicable year. All major existing arterial roads have been included in the noise modelling. It represents the design if the project was not to be built. The *Road Noise Policy* (DECCW, 2011), *Road Noise Criteria Guideline* (Transport, 2022), and *Road Noise Mitigation Guideline* (Transport, 2022) refer to this as the 'No Build' scenario.

This scenario assumes that ongoing improvements would be made to the broader road and public transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth. This scenario assumes that the entire Great Western Highway Upgrade between Katoomba and Lithgow does not go ahead.

 'with project' – These scenarios incorporate the project design alignment, including the ramps and all existing major arterial roads. The *Road Noise Policy* (DECCW, 2011), *Road Noise Criteria Guideline* (Transport, 2022), and *Road Noise Mitigation Guideline* (Transport, 2022) refer to this as the 'Build' scenario. This scenario assumes that the entire Great Western Highway Upgrade between Katoomba and Lithgow does go ahead.

The detailed scenarios which have been assessed were:

- year 2030 'without project' scenario
- year 2030 'with project' scenario
- year 2040 'without project' scenario
- year 2040 'with project' scenario.

The noise mitigation requirements have been assessed based on the most stringent scenario for each noise sensitive receiver. Generally, noise sensitive receivers are most noise affected during the 2040 Design scenario due to higher traffic volumes as a result of annual growth. To ensure all receivers are

considered each one has been assessed for all scenarios and receivers reported if the noise levels exceed the criteria.

5.1.4 Traffic noise model

The 'Year of Opening' (2030) and 'Design Year' (2040) traffic flows presented in Table 5-3, Table 5-4, Table 5-5 and Table 5-6 respectively were used in the validated road traffic noise model to provide the 'Year of Opening' and 'Design Year' road traffic noise models for the 'with project' and 'without project' scenarios. These models are used to assess the potential road noise impacts and to identify mitigation requirements. There are more traffic volume locations in the 'with project' scenario than the 'without project' scenario due to the additional project roads and ramps.

Table 5-3	'Year of Opening'	(2030) 'without project'	predicted traffic flows
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		Daytime (7 am to	10 pm)	Night-tim (10 pm to	o 7 am)	Vehicle	
Location		Traffic Volume	Heavy vehicle ratio	Traffic Volume	Heavy vehicle ratio	speed, km/h	
'Without pro	oject'		_				
	Great Western Highway Eastbound - East of Evans Lookout Road	8,851	12.8%	768	33.0%	60-80	
	Great Western Highway Westbound - East of Evans Lookout Road	8,971	13.2%	782	33.6%	60-80	
Blackheath	Great Western Highway Eastbound - West of Evans Lookout Road	8,361	13.4%	734	34.2%	60-80	
	Great Western Highway Westbound - West of Evans Lookout Road	8,823	13.3%	773	34.0%	60-80	
	Evans Lookout Road Eastbound	466	2.2%	31	2.2%	50	
	Evans Lookout Road Westbound	819	1.4%	55	1.4%	50	
	Great Western Highway Eastbound - East of Coxs River Road	5,686	16.3%	529	40.0%	60-80	
	Great Western Highway Westbound - East of Coxs River Road	5,401	18.1%	517	42.9%	60-80	
Little	Great Western Highway Eastbound - West of Coxs River Road	5,831	15.9%	539	39.3%	80	
Hartley	Great Western Highway Westbound - West of Coxs River Road	5,418	18.0%	517	42.8%	80	
	Coxs River Road Northbound	327	0%	22	0%	60	
	Coxs River Road Southbound	465	0%	31	0%	60	
	Ambermere Drive Northbound	123	0%	8	0%	60	
	Ambermere Drive Southbound	141	0%	9	0%	60	

		Daytime (7 am to		Night-tin (10 pm te		Vehicle
Location		Traffic Volume	Heavy vehicle ratio	Traffic Volume	Heavy vehicle ratio	speed, km/h
'With projec	et'					
	Great Western Highway Eastbound - East of Blackheath Interchange	10,033	11.7%	854	30.8%	80
	Great Western Highway Westbound - East of Blackheath Interchange	9,428	11.7%	799	30.5%	80
	Great Western Highway Westbound Exit Ramp	3,620	5.0%	265	13.5%	60-70
	Great Western Highway Westbound Entry Ramp	14	0.0%	1	0.0%	60
	Great Western Highway Eastbound Exit Ramp	46	0.0%	3	0.0%	60
	Great Western Highway Eastbound Entry Ramp	4,267	6.6%	326	18.5%	60
Blackheath	Great Western Highway Eastbound - West of Blackheath Interchange	5,813	15.3%	531	38.1%	80
	Great Western Highway Westbound - West of Blackheath Interchange	5,809	15.8%	535	39.0%	80
	Evans Lookout Road Eastbound	460	2.5%	31	2.5%	50
	Evans Lookout Road Westbound	861	1.3%	57	1.3%	50
	Old Great Western Highway Eastbound - West of Blackheath Interchange	4,272	6.5%	326	18.3%	60-70
	Old Great Western Highway Westbound - West of Blackheath Interchange	3,657	4.9%	267	13.3%	60
	Great Western Highway Eastbound - West of Coxs River Road Interchange	5,691	16.2%	528	39.7%	80
	Great Western Highway Westbound - West of Coxs River Road Interchange	5,558	16.2%	515	39.8%	80
Little Hartley	Great Western Highway Eastbound - East of Coxs River Road Interchange	5,813	15.3%	531	38.1%	80
	Great Western Highway Westbound - East of Coxs River Road Interchange	5,809	15.8%	535	39.0%	80
	Little Hartley Westbound Entry Ramp	406	0.0%	27	0.0%	60
	Little Hartley Eastbound Exit Ramp	280	3.6%	20	10.6%	60

Table 5-4 'Year of Opening' (2030) 'with project' predicted traffic flows

		Daytime (7 am to	10 pm)	Night-tim (10 pm to		Vehicle
Location		Traffic Volume	Heavy vehicle ratio	Traffic Volume	Heavy vehicle ratio	speed, km/h
	Coxs River Road Northbound	801	2.0%	53	2.0%	60
	Coxs River Road Southbound	277	0.0%	18	0.0%	60
	Ambermere Drive Northbound	103	0.0%	7	0.0%	60
	Ambermere Drive Southbound	149	0.0%	10	0.0%	60
	Old Great Western Highway Eastbound - West of Coxs River Road Interchange	583	0.4%	39	0.4%	60
	Old Great Western Highway Westbound - West of Coxs River Road Interchange	296	0.0%	20	0.0%	60
	Old Great Western Highway Eastbound - East of Coxs River Road Interchange	311	5.0%	23	14.9%	60
	Old Great Western Highway Westbound - East of Coxs River Road Interchange	25	4.5%	2	4.5%	60

		Daytime		Night-time			
Location		(7 am to 1	0 pm) Heavy	(10 pm to	7 am) Heavy	Vehicle speed,	
Location		Traffic Volume	vehicle ratio	Traffic Volume	vehicle ratio	km/h	
'Without pro	oject'	1	1	1	T	1	
	Great Western Highway Eastbound - East of Evans Lookout Road	9,466	13.3%	768	34.0%	60-80	
	Great Western Highway Westbound - East of Evans Lookout Road	9,615	14.0%	782	35.1%	60-80	
Blackheath	Great Western Highway Eastbound - West of Evans Lookout Road	8,903	14.1%	734	35.3%	60-80	
	Great Western Highway Westbound - West of Evans Lookout Road	9,513	14.1%	773	35.4%	60-80	
	Evans Lookout Road Eastbound	472	1.7%	31	1.7%	50	
	Evans Lookout Road Westbound	955	1.4%	55	1.4%	50	
	Great Western Highway Eastbound - East of Coxs River Road	6,090	17.0%	529	41.3%	60-80	
	Great Western Highway Westbound - East of Coxs River Road	5,783	18.8%	517	44.0%	60-80	
1.561-	Great Western Highway Eastbound - West of Coxs River Road	6,172	16.7%	539	40.8%	80	
Little Hartley	Great Western Highway Westbound - West of Coxs River Road	5,802	18.8%	517	43.9%	80	
	Coxs River Road Northbound	348	0.0%	22	0.0%	60	
	Coxs River Road Southbound	447	0.0%	31	0.0%	60	
	Ambermere Drive Northbound	108	0.0%	8	0.0%	60	
	Ambermere Drive Southbound	140	0.0%	9	0.0%	60	

Table 5-5 'Design Year' (2040) 'without project' predicted traffic flows

Location		Daytime (7 am to 7	10 pm)	Night-ti (10 pm t	me to 7 am)	Vehicle speed, km/h
'With projec	cť					
	Great Western Highway Eastbound - East of Blackheath Interchange	11,902	10.9%	998	29.2%	80
	Great Western Highway Westbound - East of Blackheath Interchange	11,418	11.0%	955	29.1%	80
	Great Western Highway Westbound Exit Ramp	4,023	6.2%	299	15.9%	60-70
	Great Western Highway Westbound Entry Ramp	20	0.0%	1	0.0%	60
	Great Western Highway Eastbound Exit Ramp	59	0.0%	4	0.0%	60
	Great Western Highway Eastbound Entry Ramp	4,740	7.2%	364	19.4%	60
Blackheath	Great Western Highway Eastbound - West of Blackheath Interchange	7,231	13.4%	640	34.7%	80
	Great Western Highway Westbound - West of Blackheath Interchange	7,428	13.7%	658	35.1%	80
	Evans Lookout Road Eastbound	495	2.1%	33	2.1%	50
	Evans Lookout Road Westbound	968	1.5%	65	1.5%	50
	Old Great Western Highway Eastbound - West of Blackheath Interchange	4,738	6.9%	361	18.6%	60-70
	Old Great Western Highway Westbound - West of Blackheath Interchange	4,062	5.9%	302	15.7%	60
	Great Western Highway Eastbound - West of Coxs River Road Interchange	7,018	13.9%	627	35.8%	80
	Great Western Highway Westbound - West of Coxs River Road Interchange	7,074	14.3%	634	36.2%	80
Little	Great Western Highway Eastbound - East of Coxs River Road Interchange	7,231	13.4%	640	34.7%	80
Hartley	Great Western Highway Westbound - East of Coxs River Road Interchange	7,428	13.7%	658	35.1%	80
	Little Hartley Westbound Entry Ramp	450	0.0%	30	0.0%	60
	Little Hartley Eastbound Exit Ramp	315	2.5%	22	7.8%	60
	Coxs River Road Northbound	945	1.7%	63	1.7%	60

Table 5-6 'Design Year' (2040) 'with project' predicted traffic flows

Location		Daytime (7 am to 1	0 pm)	Night-time (10 pm to		Vehicle speed, km/h
	Coxs River Road Southbound	235	0.0%	16	0.0%	60
	Ambermere Drive Northbound	103	0.0%	7	0.0%	60
	Ambermere Drive Southbound	114	0.0%	8	0.0%	60
	Old Great Western Highway Eastbound - West of Coxs River Road Interchange	628	0.4%	42	0.4%	60
	Old Great Western Highway Westbound - West of Coxs River Road Interchange	269	0.0%	18	0.0%	60
	Old Great Western Highway Eastbound - East of Coxs River Road Interchange	387	4.0%	28	12.0%	60
	Old Great Western Highway Westbound - East of Coxs River Road Interchange	26	4.3%	2	4.3%	60

5.1.5 Noise modelling results

Noise levels have been predicted for each assessment scenario across the extent of the project. Detailed noise prediction results are provided in Annexure H. Road traffic noise contours maps are presented in Annexure I.

The greatest impacts were identified during Year 2040 and are summarised as follows:

- road traffic noise levels are predicted to exceed the L_{Aeq} controlling noise criterion at a total of 30 sensitive receivers
- of these 30 noise sensitive receivers:
 - noise levels are predicted to increase by more than 2 dB(A) at one sensitive receiver
 - noise levels are predicted to equal or exceed the cumulative limit at two sensitive receivers. (ie ≥ L_{Aeq(15 hr)} or L_{Aeq(9 hr)} noise criterion + 5 dB(A))
 - no noise sensitive receivers have been identified as being acute (i.e. ≥ L_{Aeq(15 hr)} 65 dB(A) or L_{Aeq(9 hr)} 60 dB(A))
- two sensitive receivers are considered to be eligible for the consideration of feasible and reasonable noise mitigation measures, however one of these receives has already been identified for consideration of noise mitigation measures as part of the Great Western Highway Little Hartley to Lithgow Upgrade (West Section).

The receivers eligible for consideration of additional mitigation measures are presented in Table 5-7.

Table 5-7 Receivers eligible for consideration of additional mitigation measures

		RNCG project		Predict	ted nois								
Receiver ID	Address	road noise criteria		Without project		With project		Change				Reason for eligibility ¹	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
278	2209 Great Western Highway, Little Hartley	55	50	70	63	60	52	-10.0	-10.7	57	50	Exceeds cumulative noise limit	
2146 ²	2200 Great Western Highway, Little Hartley	55	50	60	53	61	54	1.1	0.4	58	50	Exceeds cumulative noise limit	

Notes:

1. While receivers can be eligible for consideration of additional noise mitigation due to more than one trigger, only one trigger is listed in the table in the following order: exceeds relative increase criterion, exceeds cumulative noise limit, increases >2 dB

2. Receiver 2146 was previously identified for operational treatment as part of the Great Western Highway Little Hartley to Lithgow (West Section)

Table 5-7 shows that two residential receivers have been identified as eligible for consideration of additional treatment, noting that one has previously been identified as part of the Little Hartley to Lithgow Upgrade. The location of these receivers is shown in Annexure J. For these receivers, noise walls are unlikely to be reasonable given that the receivers are not located in groups of four or more, in accordance with the *Road Noise Mitigation Guideline* (Transport, 2022). The use of a low noise pavement, such as Open Graded Asphalt (OGA), may provide a reduction of around 3 dB(A). This option may reduce the need for at-receiver noise treatments and would be investigated further as part of ongoing design development, taking into account whole-of-life engineering considerations and the overall social, economic and environmental effects.

It is noted from Annexure H that with the project, noise levels would reduce at around 2,000 noise sensitive receivers adjacent to the existing Great Western Highway, where the tunnel provides a bypass to the existing surface road. This is due to reduced traffic numbers and heavy vehicle percentages on the existing surface road. In the 2040 'without project' daytime scenario, it is predicted that 18,416 vehicles (14 per cent heavy vehicles) would use the Great Western Highway, west of Evans Lookout Road. This is predicted to reduce to 8,800 vehicles, (6 percent heavy vehicles) in the 2040 'with project' daytime scenario, it is predicted that 1,507 vehicles (35 per cent heavy vehicles) would use the Great Western Highway, west of Evans Lookout Road. This is predicted to reduce to 663 vehicles, (17 percent heavy vehicles) in the 2040 'with project' night-time scenario.

Noise levels would increase on the upgraded surface road sections of the Great Western Highway where traffic volumes would be expected to increase.

5.1.6 Maximum noise level assessment

The NSW *Road Noise Policy* (DECCW, 2011) includes a review of international sleep arousal research and concludes that at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance.

The *Environmental Noise Management Manual* (RTA, 2001) considers a maximum noise level event to be defined as a vehicle pass-by event for which the $L_{A,max}$ noise level is equal to or greater than 15 dB(A) above the $L_{Aeq(1hr)}$. Maximum noise level events have been considered at NL3 – 89 Great Western Highway, Blackheath and at NL10 - 2133 Great Western Highway, Little Hartley. These locations are considered to be representative of receivers along surface roads of the project.

Maximum noise levels are generally dependent on truck engine braking events due to changes in gradient, and/or the presence of intersections, however loud exhausts and horns may also contribute. A truck may engage its engine brakes at any location on the project alignment, however the likelihood depends on a range of factors, such as road gradient, proximity to junctions, truck condition and individual driver behaviour. Maximum noise events are less likely further away from the alignment, as maximum noise levels decrease at a faster rate with distance than is the case for L_{Aeq} road traffic noise levels.

Figure 5-1 provides a summary of the existing typical and maximum number of maximum noise level events recorded over the measurement period at 89 Great Western Highway, Blackheath which is located around 45 metres to the west of the railway line. Maximum noise levels were typically between 67 to 80 dB(A). While the area is controlled by road traffic noise, it cannot be confirmed that noise associated with each maximum noise level is attributable to road traffic, other sources may include rail pass-bys.

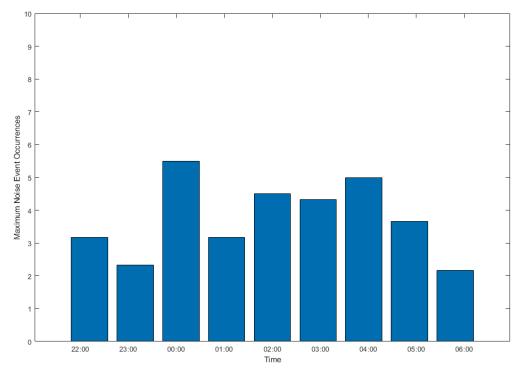


Figure 5-1 Typical and maximum noise level events - 89 Great Western Highway, Blackheath

Figure 5-2 provides a summary of the existing typical and maximum number of maximum noise level events recorded over the measurement period at 2133 Great Western Highway, Little Hartley. Maximum noise levels were typically between 65 to 70 dB(A). While the area is controlled by road traffic noise, it cannot be confirmed that noise associated with each maximum noise level is attributable to road traffic, other sources may include local fauna.

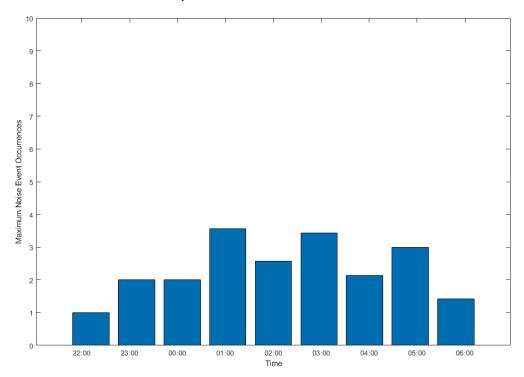


Figure 5-2 Typical and maximum noise level events - 2133 Great Western Highway, Little Hartley

The maximum noise level events illustrated in Figure 5-1 and Figure 5-2 confirm that the area is already exposed to maximum noise level events that have the potential for awakening reactions.

The current gradient on the existing Great Western Highway close to NL10 at Mount Victoria exceeds 10 per cent while the design gradient is less than 5 per cent. Given the reduction in gradient it is expected that the maximum noise events would decrease in both number and duration due to reduced congestion and gradients.

In the 2040 'without project' night-time scenario, it is predicted that 35 per cent of vehicles using the Great Western Highway, west of Evans Lookout Road are heavy vehicles, whereas the heavy vehicle percentages drops to 19 per cent in the 2040 'with project' scenario west of the Blackheath Interchange on the existing Great Western Highway alignment. In the 2040 'without project' night-time scenario, it is predicted that 1,507 vehicles would use the Great Western Highway west of Evans Lookout Road, whereas the number of vehicles drops to 663 in the 2040 'with project' scenario west of the Blackheath Interchange on the Old Great Western Highway.

Given that a substantial proportion of traffic would use the proposed road tunnels there would be a significant reduction in the number of maximum noise events that would affect residential receivers located close to the existing Great Western Highway, between the two tunnel portals at Blackheath and Little Hartley.

The number of vehicles using the Great Western Highway east of the Blackheath Interchange is predicted to increase from 19,081 to 23,320 in the 'without project' scenario compared to the 'with project' scenario in 2040. The number of vehicles using the Great Western Highway west of the Little Hartley Interchange is predicted to increase from 11,974 to 14,092 in the 'without project' scenario compared to the 'with project' scenario in 2040.

Receivers located directly to the west of the western portals and to the east of the eastern portals may experience higher road traffic noise levels due to a general increase in traffic volumes. However due to reduced congestion, improved gradients and alignment the number of maximum noise events and maximum noise levels would likely be reduced. This would reduce the likelihood of sleep disturbance.

5.2 Operational noise from fixed facilities

Noise may arise from fixed facilities associated with the project including:

- ventilation equipment
- substations (including at Little Hartley) and transformers
- water treatment plant
- emergency pumps
- operational control centres.

Most of this equipment is to be located within the tunnel itself, or within the operational infrastructure located adjacent to each tunnel portal (Blackheath and Little Hartley).

5.2.1 Tunnel ventilation details

The tunnel ventilation system consists of:

- jet fans
- cross passage pressurisation
- ventilation buildings , shafts, and outlets
- tunnel air quality monitors (AQM)
- ambient air AQM.

The two ventilation options for the project at this stage are:

- ventilation design to support emissions via portals
- ventilation design to support emissions via ventilation outlets.

5.2.1.1 Portal ventilation option

The noise emission due to jet fans would propagate from within the tunnels through the portal openings. The project comprises four portal openings – two each located at Blackheath and Little Hartley.

The following assumptions have been made regarding the jet fan layout for the purposes of this assessment:

- jet fans are to be arranged in banks of three, as shown in Figure 5-3.
- nominal jet fan properties have been proposed. This includes jet fans with a 1.6 metre diameter with a power demand up to 50 kW and a sound power level of 106 dB(A).
- fan banks (three fans) would be arranged around the tunnel substations. For the eastbound tunnel there would be 10 banks of fans around each substation at a distance of 120 metres between each fan bank. For the westbound tunnel there would be 4 banks of fans around each substation at a distance of 120 metres between each fan bank. Approximately 1,500 metres separates each substation within the tunnel.
- smooth surfaces have been assumed for floor, ceiling and tunnel walls. Quantities of operating jet fans for each design scenario are given for normal traffic conditions, low flow traffic conditions, and emergency conditions. The total quantities of fans would be around:
 - eastbound tunnel (towards Blackheath), around 174 fans in total
 - westbound tunnel (towards Little Hartley), around 75 fans in total (less fans would be required in the westbound tunnel due to traffic travelling downhill).

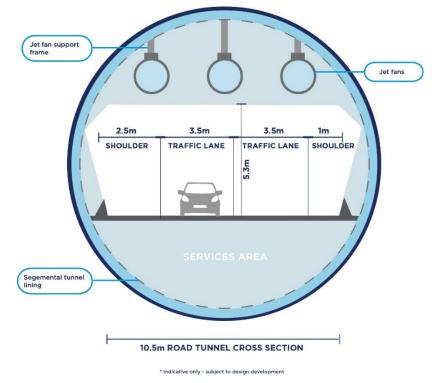


Figure 5-3 Typical jet fan arrangement (portal and ventilation outlet options)

The number of fans operating for each design scenario are provided in Table 5-8 below:

Design scenario	Traffic	Traffic volume	Other factors	Number of jet fans operating		
	speed	speed volume		Eastbound	Westbound	
Normal operation – normal traffic	60-80 km/h	200-2,600 veh/hour	-	0	0	
Normal operation – low flow traffic	20 km/h	2,250 veh/hour	-	135	53	
Emergency operation – low flow traffic	20 km/h	2,250 veh/hour	200 MW fire inside tunnel	66	75	

Table 5-8 Typical jet fan operating numbers (portal ventilation option) for the three design scenarios

It is assumed that the fans located around the substations nearest to the tunnel portals would generate most of noise at the tunnel openings. Conservatively, it is estimated that jet fans located up to two kilometres from the tunnel portals would contribute to noise at the portal of each tunnel. Jet fans located further than two kilometres from the portals have not been considered.

The sound power levels for the selected jet fans are presented in Table 5-9. The calculated portal opening sound power levels based on the above assumptions are shown in Table 5-10.

Table 5-9 Jet fan sound power levels, dB (per fan)

	Octave	Octave band centre frequency, Hz								
Equipment	63	125	250	500	1000	2000	4000	level, dB(A)		
Jet fans ¹	107	107	109	101	101	98	94	106		
Notes:		-								

1 The fan selections are indicative and may change subject to ongoing design development

Table 5-10 Assessed sound power level per m² at tunnel portal openings for the portal ventilation option, dB

Portal	Octav	e band c	entre fre	equency	, Hz			dB(A)
Fortal	63	125	250	500	1000	2000	4000	
Normal operation – normal tra	ffic							
Blackheath eastbound portal	-	-	-	-	-	-	-	-
Blackheath westbound portal	-	-	-	-	-	-	-	-
Little Hartley eastbound portal	-	-	-	-	-	-	-	-
Little Hartley westbound portal	-	-	-	-	-	-	-	-
Normal operation – low flow traffic								
Blackheath eastbound portal	59	59	61	50	50	47	41	56
Blackheath westbound portal	51	51	53	42	42	39	33	48
Little Hartley eastbound portal	59	59	61	50	50	47	41	56
Little Hartley westbound portal	51	51	53	42	42	39	33	48
Emergency operations – low f	low traf	fic						
Blackheath eastbound portal	57	57	59	47	47	44	39	54
Blackheath westbound portal	52	52	54	43	43	40	34	49
Little Hartley eastbound portal	57	57	59	47	47	44	39	54
Little Hartley westbound portal	52	52	54	43	43	40	34	49

5.2.1.2 Ventilation outlet option

The ventilation outlet option for the project would comprise the construction of ventilation buildings containing axial fans used to vent the tunnel. Ventilation buildings would be located below ground at both Blackheath and Little Hartley. The ventilation buildings would be constructed so that the outlet would be 10 metres above the surface level.. Options for the ventilation outlet axial fans are being developed with the option presenting a worst-case noise scenario being considered as part of this assessment. The proposed layout includes the arrangement of five axial fans within each ventilation building. The ventilation building would also house five noise attenuators for each fan. Ventilation outlet locations are based on preliminary designs (see Figure 1-3 and Figure 1-4) and are subject to change.

Table 5-11 Axial fan sound power levels, dB (per fan)	Table 5-11	Axial fan soun	d power levels,	dB (per fan)
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Equipment	Octave band centre frequency, Hz							Overall
	63	125	250	500	1000	2000	4000	level, dB(A)
280JM/080/5008/8/33/- /-NA-D/E300 (Outlet) ¹	123	123	122	123	121	120	119	127

Notes

1 The fan selections are indicative and may change subject to ongoing design development

The assessment assumes the introduction of attenuators for the ventilation outlet axial fans, with insertion loss data provided in Table 5-12.

ltem	Octave band insertion losses, dB								
nem	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
Axial fan attenuator	23	41	54	57	64	60	49		

The ventilation outlet option would also utilise jet fans to move exhaust air through the tunnel to each ventilation shaft. Conservatively, it is assumed that the number of jet fans utilised for the ventilation outlet option would be identical to that of the portal emissions option. In addition, it is assumed that one additional bank of fans would be located at each exit portal at a distance of approximately 50 metres from the portal to move exhaust air against the flow of traffic back to the ventilation shafts. Tunnel portal sound power levels considered for the ventilation outlet option are provided in Table 5-13.

Portal	Octave	band c	entre fre	quency,	Hz			dB(A)		
Fultai	63	125	250	500	1000	2000	4000			
Normal operation – normal traffic										
Blackheath eastbound portal	63	73	82	77	80	78	72	84		
Blackheath westbound portal	-	-	-	-	-	-	-	-		
Little Hartley eastbound portal	-	-	-	-	-	-	-	-		
Little Hartley westbound portal	63	73	82	77	80	78	72	84		
Normal operation – low flow the	Normal operation – low flow traffic									
Blackheath eastbound portal	89	89	91	80	80	77	71	86		
Blackheath westbound portal	51	51	53	42	42	39	33	48		
Little Hartley eastbound portal	59	59	61	50	50	47	41	56		
Little Hartley westbound portal	89	89	91	80	80	77	71	86		
Emergency operations – low f	low traff	ic								
Blackheath eastbound portal	89	89	91	80	80	77	71	86		
Blackheath westbound portal	52	52	54	43	43	40	34	49		
Little Hartley eastbound portal	57	57	59	47	47	44	39	54		
Little Hartley westbound portal	89	89	91	80	80	77	71	86		

Table 5-13 Assessed sound power level per m² at tunnel portal openings for ventilation outlet option, dB

Discussion and comparison of the two ventilation options are provided in Section 5.2.7.

5.2.2 Substation details

Electricity required to power the tunnel ventilation, lighting, signalling and communication systems would be supplied to the project from the existing electricity network via underground substations along the length of the tunnels at around 1.5 kilometres intervals. Additionally, one aboveground substation is proposed to be located within the Little Hartley operational infrastructure. Transformers for the aboveground substation are to be located within a roofless transformer yard located on the northern end of the Little Hartley operational facilities site. Although standard operation of each of the two transformers would likely be under 70 dB(A), a possible but unlikely worst case scenario of 85 dB(A) has been considered for each. Two on-load tap changers have also been considered. A switch room would also be located adjoining the transformer yard with all equipment contained, therefore noise levels from the switch room are expected to be negligible. Proposed location of the Little Hartley substation is shown in Figure 1-4.

Table 5-14 Electrical equipment sound power levels, dB

Equipment	Octave	band ce	Overall level, dB(A)					
Equipment	63	125	250	500	1000	2000	4000	Overall level, db(A)
Transformer	87	95	85	79	79	77	-	85
ABB, On-load tap changer (OLTC)	-	-	-	-	-	-	-	73

5.2.3 Fire pump details

Pumps are to be located within the fire water pump room at the Blackheath operational infrastructure. The room would have one *Clarke JU4H-UFADW8* fire pump driver. Mechanical engine noise is expected to be confined to the pump room building, whilst an exhaust from the pump would vent to atmosphere on the roof of the building.

The sound power levels for the selected fire pump driver are presented in Table 5-15.

Table 5-15 Fire pump driver sound power levels, dB

Equipmont	Octave	band co	Overall level, dB(A)					
Equipment	63	125	250	500	1000	2000	4000	Overall level, db(A)
Mechanical engine noise	63	84	98	112	119	123	122	126
Raw exhaust engine noise	150	145	132	129	125	127	123	134

It is recommended that a muffler be installed on the exhaust of the fire pump driver. The muffler should achieve the insertion losses presented in Table 5-16.

Table 5-16 Fire pump driver muffler insertion loss, dB

ltem	Octave band centre frequency, Hz								
nem	63	125	250	500	1000	2000	4000		
Fire pump engine muffler	40	43	46	49	49	45	36		

5.2.4 Water treatment plant

This project would require a water treatment plant to treat water collected within the tunnel prior to discharge to the environment. A water treatment plant is proposed to be located at the Little Hartley portal area. Proposed location of the Little Hartley water treatment plant is shown in Figure 1-4.

The assumed noise sound power levels for equipment in the water treatment plant are provided in Table 5-17.

Equipment	Octave	band ce						
Equipment	63	125	250	500	1000	2000	4000	Overall level, dB(A)
Blower	90	87	80	81	76	72	69	82
Pump	71	72	74	74	77	74	70	80
Total	90	87	81	82	80	76	73	84

Table 5-17 Water treatment plant at Little Hartley, source sound power level, dB

Notes

1 The equipment selections are indicative and may change subject to ongoing design development

5.2.5 Tunnel operations facility

The tunnel operations facility would be located adjacent to the Blackheath portal, just south of Evans Lookout Road and comprise an area of up to around 5,500 square metres, as shown in Figure 1-3.

Access to the tunnel operations facility would be via the off-ramp that connects the eastbound tunnel to the existing Great Western Highway or via the connection from Blackheath onto the eastbound on-ramp to the upgraded Great Western Highway. The tunnel operations facility would operate 24 hours a day, seven days a week and be continuously staffed to monitor and respond to conditions in the tunnels and on surface road connections. Operational staff parking would be provided adjacent to the for the tunnel operations facility.

The centre comprises an office building which would include heating, ventilation and air conditioning services (HVAC) similar to a commercial building; operational noise associated with building HVAC systems would be managed with standard engineering solutions confirmed during further design development.

The tunnel operations facility would include a workshop. Table 5-18 presents the sound power levels of the predicted activities and equipment anticipated for the workshop. These sound power levels are typical values taken from data provided in the Australian Standard *AS2436-2010, Guide to noise control on construction, demolition and maintenance sites* and assume equipment is modern and in good working order. L_{A1} sound power levels are typically up to 8 dB(A) above L_{Aeq} sound power levels. The

range and types of equipment used may be subject to change and would be confirmed during further design development.

Table 5-18 Sound	power levels for maintenance	e facility activities and equ	ipment at Blackheath

Facility	Equipment	Sound power level, dB(A) ¹		
Facility	Equipment	Per plant	Total	
	Compressor	60		
Workshop	Workshop Hand Tools	94	102	
Workshop	Light vehicle	90		
	Forklift, gas	100		

Notes:

1. Equipment was modelled as being located in a shed, with an insertion loss of 20 dB(A).

The Blackheath tunnel operational infrastructure incorporates a car park located at ground level adjacent to the operational control building. As a conservative estimate up to 20 light vehicles are predicted to enter the carpark during the most stringent 15-minute period.

The noise sources associated with car parking which have been assessed are:

- engine ignition
- door/boot slamming
- cars accelerating.

Time weighting reductions have been applied to the sound power levels to account for the duration which these events would occur.

5.2.6 Operational infrastructure scenarios and summary of noise levels

For the purposes of assessment, the worst case operational conditions have been assumed. This assumes all equipment and plant may be operating simultaneously during the most stringent night-time period. The operational scenarios are summarised in Table 5-19.

Scenario	Ventilation option	Ventilation scenario	Ventilation noise sources	Other noise sources	
1		Normal traffic	0 jet fans operating eastbound0 jet fans operating westbound	Water treatment plant, workshop	
2	Portal	Low flow traffic	 135 jet fans operating eastbound 53 jet fans operating westbound 	activities, carpark noise, substation	
3	ventilation	Emergency	 66 jet fans operating eastbound 75 jet fans operating westbound 	Water treatment plant, workshop activities, carpark noise, substation, fire pump exhaust	
4		Normal traffic	 1 jet fan operating eastbound 1 jet fan operating westbound 5 axial fans operating in each ventilation building 	Water treatment plant, workshop	
5	Ventilation outlet	Low flow traffic	 136 jet fans operating eastbound 54 jet fans operating westbound 5 axial fans operating in each ventilation building 	activities, carpark noise, substation	
6		Emergency	 67 jet fans operating eastbound 75 jet fans operating westbound 5 axial fans operating in each ventilation building 	Water treatment plant, workshop activities, carpark noise, substation, fire pump exhaust	

Table 5-19 Operational infrastructure - noise model night-time scenarios

5.2.7 Noise modelling results

Noise levels have been predicted for each assessment scenario across the extent of the project and are presented in Table 5-20, Table 5-21, Table 5-22, Table 5-23, Table 5-24, and Table 5-25.

Table 5-20 Receivers where noise from operational infrastructure is exceeding criteria - Scenario 1 - portal ventilation

Receiver			L _{Aeq(period)} , dB(A)			
ID	Address	NCA	Criteria	Predicted noise level	Exceedance	
	BI	ackhea	ith			
1733	3 Evans Lookout Road, Blackheath	3	35	36	1	

Receiver Address NCA			L _{Aeq(period)} , dB(A)			
	Criteria	Predicted noise level	Exceedance			
Blackheath						
1733	3 Evans Lookout Road, Blackheath	3	35	36	1	

Table 5-21 Receivers where noise from operational infrastructure is exceeding criteria - Scenario 2 - portal ventilation

Table 5-22 Receivers where noise from c	norational infrastructure is exceeding	a critoria – Sconario 3 – portal ventilation
Table 5-22 Receivers where holse from C	perational infrastructure is exceeding	g criteria – Scenario S – portal ventilation

Receiver		NCA	L _{Aeq(period)} , dB(A)			
ID	Address		Criteria	Predicted noise level	Exceedance	
Blackheath						
1971	17 Evans Lookout Road, Blackheath	3	35	39	4	
3326	25-27 Evans Lookout Road, Blackheath	3	35	39	4	
2849	21-23 Evans Lookout Road, Blackheath	3	35	39	4	
1733	3 Evans Lookout Road, Blackheath	3	35	38	3	
976	15 Evans Lookout Road, Blackheath	3	35	38	3	
4022	7 Evans Lookout Road, Blackheath	3	35	38	3	
1748	11 Evans Lookout Road, Blackheath	3	35	37	2	
3839	21-23 Evans Lookout Road, Blackheath	3	35	37	2	
503	9 Evans Lookout Road, Blackheath	3	35	37	2	
801	31 Evans Lookout Road, Blackheath	2	35	37	2	
3586	31 Evans Lookout Road, Blackheath	2	35	37	2	
1643	35 Evans Lookout Road, Blackheath	2	35	36	1	
1557	85 Great Western Highway, Blackheath	3	35	36	1	
363	31a Evans Lookout Road, Blackheath	2	35	36	1	

Receiver		NCA	L _{Aeq(period)} , dB(A)			
ID	Address		Criteria	Predicted noise level	Exceedance	
	BI	lackhea	ath			
4022	7 Evans Lookout Road, Blackheath	3	35	36	1	
1733	3 Evans Lookout Road, Blackheath	3	35	36	1	
2849	21-23 Evans Lookout Road, Blackheath	3	35	36	1	
Little Hartley						
2467	2187 Great Western Highway, Little Hartley	13	35	37	2	
2053	2133 Great Western Highway, Little Hartley	12	35	36	1	

Table 5-23 Receivers where noise from operational infrastructure is exceeding criteria - Scenario 4 - ventilation outlet

Table 5-24 Receivers where noise from operational infrastructure is exceeding criteria - Scenario 5 - ventilation outlet

Receiver		NCA	L _{Aeq(period)} , dB(A)				
ID	Address		Criteria	Predicted noise level	Exceedance		
	Blackheath						
4022	7 Evans Lookout Road, Blackheath	3	35	37	2		
1733	3 Evans Lookout Road, Blackheath	3	35	37	2		
2849	21-23 Evans Lookout Road, Blackheath	3	35	36	1		
1557	85 Great Western Highway, Blackheath	3	35	36	1		
	Lit	tle Har	tley				
2135	2133 Great Western Highway, Little Hartley	12	35	39	4		
2467	2187 Great Western Highway, Little Hartley	13	35	39	4		
3832	2200 Great Western Highway, Little Hartley	13	35	37	2		
278	2209 Great Western Highway, Little Hartley	13	35	36	1		

Table 5-25 Receivers where noise from operational infrastructure is exceeding criteria - Scenario 6 - ventilation outlet

Receiver	Address	NCA	L _{Aeq(period)} , dB(A)			
ID			Criteria	Predicted noise level	Exceedance	
Blackheath						
1971	17 Evans Lookout Road, Blackheath	3	35	40	5	
3326	25-27 Evans Lookout Road, Blackheath	3	35	40	5	

Receiver			L _{Aeq(period)} , dB(A)			
ID	Address	NCA	Criteria	Predicted noise level	Exceedance	
2849	21-23 Evans Lookout Road, Blackheath	3	35	39	4	
4022	7 Evans Lookout Road, Blackheath	3	35	39	4	
976	15 Evans Lookout Road, Blackheath	3	35	38	3	
1733	3 Evans Lookout Road, Blackheath	3	35	38	3	
1748	11 Evans Lookout Road, Blackheath	3	35	38	3	
3839	21-23 Evans Lookout Road, Blackheath	3	35	38	3	
503	9 Evans Lookout Road, Blackheath	3	35	37	2	
801	31 Evans Lookout Road, Blackheath	2	35	37	2	
3586	31 Evans Lookout Road, Blackheath	2	35	37	2	
1557	85 Great Western Highway, Blackheath	3	35	37	2	
1643	35 Evans Lookout Road, Blackheath	2	35	36	1	
363	31a Evans Lookout Road, Blackheath	2	35	36	1	
1839	6 Evans Lookout Road, Blackheath	3	35	36	1	
3874	2 Evans Lookout Road, Blackheath	3	35	36	1	
175	87 Great Western Highway, Blackheath	3	35	36	1	
3541	89 Great Western Highway, Blackheath	3	35	36	1	
4099	13-17 Brightlands Avenue, Blackheath	3	35	36	1	
Little Hartley						
2135	2133 Great Western Highway, Little Hartley	12	35	39	4	
2467	2187 Great Western Highway, Little Hartley	13	35	39	4	
3832	2200 Great Western Highway, Little Hartley	13	35	37	2	
278	2209 Great Western Highway, Little Hartley	13	35	36	1	

Considering the impacts for all ventilation design scenarios during the night-time period, the greatest impacts due to operational infrastructure are summarised as follows:

Portal ventilation option

- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for normal traffic conditions (Scenario 1) at one receiver at Blackheath (exceedances up to 1 dB). No exceedances are predicted at Little Hartley
- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for low flow traffic conditions (Scenario 2) at one receiver at Blackheath (exceedances up to 1 dB). No exceedances are predicted at Little Hartley
- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for emergency conditions (Scenario 3) at 14 receivers at Blackheath (exceedances up to 4 dB). No exceedances are predicted at Little Hartley.

Ventilation outlet option

- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for normal traffic conditions (Scenario 4) at three receivers at Blackheath (exceedances up to 1 dB). Noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for normal traffic conditions at two receivers at Little Hartley (exceedances up to 2 dB).
- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for low flow traffic conditions (Scenario 5) at four receivers at Blackheath (exceedances up to 2 dB). Noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for low flow traffic conditions at four receivers at Little Hartley (exceedances up to 4 dB).
- noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for emergency conditions (Scenario 6) at 19 receivers at Blackheath (exceedances up to 5 dB). Noise levels are predicted to exceed the L_{Aeq} controlling noise criterion for emergency conditions at four receivers at Little Hartley (exceedances up to 4 dB).

It is noted that exceedances in the ventilation outlet option are due mainly to jet fans located near the exits of each portal (utilised to force exhaust gases against the flow of traffic). To reduce noise emanating from the tunnel portals for these scenarios, quieter jet fans could be selected, or attenuators could be investigated for jet fans adjacent to the portal exit. In addition to this, most exceedances occur under emergency scenarios, where traffic flow would reduce to 20km/h, completely stop, and/or a fire would be present within the tunnel. For these scenarios, most exceedances at Blackheath are influenced by the fire pump driver exhaust. This this would operate under emergency conditions only. It should be noted that the low flow traffic conditions (scenarios 2 and 5) would in general be the worst-case scenarios for the standard operation of the project.

In general, the portal ventilation option would lead to exceedances at a lower number of neighbouring properties with overall lower noise impact. Besides the fire pump driver located at Blackheath, all other non-ventilation related operational equipment and activities are not expected to impact on any noise sensitive receivers located near to the operational facilities.

5.2.7.1 Annoying characteristics of noise sources

The fixed facilities predicted noise levels were reviewed at receiver locations to determine if any corrections for annoying characteristics were required in accordance with Fact Sheet C of the *Noise Policy for Industry* (EPA, 2017). These annoying characteristics include:

- tonal noise
- low frequency noise
- intermittent noise.

Based on the preliminary plant selections it was found that corrections were not required to be added to the noise levels from the fixed facilities. However a complete review of the final equipment selections would be undertaken during ongoing design development to confirm this.

6.0 Assessment of cumulative impacts

Cumulative effects have the potential to occur when benefits or impacts from a project overlap or interact with those of other projects, potentially resulting in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur when projects are constructed or operated concurrently or consecutively. Once the Great Western Highway Blackheath to Little Hartley (the project) is operational, other projects which interrelate may enhance the project and create positive cumulative benefits.

Four projects were reviewed against the following screening criteria for this cumulative impact assessment:

- spatially relevant (ie, the development or activity overlaps with, is adjacent to or within two kilometres of the project)
- timing (ie, the expected timing of its construction and/or operation overlaps or occurs consecutively to construction and/or operation of the project)
- scale (ie, large-scale major development or infrastructure projects that have the potential to result in cumulative impacts with the project, as listed on the NSW Government Major Project website and on the relevant council websites)
- status (ie, projects in development with sufficient publicly available information to inform this
 environmental impact statement and with an adequate level of detail to assess the potential
 cumulative impacts).

Projects identified as contributing to potential cumulative impacts have met these criteria and include:

- Katoomba to Blackheath Upgrade (including Medlow Bath Upgrade)
- Little Hartley to Lithgow Upgrade.

Given the regional setting of the project primarily within the Blue Mountains Local Government Area (LGA) and a small portion within the Lithgow LGA, there are fewer major projects within the locality.

Figure 1-8 shows the interface of the Katoomba to Blackheath Upgrade (including Medlow Bath) and the Little Hartley to Lithgow Upgrade with the project.

The indicative programs for construction works associated with this project at Blackheath and at Little Hartley are presented below. Figure 6-1 presents overlaps with the Katoomba to Blackheath upgrade and Figure 6-2 presents overlaps with the Little Hartley to Lithgow upgrade.

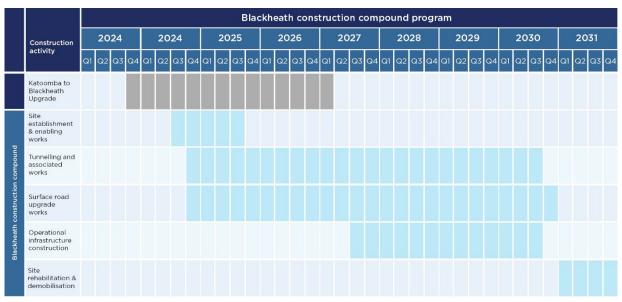


Figure 6-1 Indicative construction program - Blackheath

												Liti	tle	Har	tle	y co	onst	tru	ctio	n c	om	oou	nd	prog	gran	n											
	Construction	2022		2023			2024			2025			2026			2027			2028			2029			2030		2031		51								
	activity	Q1 G	2 Q3	Q4	QI	Q2 (33 (2 4 (ຊາ (Q2 (23 C	84 G	al C	2	23 C	24 (ຊາ ເ	22	23 C	24 (ລາ ເຊ	12 G	13 Q4	4 Q1	Q2	Q3	Q4 (ລາ	Q2 (23 C	94 G	11 Q	2 Q	3 Q4	ଦା	Q2 (Q3 Q4
	Little Hartley to Lithgow Upgrade																																				
σ	Site establishment & enabling works																																				
unoduuo u	Tunnelling and associated works																																				
constructio	Surface road upgrade works																																				
Little Hartley construction compound	Operational infrastructure construction																																				
5	Site rehabilitation & demobilisation																																				

Figure 6-2 Indicative construction program – Little Hartley

6.1 Potential cumulative construction noise impacts

These adjoining projects to the east and west would be under construction when construction of the project commences. In the case where any receiver is affected by construction noise from more than one project at any one time, it is possible that an increase of up to 3 dB(A) of the highest noise level predicted for any project may occur (assuming that at any one location equal noise levels from two stages of works are experienced). It is unlikely that utility works would be undertaken at nearby sites in more than one project concurrently, therefore cumulative night-time impacts from utility works are unlikely.

The Katoomba to Blackheath Upgrade would overlap with this project from late 2024 until early 2027 and receivers around Blackheath may be affected at times. The Little Hartley to Lithgow Upgrade would overlap with this project from mid-2024 until the end of 2026 and receivers around Little Hartley maybe affected at times. Receivers potentially affected by cumulative impacts from this project and an adjoining project are presented in Annexure K.

To minimise environmental impacts, parts of the Katoomba to Blackheath Upgrade and Little Hartley to Lithgow Upgrade construction footprints would be used to support construction of the project.

As a result, the following activities would be undertaken at the construction sites as part of the Katoomba to Blackheath and Little Hartley to Lithgow Upgrades:

- vegetation would be cleared
- topsoil would be levelled and compacted
- site access tracks would be established
- water quality controls such as water quality and sediment basins would be installed.

The environmental impacts associated with these works have been assessed as part of the Katoomba to Blackheath Upgrade and the Little Hartley to Lithgow Upgrade.

Overlapping construction project stages and identification of any receivers subject to increased noise levels would be determined during design development when more detailed construction programming information is available. Any additional mitigation measures required to manage potential cumulative construction noise and construction traffic impacts would be implemented as part of detailed construction planning.

As the highest impact areas for the project are located at the eastern and western boundaries of the project area (near to the tunnel portals) it is likely that any noise mitigation measures proposed as ongoing design develops (noise barriers, acoustic sheds, property treatment) would additionally reduce the impact of cumulative noise from adjoining projects.

Provided the minimum working distances provided in this report are implemented, it is highly unlikely that cumulative vibration would impact receivers near to the boundaries between neighbouring projects.

6.1.1 Construction fatigue

Although there would be minimum impact from cumulative impacts from the overlapping staging of the Katoomba to Blackheath Upgrade and Little Hartley to Lithgow Upgrade with the project, there is the potential for construction noise fatigue at nearby receivers due to the increased duration of the construction period. Given the expected construction duration of the entire Great Western Highway Upgrade, some receivers may be potentially affected by construction noise for around eight years. The additional surface road construction upgrades are only expected to increase exposure to construction noise by six months in addition to the project itself for receivers at Blackheath and Little Hartley.

As construction of the surface road upgrades (Katoomba to Blackheath and Little Hartley to Lithgow) is expected to be finished by 2026, the continuation of construction impacts associated with this project would likely be perceived as these construction works tapering off, with a reduction in works and associated noise. As the project moves through different stages it is expected that suitable respite would be given within areas where no construction for particular stages is to occur. Receivers at Little Hartley are expected to be impacted the most as they would be subject to noise generated by the Little Hartley to Lithgow surface construction works, and the operation of tunnelling support services from the Little Hartley construction site.

Construction fatigue would predominantly be managed through discussions with the affected community and the establishment of a Fatigue Management Plan. Where practicable respite would be provided and the total duration of works would be minimised as far as practicable.

6.2 Potential cumulative operational noise impacts

The operational road traffic noise impact assessment presented in Section 5.0 is based on traffic volumes which include the Great Western Highway Upgrades – Katoomba to Blackheath and Little Hartley to Lithgow. As such, assessed operational road traffic noise impacts presented are representative of potential cumulative impacts. Operational ancillary facilities are not likely to contribute to cumulative impacts as the facilities are localised to specific project areas.

7.0 Management of impacts

7.1 Performance outcomes

Performance outcomes have been developed that are consistent with the SEARs for the project. The performance outcomes for the project are summarised below in Table 7-1 and identify measurable, performance-based standards for environmental management.

 Table 7-1
 Performance outcomes for the project – Noise and vibration

SEARs desired performance	Project performance outcome	Timing
Construction noise and vibration (including airborne noise, ground- borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity, and adverse impacts on the structural integrity of buildings and items including Aboriginal	Construct the project to avoid or minimise exceedances of applicable noise management levels. If exceedances of noise management levels cannot be reasonably and feasibly avoided, develop and apply situation-specific construction noise mitigation and management measures.	Construction
places and environmental heritage. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community.	Construct the project to avoid or minimise exceedances of applicable structural integrity (including for sensitive structures and heritage items) and human comfort vibration standards. If exceedances of vibration standards cannot be reasonably and feasibly avoided, develop and apply situation-specific vibration mitigation and management measures.	Construction
Increases in noise emissions and vibration affecting environmental heritage as defined in the <i>Heritage</i> <i>Act 1977</i> during operation of the project are effectively managed.	Design the project to minimise the magnitude and extent of material adverse changes to road traffic noise (≥2dB(A)) at existing sensitive receiver locations during operation of the project.	Design

7.2 Management of construction impacts

The construction noise and vibration assessment presented in Section 4.0 detailed a number of exceedances of the identified NMLs for this project. Exceedances of the NMLs were predicted around the construction sites at Blackheath, Soldiers Pinch and Little Hartley for each construction component. The exceedances varied between being perceived as 'noticeable', where noise levels are predicted to be up to 10 dB above background noise levels, to 'highly intrusive', where noise levels are predicted to be over 30 dB above background noise levels. A number of receivers were predicted to be 'highly noise affected' for particular construction stages. It should be noted that the construction noise impact assessment is considered to be conservative and for substantial periods of time during construction of the project noise levels would be lower than presented in this report. Nonetheless, as a result of the exceedances, and potential exceedances of vibration criteria, the following generic and receiver specific mitigation measures have been identified.

7.2.1 Construction noise and vibration management plan

A construction environmental management plan (CEMP) would be prepared for the project. The CEMP would detail the proposed approach to environmental management, monitoring and reporting during construction. A number of sub-plans (and other supporting documentation, as required) would also be prepared as part of the CEMP including a Construction Noise and Vibration Management Plan (CNVMP). The CNVMP would include the following:

• identify relevant performance criteria in relation to noise and vibration

- identify noise and vibration sensitive receptors and features in the vicinity of the project
- include standard and additional mitigation measures from the Construction Noise and Vibration Guideline (for Road and Maritime Works) (Transport, 2022) and details about when each would be applied
- describe the process(es) that would be adopted for carrying out location and activity specific noise and vibration impact assessments to assist with the selection of appropriate mitigation measures
- consider potential cumulative construction noise impacts and construction noise fatigue
- include protocols that would be adopted to manage works required outside standard construction hours, in accordance with relevant guidelines including for management of respite periods
- detail the monitoring that would be carried out to confirm project performance in relation to noise and vibration performance criteria.

The cumulative noise impacts of any nearby major projects should be further considered by the contractor when a detailed construction schedule becomes available for the project. Consultation should be undertaken with the relevant contractors to manage potential cumulative impacts on sensitive receivers. Feasible and reasonable mitigation measures should be detailed in the CNVMP.

Feasible and reasonable mitigation measures would be detailed within the CNVMP to manage predicted noise levels at sensitive receivers and areas where construction fatigue could occur. Consultation with the affected community would also occur prior to and during construction.

7.2.2 Community consultation and complaints handling

A community and stakeholder engagement plan (Engagement Plan) would be prepared for the Upgrade Program and would be used to guide community and stakeholder engagement activities during construction of the project. Engagement during construction would include updates on planned construction activities and would respond to concerns and enquiries in a timely manner. A community communications strategy would also be developed to detail the processes and facilitate communication and feedback between Transport and the community. Further details of engagement with agencies are provided in Chapter 7 (Community and stakeholder engagement) of the EIS

All residents expected to experience an exceedance of the construction NMLs should be consulted about the project prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.

The information provided to the residents should include:

- programmed times and locations of construction work
- the hours of the project works
- construction noise and vibration impact predictions
- construction noise and vibration mitigation measures being implemented on site.

Community consultation regarding construction noise and vibration would be detailed in the Engagement Plan for the construction of the project and would include a 24 hour hotline and complaints management process.

Consultation would also be undertaken with all schools likely to be affected.

For out of hours works, consultation would take place with consideration to the *Construction Noise and Vibration Guideline (for Road and Maritime Works)* (Transport, 2022) and Strategy 2 Consultation and notification of the *Interim Construction Noise Guideline* (DECC, 2009).

Community consultation activities carried out during the preparation of the EIS broadly discussed potential noise and vibration impacts associated with the project. Following community engagement during exhibition of the EIS, information provided by affected residents would be considered as part of further design development and, as required, development of specific noise mitigation measures.

7.2.3 Work practices

Induction and training would be provided to relevant staff and sub-contractors outlining their responsibilities with regard to noise and vibration.

7.2.4 Construction hours and work scheduling

Details of all out of hours work required would form part of the CNVMP.

Noisy work would be scheduled to be undertaken during the standard hours as far as possible.. Work may be required outside of standard construction hours to maintain a safe work environment and avoid or minimise impacts to operational transport infrastructure and services or to utilities networks, including limiting disruption to pedestrians, commuters, traffic or utilities. Noisy activities that cannot be undertaken during standard construction hours are to be scheduled as early as possible during the evening and/or night-time periods.

Particularly noisy activities such as the use of impact piling rigs, road and concrete saws, rock hammers, should be scheduled where feasible and reasonable around times of high background noise to provide masking.

Deliveries would be carried out during standard construction hours where feasible and reasonable.

Respite measures are to be implemented for noisy work and vibration intensive activities in a manner consistent with EPL and Transport guideline requirements.

7.2.5 Respite

A protocol would be developed to identify the need for and provision of respite measures for residential receivers in accordance with the *Interim Construction Noise Guideline* (DECC, 2009). Respite measures may include the restriction to the hours of construction activities resulting in impulsive or tonal noise (such as rock hammering, pile driving), or other appropriate measures agreed between the contractor and residential receiver such as alternative accommodation.

The protocol would form part of the Construction Noise and Vibration Management Plan.

7.2.6 Early installation of architectural treatments

Where properties have been identified for architectural treatment and these properties would be impacted by noise from construction works, Transport would consult with those property owners on the early installation of treatments to provide noise mitigation during the construction of the project. This approach would assist in managing noise through all phases of the project. Treatments provided by Transport would be accordance with the draft *At-receiver Noise Treatment Guideline* (RMS, 2017) where feasible and reasonable.

7.2.7 Standard mitigation measures

Appendix B of the *Construction Noise and Vibration Guideline (for Road and Maritime Works)* (Transport, 2022) lists a number of standard actions and mitigation measures which should be implemented on all construction projects. The strategies are centred on management, training and the attenuation of noise at the source and would be implemented by the Contractor.

7.3 Construction noise mitigation measures

7.3.1 Construction traffic

The following measures would be implemented to reduce and manage noise and vibration impacts:

- truck drivers would be advised of designated vehicle routes, parking locations, speed limits, acceptable delivery hours or other relevant practices (i.e. ensuring vehicles are adequately silenced, minimising the use of engine brakes, and no extended periods of engine idling). Vehicle routes should be reviewed and final selections should consider noise impacts on noise sensitive receivers
- site access and egress points would be located away from residences and other sensitive land uses, where feasible and reasonable

- deliveries and spoil removal would be planned to avoid queuing of trucks on or around the construction ancillary facilities
- construction footprints would be arranged to limit the need for reversing associated with regular/repeatable movements (e.g. trucks transporting spoil) to minimise the use of reversing alarms
- where feasible and reasonable, non-tonal reversing alarms would be used, taking into account the requirements of the Workplace Health and Safety legislation.

Mitigation measures for vehicle movements outside of standard construction hours would be included in the CNVMP. Restrictions on speed, idling and the use of engine brakes would reduce the impact of construction traffic noise on sleep disturbance.

7.3.2 Construction sites

The noise associated with the operation of construction sites would primarily result from the operation of fixed and mobile plant and truck movements. Consideration would be given to the layout of the site in order to maximise distance and shielding to nearby receivers.

7.3.3 Plant and equipment selection and location

The selection of plant and equipment can have a substantial impact on construction noise levels. Appropriate plant would be selected for each task to minimise the noise impact.

Alternative works methods such as use of hydraulic or electric-controlled units in place of diesel units would be considered and implemented where feasible and reasonable. The use of alternative machines that perform the same function (such as rubber wheeled plant) would be considered in place of steel tracked plant.

Equipment would be regularly inspected and maintained to ensure it is in good working order.

Plant should be located on site with as much distance as possible between the plant and noise sensitive receivers. Noisy equipment would be orientated away from residential receivers where feasible and reasonable.

7.3.4 Noise barriers

Detailed noise assessments would be carried out for all construction sites as part of detailed construction planning. The requirement for temporary noise walls within sites and adjacent to construction works, and the requirement for other appropriate noise management measures, is to be assessed and implemented prior to the commencement of activities which have the potential to cause noise or vibration impacts.

7.3.5 Additional mitigation measures

Additional mitigation measures are provided in Appendix C of the CNVG Version 1.0, dated August 2016. These measures are applied after standard noise mitigation measures (Appendix B of the above mentioned document) have been applied and where the noise levels are still exceeding the NMLs. The guideline recommends following the approach in Tables C.1, C.2 and C.3, for airborne noise, vibration and ground-borne noise respectively, where reasonable and feasible. The content of these tables are presented in Table 7-2, Table 7-3, and Table 7-4.

Table 7-2 Triggers for additional mitigation measures – Vibration

Perception	Additional mitigation measures type ^{1, 2}
Standard hours ³	
Predicted vibration exceeds maximum levels	V, N, RP
OOHW period 1 ⁴	
Predicted vibration exceeds maximum levels	V, IB, N, RO, PC, RP, SN
OOHW period 2 ⁵	
Predicted vibration exceeds maximum levels	AA, V, IB, N, PC, RP, SN
Notes:	

1. Refer to section below for detailed descriptions of the mitigation types

2. These additional mitigation measures are applicable to the number of exceedances of the NMLs presented in Table 4-15

 Standard Hours refers to Monday – Friday (7am – 6pm), Sat (8am – 1pm)
 OOHW Period 1 refers to Monday – Friday (6pm – 10pm), Saturday (7am – 8am and 1pm – 10pm), Sunday /public holiday (8am – 6pm)

OOHW Period 2 refers to Monday – Friday (10pm – 7am), Saturday (10pm – 8am), Sunday /public holiday (6am – 7am) 5.

Table 7-3 Triggers for additional mitigation measures – Airborne noise

Perception	dB(A) above NML	Additional mitigation measures type ^{1, 2}		
All hours				
> 75 dB(A)	-	N, V, PC, RO		
Standard hours ³				
Noticeable	0	-		
Clearly audible	1 - 10	-		
Moderately intrusive	11 – 20	N,V		
Highly intrusive	> 20	N,V		
OOHW period 1 ⁴				
Noticeable	1 - 5	-		
Clearly audible	6 - 15	N, R1, DR		
Moderately intrusive	16 – 25	V, N, R1, DR		
Highly intrusive	> 25	V, IB, N, R1, DR, PC, SN		
OOHW period 2 ⁵				
Noticeable	1 - 5	Ν		
Clearly audible	6 - 15	V, N, R2, DR		
Moderately intrusive	16 – 25	V, IB, N, PC, SN, R2, DR		
Highly intrusive	> 25	AA, V, IB, N, PC, SN, R2, DR		

Notes:

1. Refer to section below for detailed descriptions of the mitigation types

2. These additional mitigation measures are applicable to the number of exceedances of the NMLs presented in the construction noise prediction tables in Section 4.5

3. Standard Hours refers to Monday – Friday (7am – 6pm), Sat (8am – 1pm)

OOHW Period 1 refers to Monday - Friday (6pm - 10pm), Saturday (7am - 8am and 1pm - 10pm), Sunday /public holiday 4. (8am - 6pm)

5. OOHW Period 2 refers to Monday – Friday (10pm – 7am), Saturday (10pm – 8am), Sunday /public holiday (6am – 7am)

Perception	dB(A) above NML	Additional mitigation measures type ^{1, 2}				
OOHW period 1 ⁴						
Clearly audible	< 10	Ν				
Moderately intrusive	10 - 20	V, N, R1, DR, SN				
Highly intrusive	> 20	V, IB, N, PC, SN, R1, DR				
OOHW period 2 ⁵	OOHW period 2 ⁵					
Clearly audible	< 10	V, N, SN				
Moderately intrusive	10 - 20	AA, V, IB, N, PC, RP, SN, R2, DR				
Highly intrusive	> 20	AA, V, IB, N, PC, RP, SN, R2, DR				

Table 7-4 Triggers for additional mitigation measures – Ground-borne noise

Notes:

1. Refer to section below for detailed descriptions of the mitigation types

2. These additional mitigation measures are applicable to the number of exceedances of the NMLs presented in Table 4-16

3. Standard Hours refers to Monday – Friday (7am – 6pm), Sat (8am – 1pm)

4. OOHW Period 1 refers to Monday – Friday (6pm – 10pm), Saturday (7am – 8am and 1pm – 10pm), Sunday /public holiday (8am – 6pm)

5. OOHW Period 2 refers to Monday – Friday (10pm – 7am), Saturday (10pm – 8am), Sunday /public holiday (6am – 7am)

7.3.5.1 Overview of additional mitigation measures

Notification (letterbox drop or equivalent) (N)

Advanced warning of works and potential disruptions can assist in reducing the impact on the community. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these would occur, impacts and mitigation measures. Notification should be a minimum of 5 working days prior to the start of works. The approval conditions for projects may also specify requirements for notification to the community about works that may impact on them.

Specific notifications (SN)

Specific notifications are letterbox dropped (or equivalent) to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. The specific notification provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

Phone calls (PC)

Phone calls detailing relevant information made to identified/affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement should be used.

Individual briefings (IB)

Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that would be implemented. Project representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project. Where the resident cannot be met with individually then an alternative form of engagement should be used.

Respite Offers (RO)

Respite Offers should be considered made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of

each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers. The purpose of such an offer is to provide residents with respite from an ongoing impact. This measure is evaluated on a project-by-project basis, and may not be applicable to all projects.

Respite Period 1 (R1)

Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month.

Respite Period 2 (R2)

Night-time construction noise in out of hours period 2 shall be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and 6 nights per month. Where possible, high noise generating works would be completed before 11pm.

Duration Respite (DR)

Respite offers and respite periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly. The project team should engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite. Where there are few receivers above the NML each of these receivers should be visited to discuss the project to gain support for Duration Respite.

Alternative Accommodation (AA)

Alternative accommodation options may be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels. The specifics of the offer would be identified on a project-by-project basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.

Verification (V)

Verification should include measurement of the background noise level and construction noise. A noise monitoring program would be implemented to assist in confirming and controlling the site specific potential for disturbance at particularly sensitive localities at the commencement of activities and periodically during the construction program as the works progress. The results would be reviewed to determine if additional mitigation measures are required. All measurements would be undertaken in accordance with Australian Standard 1055.1-1997 – Acoustics – Description and measurement of environmental noise, Part 1: General procedures.

A noise and vibration monitoring program would be presented in the CNVMP.

7.4 Construction vibration mitigation measures

In some circumstances, construction activity within the minimum working distance cannot be avoided due to the work required and the prevalent geological site conditions. These conditions may not be fully understood until work has commenced. For vibration intensive activities that occur within the minimum working distances, management methods should include:

- building condition surveys
- equipment selection and maintenance
- construction works scheduling
- supplementary vibration monitoring
- additional mitigation measures as set out in Table 7-3.

7.4.1 Building condition surveys

Prior to the commencement of tunnelling or other vibration intensive work at each site, existing condition surveys would be undertaken on all properties and structures within the Tunnel alignment (the zone on the surface equal to 50 metres from the outer edge of the tunnels) and within 50 metres from surface works. This distance has been derived based on minimum working distances for typical high vibration construction activities such as a large hydraulic hammer.

7.4.2 Equipment selection and maintenance

Equipment size would be selected taking into account the minimum working distances and the distance between the area of construction and the most affected sensitive receiver.

The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures.

Equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.

7.4.3 Works scheduling

Wherever reasonable and reasonable, vibration intensive works should be limited to the least sensitive times of the day.

7.4.4 Supplementary vibration monitoring

If the use of vibration intensive plant cannot be avoided within the minimum working distance for cosmetic damage the following procedure would occur as a minimum:

- notification of the works to the affected residents and community.
- works would not proceed until attended vibration measurements are undertaken. Vibration
 monitors are to provide real-time notification of exceedances of levels approaching cosmetic
 damage criteria.

If ongoing works are required a temporary relocatable vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.

7.4.5 Heritage and other sensitive structures

A detailed survey would be undertaken prior to vibration intensive construction commencing to identify all nearby vibration sensitive buildings. Applicable vibration criteria and construction strategies would need to be included in the CNVMP for each of the identified locations, ensuring that the works' impacts would be appropriately controlled.

7.5 Construction ground-borne noise mitigation measures

Additional mitigation measures to manage the impacts of ground-borne noise are detailed in Table 7-4.

7.6 Effect of mitigation measures

Additional mitigation measures would be implemented as necessary based on the noise levels as indicated in Section 4.0. Factors which may affect the implementation include the following:

- availability of suitable equipment
- outcomes of community consultation.

The indicative effect of the proposed noise mitigation measures is provided in Table 7-5 below.

Table 7-5 Effect of mitigation measures

Mitigation measure	Nominal noise reduction
Screening, location of site sheds, construction footprint boundary fencing	5-10 dB nominal noise reduction
Acoustic sheds ¹	Up to 25 dB nominal noise reduction
Good site layouts/Distance	About 6 dB per each doubling of distance
Construction scheduling	Provision of periods of respite
Plant and equipment selection and location Substitution of equipment and/or methodologies eg rubber wheeled excavators	5-15 dB nominal noise reduction
Monitoring	Confirmation construction noise predictions, identification of unnecessarily noisy pieces of equipment or methodology and alternative/additional methods of mitigation.
Community consultation/notification	Construction would not occur unexpectedly. Residents can plan to minimise disruption. Residents would be aware of the complaint management process.

Notes:

1. Use of an acoustic shed at Little Hartley has been included in assessment

Construction noise and vibration safeguards are presented in Table 7-6.

7.7 Management of operational impacts

Where feasible and reasonable, road traffic noise levels from the operation of redeveloped and new roads should be reduced to meet the noise criteria in accordance with Transport procedures. In many instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land-use developments, reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles, greater use of public transport, and alternative methods of freight haulage.

The hierarchy of noise mitigation is firstly to consider at-source noise mitigation measures such as road design and traffic management, then the use of quieter pavements. If these measures cannot be designed to meet the noise criteria the use of 'in corridor' mitigation measures should be considered, which are generally noise barriers and mounds. Finally, if the applicable noise criteria cannot be met by using a combination of all these methods, at-receiver mitigation measures can be considered such as architectural treatments and property boundary walls.

The use of a low noise pavement, such as Open Graded Asphalt (OGA), may provide a reduction of around 3 dB(A). This option may reduce the need for at-receiver noise treatments and would be investigated further during ongoing design development taking into account whole-of-life engineering considerations and the overall social, economic and environmental effects.

Operational noise safeguards are presented in Table 7-6.

7.8 Noise and vibration mitigation measures

Table 7-6 provides a summary of the noise and vibration mitigation measures to be adopted for the project.

Table 7-6 Noise and vibration mitigation measures

Ref	Environmental safeguards	Timing
NV01	 A Construction Noise and Vibration Management Plan (CNVMP) will be prepared as part of the Construction Environmental Management Plan (CEMP) in consultation with relevant stakeholders. The CNVMP will be prepared consistent with the <i>Construction Noise and Vibration Guideline (for Road and Maritime Works)</i> (Transport for NSW, 2022m) and will include: identification of potentially significant noise and vibration generating construction activities and locations based on further design development and construction planning, and associated 	Pre-construction and construction
	 potentially affected noise and vibration sensitive receivers details of construction noise management levels and vibration goals applicable to each sensitive receiver or group of receivers identification of feasible and reasonable measures to be implemented during construction to minimise noise and vibration impacts, such as working hours, staging, placement and operation of work sites, parking and storage areas, temporary noise barriers, haul road maintenance and controlling the location and use of vibration generating equipment 	
	 details of specific measures to be applied in circumstances where construction noise management levels and/ or vibration goals will not be met at noise sensitive receivers a monitoring program to monitor and assess the performance of construction activities against the applicable construction noise management levels and vibration goals 	
	 arrangements for consultation with potentially affected noise and vibration sensitive receivers, including notifications of planned construction works and complaint handling procedures a procedure for considering and managing construction activities outside standard construction hours, including approval processes, activity planning and scheduling, receiver notification and engagement procedures, and mitigation and management measures. 	
NV2	The procedure for considering and managing construction activities outside standard construction hours (refer to NV1) will consider activities that will be carried out 24 hours per day, seven days per week, including:	Construction
	 underground construction, including tunnel boring machine and roadheader tunnelling methodology and construction of roads and other infrastructure within tunnels spoil handling within the tunnels and acoustic shed spoil haulage tunnel fit-out including mechanical and electrical fit-out mechanical and electrical fit-out of operational buildings emergency work. 	
NV3	Noise sensitive receivers likely to be affected by noise or vibration in excess of the applicable construction noise management level or vibration threshold will be notified of the relevant construction activities	Construction

Ref	Environmental safeguards	Timing			
	 prior to the commencement of those activities. The notification will include details of: the relevant construction activities the anticipated construction period and construction hours contact information for a construction management stakeholder interface complaint and incident reporting and how to obtain further information. Feedback provided by affected noise sensitive receivers will be considered when developing a final mitigation strategy to manage construction noise impacts 				
NV4	Construction activities at Blackheath and Soldiers Pinch will be carried out during standard construction hours where feasible and reasonable. Construction activities with the potential to generate high noise levels (75 dB(A) LAeq at receiver) and/or vibration levels will be scheduled during less sensitive time periods where feasible and reasonable. Any construction activity carried out outside standard construction hours at Blackheath and Soldiers Pinch will be subject to the out of hours construction activity procedure detailed in the CVNMP, including consultation with the affected local community.	Construction			
NV5	Following detailed design, the owners of properties identified for architectural treatment to mitigate operational traffic noise impacts will be consulted in relation to the potential early application of architectural treatments in cases where those properties are also likely to experience construction noise impacts in excess of applicable construction noise management levels. If agreed with the property owner, the architectural treatment will be applied as early as possible to mitigate construction noise impacts.				
NV6	 Construction activities will be planned and carried out to minimise noise and vibration impacts on noise sensitive receivers. Where relevant, this may include application of the following measures to individual construction sites and activities: construction sites will be configured to maximise the distance and/ or provide shielding between noisy plant and equipment and sensitive receivers, where feasible and reasonable site sheds, earth bunds and hoarding will be positioned to provide shielding between noisy plant and equipment and sensitive receivers, where feasible and reasonable materials/ deliveries will be loaded and unloaded as far as practicable from sensitive receivers, and/ or loading/ unloading areas will be shielded construction sites will be configured to minimise the need for reversing vehicles, particularly for regular/ repeatable movements non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on construction vehicles and mobile plant regularly used on site vibration intensive equipment will be selected based on the structural damage minimum working distances. The use of less vibration intensive methods of construction or equipment will be considered where feasible and reasonable. 	Design and construction			

Ref	Environmental safeguards	Timing
NV7	Where the use of vibration intensive equipment within the relevant minimum working distance from a building or structure cannot be avoided, a detailed inspection of the building or structure will be carried out prior to the commencement of the vibration intensive work. A written and photographic report will be prepared to document the condition of building or structure, and a copy of the report will be provided to the relevant landowner or land manager.	Construction
NV8	A framework will be developed and implemented for coordinating construction planning and traffic management with adjacent Great Western Highway upgrade projects to minimise potential cumulative construction noise and vibration impacts where practicable.	Design and construction
NV9	During further design development, options to minimise jet fan break out noise from tunnel portals (such as jet fan selection or use of noise attenuation devices) would be investigated, with the aim of not exceeding applicable controlling noise criteria at affected receivers where feasible and reasonable.	Design
NV10	Within 12 months of commencement of construction of the project, a post-construction operational compliance assessment will be carried out in accordance with Chapter 6 of Road Noise Model Validation Guideline (Transport for NSW, August 2022).	Operation

7.9 Residual impacts

The above measures are expected to control he potential impacts from the project as far as practicable. Residual impacts are, however, expected to remain, particularly when noise or vibration intensive activities are being completed near to sensitive receivers. Residual impacts would be evaluated further during design development and would be mitigated using the processes defined in the CNVMP.

8.0 Conclusion

Transport is seeking approval under Division 5.2, Part 5 of the EP&A Act to upgrade the Great Western Highway between Blackheath and Little Hartley (the project).

The project would comprise the construction and operation of new twin tunnels around 11 kilometres in length between Blackheath and Little Hartley, and associated surface road upgrade work for tie-ins to the east and west of the proposed tunnel portals.

This technical paper provides a detailed report assessing potential noise and vibration impacts from both the construction and operational phases of the project. Relevant guidelines and assessment procedures have been followed to ensure all applicable state requirements have been considered. The project's Secretary's Environmental Assessment Requirements (SEARs) and agency comments have also been referenced in the assessment to ensure that all potential impacts have been adequately considered.

8.1 Construction impacts

A construction noise assessment has been conducted in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) and *Construction Noise and Vibration Guideline (for Road and Maritime Works)* (Transport, 2022). Reasonable worst case construction scenarios have been assessed. Construction of the project would occur both within and outside of standard construction hours.

The assessment of noise associated with the construction of the project indicates some exceedances of the *Interim Construction Noise Guideline* (DECC, 2009) noise management levels at the most affected sensitive receivers, around Blackheath. The magnitude and number of exceedances are detailed in Chapter 4.0. Exceedances of the noise management levels occur during the day and night at the most affected sensitive receivers during certain activities.

Tunnelling and associated works are predicted to result in the greatest number of exceedances of the daytime and night-time NMLs. Effective noise mitigation and management measures would need to be developed by the contractor to minimise the potential noise impacts from the works. The magnitude of these impacts is consistent with other major works projects and highlights the need for effective noise mitigation and management planning.

Measures have been recommended to mitigate construction noise impacts upon nearby sensitive receivers. The final number, degree and nature of these measures would ultimately depend on the construction strategy and work undertaken. Specific noise management and mitigation measures would be detailed in the contractor's Construction Noise and Vibration Management Plan. The recommended management and mitigation measures which would be considered in the plan include:

- effective community consultation
- training of construction workers
- use of noise barriers
- noise monitoring
- appropriate selection and maintenance of equipment
- scheduling of work for less sensitive time periods
- situating plant in less noise sensitive locations
- construction traffic management
- respite periods.

Minimum working distances for vibration intensive construction works have been presented. Equipment size would be selected by the contractor taking into account the minimum working distances and the distance between the area of construction and the most affected sensitive receiver. If works need to be undertaken within minimum working distances, vibration monitoring would be undertaken.

Construction traffic would increase road traffic noise level in some areas, but increases would be less than 2 dB(A) during the daytime and night-time periods with the exception of two sections of the proposed access roads (Great Western Highway directly east and west of Coxs River Road) associated with the night-time peak construction traffic volume scenario. An increase of 2 dB(A) or less is compliant with the traffic noise increase criterion in the *Road Noise Policy* (DECCW, 2011). As the peak construction traffic volumes are a worst-case scenario indicative of peak activities occurring at the same time, which is highly unlikely in practice, the actual noise impact of construction traffic would likely be somewhere between the predicted relative increases associated with average construction volumes and peak construction volumes

A large number of receivers are predicted to experience ground-borne noise levels which would exceed relevant criteria due to tunnelling activities. The receivers are all located in Blackheath, between Evans Lookout Road and Radiance Avenue. These exceedances are due to the shallower tunnel depth near the tunnel portals just south of Blackheath. These exceedances are temporary in nature and would occur for a few days at each identified receiver as tunnelling progresses at a rate of 70-90 m per week. The human comfort vibration criteria would also be exceeded at a number of receivers around Blackheath. The structural damage criteria would not be exceeded by the tunnelling activities.

Cumulative construction noise impacts may occur as a result of construction works for the project occurring simultaneously and other major projects, such as the adjacent Great Western Highway Upgrade projects. Consultation would be undertaken between the projects to minimise potential impacts where feasible and reasonable.

8.2 Operational impacts

An operational road traffic noise assessment has been completed in accordance with the Environment Protection Authority's *NSW Road Noise Policy* (DECCW, 2011) and Transport's *Road Noise Criteria Guideline* (Transport, 2022) and *Road Noise Mitigation Guideline* (Transport, 2022).

Exceedances of the applicable noise criteria have been identified close to the western portal. These exceedances are of the cumulative noise limit. Appropriate noise mitigation has been recommended to minimise adverse impacts on the community by the project, in accordance with the *Road Noise Mitigation Guideline* (Transport, 2022) and the draft *At-Receiver Noise Treatment Guideline* (RMS, 2017).

At-receiver architectural treatments have been recommended at two sensitive receivers that were found eligible for the consideration of noise mitigation. These requirements would be clarified during the ongoing design development. Road traffic noise levels would be reduced at about 2,000 noise sensitive receivers adjacent to the bypassed sections of the Great Western Highway.

Operational traffic noise would be monitored at sensitive receivers between six months and one year after opening. If the traffic noise levels are above the levels that are predicted during the ongoing design development, consideration of additional feasible and reasonable mitigation measures would be undertaken.

An assessment of operational fixed facilities was undertaken in accordance with the Environment Protection Authority's *Noise Policy for Industry* (EPA, 2017). Options for portal ventilation, and dedicated ventilation outlets have been considered. The assessment found that noise levels from the operational fixed facilities, would lead to minor exceedances (1-2 dB) during the most stringent night-time period for normal traffic and low-flow traffic conditions at Blackheath. With the current indicative equipment selections emergency operations would lead to exceedances of up to 5 dB at Blackheath for both ventilation options. There is scope to reduce noise levels using noise mitigation measures which would be confirmed during ongoing design development. No exceedances in the noise criteria are expected for receivers located near Little Hartley. A further assessment would be undertaken during ongoing design development to confirm the noise source assumptions and the required attenuation to meet the applicable noise criteria.

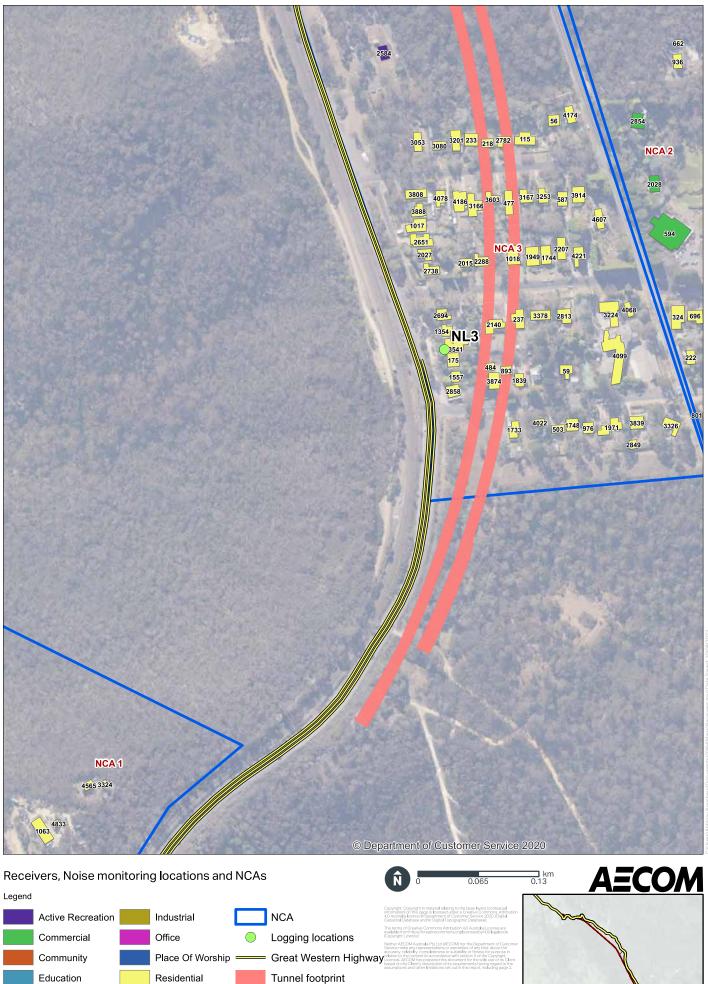
Glossary and abbreviations

Term	Description					
AADT	Annual average daily traffic					
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.					
Assessment background level (ABL)	The overall background level for each day, evening and night period for each day of the noise monitoring.					
AVATG	Assessing Vibration: A Technical Guideline					
A Weighted decibels (dB(A))	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1 kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).					
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.					
CNVG	Construction Noise and Vibration Guideline					
CNVMP	Construction Noise and Vibration Management Plan					
Day	Construction noise: The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays. Road traffic noise: The period from 0700 to 2200 h every day of the week.					
Decibel [dB]	The measurement unit of sound.					
EPA	Environment Protection Authority					
Evening	Construction noise: The period from 1800 to 2200 h Monday to Sunday and Public Holidays. Road traffic noise: Not applicable.					
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB(A) increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB(A) increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows: 0 dB(A) Threshold of human hearing 30 dB(A) A quiet country park 40 dB(A) Whisper in a library 50 dB(A) Open office space 70 dB(A) Inside a car on a freeway 80 dB(A) Outboard motor 90 dB(A) Heavy truck pass-by 100 dB(A) Jack hammer / subway train 110 dB(A) Rock concert 115 dB(A) Limit of sound permitted in industry 120 dB(A) 747 take off at 250 metres					
DECC	Department of Environment and Climate Change					

Term	Description
DECCW	Department of Environment, Climate Change and Water
Equivalent continuous sound level (L_{eq})	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Frequency	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Insertion loss	Reduction in noise by inserting a barrier between the source and receiver.
ICNG	Interim Construction Noise Guideline
L _{max}	The maximum sound pressure level measured over the measurement period.
L _{min}	The minimum sound pressure level measured over the measurement period.
L ₁₀	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10} .
L ₉₀	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90} .
NATA	National Association of Testing Authorities
NSW	New South Wales
Night	Construction noise: The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays. Road traffic noise: The period from 2200 to 0700 h every day of the week.
NCA	Noise Catchment Area
NML	Noise Management Level
NPfl	Noise Policy for Industry
OEH	Office of Environment and Heritage
OOHW	Out of Hours Works
Rating background level (RBL)	The overall background level for each day, evening and night period for the entire length of noise monitoring.
SEARs	Secretary's Environmental Assessment Requirements
Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
VDV	Vibration Dose Value

Annexure A

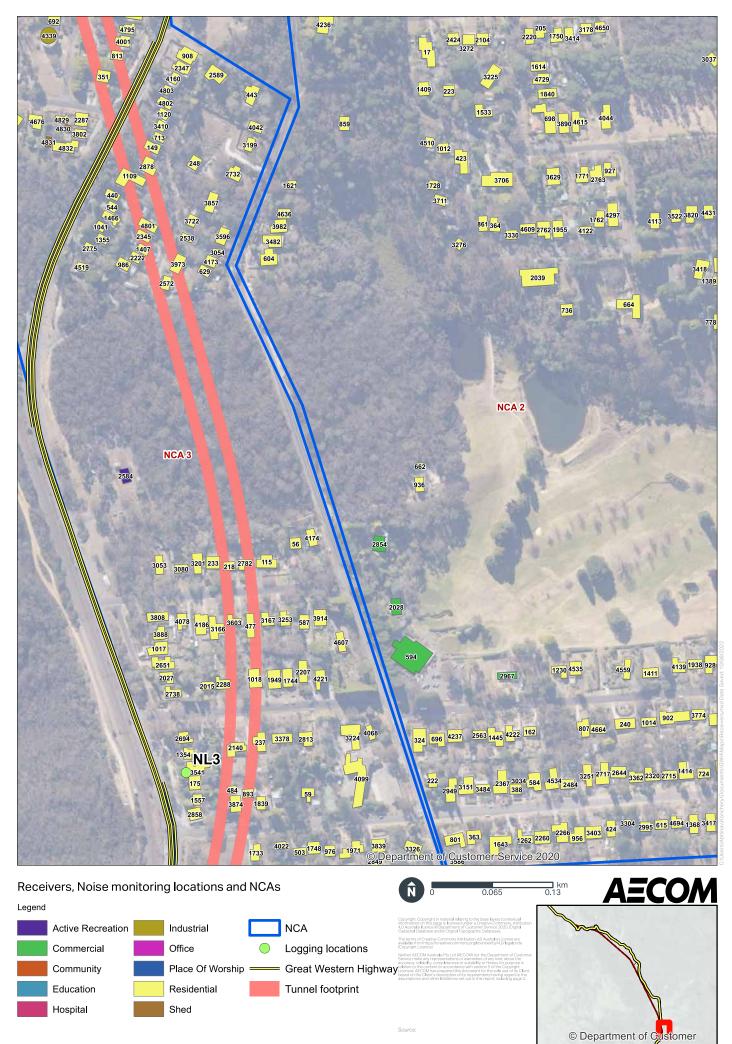
Project overview and receivers



Shed



Hospital





Tunnel footprint

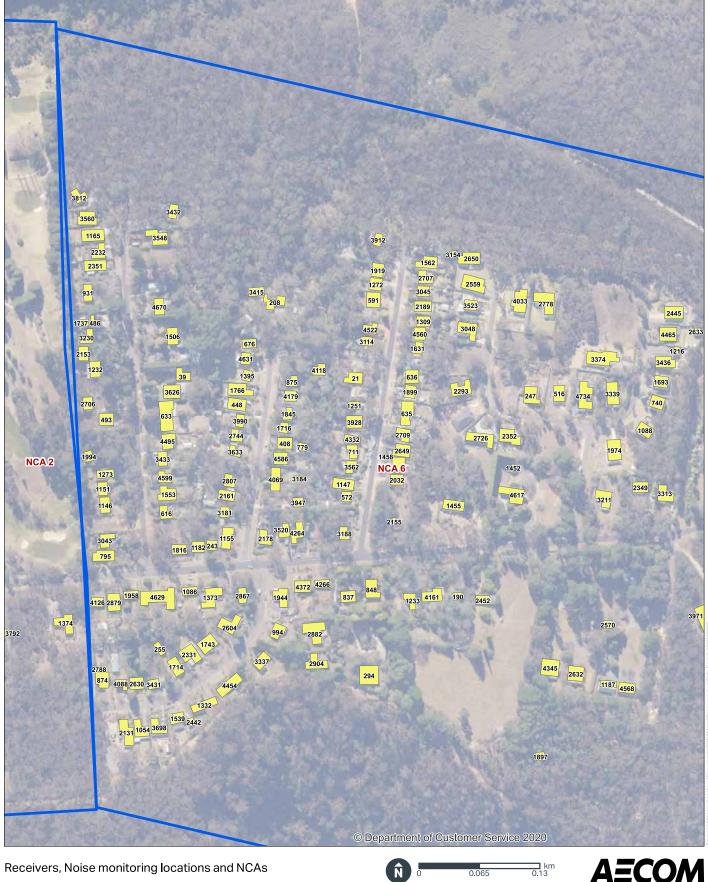


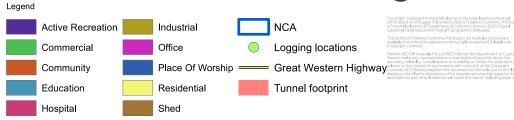
Education

Hospital

Residential

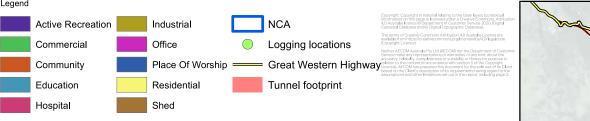
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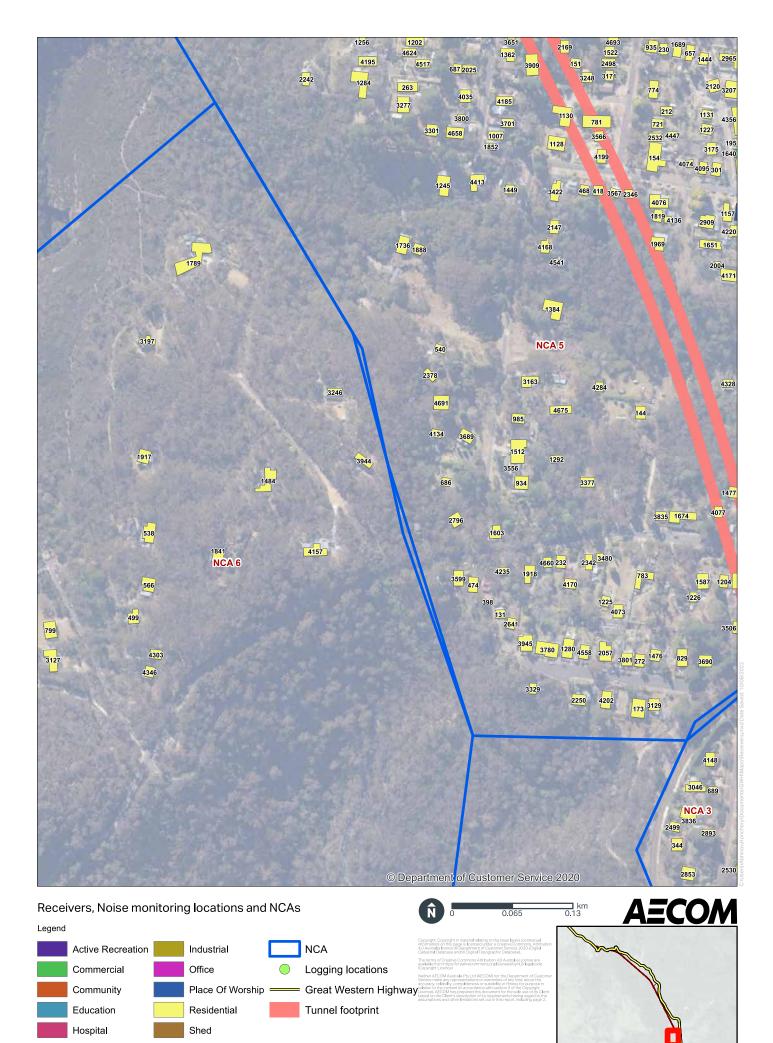










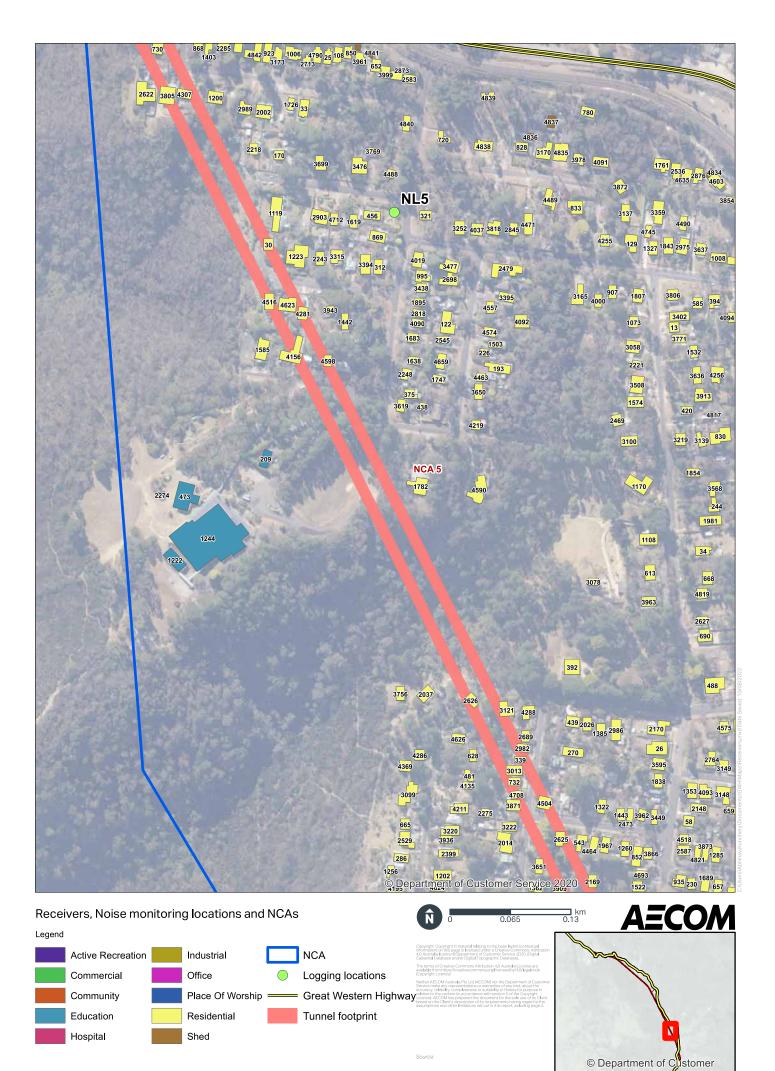


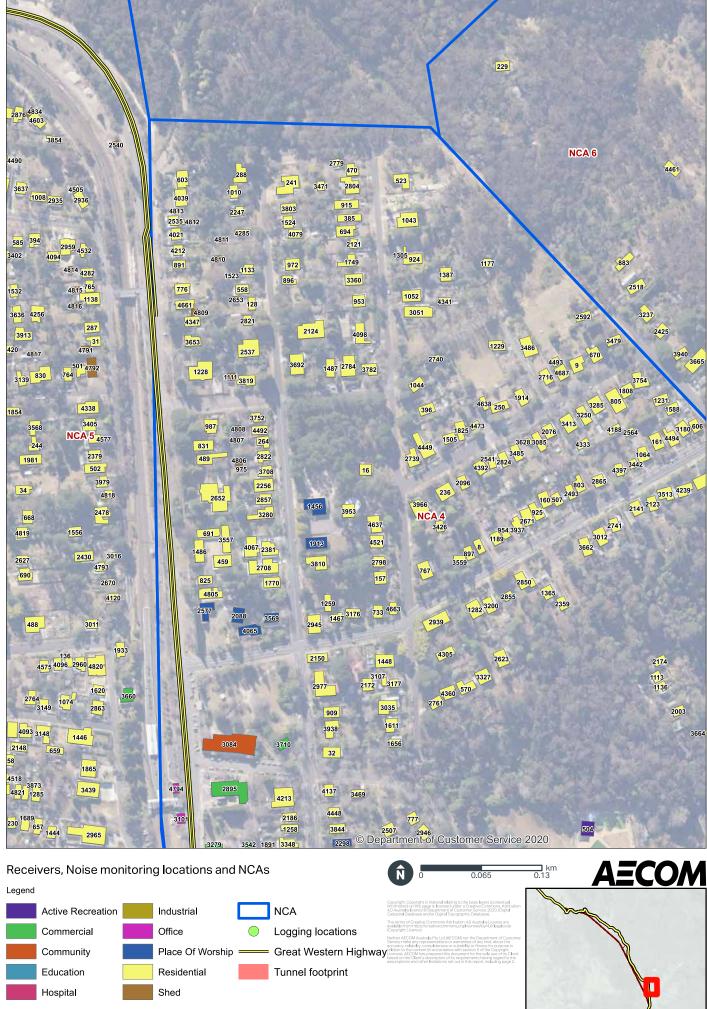


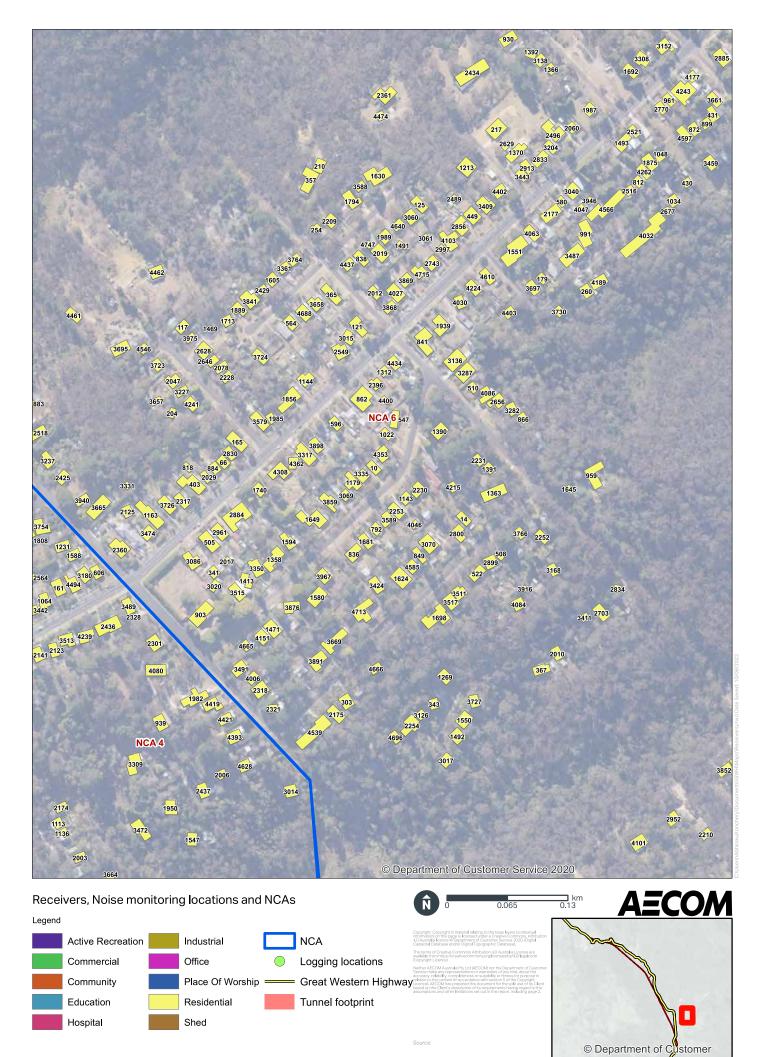
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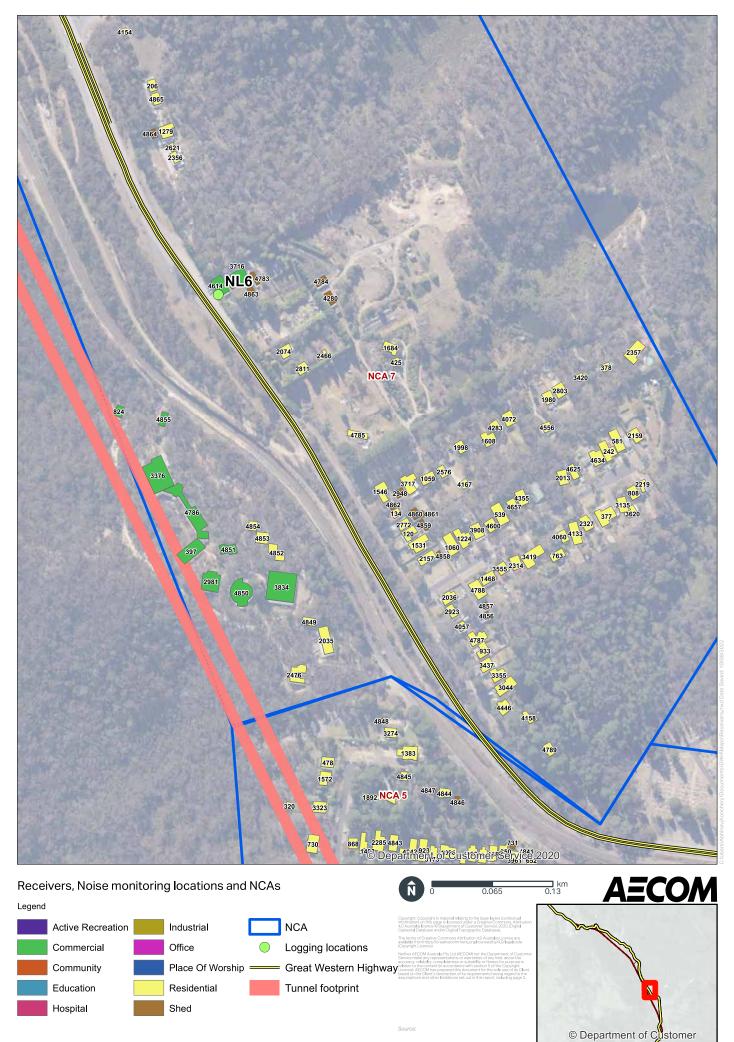


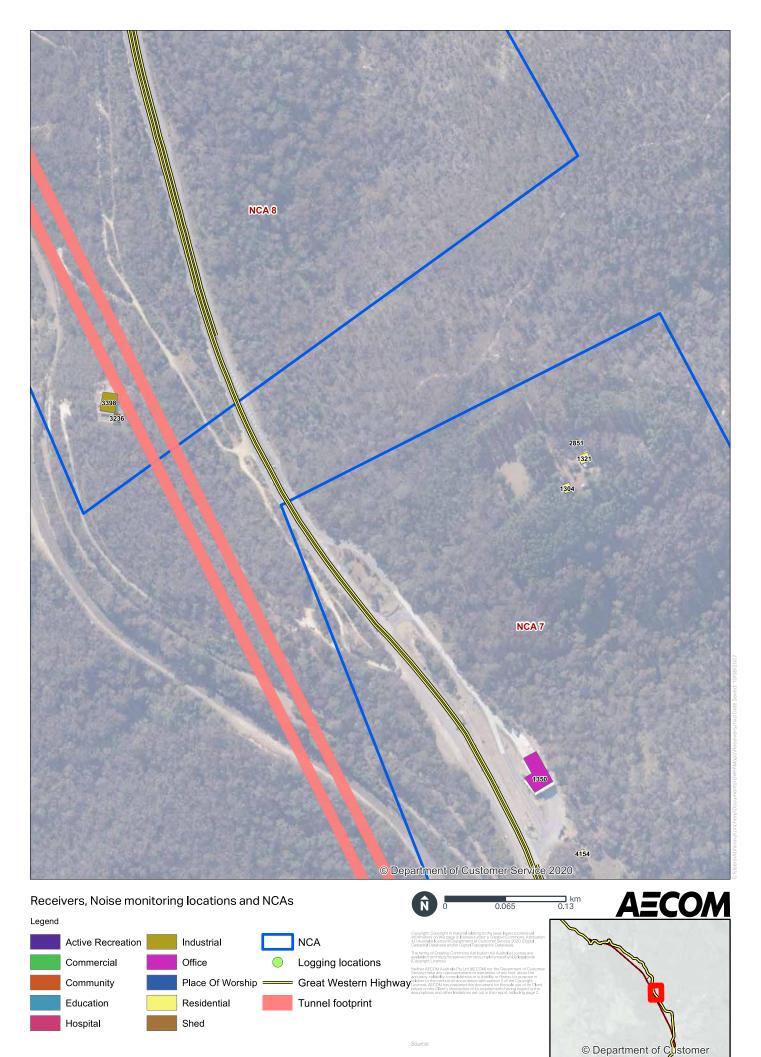
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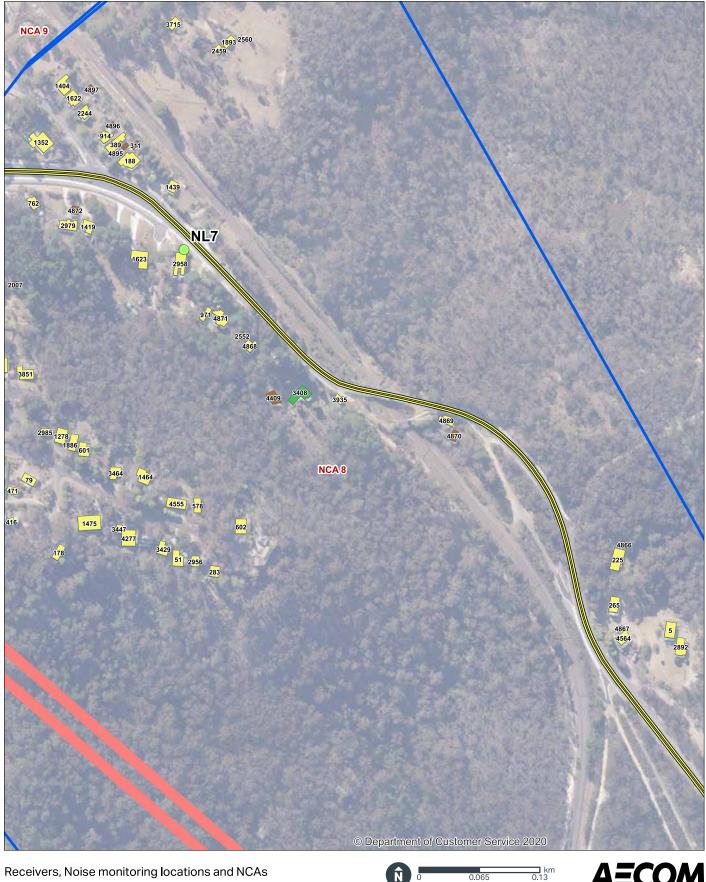


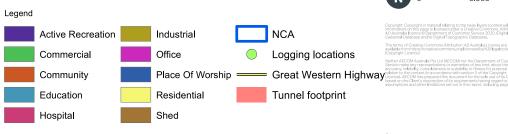




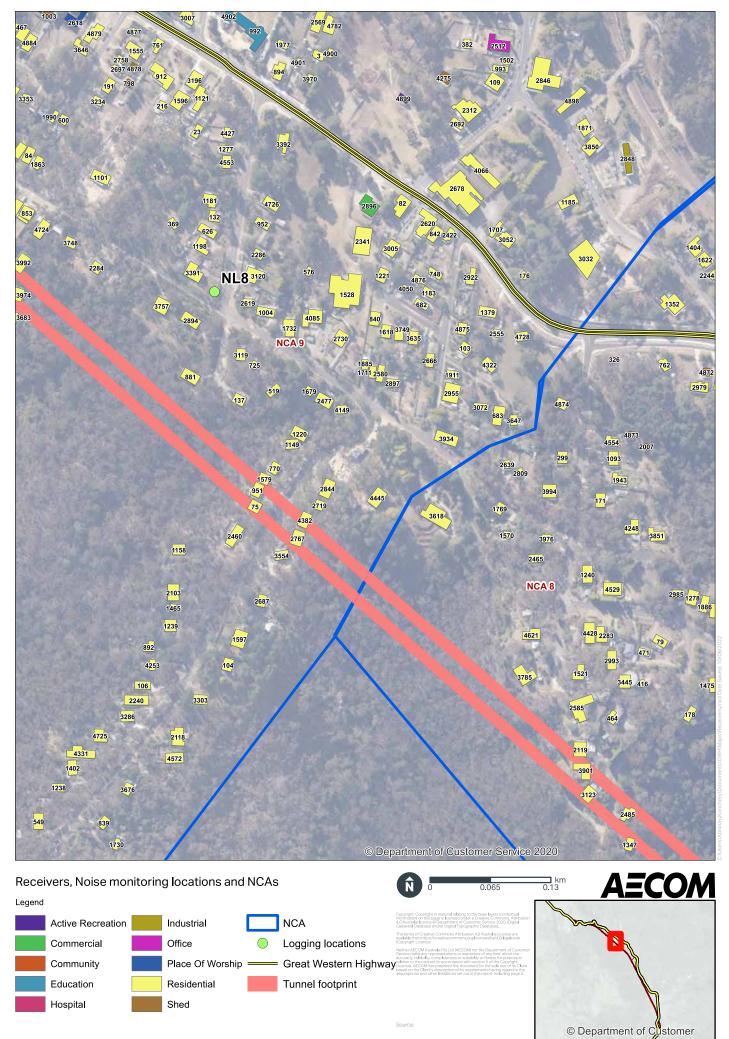


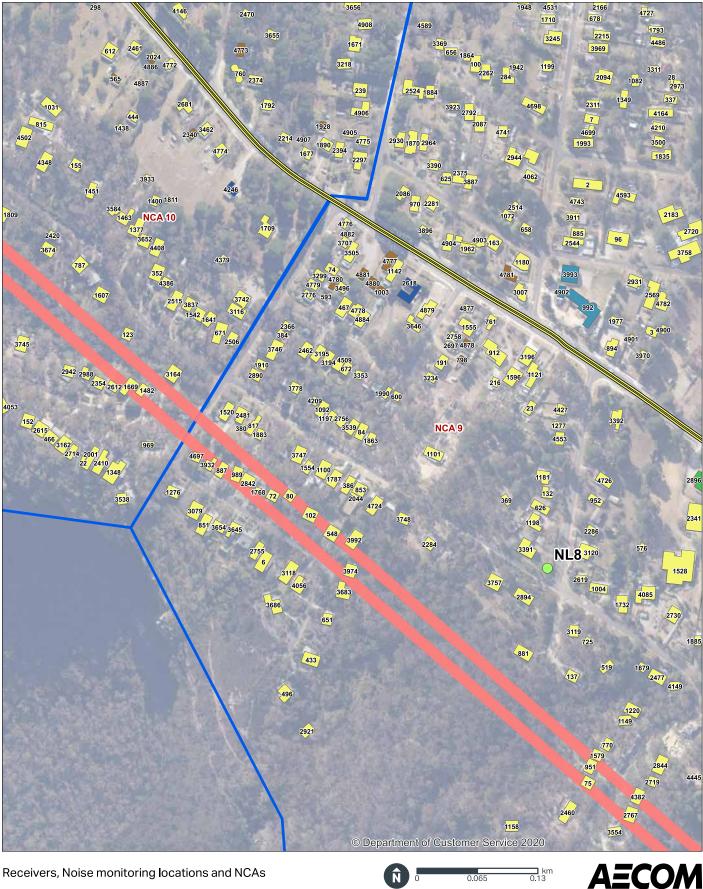
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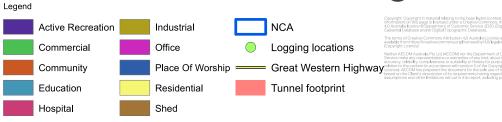




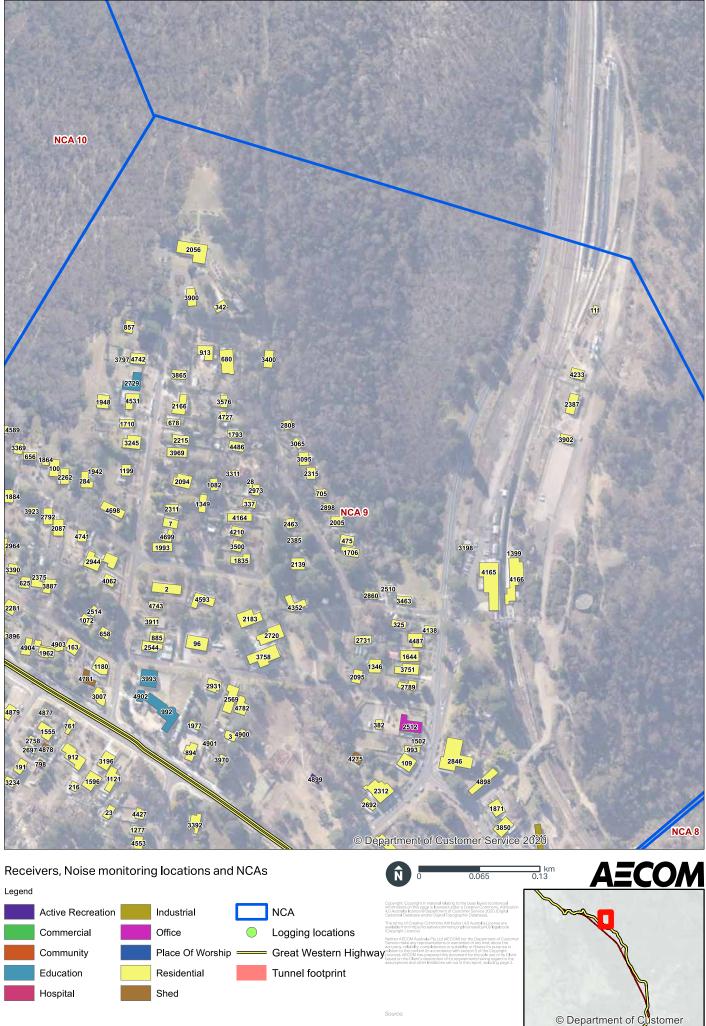


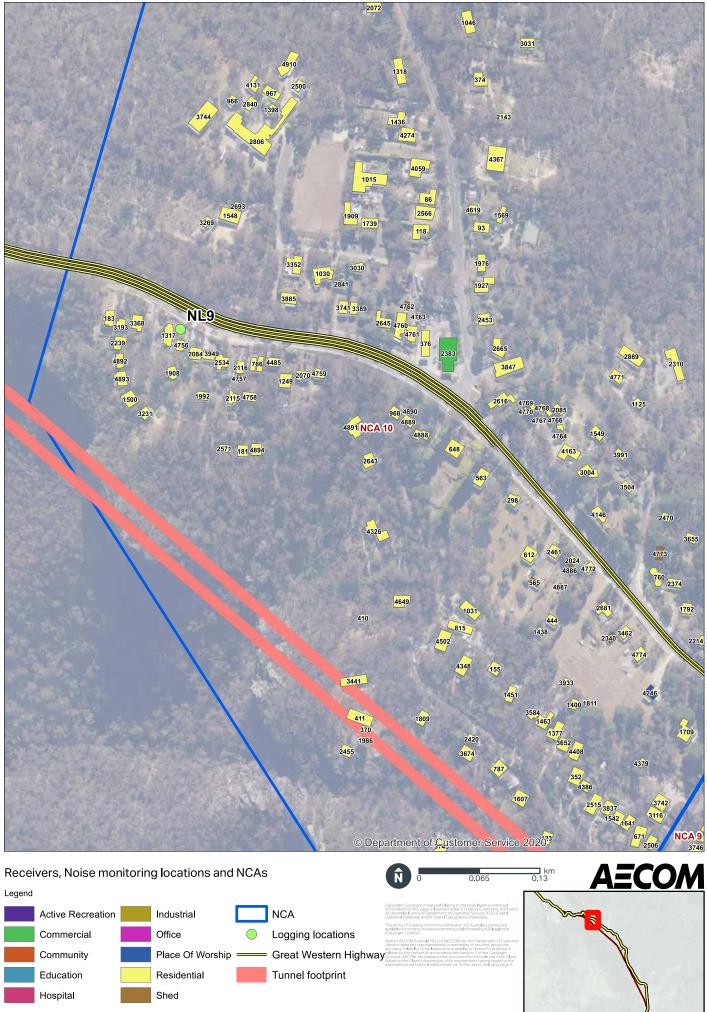


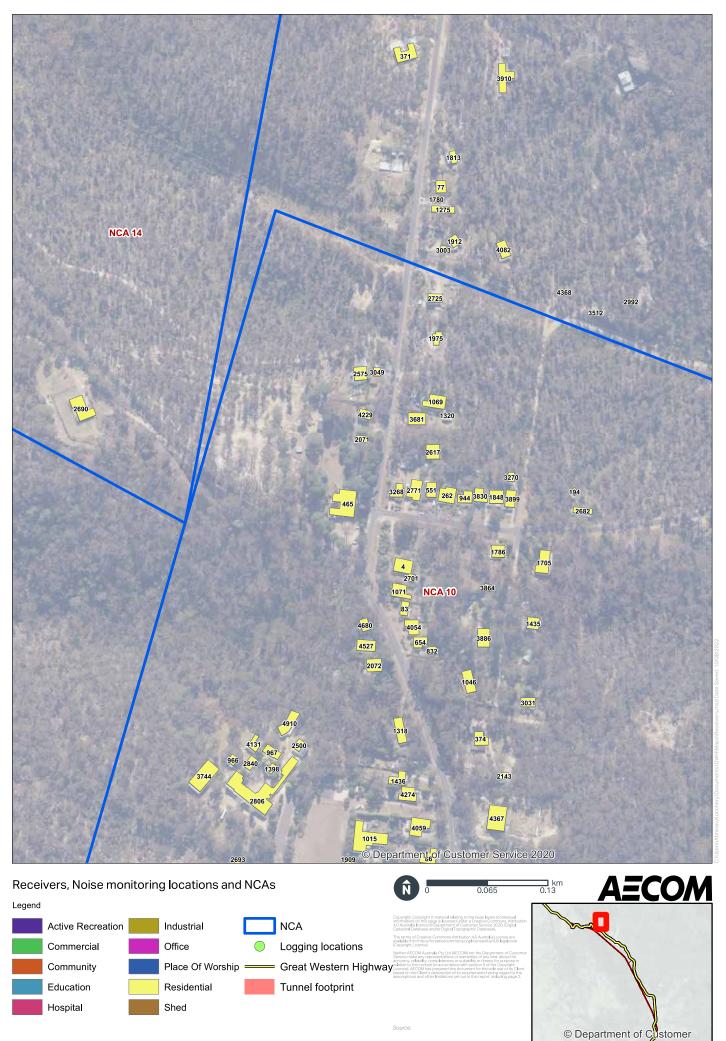


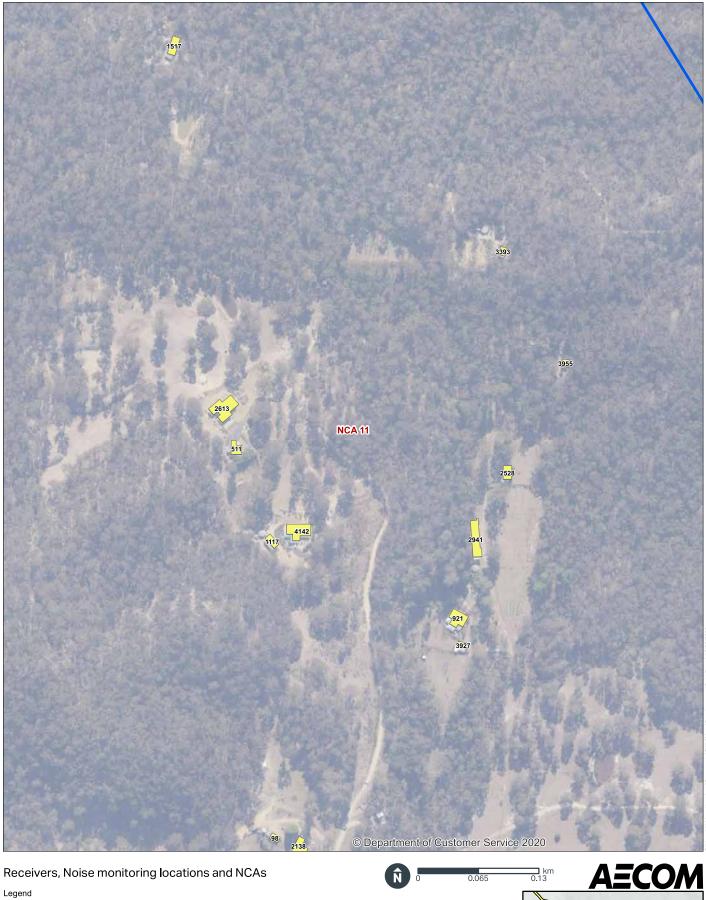


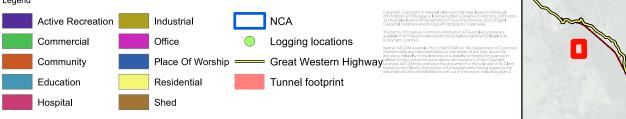








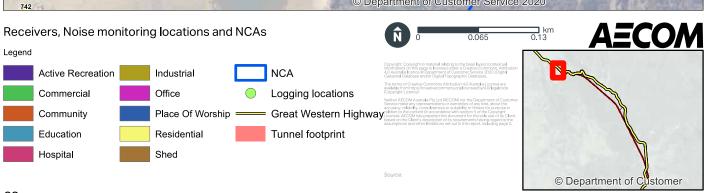


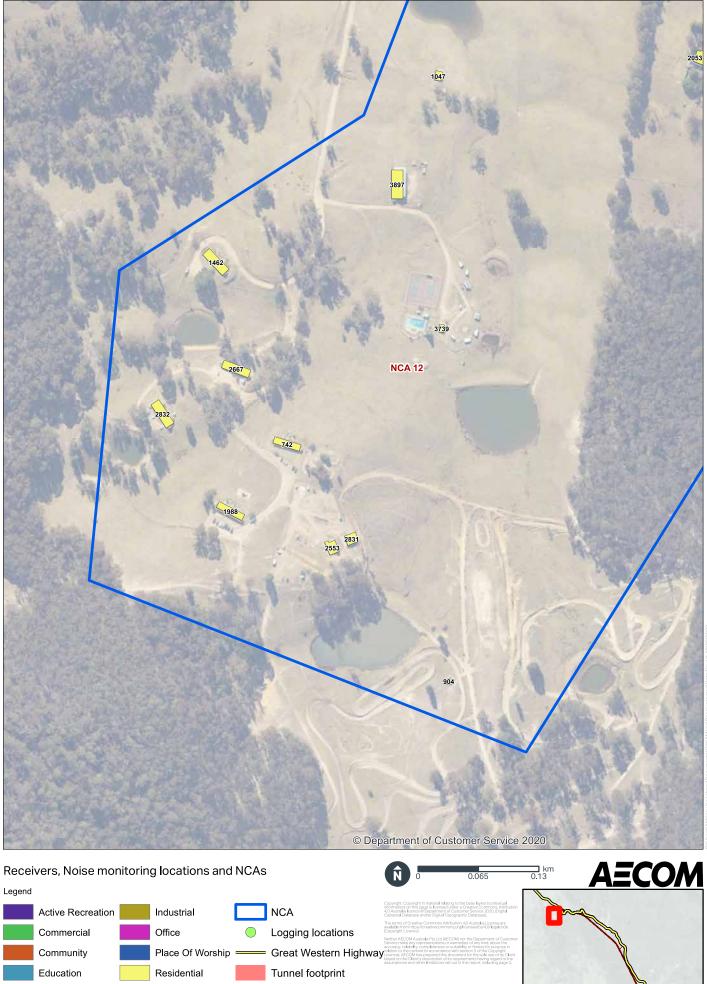


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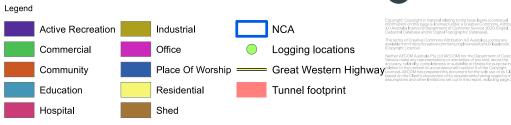
Hospital

Shed





Receivers, Noise monitoring locations and NCAs





0.065





Education

Hospital

Residential

Shed

Tunnel footprint

Annexure B

Noise logger reports

Noise Logger Report NL 1 - 82 Station Street, Blackheath



ltem	Information
Logger Type	NL-52
Serial number	898334
Address	NL 1 - 82 Station Street, Blackheath
Location	82 Station Street, Blackheath
Facade / Free Field	Free field
Environment	Background dominated by road traffic noise on GWH 53-55 dBA. Truck pass by 59 dBA. Bird calls audible occasionally 65 dBA. Sunny weather some cloud cover.

Measured noise levels

Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am	L _{Aeq,15hr} 7am-10pm	L _{Aeq,9hr} 10pm-7an
Thu Dec 9 2021	56	57	53	-	-	-	56	53
Fri Dec 10 2021	55	53	52	-	-	-	55	52
Sat Dec 11 2021	54	51	51	47	38	-	53	51
Sun Dec 12 2021	53	52	48	47	37	-	53	48
Mon Dec 13 2021	53	51	49	46	-	24	53	49
Tue Dec 14 2021	53	51	52	46	-	-	53	52
Wed Dec 15 2021	52	51	51	-	-	-	52	51
Thu Dec 16 2021	53	52	52	-	-	-	53	52
Fri Dec 17 2021	53	51	52	46	40	-	53	52
Sat Dec 18 2021	52	50	49	45	-	-	52	49
Sun Dec 19 2021	54	53	51	-	-	-	54	51
Mon Dec 20 2021	52	51	50	46	-	34	52	50
Tue Dec 21 2021	52	-	52	-	-	-	52	52
Summary	53	52	51	46	38	29	53	51

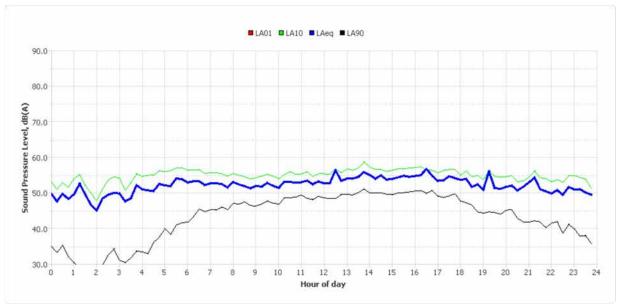
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

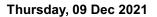


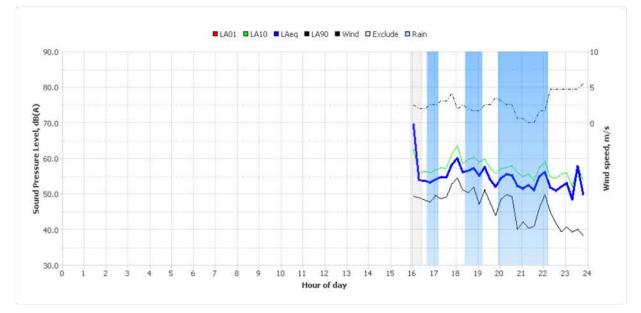
Logger Deployment Photo

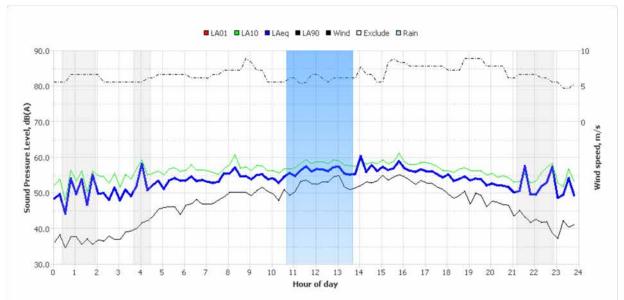


Page 1

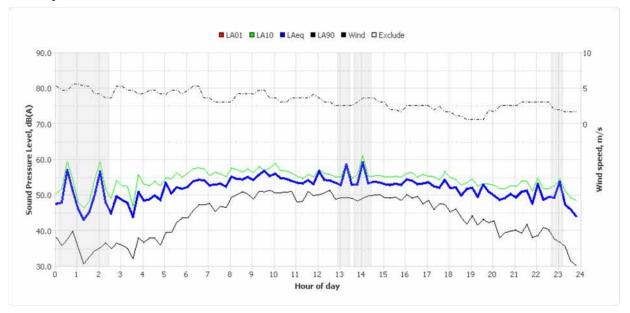




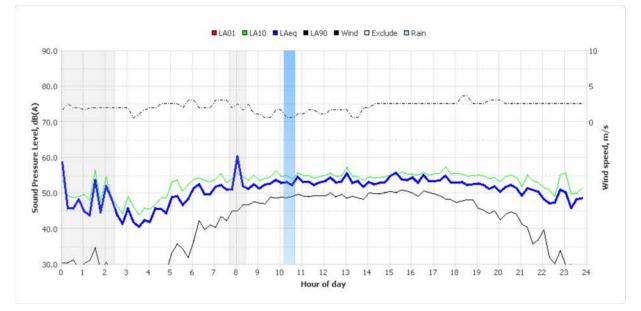


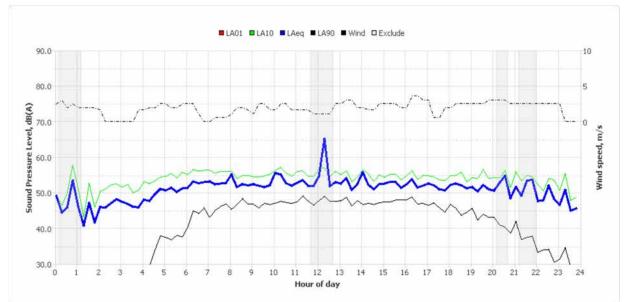


Friday, 10 Dec 2021

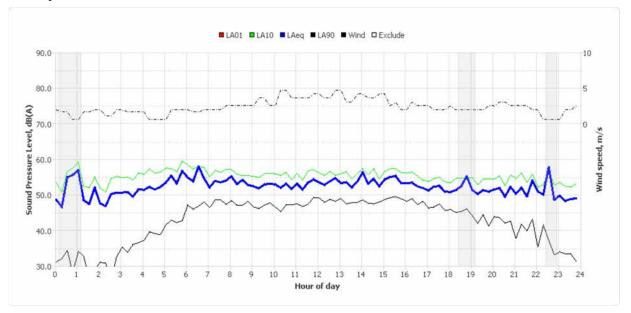


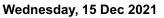


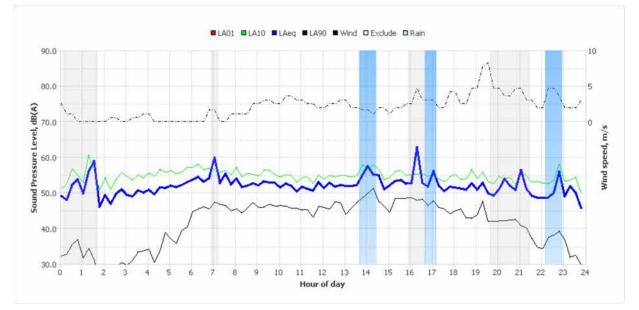


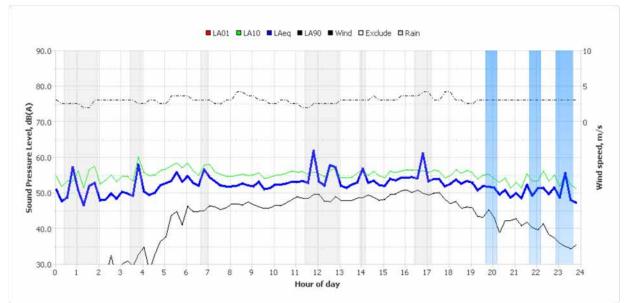


Monday, 13 Dec 2021

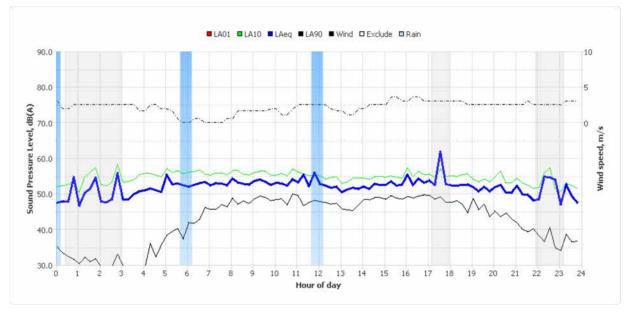


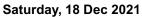


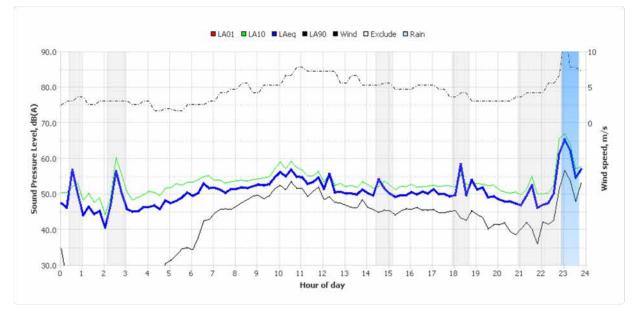


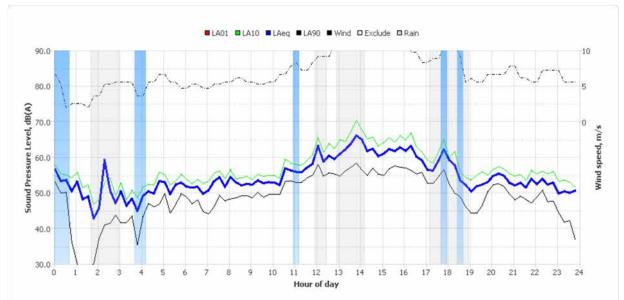


Thursday, 16 Dec 2021

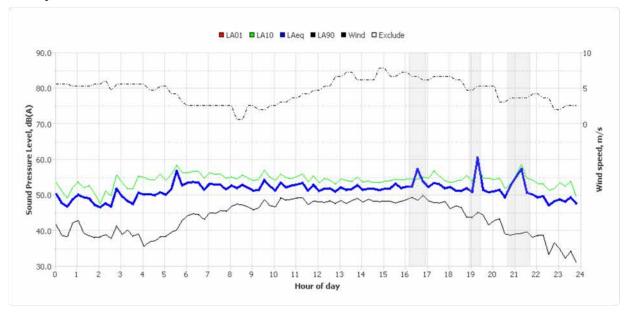




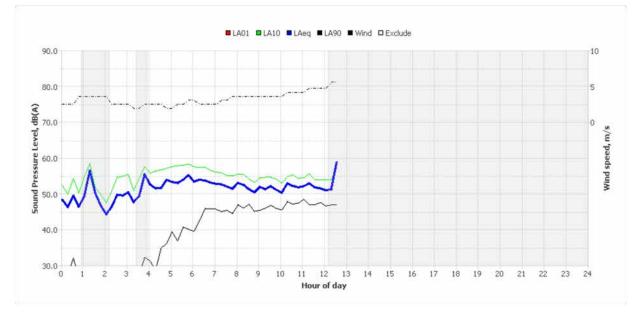




Sunday, 19 Dec 2021







Noise Logger Report NL 2- 69A Brightlands Avenue, Blackheath

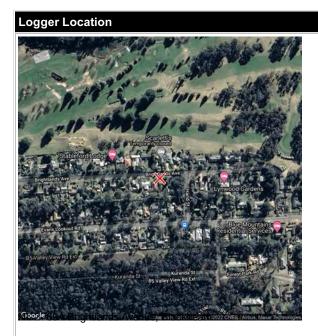


ltem	Information
Logger Type	NL-52
Serial number	553967
Address	NL 2- 69A Brightlands Avenue, Blackheath
Location	69A Brightlands Avenue, Blackheath
Facade / Free Field	Free field
Environment	Background dominated by local road traffic noise 43 dBA. Distant road traffic noise on GWH also audible. Bird calls audible occasionally. Sunny weather some cloud cover

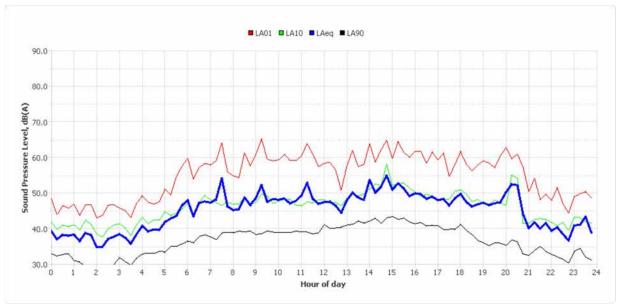
Measured noise levels

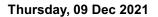
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am	L _{Aeq,15hr} 7am-10pm	L _{Aeq,9hr} 10pm-7an
Thu Dec 9 2021	49	52	44	-	-	-	50	44
Fri Dec 10 2021	50	45	44	-	-	31	49	44
Sat Dec 11 2021	47	46	42	27	23	22	47	42
Sun Dec 12 2021	50	50	44	27	22	18	50	44
Mon Dec 13 2021	50	45	43	-	26	20	49	43
Tue Dec 14 2021	47	47	39	31	25	-	47	39
Wed Dec 15 2021	48	47	43	-	26	21	48	43
Thu Dec 16 2021	48	43	40	31	-	-	47	40
Fri Dec 17 2021	48	43	38	-	-	22	47	38
Sat Dec 18 2021	50	48	47	-	33	-	49	47
Sun Dec 19 2021	52	51	43	-	-	-	52	43
Mon Dec 20 2021	47	45	42	-	-	27	47	42
Tue Dec 21 2021	49	-	42	-	-	-	49	42
Summary	49	48	43	29	25	22	49	43

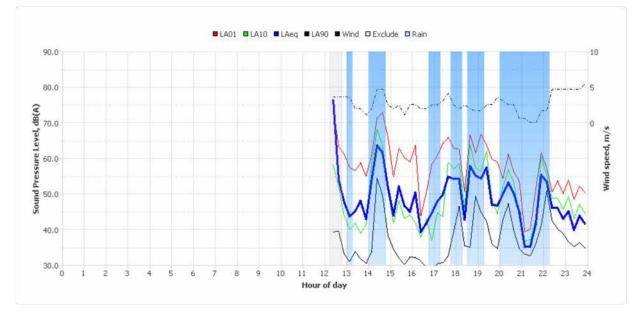
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

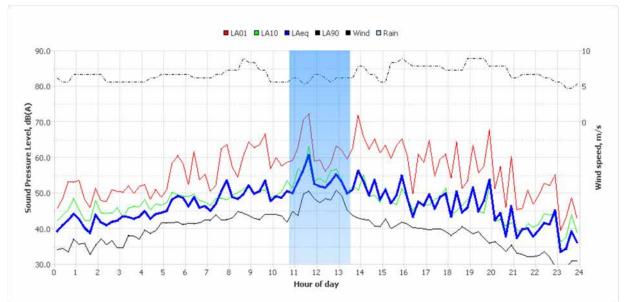




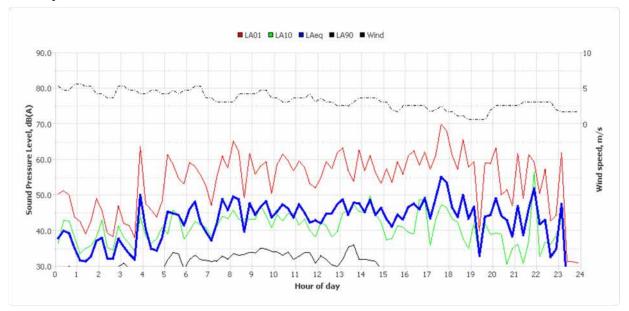




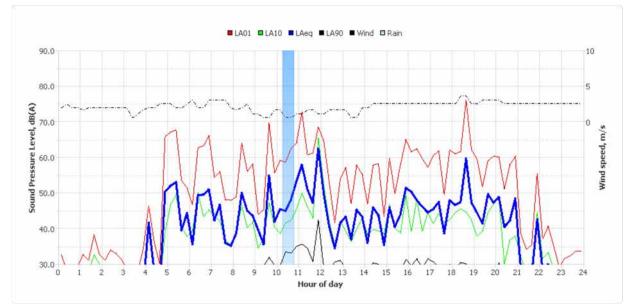


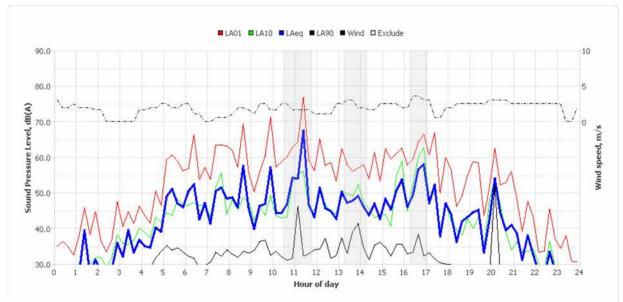


Friday, 10 Dec 2021

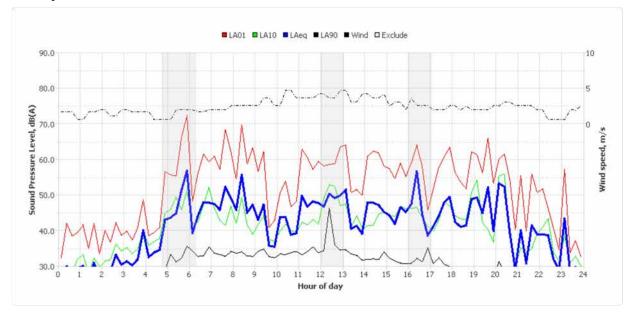


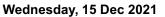


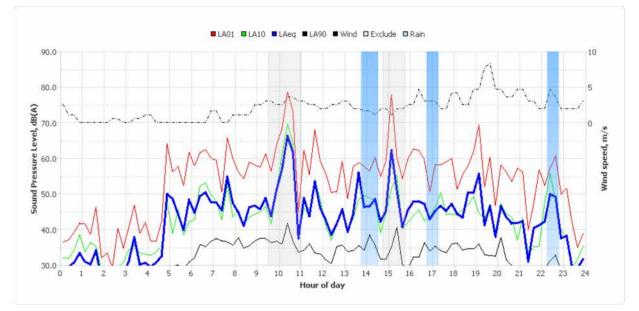


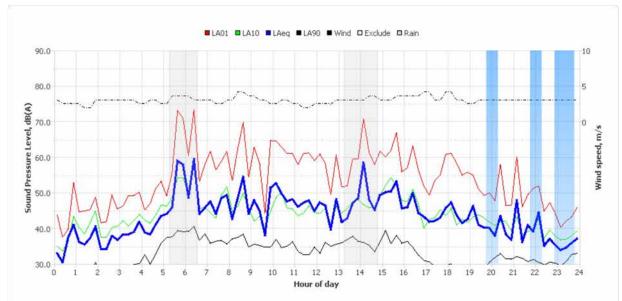


Monday, 13 Dec 2021

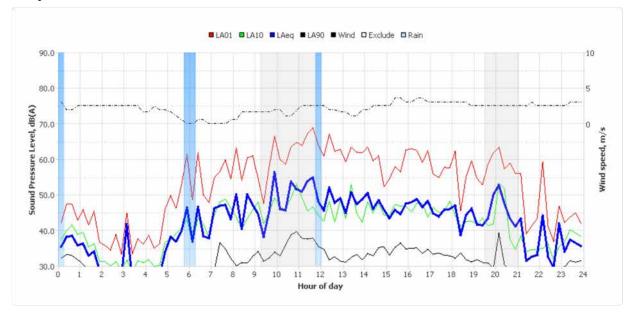




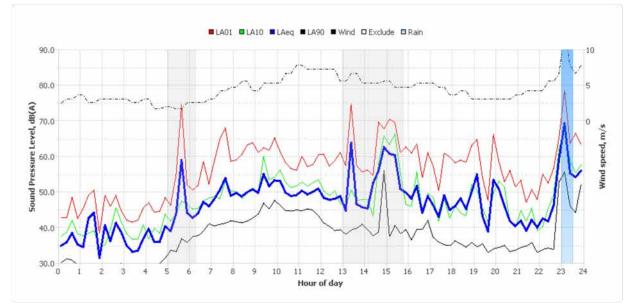


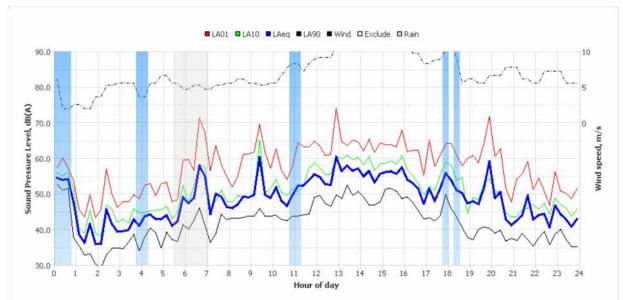


Thursday, 16 Dec 2021

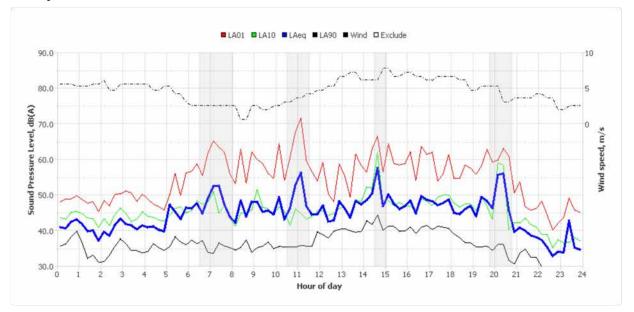


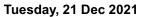


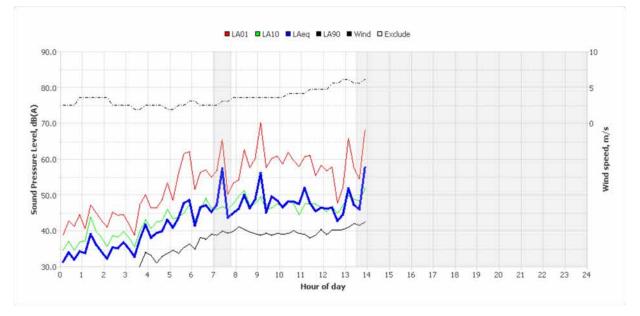




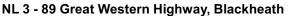
Sunday, 19 Dec 2021







Noise Logger Report NL 3 - 89 Great Western Highway, Blackheath





ltem	Information
Logger Type	NL-52
Serial number	164394
Address	NL 3 - 89 Great Western Highway, Blackheath
Location	Front yard
Facade / Free Field	Free field
Environment	Background dominated by road traffic noise on GWH. Car Pass by 55 dBA. Truck pass by 67 dBA. Bird calls audible occasionally. Sunny weather some cloud cover

Measured noise levels

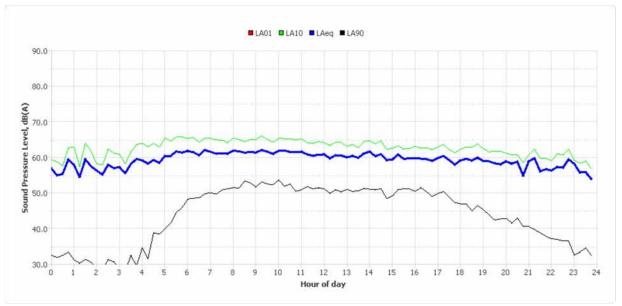
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Thu Dec 9 2021	62	62	59	-	-	-	62	59
Fri Dec 10 2021	63	60	60	-	-	35	62	60
Sat Dec 11 2021	61	57	57	50	35	-	60	57
Sun Dec 12 2021	60	58	55	46	34	20	60	55
Mon Dec 13 2021	61	58	58	49	-	20	61	58
Tue Dec 14 2021	61	58	59	48	38	24	60	59
Wed Dec 15 2021	61	59	59	50	-	-	61	59
Thu Dec 16 2021	60	59	59	49	-	25	60	59
Fri Dec 17 2021	-	-	58	-	-	-	-	58
Summary	61	59	58	49	35	24	61	58

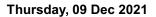
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

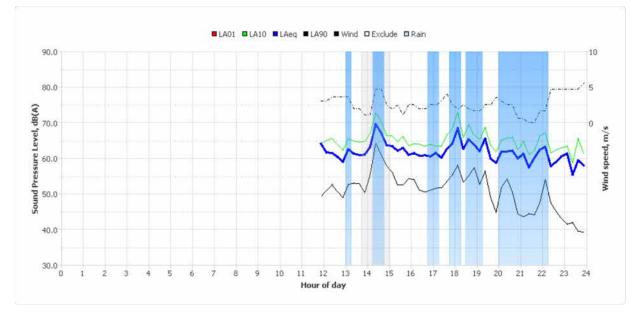
Logger Location

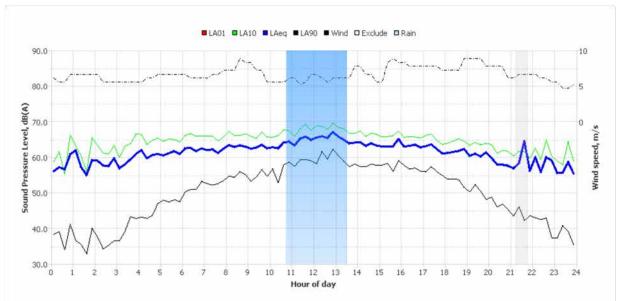








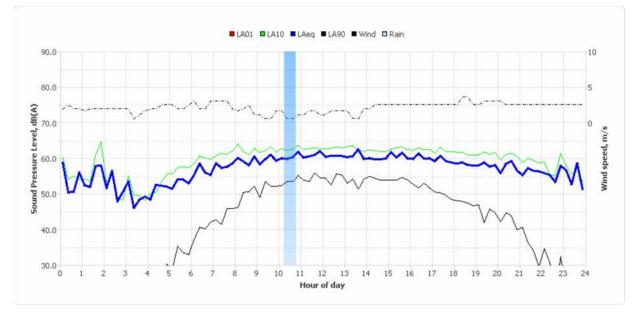


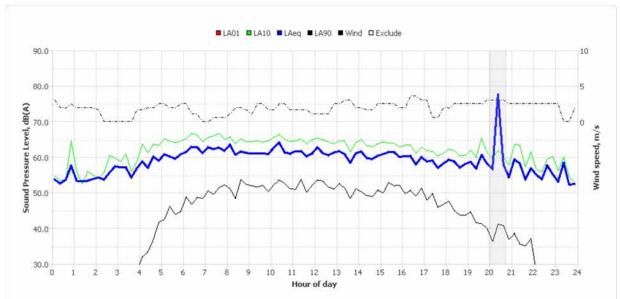


Friday, 10 Dec 2021

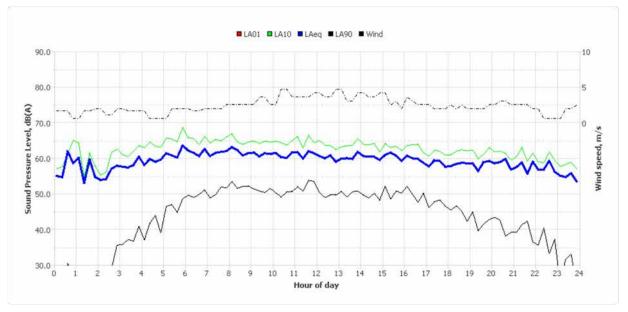


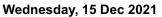


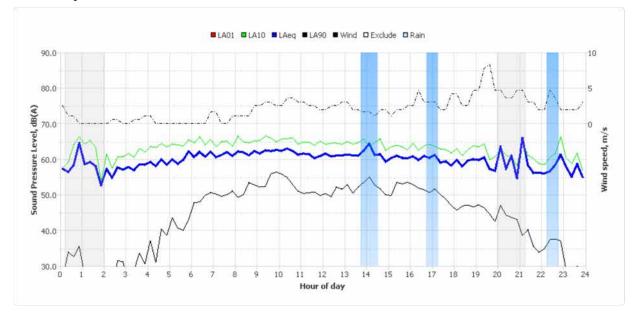


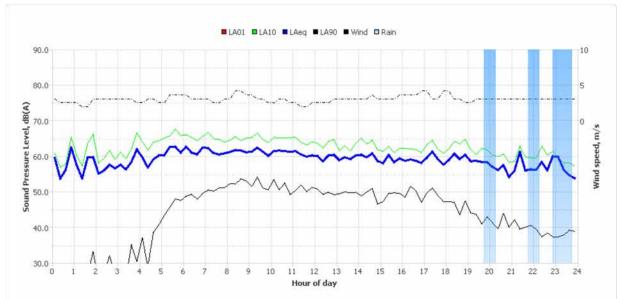


Monday, 13 Dec 2021

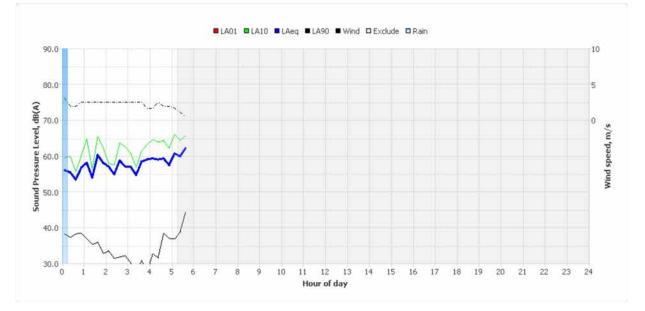








Thursday, 16 Dec 2021



Noise Logger Report NL 4 - 56 Govetts Leap Road, Blackheath



ltem	Information
Logger Type	NL-52
Serial number	164396
Address	NL 4 - 56 Govetts Leap Road, Blackheath
Location	56 Govetts Leap Road, Blackheath
Facade / Free Field	Free field
Environment	Background dominated by local road traffic noise. Car Pass by 63-65 dBA. Bird calls audible occasionally 46 dBA. Sunny weather some cloud cover

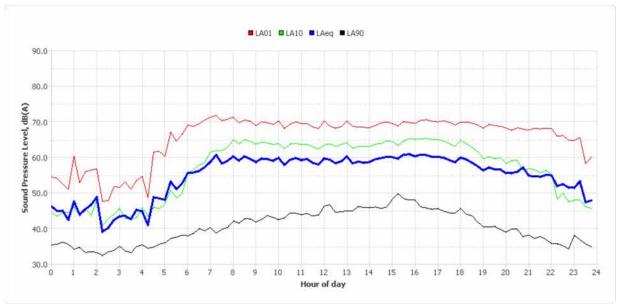
Measured noise levels

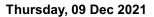
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	L _{Aeq,15hr} 7am-10pm	L _{Aeq,9hr} 10pm-7an
Thu Dec 9 2021	60	57	52	-	-	-	59	52
Fri Dec 10 2021	61	58	53	-	-	34	60	53
Sat Dec 11 2021	59	55	51	40	38	-	58	51
Sun Dec 12 2021	58	55	49	38	32	-	57	49
Mon Dec 13 2021	59	56	53	39	31	-	58	53
Tue Dec 14 2021	59	57	53	-	34	-	59	53
Wed Dec 15 2021	59	57	53	40	-	32	59	53
Thu Dec 16 2021	59	55	52	40	-	32	59	52
Fri Dec 17 2021	60	56	53	39	39	33	59	53
Sat Dec 18 2021	59	56	50	42	41	-	58	50
Sun Dec 19 2021	58	55	50	-	-	-	57	50
Mon Dec 20 2021	60	57	51	41	35	-	59	51
Tue Dec 21 2021	59	-	52	-	-	-	59	52
Summary	59	56	52	40	35	32	59	52

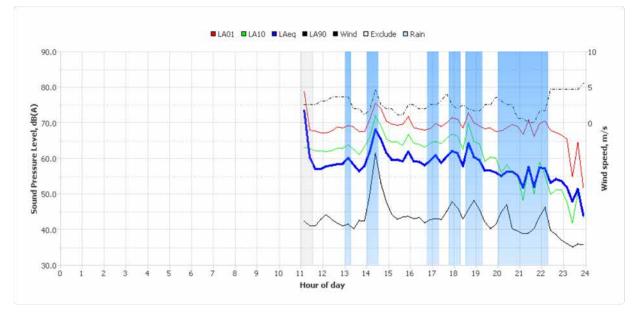
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

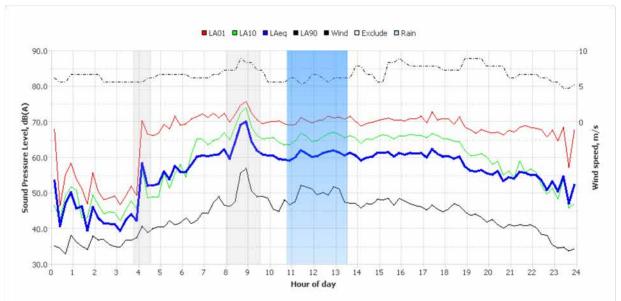




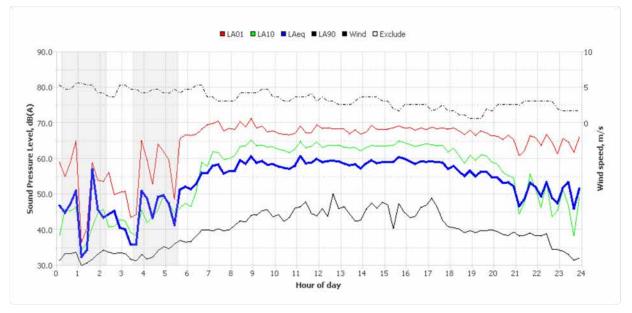




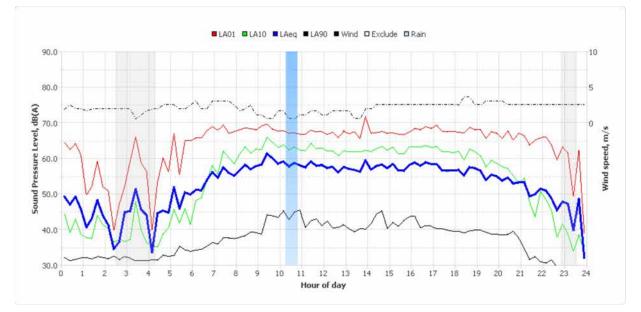


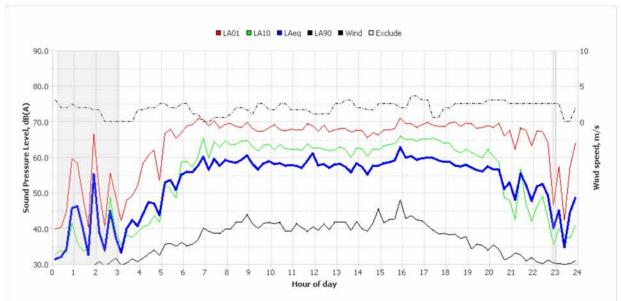


Friday, 10 Dec 2021

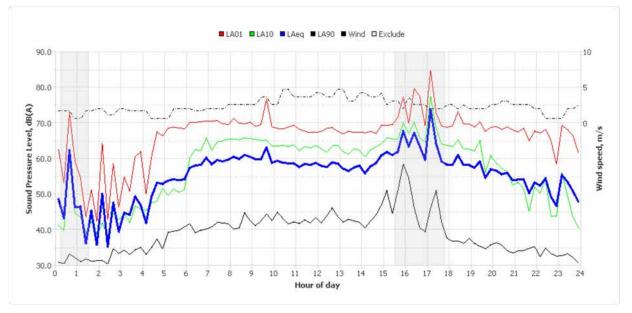


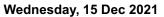


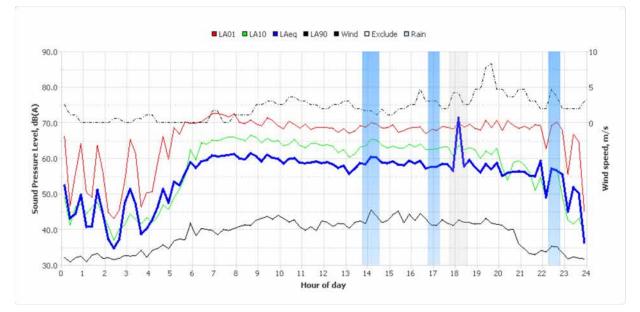


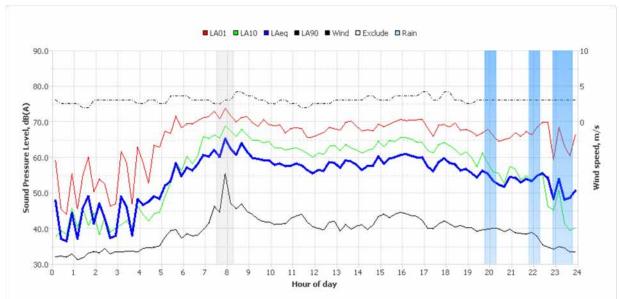


Monday, 13 Dec 2021

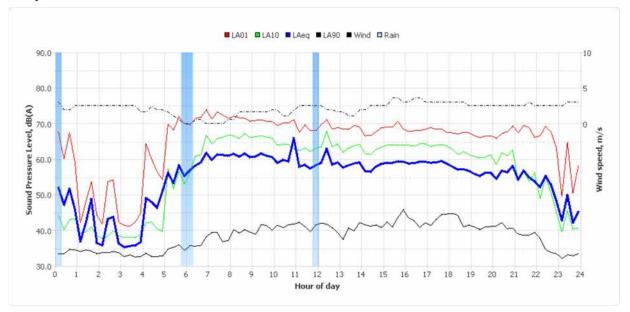


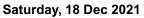


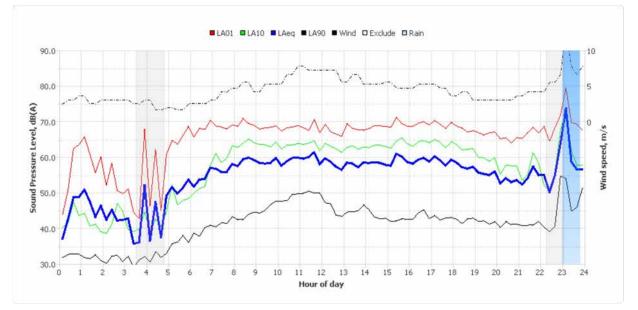


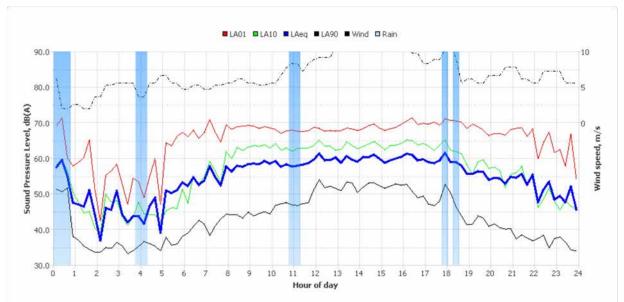


Thursday, 16 Dec 2021

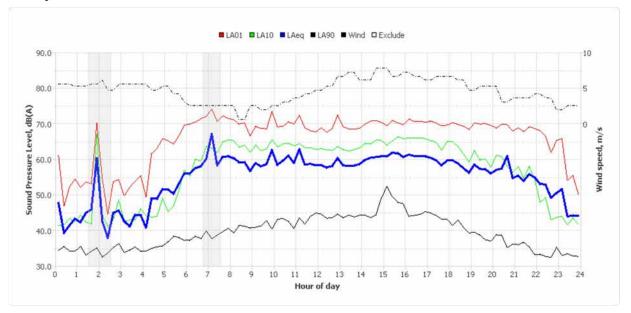




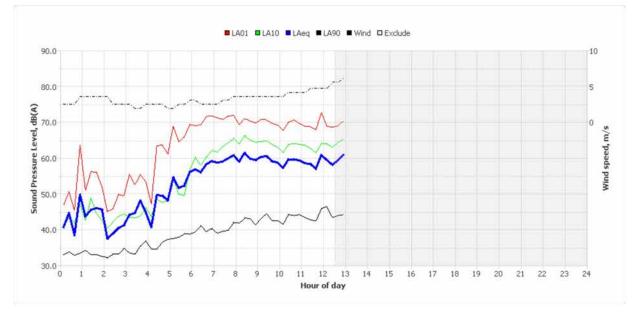




Sunday, 19 Dec 2021







Noise Logger Report NL 5 - 28 Kanimbla Road, Blackheath

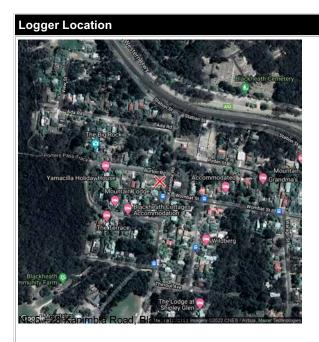


ltem	Information
Logger Type	NL-52
Serial number	164395
Address	NL 5 - 28 Kanimbla Road, Blackheath
Location	Front yard
Facade / Free Field	Free field
Environment	Background dominated by road traffic noise on GWH 48-50 dBA. Bird calls audible occasionally 65 dBA. Sunny weather some cloud cover.

Measured noise levels

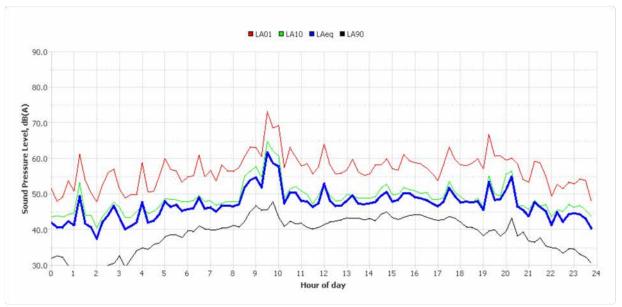
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7an
Thu Dec 9 2021	51	54	51	-	-	-	52	51
Fri Dec 10 2021	50	47	47	-	-	-	50	47
Sat Dec 11 2021	48	47	43	-	-	-	48	43
Sun Dec 12 2021	49	49	45	39	37	-	49	45
Mon Dec 13 2021	48	49	46	39	36	22	48	46
Tue Dec 14 2021	49	48	46	39	-	-	49	46
Wed Dec 15 2021	49	45	46	-	-	-	48	46
Thu Dec 16 2021	50	49	49	-	-	-	50	49
Fri Dec 17 2021	49	48	49	41	-	-	49	49
Sat Dec 18 2021	48	49	46	39	-	-	48	46
Sun Dec 19 2021	48	49	46	-	-	-	49	46
Mon Dec 20 2021	47	46	44	39	-	29	47	44
Tue Dec 21 2021	48	-	44	-	-	-	48	44
Summary	49	49	47	39	37	25	49	47

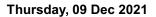
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

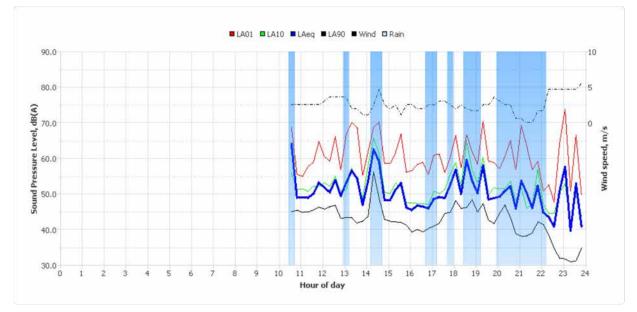


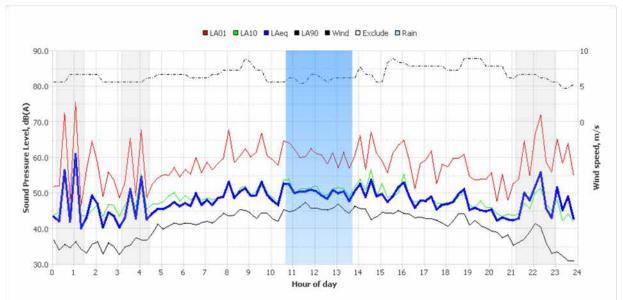


Typical Day

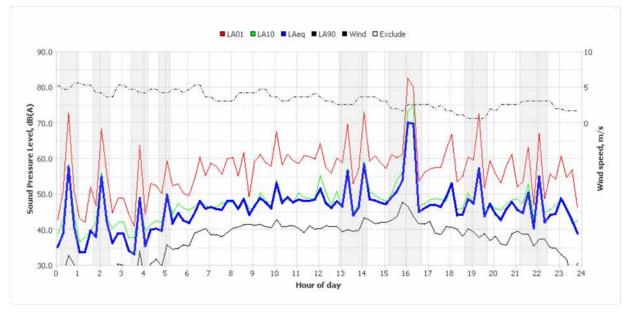




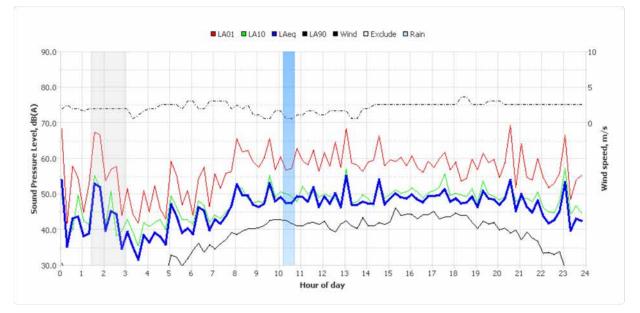


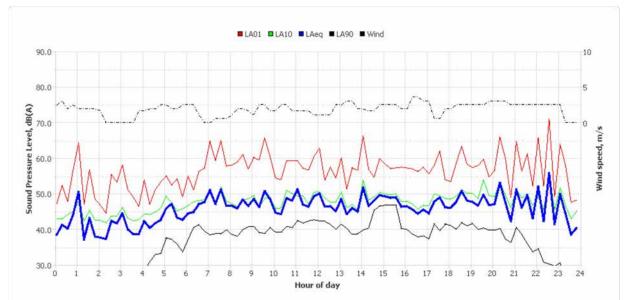


Friday, 10 Dec 2021

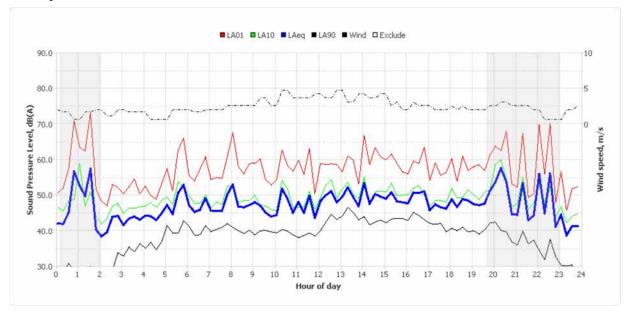


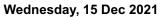


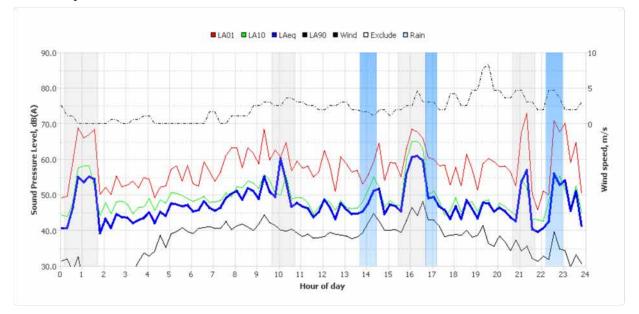


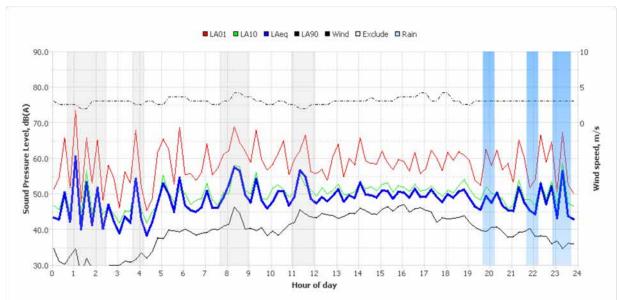


Monday, 13 Dec 2021

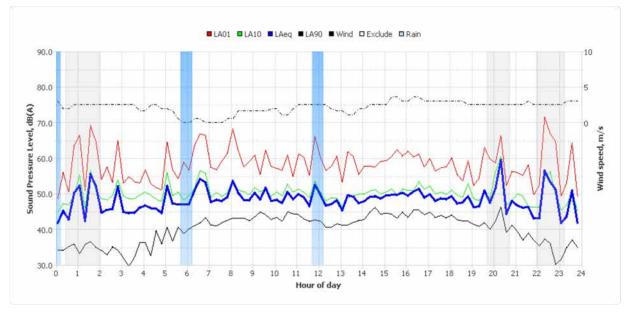




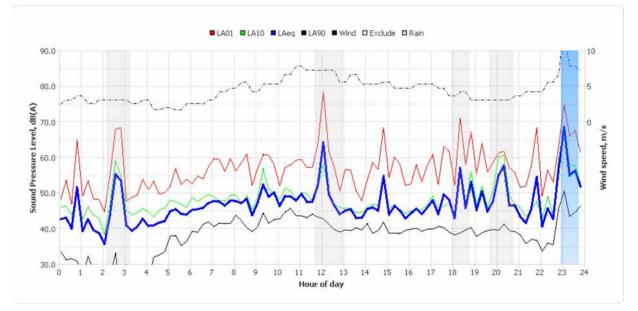


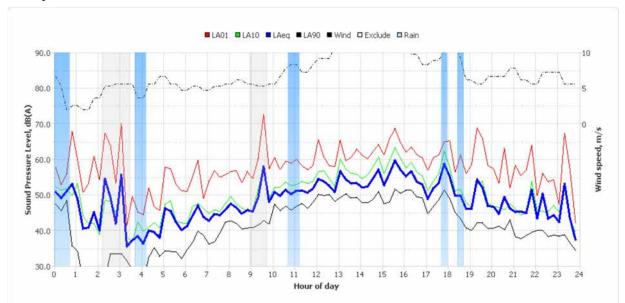


Thursday, 16 Dec 2021

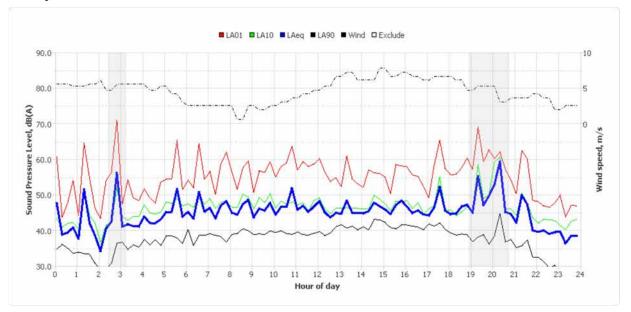




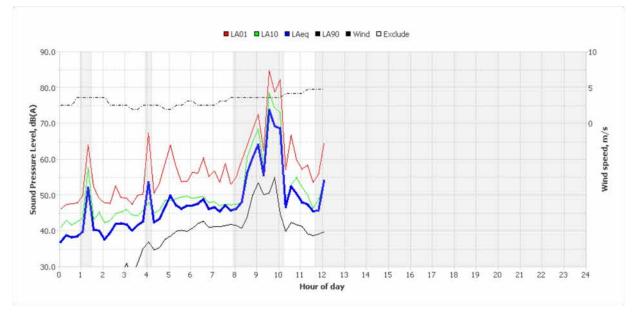




Sunday, 19 Dec 2021







Noise Logger Report NL 6 - 355 Great Western Highway, Blackheath





ltem	Information
Logger Type	NL-52
Serial number	175537
Address	NL 6 - 355 Great Western Highway, Blackheath
Location	Front yard
Facade / Free Field	Facade
Environment	Road traffic noise from gwh dominates constant traffic flow Bird calling occasionally HVNB 76-87 HVSB 76-81 LVNB 64-70 LVSB 74-78 Background approx 45 with some traffic hum. Birds heard in absence of traffic

Measured noise levels

Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Thu Dec 9 2021	73	72	68	-	-	-	73	68
Fri Dec 10 2021	-	-	68	-	-	-	-	68
Sat Dec 11 2021	73	69	68	51	37	-	72	68
Sun Dec 12 2021	72	71	66	47	38	24	72	66
Mon Dec 13 2021	73	70	70	50	37	23	72	70
Tue Dec 14 2021	73	70	70	51	37	26	72	70
Wed Dec 15 2021	73	70	70	50	35	25	73	70
Thu Dec 16 2021	73	70	70	50	-	27	73	70
Fri Dec 17 2021	73	71	70	51	39	33	73	70
Sat Dec 18 2021	72	69	68	-	39	-	70	68
Sun Dec 19 2021	69	-	66	-	-	-	69	66
Mon Dec 20 2021	73	70	71	-	-	-	72	71
Tue Dec 21 2021	73	-	71	-	-	-	73	71
Summary	73	70	69	50	37	26	72	69

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.



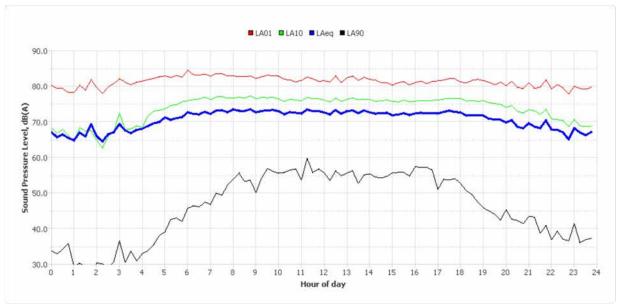


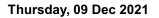
Logger Deployment Photo

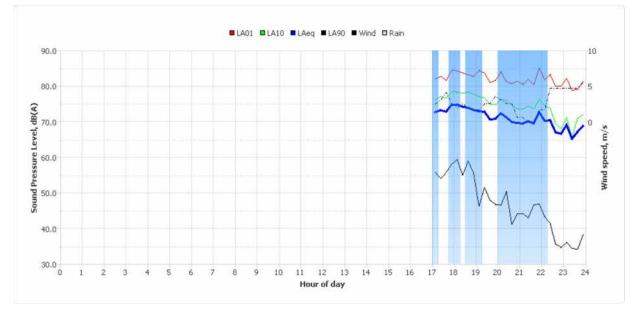


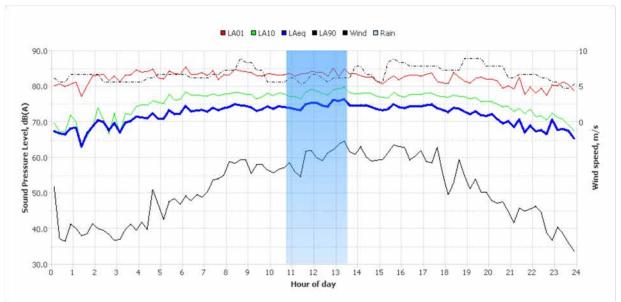
Page 1



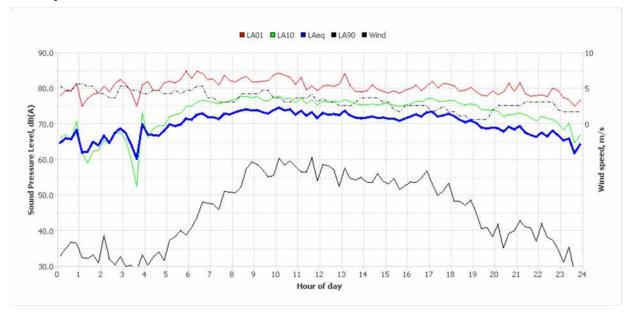




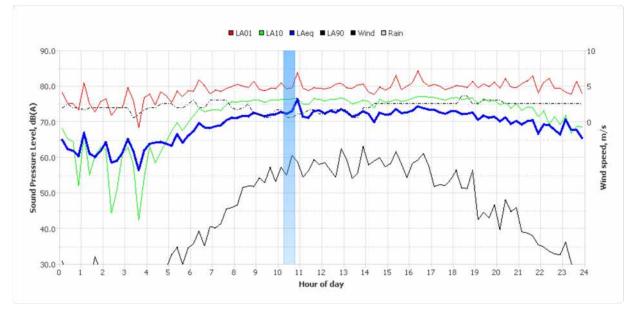


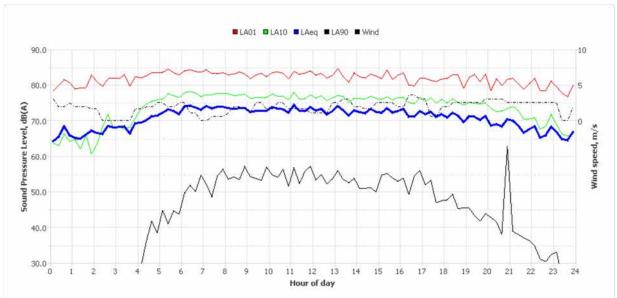




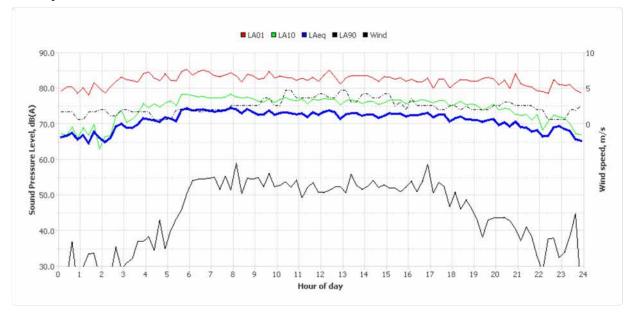


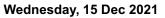


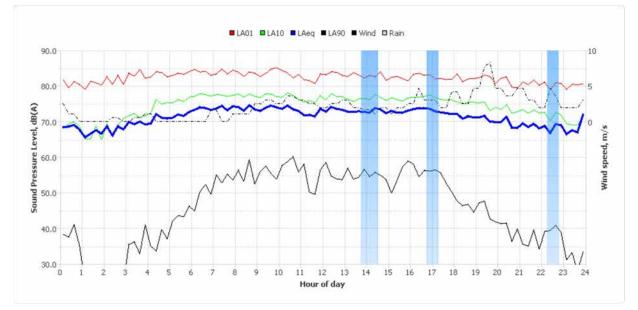


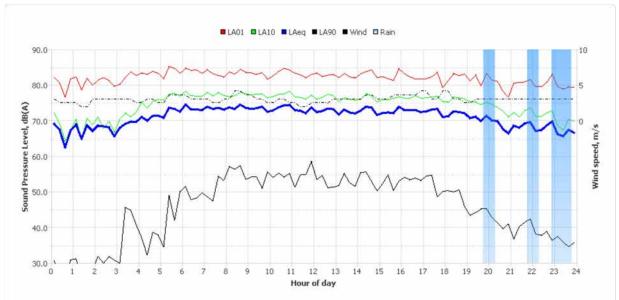


Monday, 13 Dec 2021

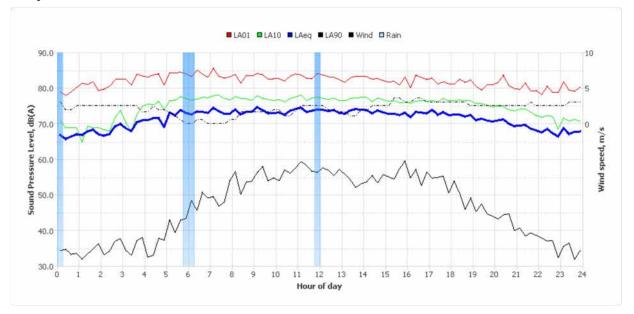


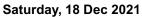


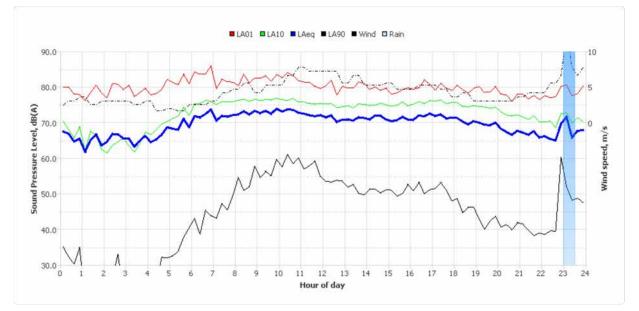


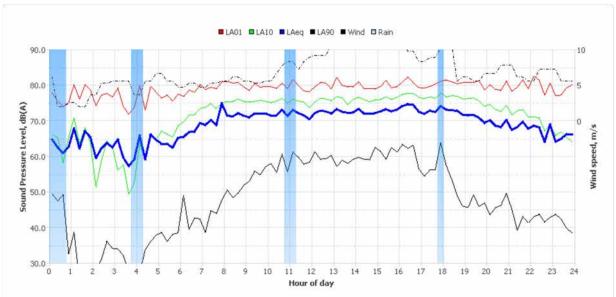


Thursday, 16 Dec 2021

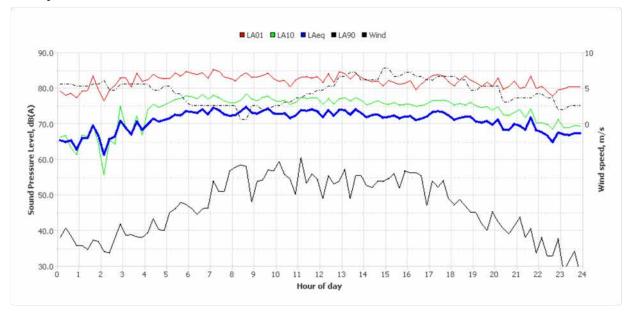




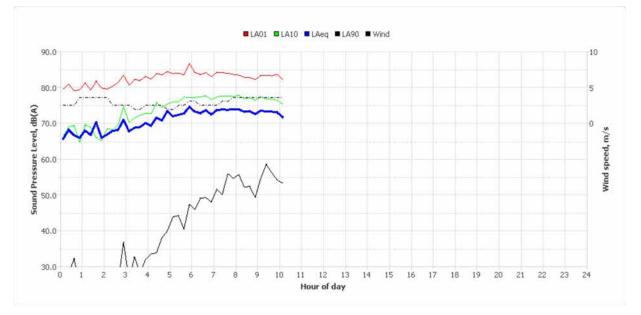




Sunday, 19 Dec 2021







Noise Logger Report NL 7 - 149 Great Western Highway, Mount Victoria

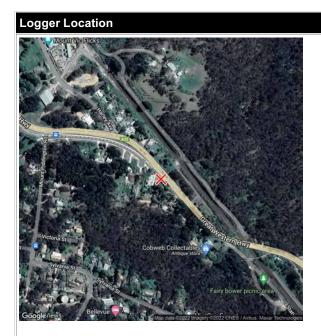


ltem	Information
Logger Type	CUBE
Serial number	12306
Address	NL 7 - 149 Great Western Highway, Mount Victoria
Location	149 Great Western Highway, Mount Victoria
Facade / Free Field	Free field
Environment	Road traffic noise from gwh dominates constant traffic flow Insects calling entire time

Measured noise levels

Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Fri Dec 10 2021	69	66	62	-	-	-	68	62
Sat Dec 11 2021	67	63	63	47	39	35	67	63
Sun Dec 12 2021	67	65	60	43	41	36	67	60
Mon Dec 13 2021	68	64	65	47	42	37	67	65
Tue Dec 14 2021	68	65	65	48	43	40	67	65
Wed Dec 15 2021	68	65	65	48	-	39	67	65
Thu Dec 16 2021	68	65	65	49	40	41	67	65
Fri Dec 17 2021	68	65	65	48	42	40	68	65
Sat Dec 18 2021	66	63	63	47	44	-	66	63
Sun Dec 19 2021	65	64	60	-	-	-	65	60
Mon Dec 20 2021	68	65	65	48	43	41	67	65
Tue Dec 21 2021	68	-	66	-	-	-	68	66
Summary	68	65	64	48	42	40	67	64

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

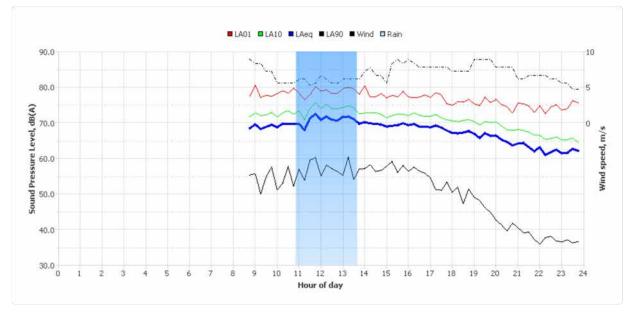


NL 7 - 149 Great Western Highway, Mount Victoria

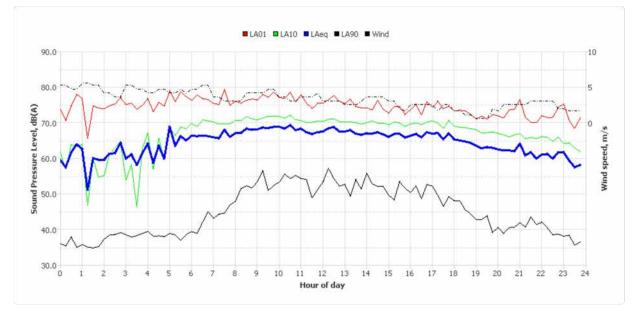
Logger Deployment Photo

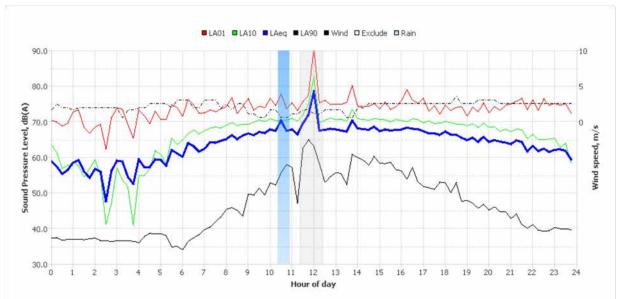


Page 1

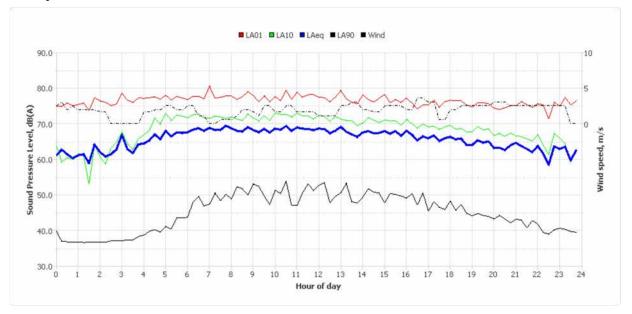


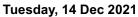


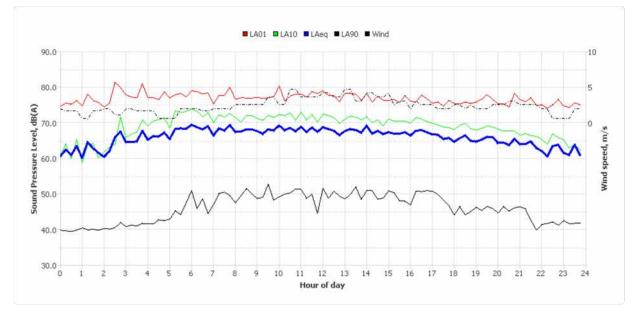


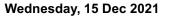


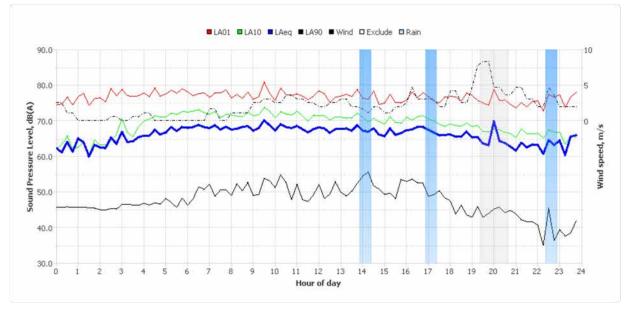
Sunday, 12 Dec 2021

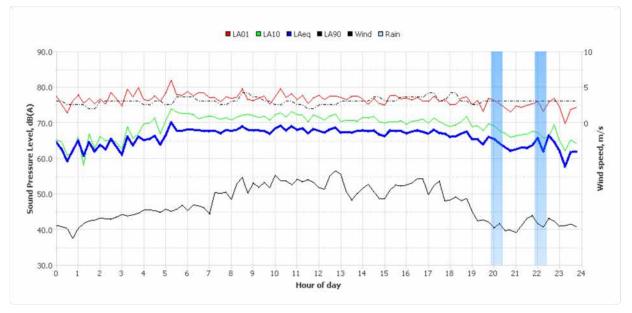


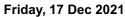


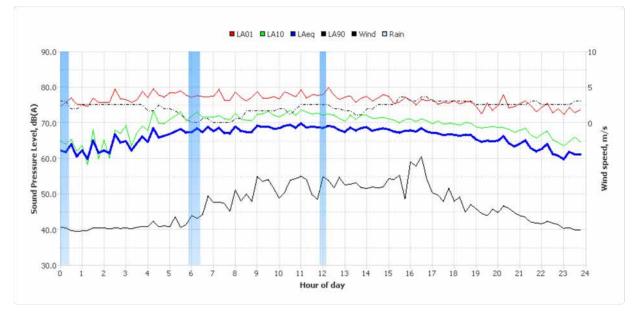


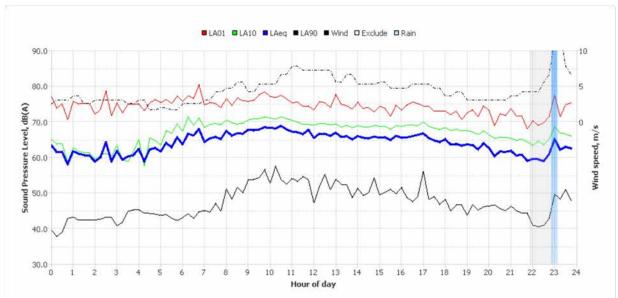




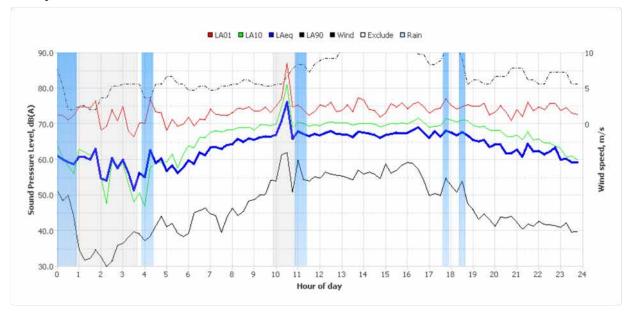


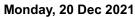


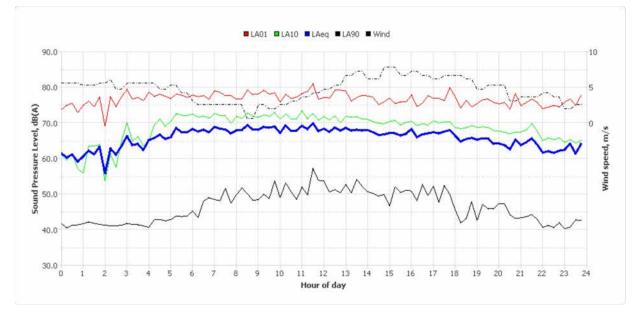


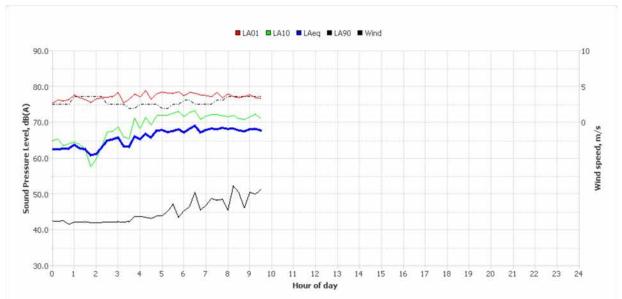


Saturday, 18 Dec 2021









Tuesday, 21 Dec 2021

Noise Logger Report NL 8 - 21 Kanimbla Valley Road, Mount Victoria



ltem	Information
Logger Type	CUBE
Serial number	12029
Address	NL 8 - 21 Kanimbla Valley Road, Mount Victoria
Location	NL 8 - 21 Kanimbla Valley Road, Mount Victoria
Facade / Free Field	Free field
Environment	Road traffic noise from gwh constant traffic flow controls ambient and contributes to background as a hum Noise Mainly enviro controlled Compression brake clearly audible up to 55 Birds calling occasionally inc crows and cockatoo insects calling Music faintly heard from nearby residence

Measured noise levels

Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Fri Dec 10 2021	51	50	45	-	-	-	51	45
Sat Dec 11 2021	47	43	42	35	33	29	46	42
Sun Dec 12 2021	46	45	39	-	36	23	46	39
Mon Dec 13 2021	47	46	41	34	-	22	47	41
Tue Dec 14 2021	48	45	44	37	-	24	47	44
Wed Dec 15 2021	48	38	44	35	-	25	47	44
Thu Dec 16 2021	49	46	43	36	37	25	48	43
Fri Dec 17 2021	49	46	45	-	-	29	48	45
Sat Dec 18 2021	48	48	43	-	-	-	48	43
Sun Dec 19 2021	49	48	45	-	-	-	49	45
Mon Dec 20 2021	49	44	44	37	-	25	49	44
Tue Dec 21 2021	45	-	44	-	-	-	45	44
Summary	48	46	43	36	36	25	48	43

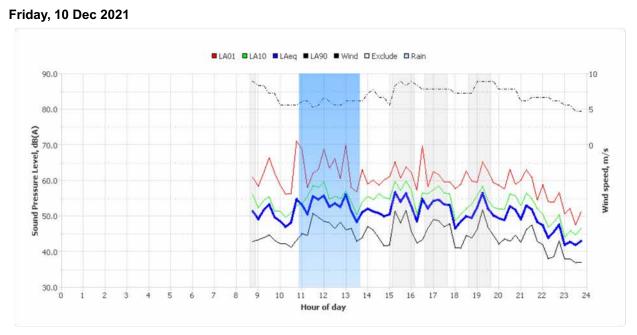
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location

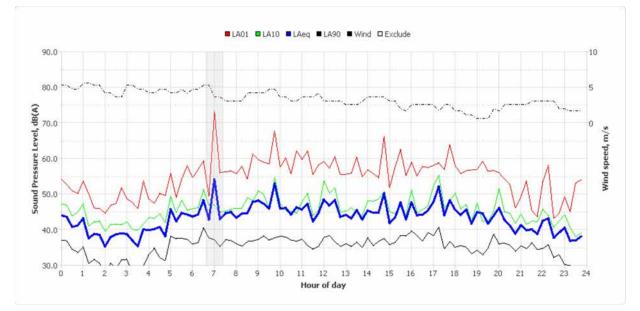


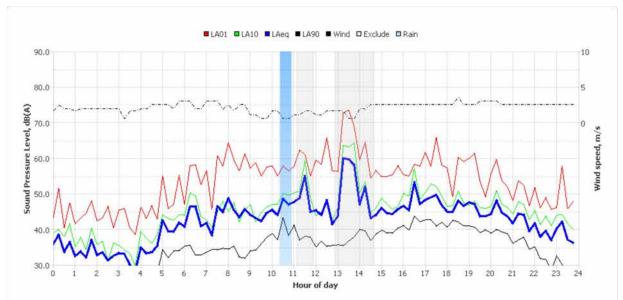
Logger Deployment Photo



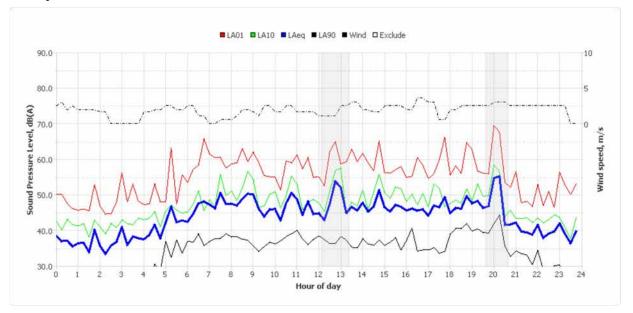




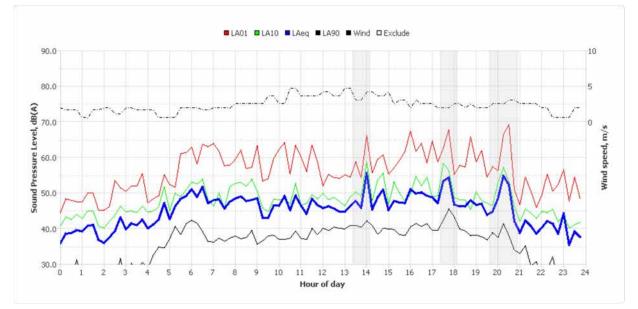


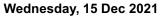


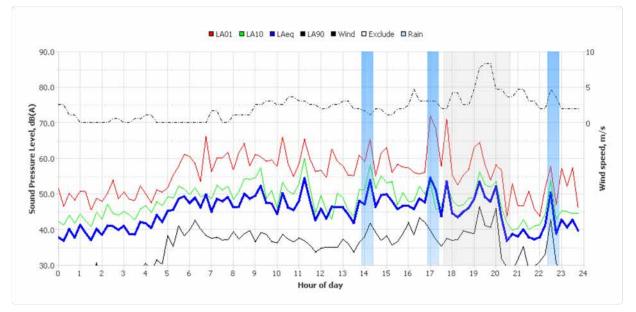
Sunday, 12 Dec 2021

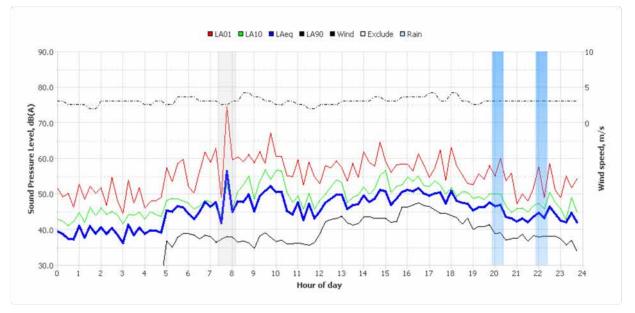




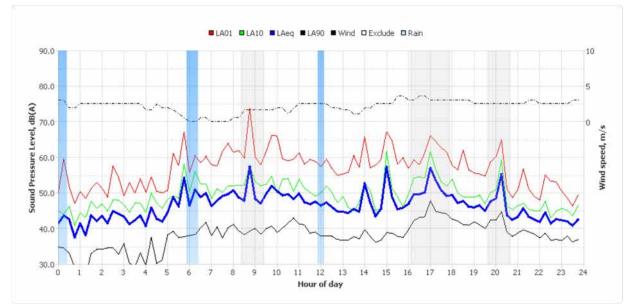


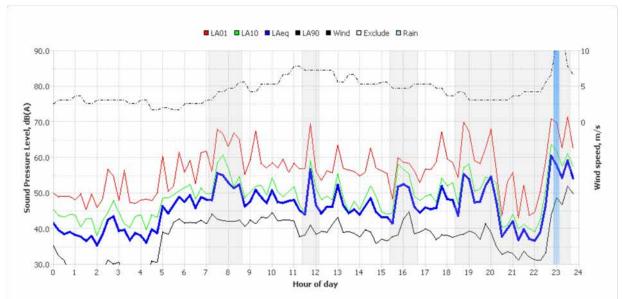




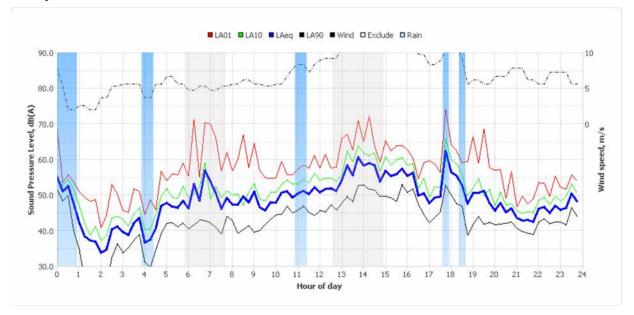


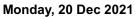


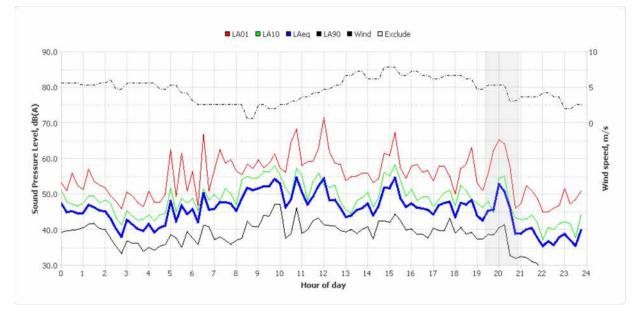


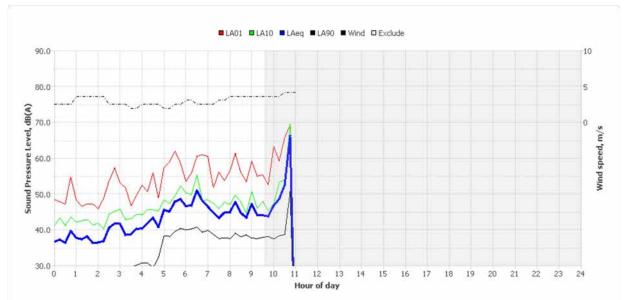


Saturday, 18 Dec 2021









Tuesday, 21 Dec 2021

Noise Logger Report NL 9 - 9 Great Western Highway, Mount Victoria





ltem	Information
Logger Type	CUBE
Serial number	12307
Address	NL 9 - 9 Great Western Highway, Mount Victoria
Location	9 Great Western Highway, Mount Victoria
Facade / Free Field	Free field
Environment	

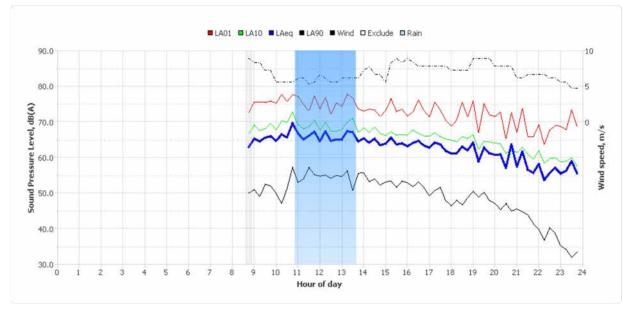
Measured noise levels

Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm				ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Fri Dec 10 2021	66	60	57	-	-	-	64	57
Sat Dec 11 2021	62	57	59	45	36	28	61	59
Sun Dec 12 2021	62	60	55	43	41	-	62	55
Mon Dec 13 2021	64	60	61	43	37	22	63	61
Tue Dec 14 2021	64	61	62	45	37	30	63	62
Wed Dec 15 2021	64	62	62	44	-	30	64	62
Thu Dec 16 2021	64	61	62	46	39	29	64	62
Fri Dec 17 2021	65	61	61	45	43	33	64	61
Sat Dec 18 2021	62	57	57	45	37	-	61	57
Sun Dec 19 2021	60	60	57	-	-	-	60	57
Mon Dec 20 2021	64	61	61	46	35	29	64	61
Tue Dec 21 2021	64	-	63	-	-	-	64	63
Summary	64	60	61	45	37	29	63	61

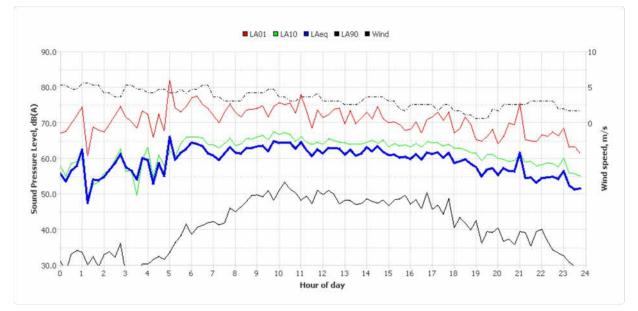
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

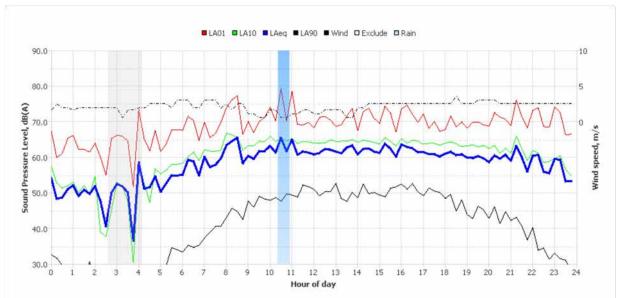


NL 9 - 9 Great Western Highway, Mount Victoria

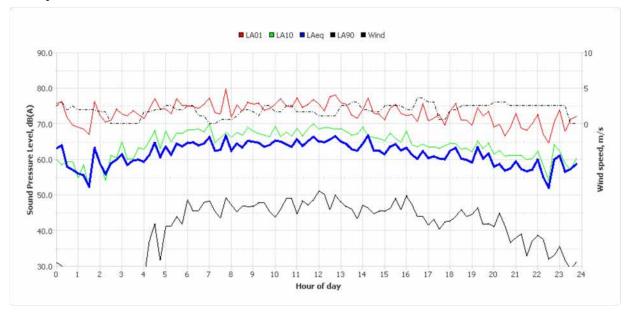


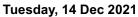


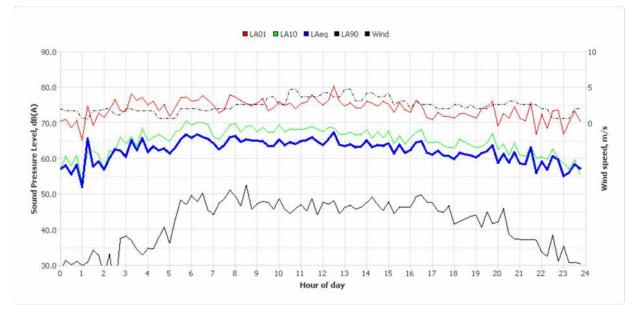




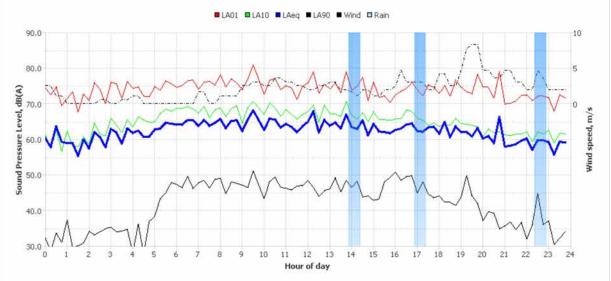


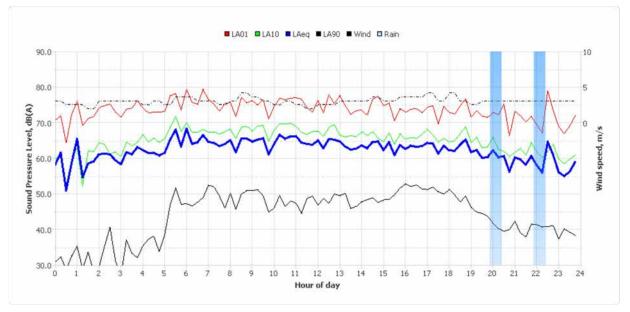


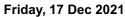


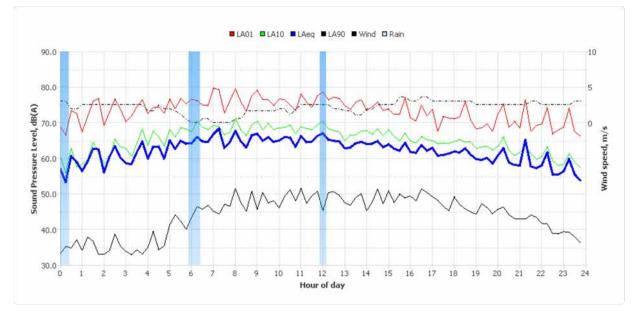


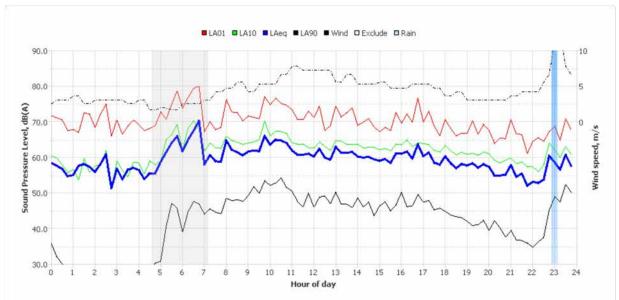




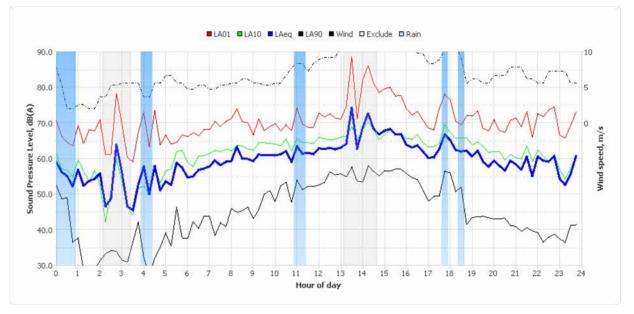


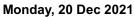


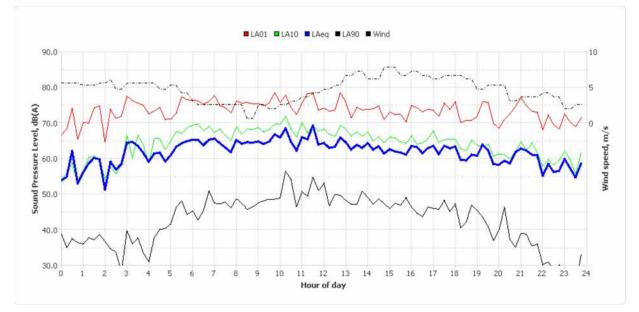


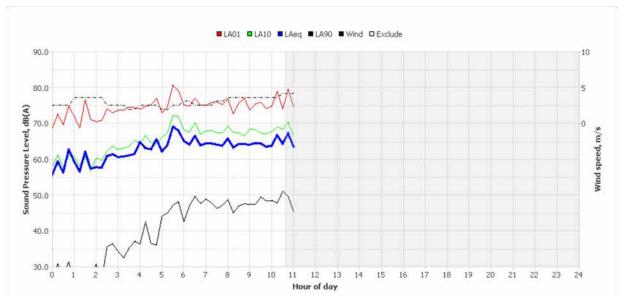


Saturday, 18 Dec 2021









Tuesday, 21 Dec 2021

Noise Logger Report NL 10 - 2133 Great Western Highway, Little Hartley

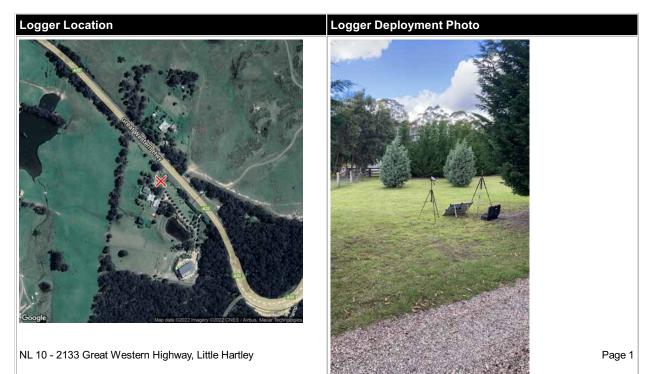


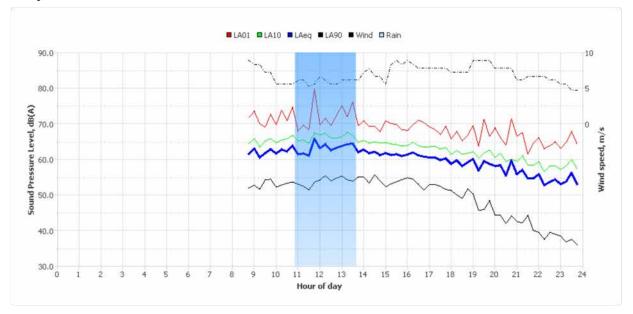
ltem	Information
Logger Type	CUBE
Serial number	12305
Address	NL 10 - 2133 Great Western Highway, Little Hartley
Location	2133 Great Western Highway, Little Hartley
Facade / Free Field	Free field
Environment	

Measured noise levels

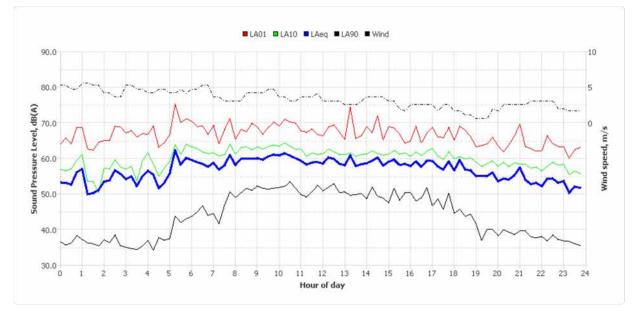
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am		ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Fri Dec 10 2021	62	58	54	-	-	-	61	54
Sat Dec 11 2021	59	56	56	47	38	35	59	56
Sun Dec 12 2021	59	58	52	46	42	32	59	52
Mon Dec 13 2021	60	57	58	47	42	31	59	58
Tue Dec 14 2021	60	58	59	46	42	33	60	59
Wed Dec 15 2021	61	57	59	-	-	33	60	59
Thu Dec 16 2021	61	58	59	47	41	34	60	59
Fri Dec 17 2021	61	59	58	49	-	33	60	58
Sat Dec 18 2021	59	55	56	48	40	29	58	56
Sun Dec 19 2021	59	58	54	-	-	-	58	54
Mon Dec 20 2021	60	58	58	48	43	31	60	58
Tue Dec 21 2021	61	-	60	-	-	-	61	60
Summary	60	58	57	47	42	33	60	57

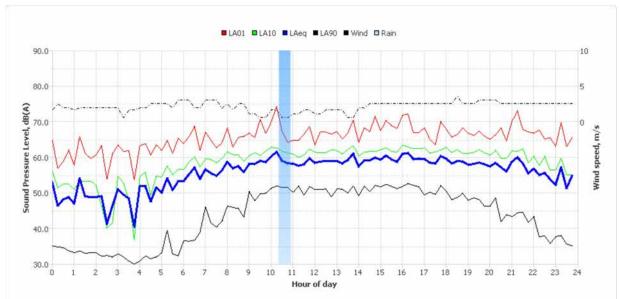
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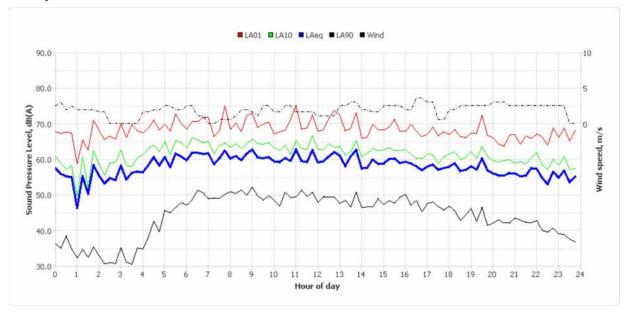


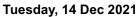


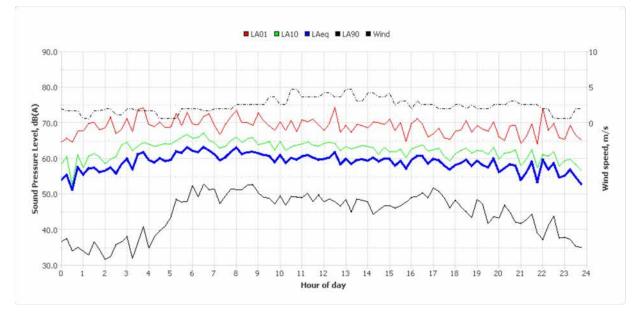


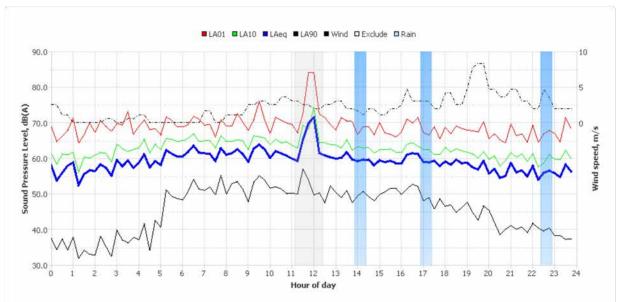


Sunday, 12 Dec 2021

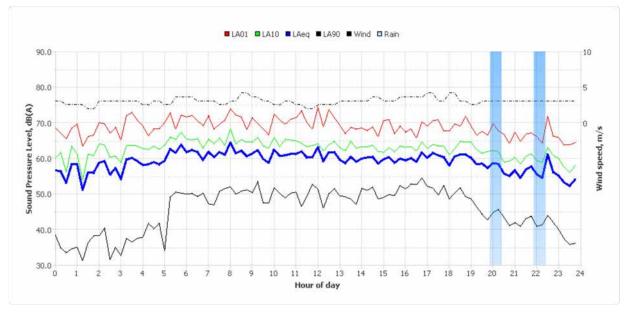


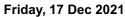


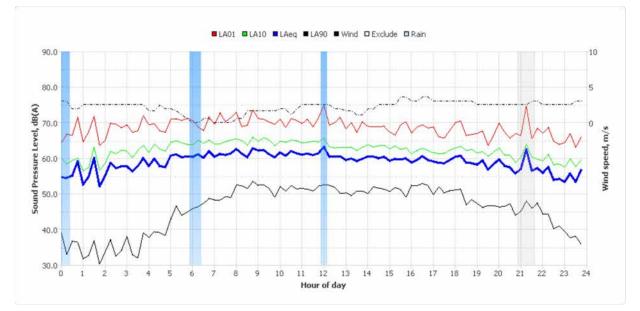


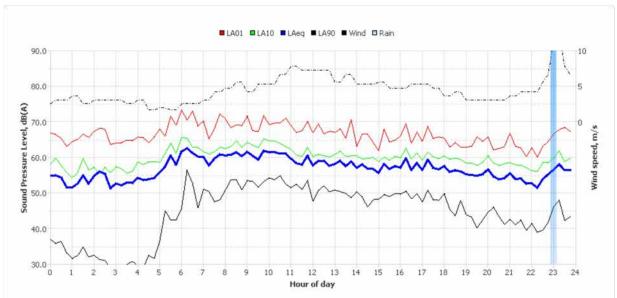


Wednesday, 15 Dec 2021

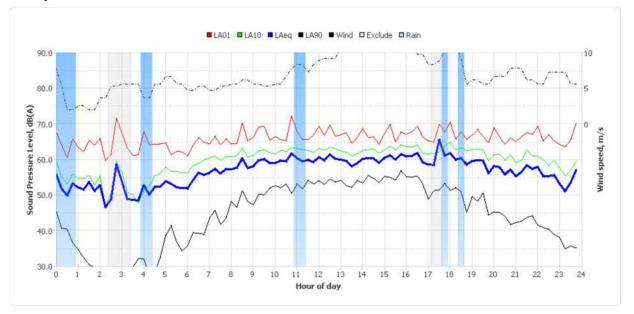


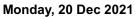


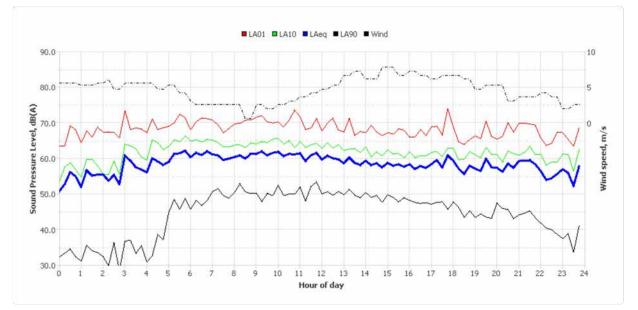


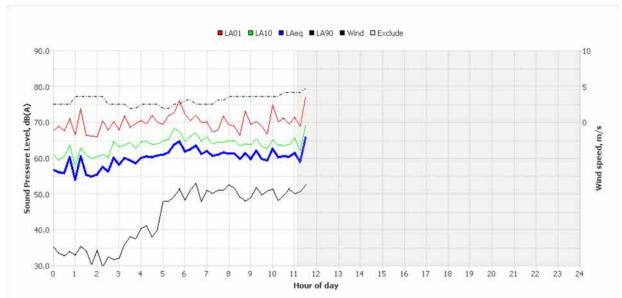


Saturday, 18 Dec 2021









Tuesday, 21 Dec 2021

Noise Logger Report NL 11 - 2187 Great Western Highway, Little Hartley



ltem	Information
Logger Type	Cube
Serial number	12304
Address	NL 11 - 2187 Great Western Highway, Little Hartley
Location	2187 Great Western Highway, Little Hartley
Facade / Free Field	Free field
Environment	

Measured noise levels

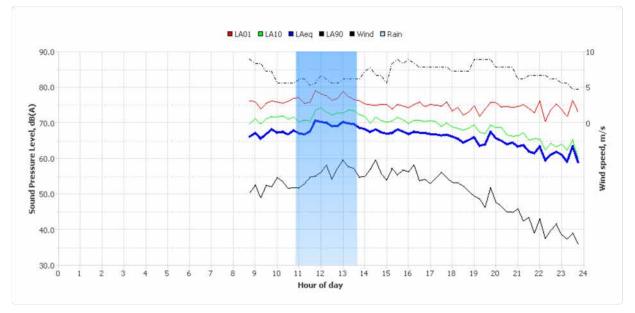
Logging Date	L _{Aeq,day} 7am-6pm	L _{Aeq,evening} 6pm-10pm	L _{Aeq,night} 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am		L _{Aeq,9hr} 10pm-7am
Fri Dec 10 2021	-	-	62	-	-	-	-	62
Sat Dec 11 2021	65	61	63	-	-	-	64	63
Sun Dec 12 2021	64	63	57	47	46	35	64	57
Mon Dec 13 2021	65	61	62	48	41	35	64	62
Tue Dec 14 2021	65	62	63	48	41	-	64	63
Wed Dec 15 2021	65	60	63	-	-	-	65	63
Thu Dec 16 2021	65	60	60	-	-	-	65	60
Fri Dec 17 2021	-	-	62	-	-	-	-	62
Summary	65	61	62	48	41	35	64	62

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

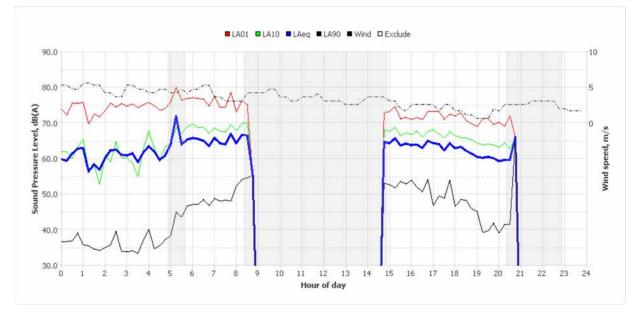
Logger Location

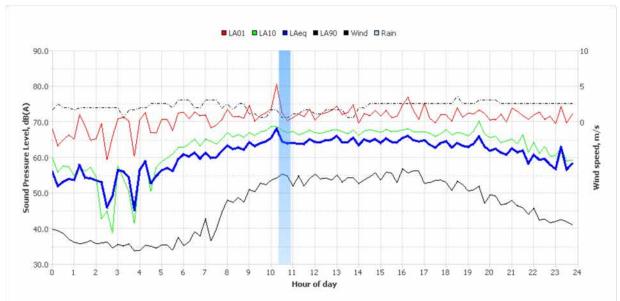


Logger Deployment Photo

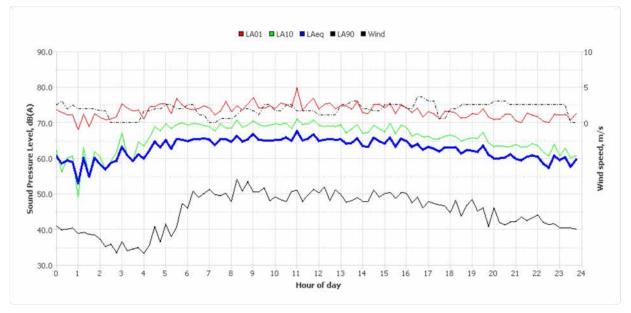


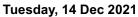


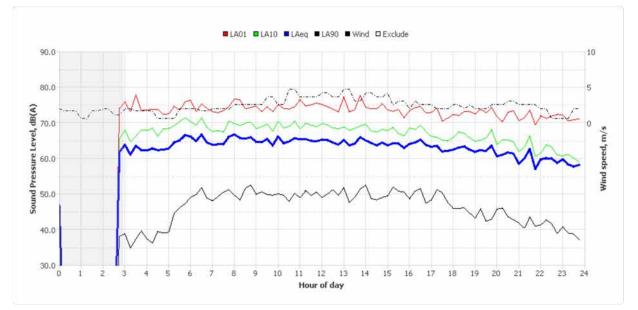


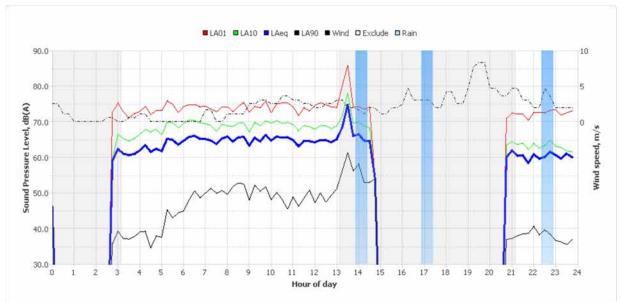


Sunday, 12 Dec 2021

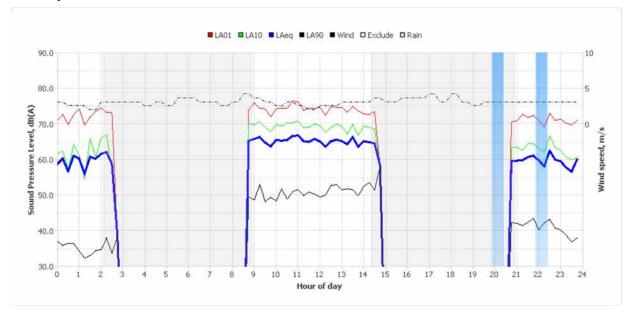


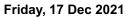


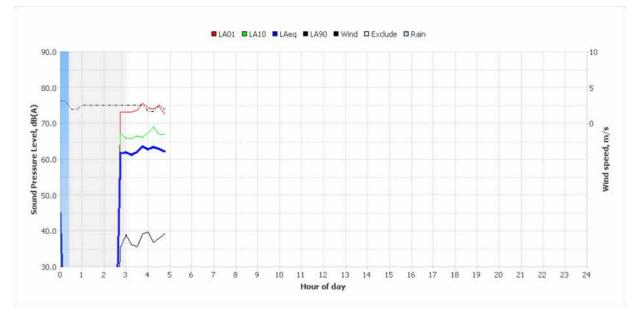




Wednesday, 15 Dec 2021

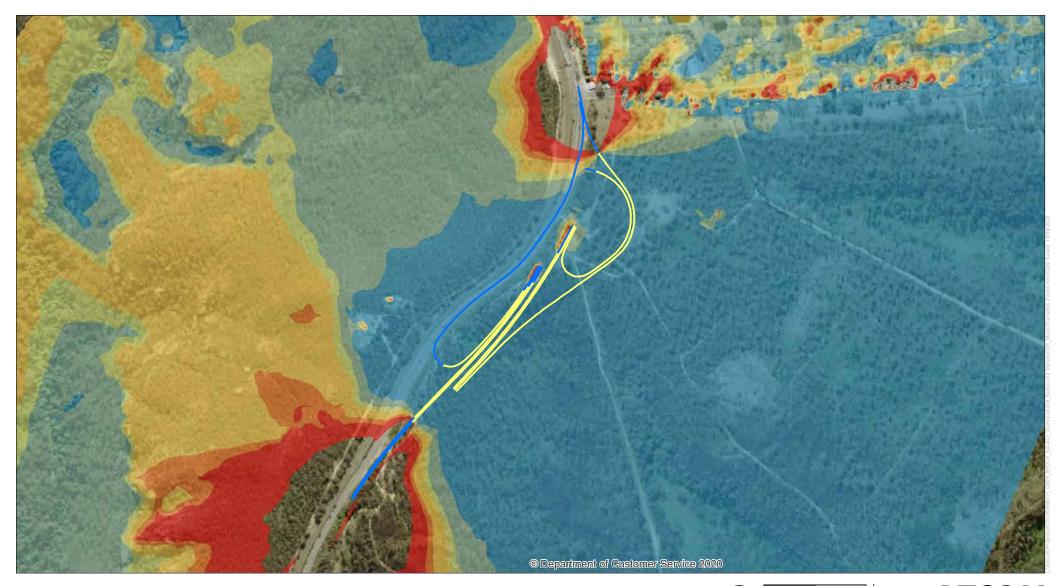




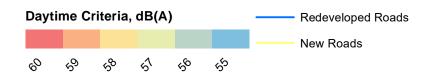


Annexure C

Operational noise transition contours



Great Western Highway Blackheath to Little Hartley - Day Transition Zone Criteria



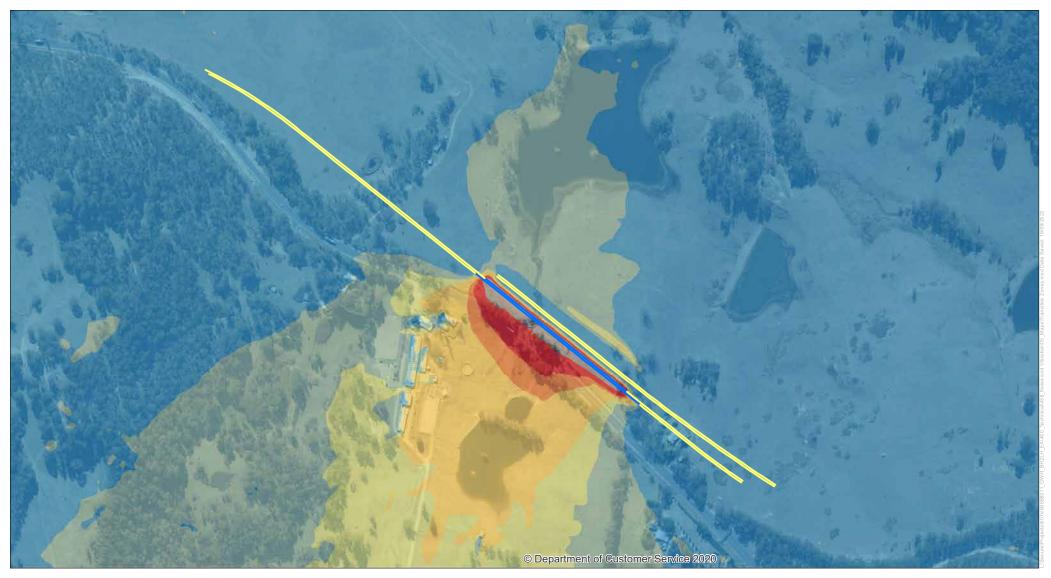
N 0 0.1 0.2

ΑΞϹΟΜ

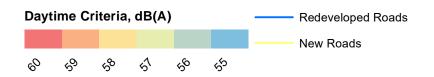
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Great Western Highway Blackheath to Little Hartley - Day Transition Zone Criteria

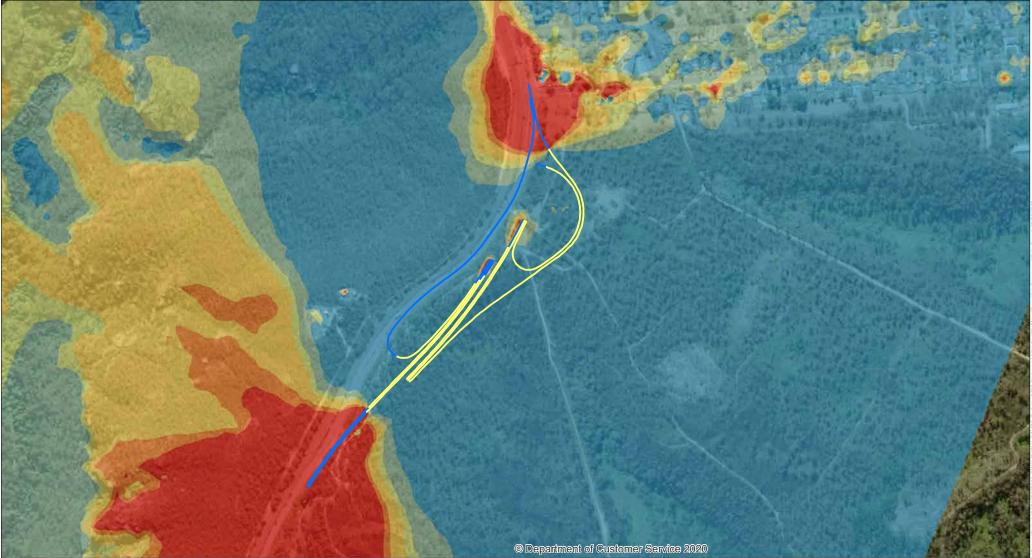




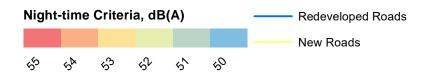
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Great Western Highway Blackheath to Little Hartley - Night Transition Zone Criteria



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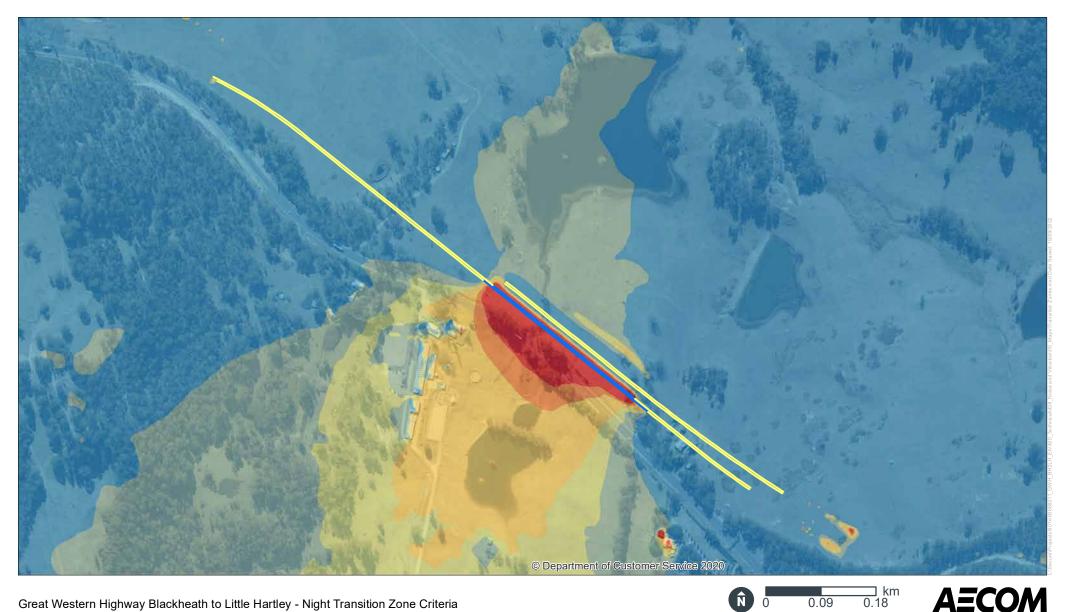




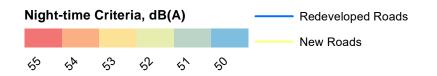
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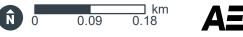
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Great Western Highway Blackheath to Little Hartley - Night Transition Zone Criteria





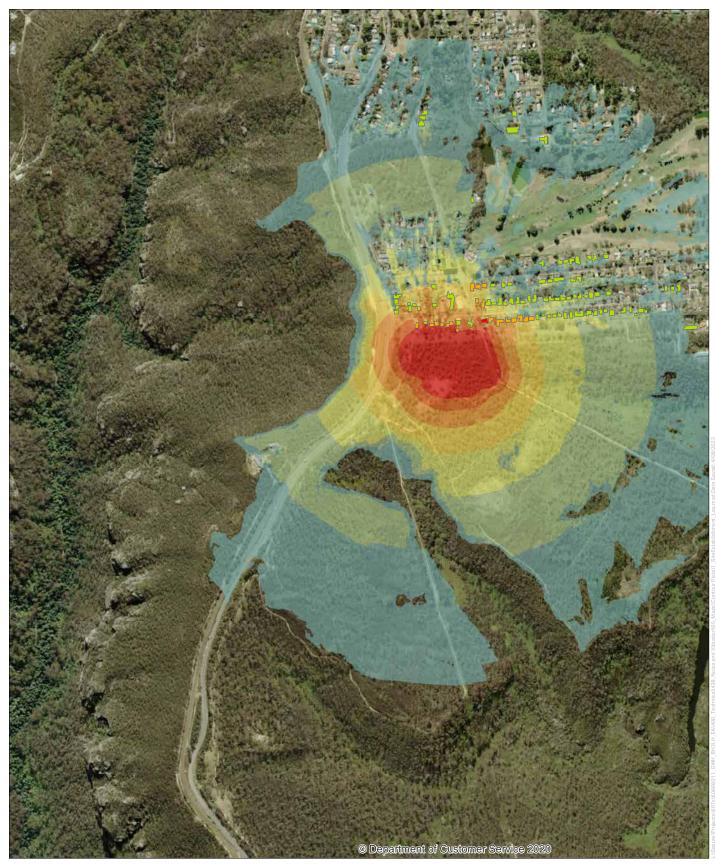
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Annexure D

Construction exceedance maps



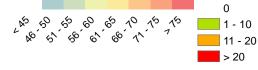
Construction Noise Contours - Site Establishment - Day





Legend

L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB

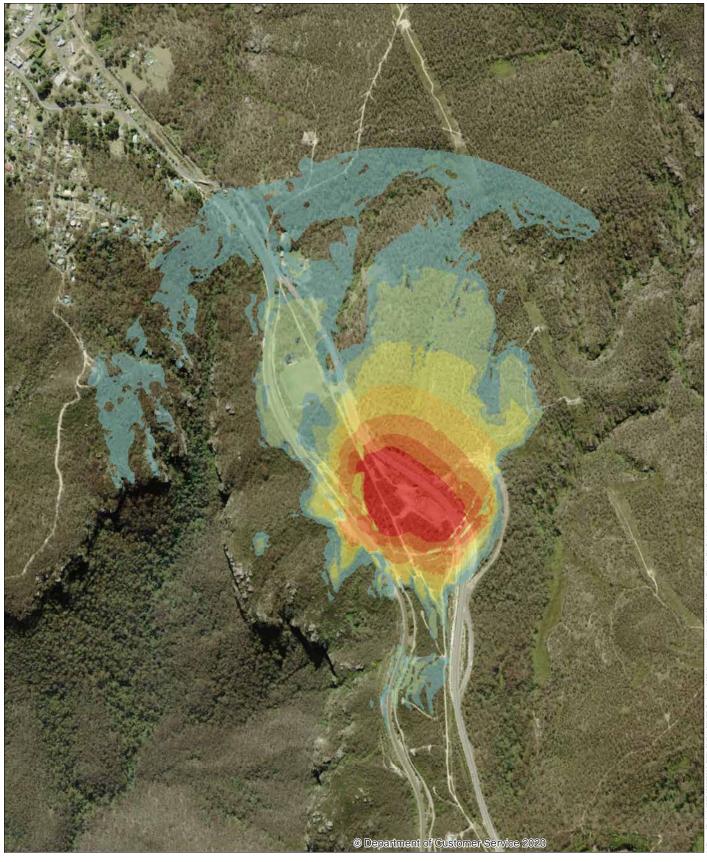


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Source:



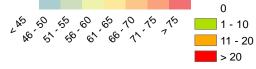
Construction Noise Contours - Site Establishment - Day





Legend

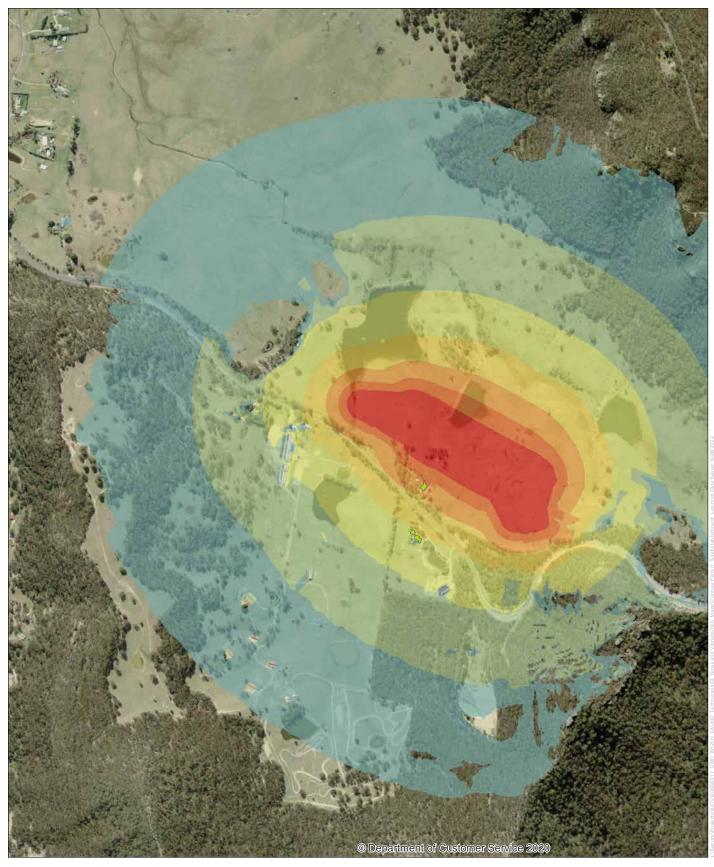
L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB



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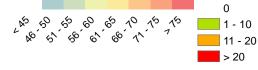
Construction Noise Contours - Site Establishment - Day





Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB

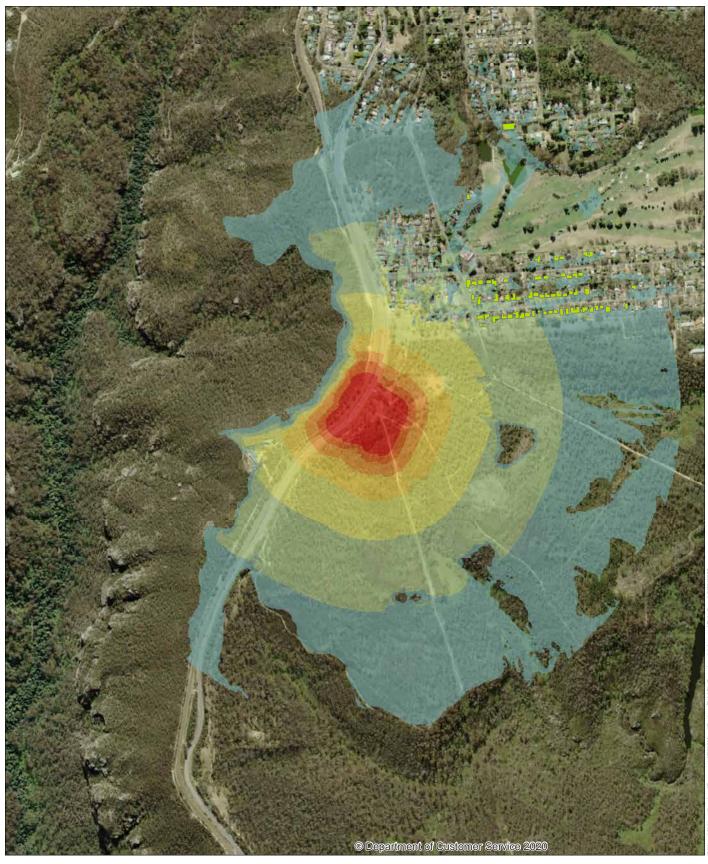


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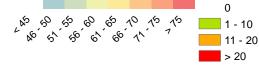
Construction Noise Contours - Tunnel Portal Construction - Day





Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB



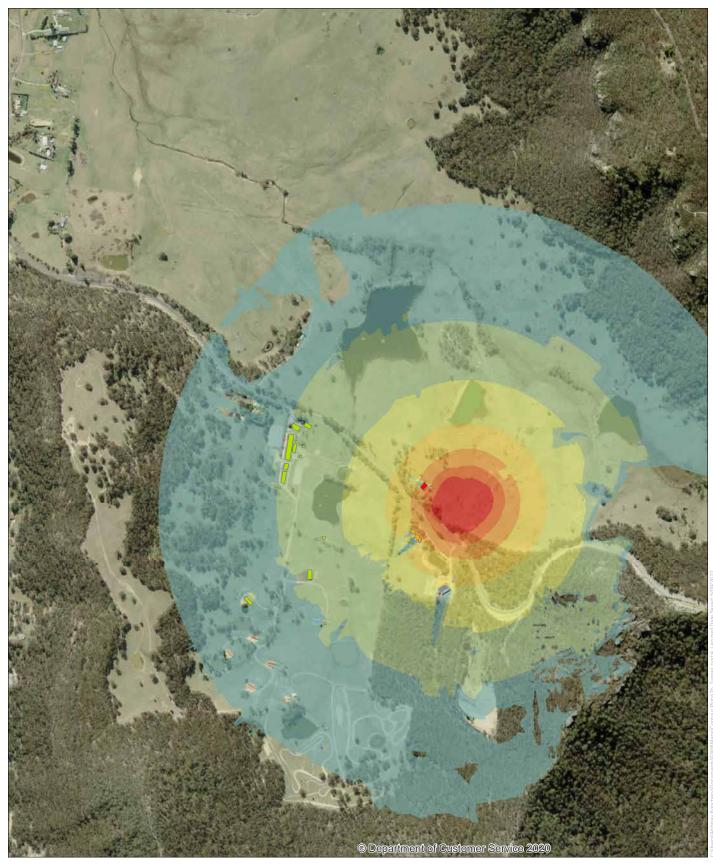
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Source



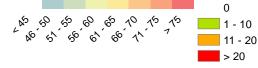
Construction Noise Contours - Tunnel Portal Construction - Day





Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB

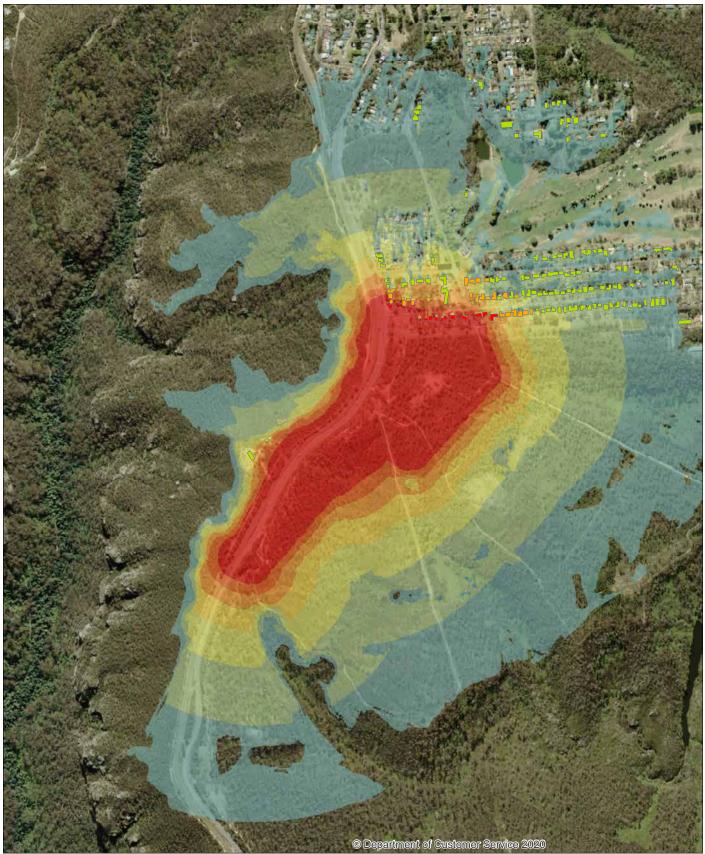


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Construction Noise Contours - Tunnelling and associated works - Day

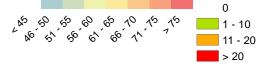


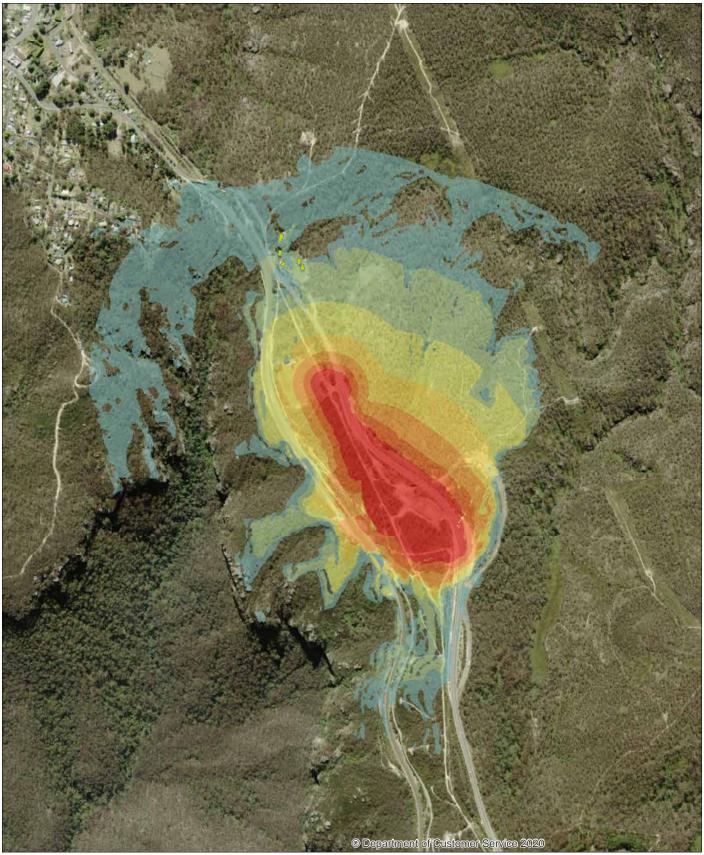


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Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB





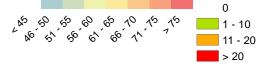
Construction Noise Contours - Tunnelling and associated works - Day





Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB

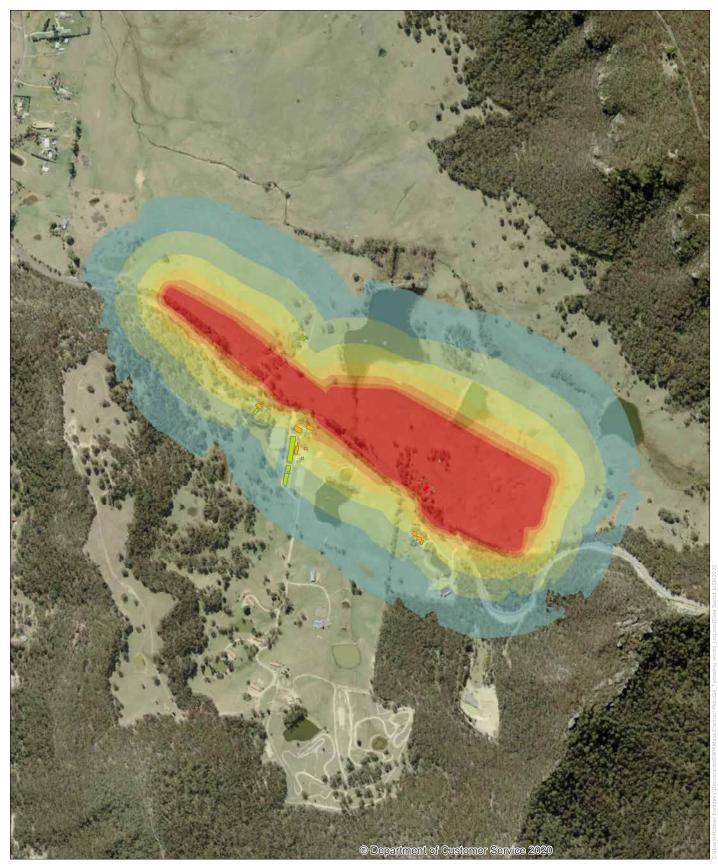


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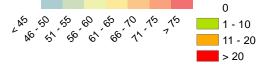
Construction Noise Contours - Tunnelling and associated works - Day





Legend

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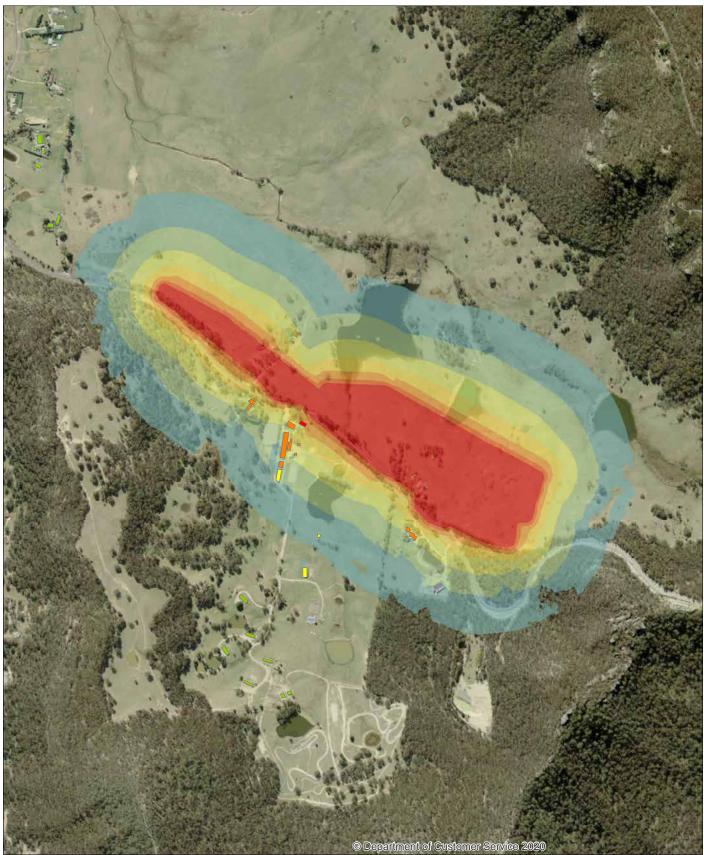


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Construction Noise Contours - Tunnelling and associated works - Night Legend





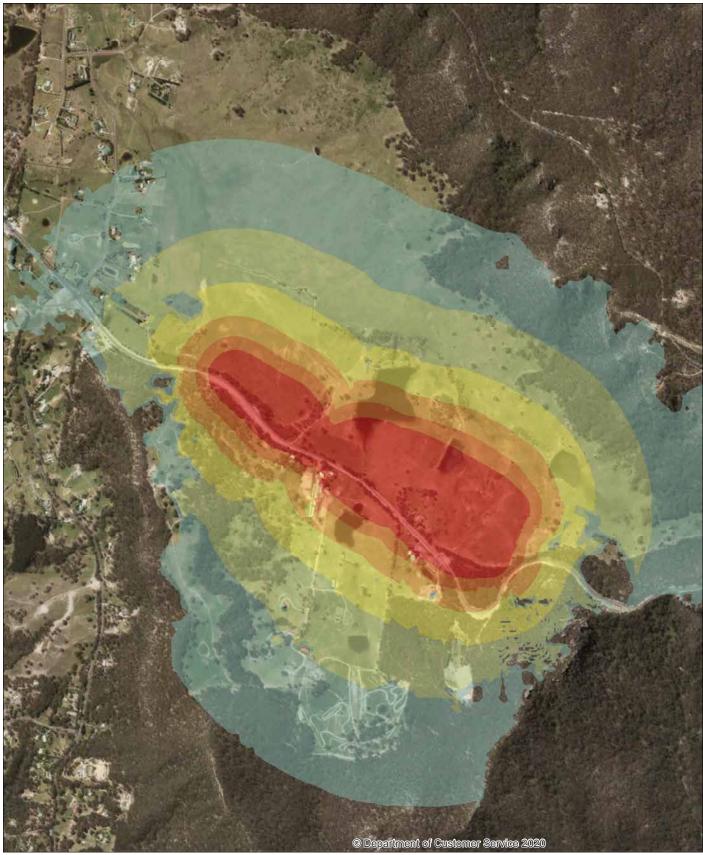
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L_{Aeq} Sound Pressure Level, dB(A)

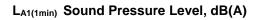
Exceedance of NML (N), dB^{Copyright: Copyright: Copyright: Copyright in AU Australia}

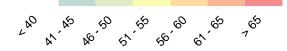


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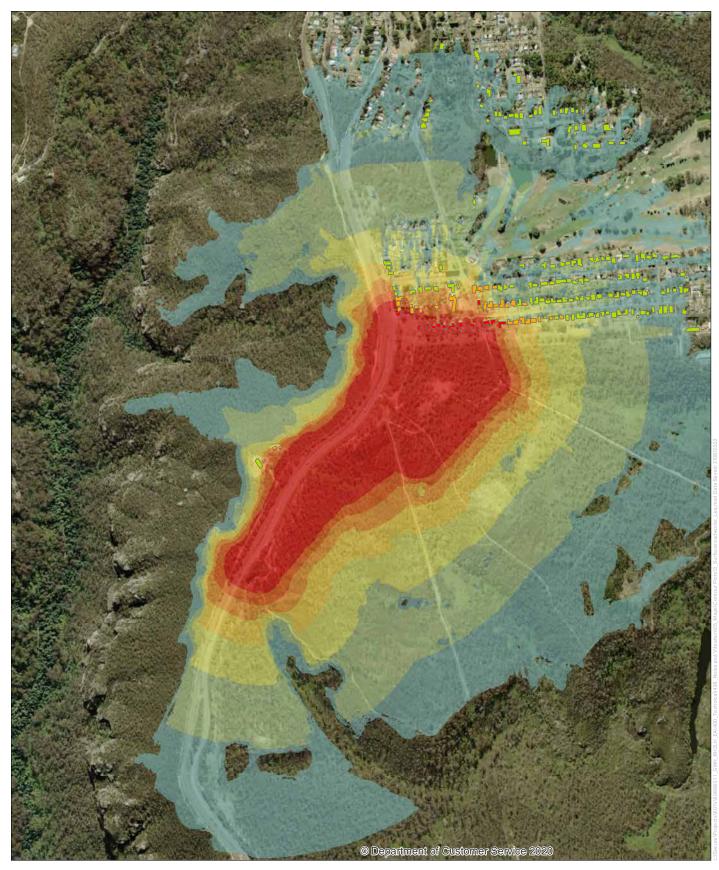
Tunnelling and associated works -Sleep disturbance Legend







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Construction Noise Contours - Surface roadworks - Day





Legend

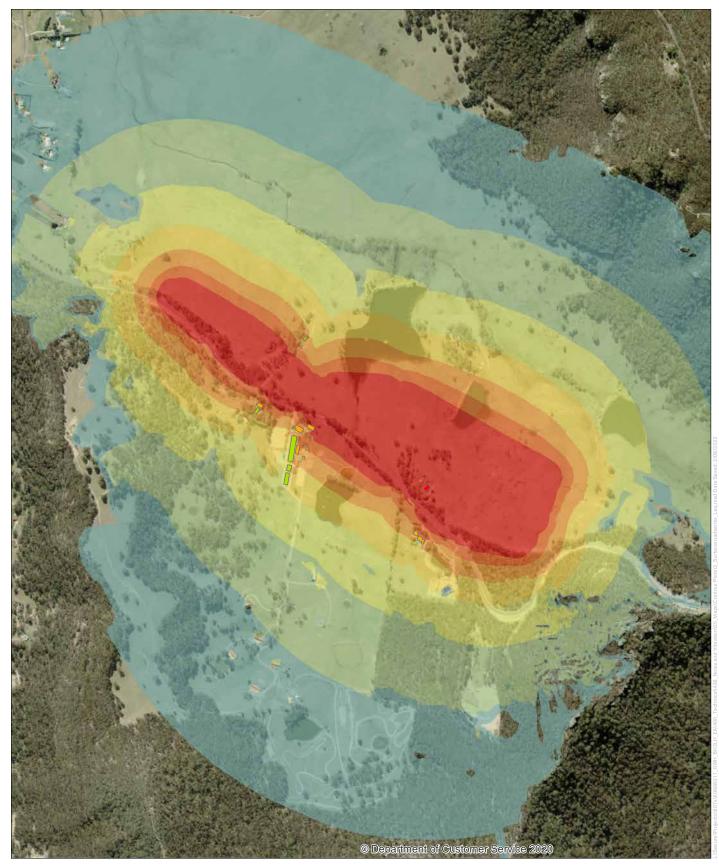
L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB



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Construction Noise Contours - Surface roadworks - Day





Legend

LAeq Sound Pressure Level, dB(A) Exceedance of NML (D), dB

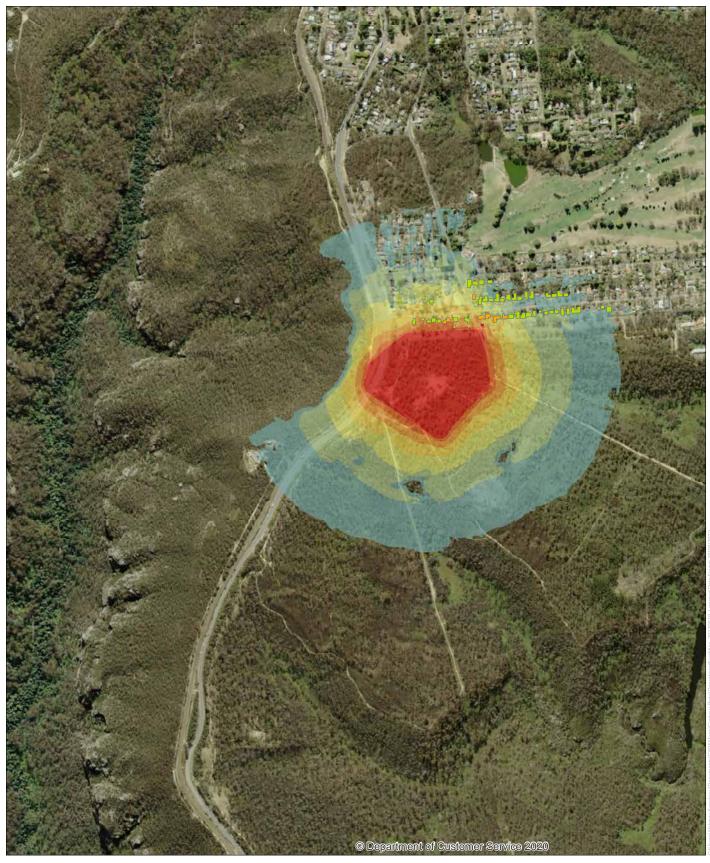


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Construction Noise Contours - Operational Facilities - Day





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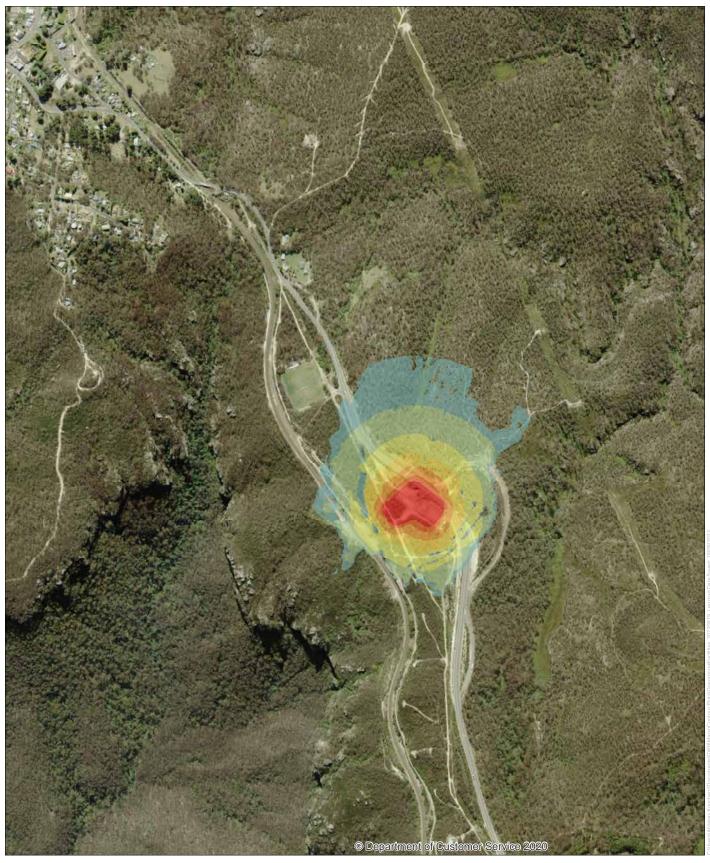
L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB



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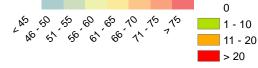
Construction Noise Contours - Operational Facilities - Day





Legend

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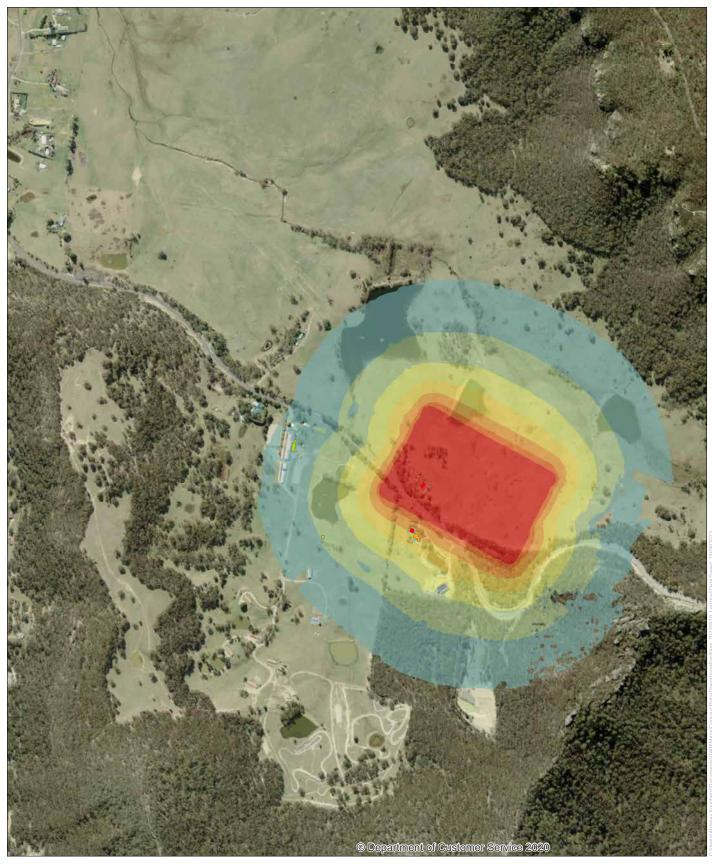


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Source



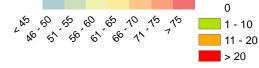
Construction Noise Contours - Operational Facilities - Day





Legend

L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB

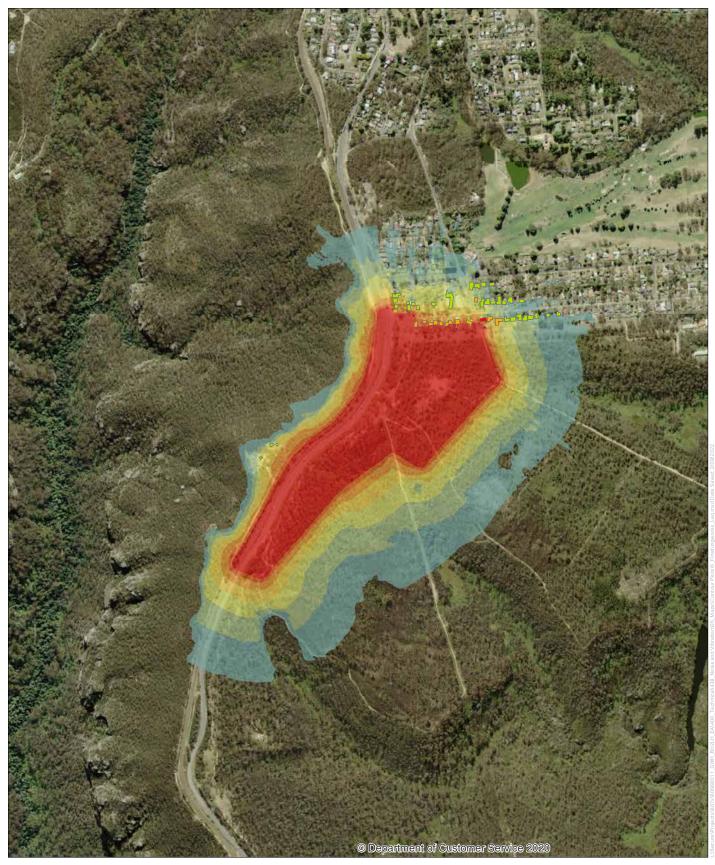


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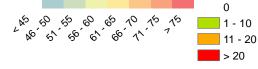
Construction Noise Contours - Finishing works - Day





Legend

L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB

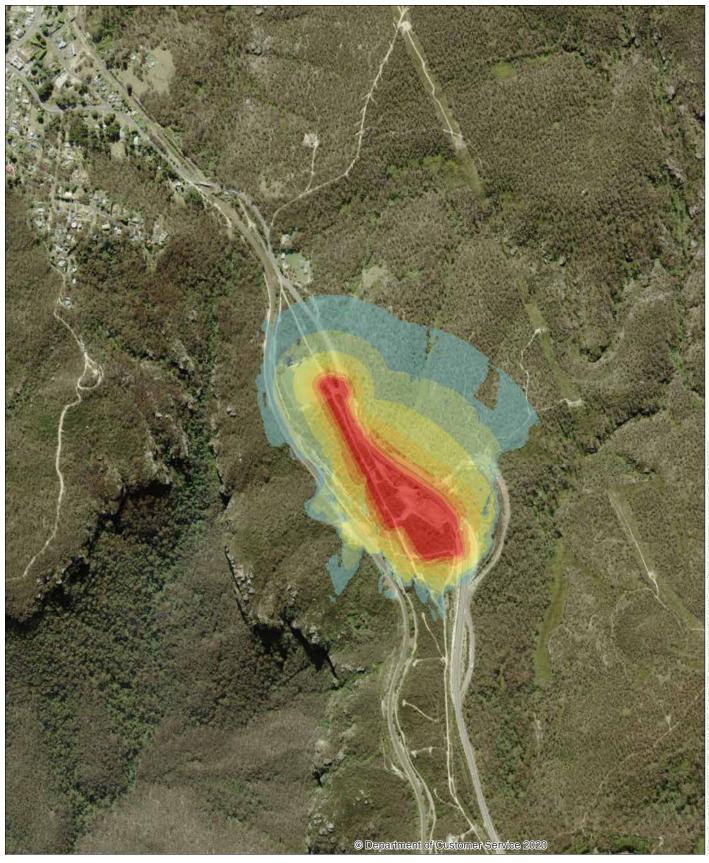


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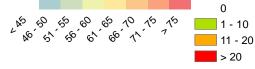
Construction Noise Contours - Finishing works - Day





Legend

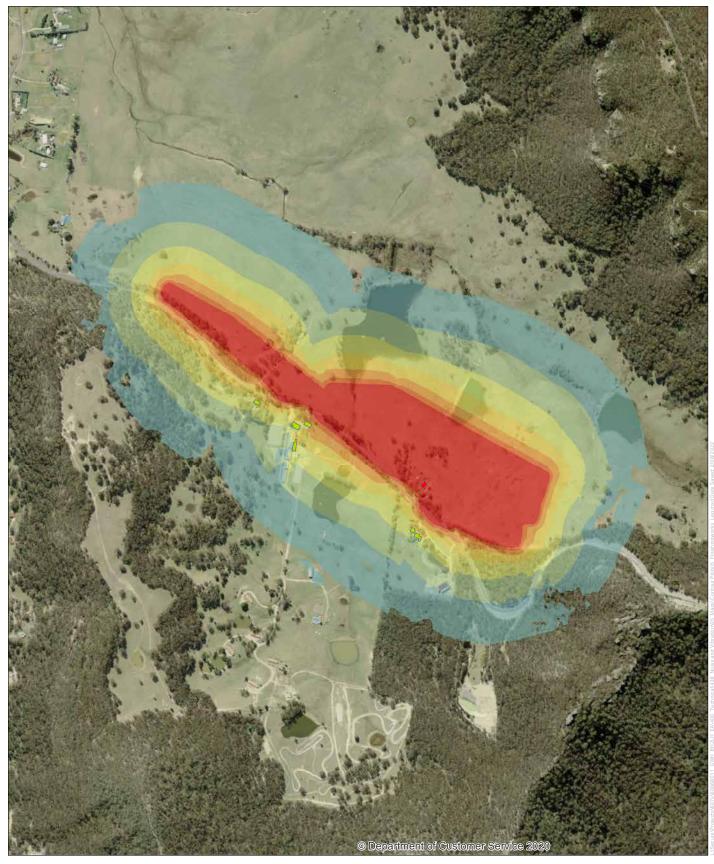
L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB



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Construction Noise Contours - Finishing works - Day





Legend

L_{Aeq} Sound Pressure Level, dB(A) Exceedance of NML (D), dB



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Standard Hours

Mitigation





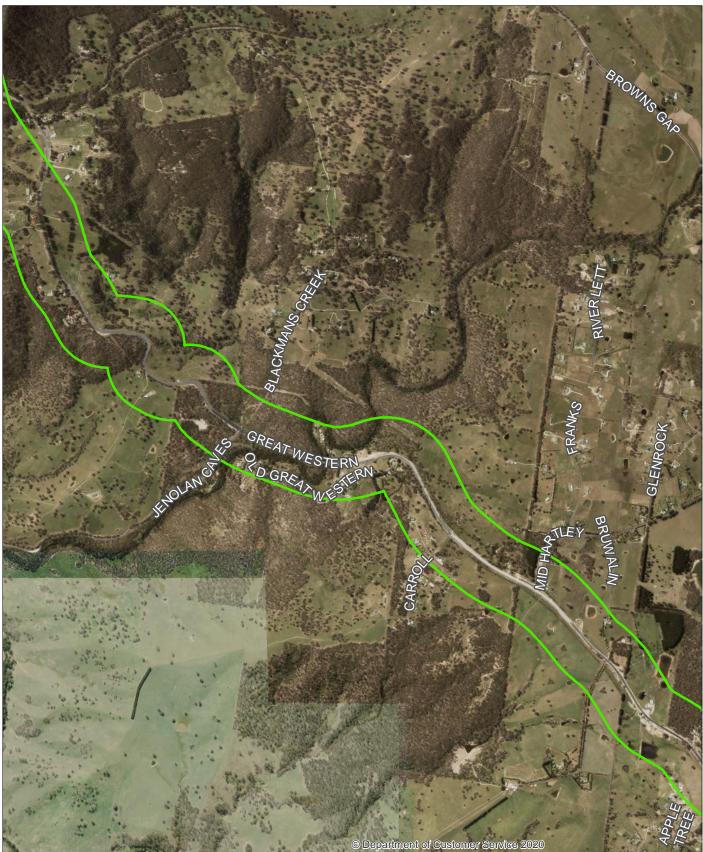
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Source: Nearmap 2022

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Standard Hours

Mitigation



Meters 900

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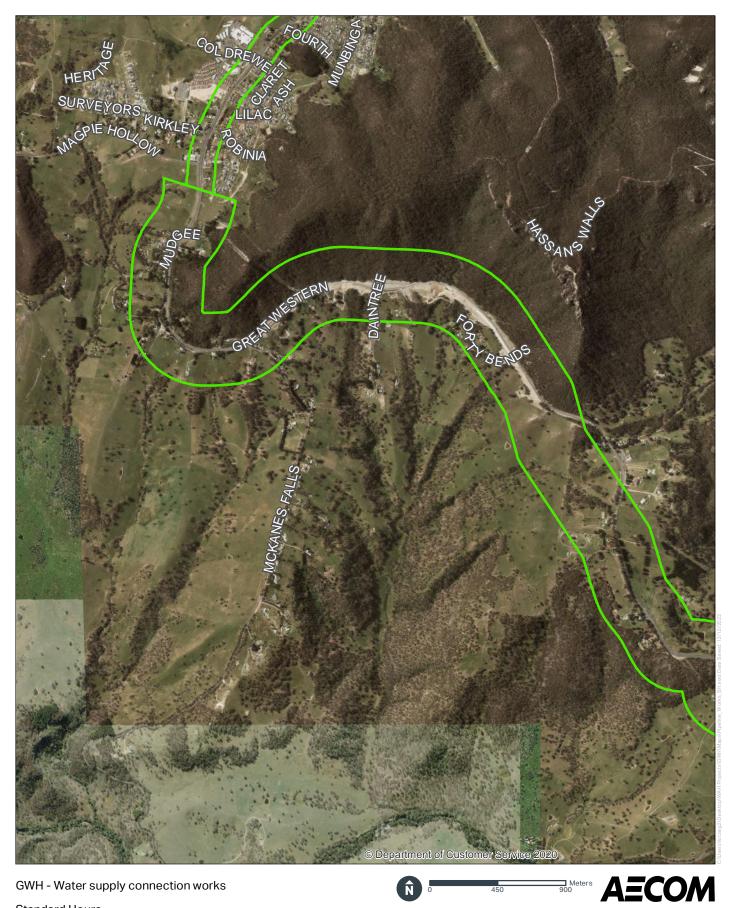
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Source: Nearmap 2022

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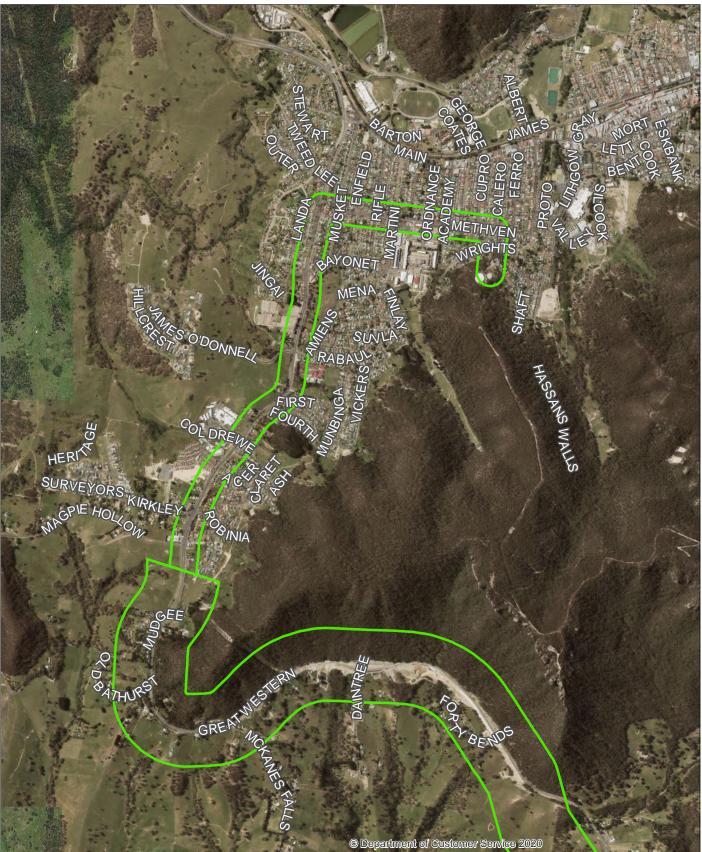
ΑΞϹΟΜ



Standard Hours

Mitigation





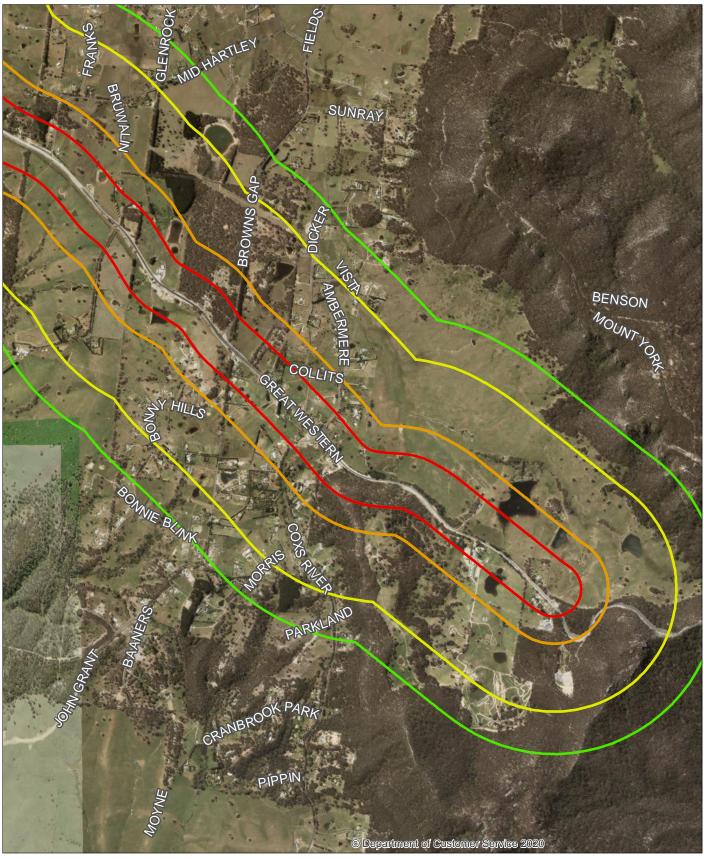
Standard Hours

Mitigation





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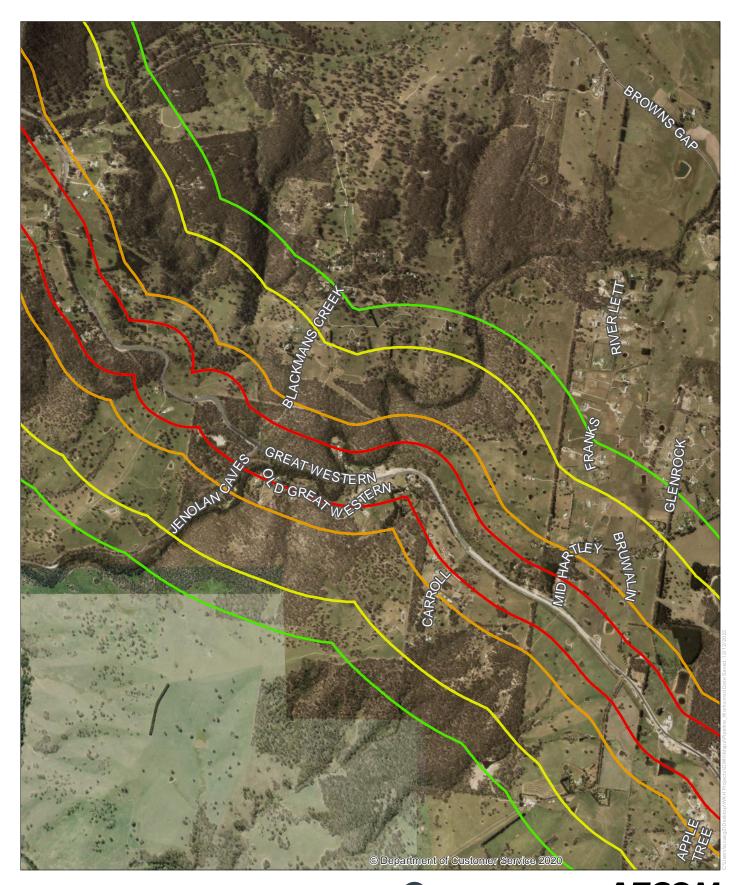


GWH - Water supply connection works Oustide Standard Hours (Night-time)





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GWH - Water supply connection works Oustide Standard Hours (Night-time)

Mitigation

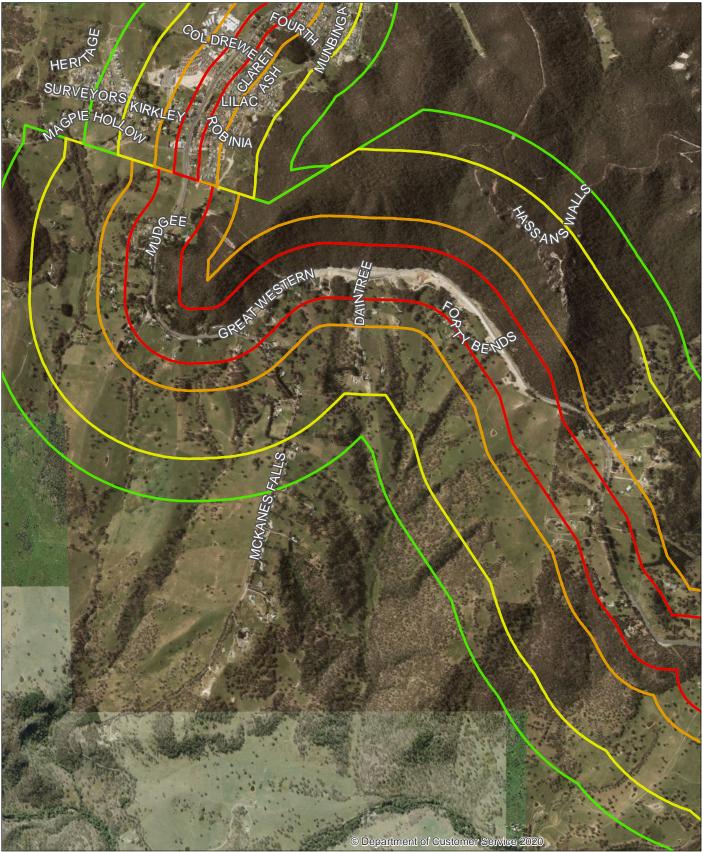


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Source: Nearmap 2022

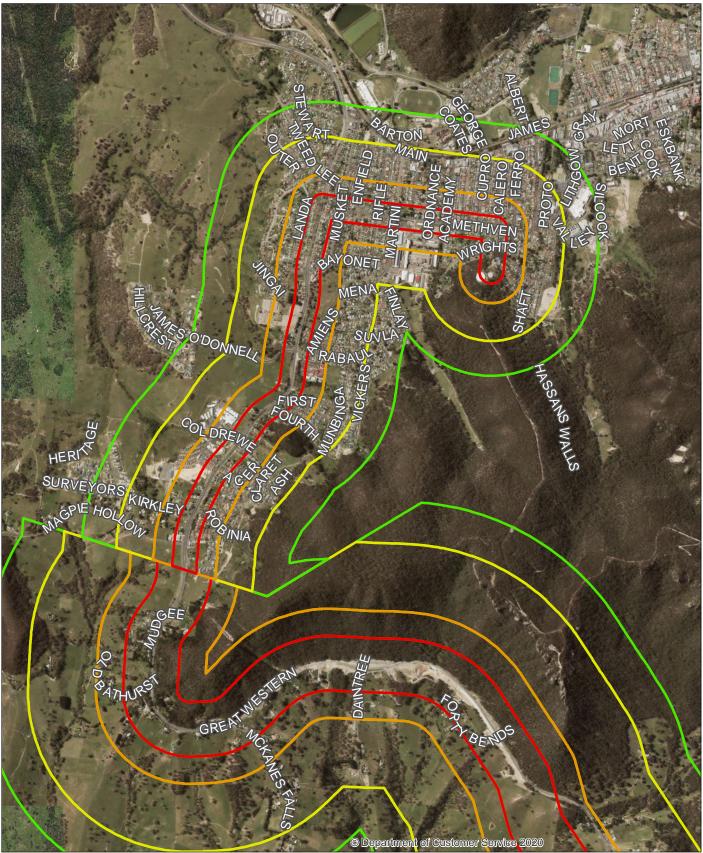


GWH - Water supply connection works Oustide Standard Hours (Night-time)

Mitigation



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GWH - Water supply connection works Oustide Standard Hours (Night-time)

Mitigation



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Meters 900

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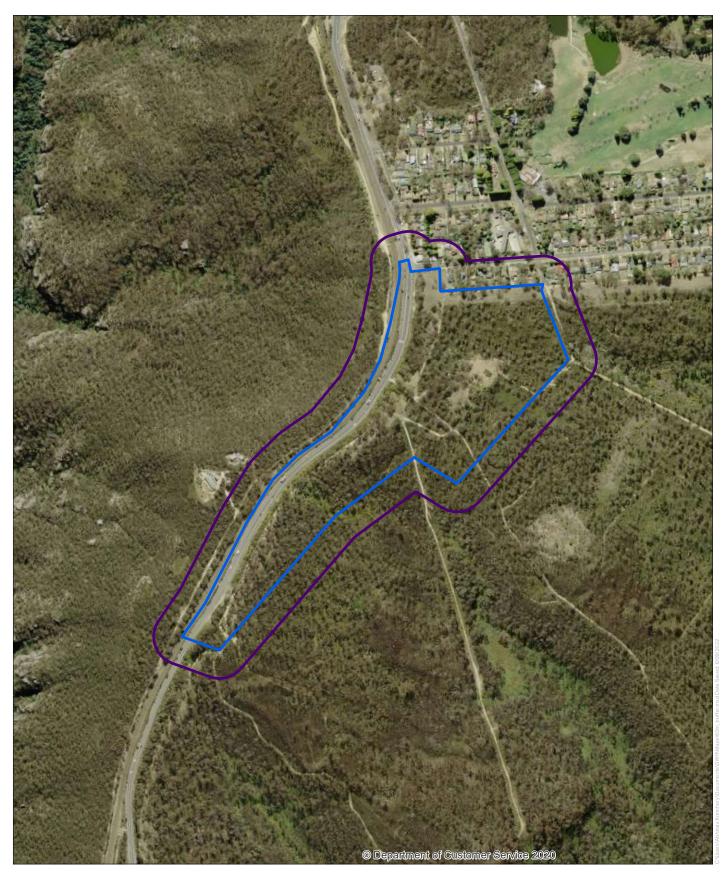
Source: Nearmap 2022

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ΑΞϹΟΜ



Surface vibration minimum working distances



Minimum working distances - Heritage structural damage





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Legend Construction footprint 60m buffer



Minimum working distances - Heritage structural damage

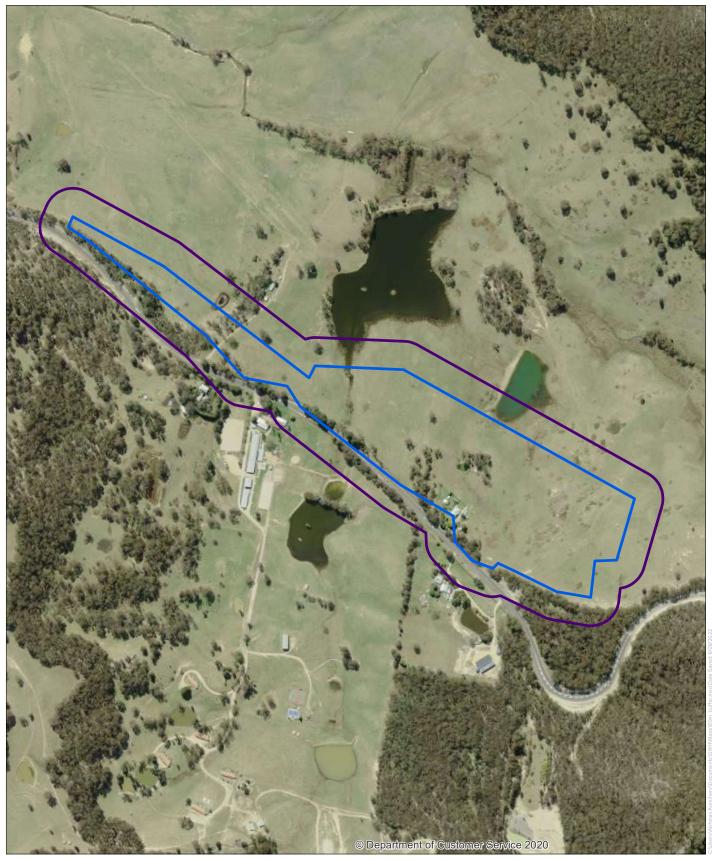




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Legend Construction footprint 60m buffer



Minimum working distances - Heritage structural damage





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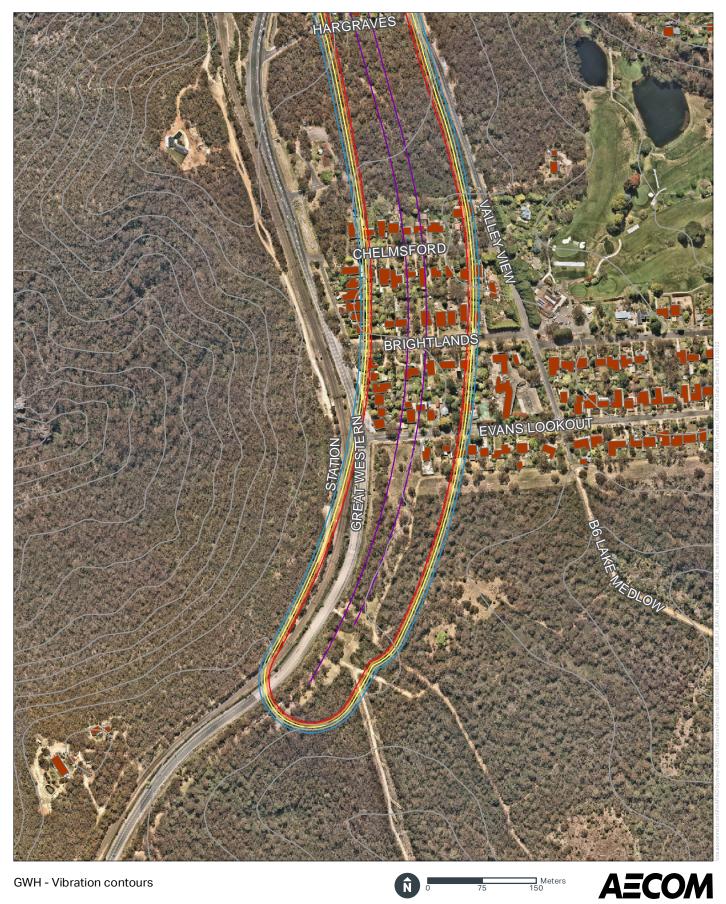
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Legend Construction footprint 60m buffer

Annexure F

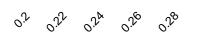
Construction tunnelling vibration maps



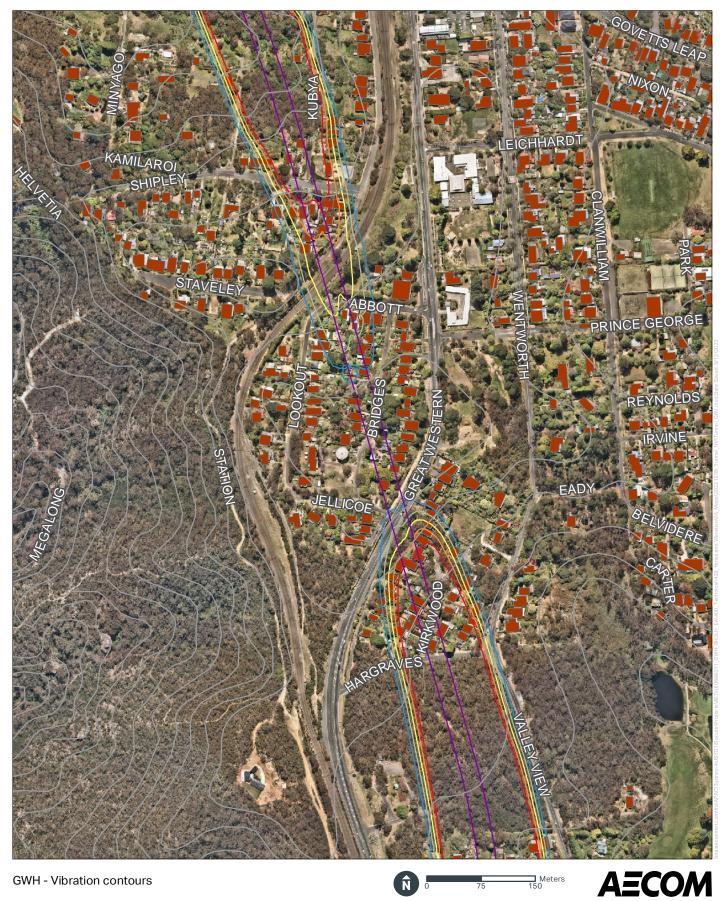
Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



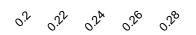
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Tunnel footprint

Residential Receivers

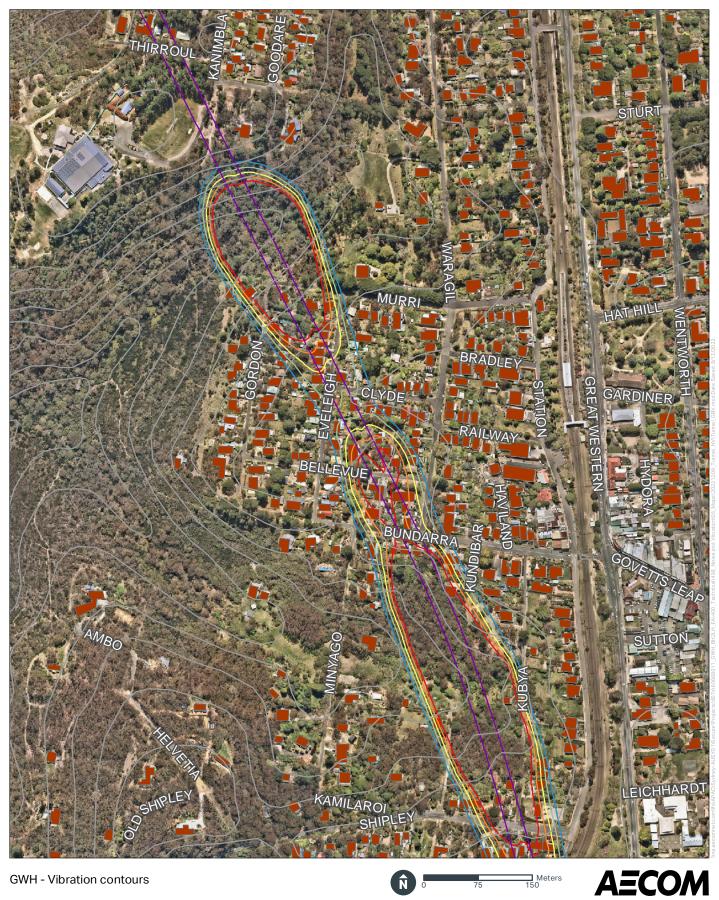
Peak Particle Velocity mm/s



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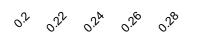
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Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



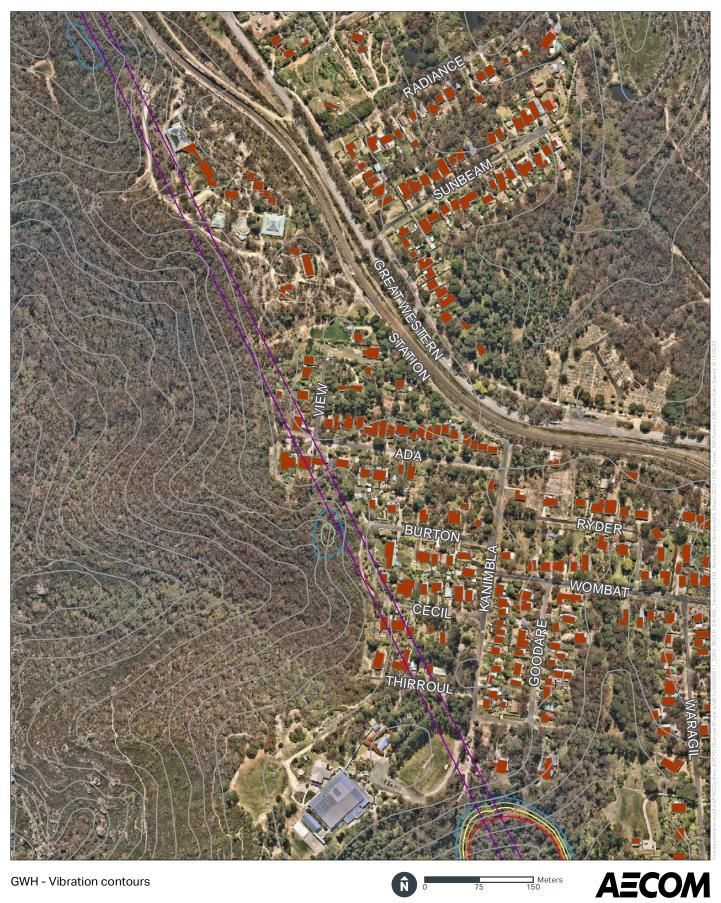
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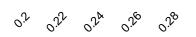
rmap 2022



Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s

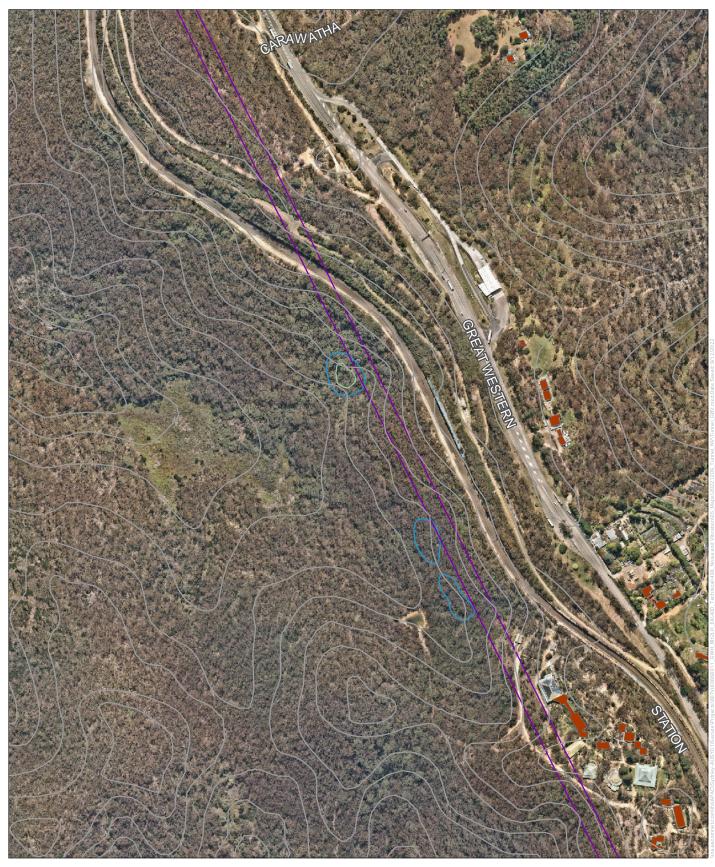


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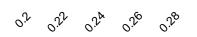
nap 2022



— Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



N 0 75 150 Meters



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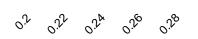
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— Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



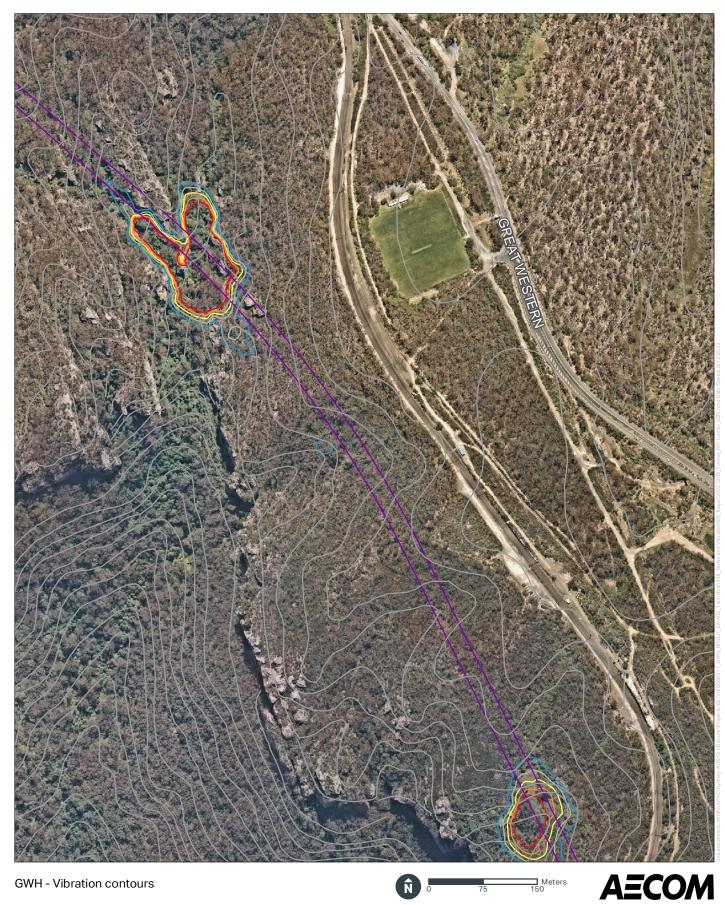
N 0 75 150 Meters



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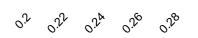
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Tunnel footprint

Residential Receivers

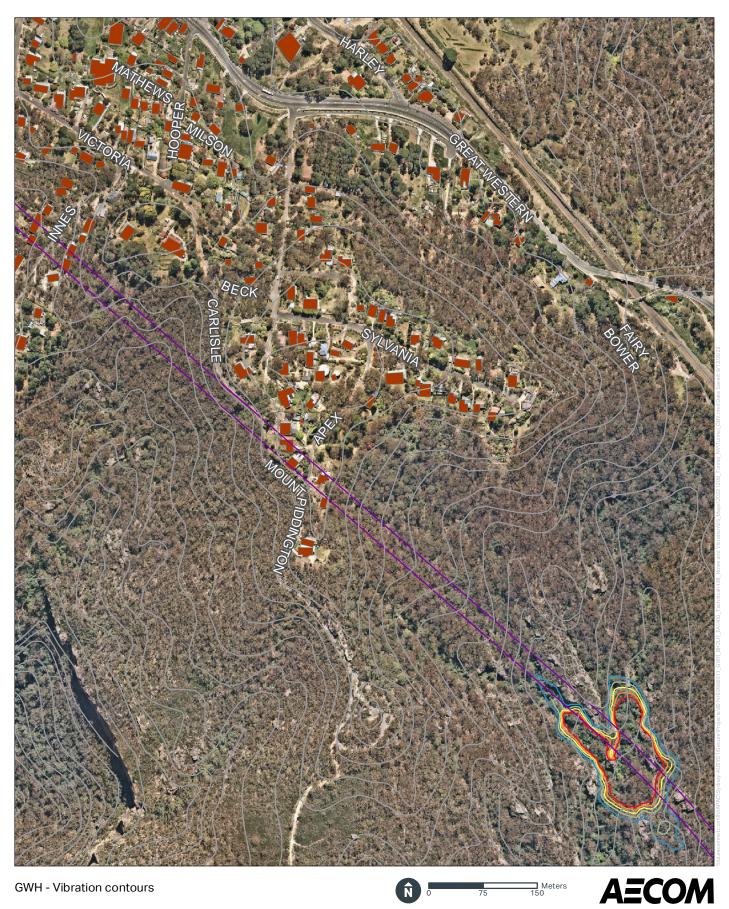
Peak Particle Velocity mm/s



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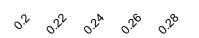
nap 2022



Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



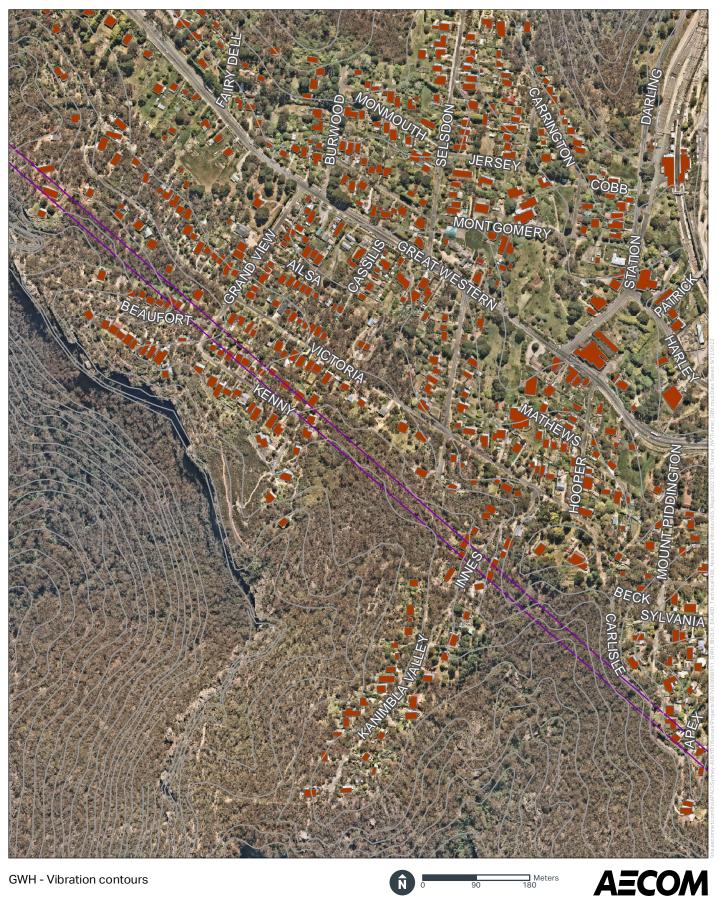
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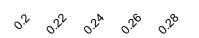
map 2022



Tunnel footprint

Residential Receivers

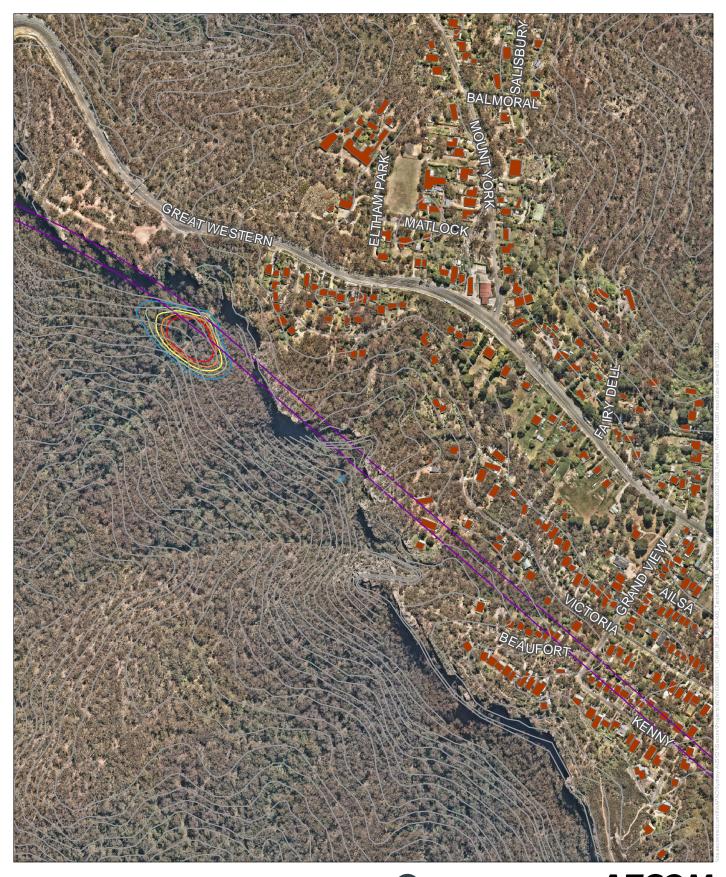
Peak Particle Velocity mm/s



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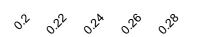
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Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s

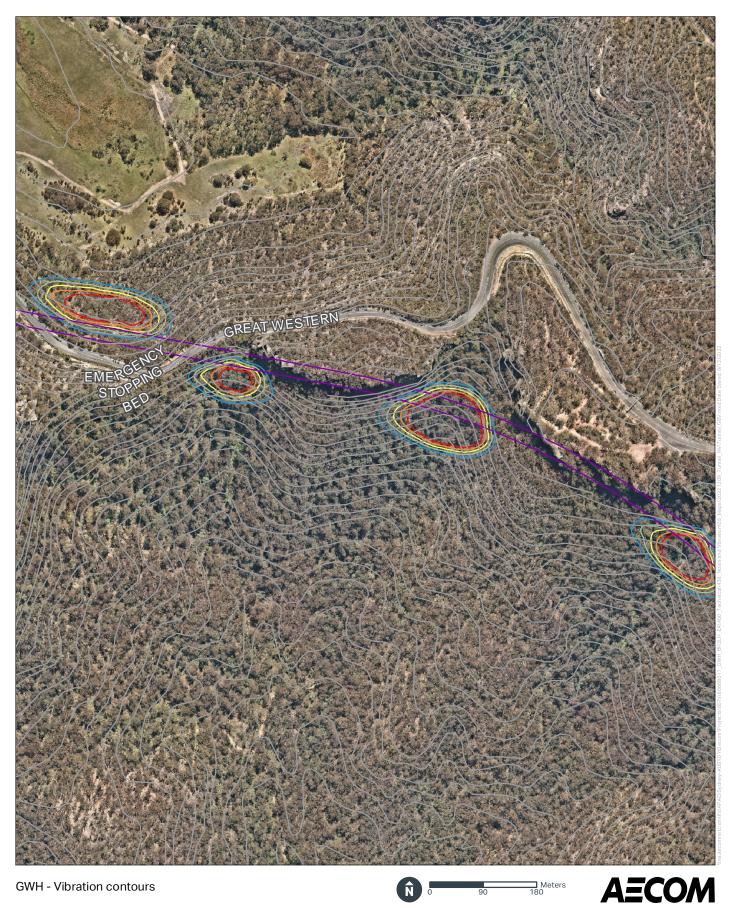


N 90 180 Meters

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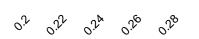
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Tunnel footprint

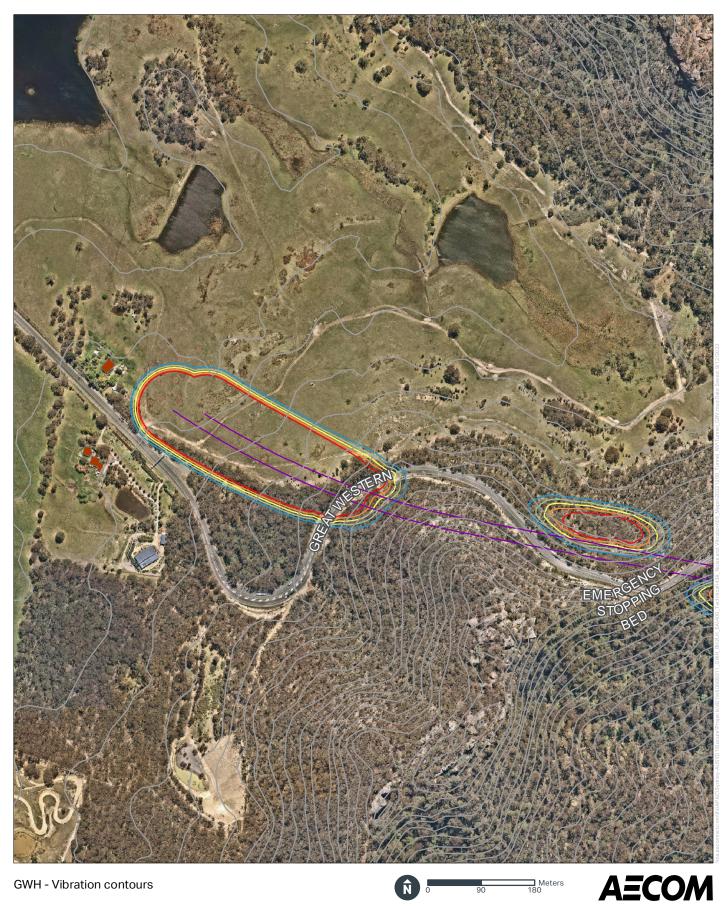
Residential Receivers

Peak Particle Velocity mm/s



Meters 180 Î C

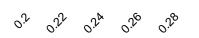
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Tunnel footprint

Residential Receivers

Peak Particle Velocity mm/s



Annexure G

Ground-borne noise maps



GWH - Ground-borne noise contours





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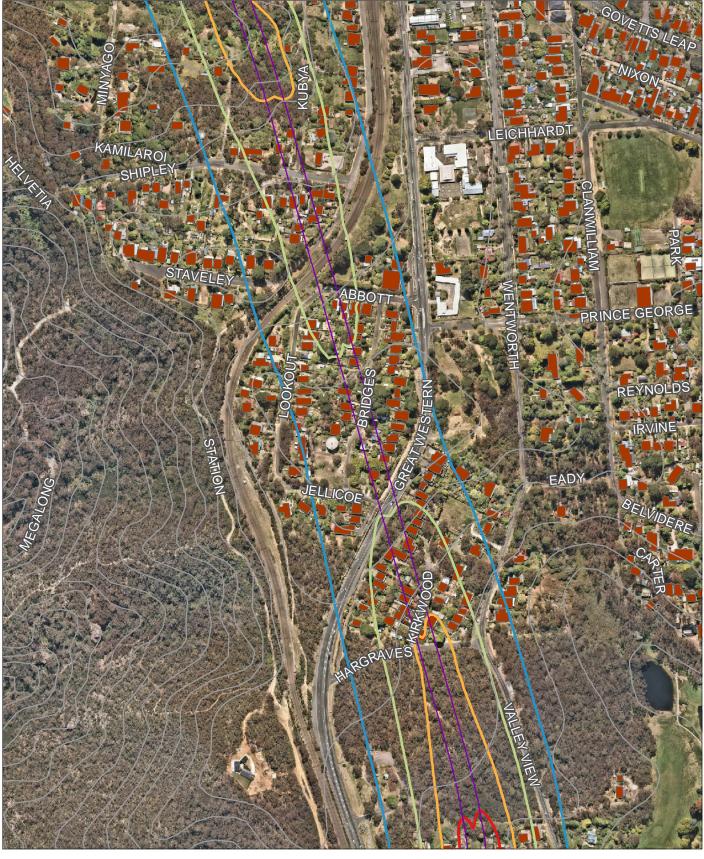
— Tunnel footprint

Residential Receivers

Sound Pressure Level, L_{Amax,slow}, dB(A)

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— Tunnel footprint

Residential Receivers

Sound Pressure Level, L_{Amax,slow}, dB(A)

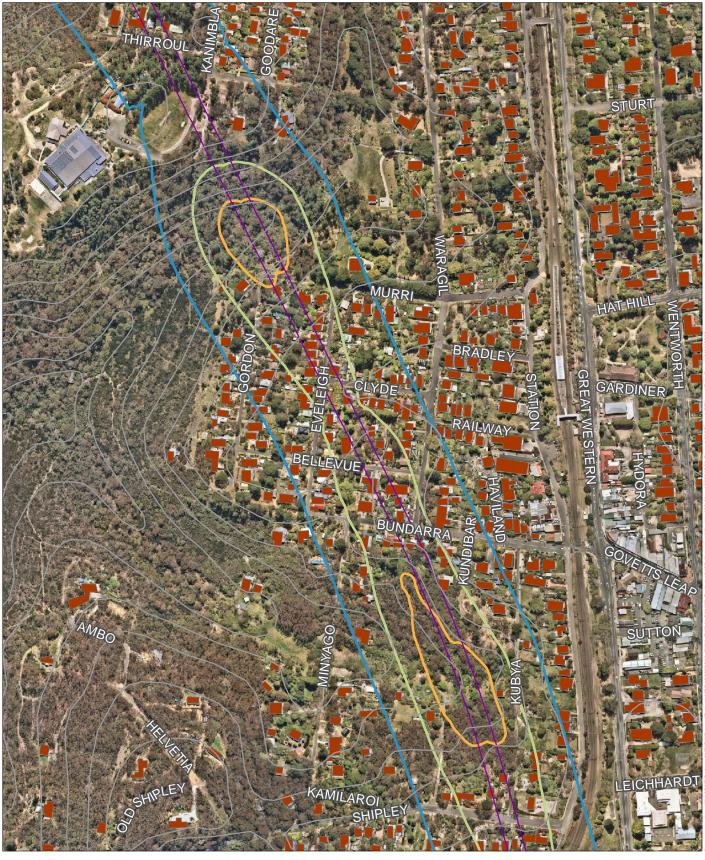
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Meters 150

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GWH - Ground-borne noise contours





—— Tunnel footprint

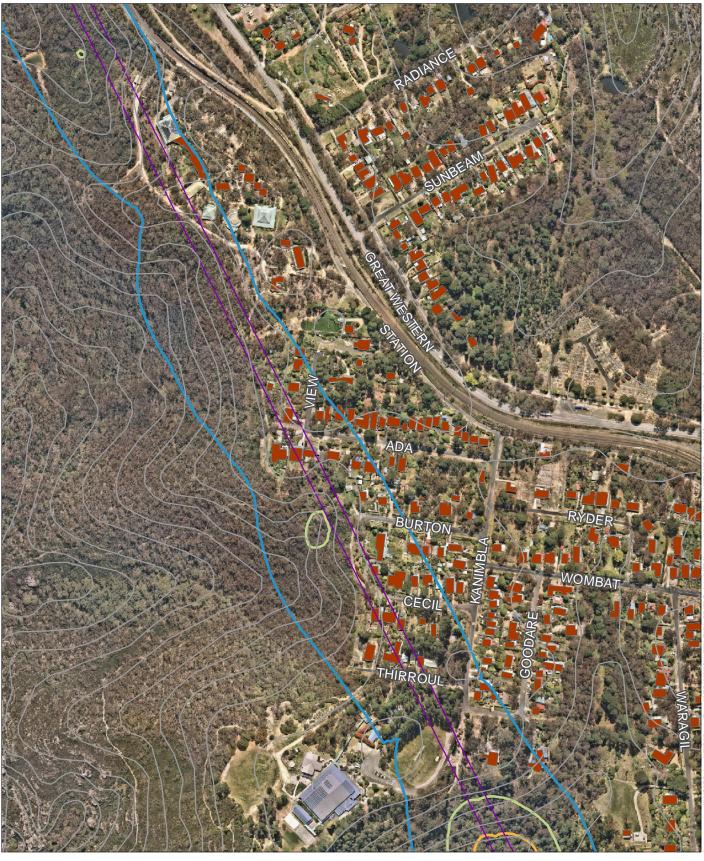
Residential Receivers

Sound Pressure Level, L_{Amax,slow}, dB(A)

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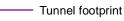
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GWH - Ground-borne noise contours







Residential Receivers

Sound Pressure Level, L_{Amax,slow}, dB(A)

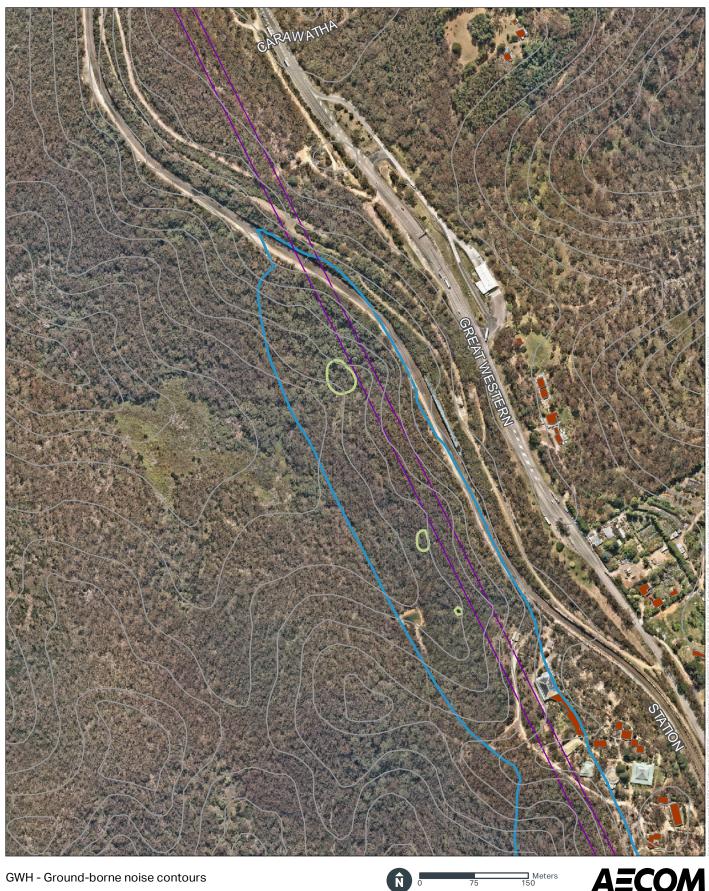
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Meters 150

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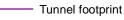
ce: Nearmap 2022



GWH - Ground-borne noise contours







Residential Receivers

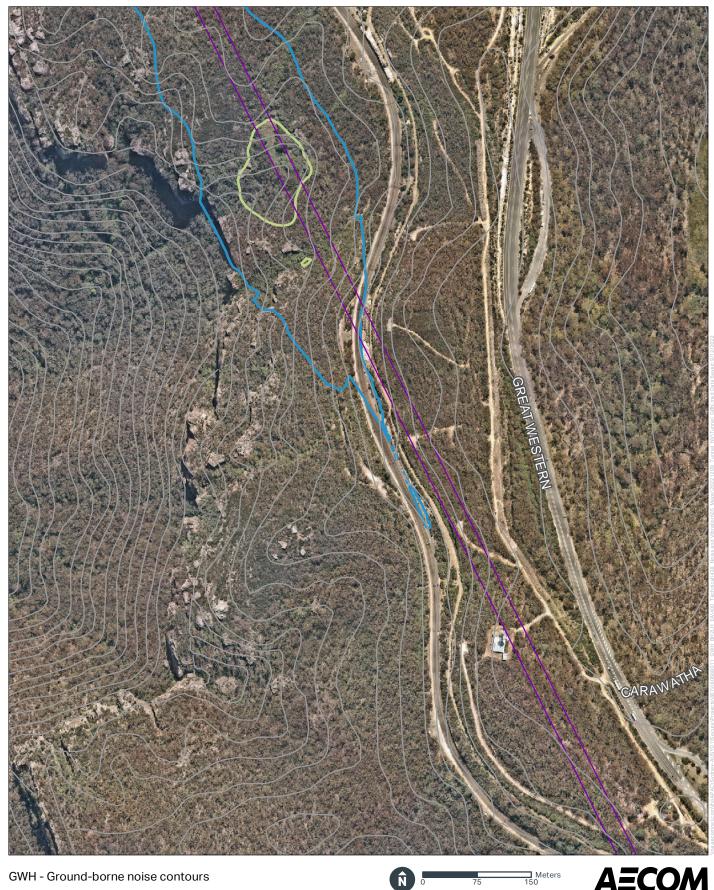
Sound Pressure Level, L_{Amax,slow}, dB(A)

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ce: Nearmap 2022



GWH - Ground-borne noise contours





- Tunnel footprint

Residential Receivers

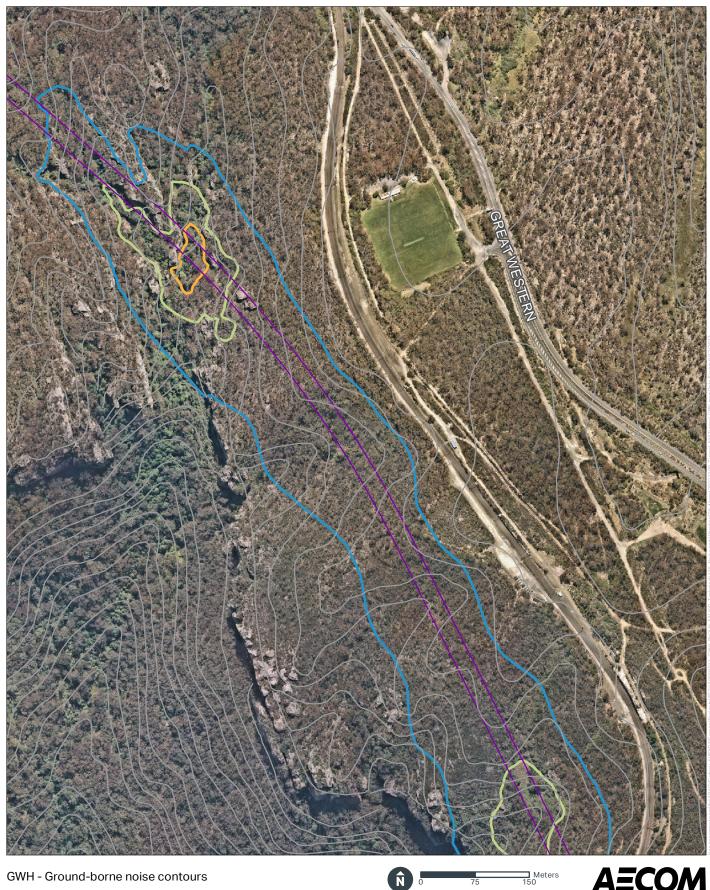
Sound Pressure Level, L_{Amax,slow}, dB(A)

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e: Nearmap 2022



GWH - Ground-borne noise contours





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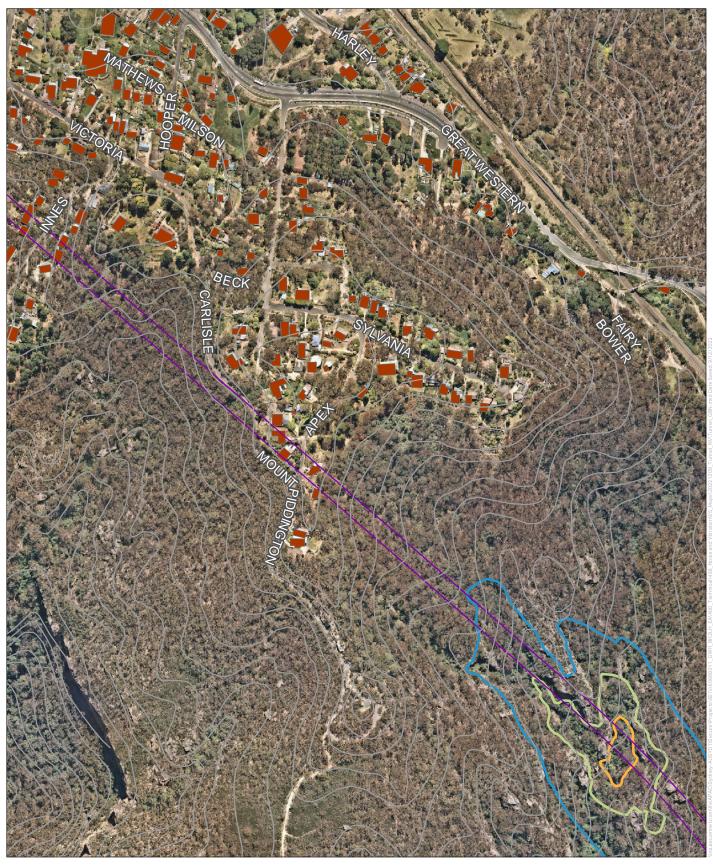
Sound Pressure Level, L_{Amax,slow}, dB(A)

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— Tunnel footprint

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Residential Receivers

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Sound Pressure Level, L_{Amax,slow}, dB(A)

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GWH - Ground-borne noise contours





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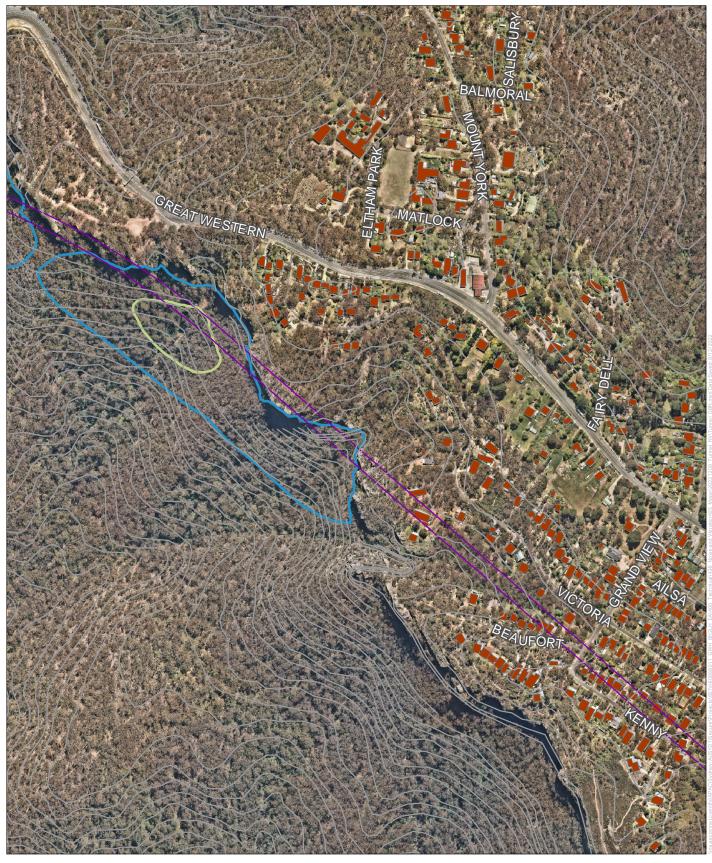
—— Tunnel footprint

Residential Receivers

Sound Pressure Level, L_{Amax,slow}, dB(A)

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— Tunnel footprint

Residential Receivers

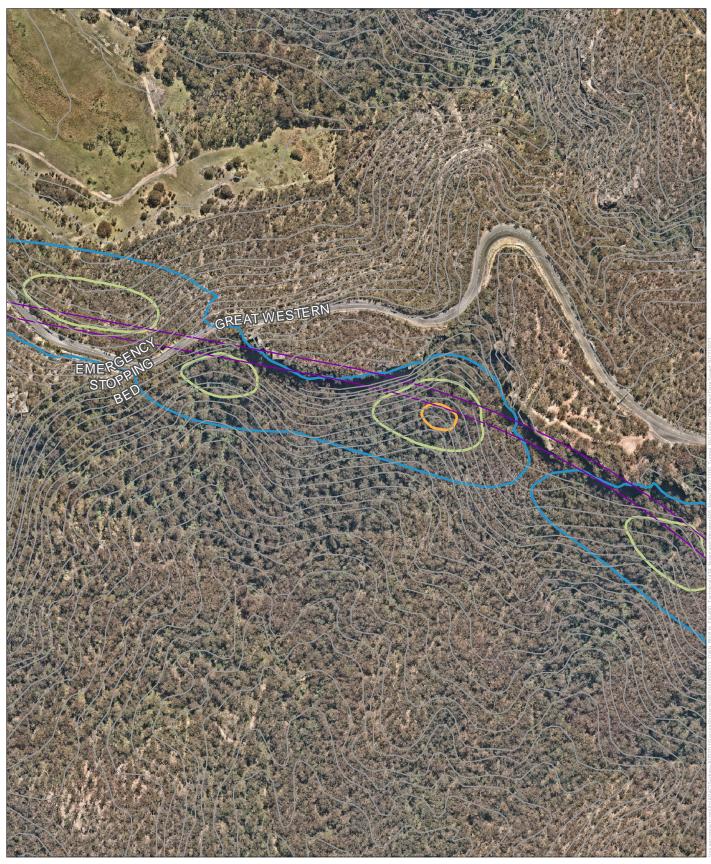
Sound Pressure Level, L_{Amax,slow}, dB(A)

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GWH - Ground-borne noise contours





— Tunnel footprint

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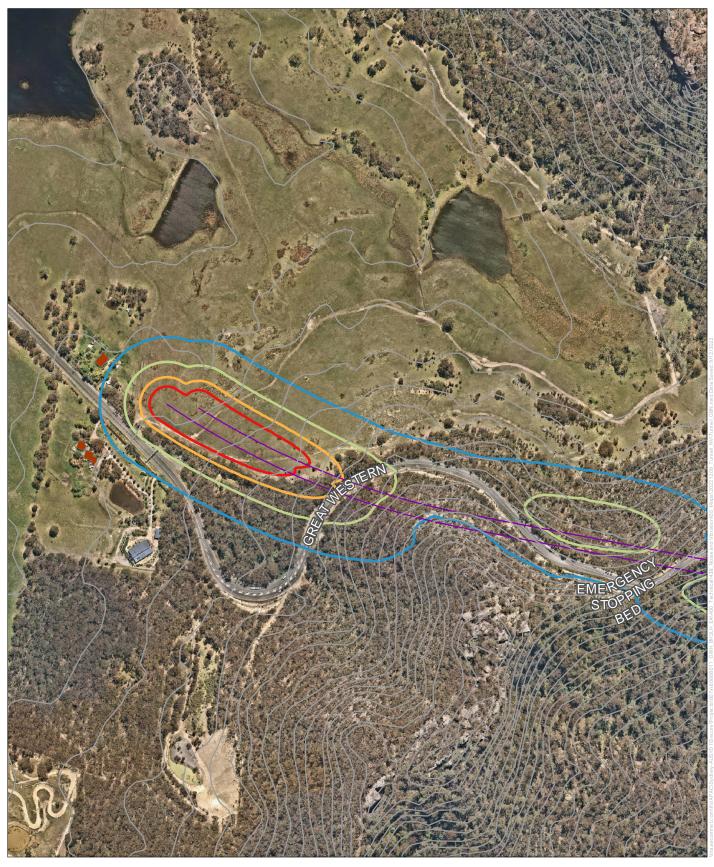
Sound Pressure Level, L_{Amax,slow}, dB(A)

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GWH - Ground-borne noise contours





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Residential Receivers

Sound Pressure Level, $L_{Amax,slow}$, dB(A)

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Annexure H

Operational road traffic noise results

		B	açade	Predicte	d noise	level Openi	ng Year :	2030	Pr	edicted I	noise level De	esign Year 2	:040	Chan proj	nge in no ject - Wit	oise level ithout pro	(With eject)											Do noise iqual or					
Receiver ID	Façade	Floor level	Direction	Without proje	ct Wi	th project	Proj	ect Only	Without	project	With proje	ct Proje	ect Only	Openin 20		Desig 2	jn Year 040	n	Project oad criteria		ad criteria	NM Cumulati crite exceedan	ive limit eria	Do noise exceed th criter	e NCG	Do noise le xceed the elative incr criteria	vels t NCG lir ease 2	the cum	ulative project adding the total	contr from t	the ibution he road t Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day Nigl	nt Da	y Night	Day	Night	Day	Night	Day Nig	ght Day	Night	Day	Night	Day	Nigh	t Day	Night	Day	Night	Day	Night	Day	Night	Day N	ight	Day	Night	Day	Night		
	18 CHELMSFORD AVENUE BLACKHEATH	GF	E	40	34	36 3		0 30				30 3						1.5 50			0	0	0 N		o N					No		No	
	18 CHELMSFORD AVENUE BLACKHEATH 18 CHELMSFORD AVENUE BLACKHEATH	GF	N		44 45	45 3 46 3				44	45	36 3 37 3	0 30 4 30		-7.6			.6 5	5 50		0	0	0 N 0 N			o No o No	N		No No	No No	No No	No No	'
56	18 CHELMSFORD AVENUE BLACKHEATH	GF	S				o 3 4 3				10	34 3							5	5	0	0	0 N		o N					No		No	
	12 EVANS LOOKOUT ROAD BLACKHEATH	GF	S		40			0 32			-	39 4	0		-0.7		-1		5 50	0 0	0	0	0 N			o No	N			No	No	No	
	12 EVANS LOOKOUT ROAD BLACKHEATH 12 EVANS LOOKOUT ROAD BLACKHEATH	GF	E N		39 42	47 3 43 3		6 30 4 30	48	39	49	37 3	6 30 4 30	-0.6	-1.6		-1			1 0	0	0	0 N 0 N			o No o No				No No	No No	No	
	12 EVANS LOOKOUT ROAD BLACKHEATH		W		42	50 4						40 4	6 35					.4 59			0	0	0 N			o No				No		No	
	12 EVANS LOOKOUT ROAD BLACKHEATH	GF	S		47	51 4	-					41 4			-5.4			.3 60			0	0	0 N			o No				No		No	
	12 EVANS LOOKOUT ROAD BLACKHEATH 12 EVANS LOOKOUT ROAD BLACKHEATH	GF	W		48 47	52 4 54 4			55	48	53	41 4		-3.3	-5.7		3 -6	1 6	0 55	5 0	0	0	0 N 0 N			o No	N		No No	No No	No No	No	
59	12 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	50	40	50 4	0 3	9 31		40	52	39 3	9 30	-0.1	-0.6	6 1.1	-0	.9 5	5 50		0	0	0 N	lo N	0 N	o No	N	0 1	No	No	No	No	-
60	88 EVANS LOOKOUT ROAD BLACKHEATH	GF	E		36	46 3	0	0 30		00		35 3	0		-0.6		,	0.6 5	5		0	0	0 N			o No				No	No	No	
	88 EVANS LOOKOUT ROAD BLACKHEATH 88 EVANS LOOKOUT ROAD BLACKHEATH		N W		37 37	39 3 46 3	-	0 30 2 30		37	40 48	31 3 36 3	0 30 2 30						5 50 5 50		0	0	0 N 0 N		0 N	o No			No No	No No	No No	No No	+'
60	88 EVANS LOOKOUT ROAD BLACKHEATH	GF	s	51	41	51 4	1 3	6 30	52	41	53	41 3	6 30	-0.1	-0.7	7 1.3	3 -0	0.7 5	5 50	0 0	0	0	0 N	lo N	o N	o No				No	No	No	
115	14-16 CHELMSFORD AVENUE BLACKHEATH 14-16 CHELMSFORD AVENUE BLACKHEATH	GF GF	N	46 44	40 38	41 3 39 3	4	1 00		10		32 3	1 30 2 30				5 -7 5 -6		5 51	1 0	0	0	0 N 0 N		0 N					No No		No No	+
	14-16 CHELMSFORD AVENUE BLACKHEATH		E N			39 3 46 3	-					31 3					-0 -7		5 51	1 0	0	0	0 N			o No		-		NO	No No	No	+
115	14-16 CHELMSFORD AVENUE BLACKHEATH		W	52	45	46 3	7 3		52	45	46	37 3	2 30	-5.9	-7.5		-7	.5 50	5 51	1 0	0	0	0 N		o N	o No	N			No	No	No	
	14-16 CHELMSFORD AVENUE BLACKHEATH 14-16 CHELMSFORD AVENUE BLACKHEATH	GF GF	N	5	45 41	45 3 43 3	,	1 30 4 30	01	45	46	37 3 34 3		0.7				.4 50	5 51	1 0	0	0	0 N 0 N		0 N	o No	N			No No	No No	No No	'
	14-16 CHELMSFORD AVENUE BLACKHEATH	GF	s s			43 3						34 3							5 51	1 0	0	0	0 N			o No	N			No	No	No	+'
115	14-16 CHELMSFORD AVENUE BLACKHEATH	GF	Ē	43	36	39 3				36	40	31 3	4 30	-4.2	-5.7	7 -4	4 -5			1 0	0	0	0 N	lo N	0 N	o No	N	0 1	No	No	No	No	
	31 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W	45 43	38 36	40 3		1 00		38	41	32 3 31 3	2 30 5 30					.3 5			0	0	0 N 0 N		0 N		N			No No	No No	No No	'
	31 BRIGHTLANDS AVENUE BLACKHEATH	GF	E		30			0 30				30 3			-4.0			.7 5			0	-	0 N			o No				No		No	
162	31 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	47	40	41 3	3 3	0 30	47	40	42	33 3	1 30	-5.6	-7.1	1 -5.6	-7	.1 56	5 51	1 0	0	0	0 N	lo N	0 N	o No	N	lo l	No	No	No	No	
175	87 GREAT WESTERN HIGHWAY BLACKHEATH 87 GREAT WESTERN HIGHWAY BLACKHEATH		N		51 60	51 4 61 5			58	51	52	43 3 52 4			-7.6	6 -6.1 4 -5.8		.8 5	5 50 0 55		0	0	0 N 0 N	lo N	0 N	o No				No No	No	No	
175	87 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S		53	54 4				53	54	45 3	8 30						5 50		0	0	0 N			o No				No	No	No	-
	87 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E		39	44 3						34 4			-2.9				00		0	0	0 N			o No				No	No	No	
	10 CHELMSFORD AVENUE BLACKHEATH 10 CHELMSFORD AVENUE BLACKHEATH	GF	S F		45 40	46 3	8 3	6 30 5 30		45 40	46	37 3	6 30 6 30		-7	7 -5.4 3 -4.6	-7		5 50		0	0	0 N 0 N		o N 0 N	o No	N		No No	No No	No	No No	
218	10 CHELMSFORD AVENUE BLACKHEATH	5	N		45	46 3	,	1 00		45		38 3	0	-5.8	-7.4	4 -5.8	-7	.3 5	5		0	0	0 N	lo N	o N	o No	N	lo l	No	No	No	No	
	10 CHELMSFORD AVENUE BLACKHEATH	GF	W			42 3 47 3		6 30 0 32		41		34 3 38 4						.6 5	00	0 0	0	0	0 N 0 N		0 1	o No				No No	No	No No	
	22 EVANS LOOKOUT ROAD BLACKHEATH	GF	S		43 42	47 3				43	51	39 4			-4.9	3 (-3			4 0	0	0	0 N		o N		N			No	No	No	
222	22 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	43	34	42 3	4	1 00	10	34		32 3			A			1.1 50	5		0	0	0 N			o No				No	No	No	
	22 EVANS LOOKOUT ROAD BLACKHEATH 58 BRIGHTLANDS AVENUE BLACKHEATH		N N	45 46	39 39	40 3	-				41	32 3 32 3	2 30		-6.7			.8 5	5 51 5 50		0	0	0 N 0 N		-	o No		-		No No	No No	No No	'
	58 BRIGHTLANDS AVENUE BLACKHEATH		W	46	39	40 3	2 3	0 30	40	39	41	32 3	0 30 0 30	-5.6	-7.3		5 -7		5 50		0	0	0 N			o No	N		No	No	No	No	
	58 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	07	30	34 3	0 0	00	00	30	35	30 3	0 00	0.1			-0				0	0	0 N		0 N		N			No	No	No	
	58 BRIGHTLANDS AVENUE BLACKHEATH 58 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W	40 39	33 32	36 3 36 3		0 30 0 30			37	30 3 30 3	0 30 0 30					.2 5 .4 5	5 50 5 50		0	0	0 N 0 N			o No o No				No No	No No	No No	
224	58 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	35	30	33 3	0 3	0 30		30	34	30 3	0 30	-2.3	-2.4	-1.6		0 5	5 50	0 C	0	0	0 N	lo N		o No				No	No	No	1
	58 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S	36	30 30	34 3 33 3		0 30 0 30	36	30 30	35	30 3 30 3	0 30 0 30		0	0 -1.8	3	0 5	5 50 5 50		0	0	0 N 0 N		0 N		N			No No	No No	No No	+
	8 CHELMSFORD AVENUE BLACKHEATH		E W		30 41			0 30 5 30				30 3 34 3						0 5			0	-	0 N 0 N			o No o No				NO NO		No No	+'
233	8 CHELMSFORD AVENUE BLACKHEATH	GF	S	51	44	45 3	7 3	6 30		44		37 3		-5.5	-7	7 -5.4	-7	.2 5	5 50	0 0	0	0	0 N	lo N	0 N	o No	N	lo l	No	No	No	No	
	8 CHELMSFORD AVENUE BLACKHEATH 8 CHELMSFORD AVENUE BLACKHEATH	GF	E N	43	36 47	38 3		4 30	43	36	39	30 3	4 30	-4.1	-5.5		-5	6 5	5 50		0	0	0 N 0 N		0 N	o No	N			No No	No No	No No	+'
	61 EVANS LOOKOUT ROAD BLACKHEATH		N		4/	4/ 3 53 4						39 3 43 3	0 30								0	0	0 N 0 N			o No o No				NO NO	No	No No	+'
235	61 EVANS LOOKOUT ROAD BLACKHEATH	F 1		55		55 4						44 3			-1	1 1	1	-1 60	D 55	5 0	0	0	0 N	lo N	o N	o No	N	lo l	No	No	No	No	
	61 EVANS LOOKOUT ROAD BLACKHEATH 61 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	W		40 41	48 3	,			40	50 52	37 3			-2.5		3 -2 5 -1		8 53		0	0	0 N 0 N			o No o No				No No	No No	No No	+'
	61 EVANS LOOKOUT ROAD BLACKHEATH		N		35	46 3		0 30				35 3	0 30					.9 5i 1.5 5i	s 53 8 53		0	0	0 N			o No				No	No	No	t'
	61 EVANS LOOKOUT ROAD BLACKHEATH	F 1	N		37	48 3		0 30				37 3	0		-0.5			0.5 51	00		0	0	0 N			o No				No	No	No	
	61 EVANS LOOKOUT ROAD BLACKHEATH 61 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	F	47	37 39	47 3 49 3		0 30		37	49 51	36 3 38 3	0 30		-0.2		, ,	1.2 51 1.2 51	00		0	0	0 N 0 N		0 N	o No	N		No No	No No	No No	No No	+'
235	61 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	54	44	53 4	2 3	0 30	54	44	55	42 3	1 30	-0.4	-1.5	5 0.9	-1	.5 60	0 55	5 0	0	0	0 N	lo N	0 N	o No	N	lo l	No	No	No	No	
	61 EVANS LOOKOUT ROAD BLACKHEATH	F 1			45	55 4	4 3 3 3			45		44 3 33 3						.3 6			0	0	0 N			o No		-		No No		No	<u> </u>
	61 EVANS LOOKOUT ROAD BLACKHEATH 61 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	W	44	34 36	44 3	3 3 5 3	0 30	45	34	46	35 3	0 30 0 30	-0.4	-1.2	1 1	I -1	-1 6	2 55	5 0	0	0	0 N 0 N			o No o No	N			NO NO	No No	No No	+'
235	61 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	48	42	45 3	8 4	4 36	48	42	46	38 4	4 36	-2.6			-4	.2 5	5 50		0	0	0 N	lo N	0 N	o No	N	lo l	No	No	No	No	
	61 EVANS LOOKOUT ROAD BLACKHEATH 61 EVANS LOOKOUT ROAD BLACKHEATH	F 1 GF	S		43 35	46 3	9 4	4 37 0 30		43	47	39 4 35 3	5 37 0 30					1.9 51 1.2 51	5 50 3 53	-	0	0	0 N 0 N			o No o No	N		No No	No No	No No	No No	+'
	61 EVANS LOOKOUT ROAD BLACKHEATH	F 1	E		35	40 3				35	47	35 3	0 30		-0.2		3 -0		5 53 8 53		0	0	0 N			o No				No	No	No	+'
	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	46	38	43 3		0		38	44	34 3	9 30		-4.2			.9 5		1 0	0	0	0 N			o No				No	No	No	1
23	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	Ν	56	49	50 4	1 3	5 30	56	49	50	41 3	5 30	-5.8	-7.4	4 -5.8	-7	.4 5	7 52	2 0	0	0	0 N	IO N	o N	o No	N	lo	No	No	No	No	1

		F	açade	Pro	edicted	noise lev	vel Openi	ng Year 2	2030	Pr	edicted r	noise level	Design Ye	ar 2040	Ch pi	ange in n roject - Wi	oise level ithout pro	(With ject)										Do nois	se levels r exceed				
Receiver ID	Façade	Floor	Direction	Without	t project	With	project	Proje	ect Only	Without	project	With pr	oject P	Project Only		ning Year 2030		ın Year)40	NCG P roa noise c	id ritoria	NCG Proje road noise crite xceedance	Cumu oria c	NMG Ilative limit riteria dance (dB)	exceed	e levels the NCG eria?	Do noise exceed th relative in criter	e NCG crease a?	the cun limit wit	nulative h project adding the total	t contr from t	the ibution the road t Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
		level		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night D	Day Nigh	t Day	Night	Day	Night	Day	Night	Day Ni	ight Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	56		9 5					49		42		30 -5			-7.4		52	0	0		No					No	No	No	No	
	5 BRIGHTLANDS AVENUE BLACKHEATH		Ν	56			0		00				42		-5			-7.6		52	0	0		No					No	No		No	
	5 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W	56 51			0	~ '	0				42		31 -5 31 -4			-7.3		52	0	0		No No					No	No		No	
	5 BRIGHTLANDS AVENUE BLACKHEATH 5 BRIGHTLANDS AVENUE BLACKHEATH		s W	52							44		37		31 -4 31 -5			-6.8		52 52	0	0	-	No					No No	No	No	No	
237	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	49	4	2 4	5 3	7 4	1 33	49	42	46	36		31 -3	4 -5.	1 -3	-5.9	9 58	53	0	0	0 0	No	No	No I	0	No	No	No	No	No	
		5	W	47			2	0			10	14.	34		30 -5			-6.6		52	0	0		No					No	No	110	No	
		GF	S	43		7 3	9 3	-				40	30		30 -3		6 -3.2	-6.4		51	0	0		No			-		No	No		No	
	37 BRIGHTLANDS AVENUE BLACKHEATH 37 BRIGHTLANDS AVENUE BLACKHEATH	GF	E N	39	3.		0 0	0 3 3 3		39	32	37	30 34	00	30 -2 30 -5			-1.8		51	0	0		No No			-	-	No No	No No	No	No No	
			NE	66									49		46 -9			-9.9		50	1.9	0		No					No	No	No	No	
278	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NW	65		8 5							49		45	9 -9.		-9.4		50	1.6	0	0 0	No					No	No		No	
	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SW	53									39		37 -6		8 -6.7	-7.6		50	0	0		No					No	No	No	No	
	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SE NE	65 69							58 63	57 60	49 52		48 -8 50 -10			-10.7	9 56 7 55	51 50	0.9	0		No No		No I No I			No No	No No	No No	No Yes	Type 1
			NW	67			,						49		46 -1			-10.7		50	2.1	0		No			-		No	No		No	13601
	141 COXS RIVER ROAD LITTLE HARTLEY	GF	E	35	3	0 3	5 3	0 3	0 30	36	30	36	30	30	30 0		0 0.5	0	55	50	0	0	0 0	No	No	No	0	No	No	No	No	No	
	141 COXS RIVER ROAD LITTLE HARTLEY	0	N	36			6 3			36	00		30		30 0		0 0.6	0	55	50	0	0		No					No	No		No	
	141 COXS RIVER ROAD LITTLE HARTLEY 141 COXS RIVER ROAD LITTLE HARTLEY	GF	E N	36		0 3	6 3 7 3	0 3		36	30	37	30		30 -0 30 0		0 0.4	0	55	50 50	0	0		No No					No No	No	No	No	
	141 COXS RIVER ROAD LITTLE HARTLEY	0.	W	37		0 3	7 3	0 3	00	07	30	38	30	00	30 0		0 0.7	0.2	00	50	0	0		No					No	No	No	No	
318	141 COXS RIVER ROAD LITTLE HARTLEY	GF	S	31		0 3	2 3	0 3	0 30	32	30	33	30	30	30 0	.8	0 1.2	0	D 55	50	0	0		No	No	No I	0	No	No	No	No	No	
	19 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	41		4 3	8 3				34	39	30		30	-3 -4.		-4.1		50	0	0		No					No	No	No	No	
	19 BRIGHTLANDS AVENUE BLACKHEATH 19 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N	49							42		35 36		30 -5 30	.7 -7.		-7.2		50 50	0	0		No No					No No	No No	-	No	
	19 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	49		2 4							35		30 -2			-5.9		50	0	0		No					No	No		No	
	19 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	42								42	31		30 -2			-4		50	0	0		No					No	No		No	
	19 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43		5 4		1 3		43	35	42	31		30 -2			-4.2		50	0	0		No					No	No	No	No	
	94 EVANS LOOKOUT ROAD BLACKHEATH 94 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N	42		5 3 6 4		0 3			35	38	30		30 -4	.7 -5. -3 -5.		-5.3		50 50	0	0		No No					No No	No No	No No	No	
	94 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	43								42	31		30	2 -3.		-3.9		50	0	0		No					No	No		No	
358	94 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	40	3	1 3	,				31	41	30	30	30 -0			-0.6		50	0	0	0 0	No					No	No		No	
		GF	E	50		0 4			5 50		40		39		30 -0			-1.2		53	0	0		No					No	No	No	No	
	31A EVANS LOOKOUT ROAD BLACKHEATH 31A EVANS LOOKOUT ROAD BLACKHEATH		N W	54 47		4 5 8 4			0 00			55 48	43 36		30 -0 30 -0		-	-1.3		53 51	0	0		No No					No No	No No	No No	No No	
	31A EVANS LOOKOUT ROAD BLACKHEATH	GF	S	50									35		32 -0	-6 -8.		-2.2		50	0	0		No					No	No		No	
	31A EVANS LOOKOUT ROAD BLACKHEATH	GF	E	43		6 4	1 3	2 3		44	36	43	32	36	30 -1	.9 -3.	5 -1.1	-3.5		51	0	0		No	No	No I	0	No	No	No	No	No	
363	31A EVANS LOOKOUT ROAD BLACKHEATH	GF	S	44							37	43	34		30 -2			-3.8		51	0	0		No					No	No	No	No	
	32 EVANS LOOKOUT ROAD BLACKHEATH 32 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W	46	-			5 3			36 45		35 44		30 -0 30 -0		2 1	-1.2		50 52	0	0		No No					No No	No No	No No	No No	
	32 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F	50	4		5 4 0 3		9 32 0 30		45	52	39		30 -0	_		-0.4		52	0	0		No					No	No		No	
	47 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	49	4					50	43	47	39		36 -2			-4.4		51	0	0		No					No	No	No	No	
		GF	E	46		6 4							35		-0			-1.1		55	0	0		No					No	No		No	
	47 EVANS LOOKOUT ROAD BLACKHEATH 47 EVANS LOOKOUT ROAD BLACKHEATH		N	54 49									43 37		30 -0 30 -1					53 53	0	0		No No					No No	No		No No	
	9 CHELMSFORD AVENUE BLACKHEATH		W	49		4 4		7 3		49	41	49	37	36	30 -1 30 -5			-3.2		53	0	0		No					No	No	No	No	
477	9 CHELMSFORD AVENUE BLACKHEATH	GF	S	50	4	3 4		6 3	5 30	00	43	45	36		30 -5	.5 -6.	9 -5.4	-7.2	2 57	52	0	0	0 0	No	No	No I	0	No	No	No	No	No	
477	9 CHELMSFORD AVENUE BLACKHEATH	GF	E	44		7 4	0 3	1 3				40	31		30 -4					51	0	0		No					No	No	No	No	
	9 CHELMSFORD AVENUE BLACKHEATH 2 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N S	51 50				-			45	46 45	37		30 -5 30 -5			-7.4		51	0	0		No No					No No	No No	No	No No	
	2 EVANS LOOKOUT ROAD BLACKHEATH 2 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	48	4					50	43	45	35		30 -5			-7.6		55	0	0		No				No	No	No	No	No	
484	2 EVANS LOOKOUT ROAD BLACKHEATH	GF		52	4	6 4	7 3	9 3	8 31	53	46	47	38	39	-5	.4 -	7 -5.3	-7.2	2 59	54	0	0	0 0	No	No	No I	0	No	No	No	No	No	
		GF		56									42		38 -4					55	0	0		No					No	No		No	
	63 EVANS LOOKOUT ROAD BLACKHEATH 63 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	42		2 4 2 4	2 3	1 3 8 4	00	43	32	44	31	30 44	30 -0 36 -2			-0.6	5 58 4 55	53	0	0		No No					No No	No	No No	No No	
	63 EVANS LOOKOUT ROAD BLACKHEATH	GF	Ň	48			5 3			48		46	30		30 -2 30 -0		2 -2.1	-4	4 55 1 58	50	0	0		NO					NO	NO	NO	No	
503	9 EVANS LOOKOUT ROAD BLACKHEATH	GF		55	4	9 5					49		41		38 -4	.2 -6.		-8.3		53	0	0	0 0	No	No	No I	0	No	No	No	No	No	
	9 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	55			0		/ 11				40		38 -5			-9.3		53	0	0	-	No					No	No		No	
	9 EVANS LOOKOUT ROAD BLACKHEATH 9 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	48	4						41	47	36		31	2 -3.		-4.6		51	0	0		No No		No I No I			No No	No No	No	No No	
		GF	E	53		4 5. 0 3					44		41		30 -1		/ 0.2 0 -0.3	-2.8		53	0	0		NO NO					NO NO	NO		No No	
			N	43		7 3			0 30				30		30 -5			-6.5		50	0	0		No					No	No		No	
		GF	W	36			5 3						30		30 -1		-0.6			51	0	0		No	No				No	No		No	
	77 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S	41	3		9 3	0 3		41	33	41	30	31	30 -1 34 -1			-2.6	5 55	50 50	0	0		No No					No	No	No	No	
509	83 EVANS LOOKOUT ROAD BLACKHEATH 83 EVANS LOOKOUT ROAD BLACKHEATH	GF	vv S	49		2 4 4 3	o 3 8 2	9 4 0 3			42	49	39		34 -1 30 -2			-3.3	3	50 50	0	0		No No					No No	No No	No	No	
	83 EVANS LOOKOUT ROAD BLACKHEATH		N	52	-		1 4				42	53	40		30 -0			-1.5		50	0	0		No					No	No		No	
527	40 EVANS LOOKOUT DOAD REACKHEATH	CE	N	54	4	4 5	3 4	3 3	0 30	54	44	55	43	31	-0	.3 -	1 1.1	-1	1 60	55	0	0	0 0	No	No	No I	0	No	No	No	No	No	
	69 EVANS LOOKOUT ROAD BLACKHEATH		W	51					00		41	52	39		30 -0			-1.4		53	0	0		No					No	No		No	
527	69 EVANS LOOKOUT ROAD BLACKHEATH	GF	5	39	3.	2 3	σ 3	0 3	3 30	40	32	38	30	34	30 -1	.7 -2.	3 -1.2	-2.3	58	53	0	U	U 0	No	No	No I	0	No	No	No	No	NO	

		Façade	Predicted	noise leve	el Openir	ng Year 2030	Pr	edicted r	ioise level Desig	n Year 20	40	Chang proje	ge in noi ect - Witl	ise level hout pro	(With bject)										oise leve				
Receiver			Without project	With p	project	Project Only	Without	project	With project	Projec	t Only	Opening 203	y Year	Desig	gn Year 040	NCG Project road noise criteria	noise	Project oad criteria dance (dB) e	NMG Cumulativ criteri exceedanc	e limit e ia	Do noise exceed th criteri	evels NCG	o noise lev xceed the N lative incre criteria?	CG limit ase roa	I or exce cumulativ with proje ds adding to the to	re co act froi 9 proi	Is the ntribution m the road ject Acute?	Is the property identified for	Treatment Type
ID	Façade	Floor level Directior	1 		1			1				203	• 												se levels			consideration of treatment?	recommended
			Day Night	Day	Night	Day Night	Day	Night	Day Night	Day	Night		Night	Day	Night	Day Nigh		Night	Day P				Day Nig						
	69 EVANS LOOKOUT ROAD BLACKHEATH	GF W	43 35				43		42 32	34	30	-1.8	-3.4				53 (50 (0 0	0	0 N		o N		No	No	No	No	No	
	69 EVANS LOOKOUT ROAD BLACKHEATH 69 EVANS LOOKOUT ROAD BLACKHEATH	GF S GF E	46 40			12 00	47		46 38 45 32		35 30		-2.9				50 (53 (0 0	0	0 N 0 N		o N o N		No	No No	No	No No	No	
	9 99 EVANS LOOKOUT ROAD BLACKHEATH	GF S	43 33	10	0		44	00	45 52		30		-0.7			50	50 0	0 0	0	0 N		0 N		No	No	No	No	No	
	9 99 EVANS LOOKOUT ROAD BLACKHEATH	GF E	38 30				38		38 30		30	-1.2	0	-0.3			50	0 0	0	0 N		0 N		No	No	No	No	No	
	99 EVANS LOOKOUT ROAD BLACKHEATH	GF S	38 30			30 30	38		37 30		30	-1.6	0	-0.9	9 0		50 (0 0	0	0 N				No	No	No	No	No	
	99 EVANS LOOKOUT ROAD BLACKHEATH	GF E	47 36				47	00	47 35		30		-1.6				50	0 0	0	0 N		o N	0	No	No	No	No	No	
	99 EVANS LOOKOUT ROAD BLACKHEATH 99 EVANS LOOKOUT ROAD BLACKHEATH	GF N GF F	51 41 50 40				52 51		52 39 51 38		30 30		-1.5				50 (50 (0 0	0	0 N 0 N		0 N		No	No	No	No No	No	
	99 EVANS LOOKOUT ROAD BLACKHEATH	GF N	53 43				54	40	54 41		30	-1	-1.4			55	50 0	0 0	0	0 N		0 N		No	No	No	No	No	
	99 EVANS LOOKOUT ROAD BLACKHEATH	GF W	41 32				42		42 30		30	-1.2	-1.6			55	50 0	0 0	0	0 N				No	No	No	No	No	
	61 BRIGHTLANDS AVENUE BLACKHEATH	GF S	43 36				43		41 30		30		-5.1				53 (0 0	0	0 N		o N		No	No	No	No	No	
	2 61 BRIGHTLANDS AVENUE BLACKHEATH	GF E	36 30				37		37 30				0	-0.1			53 (0 0	0	0 N		o N		No	No	No	No	No	
	2 61 BRIGHTLANDS AVENUE BLACKHEATH 2 61 BRIGHTLANDS AVENUE BLACKHEATH	GF N GF W	44 37				44		39 30 40 30		30	-5.6	-7.2				53 (53 (0 0	0	0 N 0 N		o N		No	No	No	No	No No	
579	72 EVANS LOOKOUT ROAD BLACKHEATH	GF N	42 33				42		40 30		30	-4.5	-6.2				50 0	0 0	0	0 N		-		No	No	No	No	No	
579	72 EVANS LOOKOUT ROAD BLACKHEATH	GF W	45 36		34		45	36	46 34		30		-1.9				50 0	0 0	0	0 N		o N		No	No	No	No	No	
	72 EVANS LOOKOUT ROAD BLACKHEATH	GF S	50 40				50		52 39		30		-0.7			56	51 (0 0	0	0 N		o N		No	No	No	No	No	
	72 EVANS LOOKOUT ROAD BLACKHEATH	GF S GF S	49 39			3 32 30 33 30	50	39 41	51 38 53 40		30	-0.1	-0.8			56	51 (0 0	0	0 N		0 N		No	No	No	No	No	
	72 EVANS LOOKOUT ROAD BLACKHEATH 72 EVANS LOOKOUT ROAD BLACKHEATH	GF E	43 34				43		44 32		30		-0.6		0.0		50 0	0 0	0	0 N		0 N		No	No	No	No	No	
	4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF W	47 40				47				30	0.0	-6.4				51 (0 0	0	0 N		0 N		No	No	No	No	No	
584	4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF N	46 40) 42	33		47	40	42 33	33	30		-6.6		-6.5		51 (0 0	0	0 N	lo N	o N	o No	No	No	No	No	No	
	4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF W	48 40				48		48 36		30	-1.6	-3.7	-0.5			50 (0 0	0	0 N				No	No	No	No	No	
	4 34 EVANS LOOKOUT ROAD BLACKHEATH 4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF S GF W	51 41				51 52		53 40 53 40		30 30		-1.1	1.2	2 -1.2		50 (50 (0 0	0	0 N 0 N		o N o N		No No	No No	No No	No No	No	
	4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF VV	54 44				52				30		-1.0	1.1			50 52 0	0 0	0	0 N		0 N		No	No	No	No	No	
	4 34 EVANS LOOKOUT ROAD BLACKHEATH	GF E	45 36		34	34 30	46	36	46 34		30	-0.9	-2.3	0.3	-2.3	55	50 0	0 0	0	0 N		o N	o No	No	No	No	No	No	
584	34 EVANS LOOKOUT ROAD BLACKHEATH 15 CHELMSFORD AVENUE BLACKHEATH	GF N GF W	47 40				48		43 34 44 35		30 30	-5	-6.6			56	51 (51 (0 0	0	0 N 0 N	lo N	o N o N		No	No No	No	No No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	F1 W	51 45				49		44 35		30	0.0	-7.1				51 0	0 0	0	0 N		0 N		No	No	No	No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	F2 W	54 47				54		48 40		30	-5.8	-7.4			56	51 (0 0	0	0 N				No	No	No	No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	GF S	47 40				47		42 33		30	-5.2	-6.7				51 (0 0	0	0 N				No	No	No	No	No	
	7 15 CHELMSFORD AVENUE BLACKHEATH 7 15 CHELMSFORD AVENUE BLACKHEATH	F 1 S F 2 S	48 42				49 50		43 35 45 36		30 30		-6.8 -6.9			00	51 (51 (0 0	0	0 N 0 N		o N o N		No	No No	No No	No No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	GF E	35 30				36		33 30		30		-0.9				51 (0 0	0	0 N		0 N		No	No	No	No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	F1 E	37 30			30 30	37	30	35 30		30	-3.1	0	-2.6		56	51 (0 0	0	0 N				No	No	No	No	No	
58	15 CHELMSFORD AVENUE BLACKHEATH	F 2 E GE N	39 32 49 42				40		37 30 43 35		30 30	-3.3	-2.2	-2.8		56	51 (0 0	0	0 N 0 N		0 N		No	No	No	No	No	
	15 CHELMSFORD AVENUE BLACKHEATH 15 CHELMSFORD AVENUE BLACKHEATH	F1 N	51 45				49		43 35		30		-7.5				51 0	0 0	0	0 N		o N		No No	No No	No	No No	No	
	15 CHELMSFORD AVENUE BLACKHEATH	F2 N	53 46			3 30 30	53	46	47 39		30	-5.9	-7.7	-5.9		56	51 (0 0	0	0 N		0 N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	GF W	47 38				48		48 36		30	-0.5	-1.7	0.7			50 (0 0	0	0 N				No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH 53 EVANS LOOKOUT ROAD BLACKHEATH	F 1 W F 2 W	50 42 54 46				50 54		50 39 54 43		31 38		-2.6		2.0		50 (50 (0 0	0	0 N 0 N		o N o N		No No	No No	No No	No No	No No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F 3 W	54 40				55		54 43		30	-1.3	-3.1	-0.2			50 0	0 0	0	0 N				No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F4 W	55 47				55	47	55 44	48	40	-1.3	-3.1	-0.4	4 -3.1	55	50	0 0	0	0 N	lo N	o N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	GF S	49 43				49		47 39		37	-2.3	-4.2				50 (0 0	0	0 N				No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH 53 EVANS LOOKOUT ROAD BLACKHEATH	F 1 S F 2 S	49 43				50 50		48 40 49 40		38 39		-3.8				50 (50 (0 0	0	0 N 0 N		o N		No No	No No	No	No No	No No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F 3 S	50 44				51	44	50 41		39	-1.6	-3.4				50 0	0 0	0	0 N		0 N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F4 S	51 45				51		50 41		39	-1.7	-3.4	-1.2			50 (0 0	0	0 N		o N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH 53 EVANS LOOKOUT ROAD BLACKHEATH	GF E F1 E	42 32 45 34				43 45						-0.2 -0.2				50 (50 (0 0	0	0 N 0 N		o N o N		No	No	No	No No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F1 E F2 E	45 34				45		40 34 49 37		30	0.1	-0.2				50 0	0 0	0	0 N		-		No	No	No	No	No	
	5 53 EVANS LOOKOUT ROAD BLACKHEATH	F3 E	50 39			30 30	51	39	52 39	30	30	0.1	-0.1	1.3	3 -0.1	55	50 0	0 0	0	0 N		o N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F4 E	50 40	, 01	1	00 00	51	10	52 40		30	0.1	-0.2		0.2	00	50 (0 0	0	0 N		o N		No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	GF N F 1 N	53 43 54 44				53 55		54 41		30		-1.3		1 -1.3		50 0	0 0	0	0 N 0 N		o N		No	No	No	No No	No	├ ───┤
	53 EVANS LOOKOUT ROAD BLACKHEATH	F1 N F2 N	54 44				55		56 43 56 44		30 30	-0.3	-1.2	0.5			50 0.1 50 1.3	3 0	0	0 N		0 N	-	NO	NO	NO	No	No	<u> </u>
61	5 53 EVANS LOOKOUT ROAD BLACKHEATH	F3 N	55 46	5 55	44	33 30	56	46	56 44	33	30	-0.5	-1.6	0.6	-1.6	55	50 1.3		0	0 N	lo N	o N	o No	No	No	No	No	No	
	53 EVANS LOOKOUT ROAD BLACKHEATH	F4 N GE N	55 46				56						-1.7				50 1.	1 0	0	0 N		o N		No	No	No	No	No	
	2 2A VALLEY VIEW ROAD BLACKHEATH	GF N GF W	48 42				49 50		43 34 44 35		30 30		-7.6				50 (50 (0 0	0	0 N 0 N		o N		No No	No	No	No No	No	<u> </u>
	2 2A VALLET VIEW ROAD BLACKHEATH	GF S	47 40			30 30	48		42 33	30	30	-5.7	-7.4			55	50 (0 0	0	0 N	lo N	0 N		No	No	No	No	No	
	2 2A VALLEY VIEW ROAD BLACKHEATH	GF E	42 36			30 30	43		38 30		30		-5.6				50 (0 0	0	0 N		o N		No	No	No	No	No	
	21 BRIGHTLANDS AVENUE BLACKHEATH	GF S	46 39		-	38 30	47		44 34		30		-5.1				50 0	0 0	0	0 N		o N		No	No	No	No	No	├ ───┤
	21 BRIGHTLANDS AVENUE BLACKHEATH	GF W GF S	47 40			38 31 38 31	47		44 34 45 34		30 30	-3.4	-5.6	-2.7		56	51 (51 (0 0	0	0 N 0 N		o N o N		No	No No	No	No No	No No	<u> </u>
690	5 21 BRIGHTLANDS AVENUE BLACKHEATH	GF E	39 32	2 37	30	30 30	40	32	38 30	31	30	-2.5	-2.1	-1.7	7 -2.1	56	51 (0 0	0	0 N	lo N	o N	o No	No	No	No	No	No	
690	5 21 BRIGHTLANDS AVENUE BLACKHEATH	GF N	47 41	42	33	30 30	48	41	42 33	31	30	-5.6	-7.3	-5.7	7 -7.2	56	51 (0 0	0	0 N	lo N	o N	o No	No	No	No	No	No	

		F	açade	Pr	edicted	l noise le	vel Openi	ng Year 2	030	Pr	edicted I	noise level	Design Year	2040	Char pro	nge in no ject - Wit	oise level thout pro	(With ject)											se levels or exceed				
Receiver ID	Façade	Floor level	Direction	Without	t projec	t With	ı project	Proje	ct Only	Without	project	With pro	oject Pro	oject Only	Openin 20			ın Year)40	NCG Pi roa noise c	id ritoria	NCG Pro road noise crit exceedanc	Ci teria	NMG umulative lii criteria ceedance (i	excee	ise level d the NC iteria?	s G relative	se levels the NCG increase eria?	the cur limit wit roads ≥2dB to	mulative th project adding the total levels?	t contr from	the ibution the road t Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Night		Night	Day	Night	Day	Night	Day 1	Night Day	y Night	Day	Night	Day	Night		Night		Night	Day Nig	nt Day	Nigh	t Day	Night	Day	Night	Day	Night		
	21 BRIGHTLANDS AVENUE BLACKHEATH		W	41		14 3	39 3							32 30				-4		50		0	0	0 No	No	No	No	No	No	No		No	
	82 EVANS LOOKOUT ROAD BLACKHEATH	GF GF		51 50		11 5 19 5		1 3 9 3						36 30 30 30						50 50		0	0	0 No	No	No	No	No	No	No		No	I
	82 EVANS LOOKOUT ROAD BLACKHEATH 82 EVANS LOOKOUT ROAD BLACKHEATH		NE	50		19 5 17 4					39	43		30 30				-0.1		50 50	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No No		No	+I
	82 EVANS LOOKOUT ROAD BLACKHEATH		NW	43	3	15 3	38 3	0 3	30	43	35	39	30	30 30	-4.2	-5.3		-5.3		50	0	0	0	0 No	No	No	No	No	No	No	No	No	
	54 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	54		14 5			51		44			39 30		-1.2		-1.3		51	0	0	0	0 No	No	No	No	No	No	No	No	No	
	54 EVANS LOOKOUT ROAD BLACKHEATH 54 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	49		19 4 19 4	., .,	0	00		39 39		00	30 30 30 30		-0.3		-0.3	3 56	51	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No No		No No	
	54 EVANS LOOKOUT ROAD BLACKHEATH		W	40		19 4		-						35 30				-1.9	50	51	0	0	0	0 No	No	NO	No	No	No	No		No	+
	68 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	45	-	9 4		1 3	30	46		41	32	30 30	-5.4			-7.1		50	0	0	0	0 No	No	No	No	No	No	No	No	No	
	68 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	49		1 4								32 30				-3.5		51	0	0	0	0 No	No	No	No	No	No	No		No	
	68 EVANS LOOKOUT ROAD BLACKHEATH 68 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	52 44		1 5 13 4					41	53 45		34 30		-0.7		-0.7		51	0	0	0	0 No	No	No	No	No	No	No No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	W	44		13 4 19 4	0	3 3 7 4		44	33	45		30 30 44 36	-0.1	-0.7		-0.7		51	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No	No No	No No	<u> </u>
742	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	39	3	12 3	36 3	0 3	4 30	39	32	36	30	35 30	-2.9	-2	-2.6	-2	2 56	51	0	0	0	0 No	No	No	No	No	No	No	No	No	
		GF	E	49		3 4								44 37				-5.4		51	0	0	0	0 No	No	No	No	No	No	No		No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 31 EVANS LOOKOUT ROAD BLACKHEATH	GF	N S	50 50		13 4 15 4					43			44 37 43 33						51 50		0	0	0 No 0 No	No	No	No No	No No	No	No No		No	<u> </u>
	31 EVANS LOOKOUT ROAD BLACKHEATH	GF	F	46		5 4		5 3		46	43	43	35	35 30		-0.2	2 0.6	-7.1	56	51	0	0	0	0 No	No	No	No	No	No	No	No	No	+
	31 EVANS LOOKOUT ROAD BLACKHEATH	GF		53		14 5								38 30		-2	2 0.7	-2.1	58	53	0	0	0	0 No	No	No	No	No	No	No		No	
	31 EVANS LOOKOUT ROAD BLACKHEATH		W	52		15 4					45	51		42 32		-5.1		-5.5		51	0	0	0	0 No	No	No	No	No	No	No		No	
	31 EVANS LOOKOUT ROAD BLACKHEATH 31 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S	50		15 4 15 4	0	7 4		51	45 45	45 46		43 33 43 33		-7.7		-8.7		50	0	0	0	0 No 0 No	No	No	No No	No No	No	No No	No	No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43		6 4		1 3	5 30	43	36	41	31	35 30		-4.7		-4.9		52	0	0	0	0 No	No	No	No	No	No	No	No	No	+
807	33B BRIGHTLANDS AVENUE BLACKHEATH	F 1	S	45		48	1	0	00		00		00	37 30				-4.9	57	52		0	0	0 No	No	No	No	No	No	No	No	No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 2	S	47		40 4		5 3						39 30				-5.3		52	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	F 3 GF	S	49		2 4	15 3	7 4 0 3		49	42	47	37 30	41 33 30 30			5 -2.6 0 -0.8	-5.6	5 57	52 53	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No No	No No	No No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 1	E	30		10 3	32 3			33				30 30				0		53	0	0	0	0 No	No	No	No	No	No	No		No	
807	33B BRIGHTLANDS AVENUE BLACKHEATH	F 2	E	36		10 3	35 3	0 3			30	37	30	30 30		C	0.5	0	58	53	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 3	E	38	-	10 3	37 3				00	39	00	30 30			0.5	0	58	53	0	0	0	0 No	No	No	No	No	No	No		No	
807	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	GF F 1	N	47		1 4				48	41	42	33 34	30 30		-7.5		-7.4		53	0	0	0	0 No 0 No	No	No	No No	No	No	No No	No	No No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 2	N	48		2 4		4 3					34	30 30				-7.4		53	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 3		49		42 4	13 3	5 3			42			30 30				-7.4		53		0	0	0 No	No	No	No	No	No	No	No	No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	GF F 1	W	47		1 4	1 3			48	41	42	33 34	30 30		-7.5		-7.5		53 53	0	0	0	0 No 0 No	No	No	No	No No	No No	No No	No	No	
	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	F I		48		2 4								30 30				-7.4		53 53	0	0	0	0 No	No	NO	No No	NO	NO	No	NO	No	+
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 3		49		2 4	13 3	5 3	1 30	49				31 30		-7.4	4 -5.8	-7.4	1 58	53	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	GF		47		1 4		3 3	00		41		00	30 30		-7.5		-7.5	00	53	0	0	0	0 No	No	No	No	No	No	No	No	No	
807	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	F 1 F 2	N	48		1 4		4 3 4 3	30	48	41 42	42	34 34	30 30		-7.5		-7.5		53 53	0	0	0	0 No 0 No	No	No	No No	No	No	No No	No No	No No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 3		49		2 4	0		00					32 30				-7.4		53	0	0	0	0 No	No	No	No	No	No	No		No	+
807	33B BRIGHTLANDS AVENUE BLACKHEATH	GF	W	48		1 4	13 3	4 3						35 30						52	0	0	0	0 No	No	No	No	No	No	No	No	No	
001	33B BRIGHTLANDS AVENUE BLACKHEATH	F 1		49		2 4		0		49	14.		00	36 30		0.1		0.0		52	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	F 2 F 3	W	50		13 4		7 3		50 52	43	46	36 38	38 30		-6.8		-6.9		52 52	0	0	0	0 No 0 No	No	No	No No	No No	No	No No	No	No	+
	33B BRIGHTLANDS AVENUE BLACKHEATH	GF	S	44		10 4	10 3	o 4 2 3	5	01	10	47		35 30	0	7.1	1.1	1.0	, 0,	52	0	0	0	0 No	No	No	No	No	No	No	No	No	
807	33B BRIGHTLANDS AVENUE BLACKHEATH	F 1	S	46	3	19 4			5 30	46	39	43	33	36 30		-5.7	-3.4	-6	57	52	0	0	0	0 No	No	No	No	No	No	No	No	No	
807		F 2	S	47		1 4		5 3	3 31	48	41	44	34	38 30	-4	-5.8		-6.1		52	0	0	0	0 No	No	No	No	No	No	No	No	No	
	33B BRIGHTLANDS AVENUE BLACKHEATH 33B BRIGHTLANDS AVENUE BLACKHEATH	F 3 GF	S W	49		13 4 10 4					43	46		41 32 35 30				-6.5 -6.5		52 52	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No No	No	No No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 1		47		11 4								36 30						52		0	0	0 No	No	No	No	No	No	No		No	
807	33B BRIGHTLANDS AVENUE BLACKHEATH	F 2	W	49	4	3 4	15 3	6 3	3 31	50	43	46	36	38 30	-4.5	-6.3	-4.1	-6.4	1 57	52	0	0	0	0 No	No	No	No	No	No	No		No	
	33B BRIGHTLANDS AVENUE BLACKHEATH	F 3 GF	W	51		4 4		8 4			44	47		41 32 30 30	-4.5			-6.5		52 50	0	0	0	0 No	No	No	No	No	No	No		No	
	101A EVANS LOOKOUT ROAD BLACKHEATH 101A EVANS LOOKOUT ROAD BLACKHEATH	GF	vv S	30		10 4 10 3	ы 3 18 2	2 3	5	00	30	45	32	30 30			1 14.6	2.1	55	50 50	0	0	0	0 No 0 No	No	No No	No No	No No	No	No No	No	No	┨────┤
819	101A EVANS LOOKOUT ROAD BLACKHEATH	GF	E	30		10 3	35 3				30	36		30 30			5.5	0	55	50	0	0	0	0 No	No	No	No	No	No	No		No	1
	101A EVANS LOOKOUT ROAD BLACKHEATH	GF	E	30		10 3	34 3		30	30	30	35	30	30 30	3.7	C	4.8	0	55	50	0	0	0	0 No	No	No	No	No	No	No	No	No	
	101A EVANS LOOKOUT ROAD BLACKHEATH 101A EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	30 30		10 3 10 4	35 3 18 3		50		30 30	36 49	30 37	30 30 30 30	4.7	6.7) 5.8 7 19.4	6.7	55	50 50	0	0	0	0 No 0 No	No No	No No	No No	No No	No No	No No	No	No No	<u> </u>
	79 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	30		40 4 18 4								30 30				-0.6		50		0	0	0 No	No	NO	No	No	NO	No		No	╂────┤
	79 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	53		13 5		-						33 30						50		0	0	0 No	No	No	No	No	No	No	_	No	
	79 EVANS LOOKOUT ROAD BLACKHEATH		W	47		8 4		6 3		47	38	48		35 30	-0.6			-2.2	2 55	50	0	0	0	0 No	No	No	No	No	No	No	No	No	
	79 EVANS LOOKOUT ROAD BLACKHEATH 97 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S W	47		1 4	5 3	7 4 6 3				46	37	43 35 30 30		-3.7	7 -1.5	-3.5	55	50 50	0	0	0	0 No 0 No	No	No No	No No	No No	No No	No No	No No	No	────
	97 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	47	-	18 4 10 3	17 3 35 3				38		30	30 30		-2	2 0.7	-2	2 55	50	0	0	0	0 No	No	No	No	No	No	No		No	
865	97 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	43	3	13 4	12 3	2 3	30	44	33	44	32	30 30	-0.8	-1.6	5 0.6	-1.6	55	50	0	0	0	0 No	No	No	No	No	No	No	No	No	
	97 EVANS LOOKOUT ROAD BLACKHEATH		N	54		13 5								31 30				-1.1		50	0	0	0	0 No	No	No	No	No	No	No		No	
865	97 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	52	4	1 5	01 4	0 3	1 30	52	41	53	40	31 30	-0.5	-1.2	2 0.9	-1.2	2 55	50	0	0	0	0 No	No	No	No	No	No	No	No	NO	1

		Façade	P	redicted	noise lev	vel Openir	ng Year 2030	P	edicted n	ioise level Desig	n Year 20	40	Chang proje	je in noi: ect - With	se level nout pro	(With ject)										se levels r exceed				
Receiver ID	Façade		Withou	ıt projec	t With	project	Project Only	Withou	t project	With project	Projec	t Only	Opening 2030	ı Year 0	Desig 20	n Year 40	NCG Project road noise criteria	re noise	Project road C e criteria dance (dB) e	NMG Cumulative criteria xceedance	exce	noise lev ed the N criteria?	els CG relativ	oise levels ed the NCG ve increase riteria?	the cui limit wit roads ≥2dB to	mulative h project adding the total	ls contri from ti project	ibution he road	Is the property identified for consideration of	Treatment Type recommended
		Floor level Direct	ion Day	Night	Day	Night	Day Night	Day	Night	Day Night	Day	Night	Day	Night	Day	Night	Day Night	Day	Night	Day N	ght Da	y Nic	ht Day	Night	noise Day	levels? Night	Day	Night	treatment?	recommended
			50,9		July		Suy night		g.n	Suy High			2.09	g.n			buy mgm	,	giit	5d) 11	gin De	.,			5,		Suy	g.it.		
	97 EVANS LOOKOUT ROAD BLACKHEATH	GF N	52					52				30	-0.5	-1.2		-1.2		i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	49 FOREST PARK ROAD BLACKHEATH	GF S	30					30		40 31 33 30		30		1.1				60 (60 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	49 FOREST PARK ROAD BLACKHEATH 49 FOREST PARK ROAD BLACKHEATH	GF E GF S	30		0 3		00 00	30	00	33 30		30 30		0	2.6		00	50 0 50 0	0 0	0	0 No 0 No	No	No	No No	No No	No No	No No	No No	No No	
	49 FOREST PARK ROAD BLACKHEATH	GF E	30					30		33 30		30	1.7	0	2.5	0.1		60 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	49 FOREST PARK ROAD BLACKHEATH	GF S	30				30 30	30		34 30		30	2.7	0	3.5	0		i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	49 FOREST PARK ROAD BLACKHEATH 49 FOREST PARK ROAD BLACKHEATH	GF E GF N	30		0		00 00	30 30		33 30 37 30		30 30		0	1.0	0		60 (60 (0 0	0	0 No 0 No	No	No	No No	No No	No No		No No	No No	
	49 FOREST PARK ROAD BLACKHEATH	GF E	30		-			30		35 30		30	3.3	0		0		50 (0 0	0	0 No	No	No	No	No	No			No	
	49 FOREST PARK ROAD BLACKHEATH	GF N	30	0 3	0 3		30 30	30	30	36 30	30	30	4.8	0	6	0	55 5	i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	
		GF E	30			-		30		35 30		30	3.5	0	1.0	0	00	50 0	0 0	0	0 No	No	No	No	No	No		No	No	
	49 FOREST PARK ROAD BLACKHEATH 49 FOREST PARK ROAD BLACKHEATH	GF N GF W	30		0 3			30		38 30 35 30		30 30		0	8.1	0		50 (50 (0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No No	<u> </u>
893	4 EVANS LOOKOUT ROAD BLACKHEATH	GF S	53	3 4	7 5	0 41	47 39	53	47	51 40	47	37	-2.8	-5.4	-2.2	-6.7	58 5	i3 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	4 EVANS LOOKOUT ROAD BLACKHEATH	GF E	48				12 00	48		47 36		32	-1.7	-3.2	-1.2	-4.2		50 0	0 0	0	0 No	No	No	No	No	No	No	No	No	
	4 EVANS LOOKOUT ROAD BLACKHEATH 4 EVANS LOOKOUT ROAD BLACKHEATH	GF N GF W	52					52 50		47 38 47 37		30 31		-7.1				i3 (i3 (0 0	0	0 No 0 No	No	No	No No	No No	No No		No No	No No	<u> </u>
902	43 BRIGHTLANDS AVENUE BLACKHEATH	GF N	47	7 4	0 4			47		42 33	31	30		-7	-5.3	-7	56 5		0 0	0	0 No	No	No	No	No	No	No	No	No	
	43 BRIGHTLANDS AVENUE BLACKHEATH	GF N	42				30 30	42		38 30 42 34		30 30	-4.6	-5.1 -7.3	-4.4		55 5	60 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	43 BRIGHTLANDS AVENUE BLACKHEATH 43 BRIGHTLANDS AVENUE BLACKHEATH	GF N GF W	48				0. 00	48		42 34		30	-5.6	-7.3			50 5		0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No	
	43 BRIGHTLANDS AVENUE BLACKHEATH	GF S	43	-				43				30	-3.6	-5.5				i3 (0 0	0	0 No	No	No	No	No	No			No	
	43 BRIGHTLANDS AVENUE BLACKHEATH	GF S	40					40		39 30		30	-1.9	-2.1	-1	-2.1		i3 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	43 BRIGHTLANDS AVENUE BLACKHEATH	GF S GF F	43					43		41 31 37 30		30 30	-3.1	-4.8		-4.9		63 (60 (0 0	0	0 No 0 No	No	No	No	No No	No	No No	No No	No	
		GF E	48					48		43 35		34		-6.4			56 5		0 0	0	0 No	No	No	No	No	No		No	No	
904	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF N	48					48		43 35	42	34		-6.5	-5.3	-6.1	56 5	i1 (0 0	0	0 No	No	No	No	No	No	No	No	No	
		GF W GF S	41				35 30 33 30	41		38 30 35 30		30	-3.7	-4 -5.4	-3.4	-4 -5.4	56 5	51 (51 (0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	GF E	31		0 3			31		31 30		30		-5.4	-0.3	-5.4	56 5		0 0	0	0 No	No	No	No	No	No		No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F1 E	32		-			33		32 30		30		0	0.0	0	56 5		0 0	0	0 No	No	No	No	No	No			No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F2 E F3 E	34					34		34 30 36 30		30	-1.4	0	-0.4	0	56 5 56 5	51 (51 (0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	GF S	32		0 3			32		32 30	30	30	-1.4	0		0	55 5	60 (0 0	0	0 No	No	No	No	No	No		No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F1 S	33					34		33 30		30	-1.4	0		0		50 0	0 0	0	0 No 0 No	No	No	No	No	No	No No	No No	No No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F 2 S F 3 S	35			3 30 5 30	30 30 30 30	35	30 30	35 30 37 30		30 30	-1.8	0	-0.5	0	55 5	50 (50 (0 0	0	0 No	No	No	No No	No No	No No	No	No	No	
928	42 BRIGHTLANDS AVENUE BLACKHEATH	GF E	30	0 3	0 3		30 30	31	30	30 30		30	-0.1	0	-0.5	0		i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F1 E	32		0 3			33		32 30 34 30		30		0	-0.2	0		60 (60 (0 0	0	0 No	No	No No	No	No	No	No No		No	
	42 BRIGHTLANDS AVENUE BLACKHEATH 42 BRIGHTLANDS AVENUE BLACKHEATH	F2 E F3 F	34	-	-	-	30 30 30 30	34		34 30 36 30		30 30	-1.5	0	-0.4	0	00 0	50 (0 0	0	0 No 0 No	NO	NO	No	No No	No No	NO	No No	No No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	GF N	47				30 30	47		41 32		30	-6	-7.6	-6	-7.5	56 5		0 0	0	0 No	No	No	No	No	No	No	No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH 42 BRIGHTLANDS AVENUE BLACKHEATH	F1 N F2 N	4		0 4 1 4					42 33 42 33		30 30		-7.5 -7.5					0 0	0	0 No 0 No	No	No No	No	No No	No No			No No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F2 N F3 N	4					40		42 33		30	-5.9	-7.5	-5.9		56 5	_	0 0	0	0 No	No	No	No	No	No			No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	GF W	39	9 3	2 3	5 30	30 30	39	32	36 30	30	30	-3.6	-1.9	-3.2	-1.9	56 5	51 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH 42 BRIGHTLANDS AVENUE BLACKHEATH	F1 W F2 W	45		8 4 2 4		00 00	45		41 32 44 35		30 30	-5	-6.8 -7.3			56 5	51 (51 (0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH	F2 W F3 W	40					49		44 35		30		-7.5	-5.3		56 5		0 0	0	0 No	No	No	No	No	No		No	No	
928	42 BRIGHTLANDS AVENUE BLACKHEATH	GF S	42				32 30	42		38 30	32	30	-4.2	-5.1	-3.8	-5.1	56 5	51 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	42 BRIGHTLANDS AVENUE BLACKHEATH 42 BRIGHTLANDS AVENUE BLACKHEATH	F1 S F2 S	43				34 30 35 30	44		40 31 41 32		30 30	-4.3	-6.3 -6.9	-3.9	-6.4	56 5	51 (51 (0 0	0	0 No 0 No	No	No No	No	No No	No	No	No No	No No	<u> </u>
	42 BRIGHTLANDS AVENUE BLACKHEATH	F 3 S	43					40		41 32		30		-0.9					0 0	0	0 No	No	No	No	No	No			No	
936	2A VALLEY VIEW ROAD BLACKHEATH	GF E	37	7 3	0 3	3 30		38		34 30	30	30	-3.8	-0.2	-3.3	-0.2		i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	2A VALLEY VIEW ROAD BLACKHEATH 2A VALLEY VIEW ROAD BLACKHEATH	GF N GF W	48				30 30	49		43 34 44 35		30	-6.1	-7.7	-6.1	-7.7	55 5	50 (50 (0 0	0	0 No 0 No	No	No	No	No No	No No	No	No No	No	
	2A VALLEY VIEW ROAD BLACKHEATH	GF VV GF S	4		3 4 0 4			47	10	44 35		30		-7.5	-5.9		00	50 (50 (0 0	0	0 NO	No	No	No	No	No		No	No	
941	143 COXS RIVER ROAD LITTLE HARTLEY	GF N	37				30 30	38		39 31		30		0	1	0.6		60 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	143 COXS RIVER ROAD LITTLE HARTLEY 143 COXS RIVER ROAD LITTLE HARTLEY	GF W GF S	30				30 30 30 30	37	30 30	39 31 32 30		30	0.6	-0.1	1.1	0.5		50 (50 (0 0	0	0 No 0 No	No	No	No	No No	No No	No No	No No	No No	
	143 COXS RIVER ROAD LITTLE HARTLET	GF E	33		0 3			34				50		0	0.3	0	55 5	i0 (0 0	0	0 No	No	No	No	No	No	No		No	
956	43 EVANS LOOKOUT ROAD BLACKHEATH	GF W	43	3 3	5 4	2 32	34 30	43	35	43 32	34	30	-1.2	-2.8	-0.2	-2.8	58 5	i3 (0 0	0	0 No	No	No		No	No	No		No	
	43 EVANS LOOKOUT ROAD BLACKHEATH 43 EVANS LOOKOUT ROAD BLACKHEATH	GF S GF E	50				44 37 35 30	50	44	48 39 43 32		37	-3.1	-4.9	-2.8	-4.9	57 5	52 (0 0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No	
		GF E GF N	43	-				53		43 32	35	30		-3.4			57 5	51 (0 0	0	0 NO	No	No	No	No	NO		No	No	
	43 EVANS LOOKOUT ROAD BLACKHEATH	GF W	49				37 30	49		49 37	37	30		-2.7	-0.2			j2 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	43 EVANS LOOKOUT ROAD BLACKHEATH 15 EVANS LOOKOUT ROAD BLACKHEATH	GF N GF W	41					48	39	48 36 49 38		30	-0.9	-2.4	-3.4	-2.4		52 (50 (0 0	0	0 No 0 No	No	No	No	No No	No No		No No	No No	
976	15 EVANS LOOKOUT ROAD BLACKHEATH	GF S	54	4 4	8 4		48 40	55	48	49 39	48			-7.5				52 (0 0	0	0 No	No	No	No	No	No			No	
976	15 EVANS LOOKOUT ROAD BLACKHEATH	GF E	49	9 4	0 4		37 30	49	40	50 38	38	30	-1	-2.5	0.2	-2.7	55 5	i0 (0 0	0	0 No	No	No	No	No	No	No	No	No	

		F	açade	P	redicted	noise le	evel Open	ing Year 2	030	Prec	dicted no	oise leve	el Desigr	n Year 2040	C	hange in r project - W	noise level Vithout pro	(With eject)										noise leve al or exce				
Receiver	Facade			Withou	ıt projec	t Wit	h project	Proje	ct Only	Without p	roject	With p	roject	Project Or		ning Year 2030	Desig	gn Year 040	NCG Pro road noise crit	oria no	CG Project road bise criteria eedance (di	Cumula cri	iteria	Do noise exceed th criter	e NCG	Do noise lev xceed the f elative incre criteria?	ICG ICG Iimi ase ro	cumulativ t with proje ads adding B to the to	ve c ect fro g pro	Is the ontribution om the road oject Acute?	Is the property identified for	Treatment Type
ID		Floor level	Direction																								nc	vise levels	?		consideration of treatment?	recommended
074		05		Day	Night	Day	Nigh		Night	Day	Night	Day	Night	Day Ni				Night		light D	ay Night	Day				Day Ni				ay Night		
	15 EVANS LOOKOUT ROAD BLACKHEATH 41 BRIGHTLANDS AVENUE BLACKHEATH	GF	N F	53				12 30 30 30		53	43 32	54 38	41	-		0.6 -1 2.4 -1	.8 0.1	_		50 50	0	0 0	0 0 N 0 0 N			o No o No	No	No	No	No	No	
	41 BRIGHTLANDS AVENUE BLACKHEATH	0.	N	4	,		00	30 30		48	41	42	30	00		5.5 -7		-7.2		51	0	0 0	0 0 0		0 N		No	No	No	No	No	
1014	41 BRIGHTLANDS AVENUE BLACKHEATH		W	44		7	40 3	31 32		44	37	40	31	32	30	1.4 -6		-6.4	4 56	51	0	0 0	0 N		0 N	o No	No	No	No	No	No	
	41 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43				30 31		44	37	40	30	34		3.9 -6	-	-6.5		52	0	0 0	0 0 N		0 N		No	No	No	No	No	
	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	s.	66			0	53 42 51 38			60 58	61 59	52 50		33 -	5.7 -7		-7.5		31	5.1 1. 3.2	.3 (0 0 0		0 N		No	No	No	No	No	
	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	55				1 3			48		40				.3 -5.8			51	0	0 0	0 0			o No	No	No	No	No	No	
1017	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	50	0 4	3		36 32	2 30		43	44	36	32	30 -	5.5 -7	.1 -5.	-7.2	2 55	51	0	0 0) 0 N	lo N	lo N	o No	No	No	No	No	No	
	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF	N	57				13 33 19 33		57	50 56	51 58	42			5.8 -7		-7.5	5 55	50 51	0	0 0	0 0 N 0 0 N	lo N		o No	No	No	No	No	No	
	101 GREAT WESTERN HIGHWAY BLACKHEATH 101 GREAT WESTERN HIGHWAY BLACKHEATH		W N	63				19 3.			56	58 57	49			5.8 -7				51	1.5		0 0 0			o No o No	No No	No	No No	No	No	
1017	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF	W	63		-	57 4	19 34			56	57	49			5.8 -7		3 -7.4	4 56	51	1.3	0 0	0 0		o N	o No	No	No	No	No	No	
1017	101 GREAT WESTERN HIGHWAY BLACKHEATH	GF	N	63	-	7		19 34		64	57	58	49	34	30 -	5.8 -7		-7.4		51	1.8	0 0) 0 N	lo N	0 N	o No	No	No	No	No	No	
	10 BRIGHTLANDS AVENUE BLACKHEATH 10 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	E	46				33 34 38 34	00	46	39 46	41 47	32			4.7 -6 5.7 -7		-6.5		50 52	0	0 0	0 0 0		o N		No	No	No	No	No	
	10 BRIGHTLANDS AVENUE BLACKHEATH 10 BRIGHTLANDS AVENUE BLACKHEATH		N	52	-			18 34 19 36			46 46	47	38			5.7 -7 5.7 -7				52 50	0	0 0	0 0 0		0 N		No No	No No	No No	No	No	
	10 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	52				38 36			45	47	38			5.5 -7				51	0	0 0	0 0 N		0 N		No	No	No	No	No	
	10 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	46				33 35		46	39	42	33			4.3 -6		-6.2	2 55	50	0	0 0	0 0 N		lo N		No	No	No	No	No	
	10 BRIGHTLANDS AVENUE BLACKHEATH 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF GF	E	45				32 34 12 48		46	39 46	41 50	32 42			4.8 -6 2.9 -3				50 51	0	0 0	0 0 N 0 0 N		o N	o No	No	No	No	No No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	58				12 40		58	40	55	42			2.9 -3				53	0	0 0	0 0 0				No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	Ŵ	53	3 4	6	45 3	38 43	36	53	46	46	39	44		7.4 -8	.1 -7.1	-7.1	7 56	51	0	0 0	0 0 N			o No	No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	55		,		38 45	00	55	49	47	39			3.4 -10		-10	00	50	0	0 0	0 N		0 N		No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E	54				13 50 14 51			47 48	51 52	44			3.3 -4 3.3 -4		3 -3.7		53 53	0	0 0	0 0 0		0 N	o No	No	No	No No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		W	50				14 5		55	48	52 51	45			3.3 -4).4	-1 -2.9	-3.1		53	0	0 0	0 0 0		0 1		NO	NO	NO	NO	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	50				34 4		51	44	43	34				10 -4	3 -9.6		51	0	0 0	0 N		o N		No	No	No	No	No	
	82 STATION STREET BLACKHEATH	GF		52				12 4			47	50	42		10		-5 -2.8			50	0	0 0	0 N			o No	No	No	No	No	No	
	82 STATION STREET BLACKHEATH 82 STATION STREET BLACKHEATH		NW SW	50				37 4° 13 4!		50	44 48	46 51	38			4.7 -6 4.7 -5	.3 -4.5	5 -6 8 -5.1		50 53	0	0 0	0 0 N 0 0 N		0 N	o No	No	No	No	No	No	
	82 STATION STREET BLACKHEATH	GF	SE	58	8 5	2		16 50		58	52	54	46	51		1.5	-6 -4.2	-5.5		50	0	0 0	0 0 0			o No	No	No	No	No	No	
	75A BRIGHTLANDS AVENUE BLACKHEATH	ō	N	45	5 3	0	40 3	31 30	00	45	38	40	31	30	00	5.3 -6		-6.9		51	0	0 0	0 0 N		0 N		No	No	No	No	No	
	75A BRIGHTLANDS AVENUE BLACKHEATH		W	38	8 3			30 30		39	31	38	30			1.9 -0		-0.5		50	0	0 0	0 0 N			o No	No	No	No	No	No	
	75A BRIGHTLANDS AVENUE BLACKHEATH 75A BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S W	4(J			30 31 30 31		41	32 34	41 41	30		30 -	1.2 -2 -2 -3		-2.3		50 51	0	0 0	0 0 0			o No	No	No	No	No	No	
	75A BRIGHTLANDS AVENUE BLACKHEATH	GF	s	42	-			30 31		42	34	41	30			1.9 -3		-3.8		51	0	0 0	0 0 0		0 N		No	No	No	No	No	
1076	75A BRIGHTLANDS AVENUE BLACKHEATH	GF	E	37		0		30 30			30	36	30			1.0	0 -0.0			51	0	0 0	0 N			o No	No	No	No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH 44 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	32				30 30 30 31			30 34	31	30			1.9 3.4 -3	0 -1.3	3 () -3.5	00	50 50	0	0 0	0 0 0			o No	No	No	No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH 44 BRIGHTLANDS AVENUE BLACKHEATH	GF	s W	40			37 37	30 31 30 31		41	34	38	30	32		3.4 -3 3.5 -3		-3.5		50	0	0 0	0 0 N 0 0 N			o No	No	No	No No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	41	1 3	5	38 3	30 33		42	35	38	30	33		3.9 -4				51	0	0 0	0 0 0	lo N	0 N		No	No	No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	36		0		30 30		37	30	35	30			2.5	0 -1.9) (56	51	0	0 0	0 N			o No	No	No	No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	36	0 0	-		30 30		36	30	34	30			2.9	0 -2.0	6 (56	51	0	0 0	0 0 0			o No	No	No	No	No	No	
	44 BRIGHTLANDS AVENUE BLACKHEATH 44 BRIGHTLANDS AVENUE BLACKHEATH	GF	r N	4		0	00	30 30 33 30	00	30	30 40	34 41	30	30 30		2.5 5.9 -7	0 -1.9	-7.5	5 56	51	0	0 0	0 0 0		0 N		No	No	No	No	No	<u> </u>
1205	81 EVANS LOOKOUT ROAD BLACKHEATH	ō	W	48				38 42			41	47	38	10		1.6 -3		-3.2		50	0	0 0	0 N	lo N	o N	o No	No	No	No	No	No	
	81 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	46	•	-		87 42		47	40	45	37			1.7 -3				50	0	0 0	0 0 0			o No	No	No	No	No	No	
	81 EVANS LOOKOUT ROAD BLACKHEATH 81 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E N	41		-		31 30 35 34	00	42	32 39	43 47	31	30 34).2 -1 1.7 -3		-1.1		50 50	0	0 0	0 0 0		0 N	o No	No	No	No	No	No	
	92 EVANS LOOKOUT ROAD BLACKHEATH	GF	s	52				2 3		53	42	47	42		30 -	0 -0				50	0	0 0	0 0		io N		No	No	No	No	No	
1206	92 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	50				39 30	30	50	39	52	39	30	30	0 -0	-			50	0	0 0	0 N	lo N	0 N	o No	No	No	No	No	No	
	92 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	50		0		30 30		51	40	52 49	39		30 -1	0 -0				50 50	0	0 0	0 0 0			o No	No	No	No	No	No	
	92 EVANS LOOKOUT ROAD BLACKHEATH 92 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	r N	48	-			37 30 30 30	0 30 0 30	48	37 34	49	37	30 30		0.1 -0 1.2 -3		-0.5		50 50	0	0 0	0 0 0		0 N	o No	No	No	No	No	No	
	92 EVANS LOOKOUT ROAD BLACKHEATH	0.	w	4(0		30 30		40	30	42	30	00	30	0	0 1.4		5 55	50	0	0 0	0 0			o No	No	No	No	No	No	
	73 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	42				32 31		43	34	43	32).7	-2 0.5	5 -2	2 55	50	0	0 0	0 N		0 N		No	No	No	No	No	
	73 EVANS LOOKOUT ROAD BLACKHEATH 73 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	52		-	51 4 47 3	40 32 18 41		52	42	53 48	40).4 -1 1.4 -3		-1.4		50	0	0 0	0 0 0		0 N		No	No	No	No	No	
	73 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	48		-		58 4. 38 4:	00	49	42	48 46	38			1.4 -3 1.9 -3				50	0	0 0		-	0 1		NO	NO	NO	NO	No	<u> </u>
1230	30 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43				30 32	2 30	43	36		30	32		4.1 -5				51	0	0 0	0 0 0		0 N	o No	No	No	No	No	No	
	30 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	43	3 3	6	39 3	30 32		44	36	40	30			1.3 -6		4 -6.3		51	0	0 0	0 0 N		0 N		No	No	No	No	No	
	30 BRIGHTLANDS AVENUE BLACKHEATH 30 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43	3 3 0 7	6	39 3	30 32 30 30		43	36 31	40	30	32 30		4.1 -5 3.2 -0			5 56	51 51	0	0 0	0 0 0			o No	No	No	No	No	No	
	30 BRIGHTLANDS AVENUE BLACKHEATH 30 BRIGHTLANDS AVENUE BLACKHEATH	GF	Ň	47	J 3			30 30 33 30		38	31 40	35 42	30	30		5.2 -0 5.7 -7		-0.8		51	0	0 0				o No	NO	NO	NO	No No	No	
1230	30 BRIGHTLANDS AVENUE BLACKHEATH	GF	Ŵ	47		-	42 3	34 32		48	41	42	33	32	30 -	5.4 -7		3 -7.2	2 56	51	0	0 0	0 0 0		lo N	o No	No	No	No	No	No	
1242	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E	60				50 56		61	54	58	50			3.1 -3	.9 -2.8	-3.5		53	0	0 0) 0 N	lo N	lo N	o No	No	No	No	No	No	
1242	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	60				50 56 13 48			54 47	58 51	50 43			3.4 -4		-3.7		53	0	0 0	0 0 0			o No	No	No	No No	No	No	<u> </u>
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		S	56				13 40			50	49	43			-4 -4				52	0	0 0	0 0 0		io N		No	No	No	No	No	
1242		1.000	12	, 30	., J	- 1	- 1 - T		0			./				- 1 · · ·								- P			1.10	1.10	1.10	1.10	1.7	

		F	açade	F	redicted	d noise l	level Open	ing Year	2030	Pr	edicted r	ioise leve	el Design	Year 2040				ise level thout pro													se levels				
Receiver ID	Façade	Floor level	Direction	Witho	ut projec	ct Wi	th project	Pro	ject Only	Without	project	With p	project	Project	Only	Openin 203	ıg Year 30	Desig 20	n Year 140	n	Project oad criteria	ro noise	Project oad criteria ance (dB)	crit	tive limit eria	Do nois exceed t crite	the NCG	Do nois exceed relative crite	he NCG ncrease	the cur limit wit roads ≥2dB to	r exceed mulative h project adding the total levels?	t cont from	s the ribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Nigh	t Da	y Nigh	t Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
			NE	6					45 38			48	39 35	46	38	-12.1	-14.6		-14.3				0 0	0	10				No	No	No	No	No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SE	5					41 34 36 30		52 50	45 42	35	41	34 30	-13.5	-17.1		-16.9				0 0	0	10				No No	No No	No	No	No No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY								37 30				32	37	30						0		0 0		10					No	No	No		No	
1243	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	NE	5	9	53	46		43 36		53	47	37	43	36	-13.3	-16.5	-13.3	-16.2	2 5!	5 50	0 0	0 0	0	0	No	No	No	No	No	No	No	No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SE	5		51 50	43 3		36 30 36 30	57	51	43	31	37	30	-14.5	-19.5	-14.7	-19.4				0 0	0	10			No	No	No	No	No	No	No	
1243	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	NW	5			42 .		36 30 36 30		50	42	31	37	30	-14.3	-19		-18.8				0 0	0	10				No No	No No	No No	No No	No No	NO	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY			6					46 39			49	40	47	39	-11.5	-13.7						0 0	0	0				No	No	No	No	No	No	
1243	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	6	0 !	53			46 39		53	49	40	47	39	-11.6	-13.6	-11.4	-13.3		5 50) 0	0 0	0	10	No	No	No	No	No	No	No	No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NW W	5					46 39 46 39		51 49	48	40	46 47	39 40	-9.4	-10.7		-10.3		5 50 6 51		0 0	0	10				No No	No No	No	No	No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY	5	SW				10		43 36				38	47	37	-3.5	-9.2		-0.0	,	0			0	10					No	No	No	No	No	
	2133 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF		5			42		35 30		50	42	31	36	30	-14.6	-19.7		-19.5		5 50	0 0	0 0	0	0			No	No	No	No	No	No	No	
	37 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	4					30 30	49	38	51	38	30	30	0.1	-0.4		-0.4				0 0	0	10			No	No	No	No	No	No	No	
	37 EVANS LOOKOUT ROAD BLACKHEATH 37 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N	5				12	35 30 30 30			55 50	42	35 30	30 30	-0.6	-1.8	-0.3	-1.9				0 0	•	10				No No	No No	No	No No	No No	No No	
	37 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	4					43 35		41	46	37	43	35	-3.9	-6.1		-6.2				0 0	0	10				No	No	No	No		No	
1262	37 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	4			42		33 30	43	34	44	32	33	30	-0.5	-2	. 0.7	-2	2 60		5 0	0 0	0	10			No	No	No	No	No	No	No	
	37 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	5					33 30		40	51	39	33	30	-0.4	-1.7	0.8	-1.7			· ·	0 0	0	10				No	No	No	No	No	No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH 79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF GF		4					30 30 32 30			40	31 32	31 33	30 30	-5.1 -3.5	-6.7 -5.3		-6.7				0 0	0	10				No No	No No	No No	No No	No No	No No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4			10		34 30		35	41	31	35	30	-2.1	-3.7		-3.6		00		0 0	-	10				No	No	No	No	No	No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	4					35 30		35	40	31	35	30	-2.8	-4.4		-4.3				0 0	0	10				No	No	No	No	No	No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4					34 30				31	34	30	-2.3	-4.1		-4.1				0 0		0				No	No	No	No	No	No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH 79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF	E N	3		30 31			30 30 30 30			38	30 30	30 31	30 30	-1.3	-0.3	-0.2	-0.3	3 5	0		0 0	0	10				No No	No No	No No	No No	No No	No No	
	79-81 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	3		30	35 3		30 30	37	30	36	30	30	30	-2.2	C	-1.5	0) 5!			0 0	0	0			No	No	No	No	No	No	No	
			SW	5			10		44 37				39	45	38	-7.5	-8.5		-8.1		6 51	1 0	0 0	0	10				No	No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SE NE	6	-	54 58			53 46 55 48		54 58	55 57.3	47	53 56	46 48	-5.7	-6.6 -8.6		-6.2		6 51 0 52		0 0	0	10			No No	No No	No No	No No	No No	No No	No No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NW	6					47 40		55	51	44	48	40	-11	-11.7		-11.3				0 0	0	10			No	No	No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SW	5			40		44 37	51	44		39	45	37	-4.8	-5.5	-4.4	-5	5 5	5 50		0 0	0	10			No	No	No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NW	5					45 37				40	45	38	-5.8	-6.7	-5.6	-6.3		00		0 0	0	0				No	No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH 89 BRIGHTLANDS AVENUE BLACKHEATH	GF F 1	E F	3					30 30 30 30			30	30 30	30 30	30 30	0	0		0) 5			0 0	0	10				No No	No No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH	F 2	E	3	0 3	30	30 3	30	30 30	30	30	30	30	30	30	0	C	0 0	0) 5	5 50	0 0	0 0	0	10	No		No	No	No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH	GF		3			37 3		30 30	00	00	37	30	30	30	6.6	C	/ /.1	0) 5	00	,	0 0	0	10	No			No	No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH 89 BRIGHTLANDS AVENUE BLACKHEATH	F 1 F 2		3		30 30	38 3		30 30 30 30		30	38	30	30 30	30 30	7.8	0.6	8.3	0.7) 5! 7 5!			0 0	0	10				No No	No No	No No	No No	No No	No No	
	89 BRIGHTLANDS AVENUE BLACKHEATH		W	3		30		30	30 30	30	30	38	30	30	30	7.2	0.0	8.1	0.7) 5	0		0 0	0	10			No	No	No	No	No	No	No	
1328	89 BRIGHTLANDS AVENUE BLACKHEATH	F 1	W	3		00			30 30		30	40	30	30	30	8.9	0.2		0.2		00	· ·	0 0	0	10				No	No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH	F 2	W	3					34 30				32	35	30	10.9	2.3		2.4				0 0		10				No	No	No	No	No	No	
	89 BRIGHTLANDS AVENUE BLACKHEATH 89 BRIGHTLANDS AVENUE BLACKHEATH	GF F 1	s	3					30 30 32 30			36	30 30	31 32	30 30	5 6.7	0		0				0 0		10				No No	No No	No No	No No	No No	No No	
1328	89 BRIGHTLANDS AVENUE BLACKHEATH	F 2	S	3	0 3	30	39 3	30	34 30	30	30	40	30	34	30	8.6	C	9.7	0	5	5 50	0 0	0 0	0	10	No	No	No	No	No	No	No	No	No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	6		01	00		35 30		01		47	35	30	-5.8		0.0	-7.5	5			5 O	0	0				No	No	No	No	No	No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH 91 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	E S	4			44 3		36 30 36 30		42	44	35	36	30 30	-5.1	-6.7		-6.9		00		0 0	0	10			No No	No No	No No	No No	No No	No No	No No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	4	,		44 3	36	37 30	50	42	45	36	37	30	-5.1	-6.5		-6.7		5 50	0 0	0 0	0	0			No	No	No	No	No	No	No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH	GF	N	5				10	35 30		/		40	36	30	-5.7	-7.2		-7.4		5 50		0 0	0	10				No	No	No	No	No	No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH 91 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	N	5				36 : 15 :	35 30 35 30				36 45	36 36	30 30	-5.3 -5.7	-6.9		-7.1				0 0	0	10				No No	No No	No No	No No	No No	No No	
	91 GREAT WESTERN HIGHWAY BLACKHEATH		W	6					35 30 46 38		52	54	45	36	30	-5.7	-7.4		-7.6		, 01		0 0	0	10				No	NO	NO	NO	No	No	
1368	57 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	5	3	44	53 4	12	32 30	54	44	55	42	32	30	-0.3	-1.3	1	-1.3	3 5	7 52	2 0	0 0	0	10	No	No	No	No	No	No	No	No	No	
	57 EVANS LOOKOUT ROAD BLACKHEATH	GF		4					44 36			49		44	37	-0.1	-1.1						0 0		0				No	No	No	No	No	No	
	57 EVANS LOOKOUT ROAD BLACKHEATH 57 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F	4					45 37 30 30			47	39	45 30	37 30	-2.6	-4.4	-2.4	-4.4	1 5	0		0 0	0	10				No No	No No	No No	No	No No	No No	
1411	36 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	4	1 :	35	37	30	30 30	42	35	37	30	30	30	-4.6	-4.6		-4.6		7 52	2 0	0 0	0	0	No		No	No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH		W	4					32 30			40	30	32	30	-5	-6.7	-4.7	-6.9				0 0	0	0		No	No	No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH 36 BRIGHTLANDS AVENUE BLACKHEATH	F 2 F 3		4	-				33 30 35 30				34	33	30 30	-5.4 -5.4	-7.2		-7.2				0 0	0	10				No No	No No	No No	No No	No No	No No	
	36 BRIGHTLANDS AVENUE BLACKHEATH	F 4		4					36 30		42	44	35	35	30	-5.4	-7.2		-7.2		1 02		0 0	0	10				No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4	1 :	34			31 30		34	38	30	32	30	-3.8	-4.1		-4.1	6			0 0	0	10	No			No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH 36 BRIGHTLANDS AVENUE BLACKHEATH	F 1 F 2	S	4		35 36	39 3		33 30 34 30		00	39 41	30 31	33	30 30	-3.6	-5.1 -4.9		-5.1		0 55 0 55		0 0	0	10				No No	No No	No No	No No	No No	No No	
	36 BRIGHTLANDS AVENUE BLACKHEATH 36 BRIGHTLANDS AVENUE BLACKHEATH	F 2 F 3	s S	4	-				34 30 36 30			41	31	35 36	30	-3.4	-4.9		-5.1				0 0	0	10					NO	NO	No		No No	
1411	36 BRIGHTLANDS AVENUE BLACKHEATH	F 4	S	4	5	38	42 3	34	38 31	45	38	43	34	38	30	-2.8	-4.4	-2.3	-4.5	5 60	0 55	5 0	0 0	0	10	No	No	No	No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	3		30 30			30 30 30 30	01	30 30	31	30 30	30	30 30	-0.8	0	0.1	0	0 59	9 54	4 0	0 0	0	0				No	No	No	No	No	No	
1411	36 BRIGHTLANDS AVENUE BLACKHEATH	IL I	E	3	2	ას	31	50	ათ 30	32	30	- 33	30	30	30	-0.9	C	0.2	0	J 59	7 54	+ 0	, 0	0	0	0//	No	No	No	No	No	No	No	UVI	1

		F	açade	P	redicte	d noise l	evel Open	ing Yea	ır 2030	Pr	edicted I	noise level	Design Year	2040	Char pro	nge in no ject - Wit	ise level hout pro	(With ect)											se levels r exceed				
Receiver ID	Façade	Floor	Direction	Withou	ut proje	ct Wi	h project	Pr	oject Only	Without	t project	With pro	iject Pro	ject Only	Openir 20	ng Year I30	Desig 20		NCG Pr roa noise ci	d d	NCG Proj road noise crite exceedance	Cun eria	NMG nulative limit criteria eedance (dB)	exceed	se levels the NCG eria?	Do nois exceed t relative i crite	he NCG ncrease	the cur limit wit roads ≥2dB to	mulative th project adding the total levels?	t contr from t	the fibution the road t Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
		level		Day	Nigł	nt Da	v Nigh	ıt Da	y Night	Day	Night	Day M	Night Day	Night	Day	Night	Day	Night	Day	Night	Day N	light Da	ay Night	Day	Night	Day	Night	Day	Night	Day	Night		
	36 BRIGHTLANDS AVENUE BLACKHEATH	F 2	E	3			32	30	30 30				30	30 30		0	0.2	0	59	54	0	0		No			No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH 36 BRIGHTLANDS AVENUE BLACKHEATH	F 3 F 4	E	3		30 30	01	30 30	30 30		00		30 30	30 30 30 30		0	0.2	0	59	54 54	0	0		No No			No No		No No	No No	No No	No No	
	36 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	4		38		30	30 30	5				30 30		-7.6	-6	-7.4	07	54	0	0		No			No		No	No	No	No	
1411	36 BRIGHTLANDS AVENUE BLACKHEATH	F 1	N	4	-			31	30 30				01	30 30		-7.6	-6	-7.5		54	0	0		No	No	No	No	No	No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH 36 BRIGHTLANDS AVENUE BLACKHEATH	F 2 F 3	N	4			41 3	33 34	30 30				33	30 30	-6	-7.5	-6	-7.5		54 54	0	0		No No			No	No No	No No	No	No	No	
	36 BRIGHTLANDS AVENUE BLACKHEATH	F 3		4			14	34 34	30 30			12	34	30 30	0	7.0	0	-7.6		54	0	0		No			No No		NO	NO		No	
1414	52 EVANS LOOKOUT ROAD BLACKHEATH	GF		4	5			33	32 30					32 30	-2.8		-1.8	-4.5	55	50	0	0	0 0	No	No	No		No	No	No		No	
	52 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	5				43	39 31 32 30		44			39 31 33 30		-1.3	11	-1.3		51	0	0		No No			No No	No No	No No	No No	No No	No No	
	52 EVANS LOOKOUT ROAD BLACKHEATH 52 EVANS LOOKOUT ROAD BLACKHEATH	GF	E N	4		37		30	32 30	17	0,		00	33 30	0.2			-1.2		51	0	0		No			No		NO	NO	NO	NO	
1414	52 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	4		33		30	32 30					33 30	-1.9			-3.3		50	0	0	0 0	No	No	No		No	No	No	No	No	
	52 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N	4		40 30		34 30	34 30 30 30				34 30	34 30		-6.5		-6.5		50 50	0	0		No			No	No	No	No	No	No	
	70 BRIGHTLANDS AVENUE BLACKHEATH 70 BRIGHTLANDS AVENUE BLACKHEATH		E N	3				30 30	30 30					30 30		-6.7	-1.7	-6.7		50 50	0	0		No No			No No	No No	No No	No	No No	No	
	70 BRIGHTLANDS AVENUE BLACKHEATH		w	4				30	32 30					32 30				-5.1		50	0	0		No					No	No		No	
	70 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4		01	37	30	32 30		01		30	32 30		0.7	-3	-3.9		50	0	0		No					No	No	No	No	
	70 BRIGHTLANDS AVENUE BLACKHEATH 70 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	4	1	34 34	38	30	32 30 32 30				30	32 30 32 30		-4.3		-4.3		50	0	0		No No			No No		No	No	No	No	
1415	70 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	3		30	33	30	30 30	36			30	30 30		0	-1.5	0	55	50	0	0		No			No	No	No	No	No	No	
	70 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	3		01		30	31 30					31 30				-1.3		50	0	0		No					No	No	No	No	
	27 BRIGHTLANDS AVENUE BLACKHEATH 27 BRIGHTLANDS AVENUE BLACKHEATH	GF	E N	4		35 39		30 32	32 30 32 30		35			32 30 32 30				-4.6		51	0	0		No No			No No	No No	No No	No No	No	No No	
	27 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	4					31 30					31 30				-4.8		51	0	0		No					No	No	No	No	
	27 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	4				33	32 30					32 30			-5.3	-7.1		51	0	0		No					No	No	No	No	
	27 BRIGHTLANDS AVENUE BLACKHEATH 27 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	3			36 36	30	30 30 34 30					30 30 34 30		-1.8 -5.5		-1.8 -5.8		51	0	0		No No			No No	No No	No No	No No	No	No	
	27 BRIGHTLANDS AVENUE BLACKHEATH		w	4				31	34 30					34 30				-5.9		51	0	0		No			No	No	No	No	No	No	
	27 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4				32	34 30					35 30				-5.4		51	0	0		No			No		No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SW	4		33	57	30 36	36 30 43 36				50	36 30 44 36				-2.7	-	50 52	0	0		No No					No	No	No No	No	
1462	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	NE	5	1	45	47	40	46 39	52	45	48	40	46 39	-4.3	-5.1	-4	-4.7	57	52	0	0	0 0	No	No	No	No	No	No	No	No	No	
			NW	4				39	46 38					46 39				-1.7		52	0	0		No					No	No	No	No	
	147 COXS RIVER ROAD LITTLE HARTLEY 147 COXS RIVER ROAD LITTLE HARTLEY		NE NW	3				33 34	30 30 30 30				01	30 30 30 30		2.8		3.3 3.2		50 50	0	0		No No				No No	No No	No	No	No	
1497	147 COXS RIVER ROAD LITTLE HARTLEY	GF	SW	3	0	30	30	30	30 30		30	30	30	30 30	0	0	0	0	55	50	0	0	0 0	No	No		No	No	No	No	No	No	
	147 COXS RIVER ROAD LITTLE HARTLEY	GF GF	SE	3		30 36		30 36	30 30 43 35		30			30 30 43 32		0.5	0	-1.6	55	50 50	0	0		No			No	No	No No	No	No	No No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	GF F 1	E F	4					43 35				- ·	43 32 48 36			-	-1.6		50	0	0		No No					NO	No No	No No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2	E	5		-	-	42	48 40		43			48 37		-0.5		-2.3	-	50	0	0		No			No		No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	GF F 1	N	5				44 47	31 30 33 30					31 30 33 30		-7.1	-5.6	-7.3		50 50	0	0		No No			No No	No No	No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	F 1 F 2		6				47 49	33 30					33 30 36 30				-7.4		50	0.9	0		No					No No	NO	No No	No	
1557	85 GREAT WESTERN HIGHWAY BLACKHEATH	GF	W	6	5	58	60	52	49 41	65	58	60	51	49 38	-5.3	-6.8	-5.3	-7.4	60	55	0	0	0 0	No	No	No	No	No	No	No	No	No	
1557		F 1 F 2		6			63	55 56	53 45 57 49		62		54 55	53 42 57 46		-7.1	-5.5	-7.6		55 55	3.2	0	0 0	No			No	No	No	No	No	No]
1557	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2 GF	vv S	7				56 46	57 49	10	00			57 46 41 31	0.0		-5.6	-7.8		55	4.6	0	0 0	No No			No No	No No	No No	No No	No No	No	
1557	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 1	S	6			57	49	49 41	63		58	49	49 38	-4.9	-6.5	-4.9	-7.1	60	55	0	0		No	No	No			No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2	S	6				53	57 49		60			57 46		-7.1	-5.3	-8.2		55	2	0		No			No		No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	GF F 1	S	4				37 44	43 35 50 42					43 33 50 39	-2.1	-3.7	-1.4	-5		53 53	0	0		No No			No No	No No	No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2	S	6					56 48					56 45				-8.5	00	53	0.7	0		No					No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	4				37	43 35				00	43 33				-5.1		53	0	0		No					No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	F1 F2	S	5		49 57		44 50	50 42 56 48		49			50 39 56 45	-2.9	-4.7	-2.3	-6.2		53	0.8	0		No No			No No	No No	No No	No	No No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	4	8	41	47	38	44 37	01	07		10	45 34	0.0		-1	-4.6	00	53	0.0	0		No			No	No	No	No	No	No	
1557	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 1	E	5	5	49		44	50 43		49	54	10	51 40				-6	58	53	0	0	0 0	No	No	No	No		No	No	No	No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH 85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2 GE	E	6		56 41		49 38	55 47 44 36		56 41			55 44 45 34		-7.1	-4.9	-8.4		53	0	0		No No			No No	No No	No No	No No	No	No No	
	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 1	E	5				30 44	50 43					45 34 51 40				-4.7		53	0	0		No			No		No	No	No	No	
1557	85 GREAT WESTERN HIGHWAY BLACKHEATH	F 2	E	6	3	56	58	49	55 47	63	56	58	48	55 45	-5.2	-7.1	-4.9	-8.4		53	0	0	0 0	No	No	No	No	No	No	No	-	No	
	67 BRIGHTLANDS AVENUE BLACKHEATH 67 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N	4		39 38	40	32	30 30 30 30	46	39			30 30 31 30	-5.4			-6.9 -6.3		50	0	0		No No			No No	No No	No	No No		No No	
	67 BRIGHTLANDS AVENUE BLACKHEATH	GF	s.	4		38	38	30	30 30 30					31 30				-6.3		51	0	0		NO NO			NO NO		No No	NO	No No	No No	
1578	67 BRIGHTLANDS AVENUE BLACKHEATH		w	4		34	38	30	32 30				30	32 30	-2.8	-3.9	-2	-3.9	56	51	0	0		No	No	No	No	No	No	No	No	No	
	67 BRIGHTLANDS AVENUE BLACKHEATH 67 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S	4.		35 30		30 30	33 30 30 30		35 30		30 30	34 30 30 30		-4.6	-2	-4.7	56	51 50	0	0		No No			No No		No No	No No	No No	No No	
	69A BRIGHTLANDS AVENUE BLACKHEATH	GF	S	4				30	30 30				30	30 30 30		-4.3		-4.3		50	0	0		No					No	No	No	No	
	69A BRIGHTLANDS AVENUE BLACKHEATH	GF	E	3		30	34	30	30 30	37			30	30 30		0	-1.6	0		51	0	0		No					No	No	No	No	

		F	açade	Pr	edicted	noise lev	vel Openi	ng Year 2030	Predicted	noise leve	el Desig	yn Year 2040	Chan proj	nge in noi ject - Witl	se level (Wi hout project	th)								equa	oise levels I or exceed				
Receive	r Façade			Without	t project	With	project	Project Only	Without project	With p	roject	Project Only	Openin 20	ng Year I30	Design Y 2040		NCG Project road noise criteria	noise criteria	Cumula cri	iteria	o noise le ceed the l criteria?	Vels NCG	o noise leve cceed the NC lative increa criteria?	G limit v road ≥2dB	umulative with project ds adding to the total se levels?	cont from	s the ribution the road ct Acute?	Is the property identified for consideration of	Treatment Type recommended
		Floor level	Direction	Day	Night	Day	Night	Day Night	Day Night	Day	Night	Day Night	Day	Night	Day N	ight	Day Nigh	ht Day Night	a Day	Night I	Day Ni	ght I	Day Nigh			Day	Night	treatment?	
158	1 69A BRIGHTLANDS AVENUE BLACKHEATH	GF	S	37	30) 3!	5 3	0 30 30	37 30	36	31	0 30 30	-2.3	0	-1.6	0	55	50 0	0 0	0 0 No	No	No	o No	No	No	No	No	No	
158	1 69A BRIGHTLANDS AVENUE BLACKHEATH	GF	E	36	30	,							-2.3	0	1.0	0	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	
	1 69A BRIGHTLANDS AVENUE BLACKHEATH 1 69A BRIGHTLANDS AVENUE BLACKHEATH	GF	N	46									-5.3	-7.1		-7		51 0 51 0	0 0	0 0 No 0 0 No		No		No	No	No No		No No	
	5 89 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	47							3	30 30 30 B 42 34	-0.4		0.5	-1.4		50 0	0 0	0 0 0		No		No	No	No		No	
	5 89 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	46				0 12			3		-1.8		-1.5	-3.3	33	50 0	0 0	0 No		No		No	No	No	No	No	
	5 89 EVANS LOOKOUT ROAD BLACKHEATH 5 89 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E N	41 55									-0.4		0.7	-1.4		50 0 51 0	0 0	0 No 0 No		No		No		No No		No No	
	5 89 EVANS LOOKOUT ROAD BLACKHEATH		W	51									-0.5		0.8	-1.5		50 0	0 0	0 No		No		No		No		No	
	5 89 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	50	40) 4	9 3	8 33 30	50 40		3	8 33 30	-0.6	-1.8	0.7	-1.8	55	50 0	0 0	0 No	No	No		No	No	No		No	
	9 52 BRIGHTLANDS AVENUE BLACKHEATH 9 52 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N	35	5	, J.		0 30 30 0 30 30		02	3	0 30 30 0 30 30	-3.2	0	-2.8	0	55 55	50 0 50 0	0 0	0 Nc		No		No		No No		No	
	9 52 BRIGHTLANDS AVENUE BLACKHEATH 9 52 BRIGHTLANDS AVENUE BLACKHEATH		E N	34									-2.9	-7.3		-7.2		50 0	0 0	0 No		No		No		No		No	
162	9 52 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	37	31	1 34	4 3	0 30 30	38 31	1 35	3	30 30	-3.3	-0.6	-2.9	-0.6	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	
	9 52 BRIGHTLANDS AVENUE BLACKHEATH 9 52 BRIGHTLANDS AVENUE BLACKHEATH	GF	S W	38		5		0 50 50			31	5 50 50	-2.9	-0.8	-2.4	-0.8	30	51 0	0 0	0 No		No		No	No	No No	No No	No	
	9 52 BRIGHTLANDS AVENUE BLACKHEATH 9 52 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	39									-3.2	-		-3.9		51 0	0 0	0 No		No		No		No		No	
162	9 52 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	35	30	3	3 3	0 30 30	35 30	34		30 30	-2.3		-1.7	0	56	51 0	0 0	0 No	No	No	o No	No	No	No	No	No	
164	3 35 EVANS LOOKOUT ROAD BLACKHEATH 3 35 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	E	33				0 30 30			31	0 30 30 0 30 30	-2.1	0	-1.5	0	58 58	53 0	0 0	0 0 No	No No	No		No		No No	No No	No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 2	E	40				0 30 30					-1.0	-1.6		-1.6	58	53 0	0 0	0 No		No		No		No		No	
164	3 35 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	37				0 30 30			3	30 30	-2.2	-0.3	-1.9	-0.3		50 0	0 0	0 No		No	o No	No		No		No	
164		F 1 F 2	S	39		2 3	6 3	0 30 30 1 33 30			3	30 30 30	-2.2	-1.7	-1.9	-1.7	55 55	50 0	0 0	0 No		No		No	No	No No		No No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH 3 35 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	41		3 4	o 3 3 3				3	2 30 30	-2.3	-0.6	-1.9	-0.6		53 0	0 0	0 No 0 No		No		No		No	No No	No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 1	E	45							3		0	-0.6	1.2	-0.6		53 0	0 0	0 No				No		No		No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 2 GF	E	48	38			,			3	7 31 30 0 31 30	0-0.8	-0.5	1.2	-0.5	58 56	53 0	0 0	0 No		No		No	No	No		No No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH 3 35 EVANS LOOKOUT ROAD BLACKHEATH		N	53									-0.8	-2.1	0.5	-2.2		51 0	0 0	0 0 No 0 0 No		No		No		No No	No No	No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 2		55									-0.7	-2	0.5	-2	56	51 0	0 0	0 No				No		No		No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH 3 35 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	W	50 53				0 10 50	50 43		3		-2.8	-4.5	-2.2	-5	55 55	50 0	0 0	0 No 0 No		No		No	No	No No		No No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 2	W	54	48						4		-2.7	-4.9	-2	-5	55	50 0	0 0	0 No		No		No		No		No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	51									-4.9			-7.5		50 0	0 0	0 No		No		No		No		No	
	3 35 EVANS LOOKOUT ROAD BLACKHEATH 3 35 EVANS LOOKOUT ROAD BLACKHEATH	F 1 F 2	S S	52 52									-4.3		-4.1	-6.6 -5.5		50 0 50 0	0 0	0 0 No 0 0 No		No		No		No No		No No	
168		GF	S	41				1 35 30			3	1 36 30	-1.8	-3.3	-1.2	-3.3	55	50 0	0 0	0 No	No	No		No	No	No	No	No	
	0 53 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	39			,						-1.8	0.7	-0.8	-0.9		50 0	0 0	0 No		No		No		No	110	No	
	0 53 BRIGHTLANDS AVENUE BLACKHEATH 0 53 BRIGHTLANDS AVENUE BLACKHEATH	GF	N W	45									-5.2		-5.1	-6.7		50 0	0 0	0 No 0 No		No		No		No No		No No	
173		GF	N	58		1 54	4 4	5 49 42			4	3 50 38	-4.2	-6.1	-3.4	-7.3	60	55 0	0 0	0 No		No		No	No	No		No	
	3 3 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	60				,			4		-4.6		-4.2	-8.2	60	55 0 55 0	0 0	0 No		No		No	No	No		No	
	3 3 EVANS LOOKOUT ROAD BLACKHEATH 3 3 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S F	58 49		-							-4.9			-8.8 -3.3		55 0	0 0	0 0 No 0 0 No		No No		No No		No No		No No	
	3 3 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	48	41	4	6 3	8 44 37	48 41	1 47	3	6 44 34	-1.5		-1.2	-4.6	55	50 0	0 0	0 No		No		No	No	No		No	
	3 3 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	51 58									-0.6		0.6	-2.5		50 0 55 0	0 0	0 No		No		No		No		No	
	3 3 EVANS LOOKOUT ROAD BLACKHEATH 3 3 EVANS LOOKOUT ROAD BLACKHEATH		N	58							4		-2.2		-1.1	-4.9	00	55 0 55 0	0 0	0 No 0 No		No		No	No	No No		No No	
173	4 72 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	42	35			0 30 30	42 35	5 38			-4.3	0.0	-4	-4.9	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	
173		GF	S	40		3 3	7 3	0 32 30	40 33		3	32 30	-3.2	-3	-2.7	-3	55	50 0	0 0	0 0 No		No		No	No	No	No	No	
	4 72 BRIGHTLANDS AVENUE BLACKHEATH 4 72 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	vv S	41							3		-3.6	-3.8	-3.1	-3.8 -3.9		50 0 50 0	0 0	0 0 No 0 0 No		No		No	No	No No		No No	<u> </u>
173	4 72 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	35									-2.6		-3.5	0	55	50 0	0 0	0 No		No		No		No		No	
	4 72 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	36				0 00			3	0 30 30 0 30 30	-3.3	0	-3	0	55	50 0	0 0	0 No		No		No		No		No	
	4 72 BRIGHTLANDS AVENUE BLACKHEATH 4 72 BRIGHTLANDS AVENUE BLACKHEATH	GF	r N	35				0 30 30 1 30 30			3	5 50 50	-3.1	-7.1	-2.6	-7	55 55	50 0 50 0	0 0	0 0 No 0 0 No		No		No		No No	No No	No No	<u> </u>
174	4 14 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	50	43	3 4	5 3	6 36 30	50 43	3 45	3	6 36 30	-5.2	-6.9	-5.3	-7.1	56	51 0	0 0	0 No	No	No	o No	No	No	No	No	No	
	4 14 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	42	35		-	0 32 30			3	33 30	-4.1		-3.8	-5.1		50 0	0 0	0 No		No		No		No		No	
	4 14 BRIGHTLANDS AVENUE BLACKHEATH 4 14 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	51 45	45	5 4i 3 4i		7 31 30 2 34 30	52 45 45 38		3	7 32 30 2 35 30	-5.9	-7.5	-6	-7.5	55 55	50 0 50 0	0 0	0 No 0 No		No		No	No	No No		No No	
174	8 11 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	48	38	3 4	8 3	8 31 30	49 38	B 50	3	B 32 30	-0.1	-0.8	1.1	-0.8	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	
	8 11 EVANS LOOKOUT ROAD BLACKHEATH	F 1	E	51									-0.2		1.1	-0.9		50 0	0 0	0 No		No		No		No		No	
	8 11 EVANS LOOKOUT ROAD BLACKHEATH 8 11 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	N	55				0 00 01			4	5 07 00	-0.7	-2.1	0.6	-2.2	60 60	55 0	0 0	0 No 0 No		No		No	No	No No	No No	No No	<u> </u>
174	8 11 EVANS LOOKOUT ROAD BLACKHEATH	GF		50	41	4	8 3	8 37 30	50 41	1 50	3	B 37 30	-1.6	-3.4	-0.3	-3.5	56	51 0	0 0	0 No	No	No	o No	No	No	No	No	No	
	8 11 EVANS LOOKOUT ROAD BLACKHEATH	F 1	W	55									-2.7	-4.9		-5.6		51 0	0 0	0 0 No		No		No		No		No	
174	8 11 EVANS LOOKOUT ROAD BLACKHEATH 8 11 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	s S	54 56				1 10 11			3		-5.2	-7.3	-5.2	-9.5 -9.4	57 57	52 0 52 0	0 0	0 0 No 0 0 No		No No		No		No No		No No	
175	7 147 COXS RIVER ROAD LITTLE HARTLEY	GF	NE	36	30) 3	8 3	0 30 30	37 30	39	3	1 30 30	1.3	0.1	1.8	0.7	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	
175	7 147 COXS RIVER ROAD LITTLE HARTLEY	GF	NW	37	30	3	8 3	0 30 30	37 30	39	3	1 30 30	1.3	0.3	1.8	0.9	55	50 0	0 0	0 No	No	No	o No	No	No	No	No	No	

		Façade	Predicte	d noise l	evel Openi	ng Year 2030	Р	redicted r	oise level Desig	n Year 20	040			se level (iout proj											Do noise	elevels				
Receiver ID	Façade	Floor level Direction	Without proje	ict Wi	th project	Project Only	Withou	t project	With project	Proje	ct Only	Opening 1 2030	Year	Design 20	n Year	NCG Project road noise criteria	noise	Project oad (criteria lance (dB) e	NMC Cumulativ criter exceedanc	e limit ia	Do noise exceed th criter	levels e NCG	Do noise l exceed the relative ind criteria	evels NCG rease I? ≥	equal or the cum	exceed ulative project dding he total	Is t contril from th project	bution le road	Is the property identified for consideration of treatment?	Treatment Type recommended
			Day Nig	ht Da	y Night	Day Night	Day	Night	Day Night	Day	Night	Day N	Night	Day	Night	Day Night	Day	Night	Day	Night	Day	Night	Day	light	Day	Night	Day	Night		
	147 COXS RIVER ROAD LITTLE HARTLEY	GF SW	31	30	32 3				33 30				0	1	0		0 (0 0	0	0 N			No N						No	
	147 COXS RIVER ROAD LITTLE HARTLEY 70 EVANS LOOKOUT ROAD BLACKHEATH	GF SE GF S	30 53	30 42	30 3 53 4	0 30 30 2 34 30			31 30 55 42		30		-0.5	0.6	-0.6	55 5 57 5	2 0	0 0	0	0 0			No N						No	
	70 EVANS LOOKOUT ROAD BLACKHEATH	GF E				2 34 30 6 30 30			48 36				-0.5	1.4			0 0	0 0	0	0 N			No N No N						No	
	70 EVANS LOOKOUT ROAD BLACKHEATH	GF N			41 3		46		41 32		30		-6.5	-4.3			0	0 0	0	0 1			No N						No	
	70 EVANS LOOKOUT ROAD BLACKHEATH	GF W	45		41 3	2 30 30	46		42 32		30	-4.4	-6.1	-3.8	-6	55 5	0	0 0	0	0 N			No N						No	
	70 EVANS LOOKOUT ROAD BLACKHEATH 70 EVANS LOOKOUT ROAD BLACKHEATH	GF N GF W	42	34	39 3 49 3	0 30 30 8 31 30	42		40 30 50 38		30	-3.2	-4.4 -0.4	-2.5	-4.4	56 5	1 (0 0	0	0 N			No N No N						No	
	62 EVANS LOOKOUT ROAD BLACKHEATH	GF N				2 30 30			41 32		30	-5.3	-0.4	-5.1		56 5	1 (0 0	0	0 1			No N						No	
1773	62 EVANS LOOKOUT ROAD BLACKHEATH	GF W	44	35	43 3	3 30 30	44	35	45 33	30	30	-1.1	-2.6	0.1	-2.6	55 5	0	0 0	0	0 N	lo I	lo I	No N) N	lo I	No	No		No	
	62 EVANS LOOKOUT ROAD BLACKHEATH	GF S			54 4 45 3		54		55 43		30		-0.7	1.3	-0.8	56 5	1 (0 0	0	0 N			No N					No	No	
	62 EVANS LOOKOUT ROAD BLACKHEATH 75 EVANS LOOKOUT ROAD BLACKHEATH	GF E GF N	45 49		10	4 30 30 8 32 30	46		47 34 50 38		30 30		-0.8 -0.8	1.2		55 5		0 0	0	0 N 0 N			No N No N						No No	
	75 EVANS LOOKOUT ROAD BLACKHEATH	GF E	49		49 3	9 32 30	50		51 39		30	0	-0.6	1.2	-0.5	55 5	0	0 0	0	0 N			No N						No	
	75 EVANS LOOKOUT ROAD BLACKHEATH	GF N	54	44	53 4	3 34 30	54		55 43		30		-0.9	1.1	-0.9		0	0 0	0	0 N	lo I		No N					No	No	
	75 EVANS LOOKOUT ROAD BLACKHEATH 75 EVANS LOOKOUT ROAD BLACKHEATH	GF W GF S	46		10	5 31 30 5 40 32		5	47 35 44 35				-1.5 -1.1	0.8	1.0		0 0	0 0	0	0 N 0 N			No N No N						No No	
	75 EVANS LOOKOUT ROAD BLACKHEATH	GF E	45		45 3		43		44 33		32		-1.1	1	-0.6	55 5		0 0	0	0 1			No N						No	
	6 EVANS LOOKOUT ROAD BLACKHEATH	GF E	50	41	50 4	0 42 34	51	41	52 40	42	32	-0.3	-1.2	0.9	-1.8	55 5		0 0	0	0 N			No N					No	No	
	6 EVANS LOOKOUT ROAD BLACKHEATH 6 EVANS LOOKOUT ROAD BLACKHEATH	GF N GF W		44 50	45 3 52 4	, , , , ,	51		46 37 53 42		30	0.0	-7	-5.1 -4.3	-7.2	58 5 60 5	3 0	0 0	0	0 N			No N No N						No	
	6 EVANS LOOKOUT ROAD BLACKHEATH	GF S				6 50 43					40		-5.4	-4.3		60 5		0 0	0	0 1			No N						No	
1842	83 BRIGHTLANDS AVENUE BLACKHEATH	GF E	37	30	36 3	0 30 30	37	30	37 30	30	30	-1.2	0	-0.2	0		0	0 0	0	0 N	lo I	lo I	No N	D N	lo I	No	No	No	No	
	83 BRIGHTLANDS AVENUE BLACKHEATH	GF N	45	38	39 3		45		40 31		30		-7	-5.1	-6.9		0 0	0 0	0	0 N			No N						No	
	83 BRIGHTLANDS AVENUE BLACKHEATH 83 BRIGHTLANDS AVENUE BLACKHEATH	GF W GF S	42	35		0 31 30	42		39 30 40 30		30		-3.3	-3.2	-5		0	0 0	0	0 N			No N No N						No	
	40 BRIGHTLANDS AVENUE BLACKHEATH	GF E		31		0 30 30	38		35 30		30		-0.9	-3.2		56 5	1 0	0 0	0	0 1			No N						No	
	40 BRIGHTLANDS AVENUE BLACKHEATH	GF N	47		41 3	2 30 30	47		41 33		30	-5.8	-7.4	-5.7	-7.3	55 5		0 0	0	0 N			No N					No	No	
	40 BRIGHTLANDS AVENUE BLACKHEATH 40 BRIGHTLANDS AVENUE BLACKHEATH	GF W GE S	38	32	35 3 37 3	0 30 30	39		36 30 38 30		30	-3.6	-1.5	-3.1		55 5	0 0	0 0	0	0 N	1 01 1 01		No N No N					No No	No	
	2 GLEN STREET BLACKHEATH	GF NE			43 3						30	0	-0.2	1.5		55 5	0 0	0 0	0	0 1			No N						No	
	2 GLEN STREET BLACKHEATH	F1 NE	45		45 3		46		47 35		30	0.1	-0.2	1.4	-0.2		0 (0 0	0	0 N			No N						No	
	2 GLEN STREET BLACKHEATH	F 2 NE GF SE	47		47 3 42 3	6 30 30 2 30 30	47		49 36		30	0	-0.2	1.4	-0.2	33 3	0	0 0	0	0 0			No N						No	
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			F	açade	P	redicted	d noise le	vel Openi	ing Year	2030	Pr	edicted	noise level	Design Yea	r 2040	Char pro	nge in no ject - Wit	ise level hout pro	(With ect)										Do nois	e levels rexceed				
		Façade		Direction	Withou	t projec	ct With	n project	Pro	ject Only	Without	t project	With pro	oject Pr	oject Only					road	ria noi:	road se criteria	Cumula crit	tive limit teria	exceed	the NCG	exceed th relative in	e NCG crease	the cun limit with roads ≥2dB to	nulative h project adding the total	contr from t	ibution he road	identified for consideration of	Treatment Type recommended
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Receiver ID	Façade	Floor level	Direction	Witho	ut proje	ct W	ith project	: Pr	oject Only	Without	project	With pr	roject I	Project On	ly Of	pening Yea 2030	ar De:	sign Yea 2040		G Project road se criteria	noise	Project oad criteria lance (dB)	crit	tive limit eria	Do nois exceed t crite	he NCG	Do nois exceed t relative i crite	he NCG ncrease	the cur limit wit roads ≥2dB to	r exceed mulative h project adding the total levels?	t cont from	s the tribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
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	65 EVANS LOOKOUT ROAD BLACKHEATH	F 1	W	4		37		36	30 30		37		36	30							53 0	0 0	0 0	0					No	No	No	No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF GF	S F	3		33 44	36	30	44 37		33		30 38	35 45			2.5 -		2.0	55 5	50 (51 (0 0	0				No No	No No	No No	No No	No No	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	5		44		38	44 37		44		38	45			5.8			57 5	52 (0 0	0	0				No	No	No	No	No	No	
			W	4		38		37	43 36				37	44	36		1.6 -1				52 (0 0	-	0				No	No	No	No	No	No	
	93 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	6		53			41 33				46	41							55 (0 0		0					No	No	No	No	No	
	93 GREAT WESTERN HIGHWAY BLACKHEATH 93 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	S E	5		50 43	51 45	42 37	36 30		50 43		42	37 38			6.6			56 5 56 5	51 (51 (0 0	0	0				No No	No No	No	No No	No	No	
2694	93 GREAT WESTERN HIGHWAY BLACKHEATH	5	N	5	0	43		36	35 30	50	43	45	36	35	30	-5.4	-7 -!	5.4	-7.2	56 5	51 (0 0	0	0	No	No	No	No	No	No	No	No	No	
	93 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E			42	43	35	35 30				35	36			6.8		'	56 5	51 (0 0	0						No	No	No	No	No	
	93 GREAT WESTERN HIGHWAY BLACKHEATH 93 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	S	4	,	42 43	44	35	35 30		42		35	36			6.7 -		0.7	56 5 57 5	51 (0 0	0 0	0				No No	No No	No No	No	No No	No	
		GF	N	5	-	43 53		45	34 30				45	35			7.3				52 1	0 0	0 0	0				No	No	No	No	No	No	
2694	93 GREAT WESTERN HIGHWAY BLACKHEATH	GF	w	6		58		51	42 34		58	59	50	42	33	-5.7	7.2 -	5.7			55 (0 0	0	0	No	No	No	No	No	No	No	No	No	
	50 EVANS LOOKOUT ROAD BLACKHEATH 50 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W	4		37		36	34 30				36	35					1.7		50 0	0 0	0	0					No	No	No	No	No	
	50 EVANS LOOKOUT ROAD BLACKHEATH 50 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F	5		44 36		43	39 31 32 30		44		43	39			1.2				51 (50 (0 0	0 0	0				No No	No No	No No	No No	No No	No No	
2715		GF	N	4	6	39		33	33 30	47			33	34	30						51 (0 0	0	0					No	No	No	No	No	
2717	42 EVANS LOOKOUT ROAD BLACKHEATH		N	4		36		30	30 30				30	30					0.1	56 5	51 (0 0		0					No	No	No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH 42 EVANS LOOKOUT ROAD BLACKHEATH	F 1 GF	N	4		41	43	34	34 30	49	41	43	34	34			2.2		-7.4 -2.2	56 5	51 0	0 0	0	0					No No	No	No No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH 42 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1		4		37 43		35	33 30	46	43		35	34			4.2 -			57 5	52 0	0 0	0	0				No No	NO	No No	No	No No	No	
2717	42 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	5	3	43		42	38 30	54	43	55	42	38	30	-0.1	0.8	1.3	-0.8		52 (0 0	0	0	No	No	No	No	No	No	No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	5		45		45	40 32				45	40			0.7	1	0.0		52 (0 0	0	0				No	No	No	No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH 42 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	E	4	-	30 32		30 31	30 30		30		30 31	30		-0.2	1.2	1	0		50 (50 (0 0	0	0				No No	No No	No No	No	No No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH	GF	N			40		32	30 30				32	30			7.4				51 (0 0	0	0				No	No	No	No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH	F 1		4		41	42	33	31 30				33	32					-7.4	56 5		0 0	0	0					No	No	No	No	No	
	42 EVANS LOOKOUT ROAD BLACKHEATH 42 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1		4	'	40 43	42	34	35 30 39 31		40		34 36	35					0.0	56 5 56 5	51 (51 4	0 0	0	0					No No	No No	No No	No No	No	
	69 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	3		43 30		30	30 30				30	39		-4.7	- 0.0			56 5	51 (0 0	0	0					No	No	No	No	No	
		GF	N	4	6	39	40	32	30 30	46	39	41	32	30	30	-5.4	-7 -	5.3	-6.9	56 5	51 (0 0	0	0					No	No	No	No	No	

		F	açade	Pro	edicted	noise lev	vel Openi	ng Year :	2030	Pr	edicted I	noise level	Design Year	r 2040	Chan proj	ge in noi ect - Witl	ise level (hout proj	With ect)										Do noise equal or					
Receiver ID	Façade	Floor level	Direction	Without	projec	t With	project	Proj	ect Only	Without	project	With pro	iject Pro	oject Only	Openin 203		Desig 20	n Year 40	NCG Proje road noise crite	nois	3 Project road se criteria dance (dE	Cumula	tive limit teria	Do nois exceed t crite	the NCG	Do noise I exceed the relative inc criteria	evels NCG rease	the cum	ulative project adding the total	Is t contrit from th project	bution le road Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Night	Day	Night	Day	Night	Day	Night	Day 1	Night Da	y Night	Day	Night	Day	Night	Day Ni	ght Day	Night	Day	Night	Day	Night	Day I	light	Day	Night	Day	Night		
	69 BRIGHTLANDS AVENUE BLACKHEATH		W	40		2 3		0 3			32	39		31 30	-2.4	-2.4		-2.4	55	50	0	0 0	0	No		No No						No	
	69 BRIGHTLANDS AVENUE BLACKHEATH 2 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S	42		5 3 6 5	,	0			00			33 30 40 32		-4.7	-2.1	-4.8	56 57	52	0	0 0		No No		No No						No	
	2 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	52		5 4					45			37 30		-7	-5.3	-7.1	56	51	0	0 0		No		No No						No	
	2 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	54		7 4				54	47	49		36 30		-7.2	-5.6	-7.3	55	50	0	0 0		No		No No		-	No			No	
	2 BRIGHTLANDS AVENUE BLACKHEATH 2 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	E N	51 61		5 4 5 5		0	0 30		45	46	37	36 30 36 30		-7.3	-5.4	-7.1	56	51	0	0 0	0	No No		No No						No	
	2 BRIGHTLANDS AVENUE BLACKHEATH	GF		66		0 6								40 32		-7.4		-7.6		01		0 0		No		No No						No	
	58 EVANS LOOKOUT ROAD BLACKHEATH	GF		46		0 4	1 3			47				30 30		-7.3		-7.3	56	51	0	0 0				No No						No	
	58 EVANS LOOKOUT ROAD BLACKHEATH 12 CHELMSFORD AVENUE BLACKHEATH	GF GF	W	38		0 3	8 3 2 3	0 3 4 3		39	30	40	30 34	30 30 36 30	-0.5	-6.3	-4.7	-6.5	56 57	51 52	0	0 0	0	No No		No No						No	
	12 CHELMSFORD AVENUE BLACKHEATH	GF	E	45		8 4						41	32	35 30		-5.9		-6.2	56	52	0	0 0		No		No No						No	
2782	12 CHELMSFORD AVENUE BLACKHEATH	GF	N	52		5 4	-	8 3		53	45		38	31 30		-7.5	-6	-7.5	55	50	0	0 0	0	No	No	No Ne) N	No	No	No	No	No	
	12 CHELMSFORD AVENUE BLACKHEATH 12 CHELMSFORD AVENUE BLACKHEATH	GF	W	49		2 4		53 73	5 30 5 30	49	42	44	35	36 30	-5.3	-6.9 -6.9	-5.3	-7	55	50	0	0 0	0			No No		-				No No	
	12 CHELMSFORD AVENUE BLACKHEATH	GF	E	45		4 4 8 4	0	,					0,	36 30		-6.9		-6	55	50	0	0 0		No		No No				-		No	<u> </u>
	55 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43		6 4								36 30		-4.8		-4.9		50	0	0 0		No		No No						No	
	55 BRIGHTLANDS AVENUE BLACKHEATH 55 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	E N	38	-	0 3 8 3	6 31 0 3	0 3		38 45	30	38	30 31	30 30 30 30		-6.9	-0.3	-6.9	56 56	51	0	0 0	0	No		No No						No	<u> </u>
	55 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	43		5 3	8 3							30 30		-5.1	-4	-5.1	55	50	0	0 0		No		No No						No	
2813	11 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	52		5 4	7 3							42 32		-6.1	-4.4	-6.5	56	51	0	0 0		No		No No						No	
	11 BRIGHTLANDS AVENUE BLACKHEATH 11 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S W	48		1 4	6 3	7 4 7 4	00	49	41	46	00	43 33 43 33	-2.7	-4	-2.3	-5.1 -5.6	56	51	0	0 0		No No		No No						No No	
	11 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	51		5 4	6 3			51	42	40		43 33	-4.5	-6.8	-4.1	-7.6	58	53	0	0 0	0			No No						No	
2813	11 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	42		4 3								32 30		-4.4		-4.4		51	0	0 0		No		No Ne						No	
	11 BRIGHTLANDS AVENUE BLACKHEATH 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	5	N W	53 39		6 4 2 3		9 3 0 3			46	48		32 30 35 30		-7.5	-5.8	-7.4	56 56	51	0	0 0		No No		No No		-				No No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	46		2 3 9 3	6 3					30		35 30		-2.1		-2.1	56	51	0	0 0	0			NO NO						No	
		GF	E	49	4	2 4								43 36		-6.5		-6.1	56	51		0 0		No		No Ne						No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		N	49		2 4								43 36 37 30		-6.5		-6.1 -10.2	56 56	51 51	-	0 0	0	No		No No		-				No No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NE	40		2 4	4 3	6 4		40	41	44		44 36	-5.2	-6.1	-4.9	-10.2	56	51	0	0 0	0			No No		-				No	
			NW	47		0 4	-	-	00		10		0,	44 36	2/	-3.6		-3.2	56	51	0	0 0	•	No	110	No No			110		140	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	SW	38 53		2 3		-			32	36 48		35 30 47 36		-1.5 -7.6		-1.5 -9.5	56 57	51 52	0	0 0		No No		No No						No No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	54		8 4					47	40		47 37		-7.6	-5.4	-9.3	57	52	0	0 0		No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	F 2	S	55		9 5					49		10	48 38	-0	-7.1	-4.9	-8.4	57	52	0	0 0		No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH 21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	E	42		3 4 5 4			0 30 1 30				01	30 30 31 30		-2.1	0.5	-2.2	59 59	54 54	0	0 0		No No		No No						No No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	F 2	E	46		7 4	0				37	47		34 30		-1.9		-2	59	54	0	0 0		No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	50		3 4	6 3	7 4		51	43	47		42 31	-4.5	-6.4	-4	-7.5	60	55	0	0 0	0			No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH 21-23 EVANS LOOKOUT ROAD BLACKHEATH	F 1 F 2		52 54		5 4 6 5	•							43 32 44 33		-6.2		-7.1 -6.4	60 60	55 55	0	0 0		No No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF		54		8 4								47 36		-7.4		-9	57	52	0	0 0		No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	F 1		55		9 5	-		10		49			48 37		-7.3		-8.8	57	52	0	0 0		No		No No						No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH 83 GREAT WESTERN HIGHWAY BLACKHEATH	F 2 GF	W	56 50		0 5 3 4		• •			50 43	52 50		49 38 46 35		-7	-4.6	-8.1	57	52 55	0	0 0	0	No No		No No				-		No	<u> </u>
2858	83 GREAT WESTERN HIGHWAY BLACKHEATH	5	N	64		7 5	8 5	0 4	1 33	64		59		40 30	1.0	-6.5		-6.8	60	55	0	0 0		No		No No						No	
	83 GREAT WESTERN HIGHWAY BLACKHEATH	GF	W	69				-			00		01	58 47		-7.8		-8.9	60	55 3	1.4	0 0		No		No No						No	
	83 GREAT WESTERN HIGHWAY BLACKHEATH 100 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S N	65 30		9 6 0 3			7 49 0 30		59 30	60 36		57 46 30 30		-7.5	-5.3 5.5	-9.2 0	60 55	55 50	0	0 0	0	No No		No No						No No	
	100 EVANS LOOKOUT ROAD BLACKHEATH	GF		30		0 3	2 3	0	00	00	00	33		30 30		0	2.7	0	55	50	0	0 0		No		No No						No	
	100 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	30		0 4	4 3			30	00	46		32 30		3.7	16	3.7	55	50	0	0 0				No No						No	<u> </u>
	100 EVANS LOOKOUT ROAD BLACKHEATH 100 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	30 30		0 3	1 31 0 31	0 3		30	30 30	32	30 30	30 30	0.9	0	1.7	0	55	50 50	0	0 0		No No		No No						No No	
2918	141 COXS RIVER ROAD LITTLE HARTLEY	GF	N	37	3	0 3	7 3				30	38	30	30 30		0	0.8	0	55	50	0	0 0	0	No	No	No No) N	No	No	No		No	
	141 COXS RIVER ROAD LITTLE HARTLEY 141 COXS RIVER ROAD LITTLE HARTLEY	GF GF	W	38		1 3	8 3			38	31 30	39	01	30 30 30 30		-0.7	0.6	-0.1	55 55	50 50	0	0 0		No		No No						No	<u> </u>
	141 COXS RIVER ROAD LITTLE HARTLEY 141 COXS RIVER ROAD LITTLE HARTLEY	GF	з Е	32		0 3	3 3 3 3		-	32	30	33	30 30	30 30		0	0.9	0	55	50	0	0 0	0	NO NO		No No						No No	
2949	24 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	43	3	4 4			0 30		34			30 30	-0.4	-1.5	0.8	-1.5	55	50		0 0	0	No	No	No No) N	No	No	No	No	No	
	24 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	41		2 4			0 30					30 30		-2.2		-2.3		50	-	0 0				No No						No	
	24 EVANS LOOKOUT ROAD BLACKHEATH 24 EVANS LOOKOUT ROAD BLACKHEATH		N	44		7 3		1 3 6 3		45	37			30 30 39 30		-6.8 -5.2	-4.9	-6.8 -5.7	56 59	54	0	0 0		No No		No No						No	<u> </u>
2949	24 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	46	3	9 4		3 3	6 30	47	39	44	33	36 30	-3.6	-5.6	-2.8	-6.1	59	54	0	0 0	0	No	No	No Ni) N	No	No	No	No	No	
	24 EVANS LOOKOUT ROAD BLACKHEATH		W	51		3 5	0 4	0 3			43			40 30		-3.3	-0.1	-3.6	59	54	0	0 0		No		No No						No	\square
	24 EVANS LOOKOUT ROAD BLACKHEATH 24 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F	57		7 5					47	58	10	40 31		-0.9	1.2	-0.9	59	54 50	0	0 0		No No		No No						No	<u> </u>
2951	86 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	46	3	6 4	6 3	6 3	0 30	47	36	48	36	30 30	0	-0.6	1.3	-0.5	55	50		0 0	0	No	No	No No	D N	No	No	No	No	No	
	86 EVANS LOOKOUT ROAD BLACKHEATH	GF		44		8 4			0 00					31 30		-6.5		-6.4	55	50	0	0 0		No		No No						No	
2951	86 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	46	3	8 4	4 3	4 3	0 30	47	38	46	34	30 30	-2	-4	-0.9	-4	55	50	U	U 0	0	No	No	No No) [No	No	No	No	NO	

		F	açade		Predicte	d noise l	evel Open	ing Yea	ır 2030	Pr	edicted	noise leve	l Design	Year 204	40			oise level thout pro													se levels				
Receiver ID	Façade	Floor level	Direction	Withc	out proje	ct Wi	h project	Pr	oject Only	Without	t project	With p	roject	Project	t Only	Openin 20	ng Year 30	Desig 2	gn Year 040	r	Project road e criteria	ro noise	Project oad criteria ance (dB)	NM Cumulat criti exceeda	tive limit eria	Do nois exceed t crite	the NCG	Do nois exceed relative crite	he NCG ncrease	the cur limit wit roads ≥2dB to	r exceed nulative h projec adding the total levels?	t cont from	s the ribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Nigt	nt Da	/ Nigh	ıt Da	y Night	Day	Night	Day		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
	86 EVANS LOOKOUT ROAD BLACKHEATH	GF	S					41	36 30				41	37	30		-0.6						0	0	0						No	No	No	No	
	51 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W					40 39	44 36 44 37				40 39	44 45	36 37				-3.				0	0	10						No No	No	No No	No	
	51 EVANS LOOKOUT ROAD BLACKHEATH	GF	s E					34	30 30				34	45	30					0 0			0		0						No	No		No	
	51 EVANS LOOKOUT ROAD BLACKHEATH	GF	N					41	32 30				41	32	30		-1.5			5 6			0	0	0			No	No	No	No	No	No	No	
	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SE					48	54 47	62	55		49	55	48	-6.2	-7	-5.9	-6.			1 0	0	0	0			No	No	No	No	No	No	No	
2999	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		NE NW				56 4	49	54 47 51 44		00		49 48	55 52	47		-6	-4.9	-5.				0	0	10				No No		No No	No No	No No	No No	
	2209 GREAT WESTERN HIGHWAY LITTLE HARTLEY		SW					43	50 43				40	50	44								0	0	10						No	No	No	No	
3034	32 EVANS LOOKOUT ROAD BLACKHEATH	GF	E		47	37		35	30 30		37	47	35	31	30	-0.9	-2.1	0.4	-2.	1 5	55 50) 0	0	0	0	No	No	No	No	No	No	No	No	No	
	32 EVANS LOOKOUT ROAD BLACKHEATH	GF	N			37		31 30	31 30				31	32	30						55 50		0	0	0				No	No	No	No	No	No	
	32 EVANS LOOKOUT ROAD BLACKHEATH 2 CHELMSFORD AVENUE BLACKHEATH	GF GF	W			01		30 45	32 30 37 30				30 45	33	30 30		-3.7		5 -3. 9 -7.				0	0	10				No No		No No	No No	No	No No	
	2 CHELMISTORD AVENUE BLACKHEATH	GF	E					33	34 30		40		33	34	30		-6.8		5 -	7 5			0	0	0			No	No		No	No	No	No	
	2 CHELMSFORD AVENUE BLACKHEATH	GF	N			53		45	30 30	60	53		45	30	30	-6.1	-7.6						0	0	0	No		No	No	No	No	No	No	No	
	2 CHELMSFORD AVENUE BLACKHEATH		W				00	10	37 30				48	37	30			,	· · · .					•	0						No	No	No	No	
	4 CHELMSFORD AVENUE BLACKHEATH 4 CHELMSFORD AVENUE BLACKHEATH	GF GF	5					42 39	37 30 37 30				42	37	30 30								0	0	10						No No	No No	No No	No No	
	4 CHELMISFORD AVENUE BLACKHEATH	GF	S					42	37 30	56	49		41	37	30	-5.8			-7.		0		0	0	0			No	No	No	No	No	No	No	
	4 CHELMSFORD AVENUE BLACKHEATH	GF	E					36	37 30		10		36	37	30		-7	-5.3	-7.			· ·	0	0	0				No	No	No	No	No	No	
	4 CHELMSFORD AVENUE BLACKHEATH	GF	N					41	33 30 37 30				41	33	30		-7.6						0	0	10				No		No	No	No	No	
	4 CHELMSFORD AVENUE BLACKHEATH 74 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W F			17	00	42 30	37 30 30 30				42 30	37 30	30 30		-7.4			4 5 0 5	0		0	-	10				No No		No No	No No	No No	No No	
	74 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			38		30	30 30				30	30	30	-5.8	-7.4		-7.				0	0	0				No	No	No	No	No	No	
3112	74 BRIGHTLANDS AVENUE BLACKHEATH		W					30	30 30				30	30	30		-7.3						0		0				No		No	No	No	No	
	74 BRIGHTLANDS AVENUE BLACKHEATH		N			38		30 30	30 30 31 30				30	30 32	30		-7.4						0	0	10					No No	No No	No No	No No	No No	
	74 BRIGHTLANDS AVENUE BLACKHEATH 74 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			36 33	37 37	30	31 30 32 30	43			30 30	32	30 30	-4.3	-5.6		· -5.				0	0	0			No	No No	No	No	No	No	No	
3112	74 BRIGHTLANDS AVENUE BLACKHEATH	GF	W		40	33	37 3	30	32 30		33	38	30	32	30		-2.7	-2.4	-2.	7 5			0	0	0	No	No	No	No	No	No	No	No	No	
	74 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			33	36 3	30	32 30		33		30	33	30		-2.8		-2.				0	0	0			No	No	No	No	No	No	No	
	67 EVANS LOOKOUT ROAD BLACKHEATH 67 EVANS LOOKOUT ROAD BLACKHEATH	GF	E N			33 42		31 41	32 30 30 30		33		31	32	30 30		-2.2		2 -2.				0	0	10			No No	No No		No No	No	No	No	
	67 EVANS LOOKOUT ROAD BLACKHEATH		W					39	30 30		42		39	30	30		-1.2		-1.	0			0	0	0				No	No	No	No	No	No	
3124	67 EVANS LOOKOUT ROAD BLACKHEATH		N			07		38	30 30		39	51	38	30	30	-0.2	-0.8	3 1	-0.	8 5			0	•	0	No				No	No	No	No	No	
	67 EVANS LOOKOUT ROAD BLACKHEATH 67 EVANS LOOKOUT ROAD BLACKHEATH	GF GF						38 38	42 35 43 35				39 38	43	35		-1.8						0	0	10						No	No	No	No	
	26 EVANS LOOKOUT ROAD BLACKHEATH		S N		48 45		45 3	38	43 35	48	42	46	38	43	35	-2.5	-4.3						0	0	01			No	No No	No	No No	No	No	No No	
	26 EVANS LOOKOUT ROAD BLACKHEATH	GF						30	31 30	44	36		30	32	30							0 0	0	0	0	No					No	No	No	No	
	26 EVANS LOOKOUT ROAD BLACKHEATH		N			34	38 3	30	31 30				30	31	30				-3.				0	0	0	No				No	No	No	No	No	
	26 EVANS LOOKOUT ROAD BLACKHEATH 26 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W			34 43		32 42	30 30 38 31	44	34		32	30	30 30	-0.4	-1.5		-1. 3 -0.				0	0	10			No No	No No		No No	No No	No No	No No	
	26 EVANS LOOKOUT ROAD BLACKHEATH	GF	s E					42 33	33 30	44			42	39	30	-0.9	-0.0		-0.				0	0	0				No	No	No	No	No	No	
3166	5 CHELMSFORD AVENUE BLACKHEATH		W					33	36 30				32	36	30								0	0	0			No	No		No	No	No	No	
	5 CHELMSFORD AVENUE BLACKHEATH	GF	S					39	37 30				39	37	30				i -7.				0		10						No	No	No	No	
	5 CHELMSFORD AVENUE BLACKHEATH 5 CHELMSFORD AVENUE BLACKHEATH	GF	E S				41 3	33 36	36 30 37 30	46			33	36 37	30 30	-4.3							0	0	10				No No	No No	No No	No No	No No	No No	
	5 CHELMSFORD AVENUE BLACKHEATH	GF	E					33	35 30			44	33	36	30		-6						0	0	0				No		No	No	No	No	
3166	5 CHELMSFORD AVENUE BLACKHEATH	GF	N			42	43	35	32 30				35	32	30	0.0			-7.	1 5			0	0	0	No	No	No			No	No	No	No	
	5 CHELMSFORD AVENUE BLACKHEATH 5 CHELMSFORD AVENUE BLACKHEATH	GF GF	É				41 3	33	33 30 32 30	47	39		33	33	30 30	-5.1 -5.9	-6.6		5 -6. 9 -7.		55 50	0 0	0	0	10			No No	No No	No No	No No	No No	No No	No No	
	11 CHELMSFORD AVENUE BLACKHEATH		N					39 33	32 30	53			39	32	30		-7.4		-7.		5 50		0	0	10				NO NO		No No	No	No	No	
3167	11 CHELMSFORD AVENUE BLACKHEATH	GF	E		45	38	40 3	32	32 30		38	40	32	32	30	-5.1	-6.7	-5.1	-6.	7 5		1 0	Ő	0	0	No	No	No	No	No	No	No	No	No	
	11 CHELMSFORD AVENUE BLACKHEATH	GF	N					36	31 30				36	32	30								0	0	0						No	No	No	No	
	11 CHELMSFORD AVENUE BLACKHEATH 11 CHELMSFORD AVENUE BLACKHEATH	GF	W					34	34 30 34 30	48			34 34	35	30	-5.3	-6.8 -6.6		2 -6. 9 -6.				0	0	10				No No	No No	No No	No No	No No	No No	
	11 CHELMSFORD AVENUE BLACKHEATH	GF	E					31	33 30				34	34	30	-4.6							0	0	0						No	No	No	No	
	6 CHELMSFORD AVENUE BLACKHEATH	GF	E		45	39	40	32	35 30	46	39	41	32	35	30	-4.7	-6.3	-4.5		7 5	i5 50		0		0	No		No	No		No	No	No	No	
	6 CHELMSFORD AVENUE BLACKHEATH	GF GF	E		44 45	37	39 3	31	33 30 34 30	44	37	40 40	31	34	30	-4.4	-5.8	3 -4.2				0 0	0	0	10						No	No		No	
	6 CHELMSFORD AVENUE BLACKHEATH 6 CHELMSFORD AVENUE BLACKHEATH	GF	E N			38 49	40 3	32 41	34 30	45	38		31 41	34	30 30		-6 -7.6		-6.				0	0	10			No No	No No	No No	No No	No No	No No	No No	
	6 CHELMSFORD AVENUE BLACKHEATH		W					41	36 30				41	36	30				-7.				0		0				No		No	No	No	No	
3201	6 CHELMSFORD AVENUE BLACKHEATH	GF	W		55	48		41	36 30				40	36	30		-7.4		-7.	5 5	0		0	0	0	No	No	No	No	No	No	No	No	No	
	6 CHELMSFORD AVENUE BLACKHEATH	GF GF	W					40	36 30 36 30		48		40	36	30 30		-7.5		-7.				0	0	0				No		No	No	No	No	
	6 CHELMSFORD AVENUE BLACKHEATH 13-17 BRIGHTLANDS AVENUE BLACKHEATH	GF	s N					40 36	36 30 30 30			49	40 36	36	30 30		-7.4		-7. 3 -7.		55 50 57 52		0	0	10				No No	No No	No No	No No	No No	No No	
	13-17 BRIGHTLANDS AVENUE BLACKHEATH		w		00			39	41 33	01	46		38	41	31		-7.1		-7.			-	0	0	0					No	No	No	No	No	
	13-17 BRIGHTLANDS AVENUE BLACKHEATH	GF						35	40 33				34	41	30	-4.4			-	7 5		3 0	0	0	0						No	No	No	No	
	13-17 BRIGHTLANDS AVENUE BLACKHEATH 13-17 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W				45 3	36 32	40 32 33 30	50 45	43		36 32	40	30 30	-4.8						3 0	0	0	10						No No	No No	No No	No No	
		GF	E					32	33 30				32	34	30				-5. 5 -3.		58 53 57 52	,	0	0	0						NO	No	No	No	
5224			17			- 4				1 72	1 34	12	55	01	50	1.5	5.4			., ,		-1 0		0	5					1.10			1.10	li su	1

		F	-açade	Pr	edicted	I noise le	evel Oper	ning Year 2030	Pred	dicted nois	e level	Desig	n Year 2040				se level (\ out proje												ise levels				
Receiver ID	r Façade	Floor level	Direction	Withou	t projec	t Wit	h project	Project Only	Without p	roject V	Vith pr	oject	Project C	Dnly	Openin 203	ig Year 30	Design 204	Year 0	rc	Project bad criteria	NCG Project road noise criteria exceedance (dB	Cumul cr	iteria	Do noise xceed th criter	e NCG	Do nois exceed t relative i crite	he NCG ncrease	the cu limit w road ≥2dB t	or exceed imulative ith project s adding o the total e levels?	cont from	s the rribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Night	t Day	/ Nigh	nt Day Night	Day I	Night D	ay	Night	Day N	light	Day	Night		Night	Day	Night	Day Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
	4 13-17 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	41				30 30 3		33	41	30		30	-1.8		-0.7	-3.3			0 0	0 1	0 0 N				No	No	No	No	No	No	
322	4 13-17 BRIGHTLANDS AVENUE BLACKHEATH 8 76 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E	41			57	30 30 3 34 32 3	0 41	33 38	40 46	30 34		30 30	-2.2	-3.2	-1.4	-3.2			0 0		0 0 N				No No	No	No	No	No	No	
		GF	S	40					0 40	40	52	39		30	-0.1		-0.6						0 0 N				No	No	No	No		No	
	8 76 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	45				34 30 3		35	46	34		30	-0.1	-0.9	1.2	-0.8				0	0 0 N				No	No	No	No	No	No	
322		GF	N	45			40 53	31 30 3 46 52 4		38	40 54	31	30 53	30	-5.1	-6.8	-4.9	-6.8		50	0 (0	0 0 N				No	No	No	No	No	No	
		GF	W	56			43	46 52 4 36 41 3		43	54 44	46		46 34	-3.6	-4.6	-3.3	-4.2			0 0		0 0 N 0 0 N				No No	No No	No	No No	No No	No	
324	3 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	54	4 4	18	45	36 42 3	5 55	48	45	36		35	-9.4	-12.4	-9.4	-12	2 56	51	0 0	0	0 0 N				No	No	No	No		No	
	3 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E	57				46 53 4		51	54	46		46 30	-3.6		-3.3	-4.3			0 (0	0 0 N				No	No	No	No	No	No	
	1 40 EVANS LOOKOUT ROAD BLACKHEATH 1 40 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	47			14	34 33 3	0 48	41 42	43 46	34		30	-5.3	-6.9 -5.9	-5.1	-1	57		0 0		0 0 N				No No	No	No	No	No	No	
325	1 40 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	48				34 34 3		41	44	34		30	-4.9		-4.5	-6.7	57	52	0 0	0 0	0 0 N				No	No	No	No	No	No	
	1 40 EVANS LOOKOUT ROAD BLACKHEATH		W	49				37 33 3		42	49	37		30	-2.3		-1.2	-4.4			0 0	0	0 0 N				No	No	No	No	No	No	
325		GF	S	49			17	38 35 3 40 36 3		40 42	50 52	38	35	30	-0.7	-1.8	0.7	-1.8			0 0		0 0 N				No No	No	No	No No	No No	No	
		GF	S	54			00		0 54	44	56	43	00	30	-0.2	2.0	1.2	-2.7			0 0	0 0	0 0 N				No	No	No	No		No	
	1 40 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	44			10	33 33 3		35	45	33	33	30	-1	-2.4	0.2	-2.4			0 (0	0 0 N				No	No	No	No	No	No	
325	3 13 CHELMSFORD AVENUE BLACKHEATH 3 13 CHELMSFORD AVENUE BLACKHEATH	GF GF	E N	45			39 44	31 32 3 36 31 3		38 43	40	31	32	30	-5.2	-6.7	-5.1	-6.8			0 0		0 0 N				No No	No	No	No	No No	No	
	3 13 CHELMSFORD AVENUE BLACKHEATH	GF	W	48			43	35 34 3		42	43	35		30	-5.4	-7	-5.4	-7	56		0 0	0 0	0 0 N				No	No	No	No	No	No	
	3 13 CHELMSFORD AVENUE BLACKHEATH	GF	S	48			14	34 34 3		41	43	34		30	-5.3	-6.8	-5.2	-7.1			0 (0 1	0 0 N				No	No	No	No	No	No	
325		GF GF	E N	43				30 32 3 31 31 3		36 38	39 40	30	33 32	30 30	-4.6	-6.2 -6.9	-4.4 -5.3	-6.3			0 0		0 0 N				No No	No No	No	No No	No No	No	
		GF	W	43		20		31 30 3		33	43	31		30	-0.6		0.6	-1.8			0 0	0 1	0 0 N				No	No		No	No	No	
	3 74 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	53				42 34 3		43	55	42		30	0	-0.6	1.4	-0.6				0	0 0 N				No	No	No	No	No	No	
	3 74 EVANS LOOKOUT ROAD BLACKHEATH 3 74 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	E N	49			49 39	38 30 3 30 31 3		38 32	50 40	38	31	30 30	-1.6	-0.5 -2.3	1.3 -0.6	-0.5		50	0 0		0 0 N 0 0 N				No No	No	No	No No	No No	No	
	3 74 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	43				32 30 3		34	44	32	31	30	-0.6	-1.8	0.6	-1.7		50	0 0	0 1	0 0 N				No	No	No	No	No	No	
	3 74 EVANS LOOKOUT ROAD BLACKHEATH		N	45				32 31 3		38	41	32		30	-4.6		-4.3	-6.4				0	0 0 N				No	No	No	No	No	No	
	4 49 EVANS LOOKOUT ROAD BLACKHEATH 4 49 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	51				39 35 3 34 38 3		42 37	51 43	39	35	30	-1.1	-2.9	0.1	-2.9			0 0		0 0 N				No No	No	No	No	No No	No	
330	4 49 EVANS LOOKOUT ROAD BLACKHEATH	GF	Ē	49	3	39	49	38 32 3	0 50	39	51	38	32	30	0	-0.5	1.3	-0.5	60	55	0 0	0	0 0 N	0 N	0	No	No	No	No	No	No	No	
		GF	N	54			00		0 54	44	55	43		30	-0.6	-1.6	0.7	-1.6				0	0 0 N				No	No	No	No	No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH 8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S W	38				30 30 3 30 32 3		30 32	38 40	30		30 30	-0.8	-1.7	-0.1	-1.7					0 0 N 0 0 N				No No	No	No	No No	No No	No	
331	8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	40) 3	33	39	30 32 3	0 41	33	40	30	33	30	-1.6	-2.7	-0.7	-2.7		50	0 0	0	0 0 N	0 N			No	No	No	No	No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	36			00	30 30 3	0,01	30	37	30	00	30	-0.5	0	0.7	0	55			0	0 0 N				No	No	No	No	No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH 8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S F	36			36 33	30 30 3 30 30 3		30 30	37 35	30		30 30	-0.7	0	-0.1	0) 55) 55			0 0	0 0 N 0 0 N				No No	No No	No No	No No	No No	No No	
331	8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	43	3	37	38	30 30 3	0 44	37	38	30	30	30	-5.6	-6.7	-5.5	-6.7	55		0 0	0 1	0 0 N	0 N			No	No	No	No	No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH 8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N	42			07	30 30 3 30 30 3	0 43	35 36	37 38	30	30 30	30 30	-5.5	-5.4 -5.9	-5.5 -5.4	-5.4		52 53	0 0	0	0 0 N				No No	No No	No	No No	No No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH 8 85 BRIGHTLANDS AVENUE BLACKHEATH		N	43				30 30 3		30	38	30		30	-5.5		-5.4	-5.9					0 0 N				No	NO	No	NO	No	No	
331	8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	44	3	38	39	30 30 3	0 45	38	39	30	30	30	-5.6		-5.5	-7.2	2 57	52	0 0	0	0 0 N	0 N	0	No	No	No	No	No	No	No	
	8 85 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W	44			39 56	31 30 3 48 54 4		38 55	40	31	30 54	30 47	-5.3	-7	-5.1	-7	55		15 0	0 0	0 0 N				No	No	No	No	No	No	
	4 83 STATION STREET BLACKHEATH 4 83 STATION STREET BLACKHEATH		SE NE	60				48 54 4	, 01	55	57	49		47	-4.9	-7.4	-4.0	-6.8	00	00	1.0		0 0 N 0 0 N				No No	No	No	No No	No No	NO	
332	4 83 STATION STREET BLACKHEATH	GF	NW	55			17	41 45 3		49	50	41	10	37	-6.1	-8.3	-5.9	-8.2		50	0 0	0 0	0 0 N	0 N	0	No	No	No	No	No	No	No	
	4 83 STATION STREET BLACKHEATH	GF	SW	55				43 48 4 40 35 3		50	52	44	49	42	-4.2	-6.2	-3.9	-5.7		50	0 0	0 0	0 0 N				No	No	No	No	No	No	
	6 25-27 EVANS LOOKOUT ROAD BLACKHEATH 6 25-27 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W	51				40 35 3 40 42 3		42 43	52 51	40		30	-0.6	-1.8 -3.1	-0.4	-1.8			0 0	0 0	0 0 N				No No	No	No	No	No	No	
332	6 25-27 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	51		15	46		6 51	45	46	37	44	33	-4.8	-6.9	-4.6	-8.2	2 55	50	0 0	0	0 0 N		0	No	No	No	No	No	No	No	
		GF	W	52				38 44 3 38 44 3		46	47	37	44	34 34	-5.3	-7.5	-5	-8.7		50	0 0	0	0 0 N				No	No	No	No	No	No	
	6 25-27 EVANS LOOKOUT ROAD BLACKHEATH 6 25-27 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F	52			47 45		7 52 0 46	46 37	47	37	44	34	-5.1		-4.9	-8.6		51	0 0	0 0	0 0 N				No No	No	No	No	No	No	
336	2 46 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	45	3	38	40	32 32 3	0 45	38	41	32	32	30	-4.5	-6.2	-4.2	-6.2	55	50	0 (0	0 0 N	0 N	0	No	No	No	No	No	No	No	
	2 46 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	41		35	38	30 31 3	0 42	35	39 39	30	32	30	-3.4	-4.5 -4.6	-2.9	-4.5		50	0 (0	0 0 N				No	No	No	No	No	No	
	2 46 EVANS LOOKOUT ROAD BLACKHEATH 2 46 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W	42		35 10	38 49	30 30 3 39 37 3	0 42	35 40	39 51	30	30	30	-3.7	-4.6	-3.2 1	-4.6		50	0 0		0 0 N				No No	No	No	No No	No No	No	
336	2 46 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	54	4	14	54	43 38 3	1 54	44	56	43	39	30	-0.2	-1	1.1	-1	56	51	0 0	0	0 0 N	0 N	0	No	No	No	No	No	No	No	
	2 46 EVANS LOOKOUT ROAD BLACKHEATH 3 73 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	E	44				33 31 3 31 33 3		35	45 41	33	31	30 30	-0.5	-1.7	0.8	-1.7				0 0	0 0 N				No No	No	No	No	No	No	
336		GF	E	42			40 37	31 33 3 30 30 3		35 30	41 39	31	33	30	-2.4	-4.2	-1.6	-4.2			0 0		0 0 N				NO NO	No No	No	No	No No	No	
336	3 73 BRIGHTLANDS AVENUE BLACKHEATH	GF		41	3	34	36	30 30 3	0 41	34	37	30	30	30	-5	1.44	-4.9	-4.2	55	50		0	0 0 N	0 N	0	No	No	No	No	No	No	No	
	3 73 BRIGHTLANDS AVENUE BLACKHEATH 8 9 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W	43			39	31 33 3		36	40	31		30 30	-3.7	-5.4	-3.1	-5.4					0 0 N	-			No	No	No	No	No	No	
	8 9 BRIGHTLANDS AVENUE BLACKHEATH	GF	c N	54	4 4		14	40 34 3		37 47	43	33 40	35	30	-2.9	-4.7	-2.3 -5.9	-4.8	56	51	0 0		0 0 N 0 0 N				No No	No No	No No	No No	No No	No No	
337	8 9 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	51		14	46	38 40 3		44	47	37		30	-4.5	-6	-4.4	-6.5	56	51	0 (0	0 0 N	0 N	0	No	No	No	No	No	No	No	
337	8 9 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	50	4	13	46	37 43 3	5 50	43	47	37	43	33	-3.9	-6	-3.5	-6.9	56	51	0 (ו וי	0 0 N	0 N	0	No	No	No	No	No	No	No	

		F	açade	Pr	edicted	noise lev	vel Openi	ng Year 2	2030	Pr	edicted I	noise level I	Design Year	2040	Cha pro	inge in no oject - Wit	oise level thout pro	(With eject)											ise levels or exceed				
Receiver ID	Façade	Floor	Direction	Without	t projeci	t With	project	Proje	ect Only	Without	project	With proj	ject Pro	oject Only		ng Year 030		gn Year 040	r	Project oad criteria		ad (criteria	NMG Cumulative criteria xceedance	limit a	noise le ceed the criteria	NCG rela	noise level eed the NC tive increas criteria?	s the c∟ G limit w se road: ≥2dB t	imulative th projects adding the totate levels?	t cont	s the ribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Night	Day	Night	Day	Night	Day	Night	Day N	light Da	y Night	Day	Night	Day	Night	Day	Night	Day	Night	Day N	light [bay N	ght D	ay Nigh	t Day	Night	Day	Night		
	45 EVANS LOOKOUT ROAD BLACKHEATH	GF	Ν	53		4 5					44			34 30							0	0	0	0 No	No	No	No	No	No	No	No	No	
	45 EVANS LOOKOUT ROAD BLACKHEATH		W	42		4 4		2			34			34 30				3 -2.		7 52		0	0	0 No		No	No	No	No	No		No	
	45 EVANS LOOKOUT ROAD BLACKHEATH 45 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S	49		3 4 5 4	0	9 4 3 3			10	47	07	44 36 33 30						02	-	0	0	0 No 0 No	No	No No	No No	No No	No No	No No		No No	
	87 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	44		6 4						10		41 33				_				0	0	0 No	No	No	No	No	No	No	No	No	
	87 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	47					0 30		37	49	36	30 30	0 0	-0.6		-0.		5 50		0	0	0 No	No	No	No	No	No	No	No	No	
	87 EVANS LOOKOUT ROAD BLACKHEATH		N	54				0				00		33 30	, U.L.		/	0.	, 00			0	0	0 No		No	No	No	No	No	110	No	
	87 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	50		1 4 3 4	-	8 3 8 4						34 30 45 37		-		-				0	0	0 No 0 No	No	No	No	No No	No No	No	-	No	
	59 EVANS LOOKOUT ROAD BLACKHEATH 59 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	49		3 4		o 4 9 4		49	43	40		45 37	-			-	4 55	5 50		0	0	0 No	No	No	No	No	No	No	No	No	
	59 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	42		2 4						44		30 30		0.4						0	0	0 No	No	No	No	No	No	No		No	
	59 EVANS LOOKOUT ROAD BLACKHEATH	F 1	E	44		4 4		3 3					33	30 30		-0.5						0	0	0 No		No	No	No	No	No		No	
	59 EVANS LOOKOUT ROAD BLACKHEATH 59 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	N	53 55		4 5	3 4 5 4	2 3 4 3			44		12	30 30 32 30								0	0	0 No 0 No	No	No	No	No No	No	No No	No	No No	
	59 EVANS LOOKOUT ROAD BLACKHEATH		W	46							45	47	35	32 30				-1.				0	0	0 No	No	No	No	No	No	No	No No	No	
	59 EVANS LOOKOUT ROAD BLACKHEATH	F 1		49				8 3						39 31			3 -0.4	-				0	0	0 No		No	No	No	No	No	-	No	
	6 GLEN STREET BLACKHEATH	GF	S	44		8 4		4 3						39 31				2 -	4 55			0	0	0 No		No	No	No	No	No		No	
	6 GLEN STREET BLACKHEATH 6 GLEN STREET BLACKHEATH	GF	E	38		0 3 4 3	6 3	0 3		38 41	30 34	38 40	30	30 30	-1.4		0.0	i I -3.	0 55	5 50	0 0	0	0	0 No 0 No	No	No No	No	No No	No	No No	-	No	
	6 GLEN STREET BLACKHEATH	GF	F	41		4 3	9 3 7 3				34	40	30	32 30				-3.		5 50		0	0	0 NO	No	NO	NO	NO	No	NO	No	No	
	6 GLEN STREET BLACKHEATH	GF	N	44	3	7 4	0 3	1 3	5 30	44		41	30	35 30						5 50	0 0	0	0	0 No		No	No	No	No	No	No	No	
	6 GLEN STREET BLACKHEATH	GF	W	45		8 4			0	45			01	39 31	-2.7					00		0	0	0 No	No	No	No	No	No	No	No	No	
	6 GLEN STREET BLACKHEATH	GF	S	45		8 4				45	38	42		39 31				-4.		5 50		0	0	0 No	No	No	No	No	No	No	No	No	
	6 GLEN STREET BLACKHEATH 28 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	45		9 4 4 5			0		39		- ·	39 31		3 -4.7		-4.				0	0	0 No	No	No	No	No	No	No	-	No	
	28 EVANS LOOKOUT ROAD BLACKIEATH	GF	E	46		4 J 8 4		5 3				47		34 30								0	0	0 No		No	No	No	No	No		No	
3484	28 EVANS LOOKOUT ROAD BLACKHEATH		N	45		8 4	1 3			45				35 30							0	0	0	0 No	No	No	No	No	No	No		No	
	28 EVANS LOOKOUT ROAD BLACKHEATH		W	45		6 4		4 3		46	36	47		33 30				-1.		5 50		0	0	0 No		No	No	No	No	No	No	No	
	89 GREAT WESTERN HIGHWAY BLACKHEATH 89 GREAT WESTERN HIGHWAY BLACKHEATH	GF GF	W	48		2 4 1 4		5 3 4 3						35 30				-	7 55			0	0	0 No 0 No	No	No No	No	No No	No No	No No	No No	No	
	89 GREAT WESTERN HIGHWAY BLACKHEATH	GF		48										35 30				-6.				0	0	0 No		No	No	No	No	No		No	
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	89 GREAT WESTERN HIGHWAY BLACKHEATH 89 GREAT WESTERN HIGHWAY BLACKHEATH		W	59		2 5 9 6								35 30 46 36		5 -7.5		-7.	0	5 00		1.1	0	0 NO	No	NO	No	No No	No	No No	No No	No No	
	89 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	56										34 30								0	0	0 No	No	No	No	No	No	No		No	
	89 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	46		9 4	5 3	7 4			39	45		43 31				-4.		5 51	0	0	0	0 No		No	No	No	No	No	No	No	
3541	89 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	47		0 4		7 4						43 32			3 -1.5	-4.		5 51 7 52	0	0	0	0 No		No	No	No	No	No	No	No	
	89 GREAT WESTERN HIGHWAY BLACKHEATH 89 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E N	48							41			44 33 35 30				-4.		52	-	0	0	0 No 0 No		No No	No No	No No	No No	No No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH		W	30	-	0 4					30	46	34	33 30				5 3.		5 50		0	0	0 No	No	No	No	No	No	No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH		W	30						30	30	48		35 30		2 5.8		3 5.		5 50		0	0	0 No	No	No	No	No	No	No	No	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 2		30		0 4		7 3						37 30			-		3 55	00		0	0	0 No		No	No	No	No	No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 3 F 4		30		0 4		9 4				50 51		40 32				s 3 9				0	0	0 No 0 No	No	No No	No	No No	No No	No		No No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	F 5	W	30) 3	0 5	0 4		1 34	30	30	51	40	42 34	19.5	9.7	7 20.9	9.	8 55	5 50	0 0	0	0	0 No	No	No	No	No	No	No	No	No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	F 6		30		0 5		-	1	00	30			42 34	17.0				, 00	00	,	0	0	0 No	No	No	No	No	No	No	No	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 7 GF	W	30 30		0 5 0 4		0 4 5 3			30 30			42 34 34 30								0	0	0 No 0 No		No No	No No	No No	No No	No No	No No	No No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	30		0 4		5 3 8 3			30	48	36	34 30		5 5.4		5. 3 7.		5 50		0	0	0 No	No	No	NO	No	NO	No	No	No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	F 2	S	30) 3	0 4	9 3	8 3	7 30	30	30	50	38	37 30	18.7	7 8.3	3 20.3	8 8.	3 55	5 50	0 0	0	0	0 No	No	No	No	No	No	No	No	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 3		30		0 4		9 3						40 32						00		0	0	0 No		No	No	No	No	No		No	
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	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 6	S	30		0 4 0 4		9 4 0 4	0	30	30	51		41 33 42 34		s 9.4 1 9.7		s 9. 3 9.		5 50	0 0	0	0	0 No	No	No	No No	No	No No	No	No No	No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	F 7	S	30) 3	0 4		0 4	2 34	00	30	51	40	42 34	19.4			3 9.	8 55	5 50		0	0	0 No	No	No	No	No	No	No	No	No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	30		0 3	0 3	0 3			30	30	30	30 30		0 0	0 (0	0 55	5 50	0 0	0	0	0 No		No	No	No	No	No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 1 F 2	E	30		0 3	0 3	0 3	-	30	30 30	30	30 30	30 30 30 30) (7	0 55	5 50 5 50		0	0	0 No 0 No	No	No	No	No No	No No	No No	No	No No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 2	E	30				0 3		30	30	30	30	30 30					0 55			0	0	0 No	NO	NO	NO	No	NO	No	No	No	
3543	98 EVANS LOOKOUT ROAD BLACKHEATH	F 4	E	30		0 3		0 3			30			30 30		0 0			0 55			0	0	0 No	No	No	No	No	No	No	No	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 5	E	30		0 3			0 30					30 30		0 0) (0 55			0	0	0 No			No	No	No	No	-	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 6	E	30		0 3	0 3	0 3	0 30	30	30	30	30	30 30	0 0)	0 55	5 50	0 0	0	0	0 No 0 No	No	No No	No	No No	No	No No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F / GF	S	30		0 3	0 3	0 3		30		30	30	30 30	9.6	5 0	0 11.3	3	0 55	5 50	0 0	0	0	0 NO 0 NO	No	NO	NO	NO	No	No	No	NO	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	30		0 4	1 3	1 3	1 30		30	43	31	31 30			1 12.9	9 1.	1 55	5 50		0	0	0 No		No	No	No	No	No	No	No	
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 2	S	30		0 4				30				34 30				1	2 55			0	0	0 No		No	No	No	No	No		No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 3 F 4	S	30		0 4 0 4				30	30 30	44 44		37 30 38 30				2 2	3 55	5 50		0	0	0 No	No	No No	No	No	No No	No No		No No	
	98 EVANS LOOKOUT ROAD BLACKHEATH 98 EVANS LOOKOUT ROAD BLACKHEATH	F 4	S	30		0 4		3 3 4 3				44	34	38 31					6 5: 2 55		,	0	0	0 No 0 No	No	NO	No No	No No	NO	No	No No	No	
5043	70 LVAIGS LOOKOOT KOAD BLACKTLATT	15	P	30	9 J	4	. J	- I - S	J 30	30	30	44	34	50 3	13.1	y 3.5	14.4	4.	2 JC	- DC	'I U	J	U	UNU	140	INU	NU	INU	NU	טאין	NU	140	I

		F	Façade		Predicte	d noise	level Oper	ning Yea	r 2030	P	redicted	noise level	Design Yea	ar 2040	Cha pro	ange in no oject - Wi	oise level thout pro	(With eject)											Do nois agual or					
Receiver ID	Façade	Floor level	Direction	With	out proje	ct V	lith project	Pr	oject Only	Withou	t project	With pr	oject Pi	roject Only		ing Year 030		jn Year 040	ro	Project oad criteria	ro noise	criteria	NM Cumulati crite exceedar	tive limit eria	Do noise exceed th criter	levels le NCG	Do noise I exceed the relative inc criteria	ovels NCG rease ?≥	the cum	nulative n project adding the total	contr from t	the ibution he road t Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	v Nigł	nt Di	ay Nigł	nt Da	y Night	Day	Night	Day	Night Da	ay Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day M	light	Day	Night	Day	Night		
	98 EVANS LOOKOUT ROAD BLACKHEATH	F 6	S			30		35	39 32				35	40 3								0		0 N			No No				No		No	
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	98 EVANS LOOKOUT ROAD BLACKHEATH	GF F 1	F			30 30		30 30	30 30				30	30 3 30 3					0 55			0	0	0 N			No No				No No		No No	
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	98 EVANS LOOKOUT ROAD BLACKHEATH	F I	N			30 30		30	30 30		30		30	50 5	0 5.4		5.9		0 55	5 50		0	0	0 N			No No				No No	No	No	
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3586	31 EVANS LOOKOUT ROAD BLACKHEATH	GF	S			46	46	38	44 36	52	46	46	37		5 -5.6	-7.6			6 55			0	0	0			No No				No		No	
	31 EVANS LOOKOUT ROAD BLACKHEATH	GF	E			35	40	31	35 30		35		31	35 3	0 -2	2 -3.7		3 -3.8		55	5 0	0	0	0 1			No No				No	No	No	
	31 EVANS LOOKOUT ROAD BLACKHEATH 31 EVANS LOOKOUT ROAD BLACKHEATH		W			40 46	45	35	38 30 44 36		40		35	38 3	4 -4.8	3 -5	5 -2.2	-5.3		5 50		0	0	0 N			No No				No No	No	No	
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	96 EVANS LOOKOUT ROAD BLACKHEATH	GF	S			30 30		38 30	33 30 30 30		30		38 30	33 3 30 3	0 19	9 8.3 9 0		8.3				0	0	0 N			No No				No No	No	No No	
	96 EVANS LOOKOUT ROAD BLACKHEATH	GF	E S			30		30	30 30				30		0 5.9			2.7				0	0	0 1			NO NO				NO		No	
	96 EVANS LOOKOUT ROAD BLACKHEATH	GF	E			30			30 30				30	30 3		0 0) () (_			0	0	0 1			No No				No		No	
	7 CHELMSFORD AVENUE BLACKHEATH	GF	Ν			46	47	38	33 30		46		38	34 3				-7.4		5 51	1 0	0	0	0		lo I	No No				No	No	No	
	7 CHELMSFORD AVENUE BLACKHEATH	GF	W			44	45 45	37 37	35 30	,	-1-1		37	35 3 36 3	0.0			-7.		51	0	0	0	0			No No				No	No	No	
	7 CHELMSFORD AVENUE BLACKHEATH 7 CHELMSFORD AVENUE BLACKHEATH	GF GF	S F			44 40			36 30				37		0 -5.3					51		0	0	0 N			No No				No No	No No	No No	
	7 CHELMSFORD AVENUE BLACKHEATH	GF	N		50	43	44	36	33 30	50			36	34 3	-5.6			5 -7.2	2 56	,	0	0	0	0 1			No No				No	No	No	
	7 CHELMSFORD AVENUE BLACKHEATH	GF	E			40		34	34 30				34	34 3				-6.		5 51		0	0	0 N			No No				No	No	No	
	103-105 EVANS LOOKOUT ROAD BLACKHEATH 103-105 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W			30 30		31 30	34 30 35 30				31 30		0 9.1 0 7.5			0.8				0		0 N			No No				No No		No No	1
	103-105 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	-		30			30 30				30	35 3								0		0 1			NO NO				NO		No	
	103-105 EVANS LOOKOUT ROAD BLACKHEATH	GF	N		30	30	40	30	30 30		30	42	30	30 3	0 9.9	9 0	11.5	5 (0 55	5 50	0 0	0	0	0 N	lo N		No No				No	No	No	
	51 FOREST PARK ROAD BLACKHEATH	GF	S			32	37	30	32 30		01		30	33 3		-	2 -1.4	1	2 55		· ·	0	0	0 N			No No			110	No		No	1
	51 FOREST PARK ROAD BLACKHEATH 51 FOREST PARK ROAD BLACKHEATH	GF GF	E c			30 30	34	30 30	30 30 32 30		30		30 30	30 3 33 3		_	-1.8	s (0 55	5 50 5 50		0	0	0 N 0 N			No No				No No	No No	No No	
	51 FOREST PARK ROAD BLACKHEATH	GF	E			30		30	30 30		30		30	33 3			0 7.6	,	0 55	5 50		0	0	0 1			NO NO				No	No	No	
3623	51 FOREST PARK ROAD BLACKHEATH	GF	Ν		30	30	37	30	31 30	30	30	38	30	31 3	0 6.8		7.9) (0 55	5 50	0 0	0	0	0 1	lo M	lo	No No	N	lo	No	No	No	No	
	51 FOREST PARK ROAD BLACKHEATH	GF	E			30			30 30				30		0 -1.9			(0	-	0			No No				No		No	
	51 FOREST PARK ROAD BLACKHEATH 51 FOREST PARK ROAD BLACKHEATH	GF	N			31 30			31 30 30 30				30 30	31 3 30 3	0 -2.2							0	0	0 N			No No				No No		No	
	51 FOREST PARK ROAD BLACKHEATH	GF	Ň			35	38	30	34 30				30	34 3	0 -3.4		5 -2.7		5 55	5 50		0	0	0			No No				No	No	No	1
3623	51 FOREST PARK ROAD BLACKHEATH		W		40	33			31 30				30	31 3			-2.5	i -:	3 55			0	0	0 N	lo M	lo I	No No) N	lo	No	No	No	No	
	2200 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S			48		44	46 39		48		44	47 3				3 -3.		5 50		0	0	0			No No				No	No	No	
	2200 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2200 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E N			47 39		42 36	46 39		,		42	46 3			7 -3.1			5 50		0	0	0 N			No No				No No		No No	1
3677	2200 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	W		52	46	51	44	45 38	3 53	46	52	44	46 3	9 -1.4	4 -2	2 -1.1	-1.0	6 55	5 50	0 0	0		0 N	lo M	No I	No No	N	lo	No	No	No	No	
	56 EVANS LOOKOUT ROAD BLACKHEATH		N			40		33	30 30				33		0 -5.7					5 51	0	0	0	0 N			No No				No		No	
3709	56 EVANS LOOKOUT ROAD BLACKHEATH	F 1	N		47	41	42	33	33 30	48	41	43	33	33 3	-5.4	4 -7.2	2 -5.3	-7.3	3 56	51	0	0	0	0 N	10	lo I	No No	N	10	No	No	No	NO	1

		F	açade	P	redicted	noise le	evel Open	ing Year :	2030	Pred	licted no	oise leve	l Design	Year 2040	Ch pr	ange in no roject - Wi	oise level ithout pro	(With ject)										se levels or exceed				
Receiver	Facade			Withou	ıt project	t Wit	h project	Proj	ect Only	Without pr	roject	With p	roject	Project Only		ning Year 2030	Desig 20	n Year 140	NCG Proje road noise crite	ria nois	Project road e criteria dance (dB)	NMC Cumulativ criter exceedanc	e limit ia	noise lev eed the N criteria?	CG excee relativ	bise levels d the NCG re increase iteria?	the cu limit wi roads	mulative th project adding the total	contr from t	the ibution the road t Acute?	Is the property identified for	Treatment Type
ID		Floor level	Direction																								noise	levels?			consideration of treatment?	recommended
				Day	Night	Day			Night			Day	Night	Day Nigh		Night	Day	Night			Night	Day	Night D			Night	Day	Night	Day	Night		
	56 EVANS LOOKOUT ROAD BLACKHEATH		W	48			45 3		0 30	49	40	47	36		30 -2.		5 -1.8	-4.9		50 50	0 0	0	0 No	No	No	No	No	No	No	No	No	
	56 EVANS LOOKOUT ROAD BLACKHEATH 56 EVANS LOOKOUT ROAD BLACKHEATH	F 1 GE	W	49	9 4			37 3 41 3		50	41	48	37		30 -2. 30 -0.			-4.4		50	0 0	0	0 No 0 No	No	No	No No	No No		No No		No No	
	56 EVANS LOOKOUT ROAD BLACKHEATH	F 1	5	54 54		~	01	41 3 43 3		52	42	55	41		30 -0.		1.1	-1.9		50	0 0	0	0 NO	No	No	NO	No	NO	No	No	No	
	56 EVANS LOOKOUT ROAD BLACKHEATH	GF	F	41					0 30	42	31	43	30		30 -0.			-0.9		50	0 0	0	0 No	No	No	No	No	No	No		No	
	56 EVANS LOOKOUT ROAD BLACKHEATH	F 1	Ē	43	3 3	3	43 3	32 3	0 30	44	33	45	32	30	30 -0.	.2 -1	1 1	-1	1 55	50	0 0	0	0 No	No	No	No	No	No	No	No	No	
	56 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	30					0 30	40	33	35	30	30	30 -4		6 -4.6	-2.6		51	0 0	0	0 No	No	No	No	No		No	-	No	
3709	56 EVANS LOOKOUT ROAD BLACKHEATH	F 1	N	41	1 3	4	36 3	30 3	0 30	41	34	37	30	30	30 -4.	.6 -4	4 -4.2	-4	4 56	51	0 0	0	0 No	No	No	No	No	No	No		No	
3709	56 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	36	5 3	0	32 3	30 3	0 30	36	30	33	30	30	30 -3.	.4 (0 -3	(56	51	0 0	0	0 No	No	No	No	No	No	No	No	No	
	56 EVANS LOOKOUT ROAD BLACKHEATH	F 1	E	37		0	34 3	30 3		38	30	35	30	30	30 ·	-3 -0.4		-0.4		51	0 0	0	0 No	No	No	No	No	No	No	No	No	
3739		GF	S	46	5			50	6 30	46	39	39	30	5	30 -7.			-8.8		55	0 0	0	0 No	No	No	No	No		No		No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E	51					5 38		45	47	39		39 -5.			-5.7		52	0 0	0	0 No	No	No	No	No	No	No		No	<u> </u>
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	52		-	46 3	39 4 38 4		52	45 40	47	39	46	39 -5.			-5.9		52	0 0	0	0 No	No	No	No	No		No	-	No	┥────┤
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	4		-		38 4 48 5		47	40 52	46 56	39 48		38 -1. 48 -	-3 -3.8		-1.4		52	0 0	0	0 No 0 No	No	NO	No	No No	No No	No No	No No	No No	───┤
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLET		W	50	5	-		40 D			52 44	30 47	40		40 38 -3					00	0 0	0	0 No	No	No	No	No		No	-	No	<u> </u>
		GF	S	57				43 5			50	51	40		43 -6.			-6.8		53	0 0	ŏ	0 No	No	No	No	No		No		No	<u> </u>
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E	59			56	48 5			53	56	49		48 -3.	.3 -4.2	2 -2.9	-3.7		53	0 0	0	0 No	No	No	No	No	No	No	No	No	
	47 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	39	9 3.	2	37 3	30 3	1 30	40	32	38	30	31	30 -2.	.6 -2.2	2 -1.9	-2.2	2 55	50	0 0	0	0 No	No	No	No	No	No	No	No	No	
	47 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	43	3 3				6 30	44	36	42	32	0,	30 -2.			-4.1		51	0 0	0	0 No	No	No	No	No	No	No	No	No	
	47 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	39		-	•	30 3			32	38	30		30 -2.			-1.3		50	0 0	0	0 No	No	No	No	No	No	No		No	
	47 BRIGHTLANDS AVENUE BLACKHEATH	GF	N	46		<u>.</u>		33 3		47	39	41	33		30 -5.			-6.8		50	0 0	0	0 No	No	No	No	No		No		No	
	64-66 EVANS LOOKOUT ROAD BLACKHEATH	GF	5	52		-		41 3 37 3	3 30 0 30	53	42	54 50	41	33	30 30 0.	0 -0.5		-0.5		52	0 0	0	0 No	No	No	No	No	No	No		No	
	64-66 EVANS LOOKOUT ROAD BLACKHEATH	0.	E N	48	5			37 3 32 3		48	37	50 41	37		30 0. 30 -5.			-0.3		51	0 0	0	0 No 0 No	No	No	No No	No		No No	No	No	
	64-66 EVANS LOOKOUT ROAD BLACKHEATH		W	40					1 30		35	41	33		30 -0.			-1.		51	0 0	0	0 No	No	No	No	No		No		No	
	105A GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	49					5 30		42	44	35		30 -5.			-6.9		50	0 0	0	0 No	No	No	No	No		No		No	
3808	105A GREAT WESTERN HIGHWAY BLACKHEATH	GF	N	60				46 3		61	54	55	46		30 -5.	.9 -7.5	5 -6	-7.6		50	0 0	0	0 No	No	No	No	No	No	No	No	No	
	105A GREAT WESTERN HIGHWAY BLACKHEATH		W	65					8 30	65	58	59	50		30 -5.			-7.6		50	4 0	0	0 No	No	No	No	No		No		No	
	105A GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	60		4		46 3		61	54	55	46		30 -5.			-7.4		50	0 0	0	0 No	No	No	No	No	No	No	No	No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH 21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	53				38 4		53	47	47	36		34 -6.			-10.4		53	0 0	0	0 No	No	No	No	No	No	No		No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH 21-23 EVANS LOOKOUT ROAD BLACKHEATH	GF	E N	49	9 4	-		38 3 42 3		50	40	50	38 42		30 -0. 30 -0.		9 0.7	-1.9		51	0 0	0	0 No 0 No	No	No	No No	No No	No No	No No	No No	No No	
	21-23 EVANS LOOKOUT ROAD BLACKHEATH	0.	W	51	1 4			40 4		52	44	50	39		33 -2			-5.2	1 00	50	0 0	0	0 No	No	No	No	No		No		No	
	2 EVANS LOOKOUT ROAD BLACKHEATH	GF	F	40				39 4			39	50	38		32 0.			-1.1		50	0 0	0	0 No	No	No	No	No		No		No	
	2 EVANS LOOKOUT ROAD BLACKHEATH	GF	N	48				35 3			42	43	34		30 -5.		7 -5.5	-7.3		55	0 0	0	0 No	No	No	No	No		No		No	
3874	2 EVANS LOOKOUT ROAD BLACKHEATH	GF	W	55	5 4	8	50	42 4	7 39	55	48	51	41	47	37 -4.	.2 -5.9	9 -3.9	-6.8	3 60	55	0 0	0	0 No	No	No	No	No	No	No	No	No	
	2 EVANS LOOKOUT ROAD BLACKHEATH	GF	S	60				47 5		60	53	57	46		41 -3.			-7		55	0 0	0	0 No	No	No	No	No	No	No	No	No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E	50		-			5 30	50	43	45	36		30 -5.			-6.9		50	0 0	0	0 No	No	No	No	No	No	No		No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH 103 GREAT WESTERN HIGHWAY BLACKHEATH	GF	N	51	1 4	-	45 3	37 3		51	44	46	37		30 -5.	.0	7 -5.4	-7.1	1 55 7 55	50	0 0	0	0 No	No	No	No	No	No	No		No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH 103 GREAT WESTERN HIGHWAY BLACKHEATH	GF	E N	50	0 4 7 5	0	20		5 30 4 30	51	43	45 52	36 43		30 -5. 30 -5.			-7.5		50 50	0 0	0	0 No 0 No	No	No	No No	No No	No No	No No	No No	No No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH		W	6				47 3			54	56	43		30 -5			-7.4		50 0	5 0	0	0 No	No	No	No	No	No	No		No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH		W	6	1 5		00	47 3			54	55	47		30 -5.	.0 7.0	0.0	-7.5		50	0 0	0	0 No	No	No	No	No	No	No		No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH		W	61				47 3			55	56	47		30 -5.			-7.5		50 0	.7 0	0	0 No	No	No	No	No		No		No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH		N	61	1 5	5			4 30	62	55	56	47	34	30 -5.			-7.5		50 0		0	0 No	No	No	No	No	No	No	No	No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH		W	64			00	50 3	, 00		57	59	50	5	30 -5.			-7.5		50 3	.6 0	0	0 No	No	No	No	No	No	No	No	No	
	103 GREAT WESTERN HIGHWAY BLACKHEATH	GF	S	58	3 5				4 30		51	53	44		30 -5.			-7.4		50	0 0	0	0 No	No	No	No	No	No	No		No	L
	103 GREAT WESTERN HIGHWAY BLACKHEATH	GF	5	51	1 4			37 3		52	44	46 50	37		30 -5.			-7.2		50	0 0	0	0 No	No	No	No	No	No	No		No	────
	103 GREAT WESTERN HIGHWAY BLACKHEATH 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	с Г	55	5 4			41 3 41 4	4 30 8 41	56	48 46	50 49	41 42		30 -5. 41 -4.			-7.4		50 52	0 0	U	0 No 0 No	No	No	No	No	No	No No	No No	No No	╡────┤
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		N	53				41 4 42 4		53	40	49	42			4 -4.8	-3.7	-4.0			0 0		0 NO	NO	NO	NO	NO		NO		No	+
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		W	44				32 3			38	40	33		30 -4.					50	0 0	0	0 No	No	No	No	No		No		No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	48				30 3		49	42	37	30		30 -11.			-11.3		51	0 0	0	0 No	No	No	No	No		No	-	No	
	17 CHELMSFORD AVENUE BLACKHEATH	GF	N	49	9 4	2	43 3	35 3	0 30	49	42	43	35	30	30 -5.			-7.3		51	0 0	0	0 No	No	No	No	No	No	No		No	
	17 CHELMSFORD AVENUE BLACKHEATH		W	45	5 3		5	31 3	0	45	38	40	31		30 -5.			-7.2		51	0 0	0	0 No	No	No	No	No		No	No	No	
	17 CHELMSFORD AVENUE BLACKHEATH	GF	S	45					2 30	45	38	40	31		30 -4.			-6.7		51	0 0	0	0 No	No	No	No	No	No	No		No	
	17 CHELMSFORD AVENUE BLACKHEATH 2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	E W/	41				30 3 39 4		41	34	37	30		30 -4. 38 -3.			-3.7		51	0 0	0	0 No	No	No	No	No No	No	No No		No	────
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	S	45	9 4			39 4 42 4		50	43	47	39 42		38 -3. 42 -6.			-3.4		51	0 0		0 No 0 No	No	No	NO	NO	No	NO	No No	No No	+
		GF	Ē	59				42 4		57	50	50	42		42 -0. 48 -3.			-7.5		53	0 0	0	0 No	No	No	No	No		No		No	<u> </u>
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		N	60				49 5			53	57	49		49 -3.			-5.		53	0 0	0 0	0 No	No	No	No	No		No		No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY		W	51				40 4		51	44	48	40		39 -3.			-4		51	0 0	0	0 No	No	No	No	No		No	-	No	
	2187 GREAT WESTERN HIGHWAY LITTLE HARTLEY	GF	N	51	1 4		48		6 39	52	45	49	41	47	39 -3.		2 -3	-3.7		51	0 0	0	0 No	No	No	No	No	No	No	No	No	
	91 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	43					0 30	44	33	45	32		30 -0.			-0.8		50	0 0	0	0 No	No	No	No	No		No		No	
	91 EVANS LOOKOUT ROAD BLACKHEATH		N	54		4			0 30	55	44	56	43		30 -0.			-0.6		50 0	.8 0	0	0 No	No	No	No	No	No	No		No	
	91 EVANS LOOKOUT ROAD BLACKHEATH		W	41		-			0 30	41	32	42	30		30 -0.			-1.5		50	0 0	0	0 No	No	No	No	No	No	No		No	
	91 EVANS LOOKOUT ROAD BLACKHEATH 7 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	s W	45	-			36 4 44 4		46	39 49	44 54	36 43		34 -1. 38 -2.			-3.2		50	0 0	U	0 No 0 No	No	No No	No	No No	No No	No No		No No	╡────┤
	7 EVANS LOOKOUT ROAD BLACKHEATH 7 EVANS LOOKOUT ROAD BLACKHEATH	-	W	50				44 4 46 5			49	54	43	17	38 -2. 40 -3			-6.4		52	0 0		0 NO	No	NO	No No	NO		NO	No	No	+
4022	/ LVANS LOOKOUT ROAD BLACKTLATT	IL 1	**	00	- J D.	4	55 4	το _Ι Ο	43	57	JZ	JD	40	51	-3.	-5.1	-2.0	-0.5	1 5/	JZ	U U	U U	0110	UVI	NU	NU	NU	140	140	140	140	1

		Façade	Predicted	noise lev	el Openir	ng Year 2030	P	redicted n	oise level Desig	n Year 20	040	Chang proje	e in noi ct - With	se level hout proj	With ect)										se levels r exceed				
Receiver ID	Façade	Floor level Directio	Without project	: With j	project	Project Only	Withou	t project	With project	Proje	ct Only	Opening 2030	Year D	Desig 20	n Year 40	NCG Project road noise criteria	ro noise	Project oad C criteria ance (dB) e	NMG Cumulative I criteria xceedance	exc	noise lev ed the N criteria?	CG excee relativ	bise levels d the NCG e increase iteria?	the cur limit wit roads ≥2dB to		Is t contril from th project	bution ne road	Is the property identified for consideration of treatment?	Treatment Type recommended
			Day Night	Day	Night	Day Night	Day	Night	Day Night	Day	Night	Day	Night	Day	Night	Day Night	Day	Night	Day Nig	ght Da	y Nig	ht Day	Night	Day	Night	Day	Night		
	7 EVANS LOOKOUT ROAD BLACKHEATH	F 2 W	61 54	4 57					58 47	53	42		-6.4			57 52	2 0.6	6 0	0	0 No	No	No	No		No		No	No	
	7 EVANS LOOKOUT ROAD BLACKHEATH 7 EVANS LOOKOUT ROAD BLACKHEATH	F 3 W GF S	61 55 55 49				62		58 48 51 40				-6.3 -6.8		-7.3	57 52 57 52		2 0	0	0 No 0 No	No	No No	No No		No No		No No	No No	
	7 EVANS LOOKOUT ROAD BLACKHEATH	F1 S	57 5						51 40		40		-0.0		-9.1	57 52		0 0	0	0 No	No	No	No		No			No	
	7 EVANS LOOKOUT ROAD BLACKHEATH	F2 S	59 53	3 54	46	52 45	59	53	54 44	53	42	-5.3	-7.2	-5.2	-8.8	57 52	2 (0 0	0	0 No	No	No	No	No	No		No	No	
	7 EVANS LOOKOUT ROAD BLACKHEATH	F3 S	60 54				60		55 46		44	-5	-6.8	-4.7	-8	57 52		0 0	0	0 No	No	No	No	No	No		No	No	
	7 EVANS LOOKOUT ROAD BLACKHEATH 7 EVANS LOOKOUT ROAD BLACKHEATH	GF E F1 E	51 4				52		53 41 54 42		30 31		-0.1	1.0			0 0	0 0	0	0 No 0 No	No	No	No No					No No	
	7 EVANS LOOKOUT ROAD BLACKHEATH	F2 E	53 43						55 42				-0.1			55 50		0 0	0	0 No	No	No	No					No	
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4337 60 BRICHTLANDS AVENUE BLACKHEATH CF S 40 33 36 30 31 30 40 33 37 30 32 30 34 -29 -29 29 29 55 50 0 0 No N			GF			37	30		30						30						55 50	0 C	0 0	0											
1433 17 VANS.LOOKOUT ROAD BLACKHATH CF N 54 44 54 33 30 55 44 56 50 0.7 0 0 No	4337	60 BRIGHTLANDS AVENUE BLACKHEATH		S											32		-3.4 -2	2.9 -2	9 -2	2.9 5			0 0	0				No N	0						
4343 77 EVANSLOOKOUT ROAD BLACKHEATH CF W 50 41 49 39 35 30 50 41 51 39 36 30 -0.7 -2 0.6 -2 55 50 0 0 No No </td <td></td> <td></td> <td></td> <td>E</td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td>0 0</td> <td>0</td> <td></td>				E				0							00						0		0 0	0											
43:37 TVANSLODKOUT ROAD BLACKHATH CF N 48 39 47 33 30 48 39 49 37 33 30 48 39 49 37 33 30 48 37 33 30 48 37 33 30 48 23 55 50 0 0 No				W											33 36									0											
4343 77 EVANSLOOKOUT ROAD BLACKHEATH CF W 45 37 45 35 34 30 46 37 46 35 34 30 -0.7 -1.9 0.5 1.8 55 50 0 0 No N								17							33								0 0	0											
4343 77 VANS LOOKOUT ROAD BLACKHEATH GF E 47 37 47 36 31 30 47 37 48 36 31 30 47 37 48 36 31 30 -01 0.8 12 0.8 55 50 0 0 No			GF	W										35		30	-0.7 -1	1.9 0	5 -1	1.8 5	55 50	0 C	0 0	0	10	lo	No	No N	0		No	No	No		
4349 60 EVANS.LOOKOUT ROAD BLACKHEATH CF S 48 37 30 30 48 37 50 37 30 30 01 -0.2 15 0.2 57 52 0 0 No No<				S					37					37									0 0	0											
4349 60 EVANS LOOKOUT ROAD BLACKHEATH CF W 49 38 49 38 51 38 31 30 101 -0.2 15 0.1 57 52 0 0 No				E c					36					36									0 1	0											
4349 60 EVANS LOOKOUT ROAD BLACKHEATH GF S 53 43 53 43 55 43 55 43 55 43 73 30 -0.1 -0.9 1.2 -0.9 56 51 0 0 No				W				49	38						00									0											
4349 60 EVANS.LOOKOUT ROAD BLACKHEATH CF E 45 36 45 31 30 46 39 41 32 30 46 33 46 33 46 33 30 -0.2 -0.9 1.1 0.9 55 50 0 0 No	4349	60 EVANS LOOKOUT ROAD BLACKHEATH		S				53	43	00 00												1 0	0 0	0											
4349 60 EVANS LOOKOUT ROAD BLACKHEATH GF W 44 33 44 33 30 30 44 33 46 33 30 46 33 30 30 44 33 46 33 30 30 0.1 -0.4 1.4 -0.4 58 53 0 0 0 0 No	4349	60 EVANS LOOKOUT ROAD BLACKHEATH	GF	E		45	36					36	47			30	-0.2 -0	0.9 1					0 0	0	10	lo	No	No N	0	No	No	No	No	No	
												39	41	32																					
		60 EVANS LOOKOUT ROAD BLACKHEATH 54 BRIGHTLANDS AVENUE BLACKHEATH					33 32							33 30	30						56 53	1 0	0 0	0								No No	No	No	

		F	açade		Predicte	d noise	level Open	ning Yea	ır 2030	P	redicted	noise level	I Design Y	(ear 2040				se level (nout proj													se levels				
Receiver ID	Façade	Floor level	Direction	Withc	out proje	ct W	th project	Pri	oject Only	Withou	t project	With pr	roject	Project O	nly	Opening 2030	Year D	Desigi 20	n Year 40	ro	Project bad criteria	ro noise	Project oad criteria ance (dB)	NM Cumulat crite exceeda	ive limit eria	Do nois exceed t crite	e levels the NCG tria?	exceed	he NCG ncrease	the cu limit wi roads ≥2dB to	or exceed mulative th projec adding the tota levels?	t cont from	s the ribution the road ct Acute?	Is the property identified for consideration of treatment?	Treatment Type recommended
				Day	Nigł	nt Da	y Nigh	ıt Da	y Night	Day	Night	Day	Night	Day N	light	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
	54 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			34			33 30				30	34	30	-3.3	-4.1	-2.9	-4.1				0	0	10				No	No	No	No	No	No	
	54 BRIGHTLANDS AVENUE BLACKHEATH 54 BRIGHTLANDS AVENUE BLACKHEATH	GF	E N			30 39		30 32	30 30 30 30				30 32	30	30 30	-2.7	-7.2	-2.1	-7.2		50 50		0	0	10				No No	No No	No	No	No No	No	
	93 EVANS LOOKOUT ROAD BLACKHEATH		S			39			41 34				36	42	34	-1.9	-3.5						0	-	10					No	No	No		No	
4354	93 EVANS LOOKOUT ROAD BLACKHEATH	GF	E		47	37	47	36	30 30	48	37	49	36	30	30	0.1	-0.3	1.5	-0.3	55	50		0	0	0	No	No	No	No	No	No	No	No	No	
	93 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N			44 34		43 32	30 30		44		43	30 30	30	-0.1	-0.8	1.3	-0.8		51	0	0	0	10			No No	No	No No	No No	No No	No No	No	
	93 EVANS LOOKOUT ROAD BLACKHEATH 71 EVANS LOOKOUT ROAD BLACKHEATH	GF	vv S			34	43 .	32 37	30 30 42 35				32	30 43	30	-0.4	-1.4	0.8	-1.4		50		0	0	0				No No	No	No	No	No	No	
4370	71 EVANS LOOKOUT ROAD BLACKHEATH	GF	Ē		48	38	48	37	30 30) 49	38	50	37	30	30	0.1	-0.3	1.4	-0.3		53	3 0	0	0	0				No	No	No	No	No	No	
	71 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	N			43		42	30 30				42	30	30	-0.2	-1	1	-1	60	55		0	0	10				No	No	No	No	No	No	
	71 EVANS LOOKOUT ROAD BLACKHEATH 68 BRIGHTLANDS AVENUE BLACKHEATH	GF	W			35 30		34	30 30 30 30		50		35 30	30	30 30	-15	-0.7	-0.7	-0.6		53		0	0	10				No No	No No	No	No	No	No	
	68 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			30		30	30 30				30	30	30	-3.5	0	-3.2	0	55	50		0	0	10					No	No	No	No	No	
4371	68 BRIGHTLANDS AVENUE BLACKHEATH	GF	E		33	30		30	30 30	33	30	31	30	30	30	-2.7	0	-2.3	0	55	50	0 0	0	0	0	No	No	No	No	No	No	No	No	No	
	68 BRIGHTLANDS AVENUE BLACKHEATH 68 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N			39 36		31	30 30				31 30	30	30 30	-5.7	-7.3 -6.3	-5.6	-7.3				0	0	10			No No	No No	No No	No	No No	No No	No	
	68 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			36 30	00	30 30	30 30				30	30	30	-5.3	-o.3	-5.1	-0.3	55	50 50		0	0	10				NO NO	NO	NO	No	No	No	1
4371	68 BRIGHTLANDS AVENUE BLACKHEATH	GF	Ŵ		37	30		30	30 30	37	30	37	30	30	30	-1.6	0	-0.9	0	55	50	0 0	0	0	0	No	No	No	No	No	No	No	No	No	
	68 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			32 42	36	30 41	31 30 35 30		32		30 41	31 36	30	-2.4	-1.5	-1.7	-1.5		50		0	0	10			No	No	No	No	No	No	No	
	78 EVANS LOOKOUT ROAD BLACKHEATH 78 EVANS LOOKOUT ROAD BLACKHEATH	GF	S F			42 32	41	41 31	30 30		14		41	30	30	-0.1	-0.7	0.8	-0.7		51		0	0	10				No No	No No	No No	No	No No	No	
	78 EVANS LOOKOUT ROAD BLACKHEATH		N			38		31	30 30				31	31	30	-4.9	-6.6	-4.6			50		0	-	0				No	No	No	No	No	No	
	78 EVANS LOOKOUT ROAD BLACKHEATH		W			37			31 30				35	32	30	-0.3	-1.2	1	-1.2		i 50		0	0	10				No	No	No	No	No	No	
	78 EVANS LOOKOUT ROAD BLACKHEATH 78 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	S W			40 40		39 39	34 30 35 30		40		39 39	35	30 30	-0.1	-0.7	1.2	-0.7		51		0	0	10				No No	No No	No No	No No	No No	No	
	59 BRIGHTLANDS AVENUE BLACKHEATH	GF	E			30		30	30 30				30	30	30	-0.2	0	0.4	0		52		0		0				No	No	No	No	No	No	
4395	59 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			38	38	30	30 30				30	30	30	-5.8	-7.4	-5.7	-7.4		51	I 0	0	0	01	No	No	No	No	No	No	No	No	No	
	59 BRIGHTLANDS AVENUE BLACKHEATH 59 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	W			31 36	36	30 30	30 30 34 30		31		30 30	30 34	30 30	-2.1	-0.5 -5.6	-1.2	-0.5		51		0	0	1 0 1 0			No No	No No	No No	No No	No No	No No	No	
	57 BRIGHTLANDS AVENUE BLACKHEATH		W			35	38	30	30 30		50		30	30	30	-4.2	-5.0	-3.8	-5	56	51	1 0	0	0	10	No		No	No	No	No	No	No	No	
	57 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			36			34 30				30	34	30	-3.3	-5.8	-2.5	-6.1		51	1 0	0	0	0				No	No	No	No	No	No	
	57 BRIGHTLANDS AVENUE BLACKHEATH 57 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	E N			30 38		30 31	30 30 30 30		30		30 31	30	30 30	-1	-7.2	-5.6	-7.3	56	51		0	0	10			No No	No No	No No	No No	No No	No No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			35			33 30				30	33	30	-2.9	-4.7	-2.1	-4.9	57	52	2 0	0	0	10				No	No	No	No	No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	E			30		30	30 30				30	30	30	-1.6	0	-0.6	0		52		0	0	0					No	No	No	No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH 65 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	N F		44 38	37	39	31	30 30 30 30		37	40	31	30	30 30	-5.2 -3.4	-6.8 -0.9	-5.1	-6.7		52	2 0	0	0	1 0 1 0			No No	No No	No No	No No	No No	No No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			39	40	32	30 30		39		32	30	30	-5.5	-7.1	-5.3	-7.1		51	1 0	0	0	10				No	No	No	No	No	No	
4436	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	W			39	41	32	30 30				32	30	30	-4.8	-6.6	-4.4	-6.4		51	1 0	0	0	10				No	No	No	No	No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH 65 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	S W			35 36		30 30	32 30 32 30		35		30 30	32	30 30	-3.3	-4.6 -5.8	-2.8	-4.6		52	2 0	0	0	10			No No	No No	No No	No No	No No	No No	No	
	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			38		31	32 30				31	31	30	-5.3	-7	-5.1	-7	57	52	2 0	0	0	10				No	No	No	No	No	No	
4436	65 BRIGHTLANDS AVENUE BLACKHEATH	GF	W			38			34 30				32	34	30	-4.2	-5.9	-3.7	-5.9		52	-	0	-	0			No	No	No	No	No	No	No	
	62 BRIGHTLANDS AVENUE BLACKHEATH 62 BRIGHTLANDS AVENUE BLACKHEATH	GF	S			34			31 30				30	32 30	30	-3.8	-4.2	-3.3	-4.2		51		0		1 0 1 0				No	No	No	No	No	No	
	62 BRIGHTLANDS AVENUE BLACKHEATH 62 BRIGHTLANDS AVENUE BLACKHEATH	GF	N		46	30 39	33 40	32	30 30 30 30) 46	39	40	30 32	30	30 30	-2	-7.3	-1.2	-7.2		51 50		0	0	10	No			No No	No No	No No	No No	No No	No No	1
4467	62 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	4	44	38	39	31	32 30	45	38	40	31	32	30	-4.9	-6.7	-4.7	-6.8	56			0	0	10	No	No	No	No	No	No	No	No	No	
	36 EVANS LOOKOUT ROAD BLACKHEATH	GF GF	W			39	48	37	33 30				37	33	30	-0.5	-1.8	0.8	-1.8	56	51		0	0	0			No	No	No	No	No	No	No	l
	36 EVANS LOOKOUT ROAD BLACKHEATH 36 EVANS LOOKOUT ROAD BLACKHEATH	GF	з Е			44 35	41	43 32	37 30		44		43	37	30 30	-0.2	-1.2	-0.9	-1.3		53	3 0	0	0	10			No No	No No	No No	No No	No	No No	No	1
4534	36 EVANS LOOKOUT ROAD BLACKHEATH	GF	N		48	41	43	34	35 30	48	41	43	34	36	30	-4.8	-6.5	-4.6	-6.5	57	52		0	0	0	No	No	No	No	No	No	No	No	No	
	36 EVANS LOOKOUT ROAD BLACKHEATH		W			41		35	36 30				35	36	30	-4.2	-6	-3.8	-5.9		50		0	0	0				No	No	No	No	No	No	
	36 EVANS LOOKOUT ROAD BLACKHEATH 32 BRIGHTLANDS AVENUE BLACKHEATH	GF	N			38 31		32 30	34 30 30 30				32 30	35 30	30 30	-4	-5.9	-3.4	-6	50	51		0	0	10				No No	No No	No	No	No No	No	1
4535	32 BRIGHTLANDS AVENUE BLACKHEATH	GF	N		47	40	41	33	30 30	47	40	42	33	30	30	-5.7	-7.3	-5.7	-7.2	56	51	i 0	0	0	10	No	No	No	No	No	No	No	No	No	1
	32 BRIGHTLANDS AVENUE BLACKHEATH	GF				32		30	30 30				30	30	30	-4	-2.3	-3.6	-2.3				0	-	0				No	No	No	No	No	No	
	32 BRIGHTLANDS AVENUE BLACKHEATH 34 BRIGHTLANDS AVENUE BLACKHEATH		S N			34 40		30 33	32 30 30 30				30 33	32 30	30 30	-3.6	-4.2	-3.2	-4.2		51		0		10				No No	No No	No No	No No	No No	No	1
4559	34 BRIGHTLANDS AVENUE BLACKHEATH	GF	W	4	47	41	42	33	30 30	48	41	42	33	30	30	-5.7	-7.2	-5.7	-7.2	56	51	0	0	0	0	No	No	No	No	No	No	No	No	No	
	34 BRIGHTLANDS AVENUE BLACKHEATH		N			40			30 30				33	30	30	-5.7	-7.3	-5.7	-7.2		51		0	0	0			No	No	No	No	No	No	No	
	34 BRIGHTLANDS AVENUE BLACKHEATH 34 BRIGHTLANDS AVENUE BLACKHEATH	GF GF	s vv			41 37		34 31	34 30 34 30				34 31	34 34	30 30	-5.3 -4.6	-7	-5.3 -4.3	-7		51		0	0	1 0 1 0				No No	No No	No No	No No	No No	No No	
	34 BRIGHTLANDS AVENUE BLACKHEATH	GF	W			39		32	33 30		-		32	33	30	-5.3	-7	-5.2	-7.2		51	0	0	0	0				No	No	No	No	No	No	1
	34 BRIGHTLANDS AVENUE BLACKHEATH	GF	S		44	37		30	31 30				30	31	30	-5.2	-7.2	-4.9	-7.4	56	51		0	0	0				No	No	No	No	No	No	
	34 BRIGHTLANDS AVENUE BLACKHEATH 83 STATION STREET BLACKHEATH	GF GF	E NE			30 51		30 44	30 30 49 42	00			30 44	30 50	30 42	-3 -4.5	0-6.6	-2.3 -4.3	-6.3		51		0	0	10				No No	No No	No No	No No	No No	No No	
	83 STATION STREET BLACKHEATH	GF	NE			-			49 42				44	45	37	-4.5	-8.8	-4.3	-0.3		50	0 0	0	0	0	No				No	No	No		No	1
	83 STATION STREET BLACKHEATH	GF	NE			51		43	48 41		51		43	49	41	-5.4	-7.7	-5.3	-7.5		50) 0	0	0	10	No	No	No	No	No	No	No	No	No	
	83 STATION STREET BLACKHEATH 83 STATION STREET BLACKHEATH		NW SW			47 44		38 40	41 33 44 36				38 40	41 44	32 37	-6.4	-8.4	-6.3	-8.4		52	2 0	0	0	1 0 1 0				No No	No No	No No	No No	No No	No	
4565	03 STATION STREET BLACKHEATH	GF	SVV	1 3	51	44	4/	40	44 36	J 51	44	48	40	44	31	-3.1	-4.5	-2.8	-4.1	56	51	ıj 0	0	0	U	0//	110	NO	NO	NO	NO	NO	NO	INO	1

		F	açade	Predicted noise level Opening Year 2030						Predicted noise level Design Year 2040						Change in noise level (With project - Without project)												Do noise levels equal or exceed				
Receiver			Direction	Withou	Without project		t With project		Project Only		project	t With project		Project Only		Opening Year 2030		gn Year 040	road	noise criteria noise criteri		NMG Cumulative limit criteria) exceedance (dB)		exceed the NCG				the cumulative		the bution he road Acute?	d Is the property	Treatment Type
ID Façade		Floor level														2030											noise levels?				consideration of treatment?	recommended
				Day	Night		Night		Night		Night	Day	Night	Day Night		Night		Night			Night	Day I	light Da			Night		Night	Day	Night		
	3 STATION STREET BLACKHEATH	GF	SE	56				15 5 30 3			50 30	53	45		4 -3.			9 -4.		50 0	0 0	0	0 No	No	No	No	No				No	
	BRIGHTLANDS AVENUE BLACKHEATH	0.	E N	35	5	0		30 31 32 31	00		30 39	34	30	000	0 -2.		1.5		0 00	00	0 0	0	0 No 0 No	No	No	No No	No				No No	
	BRIGHTLANDS AVENUE BLACKHEATH		W	38	, ,	· ·		30 31	00		37	35	30		0 -3.		0.0	, ,		50 0	0 0	0	0 No	No	No	No	No				No	
	BRIGHTLANDS AVENUE BLACKHEATH	GF	S	38	3 3	1 3	36 3	30 31		39	31	37	30		0 -2.		1 -1.0			51 0	0 0	0	0 No	No	No	No	No	No	No	No	No	
	BRIGHTLANDS AVENUE BLACKHEATH	GF	W	40	,	-		30 3		40	33	37	30		0 -3.					51 (0 0	0	0 No	No	No	No	No		No		No	
	BRIGHTLANDS AVENUE BLACKHEATH	GF	S	41	1 34		37 3	30 3		41	34	38	30		0 -3.					51 0	0 0	0	0 No 0 No	No	No	No	No	No	No		No	
4595 58	BEVANS LOOKOUT ROAD BLACKHEATH	F 1 F 2	W	46	5 3°			32 31 34 31	00		39 41	41	32		0 -5.					51 (0 0	0	0 NO	No	No	No	No				No	
	B EVANS LOOKOUT ROAD BLACKHEATH	F 1		47	4 3		12 38 5	30 31			37	30	34	00 0	0 -5					51 0	0 0	0	0 No	No	No	No	No	No			No	
	BEVANS LOOKOUT ROAD BLACKHEATH	F 2		45			10 3	31 3			38	40	31		0 -5.					51 0	0 0	0	0 No	No	No	No	No				No	
	BEVANS LOOKOUT ROAD BLACKHEATH		W	45	5 34			34 31		45	34	46	34	30 3	0	0 -0.4				50 0	0 0	0	0 No	No	No	No	No	No		No	No	
	EVANS LOOKOUT ROAD BLACKHEATH	F 1	W	47	7 34			36 31		47	36	48	36	30 3	0 -0	0 -0.5		2 -0.		50 0	0 0	0	0 No	No	No	No	No	No			No	
4595 58	BEVANS LOOKOUT ROAD BLACKHEATH	F 2 GF	W S	48				37 3 12 3			38 43	49 55	37		0 -0.		1 0.9	9 -1. 2 -1		50 0	0 0	0	0 No 0 No	No	No	No No	No		No No		No	<u> </u>
	3 EVANS LOOKOUT ROAD BLACKHEATH	F 1	S	53				12 3			43	55	42		0 -0.			2 -1. 1 -1.		51 0.9	9 0	0	0 NO	No	NO	No	No				No	<u> </u>
	BEVANS LOOKOUT ROAD BLACKHEATH	F 2	S	56				15 3			46		45		0 -0.					51 1.4		0	0 No	No	No	No	No				No	
4595 58	3 EVANS LOOKOUT ROAD BLACKHEATH	GF	E	45				34 31	0 30	46	35	47	34	30 3	0 0.	1 -0.2	2 1.5	5 -0.	2 58	53 (0 0	0	0 No	No	No	No	No	No	No	No	No	
	EVANS LOOKOUT ROAD BLACKHEATH	F 1	E	48				37 3		48	37	49	37		0 0.					53 (0 0	0	0 No	No	No	No	No		No		No	
	BEVANS LOOKOUT ROAD BLACKHEATH	F 2 GF	E N	50				39 31 32 31			39 39	52 41	39 32		0 0.					53 C	0 0	0	0 No 0 No	No	No No	No No	No		No No		No	
	3 EVANS LOOKOUT ROAD BLACKHEATH		N	40				32 31			39 40	41	32		0 -5.					53 (0 0	0	0 NO	No	NO	No	No		No		No	
	BEVANS LOOKOUT ROAD BLACKHEATH	F 2		47				33 31			40	41	33		0 -5.					53 0	0 0	0	0 No	No	No	No	No				No	
	7 VALLEY VIEW ROAD BLACKHEATH	GF	S	44				31 3			38	40	31		0 -4.					52 0	0 0	0	0 No	No	No	No	No				No	
	7 VALLEY VIEW ROAD BLACKHEATH	GF	E	38	3 3	1 3	35 3	30 31		39	31	36	30		0 -3.	6 -1.1	1 -3.1	1 -1.	1 57	52 0	0 0	0	0 No	No	No	No	No	No	No	No	No	
	7 VALLEY VIEW ROAD BLACKHEATH	GF	N	48				34 3	30	48	41	42	34		0 -	6 -7.5		6 -7.		52 0	0 0	0	0 No	No	No	No	No				No	
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	5 BRIGHTLANDS AVENUE BLACKHEATH		W	40				30 31			30	40	30		0 -0.		4 -5.0 0 0.2			53 (0 0	0	0 No	No	No	No	No				No	
	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	S	41				30 3			34	40	30		0 -2.			2 -4.		53 0	0 0	0	0 No	No	No	No	No				No	
	5 BRIGHTLANDS AVENUE BLACKHEATH	GF	E	38	3 3	1 3		30 31	0 30	39	31	37	30		0 -2.	4 -1.1	1 -1.6	6 -1.	1 58	53 (0 0	0	0 No	No	No	No	No	No	No	No	No	
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4730 50	BRIGHTLANDS AVENUE BLACKHEATH	GF	N	47				33 31	0 30	47	40		33		0 -5.		3 -5.	7 -7.	3 56	51 (0 0	0	0 No	No	No	No	No				No	
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	2 STATION STREET BLACKHEATH	GF	SE	59				47 5:		60	53	55	48							50 0	0 0	0	0 No	No	No	No	No	No			No	
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