Sydney International Speedway

Environmental Impact Statement

Technical Paper 2
Noise and Vibration

SYDNEY INTERNATIONAL SPEEDWAY

Noise and Vibration Technical Paper

Prepared for:

Sydney Metro
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BASIS OF REPORT

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
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DOCUMENT REFERENCES

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FIGURES

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Glossary and Abbreviations

Item	Description / Definition
Attended noise monitoring	Operator attended noise monitoring which is completed to determine the various contributors to the noise environment of an area. It is usually done over a short period, such as 15-minutes.
CNVS	Sydney Metro *Construction Noise and Vibration Standard*. Replaces the *Sydney Metro Construction Noise and Vibration Strategy* (Sydney Metro, 2017)
CoRTN	Calculation of Road Traffic Noise (CoRTN) (UK Department of Transport, 1988)
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts than a single impact assessed on its own.
dBA	Decibel, A-weighted
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)
DECCW	Department of Environment, Climate Change and Water (now EPA)
EPA	Environment Protection Authority
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two-axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
HNA	Highly Noise Affected. Relates to construction noise levels of ≥75 dBA and is the point above which there may be strong community reaction to noise construction noise levels.
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
L_{AE} or SEL	Sound Exposure Level – used to characterise events and is normalised to one second
L_{Aeq}	The average noise level during a measurement period, such as the daytime or night-time
L_{AFmax}	The maximum noise level measured during a monitoring period, using 'fast' weighting
LGA	Local government area
mm/s	Millimetres per second
NATA	National Association of Testing Authorities
NCA	Noise Catchment Area
NML	Noise Management Level
Noise Control Regulation	*Protection of the Environment Operations (Noise Control) Regulation 2017*. Replaces the *Protection of the Environment Operations (Noise Control) Regulation 2008*.

Item	Description / Definition
Noise intensive equipment	Construction equipment that is particularly noisy and causes annoyance. Includes items such as rock breakers and concrete saws
NPfI	Noise Policy for Industry
ONMP	Operational Noise Management Plan
OOH	Out of Hours
OOHW	Out of Hours Work
PPV	Peak particle velocity
POEO Act	The Protection of the Environment Operations Act 1997 (POEO Act)
RBL	Rating Background Level. This is the background noise level measured at a location. The method for calculating the RBL is defined in the NSW *Noise Policy for Industry*.
Realistic worst-case scenarios	Realistic worst-case construction scenarios have been developed to assess the potential impacts from the project. These scenarios are based on the noisiest items of equipment which would likely be required to complete the works.
RNP	Road Noise Policy
Secretary's environmental assessment requirements (SEARs)	Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of Planning and Environment under section 115Y of the Environmental Planning and Assessment Act 1979 (NSW).
SLR	SLR Consulting Australia Pty Ltd
SSI	State significant infrastructure. Major transport and services infrastructure considered to have State significance because of size, economic value or potential impacts.
Standard Construction Hours	Monday to Friday 7am to 6pm and Saturdays from 8am to 1pm
SWL	Sound Power Level
Unattended noise monitoring	Noise monitoring which is typically completed over a seven day period using unattended noise monitoring equipment. The equipment is left in a certain location to measure the existing background noise levels during the daytime, evening and night-time.
VC	Vibration Criterion
VDV	Vibration Dose Value
Worst-case impacts and noise levels	The worst-case (i.e. highest) impacts or noise levels predicted in this report

1 Introduction

1.1 Sydney International Speedway

The NSW Government has committed to relocating speedway racing to Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports, creating a true motorplex for the NSW motorsport racing community. The new speedway would provide the community and racing supporters a unique sporting facility that would cater for local, regional, national, and international racing events while continuing to support the growth of speedway racing in NSW.

The new speedway would be located alongside the existing Sydney Dragway to the north and east and the Sydney Motorsports Park (operated by the Australian Racing Drivers' Club) to the north.

Western Sydney Parklands Trust, in association with the NSW Office of Sport, is leading a masterplanning process for Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports, with opportunities to share infrastructure and coordinate events across the three venues. This masterplan sets the context for the planning of the new Sydney International Speedway, which is the subject of this Technical Paper.

As part of delivering Sydney Metro West - the city's next big underground railway, the existing government land currently used for speedway racing is required for a future stabling and maintenance facility. The project is planned to be constructed and operational prior to the closure of the current speedway.

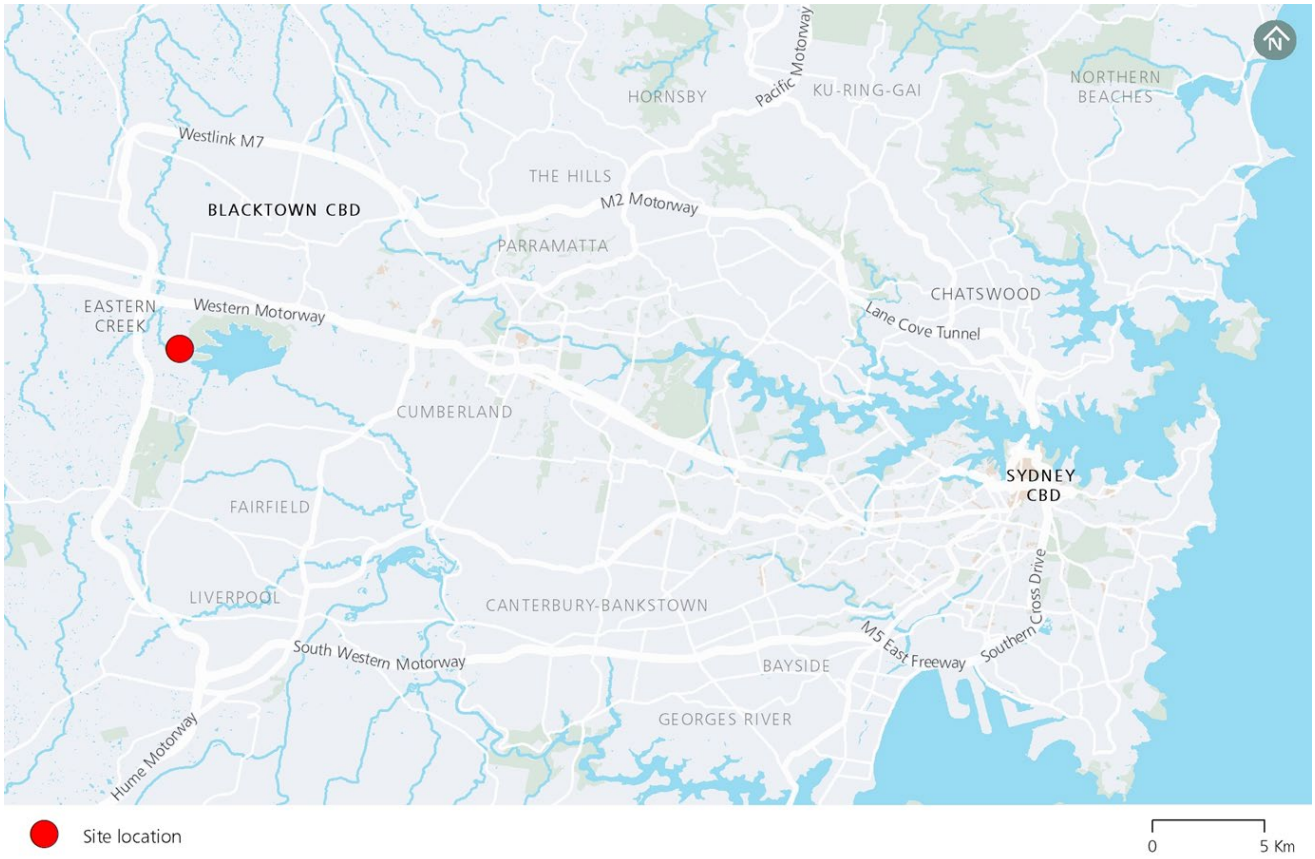
The project site is located on land owned and managed by Western Sydney Parklands Trust. Sydney Metro is applying for State significant infrastructure approval and is proposing to build the project on behalf of and pursuant to arrangements with Western Sydney Parklands Trust.

Section 5.12(4) of the EP&A Act provides for the declaration of specified development on specified land as State significant infrastructure. A declaration is being sought for the Sydney International Speedway as State significant infrastructure under Sections 5.12(4) of the EP&A Act. Schedule 4 of *State Environmental Planning Policy (State and Regional Development) 2011* will be amended to include Sydney International Speedway.

1.1.1 Location

The project would be located within Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports which sits within the Blacktown Local Government Area (LGA) in the Central River City sub-region of Greater Sydney, about six kilometres south-west of the Blacktown City Centre, and 32 kilometres west of the Sydney Central Business District. The location of the project is shown on **Figure 1**.

Figure 1 Location of the Project



1.1.2 Local Context of the Project

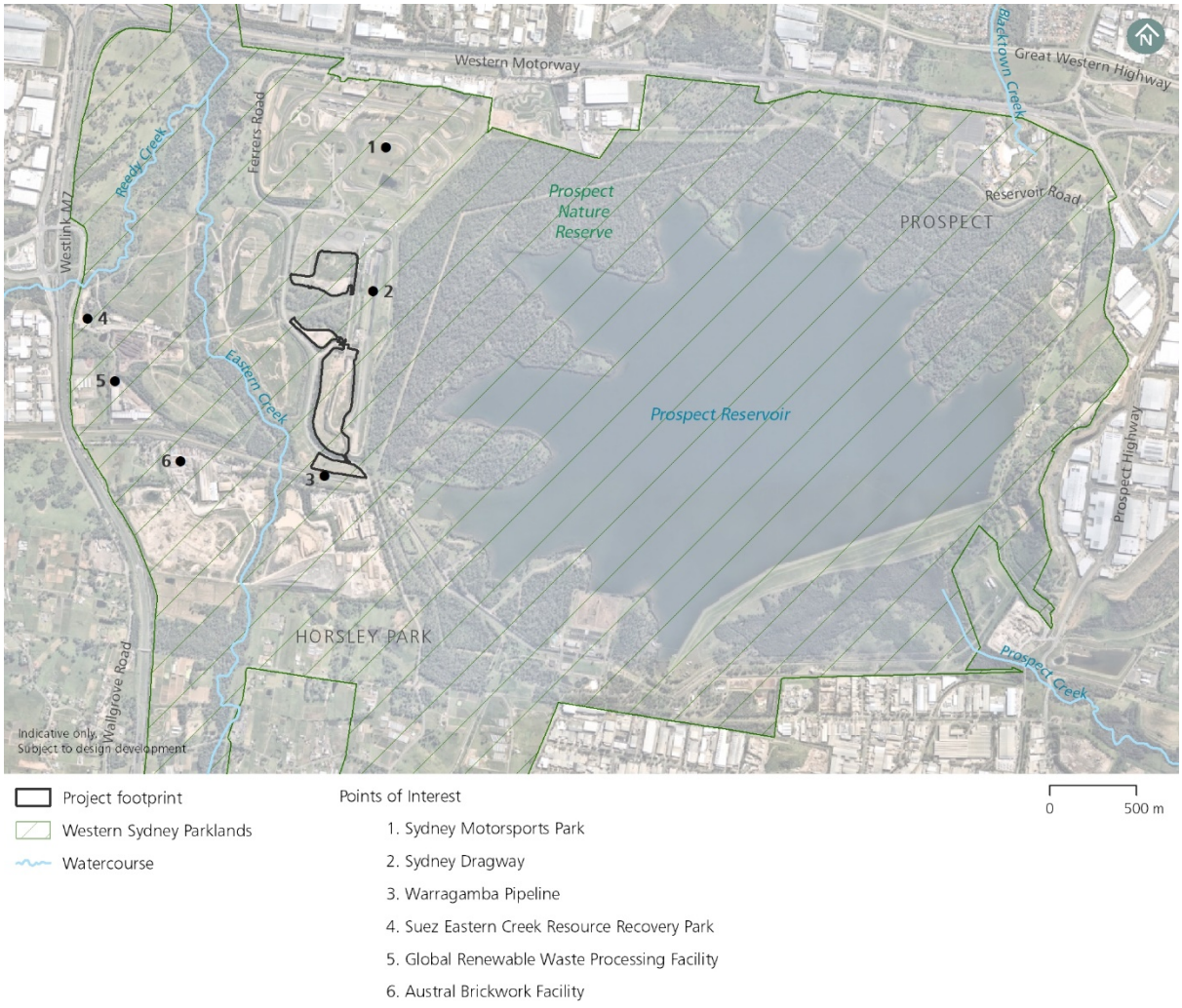
The footprint of the project site is about 21 hectares. The Western Motorway (M4 Motorway) is about 1.4 kilometres north, and the Westlink M7 is about 1.2 kilometres west of the project. Industrial and commercial developments are located to the north and west of these major roads. Prospect Nature Reserve, which contains Prospect Reservoir, is about 150 metres east of the project. The local context of the project is shown on **Figure 2**.

Sixteen precincts have been identified within the Western Sydney Parklands, each with its own character and land uses, infrastructure, issues and opportunities. The project would be situated within Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports. The project is bounded by Ferrers Road to the north-west, Ferrers Road and vegetation as part of Western Sydney Parklands in the west, the Warragamba Pipeline to the south and the Austral Bricks Horsley Park Brickworks located further south. Other motorsport operators within Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports include Sydney Dragway immediately to the north and east and Sydney Motorsports Park (operated by the Australian Racing Drivers' Club) to the north. A full list of stakeholders is provided in Chapter 4 (Stakeholder and community engagement) of the Sydney International Speedway Environmental Impact Statement.

Other businesses in the vicinity include:

- The SUEZ Eastern Creek Resource Recovery Park, about 1.1 kilometres west of the project
- Global Renewables waste processing facility, about 650 metres west of the project.

Figure 2 Local Context of the Project



1.1.3 Overview of the Project

Once complete, the project would include world class racing infrastructure in the form of a clay-based racetrack benchmarked to national and international best practice for both speedway vehicles and motorcycles. To facilitate the use of the speedway racetrack, the following ancillary racing infrastructure would be constructed:

- New vehicle access to the raceway area via an existing intersection off Ferrers Road
- A racing competitor's pit area, comprising around 150 parking bays for race vehicles and their tenders, including 20 bays for heavy vehicles transporting racing vehicles to and from the speedway and viewing platforms for pit crews
- Workshops/garages and track-side operational support areas to be used by pit crews.

High quality event support infrastructure provided to maximise the spectator experience at speedway events would comprise:

- A grandstand with the capacity to seat around 3750 spectators
- Ticketing and entryway structures
- Spectator facilities, including terraced seating for up to a total of around 7000 spectators, public amenities, corporate boxes, provision for food and beverage operators together with merchandise outlets
- Dedicated parking provided for spectators, visitors and users of the Sydney International Speedway, available for use by other motorsport operators by agreement
- Dedicated parking for Sydney Dragway to replace the existing spectator parking areas which would form part of the Sydney International Speedway project site. The new Sydney Dragway parking would be available for use by other motorsport operators by agreement

Operational support infrastructure would be provided to enable the operation of the Sydney International Speedway. Such infrastructure would include:

- Public safety including fencing and fire safety systems
- Communications including a fibre optic network (to suit internet broadcasting bandwidth and PA/AV provisions), signage and large broadcasting screens
- Services including the provision of stormwater, drainage and flooding, utilities and lighting.

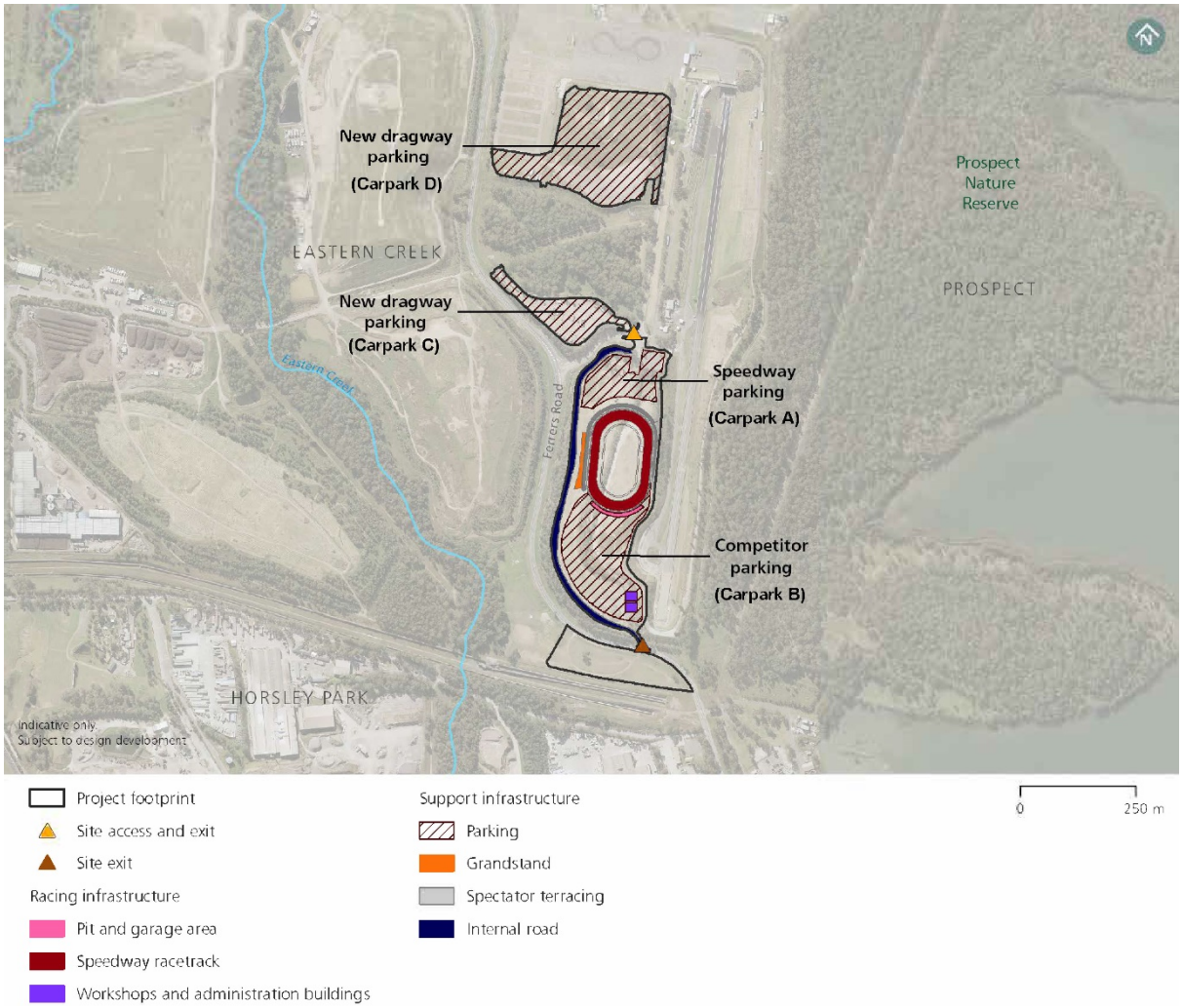
The operational site layout is shown on **Figure 3**. Operation would also include maintenance activities required to support the project.

Construction of the project is expected to take around 13 months to complete. The following construction activities would be carried out:

- Clearing, earthworks and levelling
- Landforming works
- Establishment of carparks
- Construction of racing and event support infrastructure
- Utilities connections, landscaping and finishing works.

Further detail on the project is provided in Chapter 5 (Project description) of the Sydney International Speedway Environmental Impact Statement.

Figure 3 Project Overview



1.2 Purpose and Scope of this Report

This technical paper is one of several technical papers that form part of the Environmental Impact Statement. The purpose of this technical paper is to identify and assess potential noise and vibration impacts of the project. In doing so it responds directly to the Secretary's Environmental Assessment Requirements outlined in **Section 1.3**.

The objective of this investigation was to:

- Describe the existing environment with respect to noise and vibration
- Summarise the construction and operational noise and vibration impacts of the concept design for the project on the nearby communities and receivers
- Evaluate the potential cumulative impact of the project with other major infrastructure projects
- Identify feasible and reasonable noise and vibration mitigation and management measures to be incorporated in the detailed design and construction planning stage of the project.

1.3 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements were issued for Sydney International Speedway on 19 May 2020. The requirements specific to noise and vibration and where these requirements are addressed in this technical paper are outlined in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements – Noise and Vibration

Reference	Secretary's Environmental Assessment Requirements	Where addressed
2.2.1	*The Proponent must assess construction and operational noise and vibration impacts (including cumulative impacts of concurrent events) in accordance with relevant NSW noise and vibration guidelines.* *Current Guidelines* - *Assessing Vibration: a technical guideline (DEC, 2006)* - *Interim Construction Noise Guideline (DECCW, 2009)* - *NSW Road Noise Policy (DECCW, 2011)* - *Noise Policy for Industry (EPA, 2017)*	**Section 3**, **4**, **5** and **5.6**
2.2.2	*The assessment of construction noise and vibration must address:*	
	(a) the nature of construction and operational activities and related noise characteristics	**Section 4.1.1 (construction)** **Section 4.2 (operation)**
	(b) the intensity and duration of both air and ground borne noise and vibration impacts.;	**Table 18** **Section 5.5**
	(c) the identification and nature of receivers, existing during construction and operation;	**Section 2.2**

Reference	Secretary's Environmental Assessment Requirements	Where addressed
	(d) the nature of the impact and the sensitivity of receivers and level of impact for out of hours work and events	**Section 5.2**
	(e) an assessment of operational road traffic noise	**Section 6.3**
	(f) details and analysis of the predicted effectiveness of mitigation measures to adequately manage identified impacts,	**Section 8**
	(g) any potential residual noise and vibration impacts following application of mitigation measures; and	**Section 8**
	(h) a description of how 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.	***Refer to Chapter 4 (Stakeholder and community engagement) of the Environmental Impact Statement***
2.3.1	*The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).*	**Section 3.1** **Section 5.3 (construction)** **Section 6.5 (operation)**
2.3.2	*The Proponent must assess the construction and operation vibration impacts of the development upon pipeline(s) corridor and identify relevant mitigation measures where required.*	**Section 5.3.3 (construction)** **Section 6.6 (operation)**

1.4 Terminology

The assessment has used specific acoustic terminology and an explanation of common terms is included in **Appendix A**. A glossary is also provided at the start of this document which lists the various terms used throughout this document.

2 Existing Environment

2.1 Study Area

The project site is located in the Blacktown Local Government Area (LGA) within the Western Sydney Parklands Precinct 5: Eastern Creek Motor Sports. The existing land uses bounding the project site are commercial/industrial to the south and west, with major road corridors being further to the west (M7 Motorway) and north (M4 Motorway). Prospect Reservoir is located to the east of the project. The nearest residential receivers are located to south beyond the existing industrial area and to the northwest beyond the Lighthorse (M4/M7) Interchange.

Existing sources of noise in the study area include existing commercial/industrial facilities, road traffic noise and noise from existing motorsport events at Sydney Motorsport Park and Sydney Dragway.

All identified receivers surrounding the project are included in the assessment and have been grouped into Noise Catchment Areas (NCAs) that reflect the ambient noise environment of that area, as well as the noise and vibration sensitivity of the surrounding land uses, to assist in summarising the potential impacts. The study area was chosen to include all surrounding receivers with potential noise and/or vibration impacts from the project. The study area and NCAs are shown in **Figure 4** and described in **Table 2**.

Figure 4 Study Area

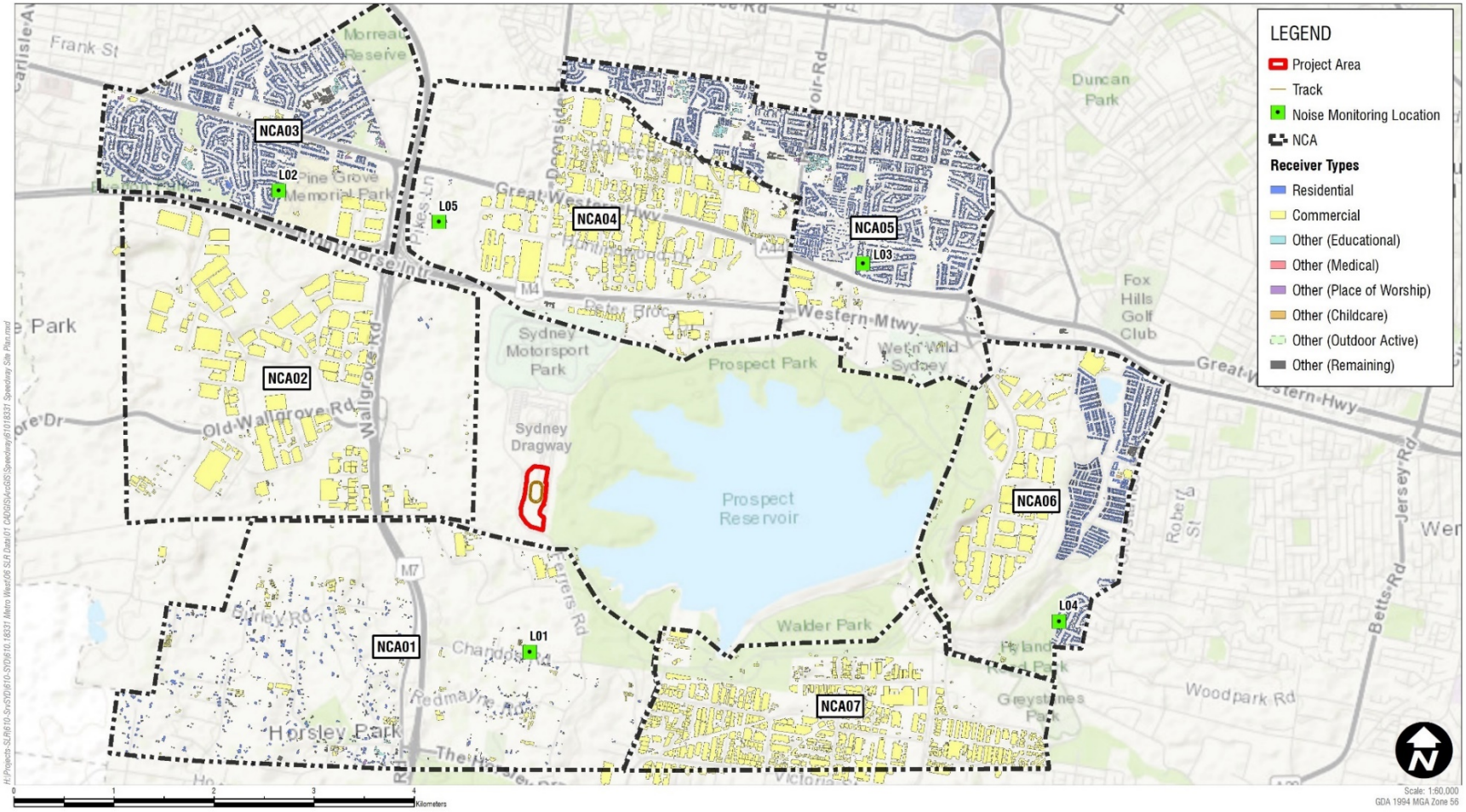


Table 2 Noise Catchment Areas and Surrounding Land Uses

NCA	Minimum Distance (metres)[1]	Description
NCA01	200 m	South of the project, in Horsley Park. This catchment is mainly residential except the area immediately south of the project which is commercial/industrial. Residential receivers beyond are sparsely distributed on either side of the M7 Motorway. The nearest residential receivers are around one kilometre to the south of the project site along Chandos Road. The catchment includes Austral Bricks Horsley Park which is between the project site and the nearest residential receivers.
NCA02	1,000 m	West of the project, in Eastern Creek. This catchment is mostly commercial and industrial receivers to the west of the M7 Motorway. Two residential receivers located around one kilometre northwest of the project site have been included in the assessment, however, it is not clear if these are currently occupied. These receivers are within the proposed Light Horse Interchange Business Hub Eastern Creek project area.
NCA03	2,200 m	Northwest of the project, in Minchinbury. This catchment is mainly residential, however, the nearest receivers are over three kilometres from the project, beyond both the M7 Motorway and M4 Motorway.
NCA04	1,500 m	North of the project, in Huntingwood and Arndell Park. This catchment is mostly commercial and industrial receivers beyond the M4 Motorway. A small number of sparsely distributed residential receivers are located in this catchment, between the M4 Motorway and Great Western Highway. The nearest of these is over two kilometres from the project.
NCA05	3,000 m	Northeast of the project, in Blacktown. This catchment is mostly residential receivers to the north of the Great Western Highway, however, the nearest receivers are over three kilometres from the project beyond the intervening commercial/ industrial area.
NCA06	3,200 m	East of the project, in Pemulwuy. The nearest receivers are commercial and industrial receivers along Prospect Highway, with residential receivers being further east and approximately three kilometres from the project.
NCA07	1,800 m	Southeast of the project, in Wetherill Park. The catchment is mostly commercial and industrial receivers.
Parklands		Open space and parklands (including Prospect Park and Nature Reserve, Western Sydney Parklands and Walder Park) are located adjacent to the project site and extend east around the Prospect Reservoir.

Note 1: Approximate minimum horizontal distance to the nearest sensitive receiver(s).

2.2 Sensitive Receivers

Receivers potentially sensitive to noise and vibration have been categorised as residential buildings, commercial/industrial buildings, or 'other sensitive' land uses which includes educational institutions, child care centres, medical facilities, places of worship, outdoor recreation areas, etc.

Receiver types and locations are shown in **Figure 4**.

The heritage listed Prospect Reservoir is located to the east of the project site. While the boundary is around 40 m from the project the structure of the reservoir is over 300 metres away. The Warragamba Pipelines Corridor is also to the south of the project site.

2.3 Noise Surveys and Monitoring Locations

2.3.1 Unattended Ambient Noise Monitoring Results

Unattended ambient noise monitoring was completed in the study area in January and February 2020. The measured noise levels have been used to determine the existing noise environment and to set criteria to assess the potential impacts from the project.

The ambient noise monitoring locations were selected with reference to the procedures outlined in the NSW EPA *Noise Policy for Industry* (NPfI). The measured existing noise levels are representative of receivers in each NCA that would likely be most affected by the project.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time. All equipment carried current National Association of Testing Authorities (NATA) calibration certificates and the calibration was checked before and after each measurement.

The results of the noise monitoring have been processed with reference to the NPfI to exclude noise from extraneous events and/or data affected by adverse weather conditions, such as strong wind or rain (measured at Horsley Park Equestrian Centre Weather Station), to establish representative existing noise levels for each NCA.

The monitoring locations are shown in **Figure 4** with the results summarised in **Table 3**. Descriptions of each monitoring location together with graphs of the daily measured noise level are in **Appendix B**.

Table 3 Summary of Unattended Noise Monitoring Results

Location ID	NCA	Address	Noise Level (dBA)[1,2]					
			Background Noise (RBL)			Average Noise Level (L_{Aeq})		
			Day	Evening	Night	Day	Evening	Night
L01	NCA01	150-151 Chandos Road, Horsley Park	39	39[3] (actual 40)	39[3] (actual 40)	49	49	48
L02	NCA03	8 Farrington Street, Minchinbury	41	41[3] (actual 45)	41	55	57	49
L03	NCA05	94 Ollier Crescent, Prospect	43	43	38	54	54	49
L04	NCA06	48 Munro Street, Greystanes	35	35[3] (actual 36)	35[3] (actual 39)	48	48	47
L05[4]	NCA04	51 Pikes Lane, Eastern Creek	47	47	41	52	51	52

Note 1: The RBL and L_{Aeq} noise levels have been determined with reference to the procedures in the NPfI.

Note 2: Daytime is 7am to 6pm, evening is 6pm to 10pm and night-time is 10pm to 7am.

Note 3: RBL for evening set at no greater than the daytime, and RBL for night-time set no greater than the day or evening following principles outlined in the NPfI.

Note 4: Data from noise monitoring undertaken by SLR in December 2018 as part of a nearby project.

The unattended noise monitoring results indicate existing daytime background noise levels are dominated by road traffic noise from distant major roads, including the M7 Motorway, M4 Motorway and Great Western Highway. Nearby insect noise is considered likely to have influenced the evening and night-time measurements during the survey which is a common occurrence during warmer months. Guidance from the NPfI has been followed in determining the RBLs for these locations.

2.3.2 Attended Noise Measurements

Short-term attended noise monitoring was completed at each ambient noise monitoring location. The attended measurements allow the contributions of the various noise sources at each location to be determined. Detailed observations from the attended measurements are provided in **Appendix B**. These measurements show the ambient noise environment is generally influenced by environmental noise, road traffic on the surrounding road network and some insect noise during the night-time.

2.4 Prevailing Weather Conditions

An assessment of prevailing wind conditions has been completed using data measured at Horsley Park Equestrian Centre Weather Station. The detailed weather analysis for the 12-month period from January to December 2019 is shown in **Appendix C**, consistent with the requirements of NPfI Fact Sheet D. The measured prevailing weather conditions are summarised in **Table 4**.

Table 4 Prevailing Weather Conditions

Weather Condition	Frequency of Occurrence[1]		
	Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Wind - Calm	●	●	■
Wind - 0.5 to 2 metres per second	●	●	●
Wind - 2 to 3 metres per second	●	●	●
Wind - 0.5 to 3 metres per second	●	■	■
Atmospheric Stability F or G – Moderately or Extremely Stable	●	●	■

Note 1: Green circle = frequency of occurrence less than 30 per cent, orange square = frequency of occurrence more than 30 per cent.

As shown above, the seasonal frequency of occurrence of the prevailing winds during the daytime is less than 30 per cent, however, prevailing winds during the evening and night-time exceeds the 30 per cent threshold. Temperature inversions of Class F (moderately stable) or Class G (extremely stable) also occur for more than 30 per cent of the night-time period.

With refence to **Appendix C**, the prevailing wind direction during the evening and night-time is from the west and south-west. This is a noise enhancing source to receiver direction for receivers east and north-east of the project site.

The resulting meteorological modelling conditions are discussed in **Section 4.2.4**.

3 Policy Context

This section summarises the guidelines and/or policies referred to in the assessment.

3.1 Relevant Guidelines Overview

The guidelines used in this assessment are listed in **Table 5**. The guidelines aim to protect the community and environment from excessive adverse noise and vibration impacts from the project.

Table 5 Noise and Vibration Guidelines

Guideline/Policy Name	Where Guideline Used
Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change (DECC), 2009	Assessment of construction airborne noise impacts on sensitive receivers
Assessing Vibration: a technical guideline, Department of Environment and Conservation (DEC), 2006	Assessment of construction vibration impacts on sensitive receivers
AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors	Provides recommended design sound levels for internal areas of occupied spaces
Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011	Assessment of construction traffic impacts and operational impacts of facility related traffic on public roads
BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993	Screening assessment of construction vibration impacts (cosmetic damage) to sensitive buildings and structures
DIN 4150: Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung, 1999	Screening assessment of construction vibration impacts (cosmetic damage) to vibration sensitive heritage buildings and structures, where the structure is found to be unsound
Construction Noise and Vibration Strategy, Transport for NSW, 2016	Assessment and management protocols for airborne noise, ground-borne noise and vibration impacts for construction of infrastructure projects
Sydney Metro Construction Noise and Vibration Standard (CNVS), Sydney Metro, 2020	Assessment and management protocols for construction of Sydney Metro projects. This Sydney Metro standard is based on the requirements of the ICNG and Transport for NSW CNVS, as appropriate to Sydney Metro and is the guiding strategy for assessing and managing the potential impacts during construction of the project. This Sydney Metro standard replaces the *Sydney Metro Construction Noise and Vibration Strategy* (Sydney Metro, 2017)
Noise Policy for Industry (NPfI), Environmental Protection Authority (EPA), 2017	Ambient noise monitoring and analysis procedures, and assessment of sleep disturbance
Noise Guide for Local Government (NGLG), Environmental Protection Authority (EPA), 2013	Assessment of motorsport facility operations

3.2 Construction Airborne Noise Guidelines

The *Sydney Metro Construction Noise and Vibration Standard* (CNVS) references the NSW *Interim Construction Noise Guideline* (ICNG) for assessing and managing impacts from construction noise on projects undertaken by Sydney Metro.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers. The realistic 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impacts.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.2.1 Residential Receivers

3.2.1.1 Noise Management Levels

The ICNG approach for determining NMLs at residential receivers is shown in **Table 6**.

Table 6 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises 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 dBA	The Highly Noise Affected (HNA) 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 restructuring the hours during which 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.

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Outside Standard Construction Hours:	Noise affected RBL + 5 dB	• 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 above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI). The RBLs have been determined in accordance with the calculation procedures outlined in the NPfI as described in **Section 2.3**.

In the ICNG, works are recommended to be completed during Standard Construction Hours. More stringent requirements are placed on works that are required to be completed outside of Standard Construction Hours (i.e. during the evening or night-time) which reflects the greater sensitivity of communities to noise impacts during these periods.

Construction of the project is expected to be completed during up to 24 hours per day, seven days a week for the duration of construction.

3.2.1.2 Sleep Disturbance

Major infrastructure projects often require certain works to be completed during the night-time. Where night works are located close to residential receivers there is potential for sleep disturbance impacts.

Where construction works are planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed.

The most current method for assessing sleep disturbance from NSW transport infrastructure projects is contained in the EPA's *Noise Policy for Industry* (NPfI). Although the NPfI sleep disturbance criteria relate to industrial noise, they are considered relevant for reviewing potential impacts from construction noise.

The NPfI defined sleep disturbance criteria is 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater. Sleep disturbance screening criteria are shown in **Table 7**.

3.2.1.3 Summary of Residential NMLs

The residential NMLs for the project have been determined using the results from the unattended ambient noise monitoring (see **Section 2.3**) and are shown in **Table 7**.

Table 7 Residential Receiver Construction Noise Management Levels

NCA	Representative Background Monitoring Location	Daytime RBL	NML (LAeq(15minute) – dBA)				Sleep Disturbance Screening Criteria (52 dBA or RBL +15 dB whichever is higher)
			Standard Construction (RBL +10 dB)	Out of Hours (RBL +5 dB)			
			Daytime[1]	Daytime[1]	Evening[2]	Night-time[2]	
NCA01	L01	39	49	44	44	44	54
NCA02	L01	39	49	44	44	44	54
NCA03	L02	41	51	46	46	46	56
NCA04	L05	47	57	52	52	46	56
NCA05	L03	43	53	48	48	43	53
NCA06	L04	35	45	40	40	40	52
NCA07	L04	35	45	40	40	40	52

Note 1: Daytime out of hours is 7 am to 8 am and 1pm to 6pm on Saturday, and 8am to 6pm on Sunday and public holidays.

Note 2: RBLs shown in **Table 3**.

The noise monitoring locations were selected to measure background noise levels representative of the potentially most affected residential receivers in each NCA. These locations would likely be most affected during construction of the project.

3.2.2 Other Sensitive Land Uses and Commercial Receivers

Non-residential land uses have been identified in the study area. These include 'other sensitive' land uses such as educational institutes, medical facilities, outdoor recreational areas and commercial properties. The ICNG NMLs for 'other sensitive' receivers are shown in **Table 8**.

Table 8 ICNG NMLs for 'Other Sensitive' Receivers

Land Use	Noise Management Level LAeq(15minute) (dBA) (Applied when the property is in use)	
	Internal	External
Classrooms at schools and other educational institutions	45	55[1]
Hospital wards and operating theatres	45	65[1]
Places of worship	45	55[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70
Industrial	-	75

Note 1: The criteria is specified as an internal noise level for this receiver category. As the noise model predicts external noise levels, it has been conservatively assumed that all schools and places of worship have openable windows and external noise levels are 10 dB higher than the corresponding internal level, which is representative of windows being partially open to provide ventilation. Hospitals are assumed to have fixed windows with 20 dB higher external levels.

The ICNG references *AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors* for criteria for 'other sensitive' receivers which are not listed in the guideline. Neither the ICNG nor AS2107 provide criteria for child care centres so the Association of Australian Acoustical Consultants *Guideline for Child Care Centre Acoustic Assessment* (GCCCAA) has been referenced. The NMLs for 'other sensitive' receivers are shown in **Table 9**.

Table 9 NMLs for 'Other Sensitive' Receivers

Use	Period	NML Derived From	Noise Management Level LAeq(15minute) (dBA)	
			Internal	External
Hotel	Daytime & evening	AS2107: Bars and lounges	50	70[1]
	Night-time	AS2107: Sleeping areas, Hotels near major roads	40	60[1]
Bar/Restaurant	When in use	AS2107: Bars and Lounges / Restaurant	50	70[1]
Child care centres	Daytime	GCCCAA: Outdoor play areas	-	55
		GCCCAA: Sleeping areas	40	50[2]
Public building	When in use	AS2107: Public space	50	60[2]

Note 1: It is assumed that these receiver types have fixed windows with a conservative 20 dB reduction for external to internal noise levels.

Note 2: Receiver conservatively assumed to have openable windows and a 10 dB outside to inside facade performance.

3.3 Construction Traffic Noise Guidelines

The potential impacts from construction traffic when travelling on public roads are assessed under the NSW *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB due to construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in **Table 10**.

Table 10 RNP Criteria for Assessing Construction Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7am - 10pm)	Night-time (10pm - 7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

Where the criteria are exceeded the project would consider the use of all feasible and reasonable mitigation and management measures to minimise the impacts.

3.4 Construction Vibration Guidelines

3.4.1 Residential and other non-heritage structures

The effects of vibration from construction works can be divided into three categories:

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction works are located close to occupied buildings. Vibration from construction works tends to be intermittent in nature and the EPA's *Assessing Vibration: a technical guideline* (2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV) shown in **Table 11**.
- Those where building contents may be affected (**building contents**). People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents.
- Those where the integrity of the building/structure may be compromised (**structural or cosmetic damage**). If vibration from construction works is sufficiently high it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in Australian Standard AS 2187-2, British Standard BS 7385 and German Standard DIN 4150, which are referenced in the Sydney Metro CNVS. The limits are shown in **Figure 5** and **Table 12**.

Table 11 Human Comfort Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value[1] ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (e.g. operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods and is dependent on the level of vibration as well as the duration.

Figure 5 Transient Vibration Values for Minimal Risk of Cosmetic Damage

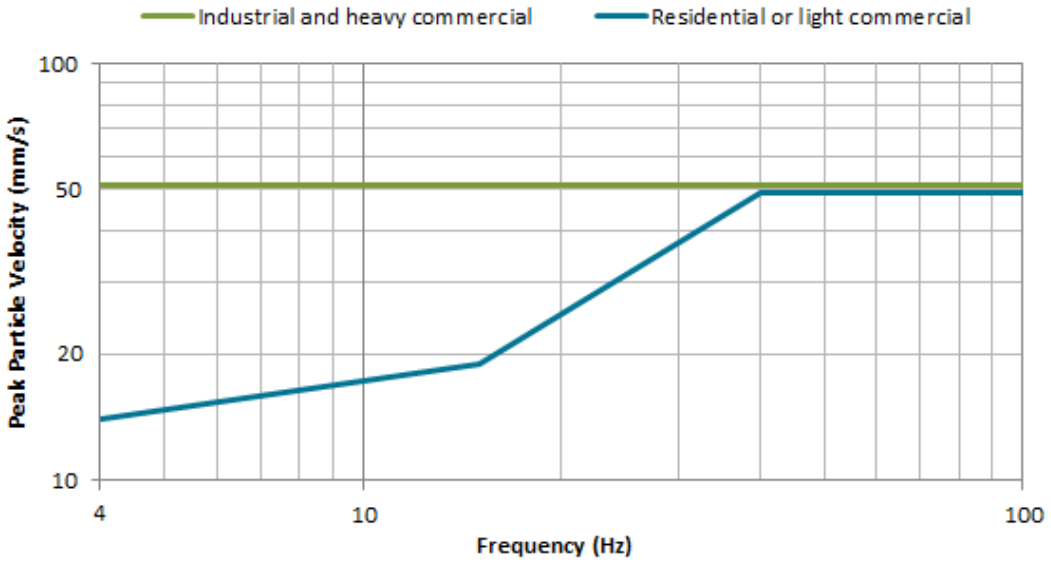


Table 12 Transient Vibration Values for Minimal Risk of Cosmetic Damage

Type of Building	Peak Particle Velocity[1]
Reinforced or framed structures. Industrial and heavy commercial buildings	25 mm/s
Unreinforced or light framed structures. Residential or light commercial type buildings	7.5 mm/s

Note 1: Cosmetic damage vibration limits are reduced by 50 percent to account for dynamic loading caused by continuous vibration dynamic magnification due to resonance.

3.4.2 Heritage Buildings and Structures

The Sydney Metro CNVS states that heritage buildings and structures should be assessed according to the cosmetic damage screening criteria in **Table 12** and should not be assumed to be more sensitive to vibration unless found to be structurally unsound.

Where heritage buildings and structures are found to be structurally unsound, a more conservative cosmetic damage objective of 2.5 mm/s Peak Particle Velocity (PPV) (from DIN 4150) would be considered.

3.4.3 Utilities and Other Vibration Sensitive Assets

Construction of the project could potentially affect other utilities and assets which may be particularly sensitive to vibration. Examples include pipelines, tunnels, fibre optic cable routes and high pressure gas pipelines.

German Standard DIN 4150 provides the guideline vibration limits for buried pipework shown in **Table 13**.

Table 13 DIN 4150 Guideline Values for Short-term Vibration on Buried Pipework

Line	Pipe Material	Guideline Values Vibration Velocity at the Pipe (mm/s)
1	Steel, welded	100
2	Vitrified clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastics	50

For other potentially affected assets, specific vibration limits should be determined on a case-by-case basis in consultation with the asset owner.

3.5 Motorsport Facility Operations

Motorsport noise from the project has the potential to annoy nearby receivers. Different types of noise invoke different responses in people that are affected and hence have different levels at which they are deemed 'acceptable'. Annoyance reactions depend on many factors and are not based solely on the level of noise.

Motorsport noise has, however, been part of the local environment at the project site for around 30 years and is commonly regarded as an integral part of the patron experience for motorsport activities. The aim of assessment guidelines is to provide a framework to achieve balance between the need for project, the desired operations of the project, and the protection of noise amenity in the community. For this project, this means a balance between maintaining operations of the Speedway industry in NSW, patron experience of motorsport (including noise), and minimising noise at nearby non-patron noise-sensitive receivers.

The main legal framework and basis for managing unacceptable noise is provided in the *Protection of the Environment Operations Act 1997* (POEO Act) and the *Protection of the Environment Operations (Noise Control) Regulation 2017* (Noise Control Regulation).

Noise emissions from Sydney International Speedway would include:

- The general running of the facility (car parking and office-based activities) along with
- Noise from motorsport events.

Noise from sporting facilities, including motor sport facilities, are excluded from the scope of the NSW EPA's *Noise Policy for Industry* (NPfI) and *Road Noise Policy* (RNP) and therefore guidance available for local councils has been referenced for this assessment.

3.5.1 Noise Guide for Local Government

The *Noise Guide for Local Government* (NGLG) is administered by the EPA and provides guidance for councils on the assessment of noise from sporting venues including *Motor sports – on private land*. While assessment of existing venues can be managed using the Offensive Noise Test described in Section 2.1.4 of the guideline, the NGLG (Case study 2) also recommends assessment of proposed facilities include consideration of the following:

- The sound power level of the different types of racing vehicle(s)
- The number and type of events planned for the facility (e.g. drag racing, motocross, circuit racing, speedway or go-karts)
- The number and location of racing cars on the circuit and in any pit or warm-up areas
- Potential meteorological effects on noise propagation and impacts in the surrounding area.

The NGLG (Case study 2) also provides examples of noise mitigation and management options including:

- On-site mitigation (e.g. earth mounds, barriers)
- Noise source controls (e.g. Australian Motor Sport noise specifications, testing)
- Operational noise controls (e.g. time restrictions, respite periods, event limits)
- Receiver noise controls (e.g. noise insulation for nearby houses, property acquisition).

The NGLG notes that communities are generally more sensitive to a new source of noise than noise from existing facilities at the same level. This means that the number of acceptable events for an existing facility would be more than for a new facility of comparable size and proximity to residences. In this way, the NGLG aims to guide councils, as the Appropriate Regulatory Authority (ARA), to apply case-by-case judgement to achieve a solution which balances the noise expectations of patrons with the amenity needs of the affected community.

It is noted that special legislation may exempt certain events from the POEO Act and Noise Control Regulation, such as Section 30 of the *Homebush Bay Homebush Motor Racing (Sydney 400) Act 2008* or Section 12 of the *Mount Panorama Motor Racing Act 1989*. No exclusions have been identified for the project and therefore all proposed events have been included in the assessment.

3.5.1.1 Qualitative Assessment – Offensive Noise

The NGLG 'offensive noise' checklist is reproduced in **Table 14**. The checklist is intended as a guide for council officers and authorised persons to make a systematic judgement about whether a particular noise is offensive. The offensive noise test is, however, typically applied in respect of enforcement actions rather than assessment of environmental impact to support consideration of an application for planning approval.

As discussed above, the NGLG provides a case study for motorsports events which requests noise assessments to consider noise mitigation strategies including on-site mitigation, noise source controls, operational noise controls and receiver noise controls such as treatment of affected properties.

Table 14 NGLG Offensive Noise Test

EPA Checklist Questions
Q1. Is the noise loud in an absolute sense? Is it loud relative to other noise in the area? This establishes that the noise is likely to be heard by neighbours. Its volume alone may be annoying. An example would be music being played at a very high volume in a residence so it can be heard over very noisy activity outside, such as construction work. The noise may also be loud relative to the background noise.
Q2. Does the noise include characteristics that make it particularly irritating? The presence of tones, impulses or fluctuations in volume can make people more likely to react to the noise. These can be judged subjectively but noise measurements will help to quantify the extent of these characteristics. Examples might be screeching sounds from poorly maintained equipment or a 'beeper' alarm that uses a pulsed sound.
Q3. Does the noise occur at time when people expect to enjoy peace and quiet? People usually expect their surroundings to be quieter during the evening and at night. Noise that regularly disturbs sleep is likely to be considered offensive and this should be taken into account.
Q4. Is the noise atypical for the area? Where noise from an activity that is causing nuisance is new or unusual for an area, people are more likely to react. An example might be a community event with amplified music affecting a residential area that has not traditionally been affected by such events.
Q5. Does the noise occur often? Noise can be more annoying when it occurs frequently. Examples might be a leaf blower used every morning or a band that practises frequently without regard to the impact on neighbours.
Q6. Are a number of people affected by the noise? Only one person needs to be affected by the noise for it to be deemed offensive. Some councils have a policy of requiring a minimum number of complaints from different individuals before taking formal action.

3.5.2 Superseded Documents

Guidance regarding the acceptable number of noisy events at motorsport venues is not definitive. Previous guidance within the NSW EPA *Environmental Noise Control Manual* (ENCM) provided indicative event limits from individual motorsport venues however recommended that consideration should be given to the specific site and allowance made for local conditions wherever necessary. This document has been superseded and the NGLG states that the ENCM does not contain current information on noise management and should not be used or relied upon. Instead, the NGLG *Motor sports – Case Study 2* shows an example of how a local council may approach mitigation for a site-specific mitigation plan and provides guidance on the type of mitigation options for consideration during the planning stage (refer to **Section 3.5.1**).

3.5.3 Sleep Disturbance

Events at the project site would take place between 6pm and 10pm. As motorsport events are not proposed during the night-time (i.e. after 10pm), the project is therefore not expected to result in any additional sleep disturbance impacts during operation and sleep disturbance has not been considered further as part of this Noise and Vibration Impact Assessment.

3.5.4 Outdoor Open Areas (Parklands)

The NGLG does not specify guidance for the assessment of outdoor recreational area such as the parklands and open spaces which border the project site. To assess potential noise impacts at these areas, a trigger level of $L_{Aeq(period)}$ 50 dBA (while the area is in use) has been used. This level is consistent with guidance for similar areas contained in the NSW *Noise Policy for Industry*, and lower than guidance in the NSW *Road Noise Policy* ($L_{Aeq(15hour)}$ 55 dBA). While neither of these guidelines are considered to apply to motorsport noise, the nominated noise goal is considered a reasonable guide to identify and assist in guiding the need for mitigation.

3.5.5 Fireworks display

Licenses to hold fireworks displays are managed by Safework NSW. An evaluation of the potential noise impacts from occasional firework displays during some events would be undertaken during detailed design when more information is available regarding the proposed displays associated with the project.

3.6 Operational Road Traffic Noise

When traffic related to the project is on the public road network, vehicle movements are regarded as 'additional road traffic' (rather than as part of the project site operations) and are assessed under the NSW *Road Noise Policy* (RNP).

The RNP recognises that fewer opportunities generally exist to reduce the noise impacts from new land use developments generating additional traffic on existing roads and suggests that any increase in the total traffic noise level resulting from the project should be limited to 2.0 dB above the existing level.

The RNP criteria applicable to the project is reproduced below in **Table 15**.

Table 15 Road Noise Policy Criteria for Assessing Additional Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7am - 10pm)	Night-time (10pm - 7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

3.7 Facility Operations

3.7.1 Criteria

The *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the NSW *Environment Protection Authority's* (EPA's) requirements for the assessment and management of noise from industry in NSW. The NPfI criteria has been used to assess the potential noise impacts when the facility is not holding a motorsport event, such as during general maintenance and office activities.

3.7.1.1 Trigger Levels

The NPfI describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

For this assessment, the area surrounding the project site is considered to be 'suburban'.

3.7.1.2 Project Specific Criteria

The project noise trigger level is the lowest value of the intrusiveness or amenity noise level for each period and these are shown below in bold.

Table 16 Project Specific Noise Trigger Levels

NCA	Period	Representative Noise Logger	Recommended Amenity Noise Level $L_{Aeq(period)}$	Measured Noise Level (dB)A		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				RBL[1] (dBA)	LAeq(period)	Intrusiveness	Amenity[2,3]
NCA01 and NCA02	Daytime	L01	55	39	49	**44**	53
	Evening		45	39	49	44	**43**
NCA03	Daytime	L02	55	41	55	**46**	53
	Evening		45	41	57	46	**45**[4]
NCA04	Daytime	L05	55	47	52	**52**	53
	Evening		45	47	51	52	**43**
NCA05	Daytime	L03	55	43	54	**48**	53
	Evening		45	43	54	48	**43**
NCA06	Daytime	L04	55	35	48	**40**	53
	Evening		45	35	48	**40**	43
NCA07	n/a – no residential receivers identified						

Note 1: RBL = Rating Background Level. In accordance with the NPfI, evening and night-time RBLs are taken to be no higher than the daytime for the purpose of setting the corresponding Intrusiveness criteria.

Note 2: The recommended amenity noise levels have been reduced by 5 dB to give the project amenity noise levels representing the objective for noise from a single industrial development at a receiver location, as outlined in the NPfI.

Note 3: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 4: Project amenity level was set at 15 dB below the existing road traffic noise level, as outlined in the NPfI.

4 Methodology

This section describes the methodology used to assess the potential noise and vibration impacts from the project.

4.1 Construction Noise and Vibration Assessment

4.1.1 Airborne Noise Assessment

A noise model of the study area has been used to predict noise levels from construction of the project to all surrounding receivers. The model uses ISO 9613 algorithms in SoundPLAN software to predict noise levels at external building facades and outdoor recreation areas.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the project site area and surrounding areas.

Section 4.1.1.1 to **Section 4.1.1.3** summarise the key project details which have been incorporated into the noise model for the construction noise assessment.

4.1.1.1 Works Descriptions

Representative scenarios have been developed to assess the likely impacts from the various construction stages of the project. These scenarios are shown in **Table 17** together with a high-level description of each works activity. The location of the various work scenarios is shown in **Figure 6**.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

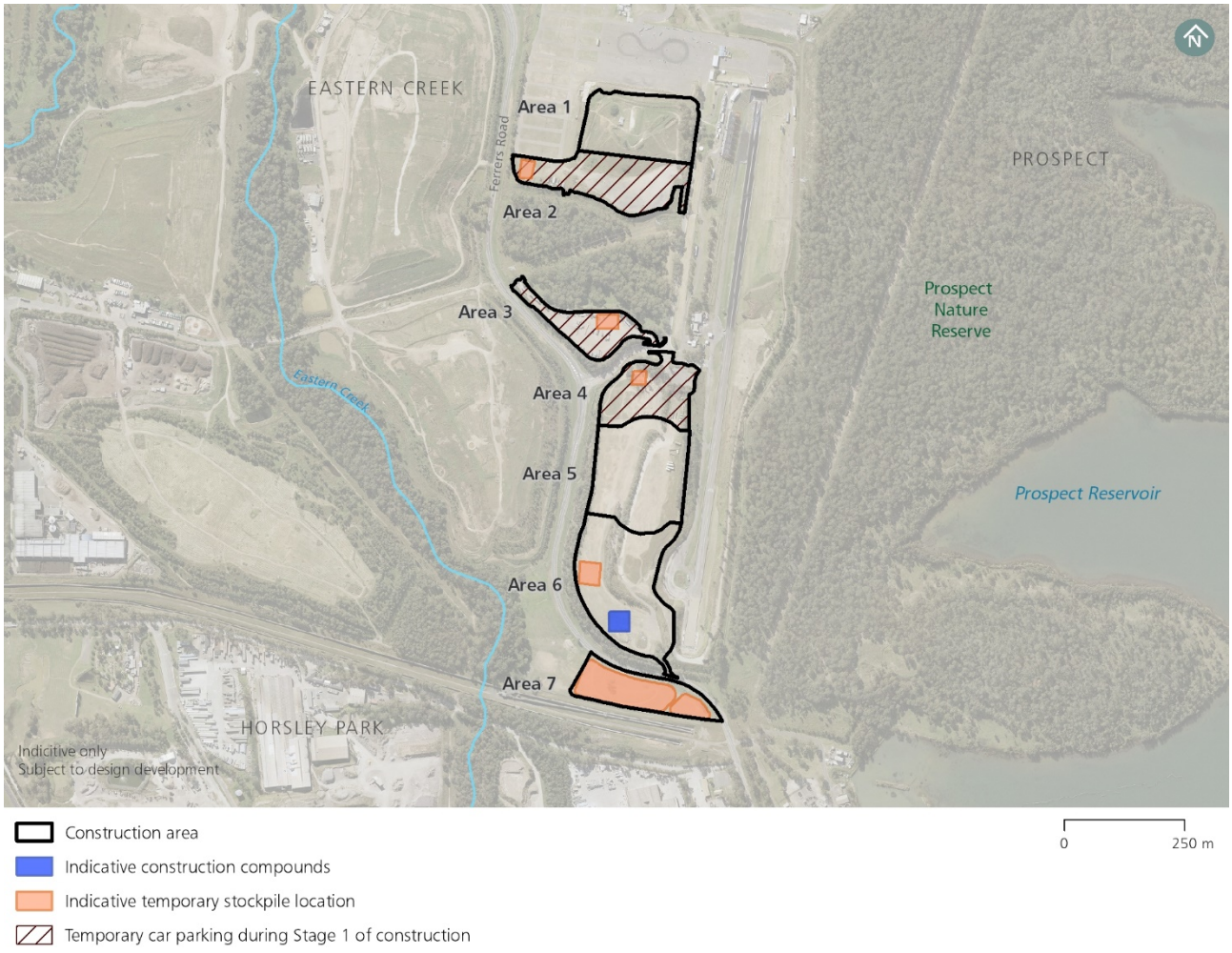
The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

Table 17 Construction Scenario Descriptions

Scenario[1]	Activity	Description
Temporary Works	Establish site compound	Installing offices, toilets and other temporary facilities, parking, temporary stockpile area and connecting temporary services.
	Enabling works	Set up exclusion zones including environmental, conduct pre-construction survey (condition assessment), set up survey control marks, set up erosion and sedimentation controls, establish three temporary carparks
Stage 1 – Areas 1, 5, 6 and 7	Site clearance	General land clearing, tree and stump removal, topsoil stripping
	Earthworks	Bulk earthworks and haulage of material
	Drainage works	Excavation and installation of pipes, pits and headwalls
	Utilities connections	Installation of electrical, sewer, water and telecommunication services
	Construction of racing infrastructure	Construction of pavement, seating, kerbs & barriers, fencing and finishing works (e.g. screen, speakers, etc.)
	Construction of event support infrastructure	Construction of footings, installation of modular buildings and finishing works (e.g. connecting services, installing shelves, etc.)
	Construction of internal road	Construction of pavement, kerbing and sealing
	Construction of carparks	Construction of pavement, barrier, fencing, sealing, line marking and signage
Stage 2 – Areas 2, 4 and 7 Stage 3 – Area 3	Site clearance	General land clearing, tree and stump removal, topsoil stripping
	Earthworks	Bulk earthworks and haulage of material
	Drainage works	Excavation and installation of pipes, pits and headwalls
	Construction of carparks	Construction of pavement, barrier, fencing, sealing, line marking and signage
Stage 4	Asphalting	Importing and placing asphalt including tack coating and compacting
	Landscaping	Placing topsoil, turfing, planting, mulching, spray seeding and hydro mulching
	Signage & Line marking	Installing line marking and signage
Southern Area Stockpiling works	Earthworks	Stockpile extracted materials and landscaping

Note 1: Equipment lists for each scenario and Sound Power Level data are provided in **Appendix D**.

Figure 6 Construction Works Locations



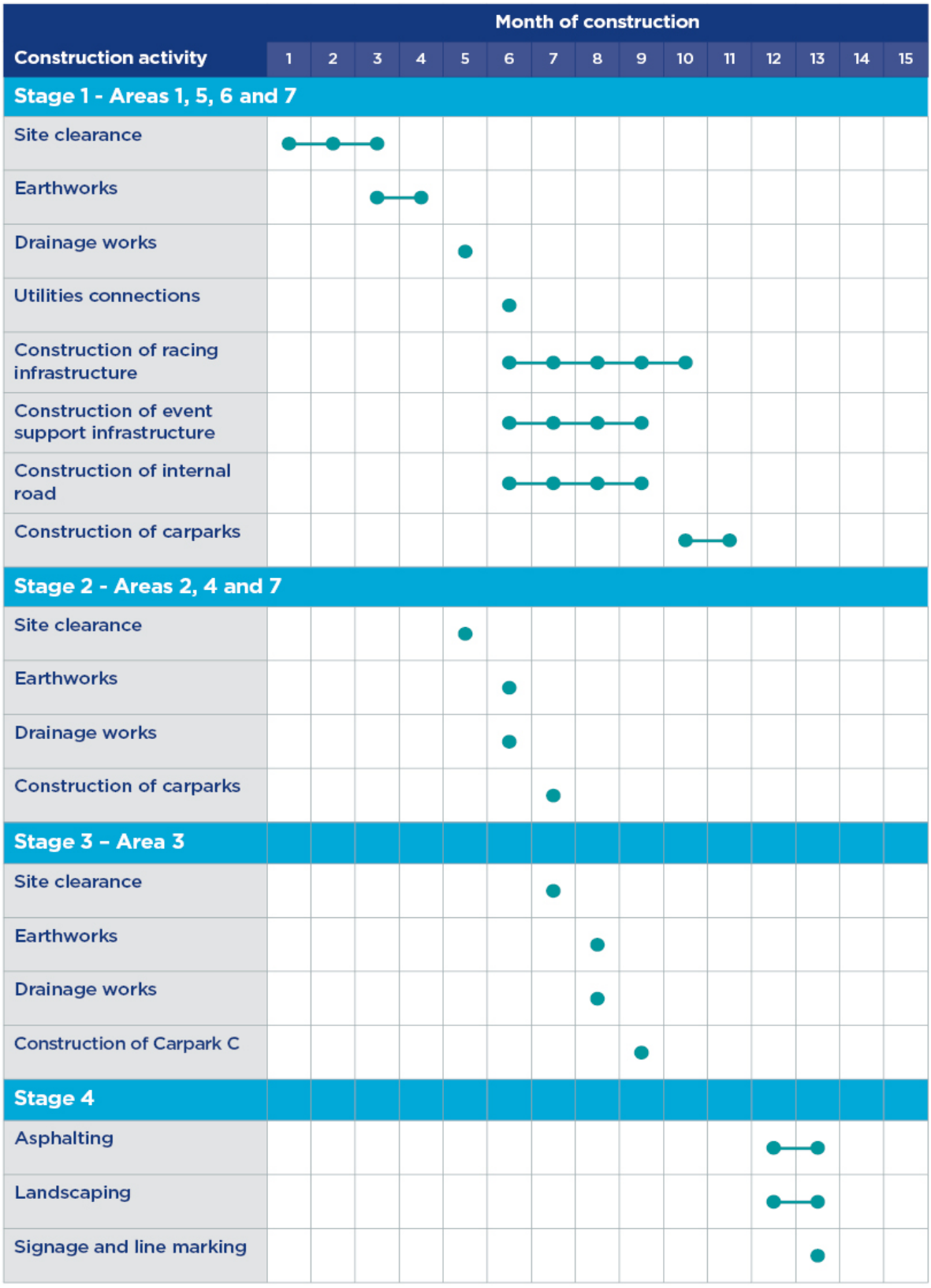
4.1.1.2 Working Hours

For the purpose of this assessment and to inform construction planning, all scenarios have been included in the assessment as potentially occurring up to 24 hours per day, seven days a week for the duration of construction.

4.1.1.3 Works Schedule

Subject to planning approval, the works are planned to start in late-2020 with peak construction occurring in mid-2021 and completion in late-2021. The indicative construction program is shown in **Table 18**.

Table 18 Indicative Construction Schedule



4.1.2 Construction Vibration

The potential impacts during vibration intensive works have been assessed assuming a vibratory roller could be used anywhere within the project site (see **Figure 6**). This is considered to be representative of worst-case construction vibration impacts of the project.

4.1.3 Construction Traffic Noise

The potential increase in road traffic noise levels associated with the project has been estimated using the *Calculation of Road Traffic Noise* (CoRTN) algorithm.

For this project, the potential impacts from construction traffic would be controlled by vehicle movements on Ferrers Road immediately adjacent (west) to the project site. From Ferrers Road, vehicles would access the Westlink M7 (via The Horsley Drive) where the existing traffic volumes are sufficiently high that change in noise levels from additional construction vehicles would not be expected to be discernible.

For the purpose of this assessment, Ferrers Road has been considered as a sub-arterial road.

The following construction traffic is anticipated during peak construction periods:

- Up to 600 heavy vehicles per day between 7am and 3pm during *cut/fill earthworks*
- Up to 90 light vehicles arriving between 6am and 7am, and departing between 5pm and 6pm
- Up to a total of 25 oversize delivery vehicles during out of hours periods during *Stadium and buildings* works.

4.2 Operational Motorsport Noise Assessment

A three-dimensional SoundPLAN noise model of the study area has been used to predict operational motorsport noise levels to the surrounding receivers.

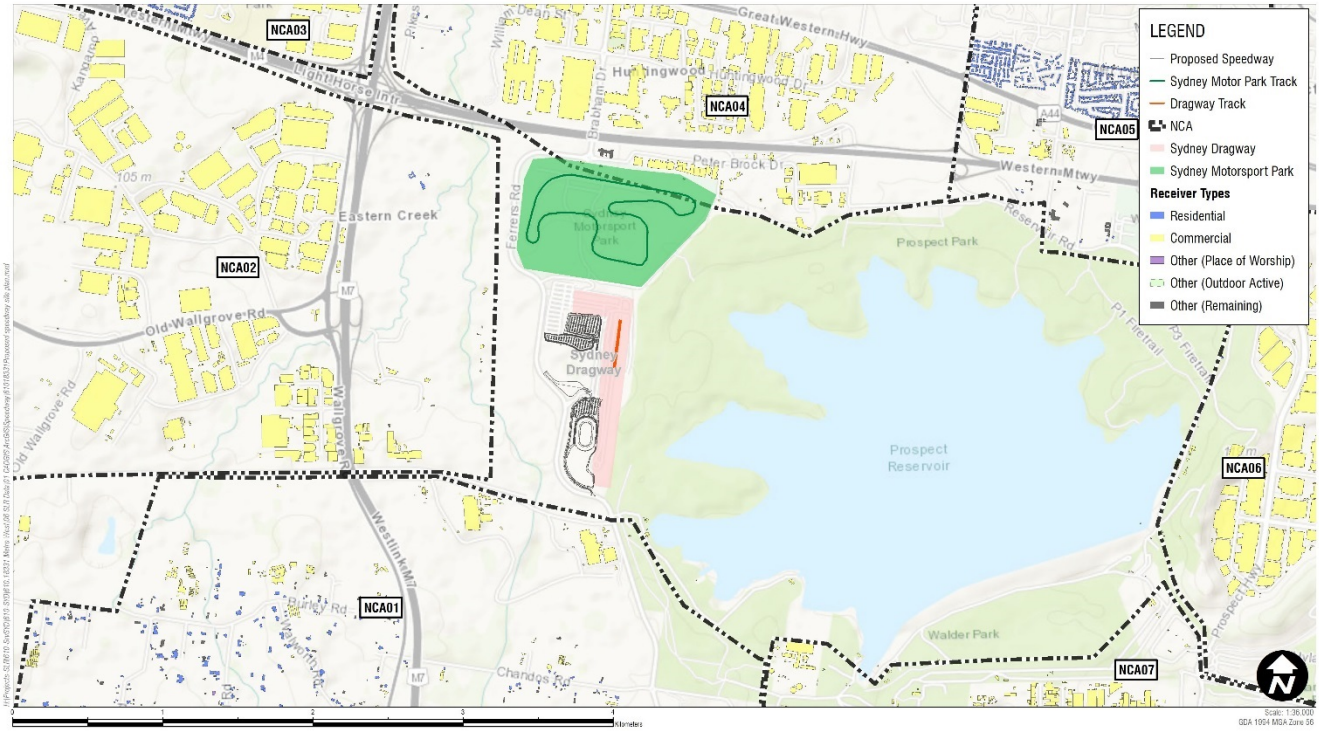
Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the study area and surrounding areas.

The proposed design of the Sydney International Speedway is shown in **Figure 7** and its location relative to the nearby existing sources of motorsport noise (Sydney Dragway and Sydney Motorsport Park) is shown in **Figure 8**.

The proposed speedway is closer to residential receivers to the south in NCA02 than Sydney Dragway and Sydney Motorsport Park, but further away than residential receivers to the northwest, northeast and east in NCA02 to NCA06.

Figure 7 Proposed Sydney International Speedway

Figure 8 Proposed Sydney International Speedway and Existing Sources of Motorsport Noise



4.2.1 Event Information

A summary of the proposed events at Sydney International Speedway and existing venues (Sydney Dragway and Sydney Motorsport Park) is shown in **Table 19**.

Table 19 Motor Sport Event Information

Category	Sydney International Speedway	Sydney Dragway	Sydney Motorsport Park
Type of racing events	• Sprint cars • Wingless sprints • Street stockers • V8 dirt modifieds • Formula 500s	• Top fuel • Pro alcohol • Pro slammer • Top bike • Top sportsman • Super street	• V8 supercars • Production cars • Superbike and supersport motorcycles • Corporate and private track days • Driver training
Spectator attendance	• Around 4,000 to 8,000 people per major event • Around 500 to 1,500 people for smaller events	• 5,000 to 10,000 people per major event • Around 500 to 1,000 people for smaller events	• Around 15,000 to 20,000 people per major event • Around 500 to 1,000 people for smaller events
Frequency of events	• Based on the existing Sydney Speedway 2019-2020 season schedule (36 racing events per year) it has been assumed there would be an average of one event per week at the proposed Sydney International Speedway across the season (September to May), typically on a Saturday. • Mid-week events (typically Wednesday and Friday nights), across the Christmas and early January period. • Facility to be operational all year round.	• Based on the 2019 Sydney Dragway events schedule, there are on average two major national events per month, typically on a Saturday. Major international events including Top Fuel vehicles typically occur across three weekends per year, running over Friday and Saturday night. • Mid-week events occur every Wednesday night and consist of super street cars. Similar events are also held on one Friday night per month. • The facility is operational all year round.	• Based on the 2020 Sydney Motorsport Park events schedule, there are on average three mid-week corporate driver training and track days throughout the year. Further public training and track events occur throughout the year except during major events. • Major events typically occur across one weekend per month, with further corporate/private driver training and track days occurring on other weekends throughout the year. • The facility is operational all year round.
Approx. events per year	• 36	• 70	• 70+

Category	Sydney International Speedway	Sydney Dragway	Sydney Motorsport Park
Event timings	• 2pm gates open • 6 – 10pm racing • Some events conclude with fireworks	Typical events: • 4:.30pm gates open • 6 – 10pm racing Some major events: • 6am gates open • 7am – 6pm racing	Varies depending on event. Typical all day events: • 6am gates open • 7am – 6pm racing Supercars night race on Friday/Saturday
Competitor numbers	• 60 to 120 per race event	Varies depending on event. Typical all day events: • 100 to 150 per race event	Varies depending on event. Typical all day events: • 100 to 150 per race event
Other operational activities	• Event preparation and clean up activities. • Maintenance of the racetrack and site facilities.	• Event preparation and clean up activities. • Maintenance of the racetrack and site facilities. • Occasional private test days and corporate events.	• Event preparation and clean up activities. • Maintenance of the racetrack and site facilities.

4.2.2 Modelling Assumptions

On the basis of the information shown above in **Table 19** and a review of the 2019 event calendar, the modeling parameters assumed for the operation of the Sydney International Speedway are shown in **Table 20**.

Table 20 Speedway Modelling Assumptions

Event	Throttle on-time	Maximum Number Vehicles on Track[1]	Maximum Race Duration (minutes)[2]	Proposed Number of Events per year
Sprint cars	75%	12	12	17[3]
Wingless Sprints	75%	12	12	19[4]
Formula 500s	75%	12	12	
Street stocks	75%	12	12	
V8 Dirt modifieds	75%	12	12	
Motorcycles	75%	12	12	

Note 1: Average number of cars per race based on observations from 2019 races at existing Sydney Speedway.

Note 2: Average duration of race time during a 15 minute period based on observations from 2019 races at existing Sydney Speedway.

Note 3: Based on the 2019 event calendar for the existing speedway sprint car events.

Note 4: Based on the 2019 event calendar for the existing speedway non-sprint car events. Total count is assumed to be split across the different events (i.e. four events each).

The above information shows the assumed number of events per year for the proposed Sydney International Speedway. While the most frequent event may be described as a 'sprint car' event, other secondary races for other categories are also likely occur on the same day during certain events. The assessment of the potential impacts from the project assumes the average impact across all events proposed throughout the year based on the impacts from the primary race vehicle for each event.

4.2.3 Source Noise Levels

Competitor Vehicles

The assumed source noise levels for the proposed Sydney International Speedway vehicles are shown in **Table 21**.

Table 21 Speedway Vehicles Sound Noise Levels

Vehicle	Octave Band Centre Frequency (Hz) Sound Power Levels (dB)										Total (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Sprint cars (x16)[1]	125	136	145	145	141	135	130	126	120	110	142
Street stocks	-	121	124	126	118	115	115	111	100	-	123
Wingless Sprints[2]											
V8 Dirt modifieds (x15)[3]	127	133	142	137	136	132	130	125	116	127	138
Motorcycles[4]	-	118	122	122	115	113	113	108	104	-	120
Formula 500s[5]											

Note 1: Sprint cars taken from Kwinana International Motorplex – Public Environmental Review, ERM 1999.

Note 2: Engine configuration is similar to Street stocks therefore SWL is conservatively assumed to be representative

Note 3: Taken from Central New York Race Park – Sound Level Assessment Report, Epsilon Associates Inc, 2013

Note 4: Typical motorcycles have been taken from *Sound power levels of motocross courses,* Granneman et al, 2005 Congress and Exposition on Noise Control Engineering in Rio de Janeiro, Brazil representing 450cc motorcycles and considered appropriate for this assessment. A source spectrum of typical motocross activities has been taken from *Background Plus: The Universal Criteria,* Roger Hawkins, AAS Acoustics 2008.

Note 5: Engine configuration is similar to Motorcycles therefore SWL is conservatively assumed to be representative

Verification of Noise Levels

Due to restrictions in place at the time of this assessment being completed, site measurements to verify the proposed source noise levels or measure existing motorsport noise levels were unable to be carried out. Various assumptions have, therefore, been made in determining the source data.

4.2.4 Meteorological Conditions

Weather conditions with the potential to increase noise at receivers are a feature of the area (see **Section 2.4** and **Appendix C**). The NPfI requires assessment under noise enhancing weather conditions when the frequency of occurrence of noise enhancing conditions is measured to be greater than 30 per cent. The meteorological conditions included in the noise modelling are summarised in **Table 22**.

Table 22 Meteorological Conditions for Noise Modelling

Assessable Weather Condition	Period[1]	Air Temp. (°C)	Relative Humidity (per cent)	Wind Velocity (metres per second)	Modelled Wind Direction	Stability Category[2]
Standard / Neutral	Daytime	21	59	0.5	Source > Receiver	D
	Evening	20	67	0.5	Source > Receiver	D
Noise Enhancing / Adverse	Evening	20	67	3	Source > Receiver[3]	D

Note 1: Night-time weather conditions are not applicable as events are not proposed during this period (refer **Section 4.2.4**).

Note 2: Refer to the NPfI for definitions of these categories.

Note 3: Prevailing wind direction more than 30 per cent occurrence is from the south-west, south-south-west and west-south-west.

As described in the NPfI, where wind is identified as a significant feature, noise modelling should consider a three metres per second wind in the directions identified as significant, or alternatively use a source-to-receiver component for all receivers of three metres per second as a conservative approach.

The prevailing wind direction near the project site is from the south-west for more than 30 per cent of the time. A three metres per second source to receiver wind direction in the evening has therefore been conservatively applied to the assessment for all receivers. It is noted that this approach is conservative for receivers to the south of the project site in NCA01 and NCA07 as the prevailing wind direction is from the south-west.

Night-time weather conditions are not applicable for this assessment as the events are not proposed during the night-time (after 10pm).

4.3 Operational Road Traffic Noise Assessment

Operational road traffic noise levels at nearby receivers from vehicles accessing the project site during events have been predicted to using the *Calculation of Road Traffic Noise* (CoRTN) (UK Department of Transport, 1988) algorithms.

4.3.1 Forecast Event Traffic

Additional road traffic noise may occur during events at the Sydney International Speedway as a result of additional vehicles accessing the project site. All vehicles are proposed to access the project site via Ferrers Road, which is considered a sub-arterial road for this assessment. The assumed worst-case traffic movements identified by the Traffic Impact Assessment are shown in **Table 23**.

Table 23 Worst-case Forecast of Vehicles Accessing Sydney International Speedway (via Ferrers Road)

Time	Light Vehicles	Heavy Vehicle
Daytime (7am-10pm)	1,125[1]	75[2]
Night-time (10pm-7am)	n/a[3]	75[2]

Note 1 Number corresponds to cars during a "major" event representative of the highest traffic demand event. The Traffic Impact Assessment (Technical Paper 1 of the Environmental Impact Statement) notes that all spectators are assumed to arrive / depart by car.

Note 2: Number not provided in the Traffic Impact Assessment. Nominal upper allowance for competitor transport vehicles assumed for the noise assessment. It is assumed that these vehicles may arrive/depart during either the daytime or night-time period.

Note 3: The Traffic Impact Assessment (Technical Paper 1 of the Environmental Impact Statement) notes that all spectators are assumed to arrive / depart by car during the daytime period – typically arriving and departing from the project site at two distinct peaks between 14:00-17:00 corresponding to the beginning of the races and 21:00-22:00 corresponding to the end of the event.

4.3.2 Road Traffic Noise During Concurrent Operations

The potential cumulative road traffic noise impacts during concurrent operation of the Sydney International Speedway and Sydney Dragway have been assessed using the following scenarios outlined in the Traffic Impact Assessment (Technical Paper 1 of the Environmental Impact Statement):

- Friday scenario which consists of a minor Speedway event (1200 spectators/ 480 cars / 120 competitors plus a minor Dragway event (2000 spectators / 800 cars / 100 competitors).
- Nominal allowance of 150 heavy vehicle movements (competitor transport) to or from the project site during the daytime or night-time periods (i.e. up to a total of 150 heavy vehicle movements in any one period accessing Ferrers Road).

4.4 Facility Operations – Industrial Noise

On days when no events occur at Sydney International Speedway, the operations would be expected to be limited to the general running of the facility (such as car parking and office-based activities) along with maintenance activities, as required. Information relating to these activities is limited at this early stage in the project and a qualitative assessment of the potential impacts has been completed.

5 Construction Assessment

The following overview is based on the predicted impacts at the most affected receivers and is representative of the worst-case situation where construction equipment is at the closest point to each receiver.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 24**. The likely subjective response of people affected by the impacts is also shown in the table, noting that the subjective response would vary and depends on the period in which the impacts occur (i.e. people are generally less sensitive to impacts during the daytime and more sensitive in the evening and night-time).

Table 24 Exceedance Bands and Corresponding Subjective Response to Impacts

Exceedance of Management Level	Likely Subjective Response	Impact Colouring
No exceedance	No impact	
1 to 10 dB	Minor to marginal	
11 dB to 20 dB	Moderate	
>20 dB	High	

The predicted construction airborne noise impacts are presented for the most affected receivers. Receivers which are further away from the works and/or shielded from view would have substantially lower impacts. The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

A summary of the predicted construction impacts during Standard Construction Hours and during the night-time is provided below. Summaries of the number of receivers predicted to have 'minor', 'moderate' and 'high' impacts in each NCA are provided in **Appendix B**.

5.1 Standard Construction Hours

A summary of the predicted construction airborne noise levels (without additional mitigation) in each NCA for the various construction activities is shown in **Table 25** for residential, commercial, and 'other sensitive' receivers.

The table presents the expected range of impacts from the construction scenarios determined with the 'lowest' and 'highest' noise levels. This represents the likely range of noise levels expected throughout construction during noise generating works.

Construction noise level contours across the project site are shown in **Figure 9** for the scenario which results in the highest noise levels at adjacent receivers (*Stage 1 – Areas 1, 5, 6, and 7, Site Clearance*).

The noise levels presented in this report are based on a realistic worst-case assessment of each works scenario. For most construction activities, it is expected that the construction noise levels during less intensive activities would frequently be lower than predicted.

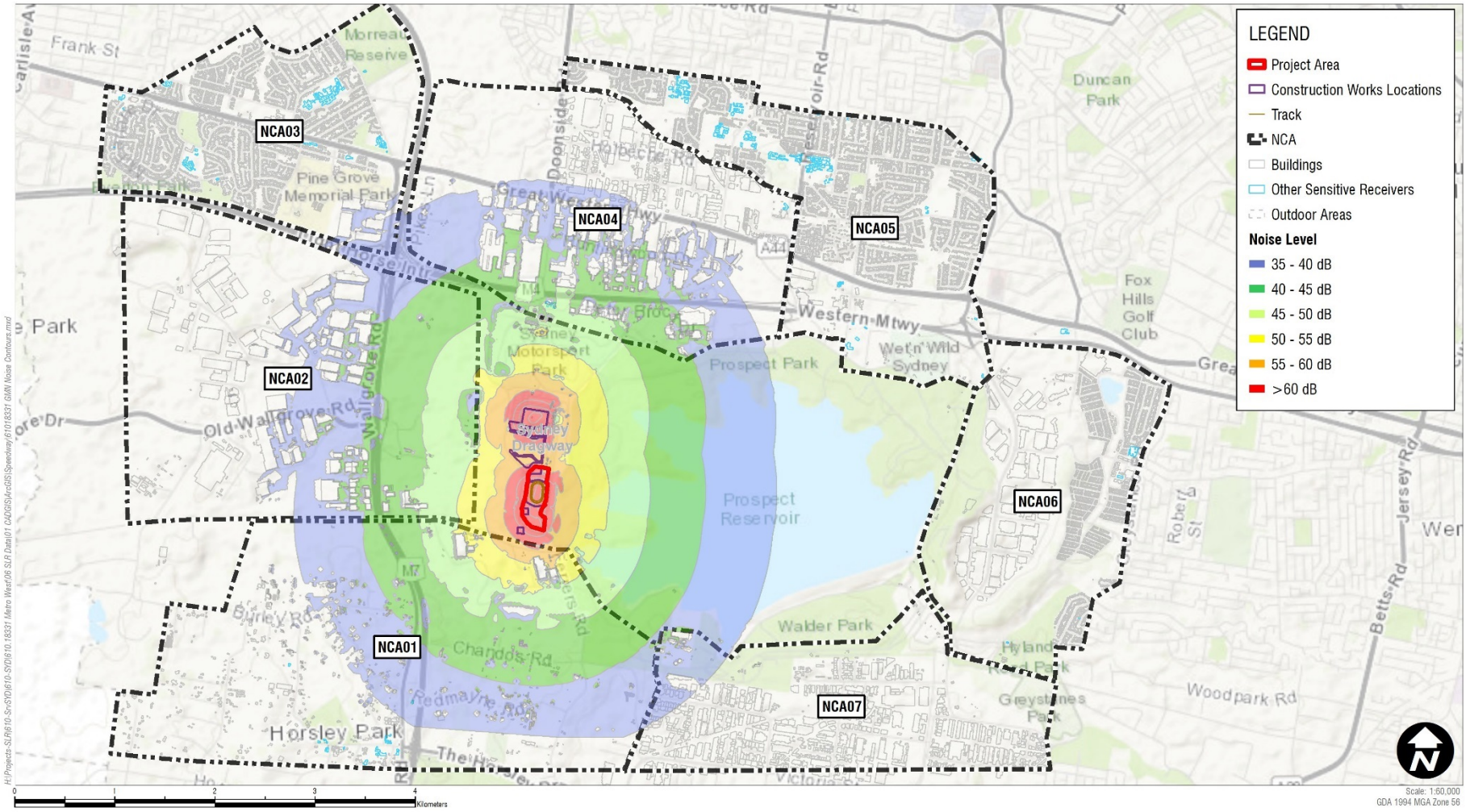
Table 25 Predicted Worst-Case Construction Noise Impacts – Standard Construction Hours

NCA	NML (dBA)	Predicted Worst-case $L_{Aeq(15minute)}$ Noise Level (dBA)									
		Temporary Works	Stage 1 – Areas 1, 5, 6 and 7		Stage 2 – Areas 2, 4 and 7		Stage 3 – Area 3		Stage 4		Area 7 Stockpiling works
			Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	
		Establish site compound/ Enabling Works	Construction of event support infrastructur	Site Clearance	Drainage works	Site Clearance	Drainage works	Site Clearance	Signage & Line marking	Asphalting	Earthworks
Residential – Daytime											
NCA01	49	35	38	45	36	41	35	40	37	43	41
NCA02	49	34	35	45	40	45	38	43	34	40	33
NCA03	51	<30	<30	34	<30	34	<30	33	<30	31	<30
NCA04	57	<30	30	38	33	38	32	37	<30	34	<30
NCA05	53	<30	<30	33	<30	33	<30	32	<30	30	<30
NCA06	45	<30	<30	34	<30	33	<30	32	<30	31	<30
NCA07	n/a – no residential receivers in this NCA										
Most-affected Commercial Receiver											
Varies	70	51	48	58	47	52	45	50	49	55	57
Most-affected 'Other Sensitive' Receiver											
NCA04[1]	70	34	36	47	40	45	38	43	34	40	33

Legend
No Exceedance | 1 - 10 dB above NML | 11 - 20 dB above NML | >20 dB above NML

Note 1: Hotel located on Peter Brock Drive, Eastern Creek.

Figure 9 Predicted Construction Noise Level Contours – *Stage 1 - Carpark A2, D1 & Speedway area, Site Clearance*



No exceedances of the NMLs are predicted during Standard Construction Hours at any receiver during construction of the project. This is due to the large separation distance between the project site and surrounding receivers. The highest noise activity has been identified as *Site Clearance* during the Stage 1, Stage 2 and Stage 3 works, however noise levels are also predicted to be compliant during this worst-case scenario.

The impacts presented are based on all equipment working simultaneously in each assessed scenario. There would be periods when construction noise levels are much lower than the worst-case levels predicted and there would be times when no equipment is in use.

5.1.1 Outdoor Open Areas (Parklands)

Parklands surrounding the project site are shown in **Figure 4**. With reference to the predicted noise contours for the highest noise activity (*Site Clearance*) the noise goal for the open areas (50 dBA) is predicted to be exceeded at adjacent areas surrounding the Prospect Reservoir up to around 1,200 metres from the works. This means that passive/contemplative activities may be impacted in these areas during the works. Active users (e.g. running, jogging, cycling etc) would be less impacted by noise than passive users of the parkland.

The majority of the parkland area to the east (surrounding Prospect Reservoir) is not predicted to experience NML exceedances. Noise mitigation is discussed further in **Section 8.1**.

5.2 Night-time Construction

5.2.1 Average (L_{Aeq}) Noise Levels

A summary of the predicted construction airborne noise levels (without additional mitigation) for construction scenarios which may occur during the night-time (refer to **Section 4.1.1.1**) is shown in **Table 26**.

The assessment shows that night-time noise levels are also generally expected to be below the management levels. A 'minor' 1 dB exceedance of the night-time NML is predicted during 'Site Clearance' for Stage 1 and Stage 2 Carpark works at two receivers in NCA01 and NCA02 (150-154 Chandos Road, Horsley Park in NCA01 and 165 Wallgrove Road, Eastern Creek in NCA02). The receiver in NCA02 is potentially unoccupied and not currently noise sensitive, as noted in **Table 2**.

Noise levels during 'Site Clearance' are generally controlled by the use of a wood chipper. If the chipper were to be restricted to the daytime then night-time noise levels would not be expected to exceed night-time NMLs.

The impacts presented are based on all equipment working simultaneously in each assessed scenario. There would be periods when construction noise levels are much lower than the worst-case levels predicted and there would be times when no equipment is in use.

The proposed noise mitigation measures for construction airborne noise impacts are discussed in **Section 8.1**.

5.2.2 Sleep Disturbance Screening Assessment

A sleep disturbance screening assessment has been undertaken for the construction works and a summary is provided in **Table 27**. A review of the predictions shows that most scenarios are also below the sleep disturbance screening criterion, however, 'minor' exceedances are expected at some of the nearest receivers in NCA01 and NCA02 during 'utilities connections' for Stage 1, due to use of a concrete saw.

Table 26 Predicted Worst-Case Construction Noise Impacts – Night-time

NCA	NML (dBA)	Predicted Worst-case $L_{Aeq(15minute)}$ Noise Level (dBA)									
		Temporary Works	Stage 1 – Areas 1, 5, 6 and 7		Stage 2 – Areas 2, 4 and 7		Stage 3 – Area 3		Stage 4		Area 7 Stockpiling works
			Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	
		Establish site compound/ Enabling Works	Construction of event support infrastructure	Site Clearance	Drainage works	Site Clearance	Drainage works	Site Clearance	Signage & Line marking	Asphalting	Earthworks
Residential – Night-time											
NCA01	44	35	38	45	36	41	35	40	37	43	41
NCA02	44	34	35	45	40	45	38	43	34	40	33
NCA03	46	<30	<30	34	<30	34	<30	33	<30	31	<30
NCA04	46	<30	30	38	33	38	32	37	<30	34	<30
NCA05	43	<30	<30	33	<30	33	<30	32	<30	30	<30
NCA06	40	<30	<30	34	<30	33	<30	32	<30	31	<30
NCA07	n/a – no residential receivers in this NCA										
Most-affected Commercial Receiver											
Varies	70	n/a – no commercial receivers identified to operate during the night-time									
Most-affected 'Other Sensitive' Receiver											
NCA04[1]	60	34	36	47	40	45	38	43	34	40	33

Legend

No Exceedance | 1 - 10 dB above NML | 11 - 20 dB above NML | >20 dB above NML

Note 1: Hotel located on Peter Brock Drive, Eastern Creek.

Table 27 Sleep Disturbance Screening Assessment

NCA	NML (dBA)	Predicted Worst-case $L_{Aeq(15minute)}$ Noise Level (dBA)									
		Temporary Works	Stage 1 – Areas 1, 5, 6 and 7		Stage 2 – Areas 2, 4 and 7		Stage 3 – Area 3		Stage 4		Area 7 Stockpiling works
			Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	
		Establish site compound/ Enabling Works	Construction of event support infrastructure	Utilities connections	Drainage works	Site Clearance	Drainage works	Site Clearance	Signage & Line marking	Asphalting	Earthworks
Residential – Night-time											
NCA01	54	41	44	56	42	48	41	47	<30	<30	46
NCA02	54	40	41	57	46	52	44	50	<30	<30	47
NCA03	56	<30	33	46	36	42	34	40	<30	<30	36
NCA04	56	34	35	50	40	46	38	44	<30	<30	40
NCA05	53	<30	33	46	34	40	32	38	<30	<30	36
NCA06	50	<30	33	44	34	40	33	39	<30	<30	34
NCA07	n/a – no residential receivers in this NCA										

Legend

No Exceedance | 1 - 10 dB above NML | 11 - 20 dB above NML | >20 dB above NML

5.3 Construction Vibration

5.3.1 Residential and Other Non-Heritage Structures

Vibration intensive equipment is proposed to be used during construction and includes the use of a vibratory roller. This item of vibration intensive equipment has been assumed for the noise and vibration impact assessment that it would be used anywhere within the project site, as shown in **Figure 6**.

The only identified structures within 200 metres of the project site are the Sydney Dragway buildings located at the north end of the project site. The minimum distance between the closest potential working area and these buildings is around 60 metres.

Assuming a light framed commercial structure, the predicted vibration velocity for a vibratory roller operating at 60 metres is below the cosmetic damage criterion and therefore no exceedance of the vibration management level is identified.

The human comfort vibration criteria are also not predicted to be exceeded during the works. A vibratory roller operating on the project site boundary would be expected to take over 10 hours to reach a VDV of 0.4 $m/s^{1/75}$. As this would not occur, impacts are therefore unlikely.

5.3.2 Heritage Buildings and Structures

The nearest heritage building or structure identified in the study area is the Prospect Reservoir. The distance to the structure of the reservoir is around 300 metres east of the project site. This separation distance is considered sufficient to mitigate potential vibration impacts and no exceedance of the heritage vibration damage criterion is expected during the works.

5.3.3 Utilities and Other Vibration Sensitive Assets

The Warragamba Pipelines Corridor is to the south of the project site, approximately 20 metres from the edge of the *Southern Area Stockpiling* works area as shown in **Figure 10**.

Assuming a reinforced concrete structure, the predicted vibration velocity for a vibratory roller operating 20 m away is below the cosmetic damage criterion (see **Table 13**).

Figure 10 Southern Area Stockpiling Works Area Showing Adjacent Pipeline

5.4 Construction Traffic Noise Assessment

Based on the forecast construction traffic movements related to the project site (**Section 4.1.3**), the predicted change in noise levels at receivers on Ferrers Road are summarised in **Table 35**.

Table 28 Predicted Construction Road Traffic Noise Level Increase

Location	Minimum Distance to Nearest Trafficable Lane	Predicted Increase (dBA)[1]	
		Daytime $L_{Aeq(15hour)}$ 7am – 10pm External Noise Level	Night-time $L_{Aeq(9hour)}$ 10pm – 7am External Noise Level
Ferrers Road residential receivers	15-20m	< 2.0	< 2.0

Note: Existing road traffic noise levels are estimated based on existing traffic volumes on Ferrers Road south of the project site presented in the Traffic Impact Assessment Report.

The above shows that construction traffic from the project is predicted to result in an increase in road traffic noise levels of less than 2.0 dB and does not trigger the requirement for consideration of additional noise mitigation.

5.5 Impact Duration

The construction schedule (see **Section 4.1.1.1**) provides an indication of the total duration of the individual stages during construction of the project. This is not the same as the noise and/or vibration impact duration which would be significantly less than the overall construction schedule.

The assessment of the potential construction impacts is based on realistic construction scenarios which predict the likely worst-case 15-minute noise level from the various stages of the works. It is noted that the construction noise impacts would frequently be lower than predicted as the worst-case situation is typically only apparent for a relatively short period when noisy equipment is in use nearby.

5.6 Concurrent Sydney International Speedway Works

The proposed staging of the construction (see **Table 18**) results in overlapping construction activities between month 5 and month 10 of construction. During this period, activities for Stage 1, Stage 2, Stage 3 and Stage 4 may occur concurrently.

The potential impacts of overlapping construction scenarios, assuming all worst-case activities for each stage occur concurrently, are shown in **Table 29**. It is noted that the likelihood of worst-case impacts from multiple works scenarios happening at the same time is considered low and the assessment should be regarded as conservative.

The concurrent impact assessment indicates that all potential concurrent construction scenarios are predicted to be below the daytime NMLs with the exception of a 'minor' (1 dB) exceedance in NCA02 during the proposed overlapping works scheduled in May.

The potential key overlapping activities are from Stage 1 (construction of event support infrastructure, construction of internal road, construction of carpark and construction of racing infrastructure), Stage 2 (construction of carpark) and Stage 3 (Site Clearance). If these activities are undertaken concurrently during the night-time, 'minor' (less than 10 dB) temporary exceedances are predicted at the nearest receivers in NCA01 and NCA02.

These potential impacts would be managed through appropriate scheduling of night-time activities. The proposed noise mitigation measures for concurrent construction airborne noise impacts are discussed in **Section 8.1**.

Table 29 Predicted Concurrent Worst-case Noise Levels

Scenario	NML (dBA)	Predicted Worst-case $L_{Aeq(15minute)}$ Noise Level (dBA)					
		Concurrent 1 (Month 5)	Concurrent 2 (Month 6)	Concurrent 3 (Month 7)	Concurrent 4 (Month 8)	Concurrent 5 (Month 9)	Concurrent 6 (Month 10)
Residential – Daytime							
NCA01	49	48	48	47	47	45	46
NCA02	49	49	50	49	49	45	45
NCA03	51	38	39	38	38	35	35
NCA04	57	42	43	42	42	38	38
NCA05	53	37	38	37	37	34	34
NCA06	45	38	38	38	38	34	35
NCA 07	n/a – no residential receivers in this NCA						
Residential – Night-time							
NCA01	44	48	48	47	47	45	46
NCA02	44	49	50	49	49	45	45
NCA03	46	38	39	38	38	35	35
NCA04	46	42	43	42	42	38	38
NCA05	43	37	38	37	37	34	34
NCA06	40	38	38	38	38	34	35
NCA 07	n/a – no residential receivers in this NCA						
Most-affected Commercial Receiver							
NCA02	70	60	58	58	58	56	56
Most-affected 'Other Sensitive' Receiver							
NCA04[1]	70	50	50	50	49	46	46

Note 1: Hotel located on Peter Brock Drive, Eastern Creek.

Legend

No Exceedance | 1 - 10 dB above NML | 11 - 20 dB above NML | >20 dB above NML

6 Operational Assessment

6.1 Motorsport Noise

Motorsport noise levels have been predicted to all identified residential receivers in the study area. The following presents a summary of the predicted levels and likely impacts at the most affected receivers in each NCA, which is typically the nearest receivers to the project.

The predicted levels represent realistic worst-case scenarios during the various race events, based on the assumptions detailed in **Section 4.2**. It is noted that motorsport noise levels would vary during events depending on what race activities are occurring and would frequently be lower than the worst-case levels predicted.

The assessment uses the following three approaches to determine the potential for impacts from the project:

- Assessment of the predicted motorsport noise levels from the project against the measured existing background levels
- Comparison of noise levels from the project against existing motorsport noise levels from Sydney Dragway and Sydney Motorsport Park
- NGLG offensive noise assessment.

6.1.1 Motorsport Noise Levels Relative to Existing Background Level

The predicted motorsport noise levels and proposed event details for the project have been used to determine the potential impacts by evaluating the likely exceedance of the measured existing background noise levels in the study area.

A summary of this assessment is shown in **Table 30** and **Table 31** for neutral and adverse weather conditions, respectively.

The assessment shows the following at residential receivers:

- In the absence of mitigation measures, the worst-case noise levels are predicted to exceed background levels at the nearest receivers while racing is underway during certain events. Residential receivers to the south of the project in NCA01 are expected to be most affected due to receivers in this catchment being the closest to the project. Residential receivers are, however, sparsely distributed in this area and only a relatively small number of affected.
- During neutral weather conditions (see **Table 30**), exceedances of up to 12 dB above existing background are predicted in NCA01 while racing is underway during the noisiest sprint car events. Noise levels in NCA01 during lower noise events, such as V8 modifieds and other events, are predicted to result in exceedances of up to 8 dB. The average exceedance of the background level in NCA01 is predicted to be 7 dB during neutral weather.
- Residential receivers in NCA02 and NCA06 are further away from the project site and less affected. Worst-case noise levels during neutral weather conditions are predicted to exceed background levels by up to 7 dB and 8 dB while racing is underway during sprint car events in NCA01 and NCA02 respectively, with levels during lower noise events generally being below background level. The average exceedance of the background level in NCA02 during neutral conditions is predicted to be

2 dB, with NCA06 predicted to be 3 dB. While NCA06 receivers are further away than NCA02, differing ground type and noise screening effects from intervening structures / buildings are likely causes of the differences between these NCAs.

- It is noted that the exceedance in NCA02 is at an isolated property to the north-west of the project site (165 Wallgrove Road, Eastern Creek). As noted in **Table 2**, this property is potentially unoccupied and therefore unlikely to currently be noise sensitive. No other residential receivers in NCA02 are predicted to have noise levels above background level.
- Noise levels in NCA03, NCA04 and NCA05 during neutral weather conditions are generally predicted to be below background during all events.
- Adverse weather conditions which include wind conditions that enhance noise effects at receivers (see **Table 31**), are predicted to increase noise levels by up to around 3 to 4 dB. While adverse weather conditions have been assessed in NCA01, it is noted that the weather analysis (see **Section 2.4** and **Appendix C**) indicates that the prevailing wind direction is away from NCA01 receivers (i.e. towards the project site). The predicted noise levels under adverse weather in NCA01 are therefore conservative and the predictions for neutral conditions are considered more representative of the likely impacts in this catchment.

To indicate the extent of the predicted impacts, noise contours for the highest noise events at Sydney International Speedway (i.e. sprint cars) have been generated. The predicted motorsport noise levels are shown in **Figure 11** for neutral weather conditions and in **Figure 12** for adverse weather conditions. The figures show the location of the potentially affected residential receivers.

Table 30 Worst-case Predicted Motorsport Noise Levels – Neutral Weather

NCA	Distance to Nearest Residential	Event	Assumed Number of Events	Noise Level $L_{Aeq(15minute)}$ (dBA)		
				Predicted	Exceedance of Background[1]	Average Exceedance[2]
NCA01	1200 m	Sprint cars	17	51	12	7
		Wingless Sprints	4	42	3	
		Formula 500s	4	40	1	
		Street stocks	4	42	3	
		V8 Dirt modifieds	4	47	8	
		Motorcycles	4	40	1	
NCA02	1900 m	Sprint cars	17	46	7	2
		Wingless Sprints	4	37	-	
		Formula 500s	4	34	-	
		Street stocks	4	37	-	
		V8 Dirt modifieds	4	42	3	
		Motorcycles	4	34	-	

NCA	Distance to Nearest Residential	Event	Assumed Number of Events	Noise Level $L_{Aeq(15minute)}$ (dBA)		
				Predicted	Exceedance of Background[1]	Average Exceedance[2]
NCA03	3700 m	Sprint cars	17	39	-	<0
		Wingless Sprints	4	30	-	
		Formula 500s	4	26	-	
		Street stocks	4	30	-	
		V8 Dirt modifieds	4	34	-	
		Motorcycles	4	26	-	
NCA04	2800 m	Sprint cars	17	42	-	<0
		Wingless Sprints	4	33	-	
		Formula 500s	4	30	-	
		Street stocks	4	33	-	
		V8 Dirt modifieds	4	37	-	
		Motorcycles	4	30	-	
NCA05	3400 m	Sprint cars	17	44	1	<0
		Wingless Sprints	4	35	-	
		Formula 500s	4	31	-	
		Street stocks	4	35	-	
		V8 Dirt modifieds	4	39	-	
		Motorcycles	4	31	-	
NCA06	3200 m	Sprint cars	17	43	8	3
		Wingless Sprints	4	35	-	
		Formula 500s	4	31	-	
		Street stocks	4	35	-	
		V8 Dirt modifieds	4	37	2	
		Motorcycles	4	31	-	
NCA07	n/a – no residential receivers identified in this NCA					

Note 1: Background levels during the daytime and evening are the same for all NCAs (see **Table 3**).

Note 2: Arithmetic average weighted by the proposed number of events

Table 31 Worst-case Predicted Motorsport Noise Levels – Adverse Weather

NCA	Distance to Nearest Residential	Event	Proposed Number of Events	Noise Level $L_{Aeq(15minute)}$ (dBA)		
				Predicted	Exceedance of Background[1]	Average Exceedance[2]
NCA01[2]	1200 m	Sprint cars	17	55	16	11[3]
		Wingless Sprints	4	46	7	
		Formula 500s	4	43	4	
		Street stocks	4	46	7	
		V8 Dirt modifieds	4	50	11	
		Motorcycles	4	43	4	

NCA	Distance to Nearest Residential	Event	Proposed Number of Events	Noise Level $L_{Aeq(15minute)}$ (dBA)		
				Predicted	Exceedance of Background[1]	Average Exceedance[2]
NCA02	1900 m	Sprint cars	17	50	11	6
		Wingless Sprints	4	41	2	
		Formula 500s	4	38	-	
		Street stocks	4	41	2	
		V8 Dirt modifieds	4	45	6	
		Motorcycles	4	38	-	
NCA03	3700 m	Sprint cars	17	42	1	<0
		Wingless Sprints	4	32	-	
		Formula 500s	4	29	-	
		Street stocks	4	32	-	
		V8 Dirt modifieds	4	37	-	
		Motorcycles	4	29	-	
NCA04	2800 m	Sprint cars	17	46	-	<0
		Wingless Sprints	4	36	-	
		Formula 500s	4	33	-	
		Street stocks	4	36	-	
		V8 Dirt modifieds	4	41	-	
		Motorcycles	4	33	-	
NCA05	3400 m	Sprint cars	17	47	4	<0
		Wingless Sprints	4	38	-	
		Formula 500s	4	34	-	
		Street stocks	4	38	-	
		V8 Dirt modifieds	4	42	-	
		Motorcycles	4	34	-	
NCA06	3200 m	Sprint cars	17	45	10	5
		Wingless Sprints	4	37	2	
		Formula 500s	4	33	-	
		Street stocks	4	37	2	
		V8 Dirt modifieds	4	40	5	
		Motorcycles	4	33	-	
NCA07	n/a – no residential receivers identified in this NCA					

Note 1: Background levels during the daytime and evening are the same for all NCAs (see **Table 3**).

Note 2: Arithmetic average weighted by the proposed number of events

Note 3: Prevailing adverse wind direction is away from NCA01 receivers (towards the noise source) and therefore NCA01 results are conservative.

Figure 11 Noise Contours – Predicted Noise Level from Sprint Cars – Neutral Weather

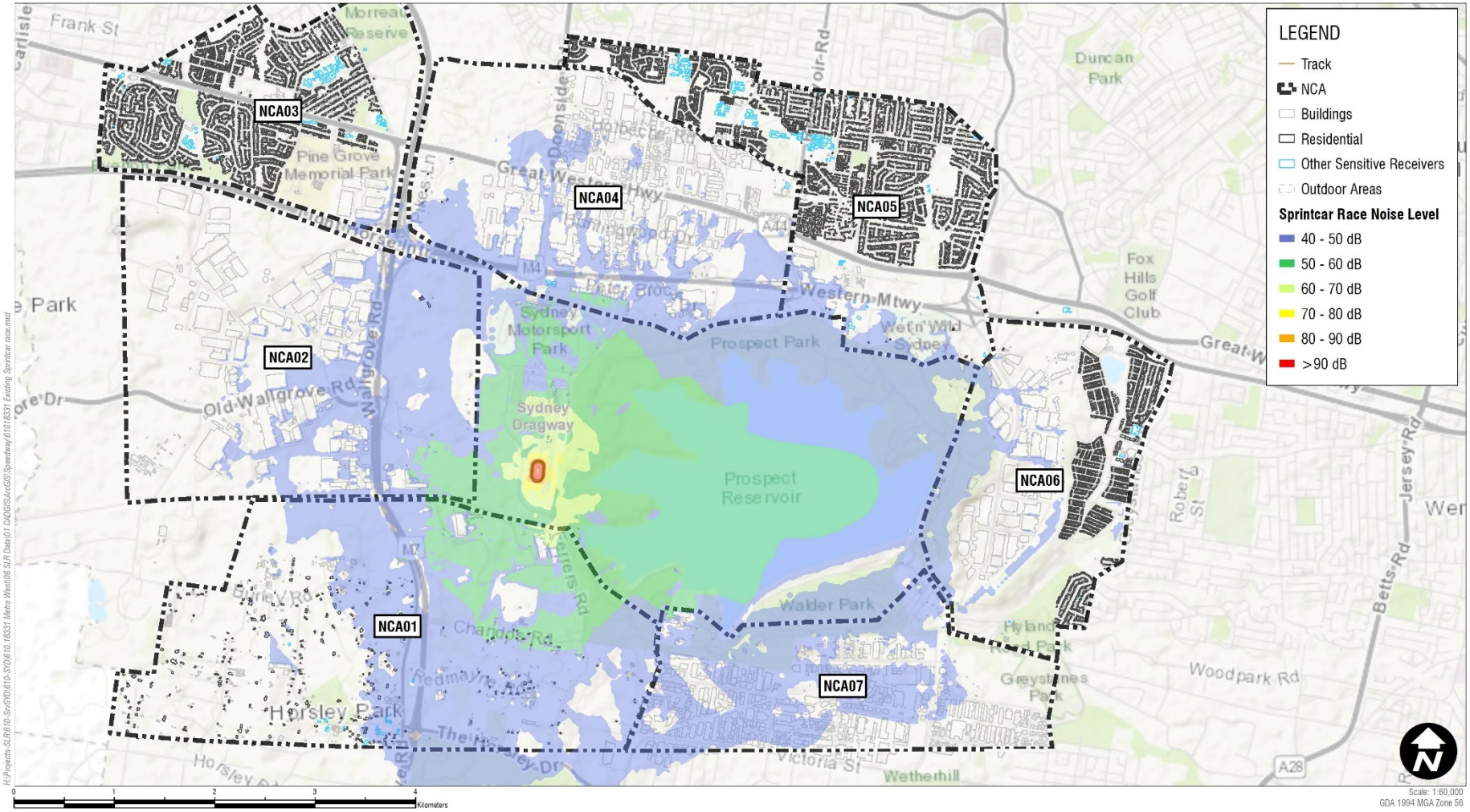
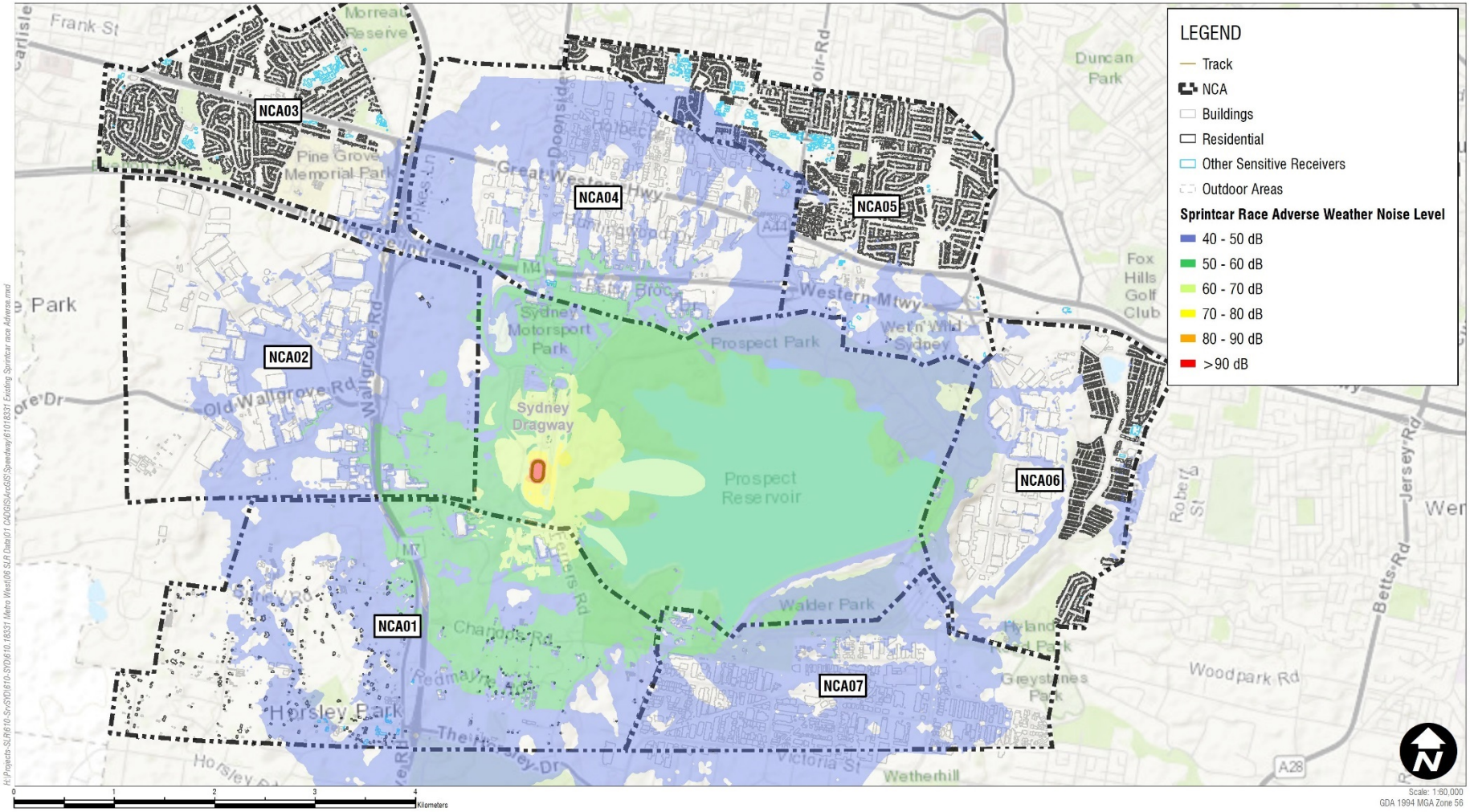


Figure 12 Noise Contours – Predicted Noise Level from Sprint Cars – Adverse Weather (including source to receiver wind)



6.1.2 Comparison with Existing Motorsport Events

6.1.2.1 Representative Events

Existing motorsport has been a feature of the study area for around 30 years with many different events currently occurring at Sydney Dragway and Sydney Motorsport Park (see **Section 4.2.1**). Sydney Dragway is located to the east of the project site and Sydney Motorsport Park is located to the north, as shown in **Figure 17**.

While the scope of this assessment does not include detailed assessment of noise levels from the existing venues, indicative noise levels have been estimated at surrounding receivers using the noise model developed for the Speedway assessment. Indicative noise level contours (assuming neutral weather) are shown in **Figure 13** to **Figure 16** for various representative existing events at Sydney Motorsport Park and Sydney Dragway. Noise levels from the following events have predicted:

- V8 Supercar Race at Sydney Motorsport Park based on a 26 car V8 supercar race over a 15-minute period using source noise levels estimated from *Ruapuna Park and Christchurch Kart Club Noise Assessment,* Marshall Day Acoustics 2007. This event represents a likely worst-case noise event from this circuit.
- Top Fuel Race at Sydney Dragway based on four races in a 15-minute period using source noise levels estimated from *Kwinana International Motorplex – Public Environmental Review*, ERM 1999. This event represents a likely worst-case noise event at Sydney Dragway.
- Sydney Motorsport Park Track Day (Porsche 911) based on 20 cars on track at one time during a 15-minute period using source noise levels estimated from *BlackRock Motor Park Noise Impact Assessment*, VIPAC 2017. This event represents a likely typical noise event at this circuit.
- Super Stock event at Sydney Dragway based on ten races in a 15-minute period using source noise levels estimated from *Kwinana International Motorplex – Public Environmental Review*, ERM 1999. This event represents a likely typical noise event at Sydney Dragway.

Figure 13 High Noise Event – V8 Supercar Race $L_{Aeq(15minute)}$ (26 cars)

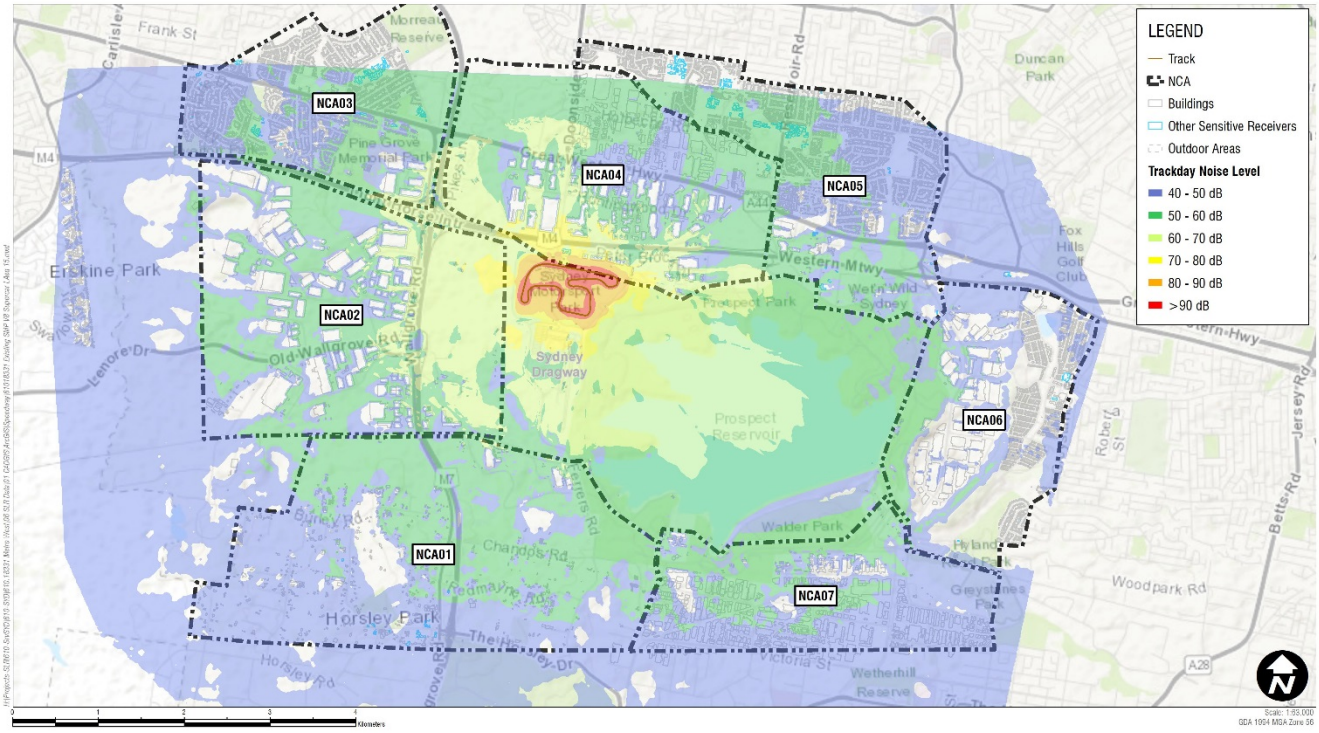


Figure 14 High Noise Event – Top Fuel Race $L_{Aeq(15minute)}$ (2 cars)

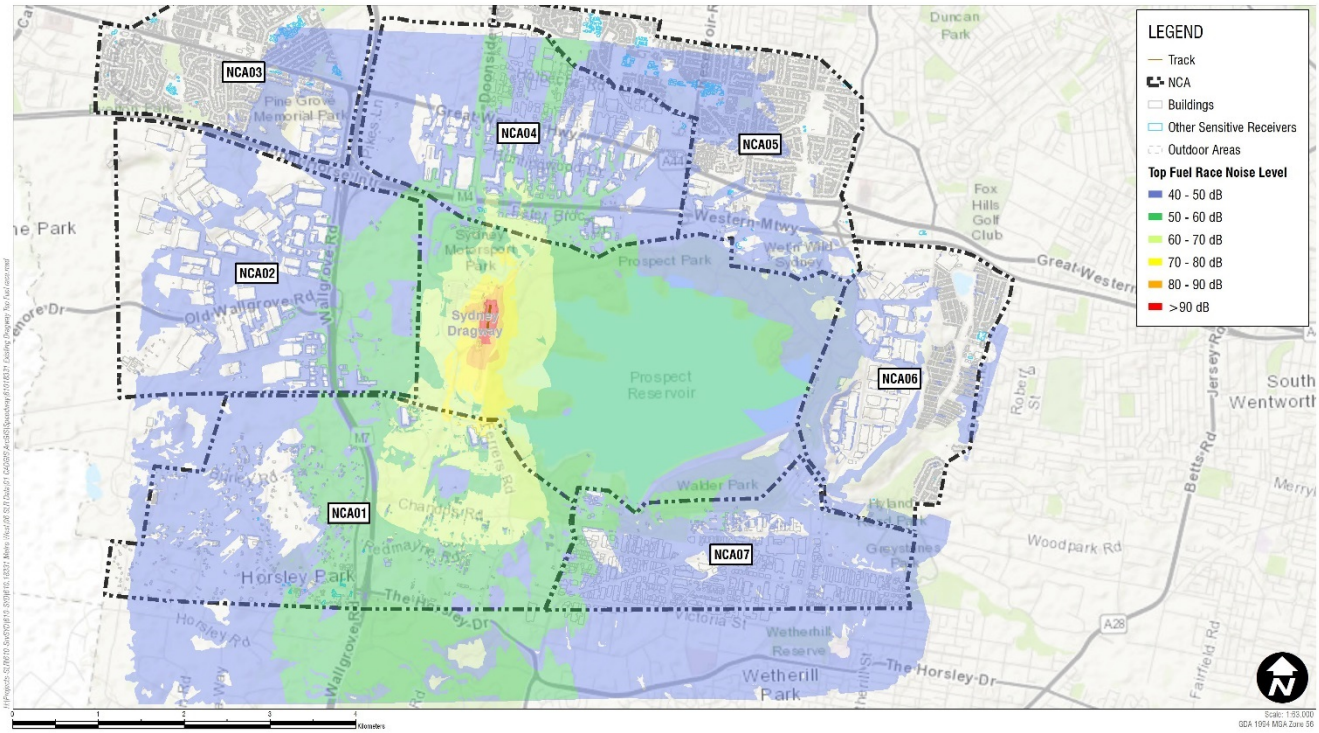


Figure 15 Typical Noise Event – Sydney Motorsport Park Track Day $L_{Aeq(15minute)}$ (Porsche 911 x 20 cars)

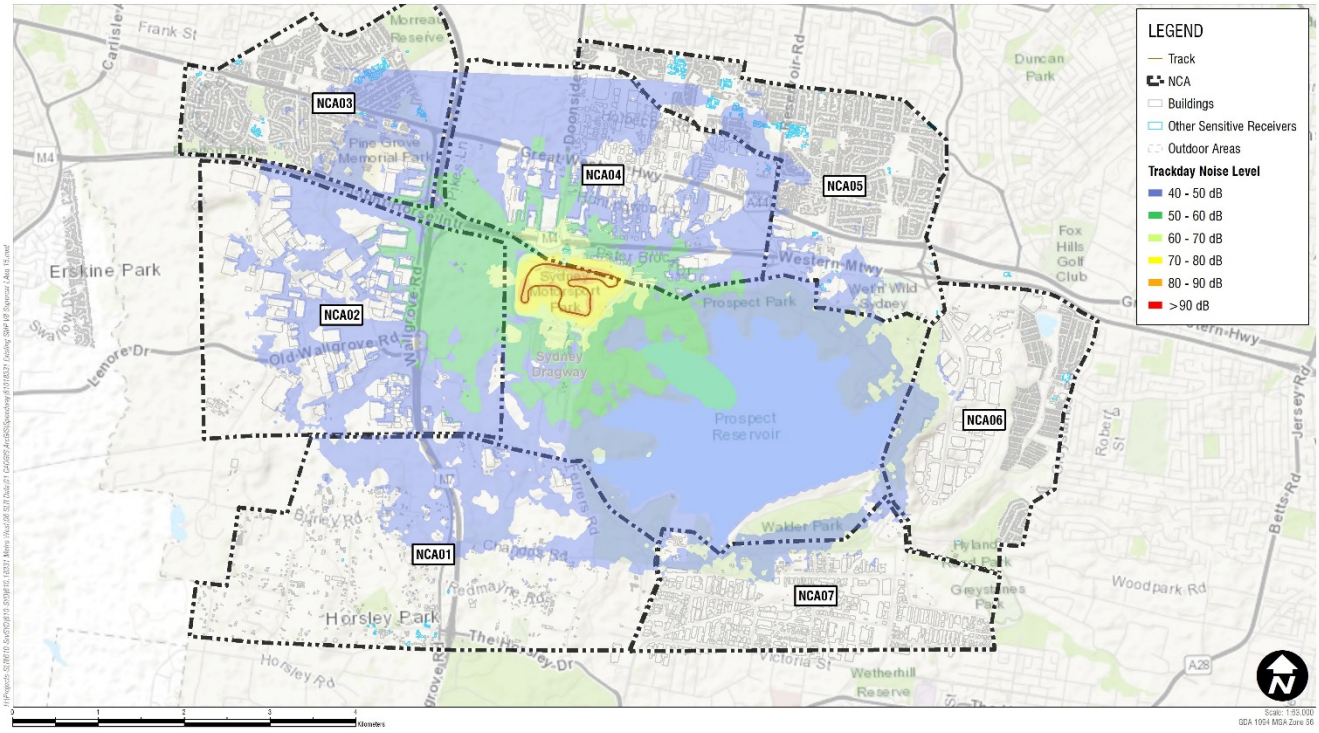
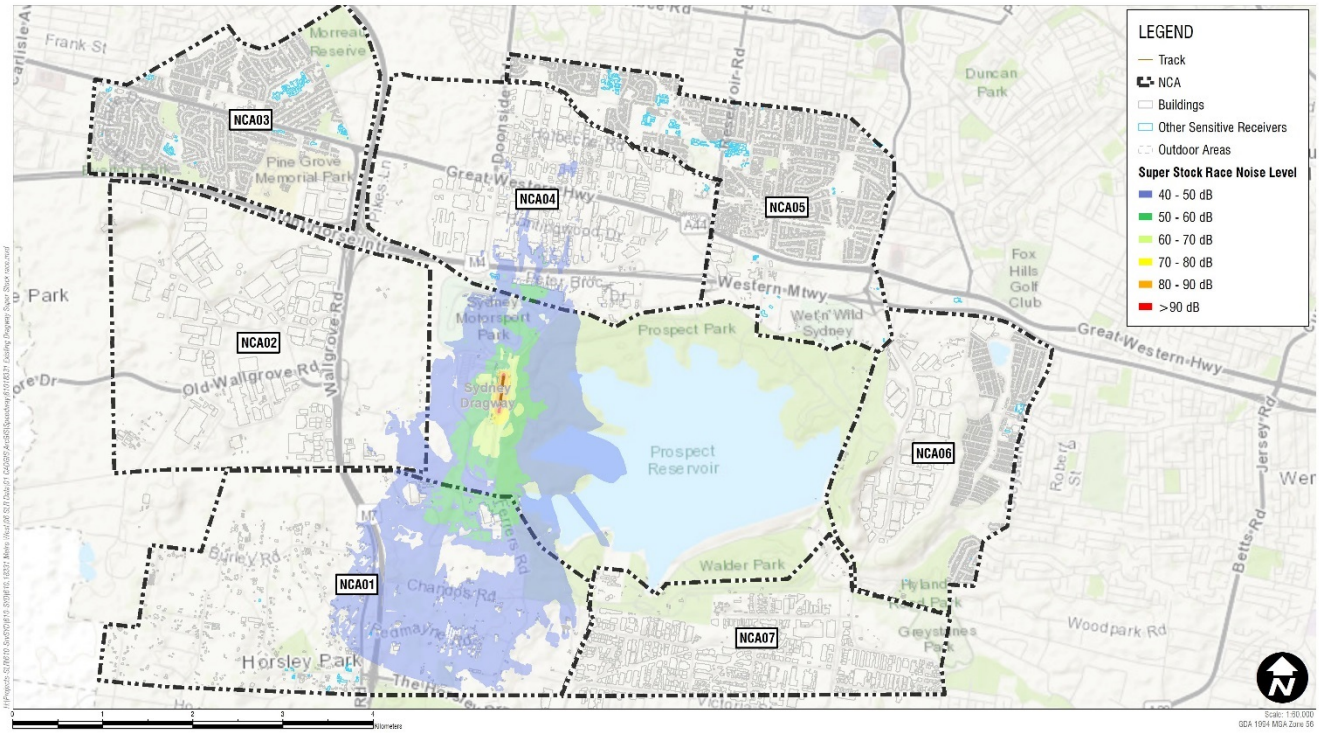


Figure 16 Typical Noise Event – Super Stock $L_{Aeq(15minute)}$ (2 cars) Typical Sydney Dragway



6.1.2.2 Model Validation

Provisional measurements of a NSW Atura Drag Racing Series event at Sydney Dragway in February 2020 at the locations shown in **Figure 17** are provided in **Table 32**. This series consists of modified and performance vehicles that are likely comparable to Super Stock vehicles detailed in **Table 21.**

Figure 17 Motorsport Noise Measurement Locations

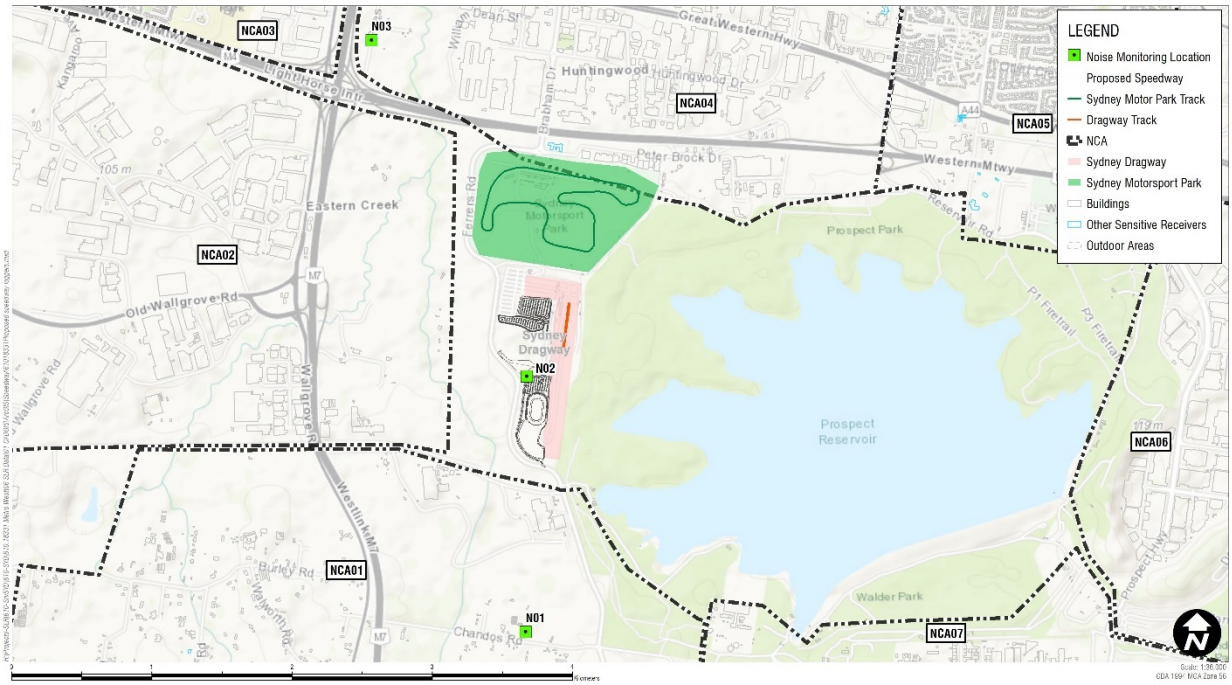


Table 32 Indicative Existing Noise Levels – Sydney Dragway

ID	Distance to Event	Duration	Notes	Noise Level (dBA)		
				Background LA90	Maximum LAmax	Average LAeq
N01	2100 m	15 minutes	Road traffic noise from Ferrer Road and Chandos Road dominant. Dragway races audible at times of low traffic with an average noise level of 45-48 dBA per race. Maximum dragway noise levels of around 50-52 dBA measured.	44	67	51
		13 minutes	Road traffic noise from Ferrer Road and Chandos Road dominant. Dragway races audible at times of low traffic and measured to be around 45 dBA. Maximum dragway noise levels of around 50-52 dBA measured.	42	74	46

ID	Distance to Event	Duration	Notes	Noise Level (dBA)		
				Background LA90	Maximum LAmax	Average LAeq
N02	240 m	14 minutes	Dragway races dominant and measured to be around 69 dBA per race with a maximum level of around 84 dBA. Traffic from Ferrer road along with birdsong audible between races. A total of 10 races occurred during this measurement.	47	84	63
		15 minutes	Dragway races dominant with an approximate noise level of 73 dBA per race and maximum noise level of 88 dBA. Traffic from Ferrer Road along with birdsong also audible between races. A period of maintenance occurred for eight minutes along with six races during this measurement.	46	88	67

Note: Measurements were attempted at N03 (approximately 2500m from dragway), however, dragway activities were inaudible.

Review of the measurements shows average noise levels of around 45 to 48 dBA at N01 due to motorsport noise from Sydney Dragway. Comparison to the noise contours of a typical event at this venue (see **Figure 16**) shows noise levels in the vicinity of Chandos Road are consistent with these measurements and therefore provides a provisional validation of the noise model.

6.1.2.3 Summary

To provide context for the predicted noise levels from the proposed Sydney International Speedway, the predicted noise levels from the proposed Sydney International Speedway (see **Table 30**) have been compared to indicative predicted noise levels from Sydney Motorsport Park and Sydney Dragway (see **Figure 13** to **Figure 16)**. This is summarised in **Table 33**. The events which are predicted to result in the highest noise levels in each catchment are shaded in red.

Table 33 Comparison of Motorsport Noise Levels with Existing Events

NCA	Predicted Noise Level (dBA)					
	Proposed Sydney International Speedway		Sydney Motorsport Park[1]		Sydney Dragway[1]	
	Noisy Events	Typical Events	Noisy Events	Typical Events	Noisy Events	Typical Events
NCA01	51	41-48	50-52	40-42	60-62	40-45
NCA02	46	34-42	60-65	50-55	54-56	<40
NCA03	<40	<40	50-52	40-44	45-47	<40
NCA04	42	<40	60-62	48-51	45-47	<40
NCA05	44	<40	48-50	39-41	44-46	<40
NCA06	43	<40	50-52	39-41	40-45	<40
NCA07	n/a - no residential receivers identified in this NCA					

Note 1: Estimate based on indicative contours for neutral weather conditions at the nearest residential locations shown in **Figure 4**.

The above comparison indicates the following:

- Noise levels at the surrounding receivers during the proposed Sydney International Speedway events are generally expected to be comparable to, or lower than, noise levels from existing motorsport events at Sydney Motorsport Park and Sydney Dragway. This is most apparent in NCA02 to NCA06 (i.e. to the west, north and east of the project site) due to the existing venues being closer to receivers in these catchments.
- Events at Sydney International Speedway are, however, predicted to result in worst-case noise levels that are slightly higher than noise from typical events at the existing venues for receivers to the south in NCA01, which is due to Sydney International Speedway being closer to these receivers.

The event information in **Section 4.2.1** shows that the total number of existing events (in the region of 140+ annually) is substantially more than proposed by the project (36 annually). The timing of the proposed events is also likely to overlap with existing events, such that some of the proposed events would occur on days already scheduled for existing motorsport events. The number of additional days motorsport would occur in the precinct as a result of the project is, therefore, effectively lower than 36.

Further discussion of cumulative noise is provided in **Section 6.8**. Noise mitigation recommendations are summarised in **Section 8.2**.

6.1.3 NGLG 'Offensive Noise Test'

The potential impacts from project have been evaluated qualitatively using the 'offensive noise test' defined in the NGLG and is summarised in **Table 34**.

While it is recognised that the 'offensive noise test' relies on the subjective judgement, it is considered appropriate for determining the likelihood of impacts from the project.

Table 34 Offensive Noise Test

EPA Checklist Questions	Answer	Discussion
Q1. Is the noise loud in an absolute sense? Is it loud relative to other noise in the area?	No	Motorsport noise has been a feature of the area from events at Sydney Dragway and Sydney Motorsport Park over the past 30 years. Noise levels from the project at receivers to west, north and east are generally expected to be lower than existing motorsport noise levels due to Sydney Dragway and Sydney Motorsport Park being closer to receivers in these directions. Noise levels from the noisiest events at Sydney International Speedway events are predicted to be higher than typical events at the existing venues for receivers to the south in NCA01 due to the speedway being closer than the existing facilities, but lower than Top Fuel events. Reference to the unattended noise monitoring data in **Appendix B** shows that $L_{Aeq(15minute)}$ daytime and evening noise levels in this area, measured at 150-151 Chandos Road in Horsley Park, are generally between 45 and 55 dBA, with frequent maximum noise levels of between 60 and 80 dBA, which is mostly due to existing road traffic noise. This is generally higher than predicted noise levels from most proposed events at Sydney International Speedway (see **Section 6.1.1**).

EPA Checklist Questions	Answer	Discussion
Q2. Does the noise include characteristics that make it particularly irritating?	Yes	Motorsport noise is generally intermittent in nature and can be tonal.
Q3. Does the noise occur at time when people expect to enjoy peace and quiet?	Potentially	Some events are scheduled to occur in the evening. The latest races would end is 10pm, with no racing during the night-time. It is noted that existing events at Sydney Dragway also take place in the evening and finish at 10pm.
Q4. Is the noise atypical for the area?	No	Motorsport noise has been a feature of the area for over 30 years. Existing events occur at both Sydney Dragway and Sydney Motorsport Park.
Q5. Does the noise occur often?	Potentially	Events are expected to occur on a weekly basis during the September to May season. This is consistent with current operations at the existing motorsport venues.
Q6. Are a number of people affected by the noise?	Potentially	The closest residential receivers are located around 1.2 kilometres to the south of the project site in NCA01. While these receivers are predicted to be impacted by the project, with relatively high exceedances of background noise levels during noisy events, the residences in this area are generally sparsely distributed and are already impacted by events at Sydney Dragway. Large numbers of residential receivers are located to the north and east of the project site, however, these areas are distant from the project site (i.e. several kilometres away) and are expected to be impacted to a much lower degree.

Based on the above assessment, the project is not expected to result in offensive noise levels for the majority of receivers surrounding the project site due to motorsport noise being an existing feature and the predicted exceedances of the background levels being relatively low for most NCAs.

Receivers to the south in NCA01 are, however, expected to be subject to an increase in motorsport noise levels from the project, meaning noise levels in this area are likely to be noticeable for residents when noisy events occur. Overall, due to motorsport being a feature of the area, it is considered unlikely that the events proposed by the project compared to existing operations would significantly change the result of a subjective offensive noise test.

6.2 Noise from Firework Displays

Fireworks displays may be provided at the end of major Speedway events. An assessment of noise impacts from the firework displays would be undertaken when further information is available on the format of the displays. However, impacts are expected to be minimal due to the limited number of events each year and the short duration of fireworks displays.

6.3 Operational Road Traffic Noise

The predicted road traffic noise levels at residential receivers on Ferrers Road are summarised in **Table 35**. No residential receivers are identified adjacent to Ferrers Road north of the project site.

The assessment shows that operational traffic from the project is predicted to result in an increase in road traffic noise levels of less than 2.0 dB which does not trigger the requirement to consider additional noise mitigation.

Table 35 Predicted Sydney International Speedway Operational Road Traffic Noise Level Increase

Location	Scenario	Minimum distance to nearest trafficable lane	Predicted Increase (dBA)[1]	
			Daytime $L_{Aeq(15hour)}$ 7 am – 10pm External Noise Level	Night-time $L_{Aeq(9hour)}$ 10pm – 7am External Noise Level
Ferrers Road residential receivers south of the project site	Saturday Major Speedway event	15-20m	0.5	0.9

Note 1: Existing road traffic noise levels are estimated based on existing (no event) traffic volumes on Ferrers Road south of the project site presented in the Traffic Impact Assessment Report

6.4 Facility Operations

At this stage of the design, details regarding the operational activities which would occur non-event days have not been finalised, however, are expected to be limited to car parking, general maintenance and mechanical plant noise from the various buildings. Given this type of noise source generally has relatively low noise emissions, and the nearest receivers are distant from the project, noise impacts during non-event operation are unlikely to adversely affect surrounding receivers.

Noise criteria for industrial noise emissions from the project has been determined in **Section 3.7**. Further assessment of these noise sources would be undertaken as the project progresses and more information becomes available.

6.5 Heritage Items

The nearest heritage building or structure identified in the study area is the Prospect Reservoir structure (not land boundary) which is around 300 m east of the project site. This separation distance is sufficient to mitigate potential vibration impacts and no exceedance of the heritage vibration damage criterion is expected during operation of the project.

6.6 Vibration impacts to the Warragamba Pipelines Corridor

The Warragamba Pipelines Corridor is located to the south of the project site, approximately 20 metres from the edge of the *Southern Area Stockpiling* works area, as shown in **Figure 10**.

The project is not expected to introduce any new sources of operational vibration near this area and therefore no vibration impacts on the pipeline are expected.

6.7 Outdoor Open Areas (Parklands)

Parklands surrounding the project site are shown in **Figure 4**. With reference to the predicted noise contours for the highest noise Sprint Car races (**Figure 11** and **Figure 12**), the noise goal for open areas (50 dBA) is predicted to be exceeded at adjacent areas (pathways) surrounding the Prospect Reservoir and up to around 1,500 metres from the facility, as well as over the reservoir. This means that passive/contemplative activities may be impacted in these areas during the works. Active users (e.g. running, jogging, cycling etc) would be less impacted by noise than passive users of the parkland. Lower noise events are typically 5-10 dB lower than the Sprint Car races and therefore would impact a much smaller area, limited generally to paths immediately adjacent to the facility.

Areas of the parkland to the east (surrounding Prospect Reservoir) are not predicted to experience noise goal exceedances during the Sprint Car races.

It is noted that noise from existing events at SMSP and Sydney Dragway already impact the most parkland areas to a greater extent than noise from events at Sydney International Speedway would.

Noise mitigation is discussed further in **Section 8.2**.

6.8 Concurrent Events

6.8.1 Motorsport Operations

Event information for Sydney Dragway and Sydney Motorsport Park (**Section 4.2.1**), indicates that existing motorsport events are likely to occur on the same days as the proposed Sydney International Speedway events. The common days are Wednesdays and Fridays. In accordance with the Major Events Operation Plan, the Sydney Dragway or Sydney International Speedway operator would have exclusive access to the project site at certain agreed dates during the year. Concurrent major events would not take place on these dates unless with the agreement of the operator who has exclusive access on those dates.

The assessment presented in **Section 6.1.2** predicts that receivers to the south of the project are the only receivers expected to be subject to motorsport noise levels that are potentially higher than existing motorsport noise levels.

Noise from existing high noise events at Sydney Motorsport Park (e.g. V8 Supercars) are estimated to be higher in NCA02 to NCA07, and similar in NCA01 when compared to events associated with the project. Noise levels during high noise events at Sydney Dragway (e.g. Top Fuel) are also likely to be higher in all NCAs than during events associated with the project. This means that the potential for increased noise levels due to cumulative events is dependent on the events occurring on any given day, their relative noise emissions and their proximity to receivers.

In general, noise levels during multiple events are expected to be controlled by the noisiest and/or closest event to a particular receiver and rather than increase noise levels, the impact of concurrent events would generally be expected to be a potential increase in the duration, and annoyance, of noise impacts at the affected receivers.

Recommendations for mitigating and managing potential cumulative impacts are discussed in **Section 8.2**.

6.8.2 Road Traffic Impacts

The predicted road traffic noise levels at residential receivers on Ferrers Road when there are concurrent Sydney Dragway and Sydney International Speedway events are summarised in **Table 36**.

Operational road traffic noise during concurrent operations is predicted to result in an increase in road traffic noise levels of less than 2.0 dB and does not trigger the requirement for consideration of additional noise mitigation.

Table 36 Predicted Concurrent (Speedway and Dragway) Operational Road Traffic Noise Level Increase

Location	Scenario	Minimum Distance to Nearest Trafficable Lane	Predicted Increase (dBA)[1]	
			Daytime $L_{Aeq(15hour)}$ 7am – 10pm External Noise Level	Night-time $L_{Aeq(9hour)}$ 10pm – 7am External Noise Level
Ferrers Road residential receivers south of the project site	Friday concurrent event	15-20m	0.4	0.6

Note 1: Existing road traffic noise levels are estimated based on existing traffic volumes on Ferrers Road south of the project site presented in the Traffic Impact Assessment Report

7 Cumulative Impacts

7.1 Cumulative Construction Noise

Cumulative construction impacts can occur where multiple works are being completed near to a particular location at the same time concurrently or if more than one activity or project occurs in the same area consecutively.

No other major projects have been identified in the area that are likely to contribute to cumulative construction noise impacts.

7.2 Construction Fatigue

The project is considered unlikely to result in construction fatigue impacts at the surrounding receivers as the worst-case concurrent noise impacts are predicted to only result in 'minor' exceedances. Noise levels during most of the individual work scenarios are not expected to exceed the criteria.

8 Management of Impacts

8.1 Construction

The ICNG acknowledges that due to the nature of construction works it is inevitable that there will be impacts where construction is near sensitive receivers. Where exceedances of the noise and vibration management levels are predicted, the following mitigation and management measures should be applied, where feasible and reasonable.

8.1.1 Construction Environmental Management Framework

The Construction Environmental Management Framework (CEMF) is a Sydney Metro project framework which sets out the environmental, stakeholder and community management requirements for construction of the project. The construction contractor (once appointed) would be required to implement and adhere to the requirements of the CEMF. The CEMF is provided as Appendix C of the Environmental Impact Statement.

The CEMF would require the principal contractors to prepare a Construction Noise and Vibration Management Plan (CNVMP) for their scope of works in line with the requirements of the ICNG (see **Section 3**) and the Sydney Metro Construction Noise and Vibration Standards (CNVS) (see **Section 8.1.2**).

The CNVMP would be prepared before construction begins and would define how the predicted impacts would be mitigated and managed. The CNVMP would include:

- Identification of nearby sensitive receivers
- Description of works, construction equipment and hours of work
- Criteria for the project and relevant licence and approval conditions
- Requirements for noise and vibration monitoring
- Details of how community consultation would be completed, including procedures for notification of potentially affected receivers prior to works commencing
- Procedures for handling complaints.

The CNVMP would also consider cumulative concurrent construction impacts and the likelihood for ‘construction fatigue’ from consecutive projects in the areas which have substantial night-time works.

8.1.2 Sydney Metro Construction Noise and Vibration Standard

The Sydney Metro CNVS contains assessment and management protocols for construction of Sydney Metro projects. The strategy is based on the requirements of the ICNG and Transport for NSW CNVS, as appropriate to Sydney Metro and is the guiding strategy for mitigating and managing all construction noise and vibration impacts from the project. The Sydney Metro CNVS is provided in Appendix C of the Environmental Impact Statement.

8.1.3 Standard Mitigation Measures

The Sydney Metro CNVS contains a number of 'standard mitigation measures' for mitigating and managing construction impacts on Sydney Metro projects. The measures are shown in **Appendix D** and would be applied to the works where feasible and reasonable.

The standard measures include items such as requiring construction contractors to complete site inductions to make workers aware of any noise and vibration specifics, completing regular monitoring to check noise and vibration levels are as expected, and checking that noise emission levels for construction equipment remains within allowed CNVS and manufacturers specifications.

8.1.4 Additional Noise Mitigation Measures

Where impacts remain after the use of 'standard mitigation measures', the Sydney Metro CNVS requires 'additional mitigation measures' to be applied, where feasible and reasonable.

The 'additional mitigation measures' are determined on the basis of the exceedance of the appropriate management levels. The CNVS defines how 'additional mitigation measures' are applied to airborne noise impacts and the approach is shown in **Table 37**.

Table 37 Additional Mitigation Measures Matrix – Airborne Construction Noise

Time Period		Mitigation Measure			
		$L_{Aeq(15minute)}$ Noise Level above Background (RBL)			
		0 to 10 dBA	10 to 20 dBA	20 to 30 dBA	>30 dBA
Standard	Mon-Fri (7am - 6pm)	-	-	M, LB	M, LB
	Sat (8am - 1pm)				
	Sun/Pub Hol. (Nil)				
OOHW Period 1	Mon-Fri (6pm - 10pm)	-	LB	M, LB	M, IB, LB, PC, RO, SN
	Sat (7am - 8am) & (1pm - 10pm)				
	Sun/Pub Hol. (8am - 6pm)				
OOHW Period 2	Mon-Fri (10pm - 7am)	-	M, LB	M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
	Sat (10pm - 8am)				
	Sun/Pub Hol. (6pm - 7am)				

Note: The following abbreviations are used: Alternative accommodation (AA), Monitoring (M), Individual briefings (IB), Letter box drops (LB), Project specific respite offer (RO), Phone calls (PC), Specific notifications (SN).

As the predictions in **Section 5** result in 'minor' (less than 10 dB) worst-case impacts at the nearest receivers during night-time works, reference to **Table 37** shows no requirement for 'additional mitigation measures'.

8.1.5 Construction Noise and Vibration Impact Statements

A site specific Construction Noise and Vibration Impact Statement (CNVIS) would be prepared for all works outside Standard Construction Hours likely to exceed the relevant NMLs.

The CNVIS assessments would be completed prior to the works starting and would assess the potential impacts at receivers near the works and determine appropriate measures to minimise the impacts as far as practicable.

The mitigation and management measures would be determined based on the magnitude and duration of the predicted impacts and would be consistent with the 'standard' and 'additional mitigation measures' defined in the Sydney Metro CNVS, or any relevant conditions of approval.

A CNVIS would only be required for the project, should a wood-chipper be used during night-time construction works, or for changes to the proposed construction methodology requiring the use of additional equipment not included in this assessment.

8.2 Operation

8.2.1 Management of Individual Vehicle Noise Emissions

Motorsport Australia provides general requirements for cars in their 2020 Motorsport Australia Manual. Schedule A notes the following with regard to noise emitted by vehicles:

> *(l) be configured such that the sound emitted when measured 30m from the track edge does not exceed 95dB(A) unless event regulations set a lower limit*

The vehicles proposed at Sydney International Speedway are considered likely to comply with this general requirement. Notwithstanding, it is recommended that vehicles using the facility are regularly spot tested to check compliance.

8.2.2 Noise Barriers

Noise barriers near to the track have been investigated as a potential mitigation measure, however, they were found to offer minimal noise benefit due to both access points creating gaps in the barrier, the relatively large source area (i.e. the track) and the large separation distance to the nearest receivers.

8.2.3 At-property Noise Treatment

The predicted motorsport noise levels (see **Section 6.1**) may exceed the nominated background level +5 dB noise goal for motorsport venues (see **Section 3.5**) at some of the nearest receivers. Consistent with the mitigation approach in NSW for other types of project such as roads, rail and industrial projects, at-property treatment is recommended to be considered to mitigate noise impacts at these receivers.

Fifteen residential receivers (13 in NCA01 and two in NCA02) have been identified with predicted average noise levels of more than 5 dBA above the background level. These receivers are shown in **Figure 18** and **Table 38**.

Figure 18 Residential Receivers Considered Eligible for At-property Treatment (NCA01 and NCA02)

Table 38 Addresses of Identified Receivers

Number	NCA	Address
1	NCA01	203-209 Chandos Road, Horsley Park
2		137-153 Chandos Road, Horsley Park
3		117 Chandos Road, Horsley Park
4		150-154 Chandos Road, Horsley Park
5		126-130 Chandos Road, Horsley Park
6		259-273 Chandos Road, Horsley Park
7		171-185 Chandos Road, Horsley Park
8		121-135 Chandos Road, Horsley Park
9		187-201 Chandos Road, Horsley Park
10		155-169 Chandos Road, Horsley Park
11		105-119 Chandos Road, Horsley Park
12		168-174 Chandos Road, Horsley Park
13		211-217 Chandos Road, Horsley Park
14	NCA02	165 Wallgrove Road, Eastern Creek[1]
15		165 Wallgrove Road, Eastern Creek[1]

Note 1: Currently assumed to be unoccupied.

As discussed in **Section 6.1.1**, the NCA01 receivers are unlikely to experience adverse weather conditions and the above mitigation counts are based on neutral weather for this catchment. The two identified buildings in NCA02 are possibly unoccupied and therefore not currently noise sensitive. This should be confirmed during detailed design.

Typical treatment may consist of mechanical ventilation to allow windows to be kept closed on affected facades while providing adequate ventilation. Other options may include window upgrades to glazing and/or acoustic seals. The extent and type of treatment would be confirmed during detailed design following inspection of the properties.

8.2.4 Operational Environmental Management Plan

An Operational Environmental Management Plan (OEMP) would be prepared by the operator, once appointed. The OEMP would contain an Operational Noise Management Plan (ONMP) which confirms the following aspects of the assessment, including any refinements made during detailed design:

- All major noise sources from the project
- The facilities operating hours and types of events
- The predicted numbers of light and heavy vehicle traffic created by the operation as well as the likely routes to be taken to and from the project site to the main thoroughfares
- Any noise sensitive locations with the potential to be affected by the project
- Site specific noise criteria
- Prevailing weather conditions applicable to the project site
- Predicted noise impacts from the project
- Mitigation measures to address any exceedances of the noise criteria.
- Complaints handling and response procedure.

Community feedback received as part of the planning approvals process for this project would be incorporated into the ONMP to address concerns and expectations of the community. The aim of the ONMP should be to minimise noise impact from the venue where feasible and reasonable without unduly constraining operation of the various venues. This would likely incorporate detailed event planning informed by assessment of noise emissions from each venue.

It is recommended that Blacktown City Council are consulted as part of the OEMP process.

8.3 Project Specific Mitigation

The project-specific mitigation measures detailed in **Table 39** are recommended to be used as far as practicable to minimise the construction and operational noise impacts from the project.

Table 39 Recommended Project Specific Noise Mitigation Measures

ID	Item	Discussion and Recommendations
Construction		
NV01	Night-time impacts	Feasible and reasonable options to reduce night-time noise impacts associated with the wood chipper would be investigated including positioning or shielding of equipment, restricting the use of the wood chipper to daytime construction hours, or through the early implementation of at-property treatments required to reduce operational noise.
Operation		
NV02	Operational motorsport noise	At-property treatment would be provided to noise sensitive receivers where the predicted average event noise level $L_{Aeq(15minute)}$ is more than 5 dB above the background noise level.
NV03	Firework Displays	An evaluation of the potential noise impacts from occasional firework displays during some events would be undertaken during detailed design when more information is available regarding the proposed displays associated with the project
NV04	Operational Environmental Management Plan	An Operational Environmental Management Plan (OEMP) (to be prepared by the operator, once appointed) would include the following measures to manage and mitigate noise: • Establishing vehicle noise control limits for events and monitoring to verify compliance with these limits • Managing the use of the public address system to minimise noise • Coordination with other motorsports operators to minimise noise from concurrent events • Establishment of a complaints handling and response procedure.

9 Conclusion

Sydney Metro is proposing to relocate speedway racing to the Western Sydney Parklands' Precinct 5: Eastern Creek Motor Sports. The existing land use surrounding the project site is mostly commercial/industrial with distant residential receivers.

Construction

Construction of the project would be undertaken up to 24 hours per day, seven days a week for the duration of construction. The construction noise impacts from the project are generally low, due to the large separation distance between the project site and nearest receivers. Construction noise levels are predicted to be within the Noise Management Levels for all works during Standard Construction Hours. A 'minor' 1 dB exceedance is predicted during night-time construction at two receivers in NCA01 and NCA02.

The main potential source of construction vibration would be from vibratory rollers. The separation distance between the project site (equipment location) and the nearest potentially affected vibration-sensitive receivers is sufficient for vibration levels to be expected to be below the criteria.

Construction noise impacts would be mitigated and managed in accordance with the mitigation measures and recommendations in **Section 8.1** of this report.

Operation

The project would introduce a new source of motorsport of noise to the Western Sydney Parklands Precinct 5: Eastern Creek Motorsports. Motorsport noise is, however, noted as being a feature of the area for over 30 years, with existing events regularly occurring at Sydney Dragway (which is to the immediate east of the project) and Sydney Motorsport Park (which is to the immediate north of the precinct).

While motorsport noise levels from the project are predicted to be above the existing background level at nearest receivers during the noisiest events, noise levels at receivers to the west, north and east are generally expected to be comparable to, or lower than, noise levels from existing motorsport events at Sydney Motorsport Park and Sydney Dragway.

The project is expected to result in noise levels that are higher than typical events at the existing motorsports venues within the Eastern Creek Motorsports precinct for receivers to the south of the project site in NCA01, due to the proposed Sydney International Speedway being closer to receivers in this catchment than the existing facilities.

The characteristics of noise from the project have been reviewed to determine the likelihood of offensive noise impacts at the nearest receivers. This exercise concluded that most receivers surrounding the project are not expected to be subject to offensive noise impacts. Receivers to the south in NCA01 were identified as likely to have impacts that are noticeable, however, due to motorsport being an existing feature of the area it is considered unlikely that the events proposed by the project would be sufficient to significantly change the result of a subjective offensive noise test completed for existing operations.

Recommendations to manage the potential operational noise impacts to sensitive receivers from the project have been made in in **Section 8.2** of this report.

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

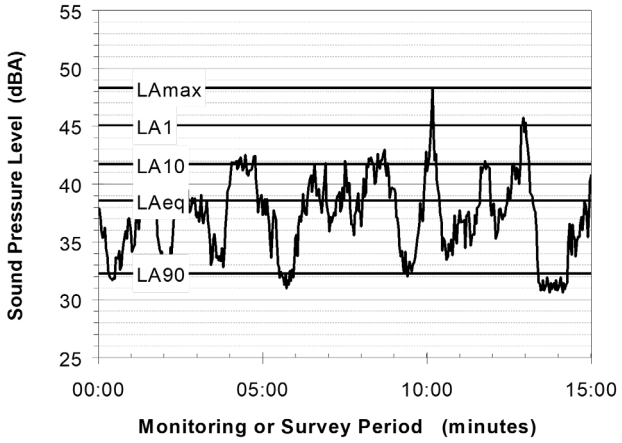
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

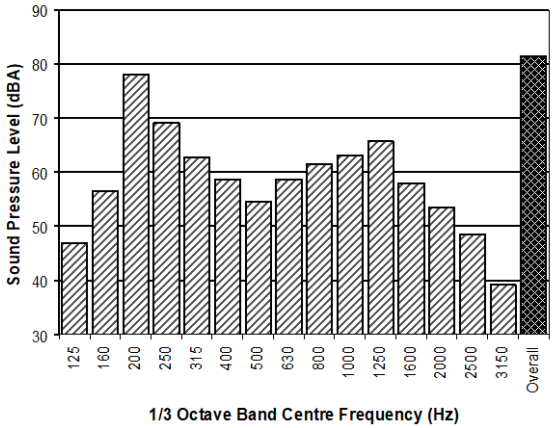
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (i.e. differences in distinct frequency components between adjoining octave or 1/3 octave bands) and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (i.e. vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

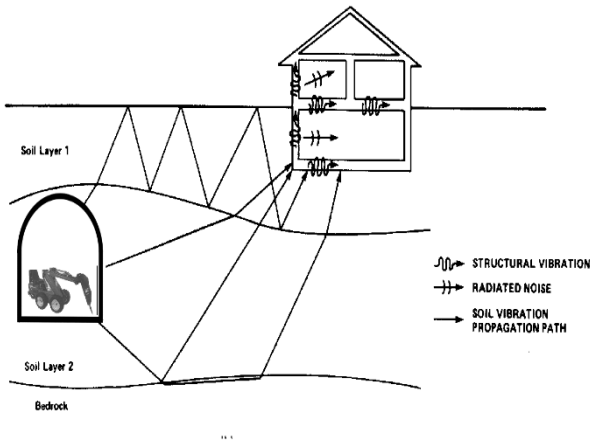
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (e.g. rock breakers), and building services plant (e.g. fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

APPENDIX B

Existing Noise Monitoring Results

Noise Monitoring Location	L.01
Noise Monitoring Address	**150-151 Chandos Road, Horsley Park**

Logger Device Type: Svantek 957, Logger Serial No: 21425
Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2414604

Ambient noise logger deployed at residential address 150-151 Chandos Rd, Horsley Park. Logger located with view of Chandos Rd to the south and Ferrers Rd to the east.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from Chandos Rd to the south and Ferrers Rd to the east. Industrial activity also contributes to the noise level at this location.

Recorded Noise Levels (LAmax):
18/02/2020: Light-vehicle traffic Chandos Rd: 49-55 dBA, Heavy-vehicle traffic Chandos Rd: 53-57 dBA, Birds: 46-63 dBA, Industrial activity: 47-67 dBA, Helicopter: 45-54 dBA

Map of Noise Monitoring Location

Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	39	49	51	57
Evening	40	49	50	56
Night-time	40	48	49	54

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	49	53
Night-time (10pm-7am)	48	53

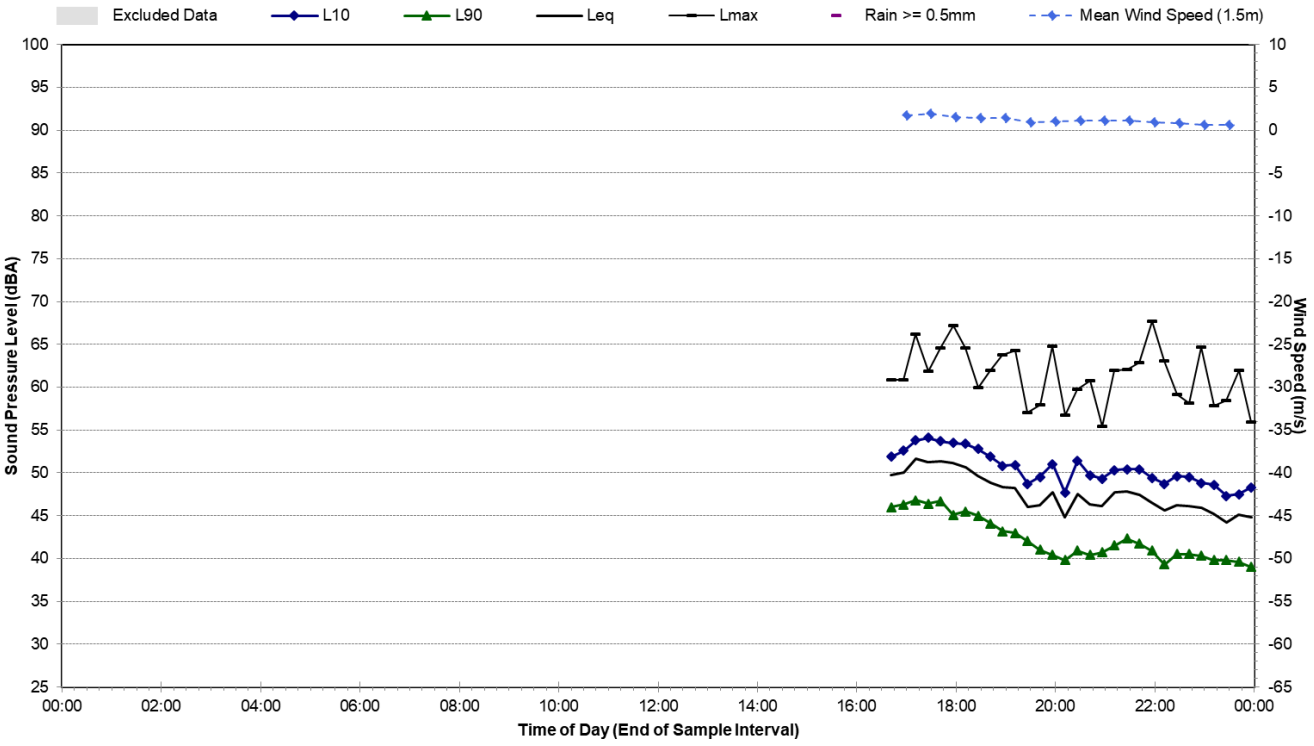
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
18/02/2020	16:03	43	48	67

Photo of Noise Monitoring Location

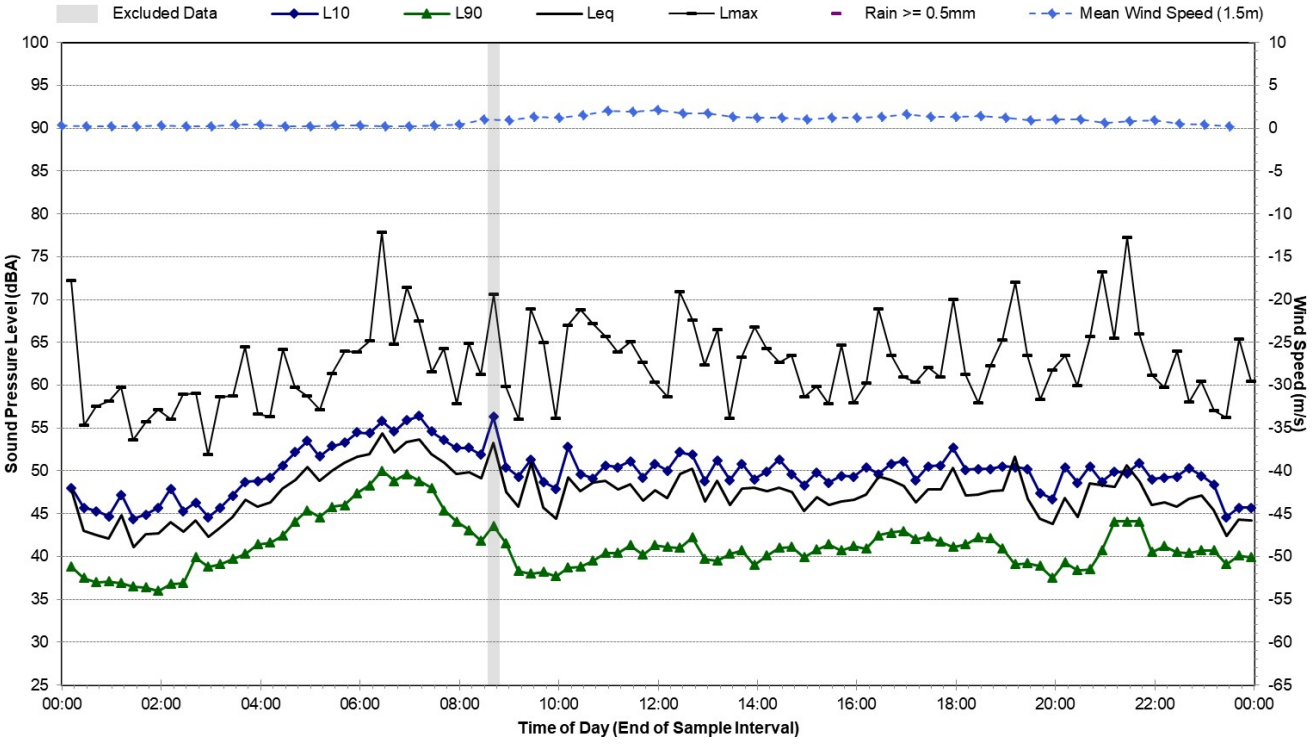
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Wednesday, 29 January 2020



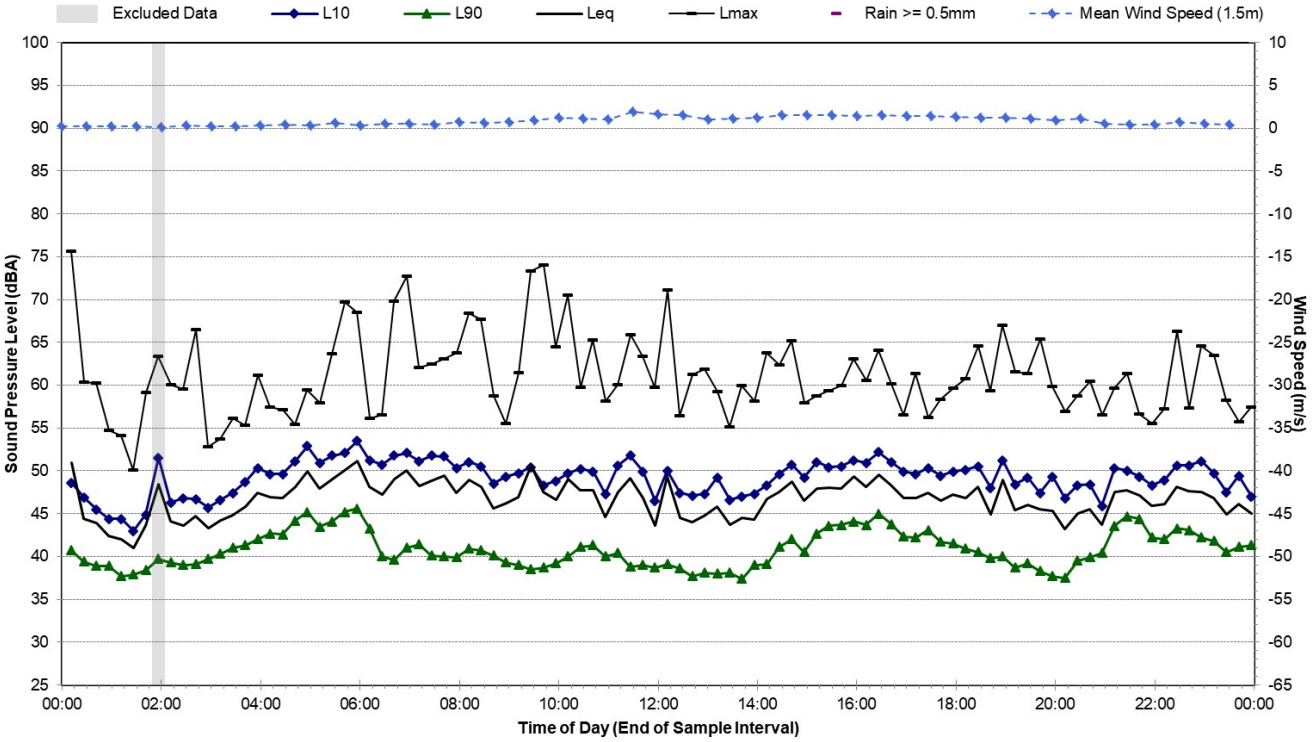
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Thursday, 30 January 2020



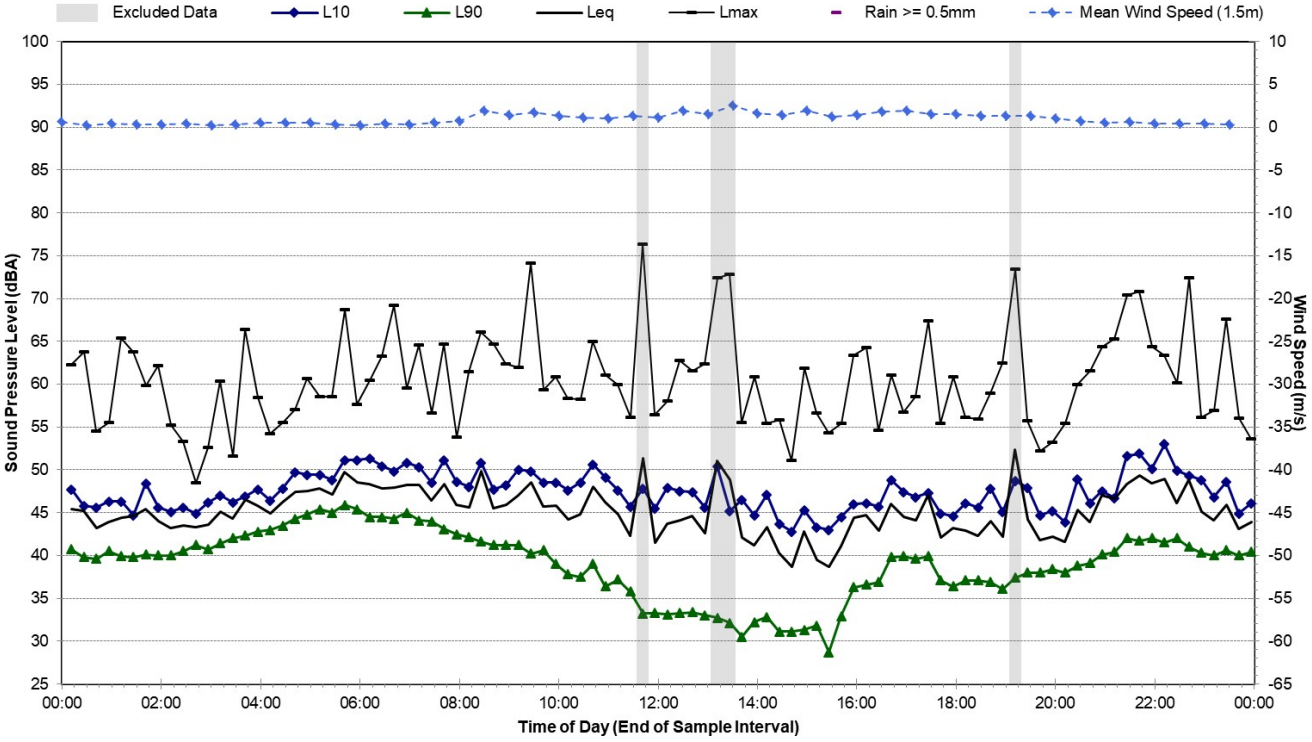
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Friday, 31 January 2020



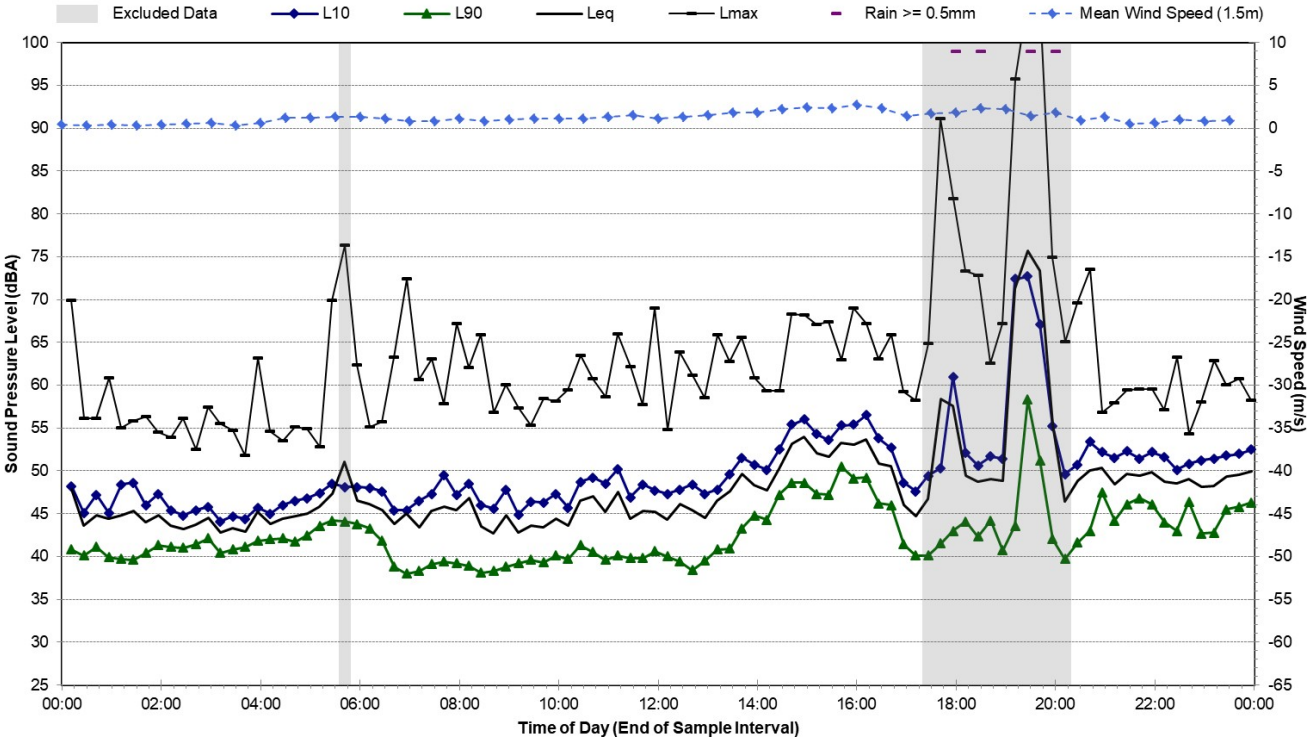
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Saturday, 1 February 2020



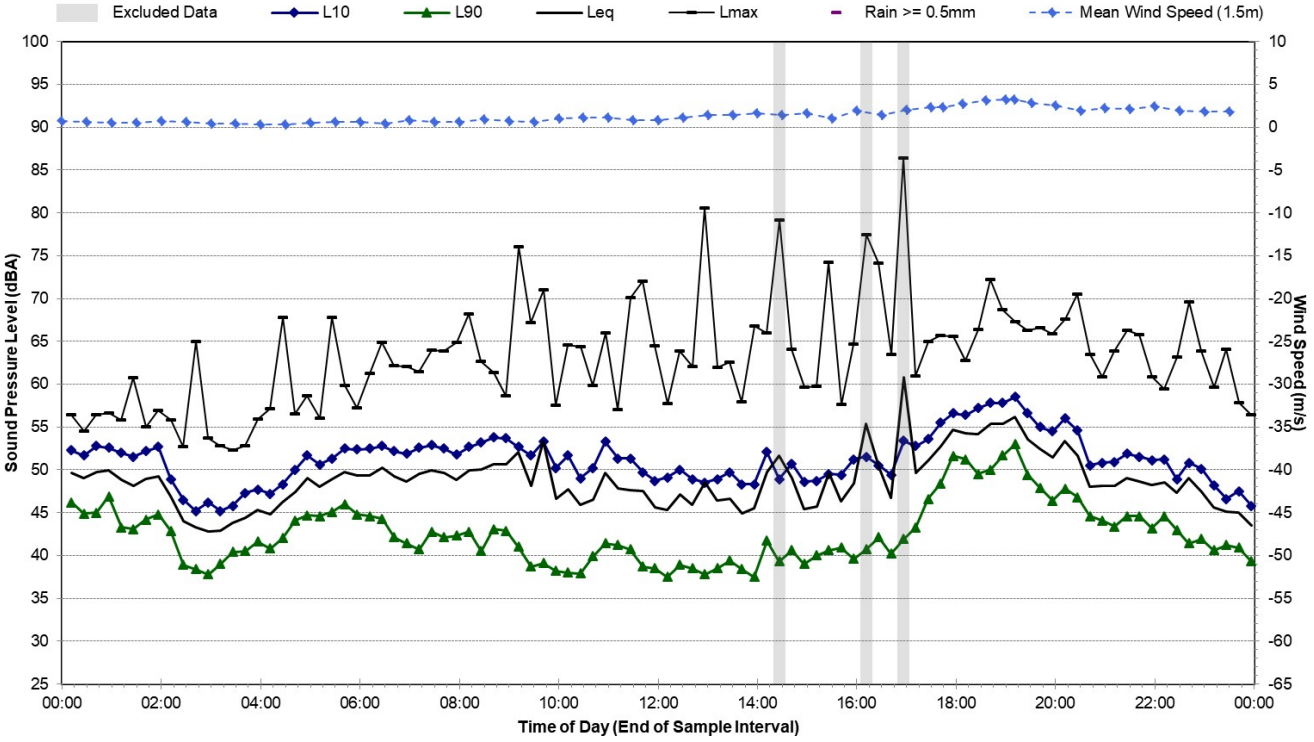
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Sunday, 2 February 2020



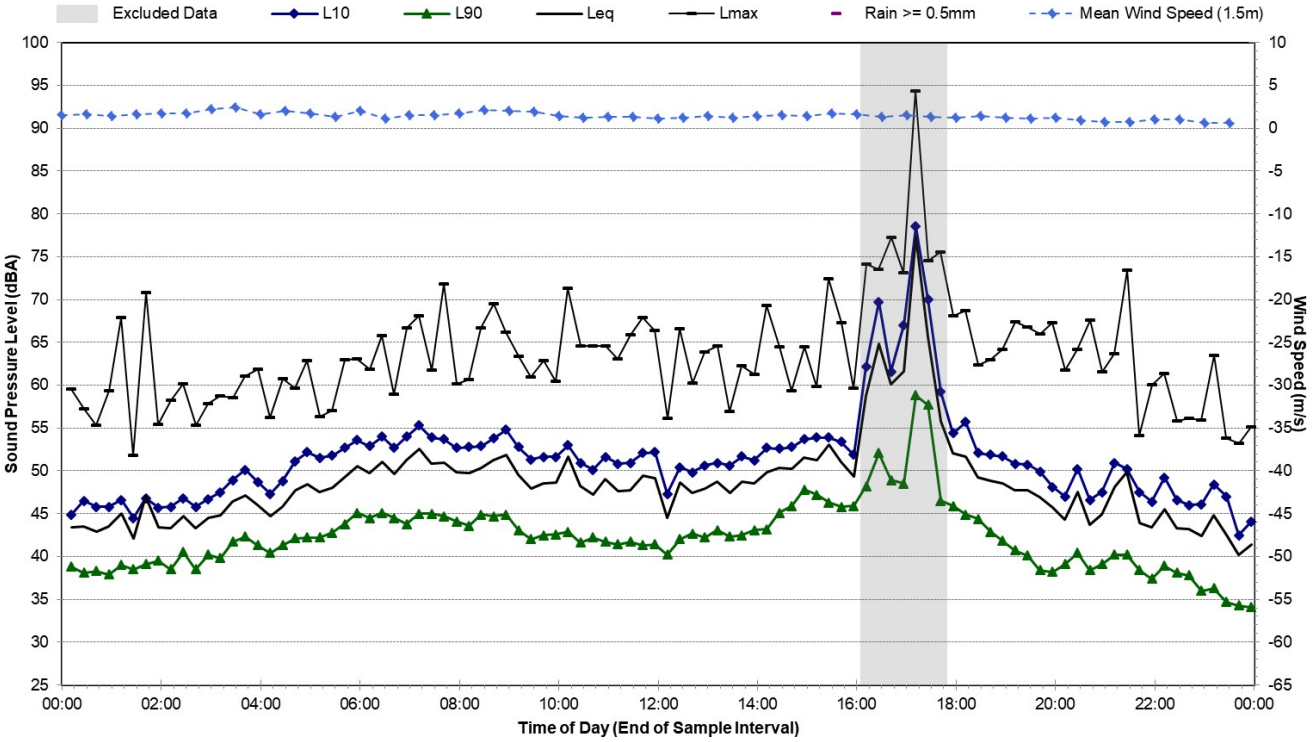
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Monday, 3 February 2020



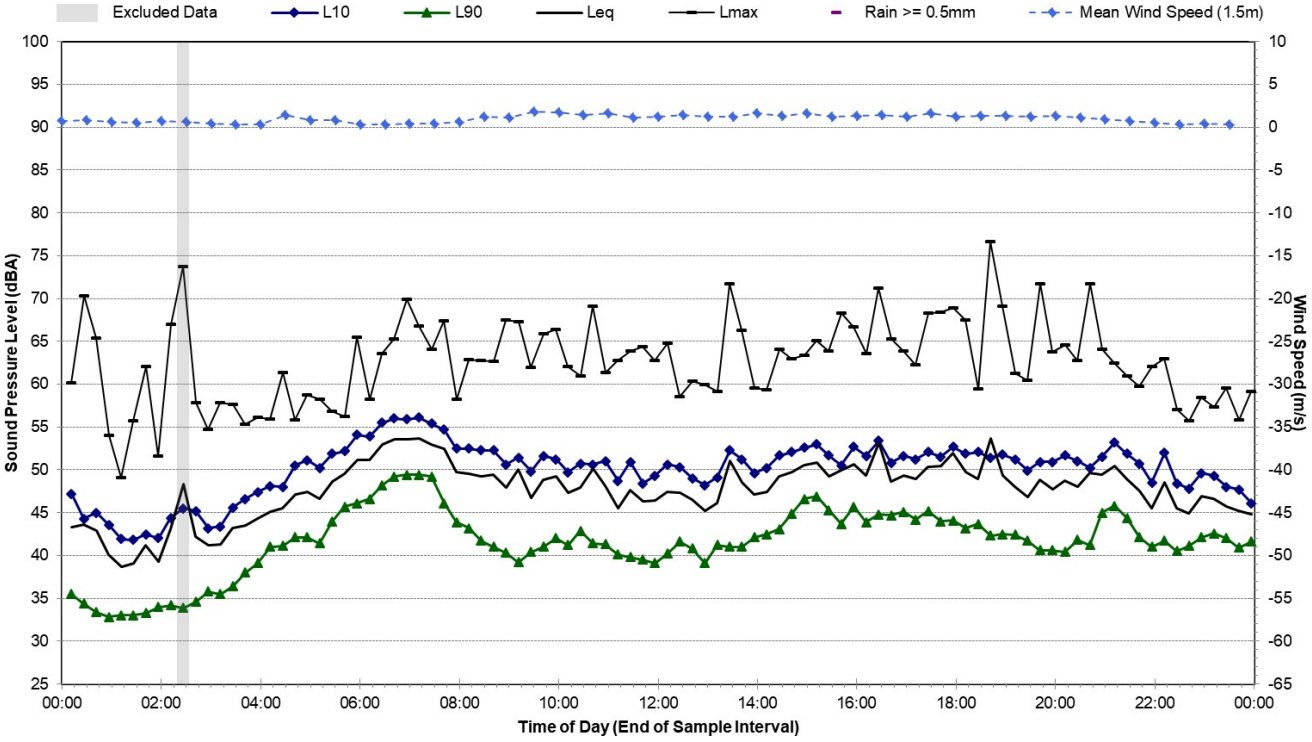
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Tuesday, 4 February 2020



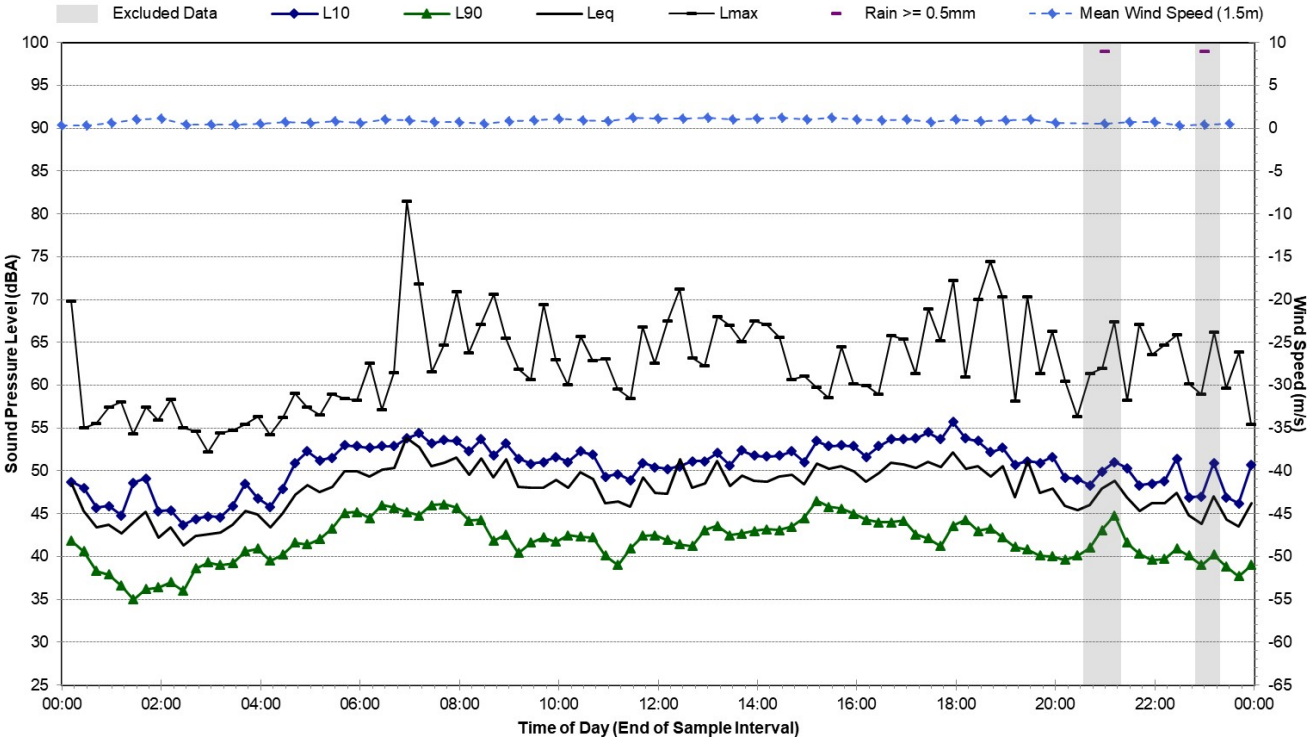
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Wednesday, 5 February 2020



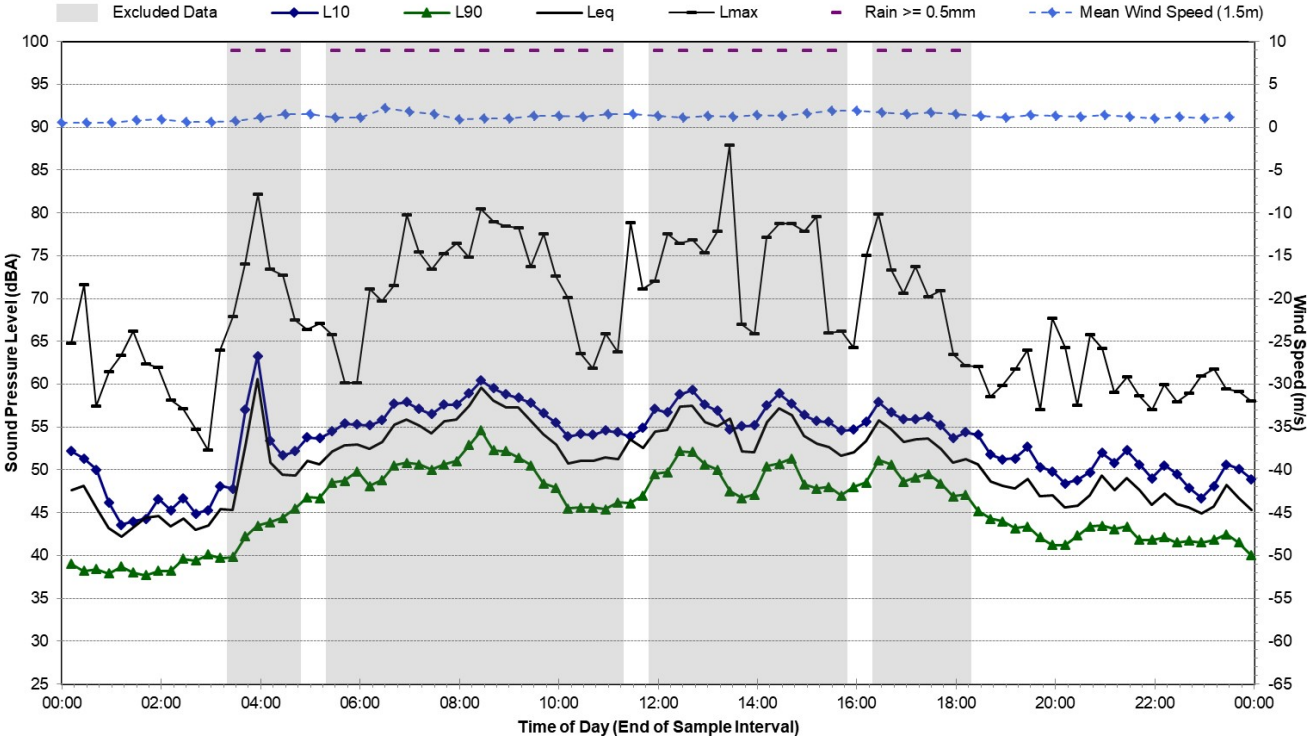
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Thursday, 6 February 2020



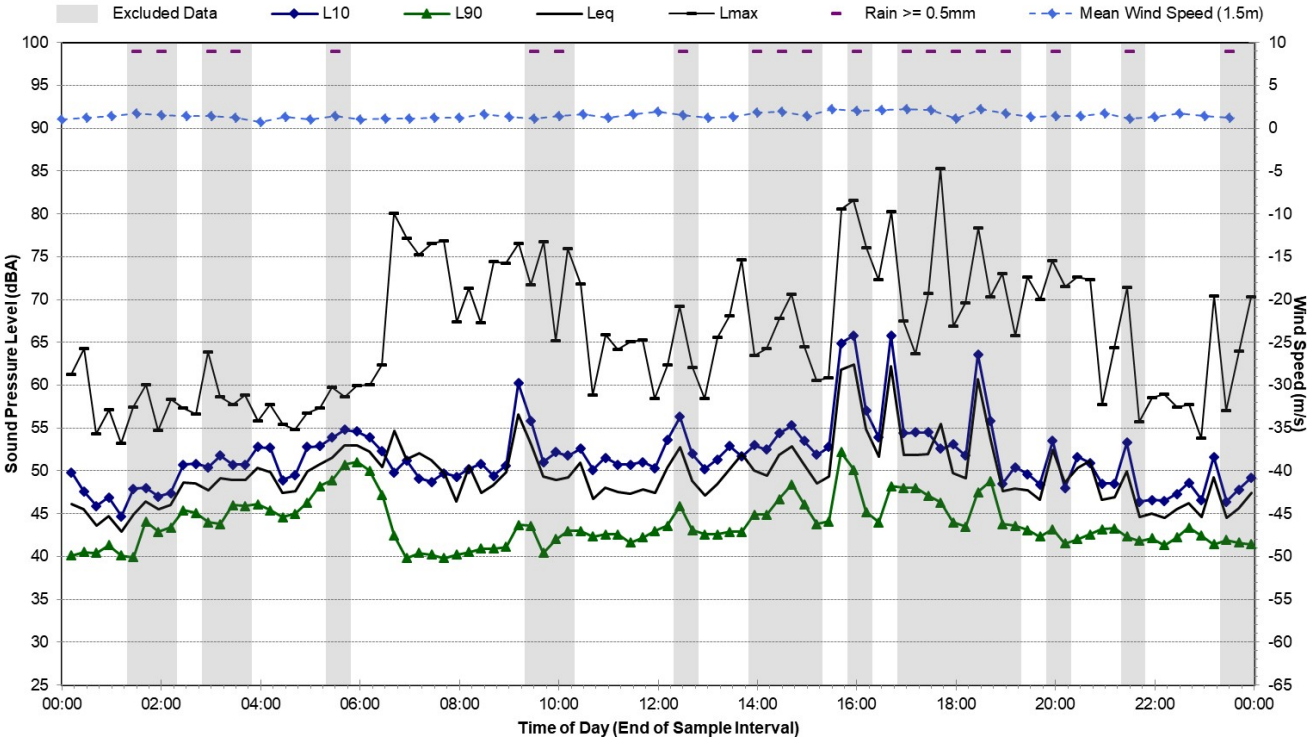
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Friday, 7 February 2020



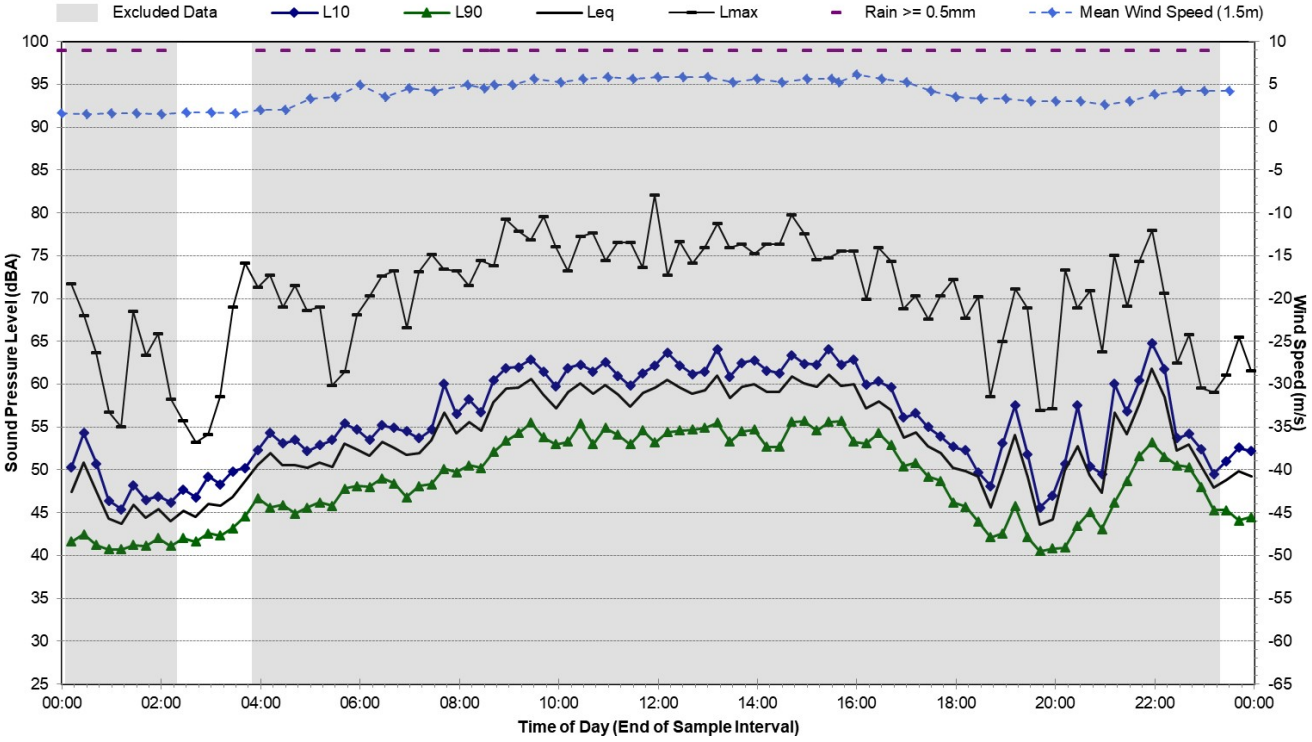
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Saturday, 8 February 2020



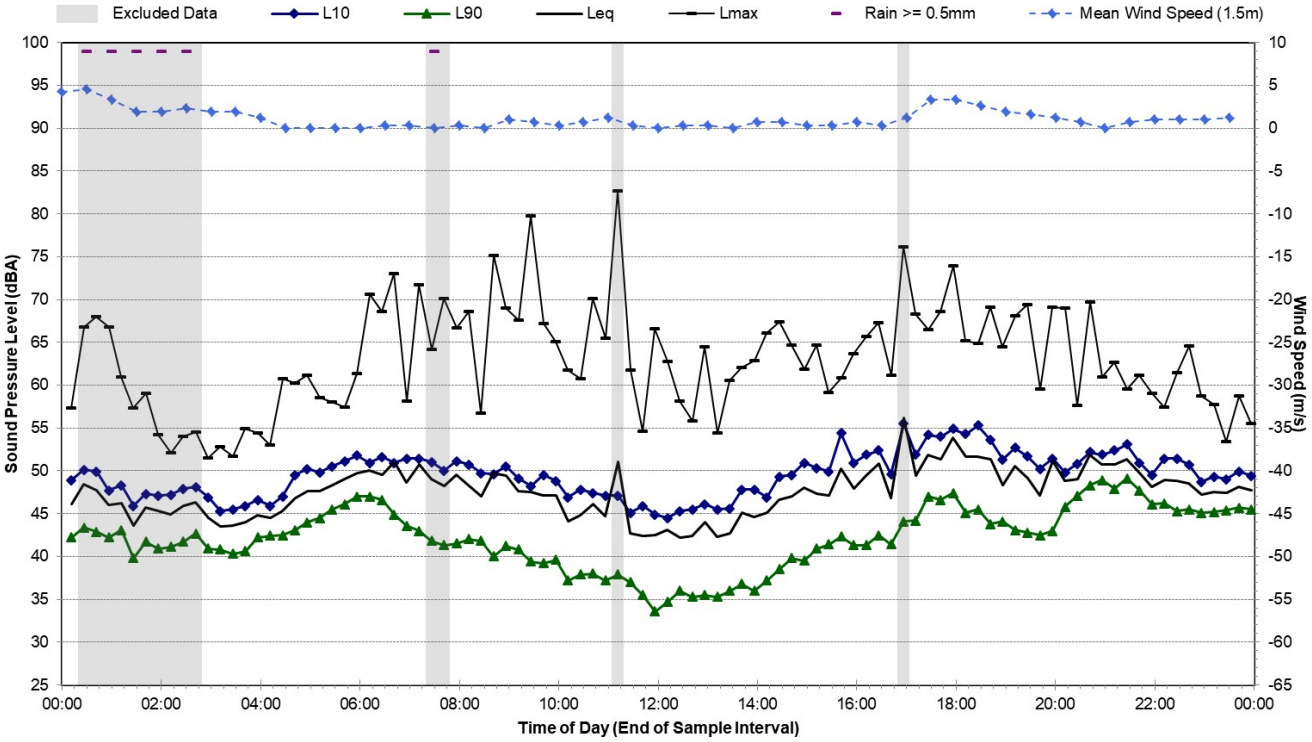
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Sunday, 9 February 2020



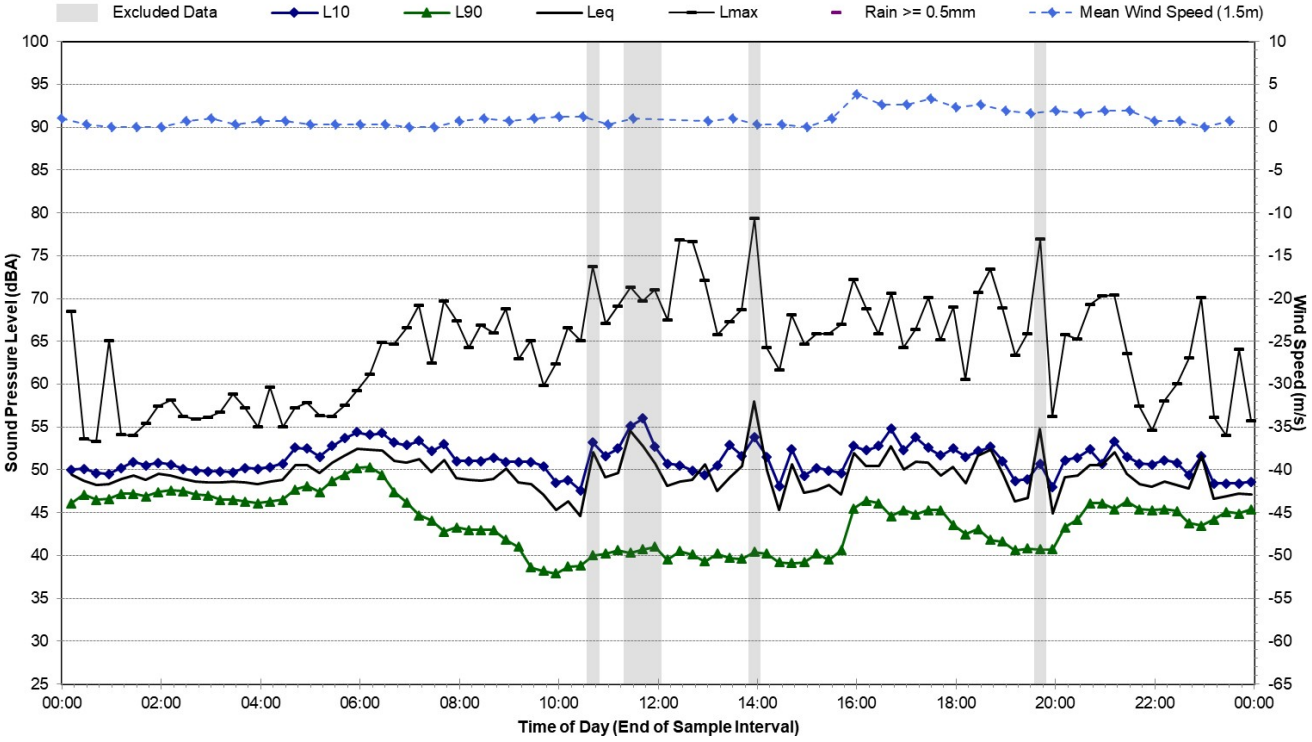
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Monday, 10 February 2020



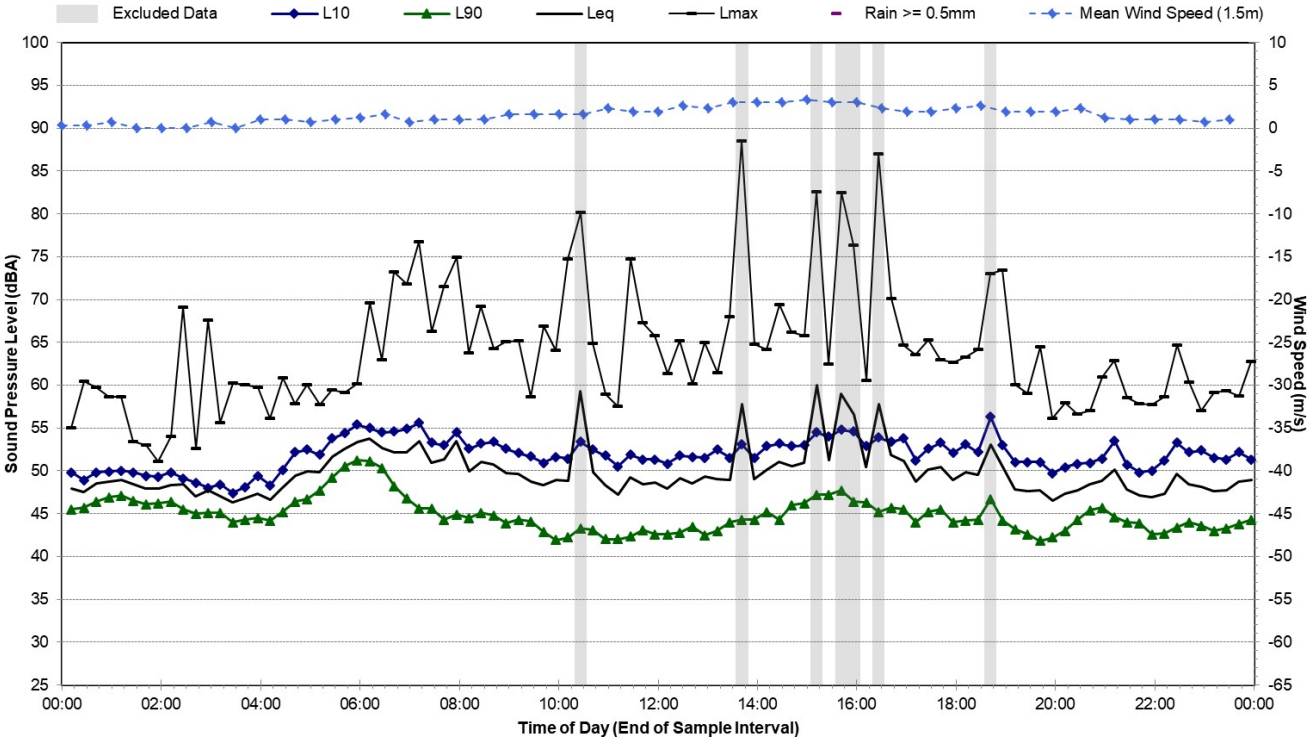
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Tuesday, 11 February 2020



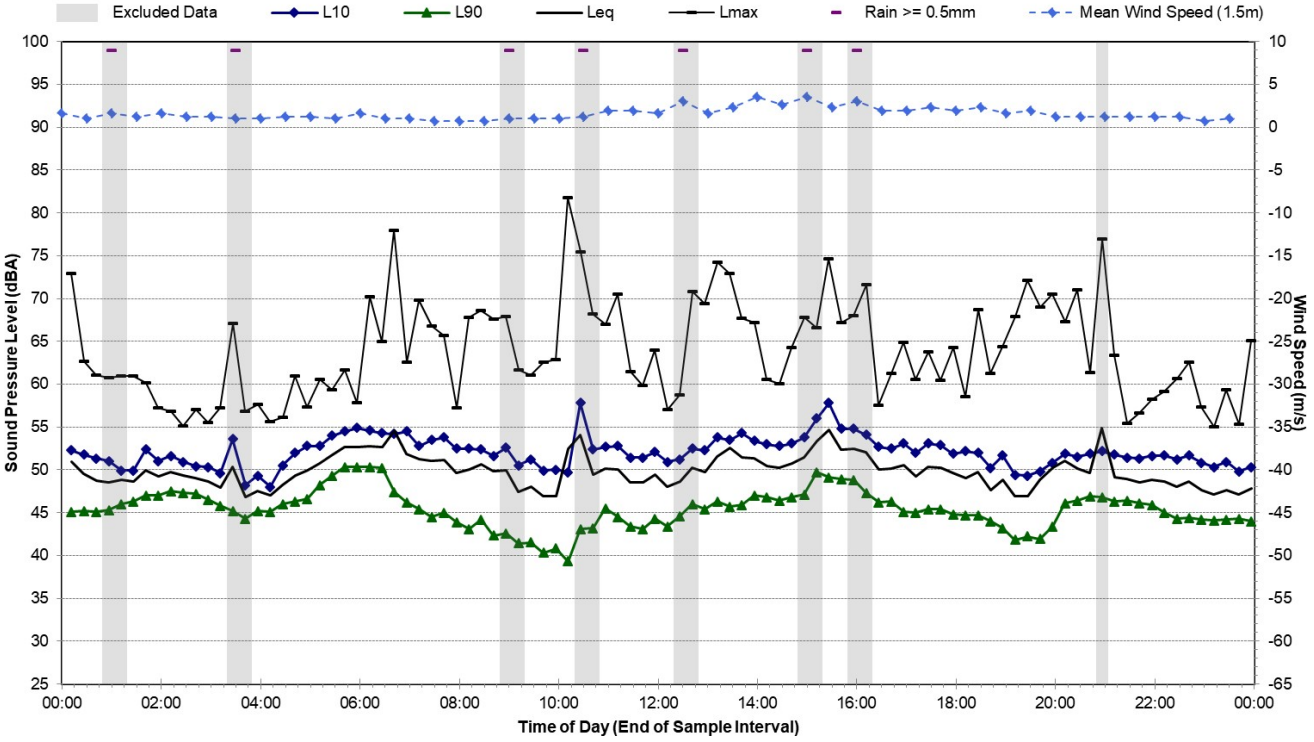
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Wednesday, 12 February 2020



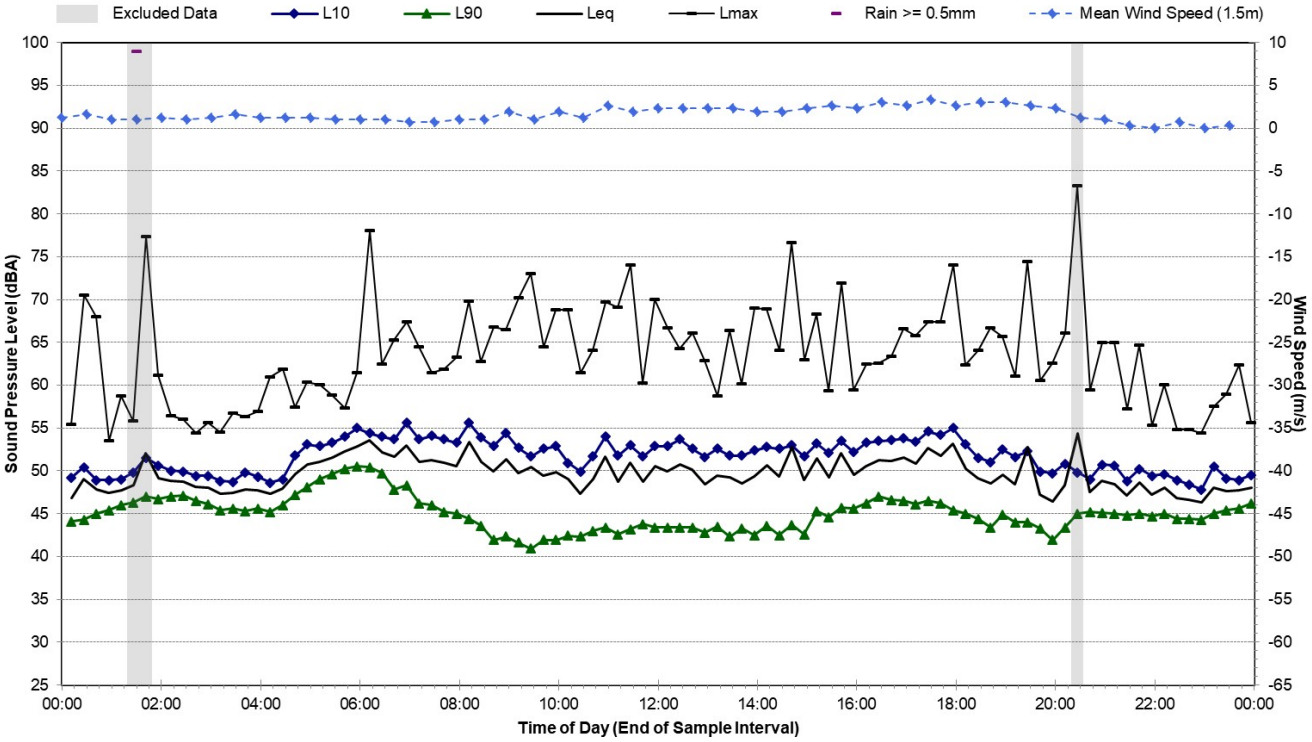
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Thursday, 13 February 2020



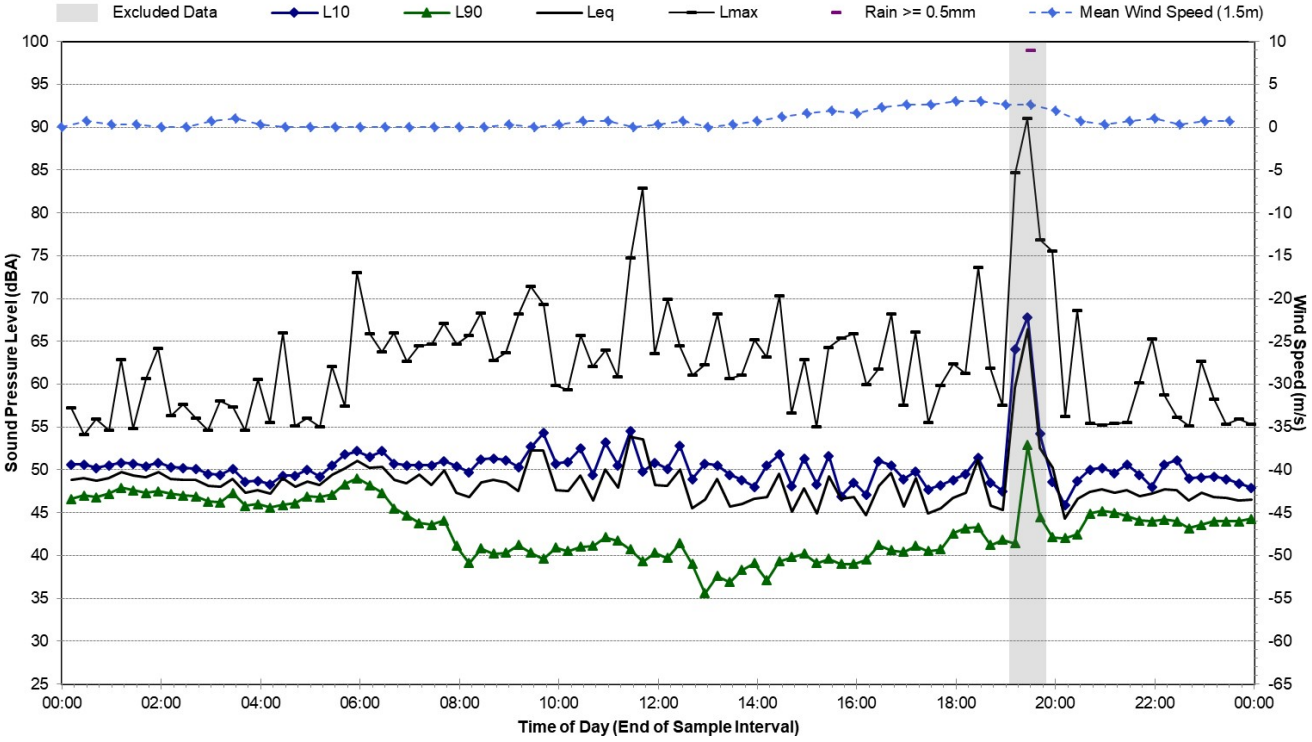
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Friday, 14 February 2020



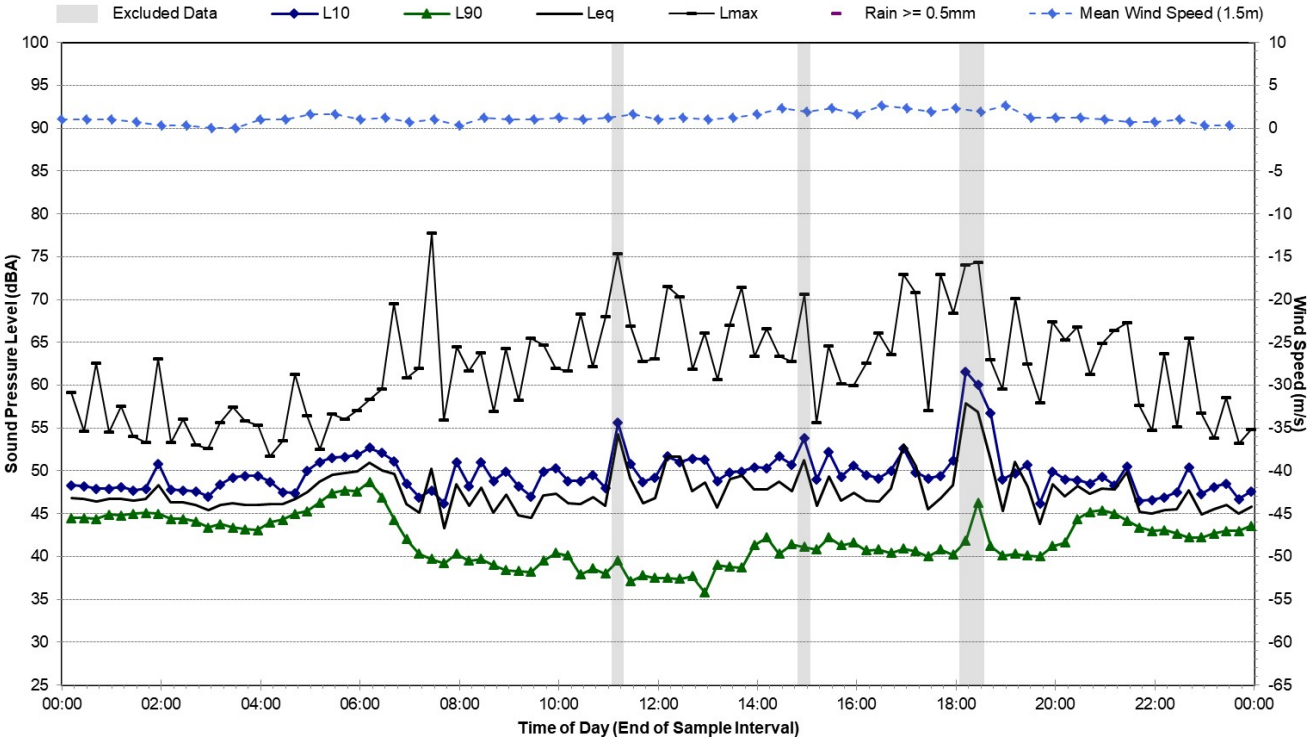
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Saturday, 15 February 2020



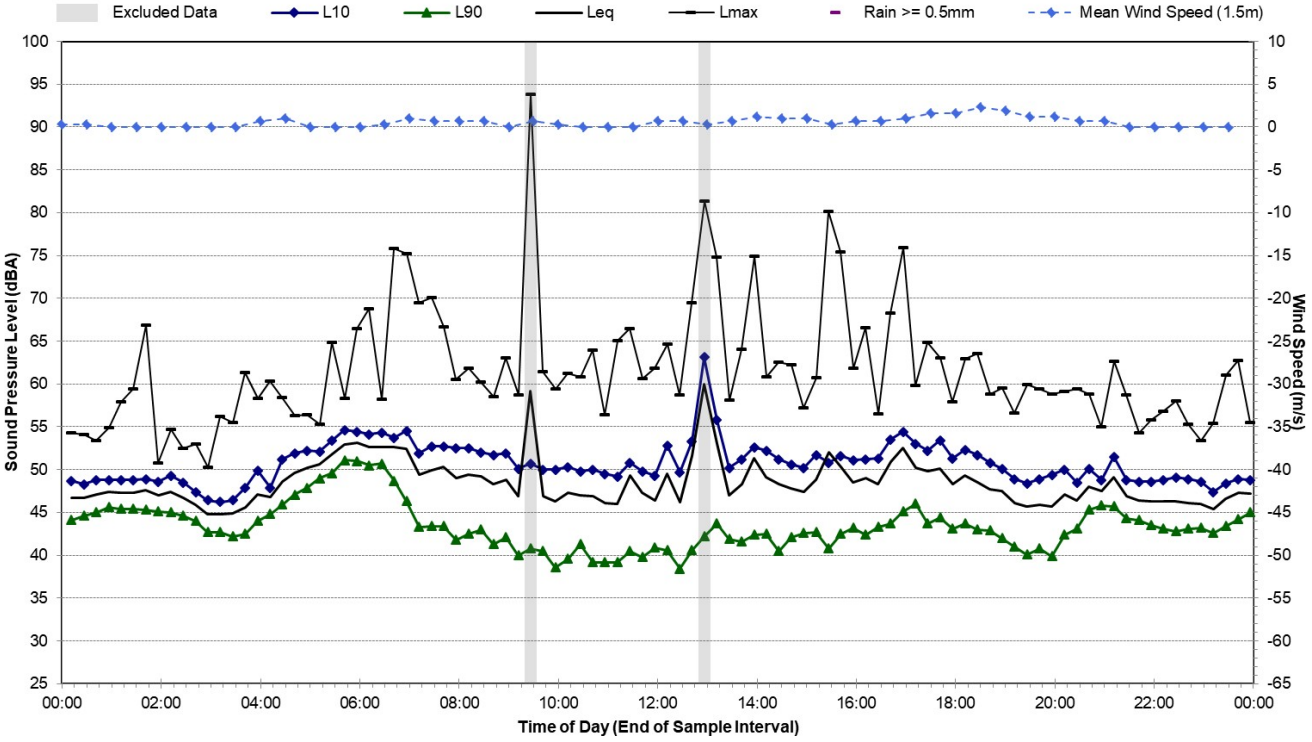
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Sunday, 16 February 2020



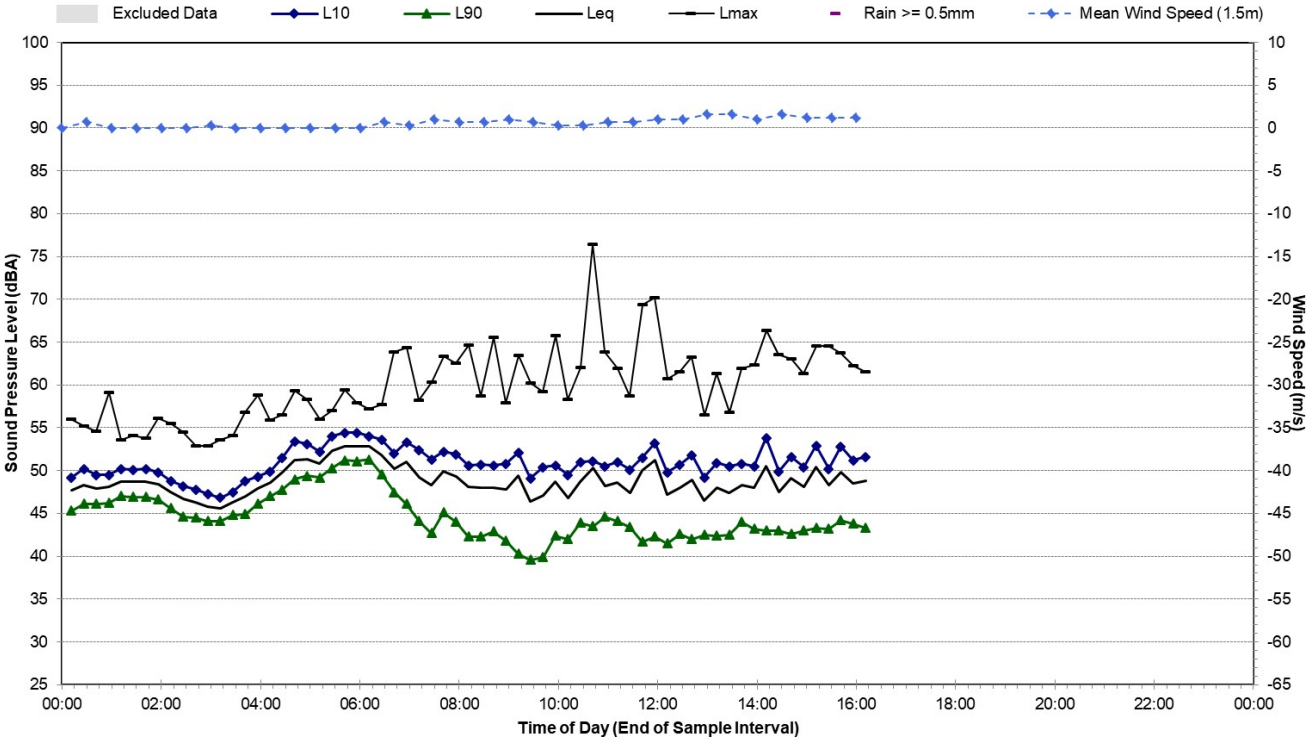
Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Monday, 17 February 2020



Statistical Ambient Noise Levels

150-151 Chandos Rd, Horsley Park - Tuesday, 18 February 2020



Noise Monitoring Location	L.02
Noise Monitoring Address	**8 Farrington Street, Minchinbury**

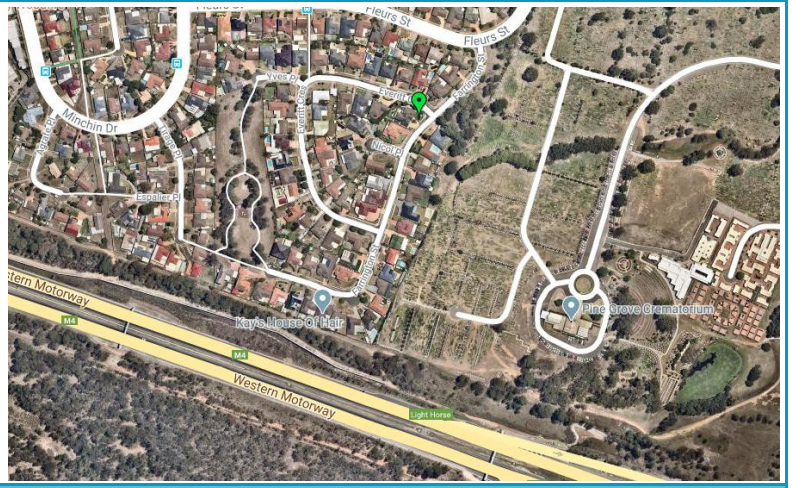
Logger Device Type: Svantek 957, Logger Serial No: 20677
Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2414604

Ambient noise logger deployed at residential address 8 Farrington St, Minchinbury. Logger located with view of Farrington St to the east and Western Motorway to the south.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Western Motorway to the south and Great Western Highway to the north. Road traffic noise from Farrington St also contributes to the noise level at this location.

Recorded Noise Levels (LAmax):
18/02/2020: Road traffic Western Motorway: 46-52 dBA, Motorcycle Great Western Hwy: 55 dBA, Birds: 49-53 dBA, Light-vehicle traffic Farrington St: 54-67 dBA, Aircraft: 52-55 dBA, Dog bark: 56 dBA, Landscaping activity: 48-51 dBA

Map of Noise Monitoring Location



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	41	55	55	65
Evening	45	57	57	66
Night-time	41	49	48	56

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	55	60
Night-time (10pm-7am)	50	55

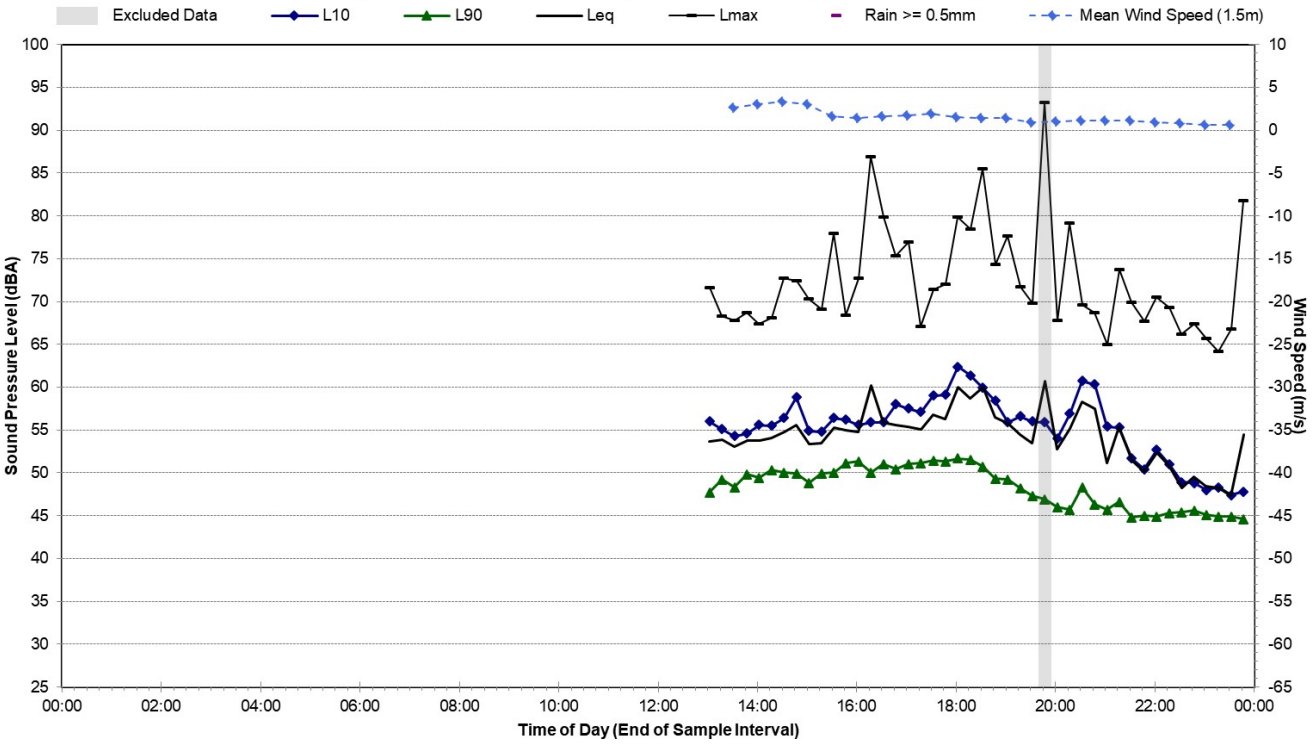
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
18/02/2020	12:05	47	51	67

Photo of Noise Monitoring Location

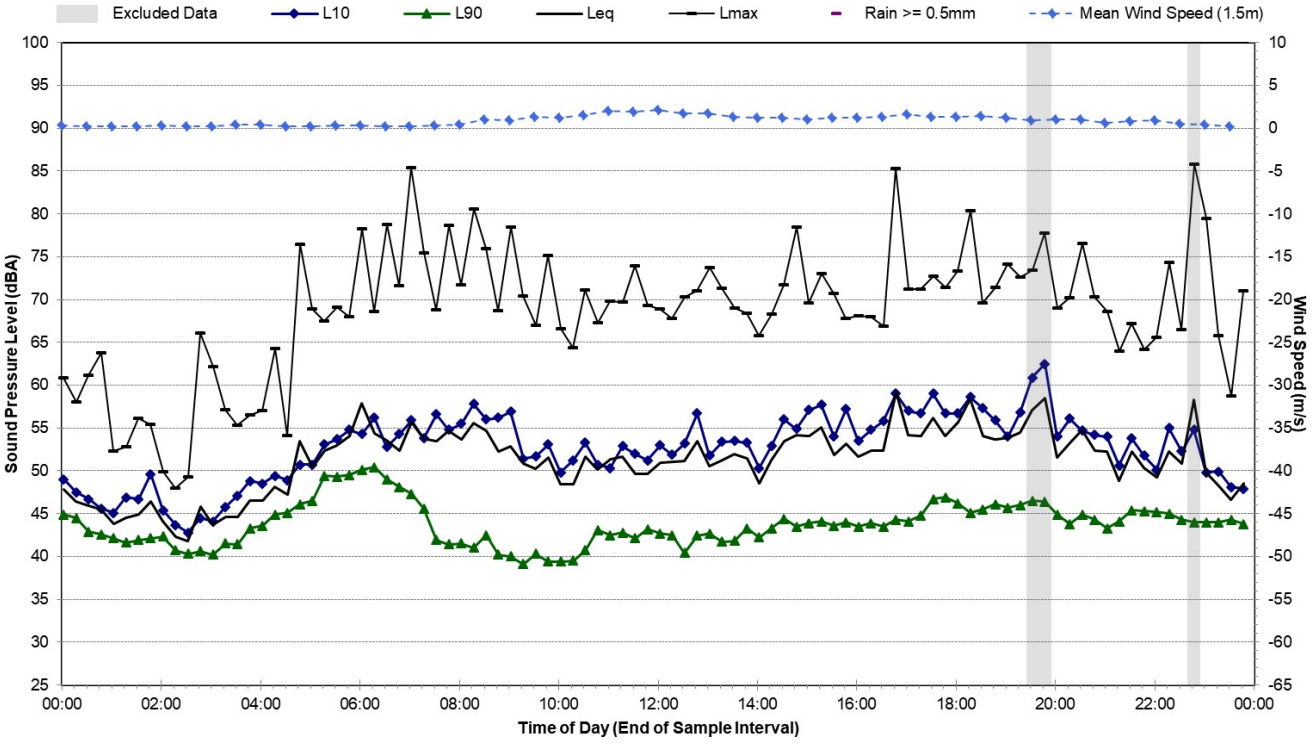
Statistical Ambient Noise Levels

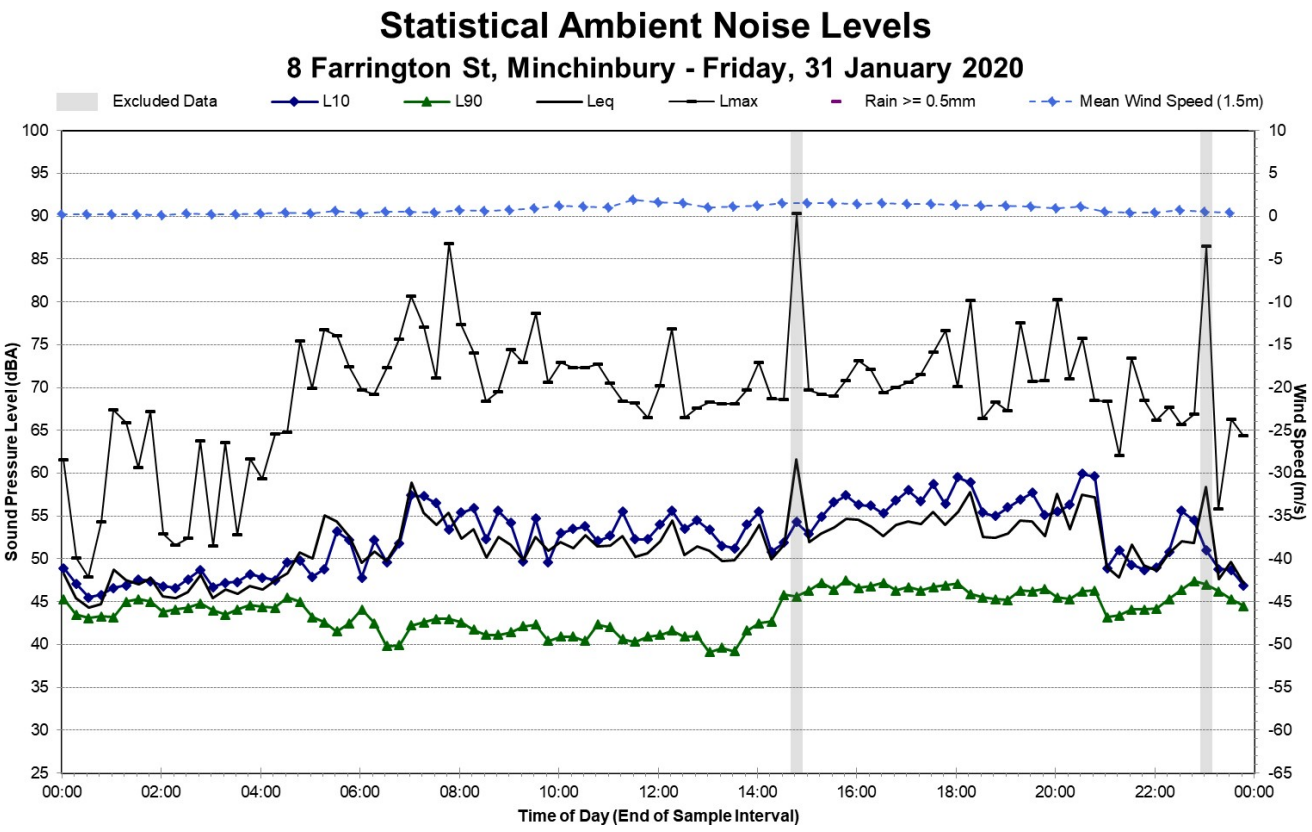
8 Farrington St, Minchinbury - Wednesday, 29 January 2020

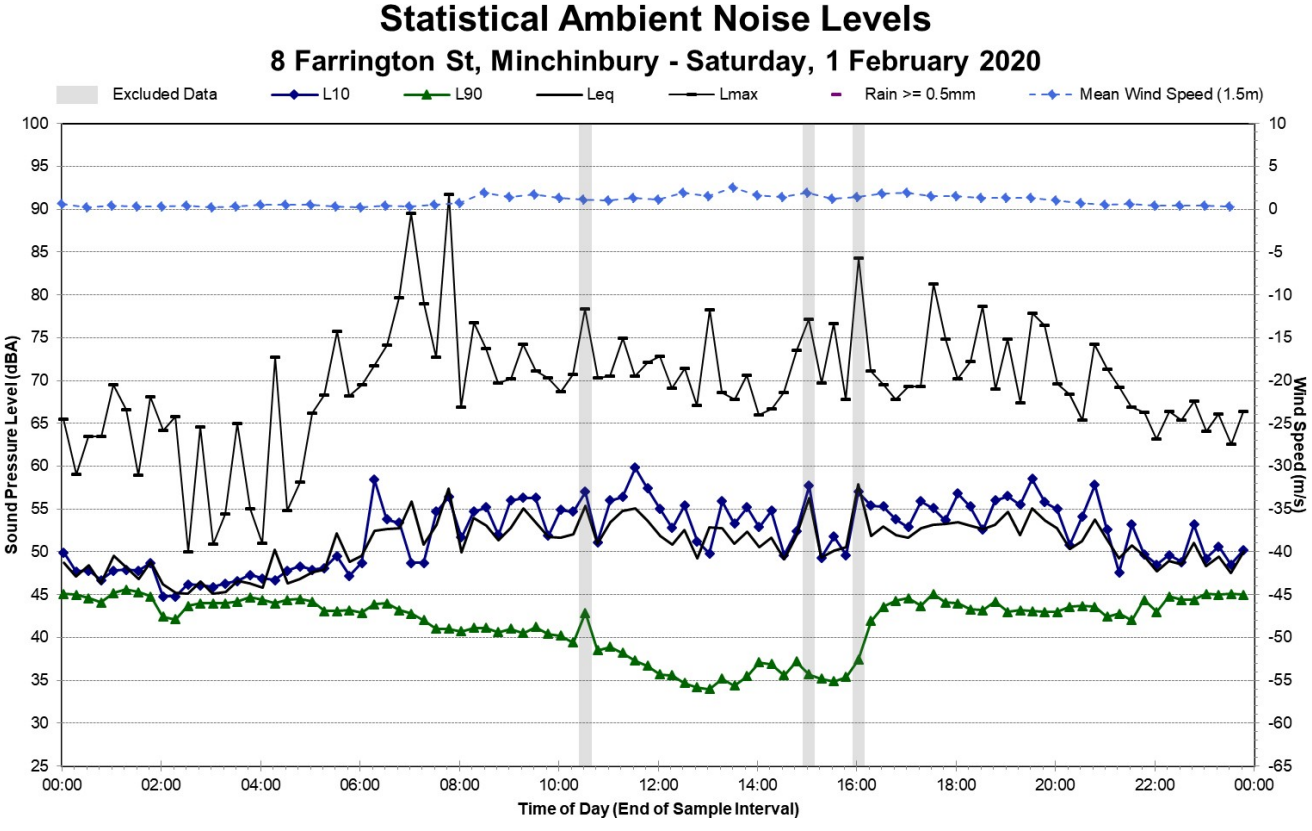


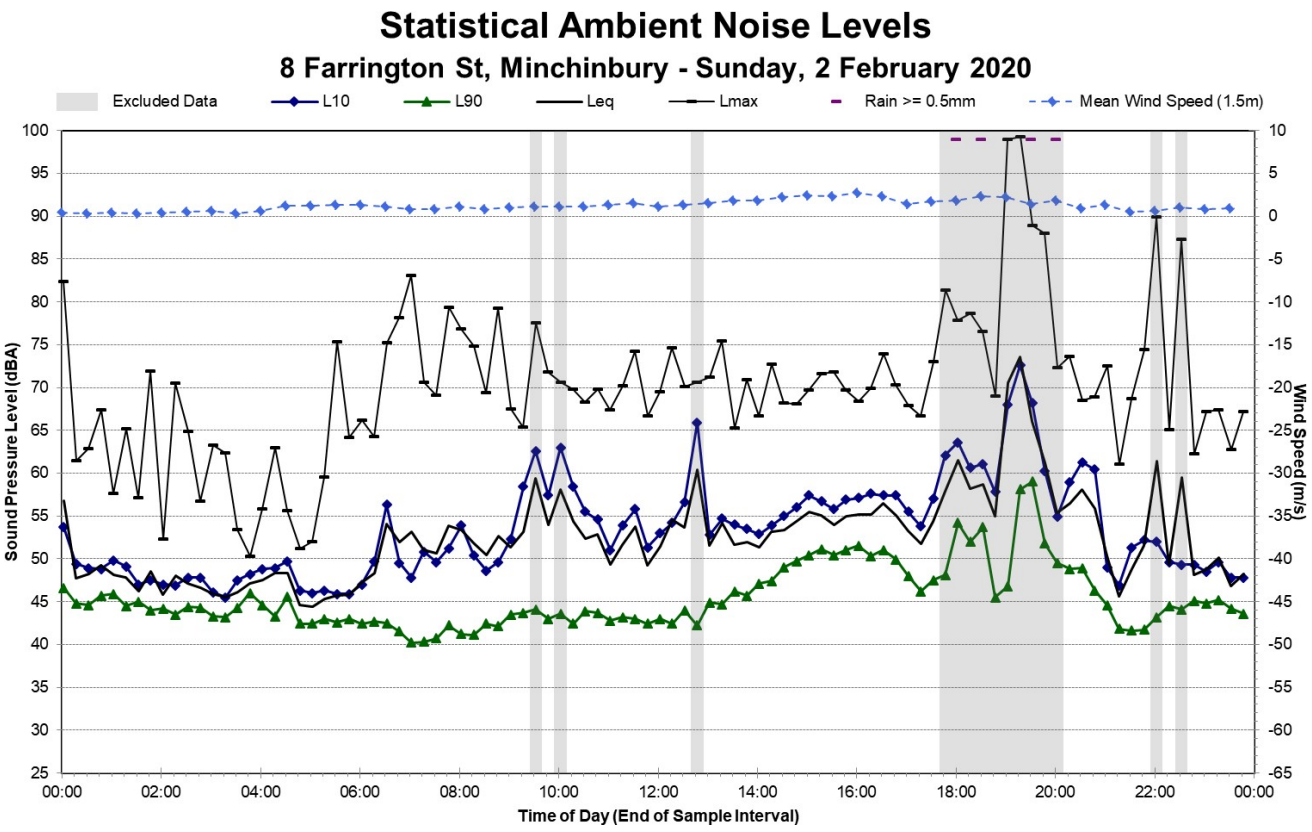
Statistical Ambient Noise Levels

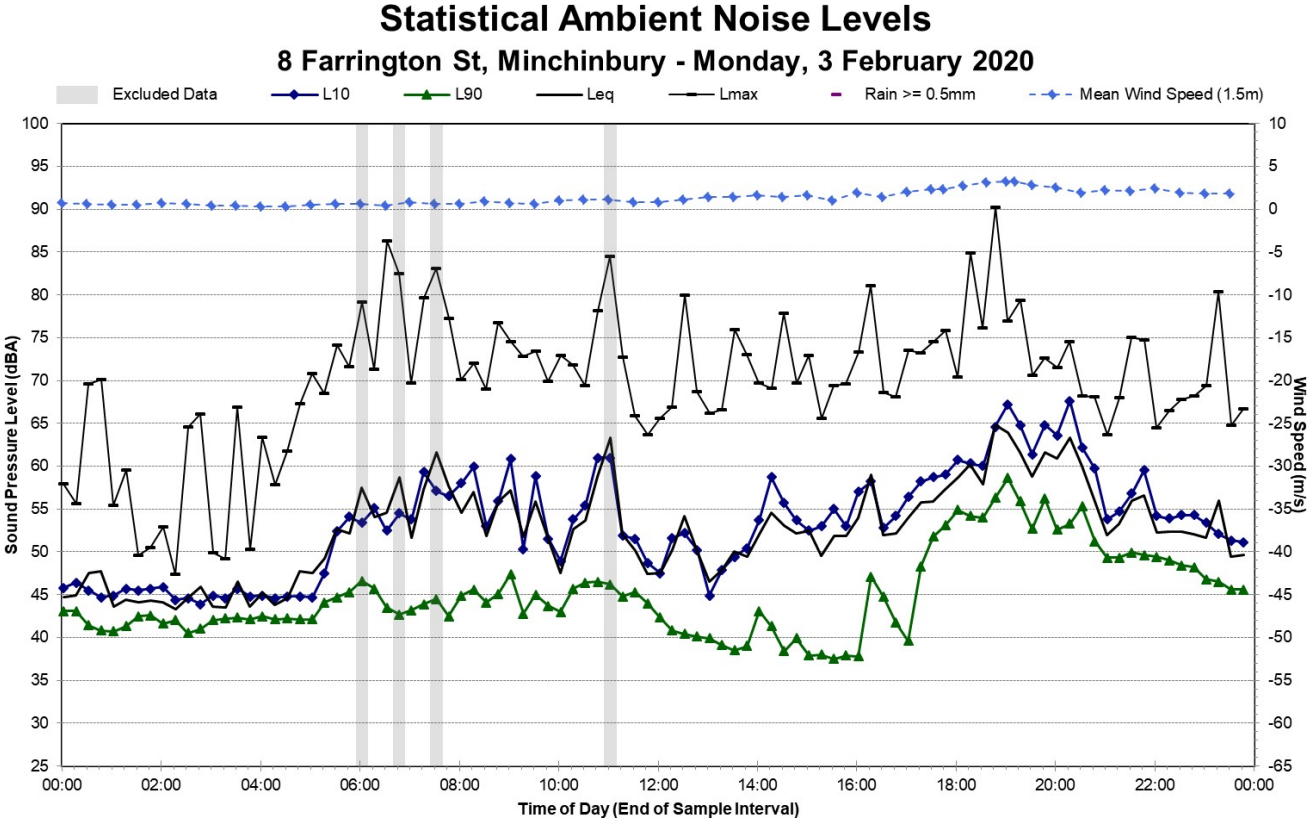
8 Farrington St, Minchinbury - Thursday, 30 January 2020




Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Friday, 31 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

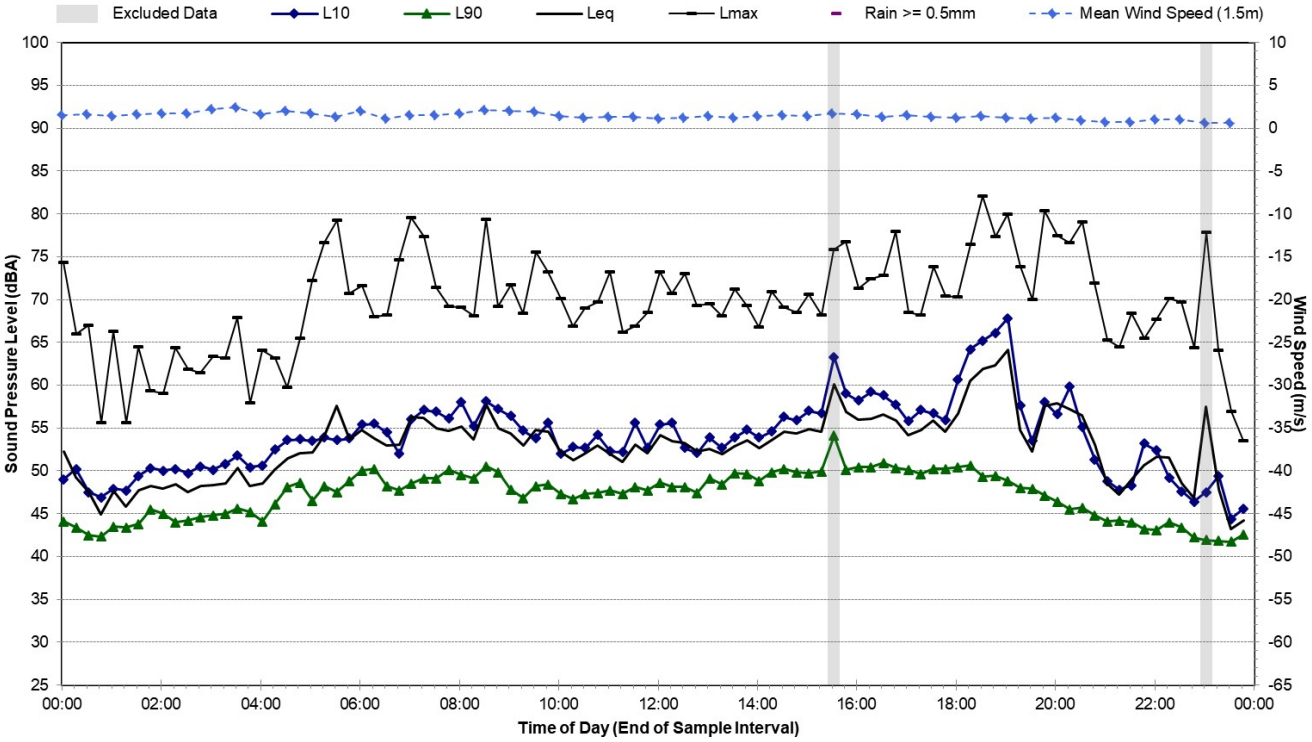

Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Saturday, 1 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Sunday, 2 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Monday, 3 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

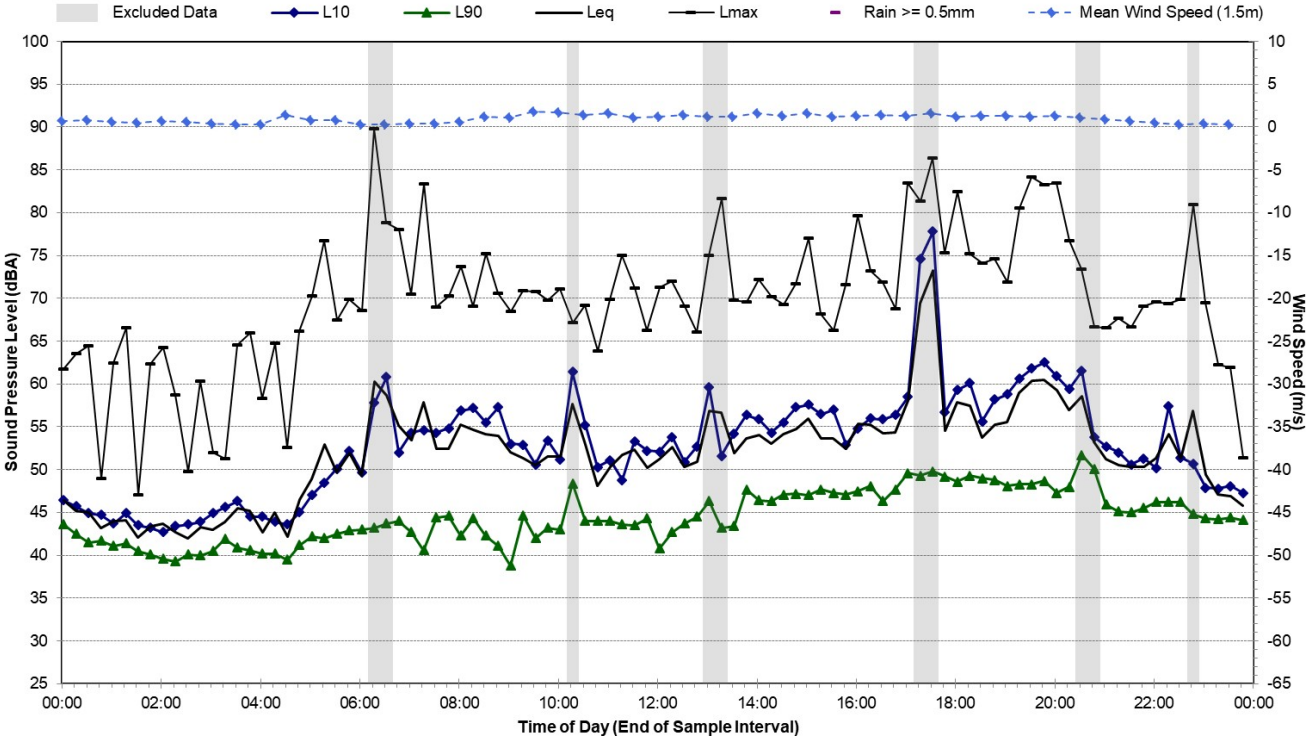
Statistical Ambient Noise Levels

8 Farrington St, Minchinbury - Tuesday, 4 February 2020



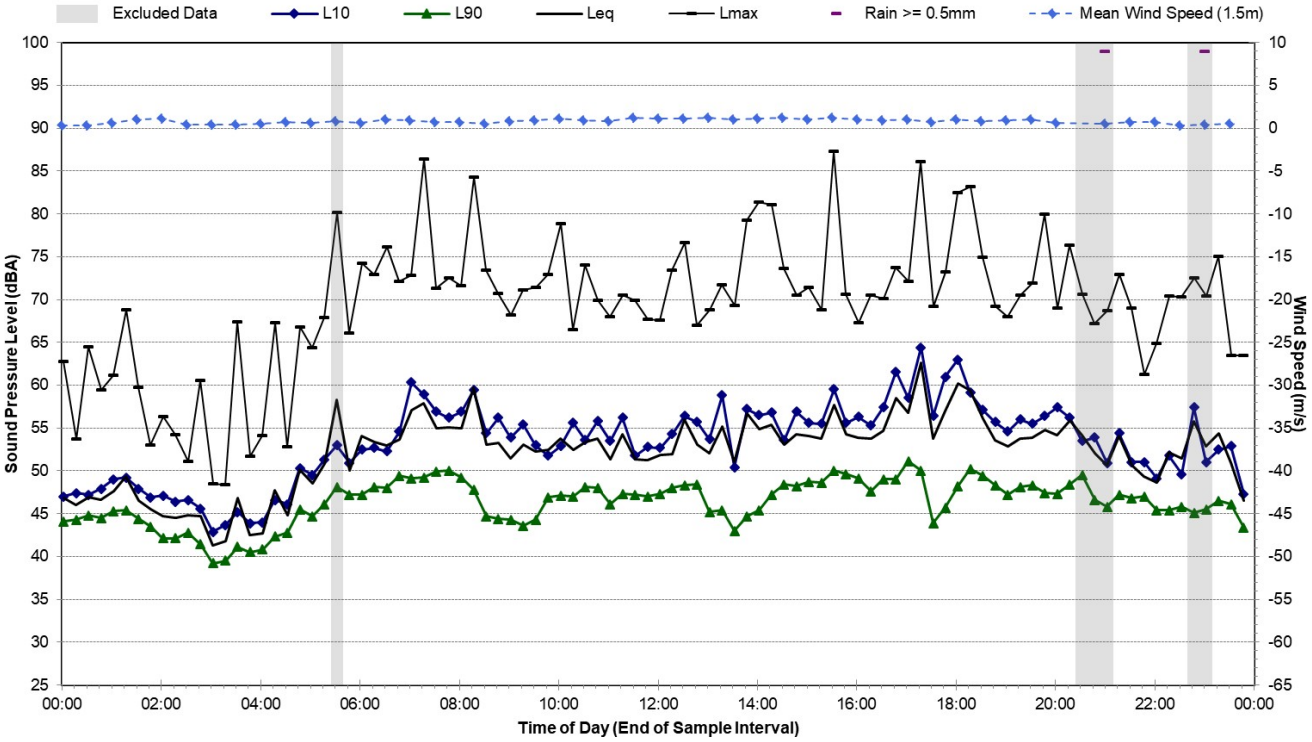
Statistical Ambient Noise Levels

8 Farrington St, Minchinbury - Wednesday, 5 February 2020



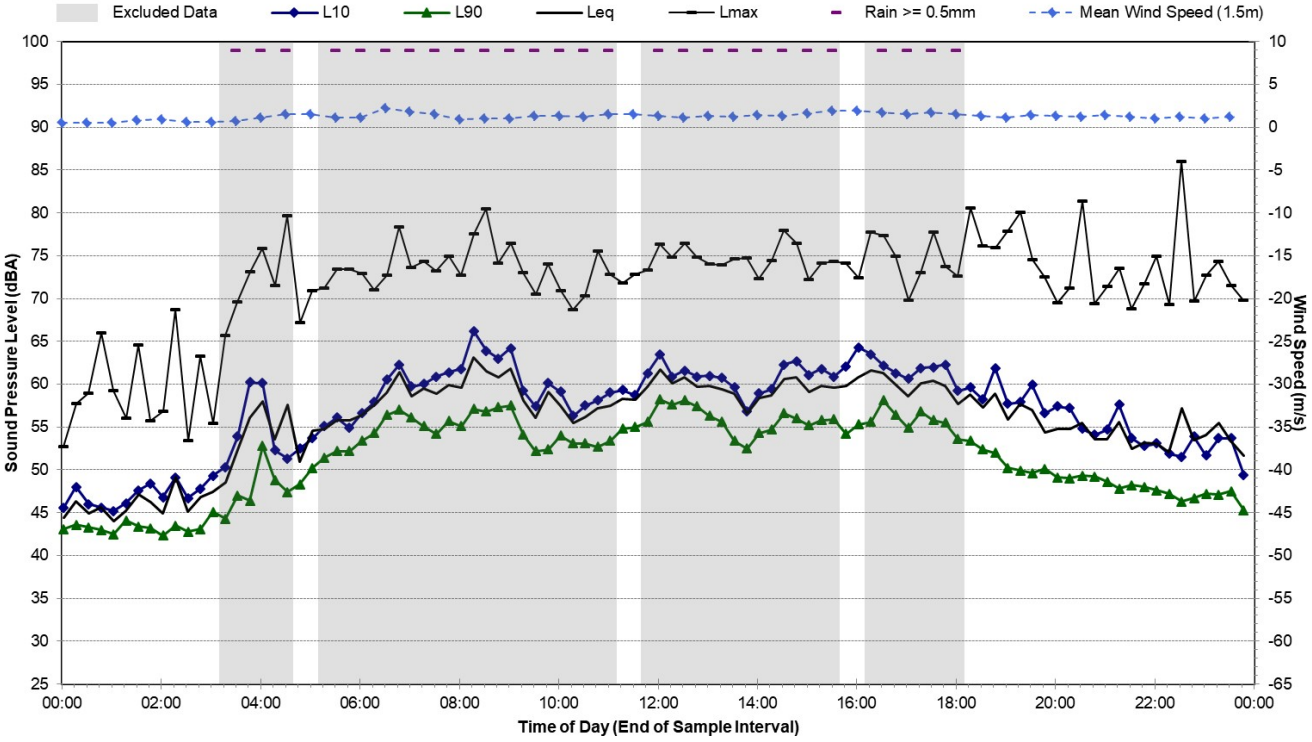
Statistical Ambient Noise Levels

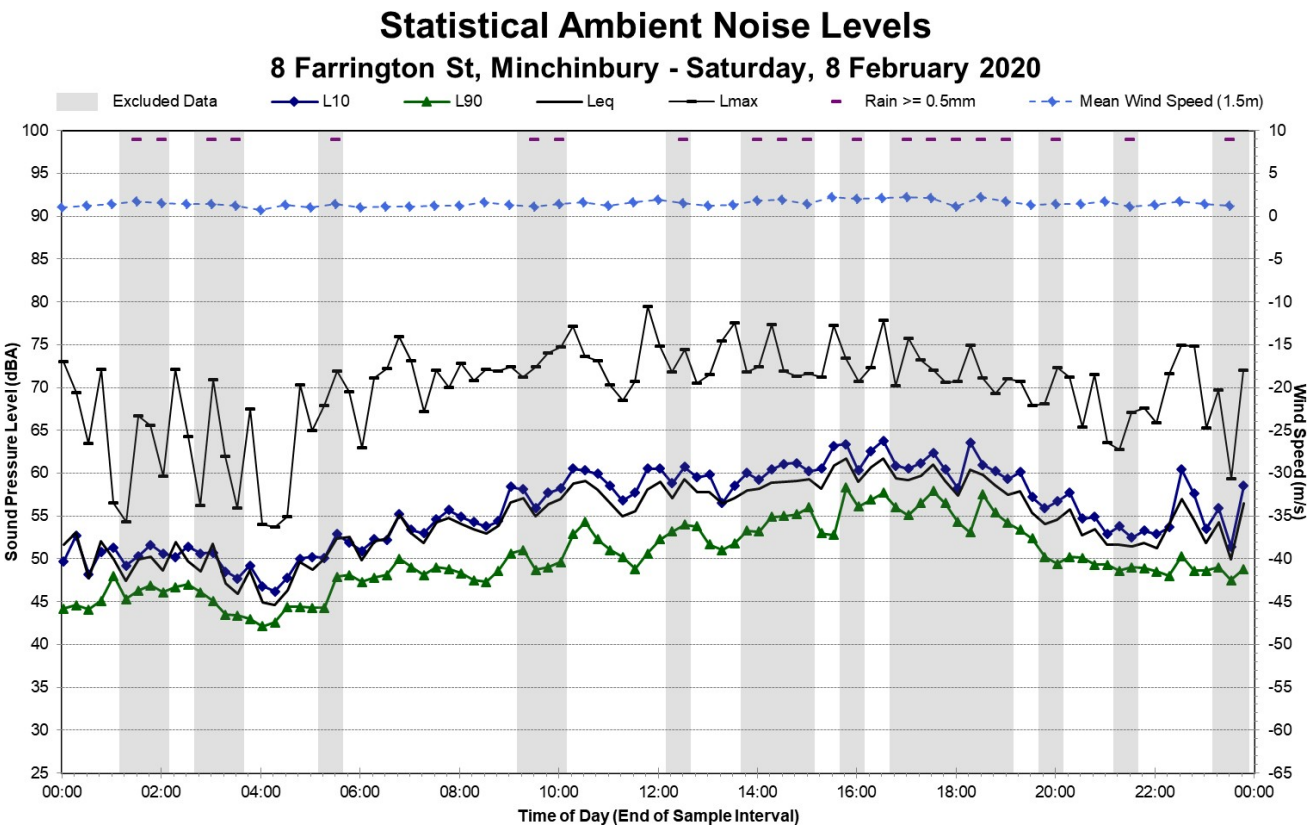
8 Farrington St, Minchinbury - Thursday, 6 February 2020

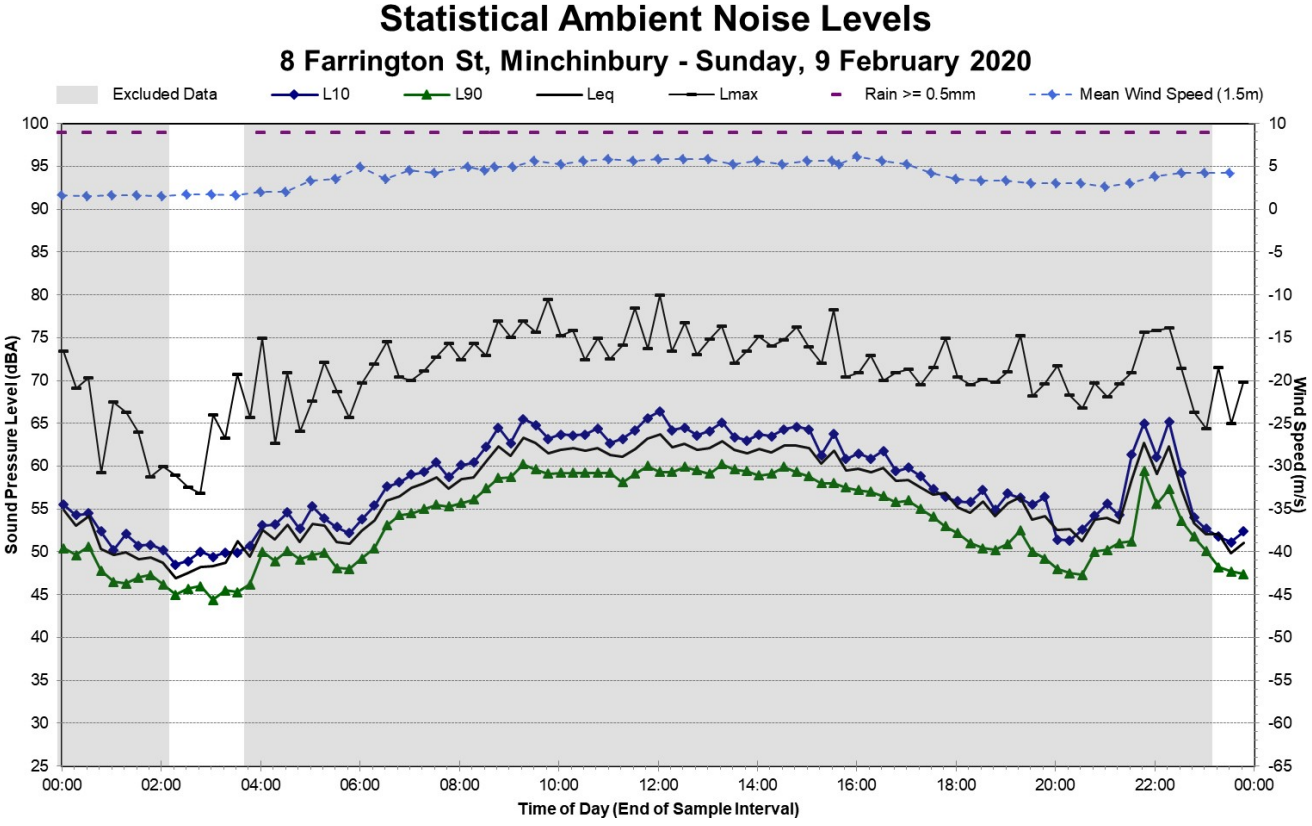


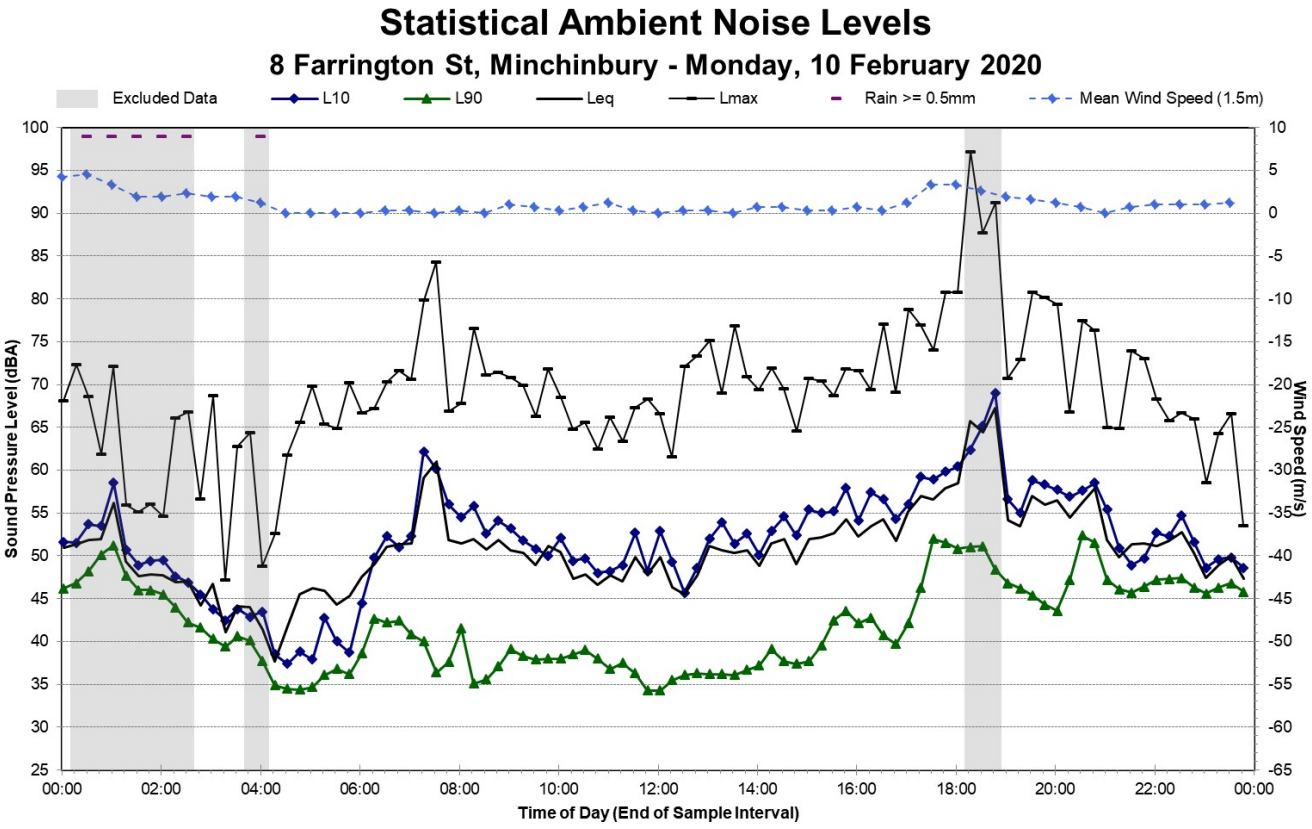
Statistical Ambient Noise Levels

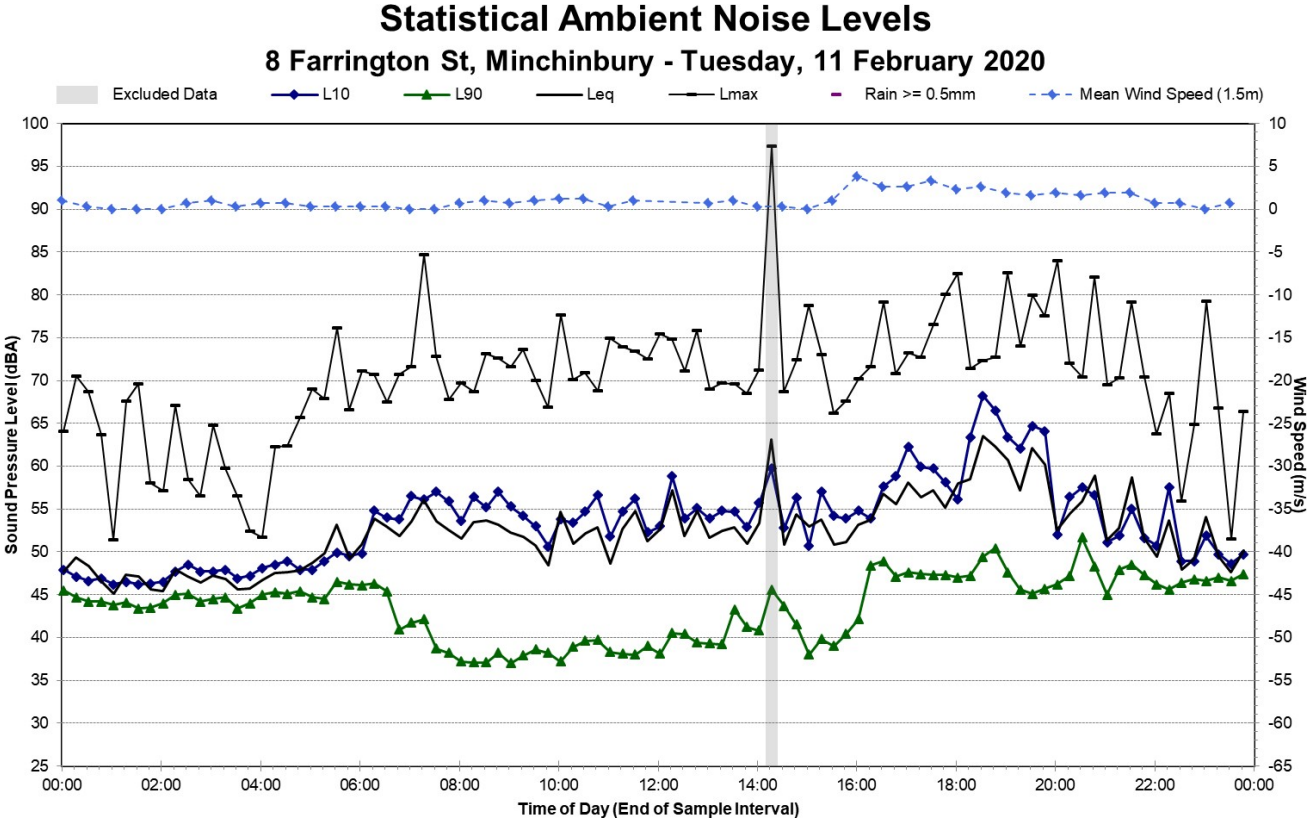
8 Farrington St, Minchinbury - Friday, 7 February 2020




Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Saturday, 8 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

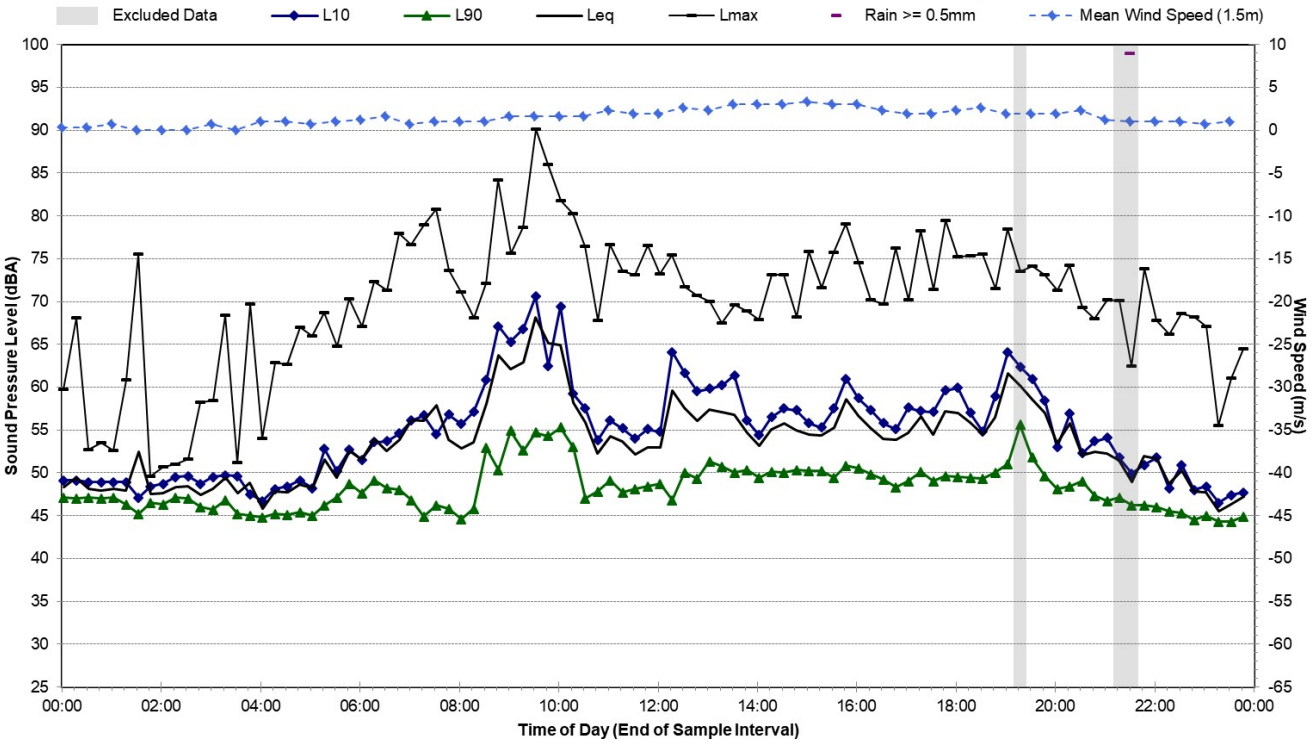

Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Sunday, 9 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Monday, 10 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Tuesday, 11 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

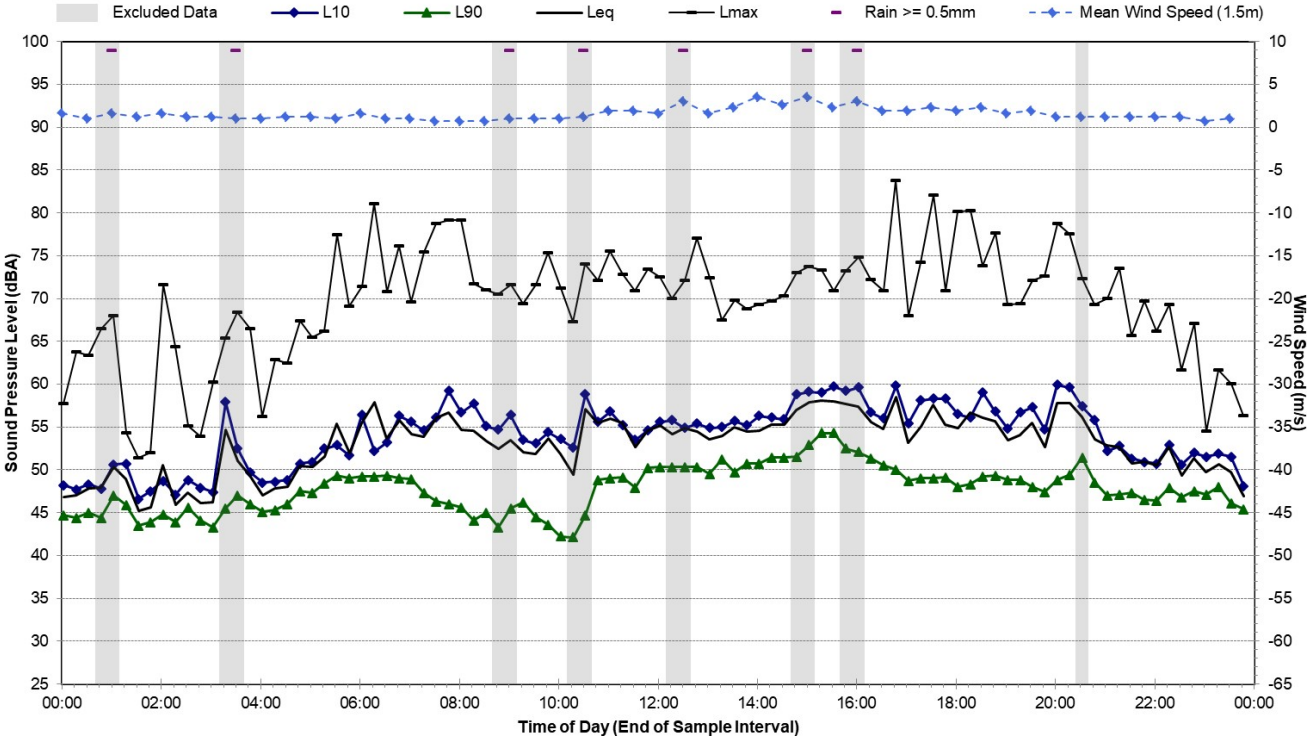
Statistical Ambient Noise Levels

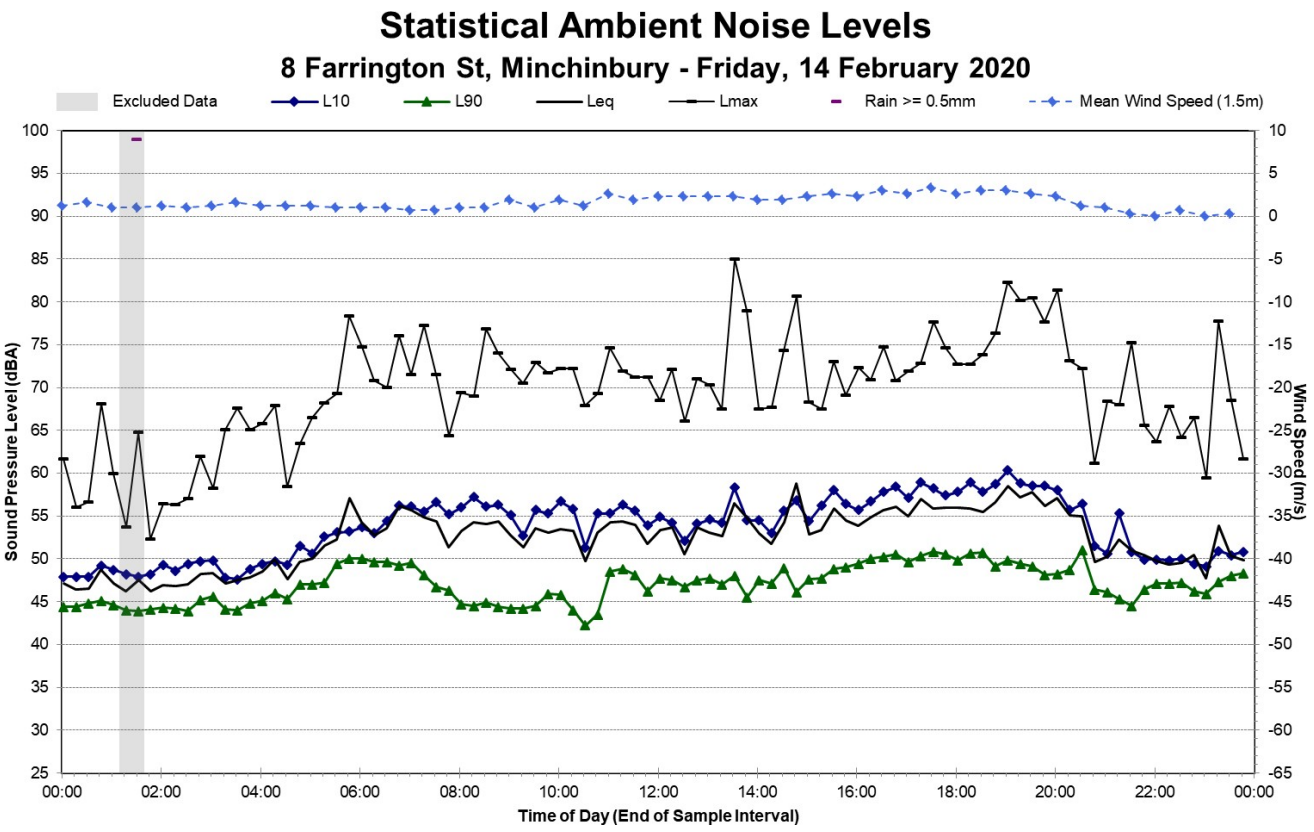
8 Farrington St, Minchinbury - Wednesday, 12 February 2020

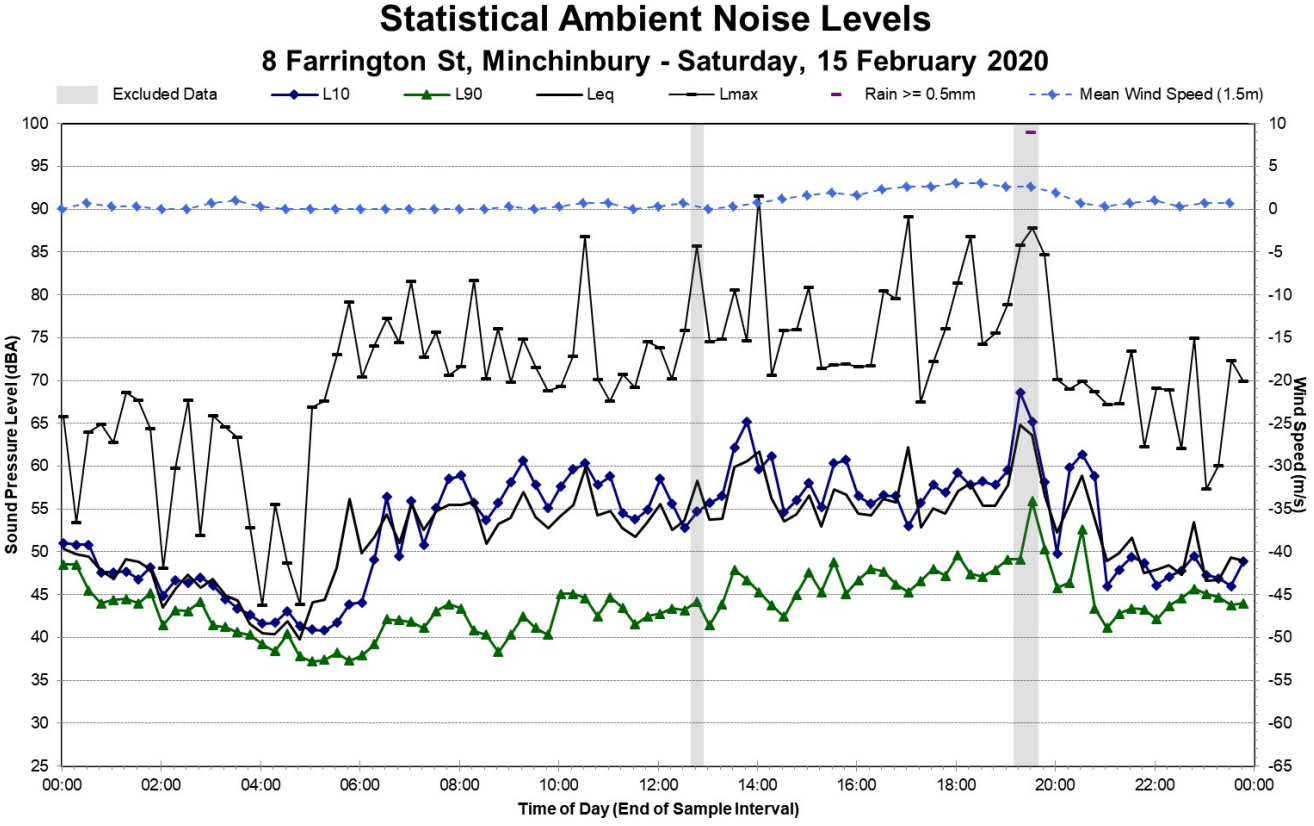


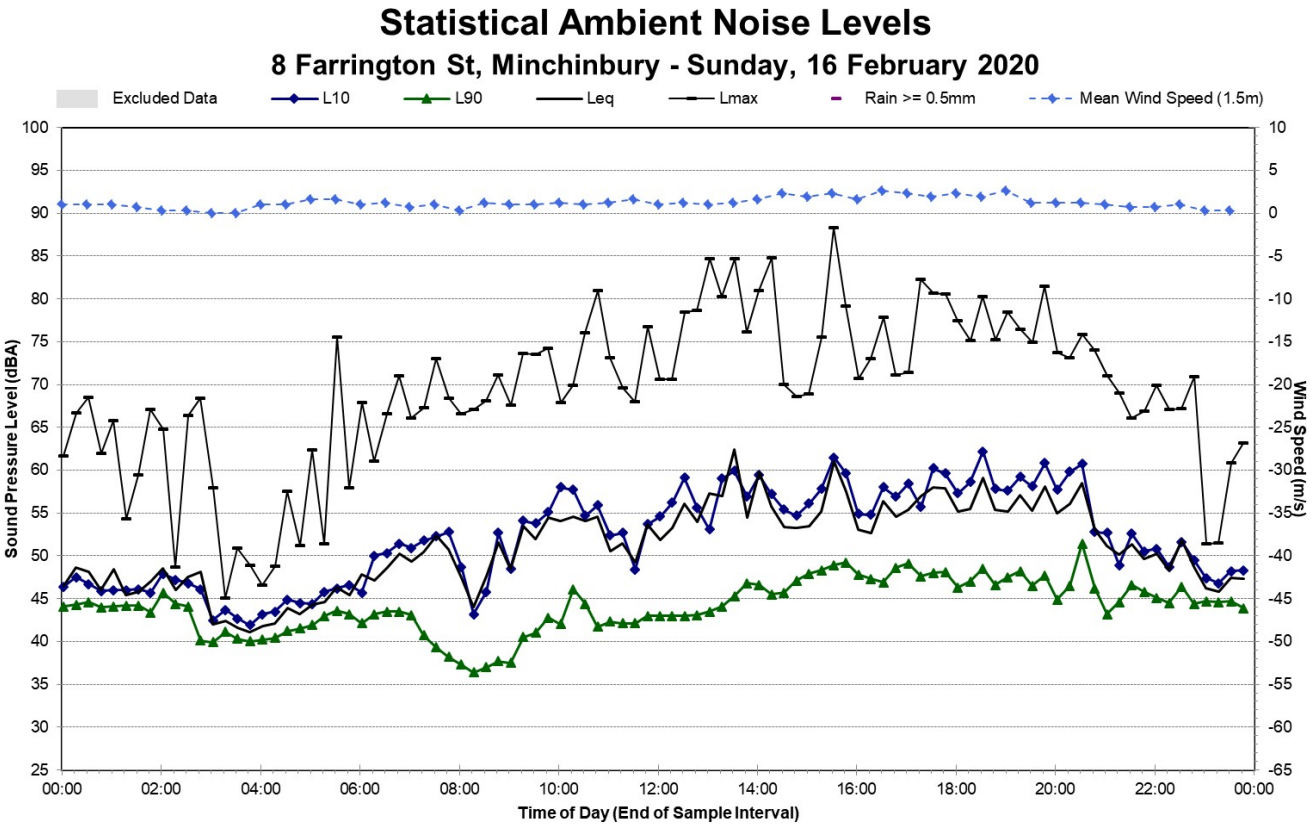
Statistical Ambient Noise Levels

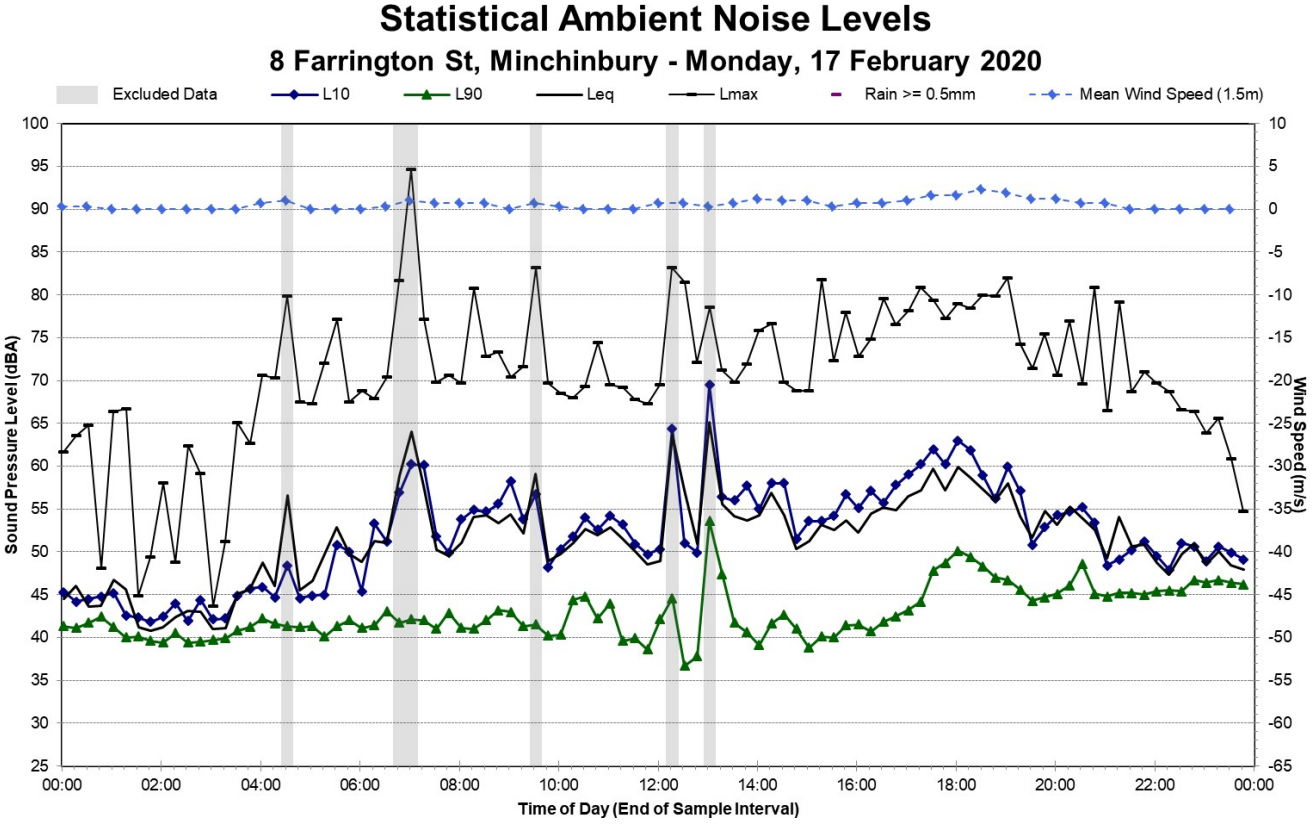
8 Farrington St, Minchinbury - Thursday, 13 February 2020

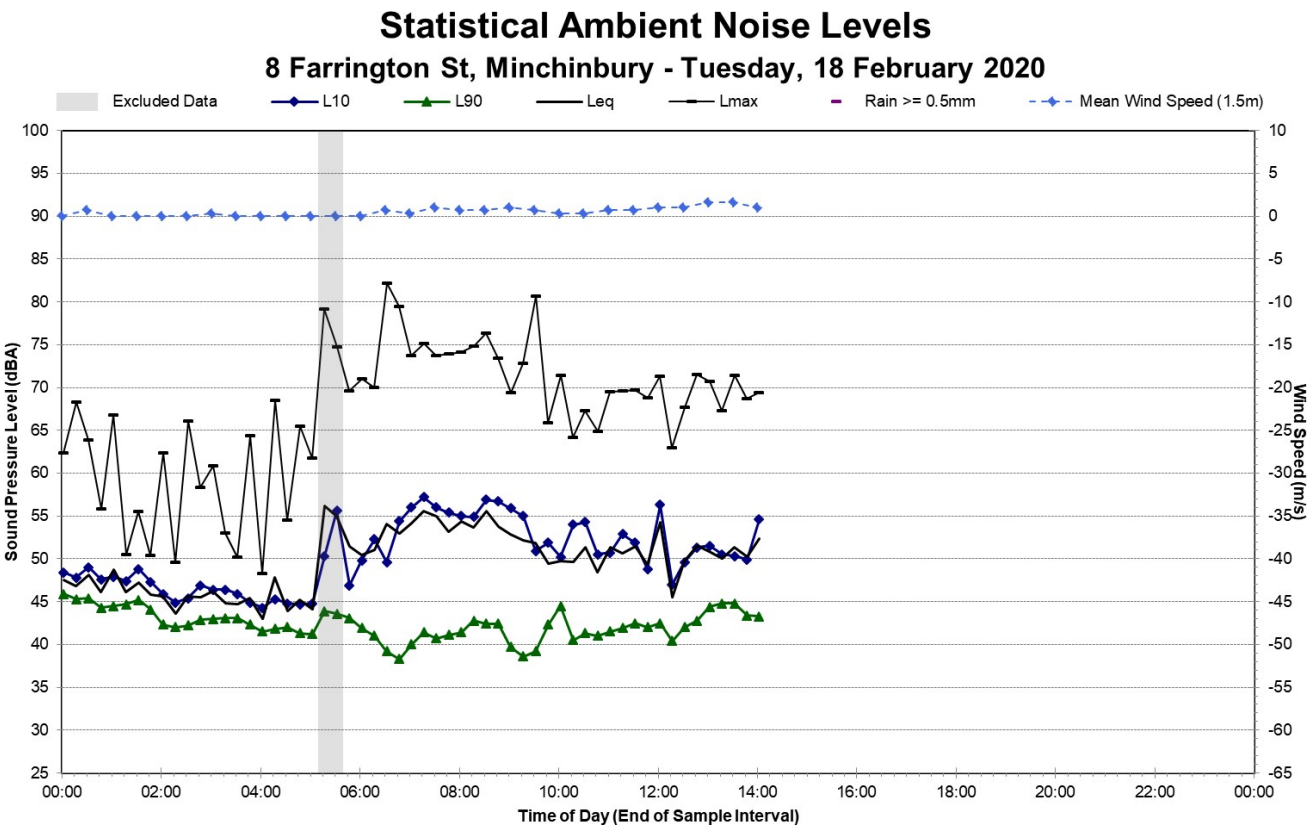



Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Friday, 14 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Saturday, 15 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Sunday, 16 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Monday, 17 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
8 Farrington St, Minchinbury - Tuesday, 18 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

Noise Monitoring Location	L.03
Noise Monitoring Address	**94 Ollier Crescent, Prospect**

Logger Device Type: Svantek 957, Logger Serial No: 23815
Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2414604

Ambient noise logger deployed at residential address 94 Ollier Crescent, Prospect. Logger located with view of Great Western Highway to the south and Ollier Crescent to the east.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Great Western Highway to the south and Ollier Crescent to the east. Road traffic noise from Flushcombe Rd and aircraft flyovers also contribute to the noise level at this location.

Recorded Noise Levels (LAmax):
18/02/2020: Light-vehicle traffic Ollier Cres: 56-72 dBA, Road traffic Great Western Hwy: 50-54 dBA, Birds: 54-68 dBA, Aircraft: 52-60 dBA, Dog bark: 56 dBA, Motorcycle: 80 dBA

Map of Noise Monitoring Location

Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	43	54	56	62
Evening	43	54	54	60
Night-time	38	49	48	54

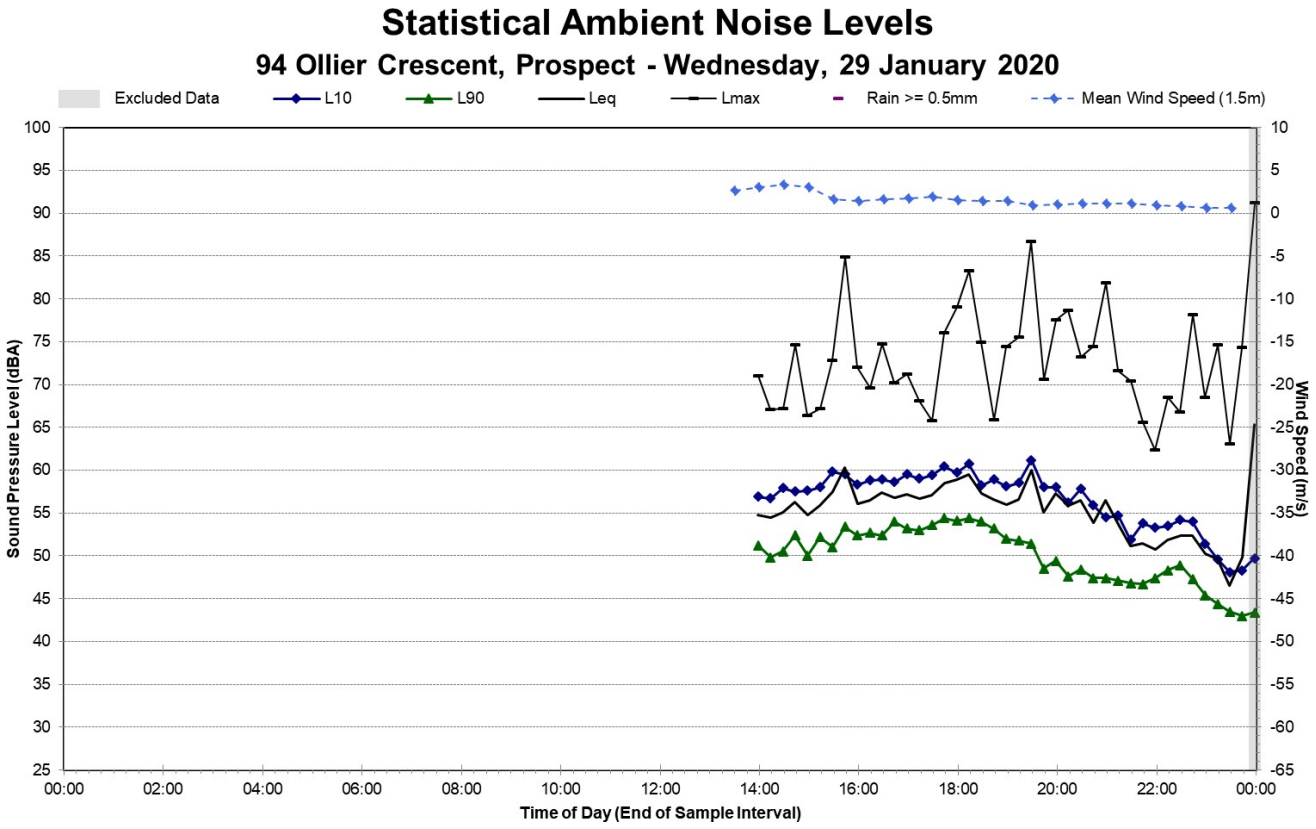
Ambient Noise Logging Results – RNP Defined Time Periods

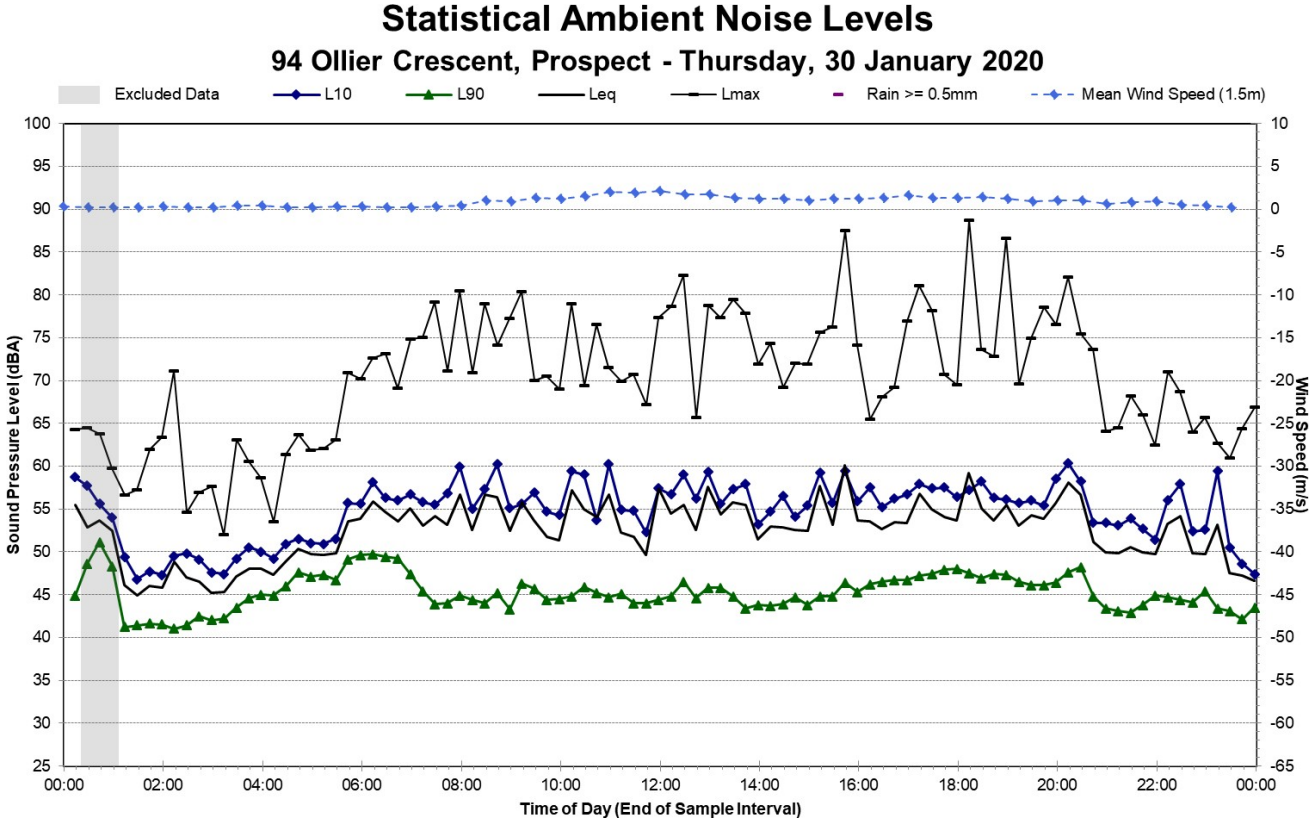
Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	55	61
Night-time (10pm-7am)	49	56

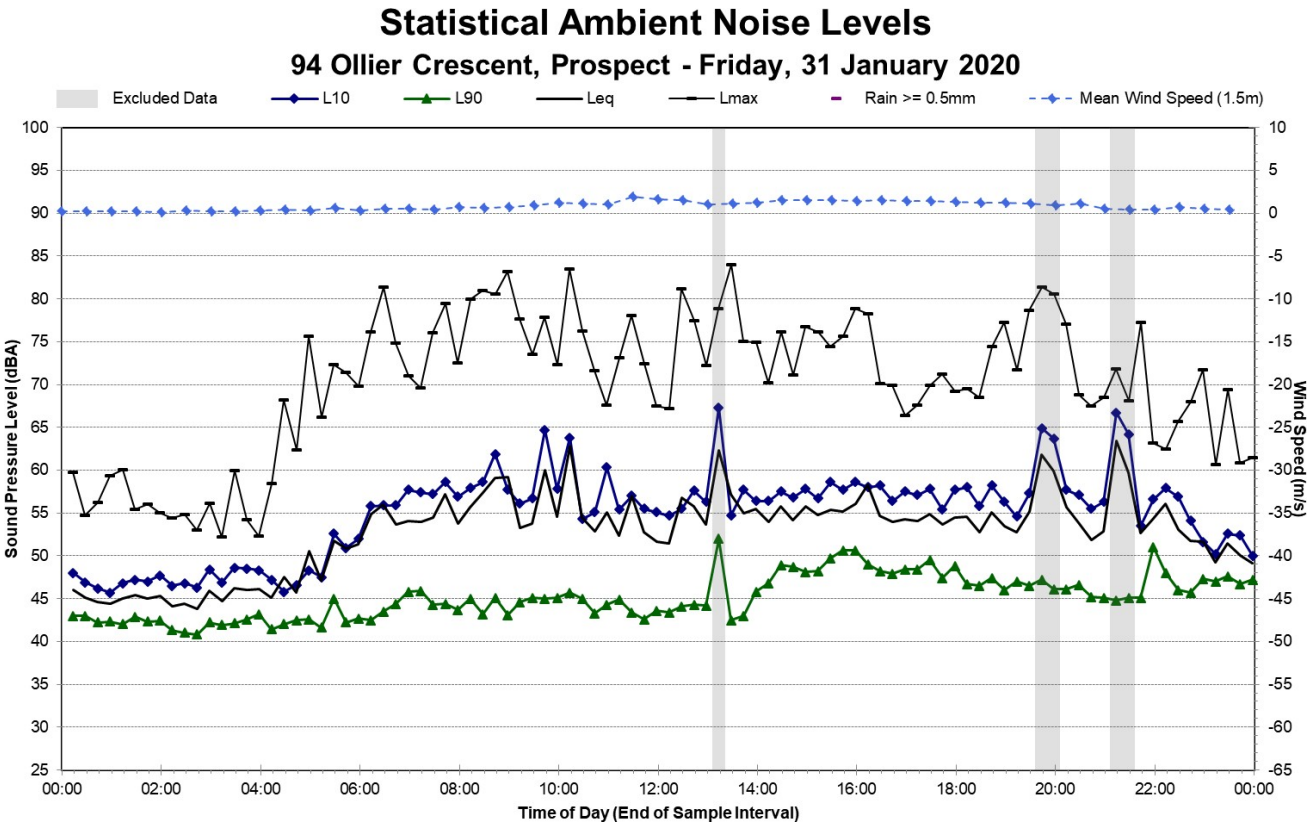
Attended Noise Measurement Results

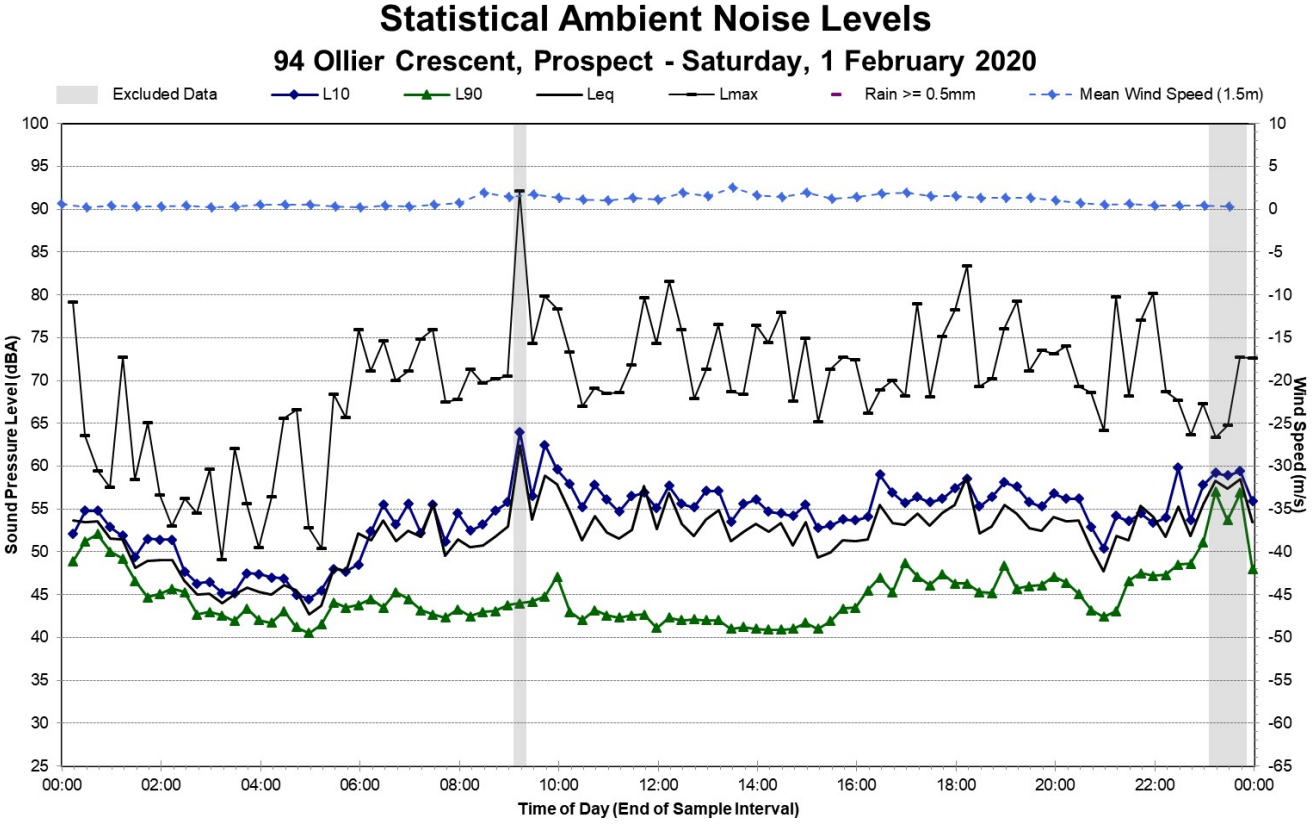
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
18/02/2020	13:41	48	56	80

Photo of Noise Monitoring Location


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Wednesday, 29 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

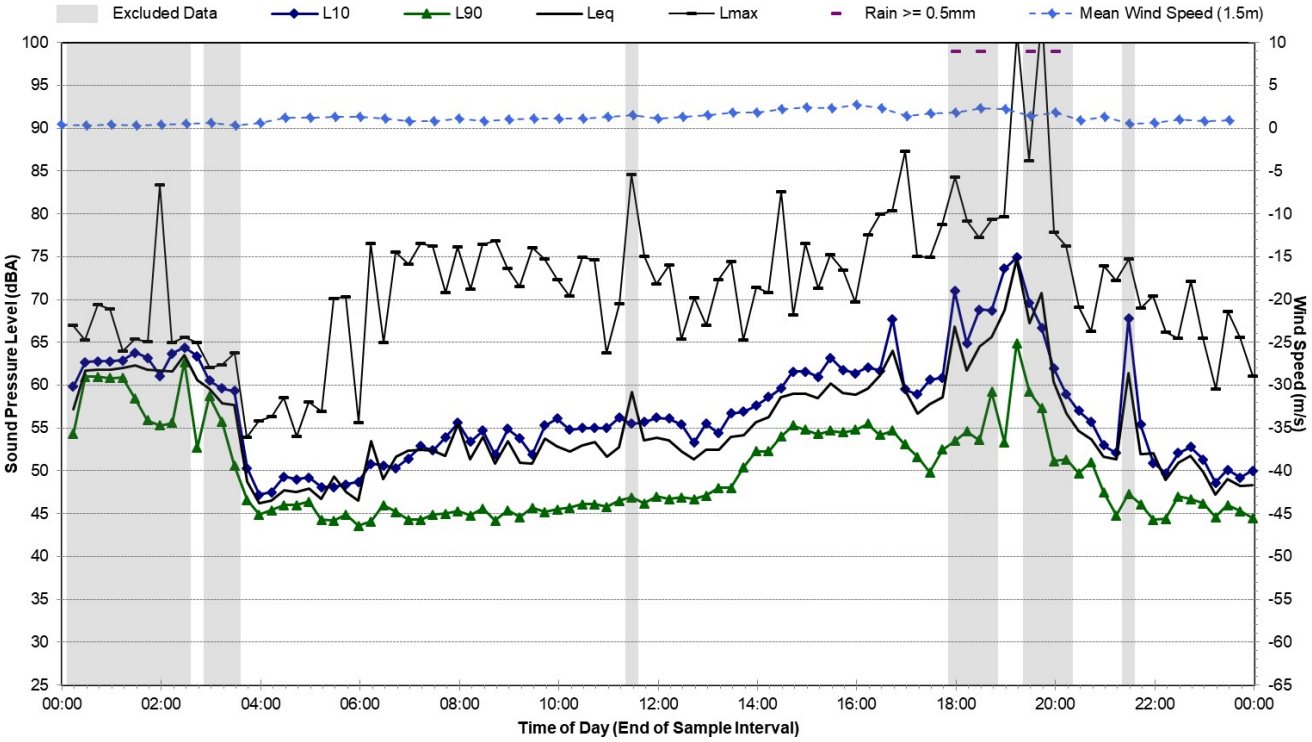

Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Thursday, 30 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Friday, 31 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Saturday, 1 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

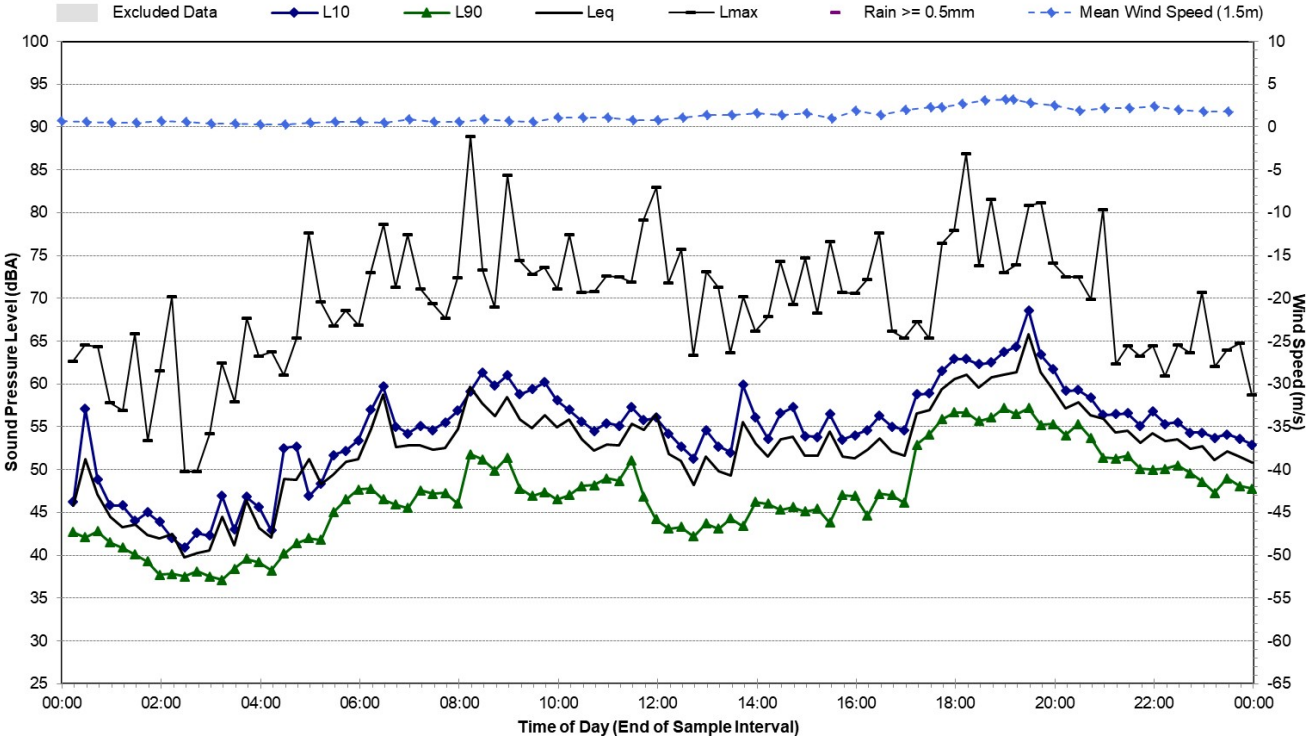
Statistical Ambient Noise Levels

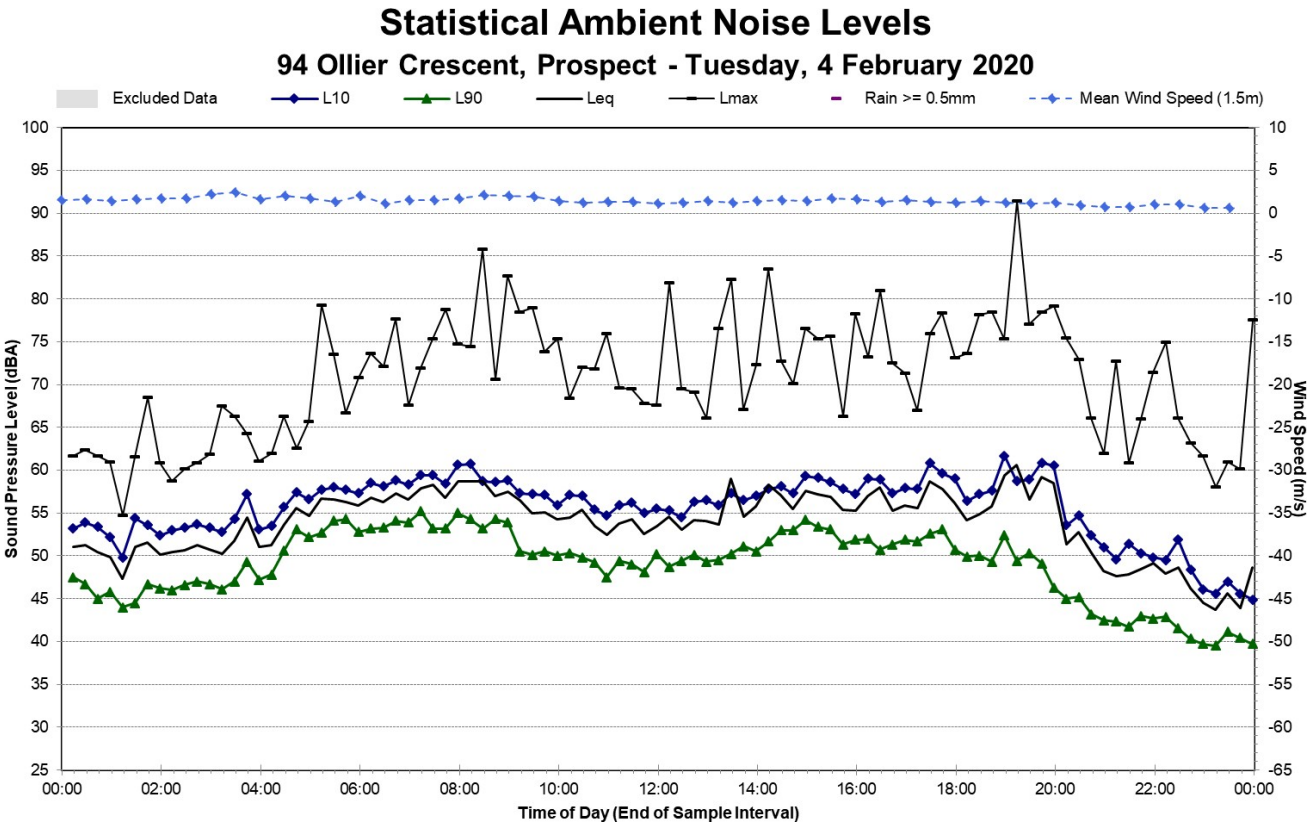
94 Ollier Crescent, Prospect - Sunday, 2 February 2020

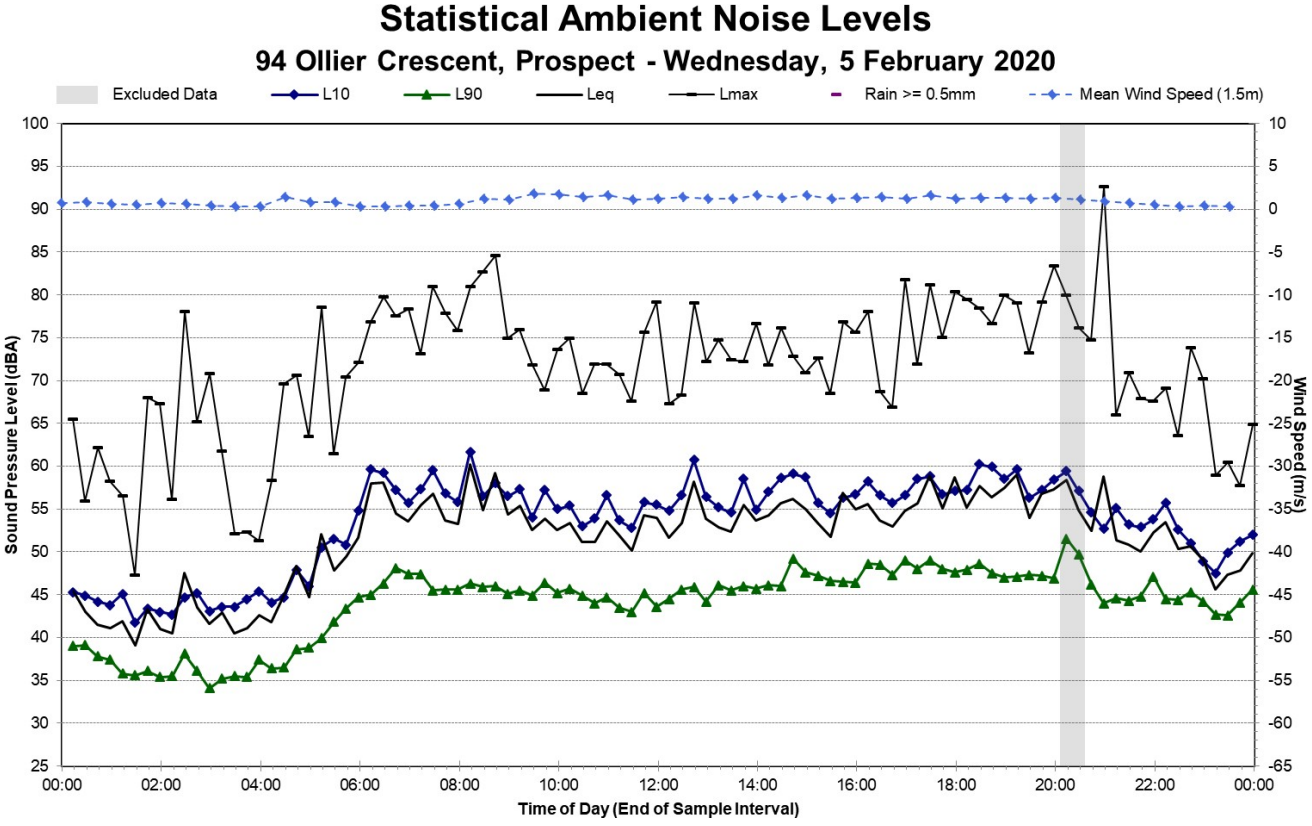


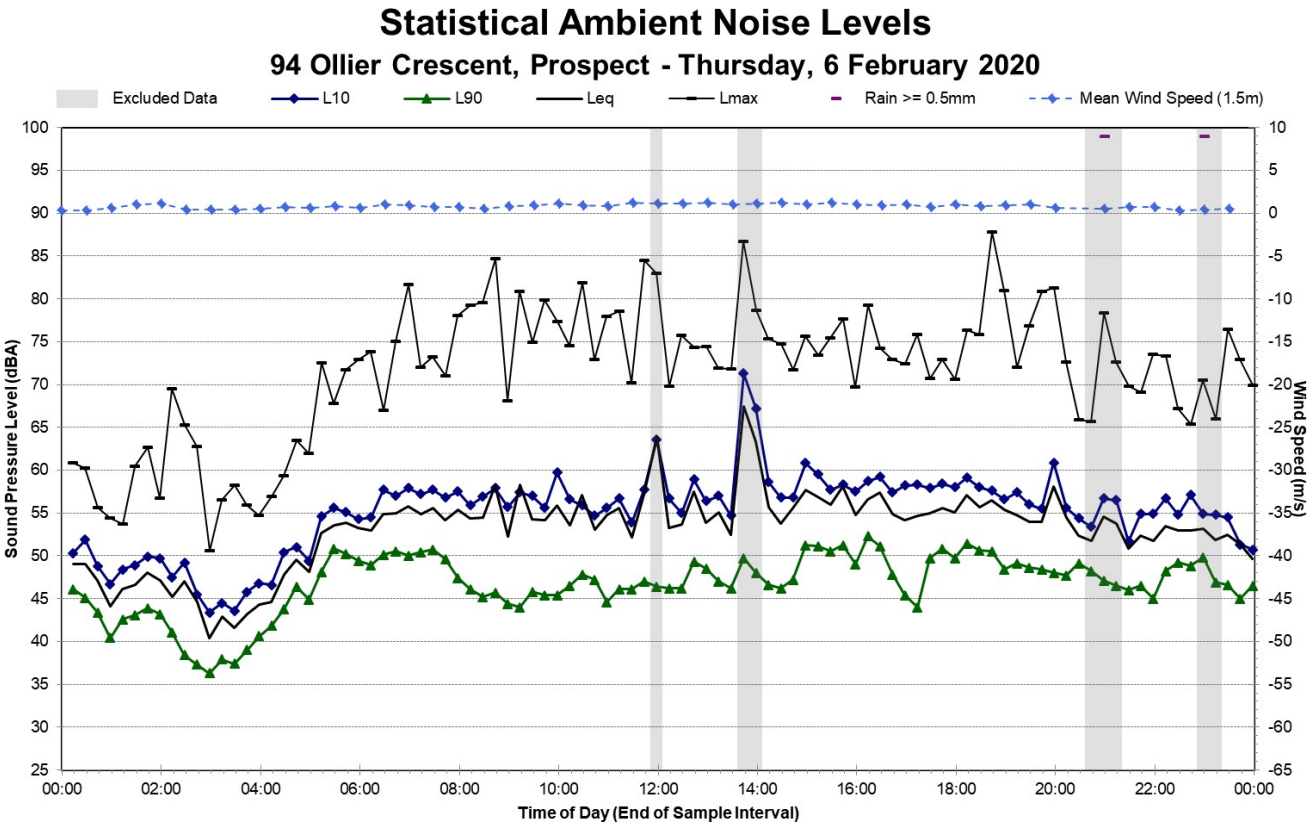
Statistical Ambient Noise Levels

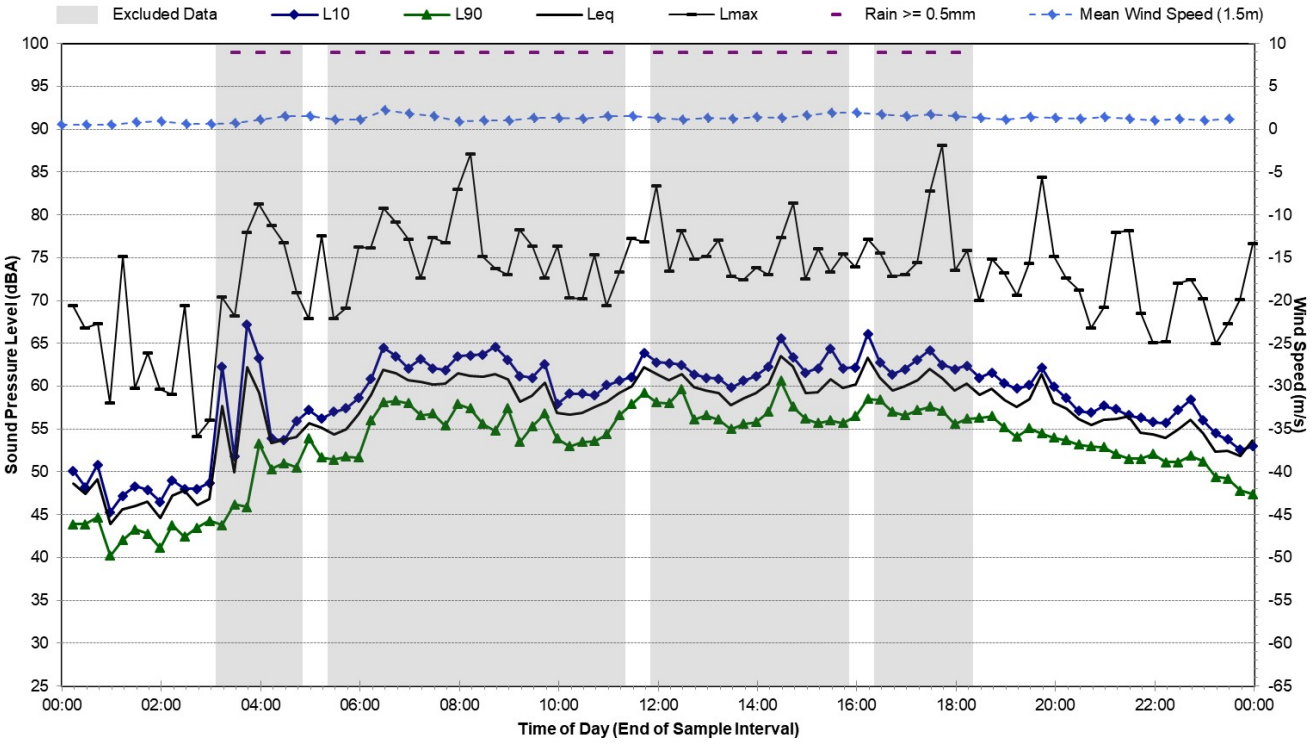
94 Ollier Crescent, Prospect - Monday, 3 February 2020

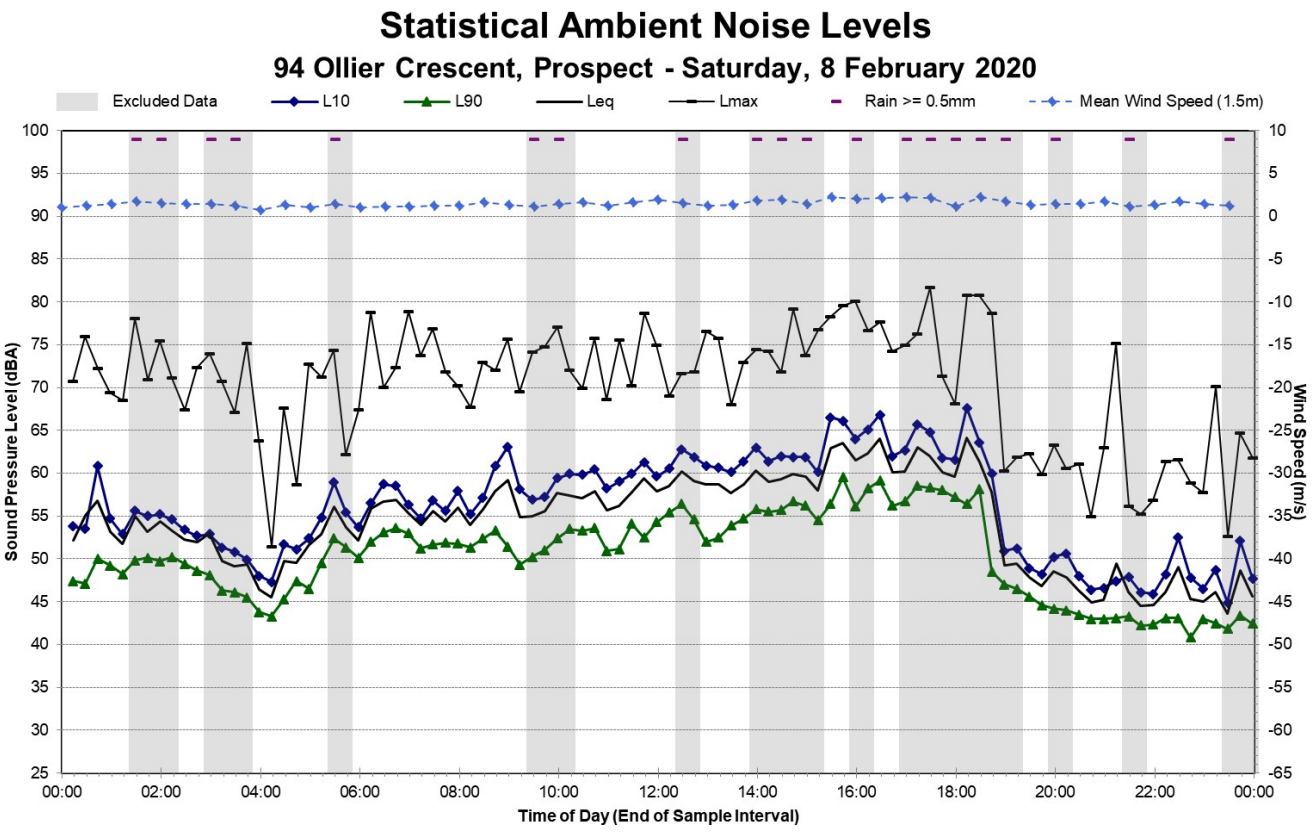


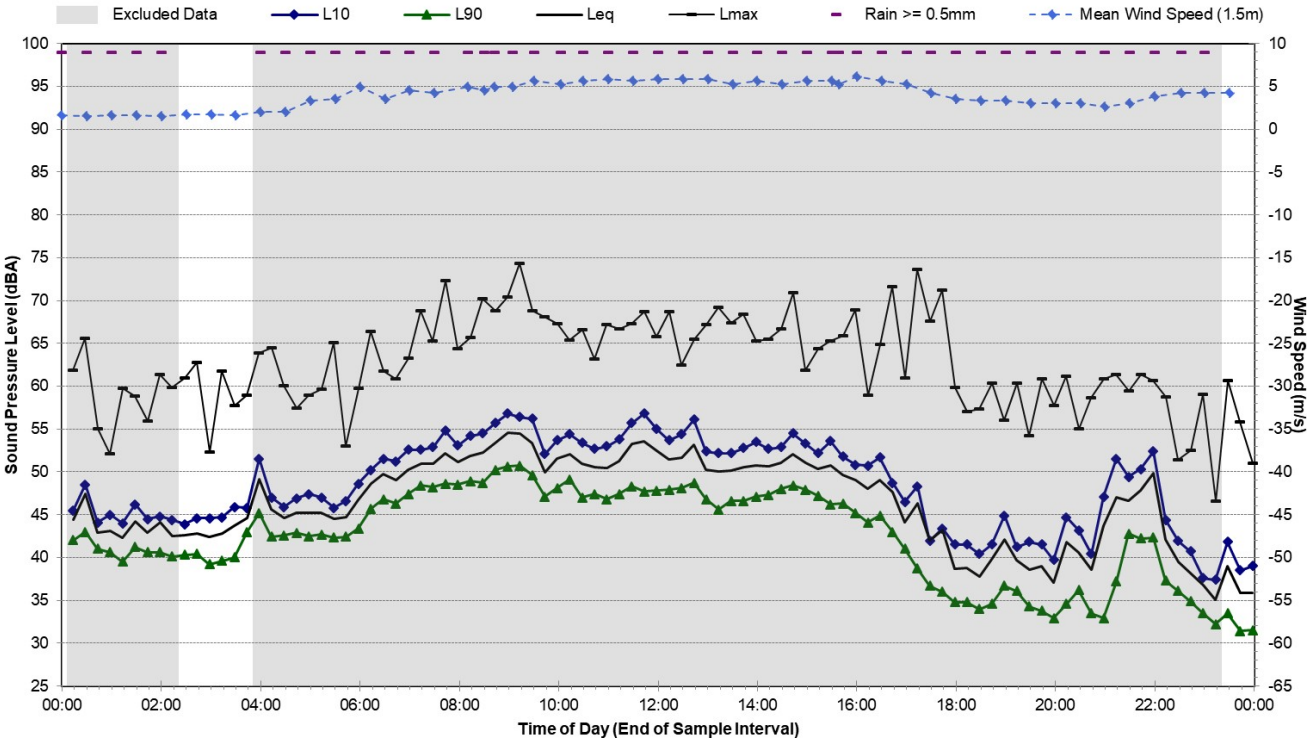

Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Tuesday, 4 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

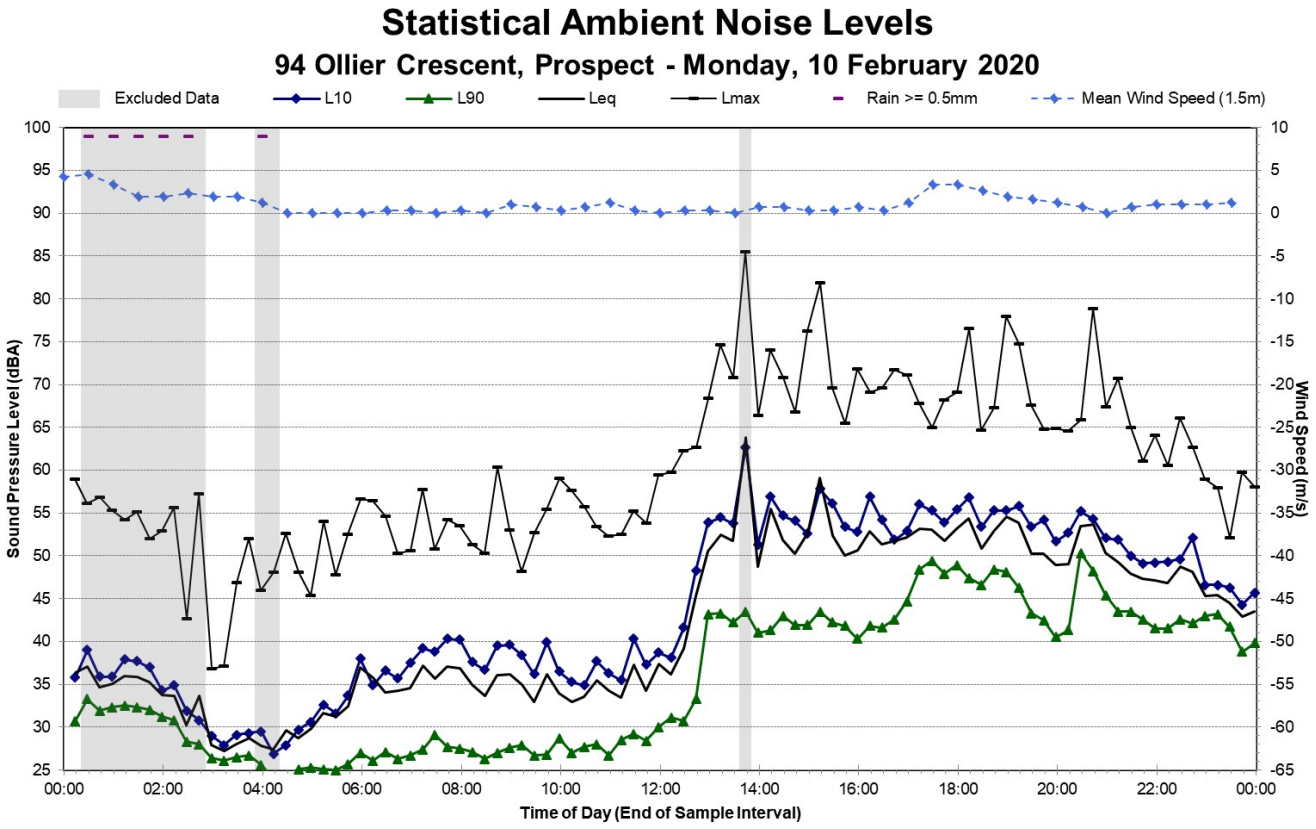

Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Wednesday, 5 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

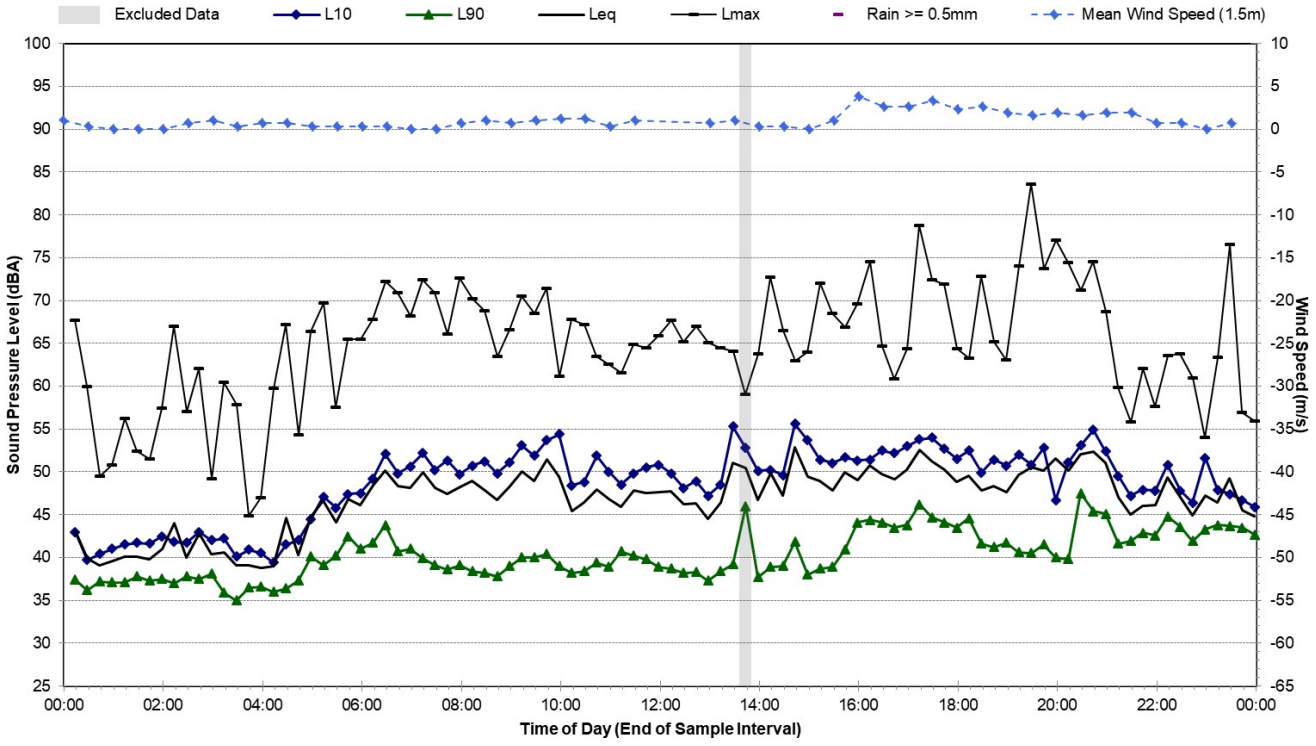

Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Thursday, 6 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Friday, 7 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Saturday, 8 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

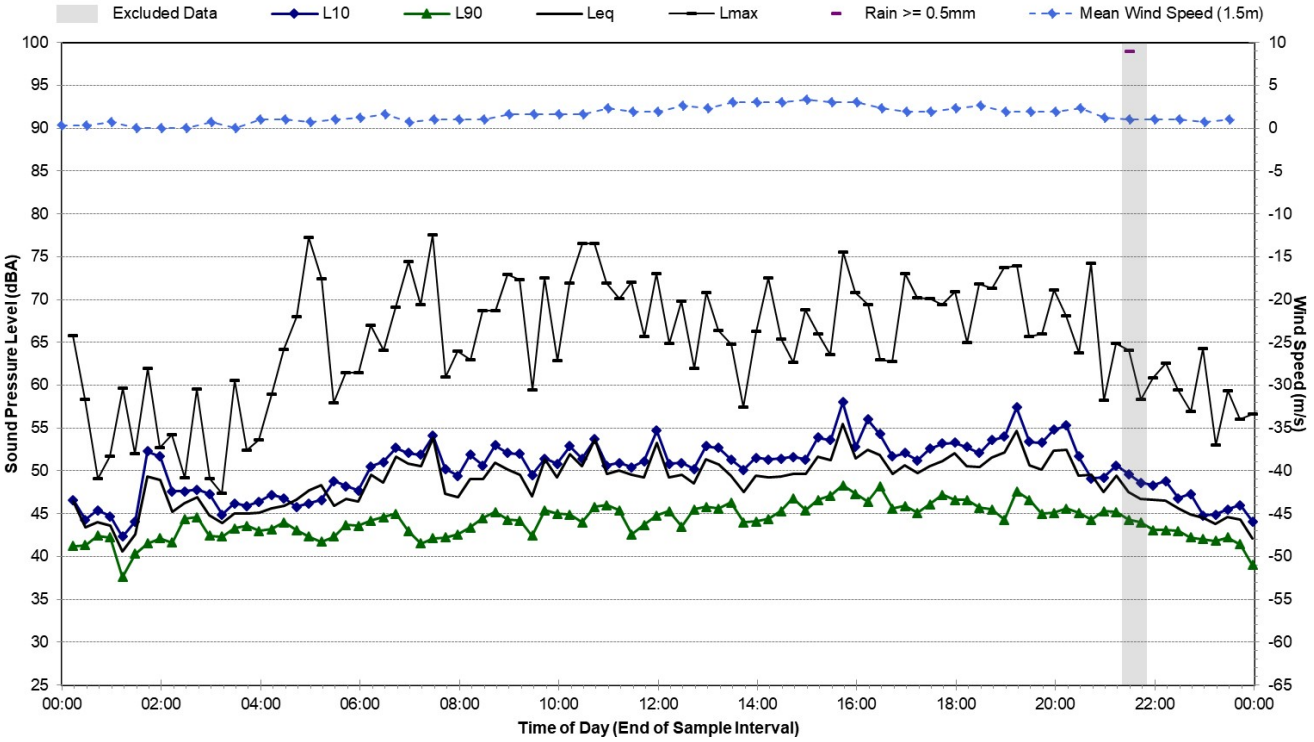

Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Sunday, 9 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Monday, 10 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Tuesday, 11 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

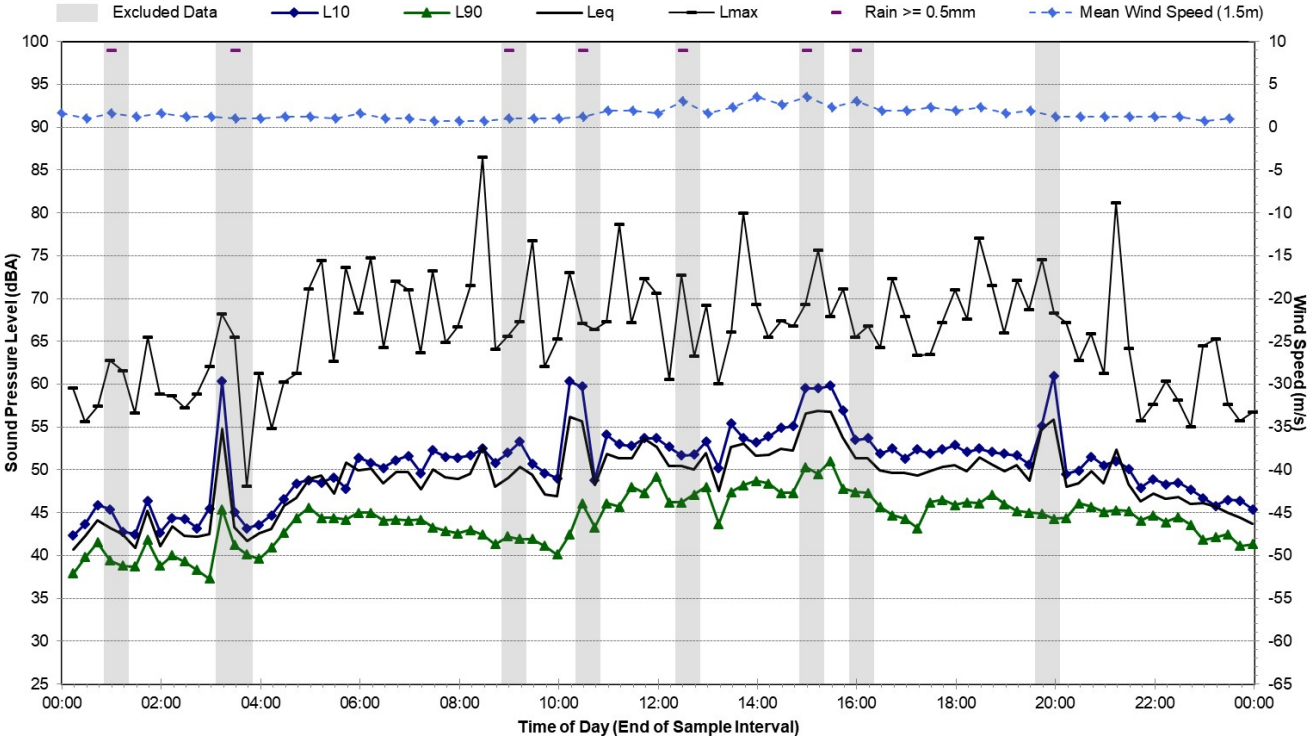
Statistical Ambient Noise Levels

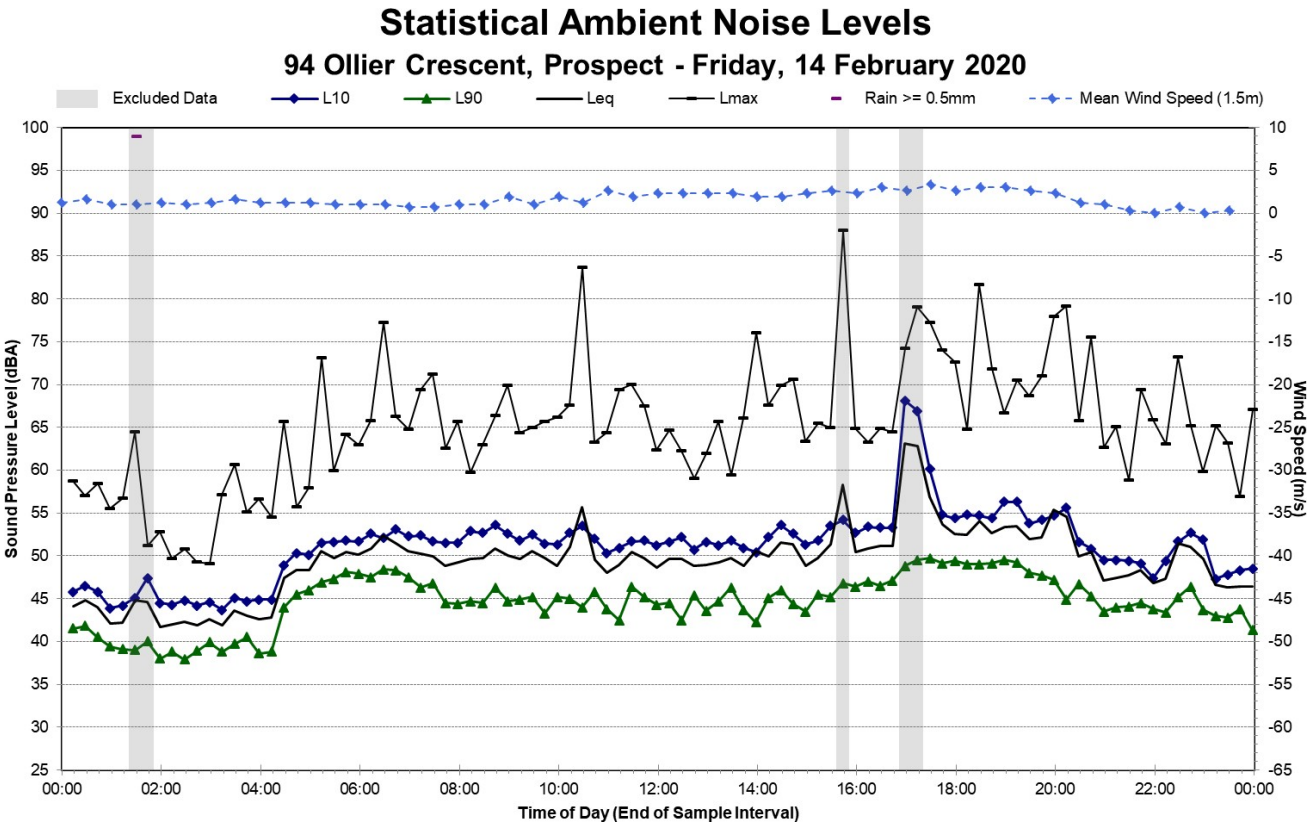
94 Ollier Crescent, Prospect - Wednesday, 12 February 2020

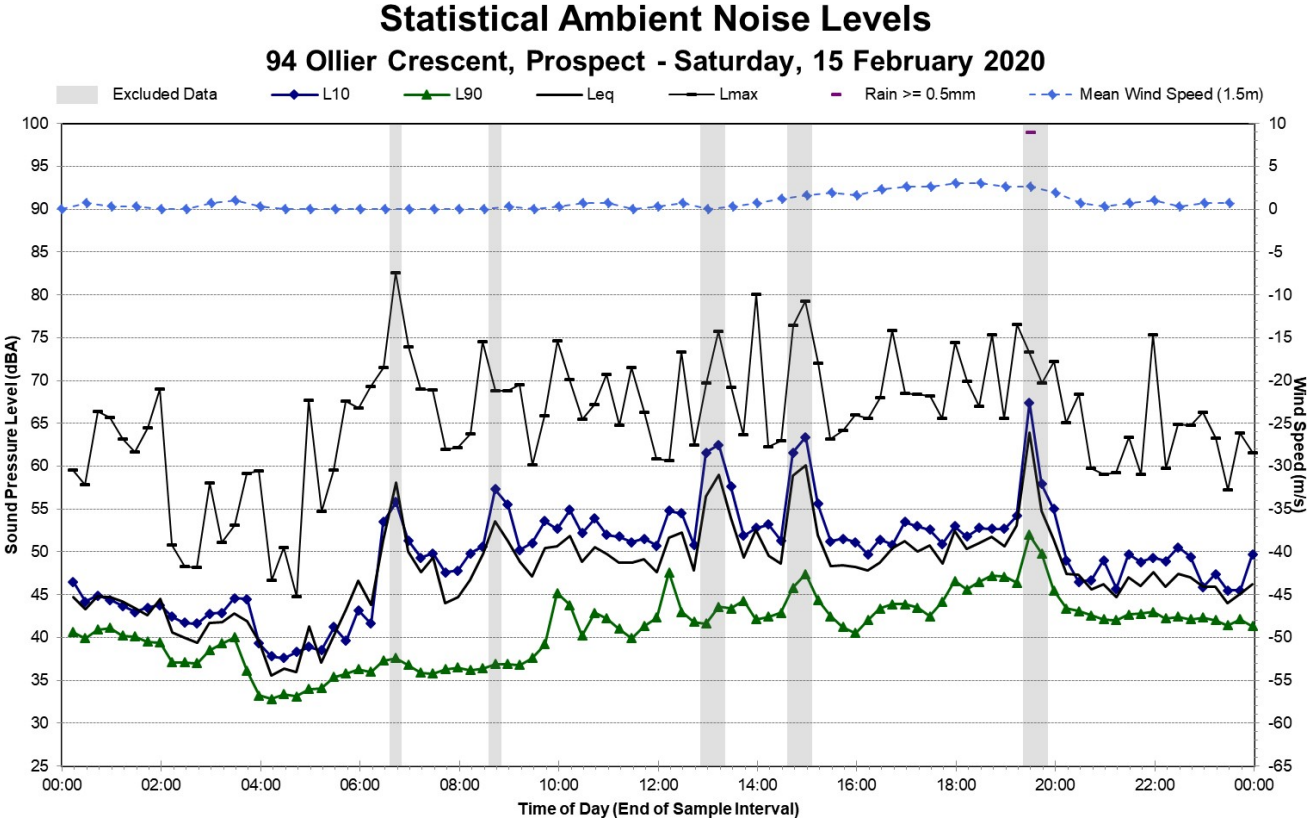


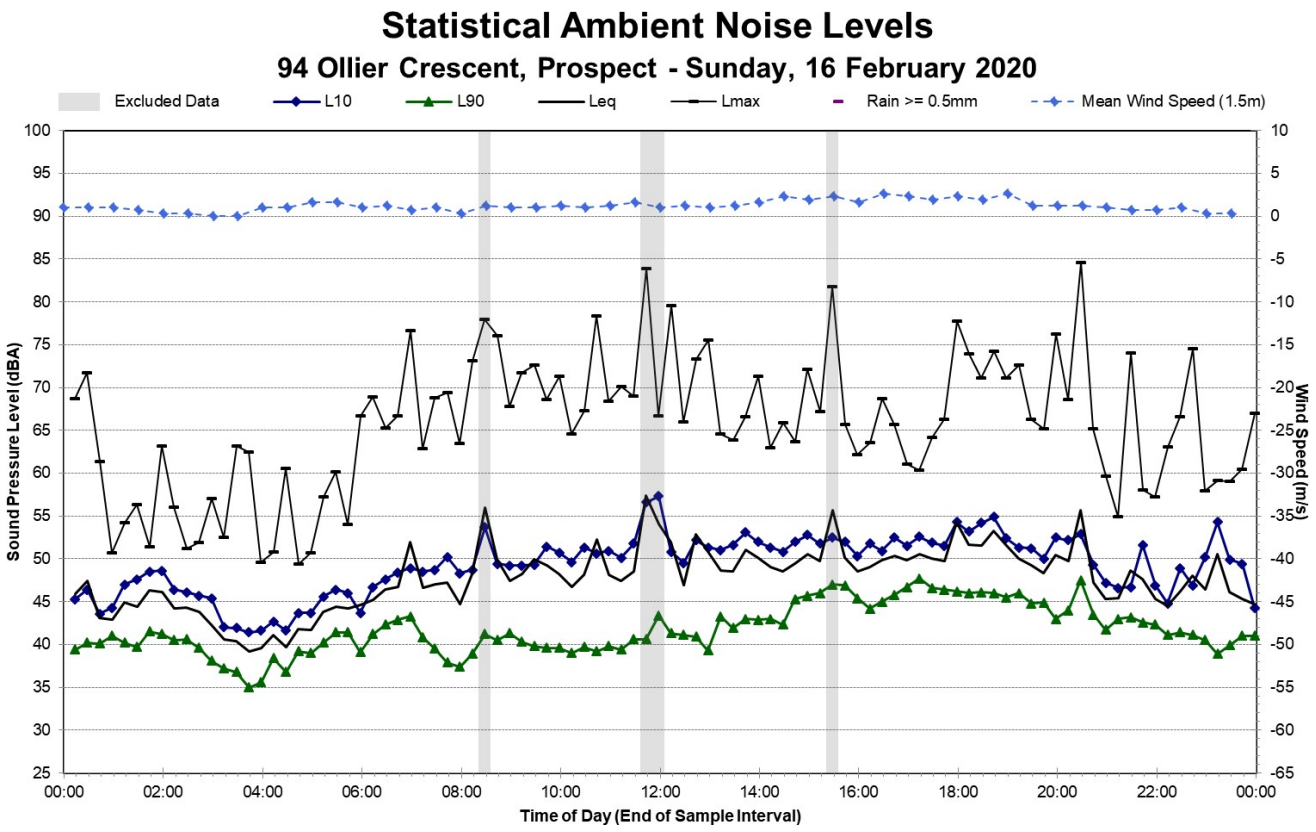
Statistical Ambient Noise Levels

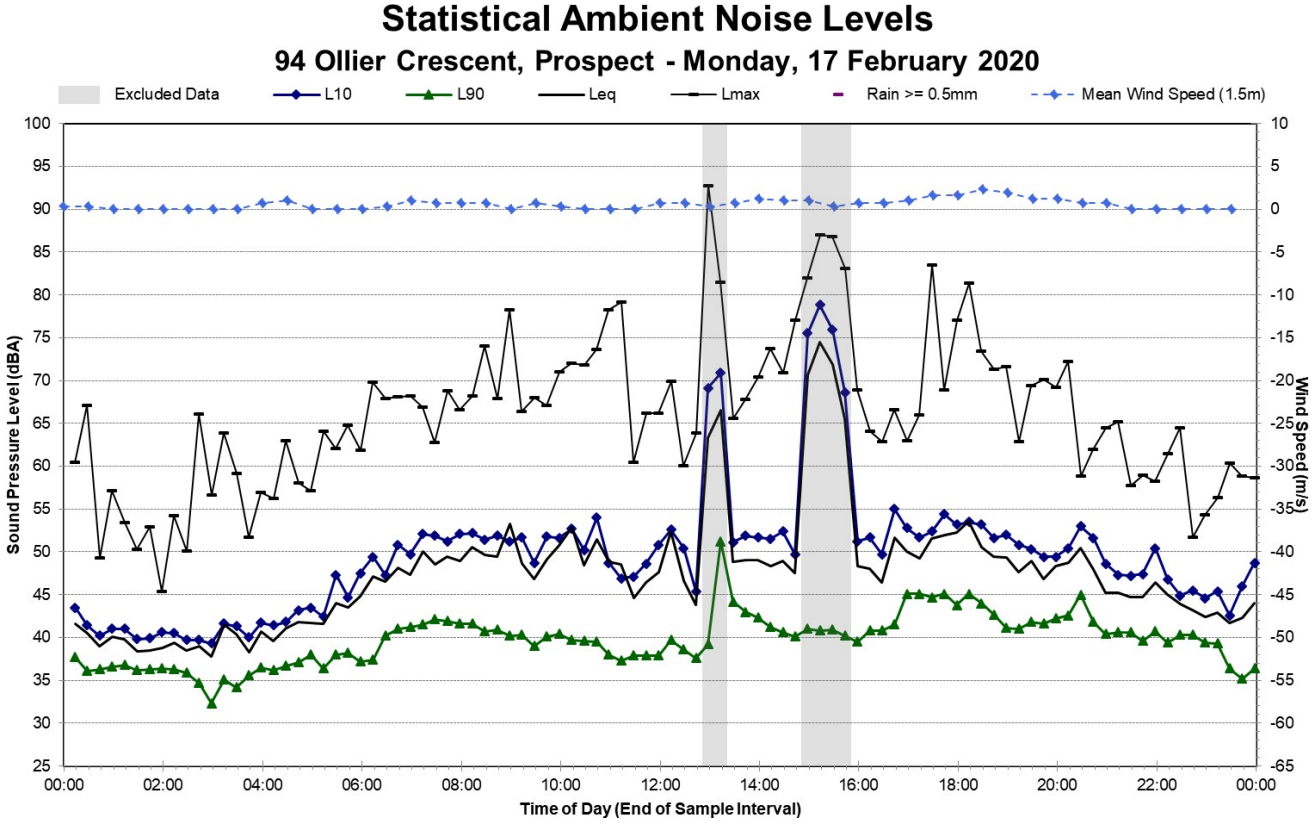
94 Ollier Crescent, Prospect - Thursday, 13 February 2020

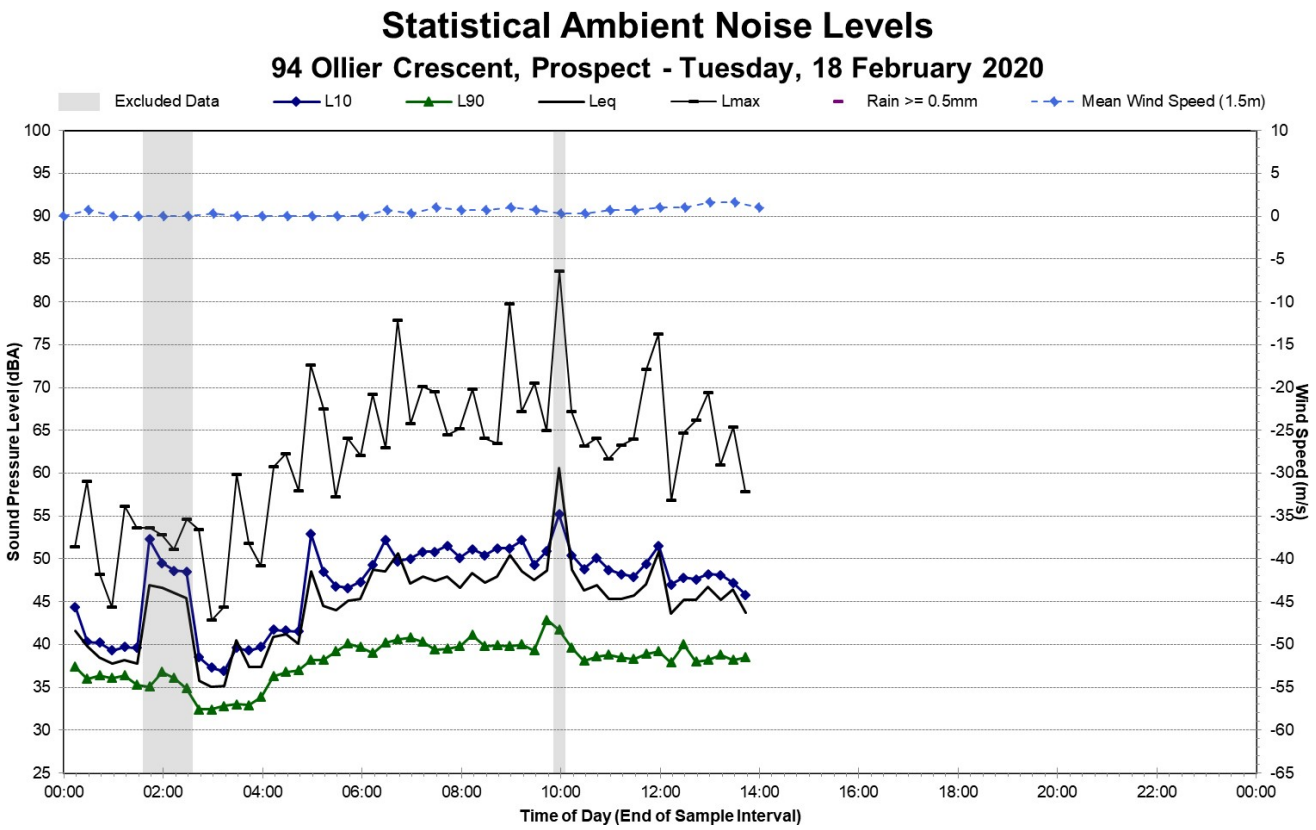



Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Friday, 14 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Saturday, 15 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Sunday, 16 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Monday, 17 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
94 Ollier Crescent, Prospect - Tuesday, 18 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

Noise Monitoring Location	L.04
Noise Monitoring Address	**48 Munro Street, Greystanes**

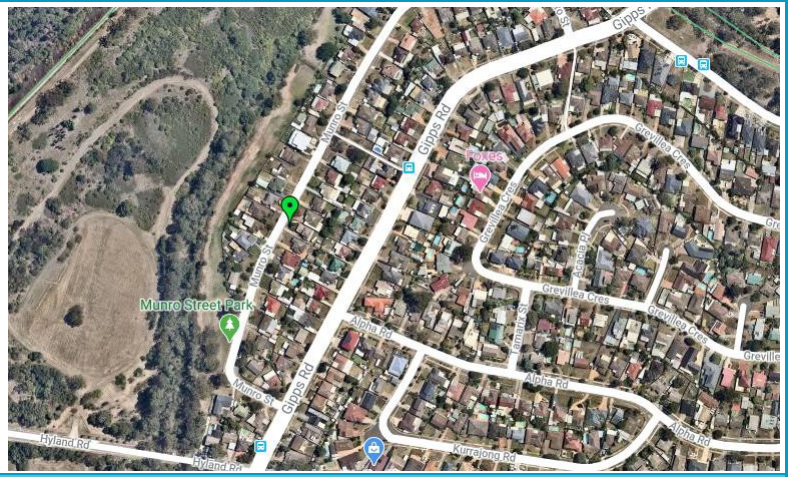
Logger Device Type: Svantek 957, Logger Serial No: 23244
Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2414604

Ambient noise logger deployed at residential address 48 Munro St, Greystanes. Logger located with view of Munro St to the west and Gipps Rd to the east.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Gipps Rd to the south. Road traffic noise from Munro St also contributes to the noise level at this location.

Recorded Noise Levels (LAmax):
18/02/2020: Road traffic Gipps Rd: 40-47 dBA, Heavy-vehicle traffic Munro St: 74 dBA, Birds: 60-67 dBA, Aircraft: 40-44 dBA, Emergency Siren: 66 dBA, Landscaping: 46-52 dBA

Map of Noise Monitoring Location



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	35	48	48	59
Evening	36	48	47	56
Night-time	39	47	49	52

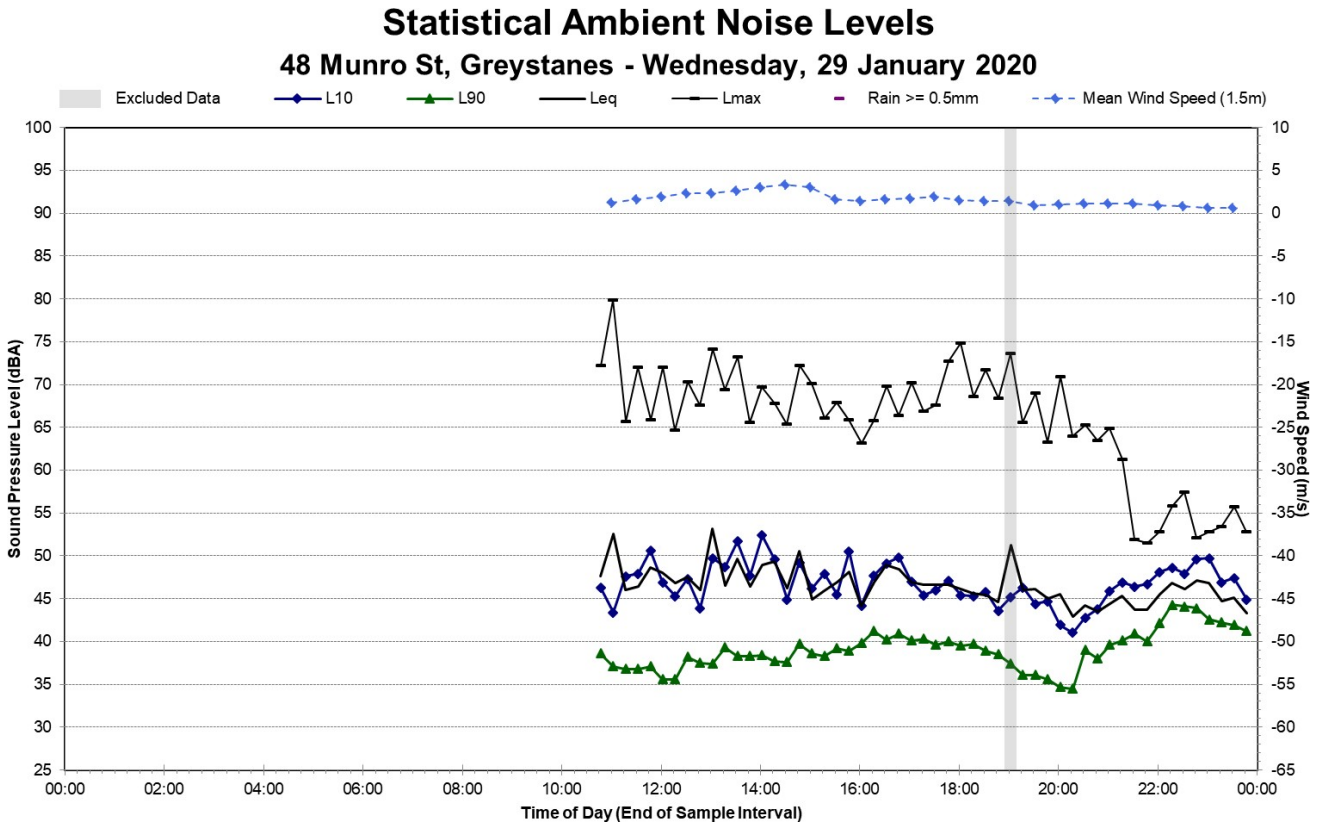
Ambient Noise Logging Results – RNP Defined Time Periods

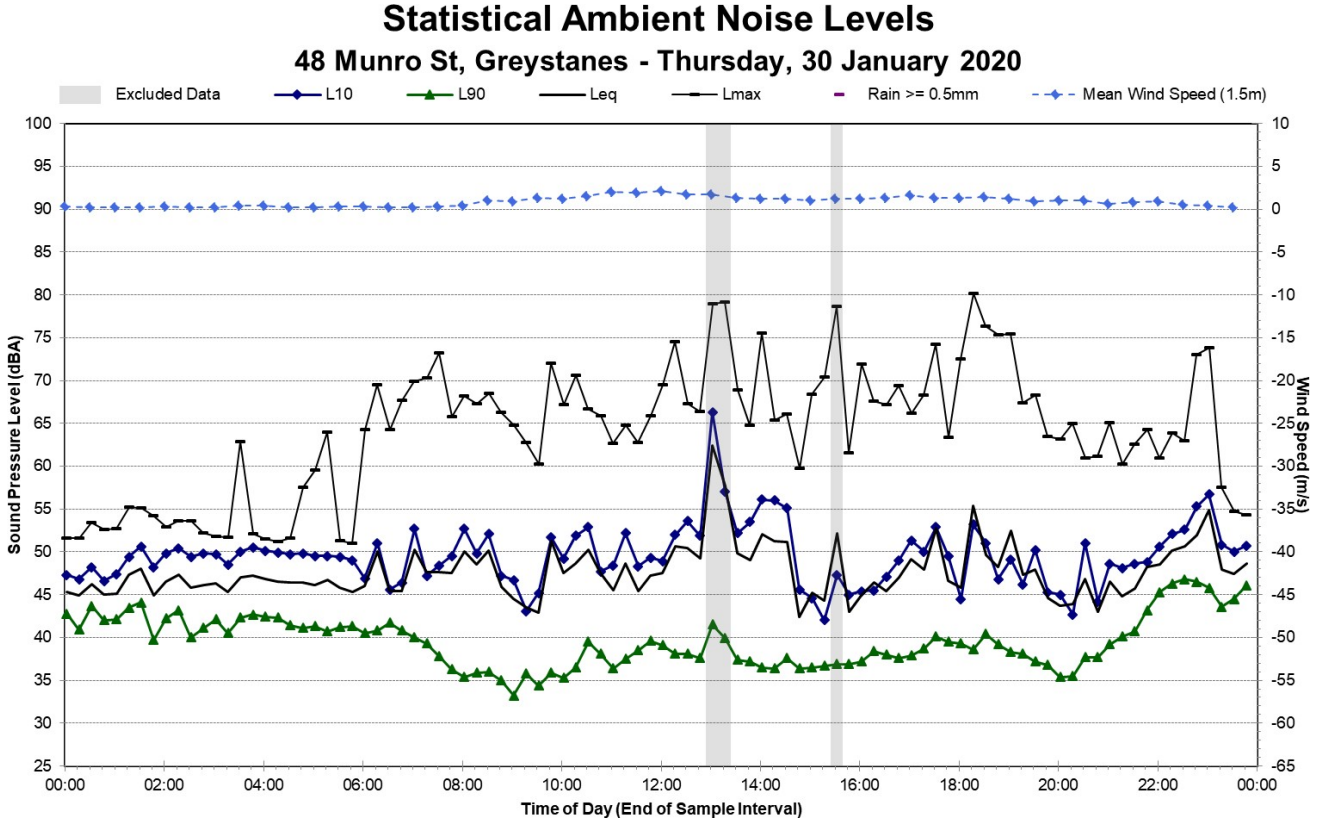
Monitoring Period 29/01/2020 – 18/02/2020	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	48	52
Night-time (10pm-7am)	47	50

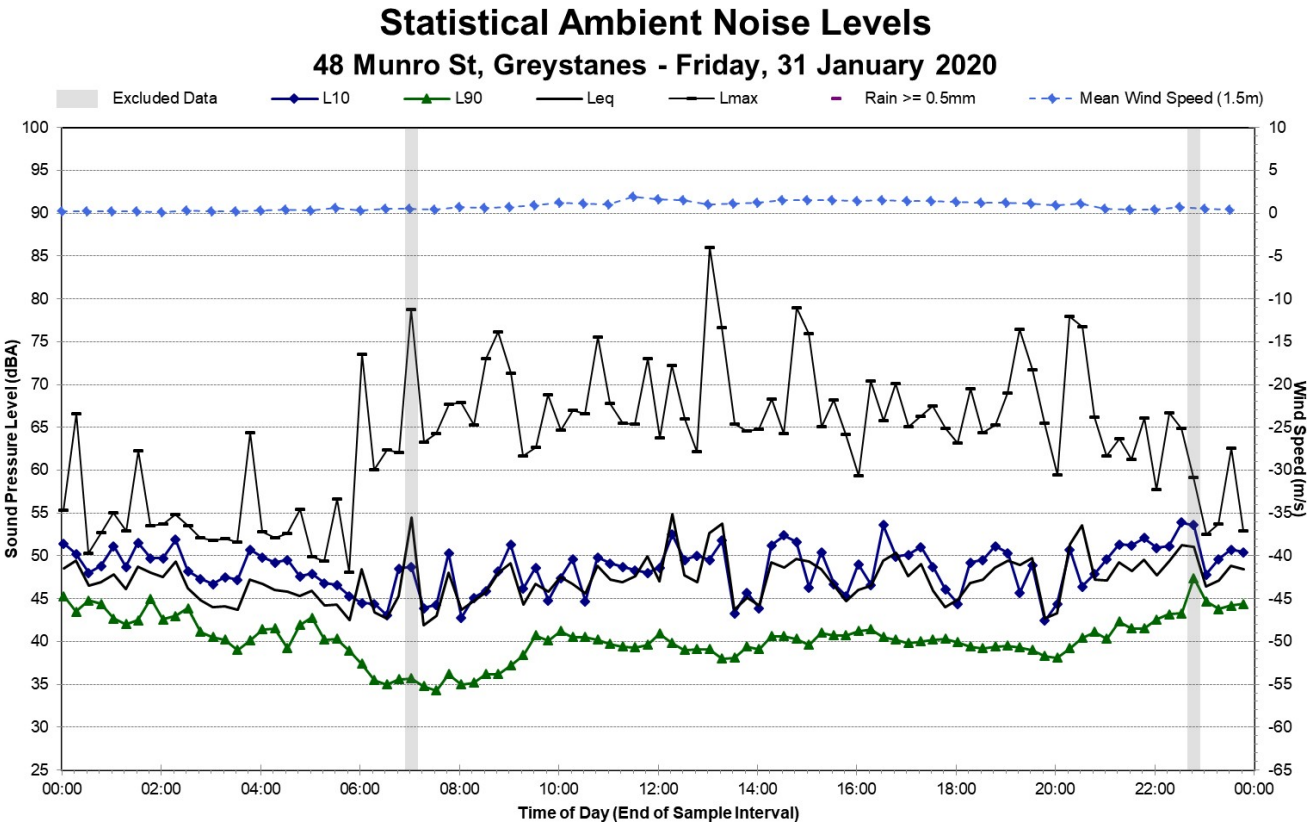
Attended Noise Measurement Results

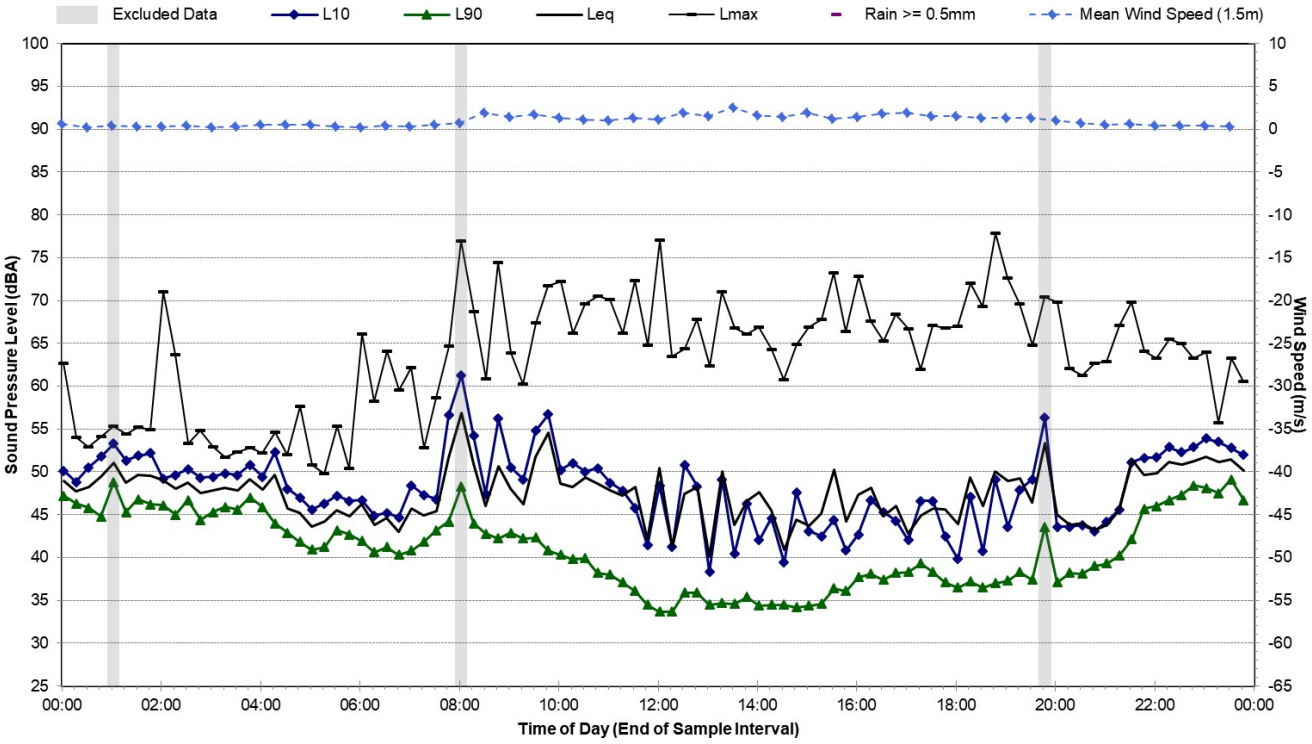
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
18/02/2020	10:07	40	55	74

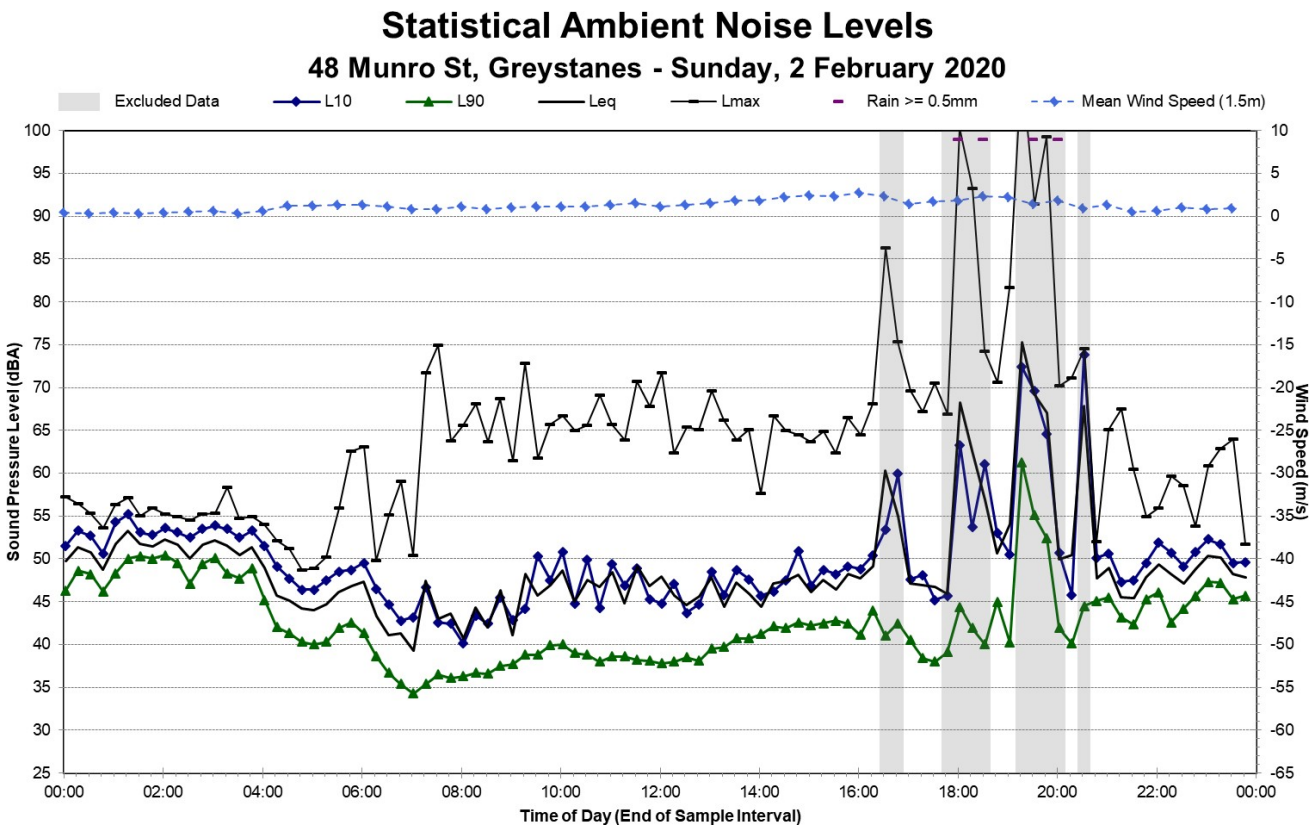
Photo of Noise Monitoring Location

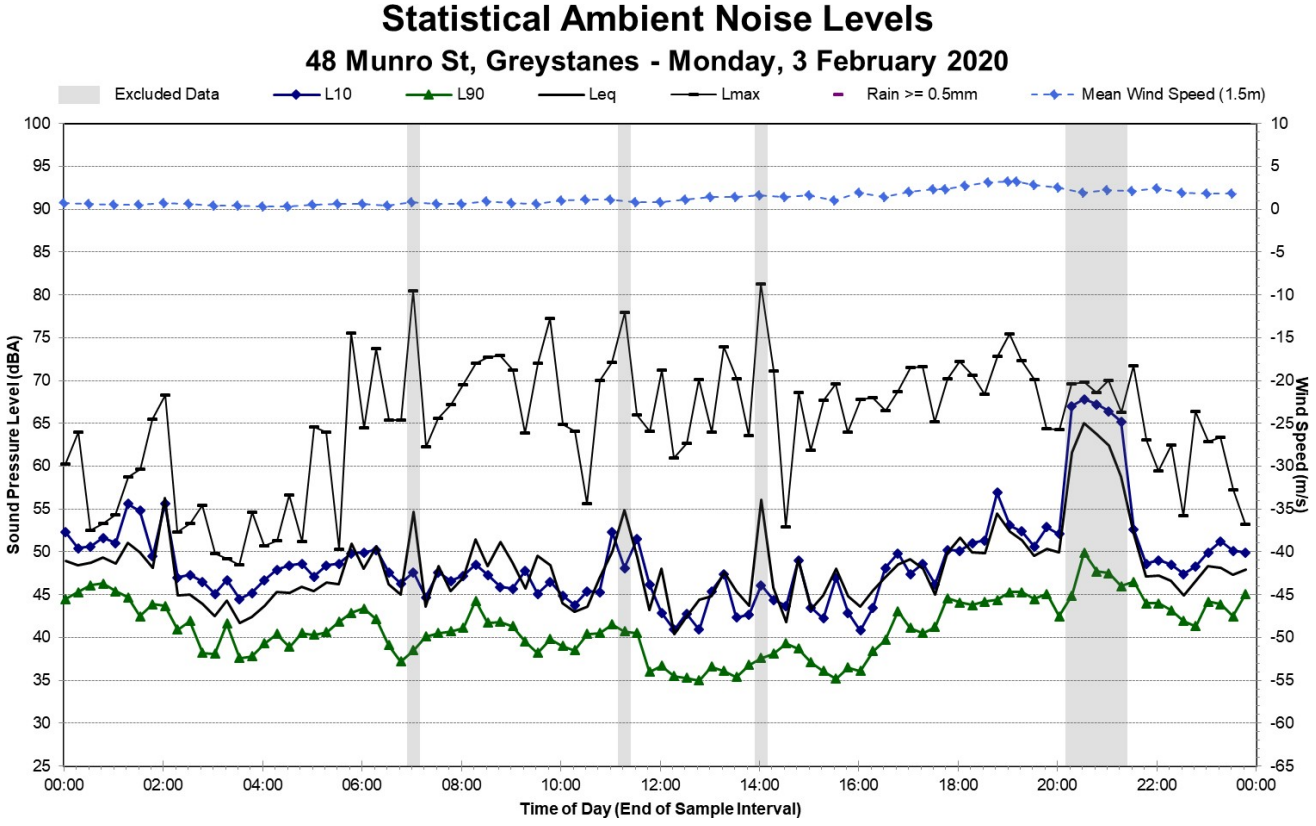

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Wednesday, 29 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

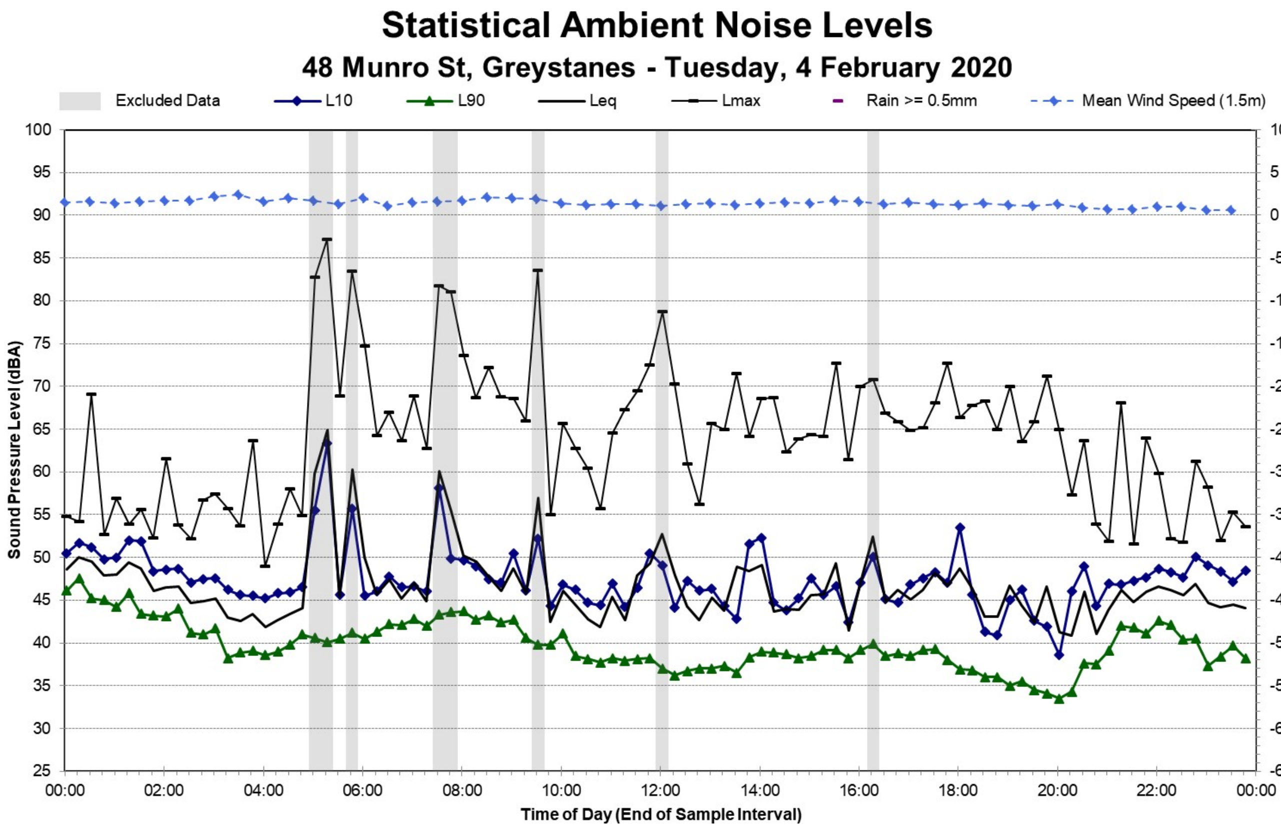

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Thursday, 30 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

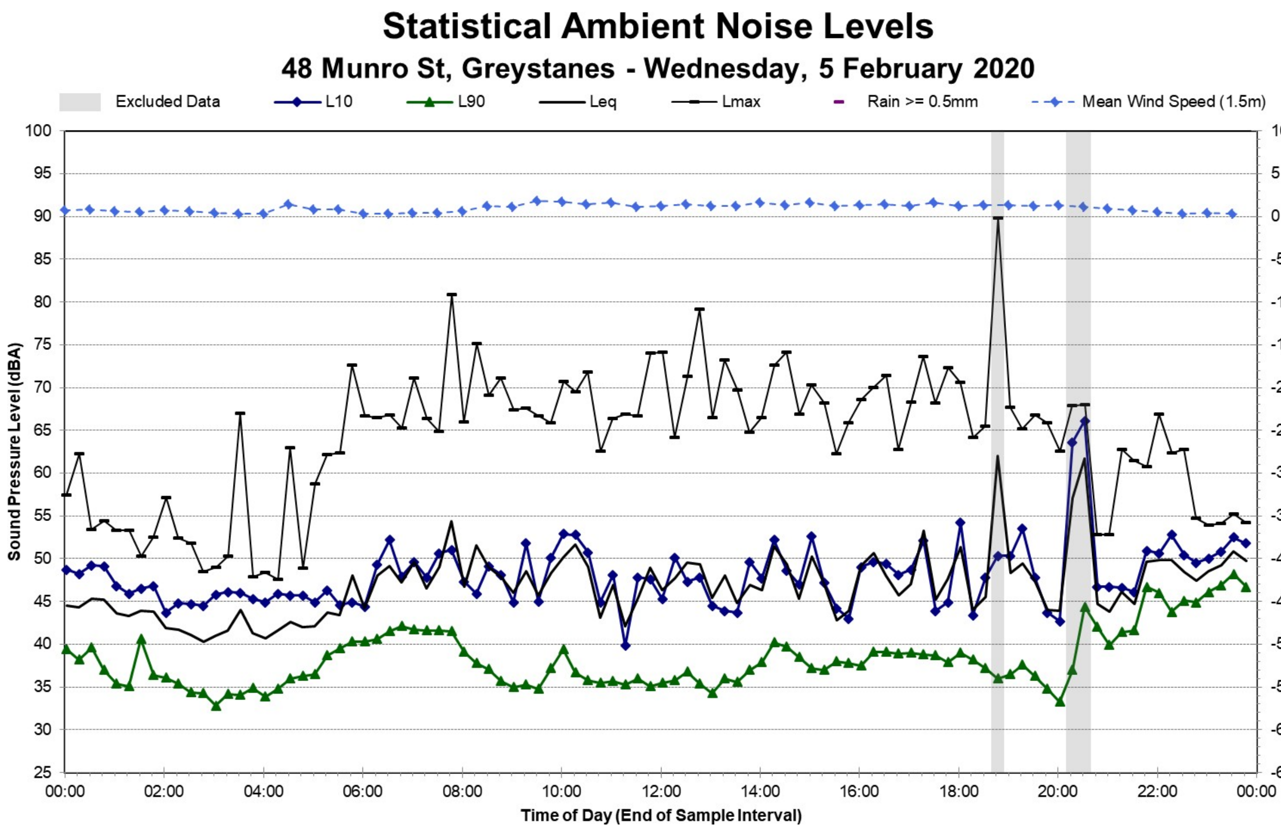

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Friday, 31 January 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

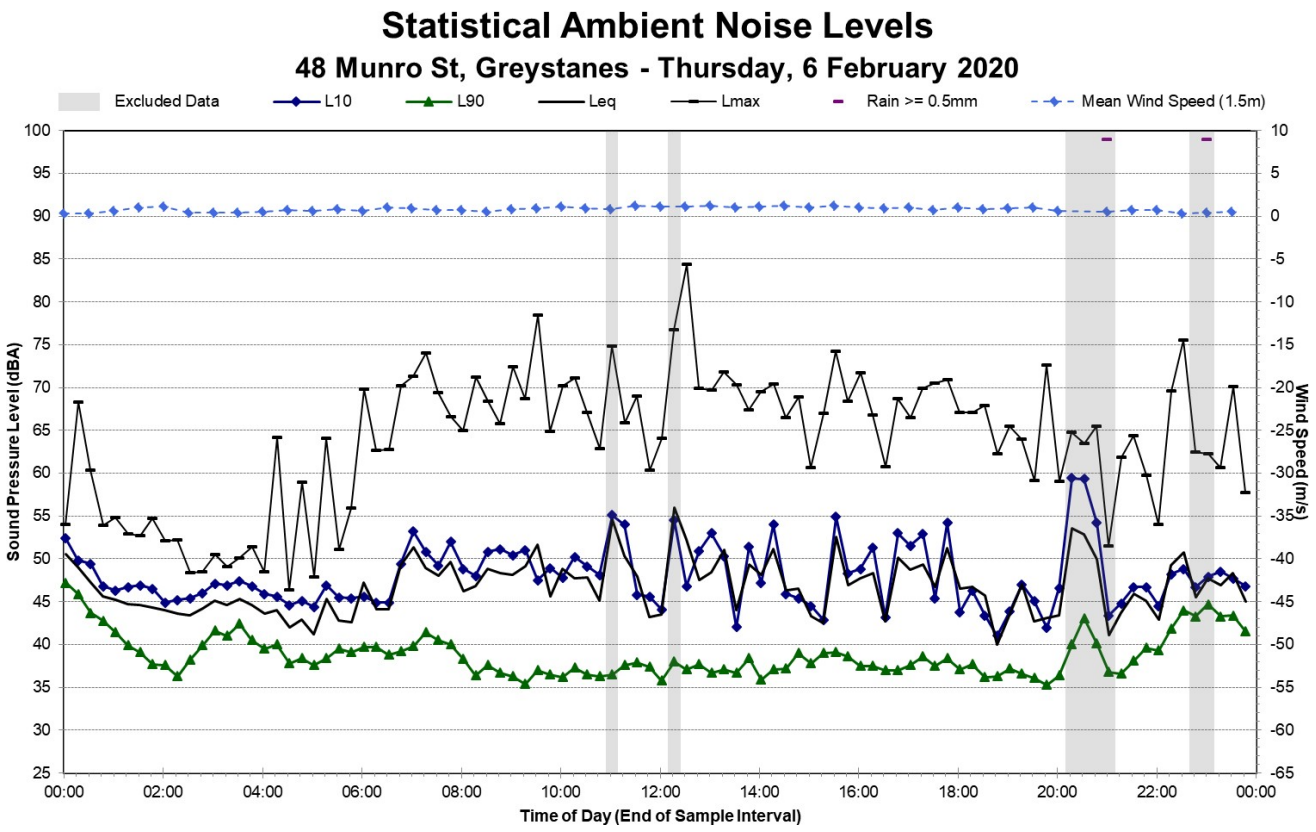

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Saturday, 1 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

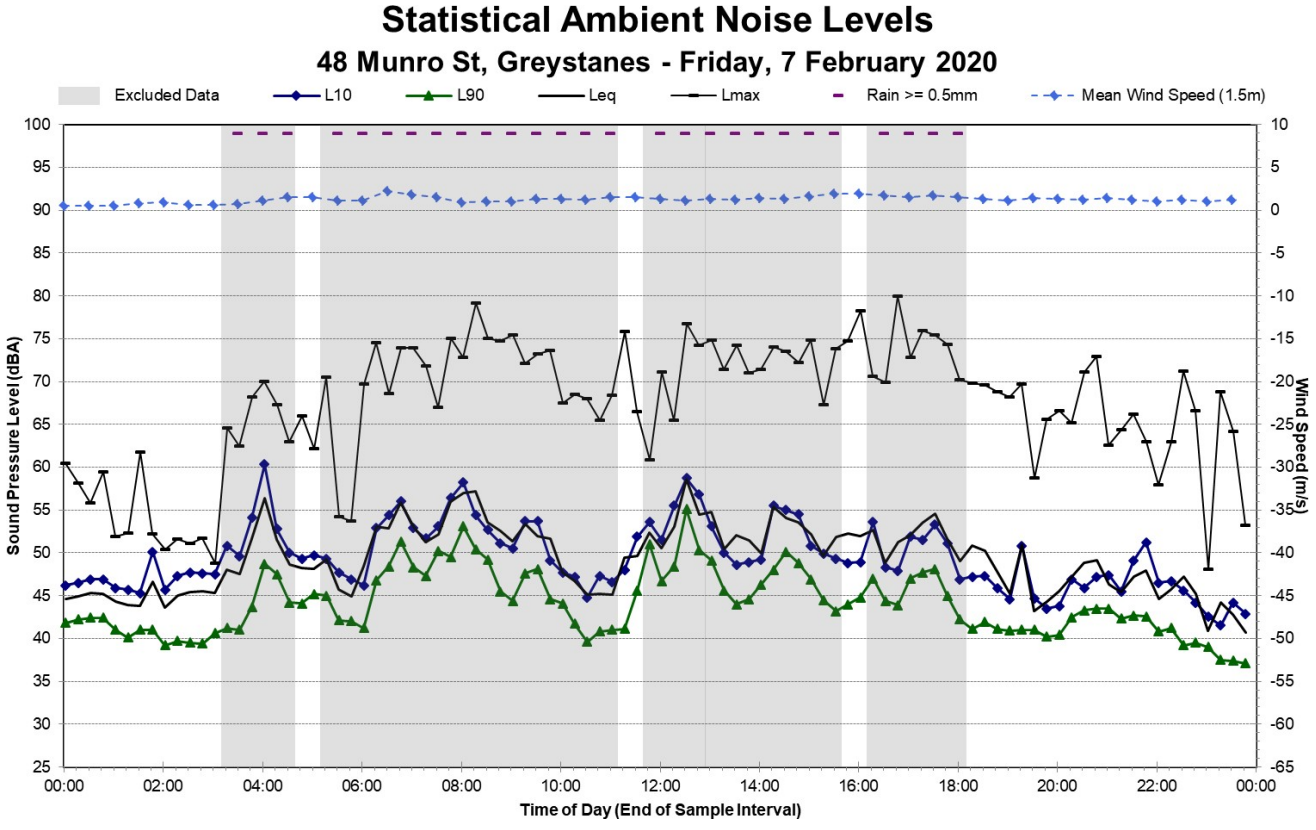

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Sunday, 2 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

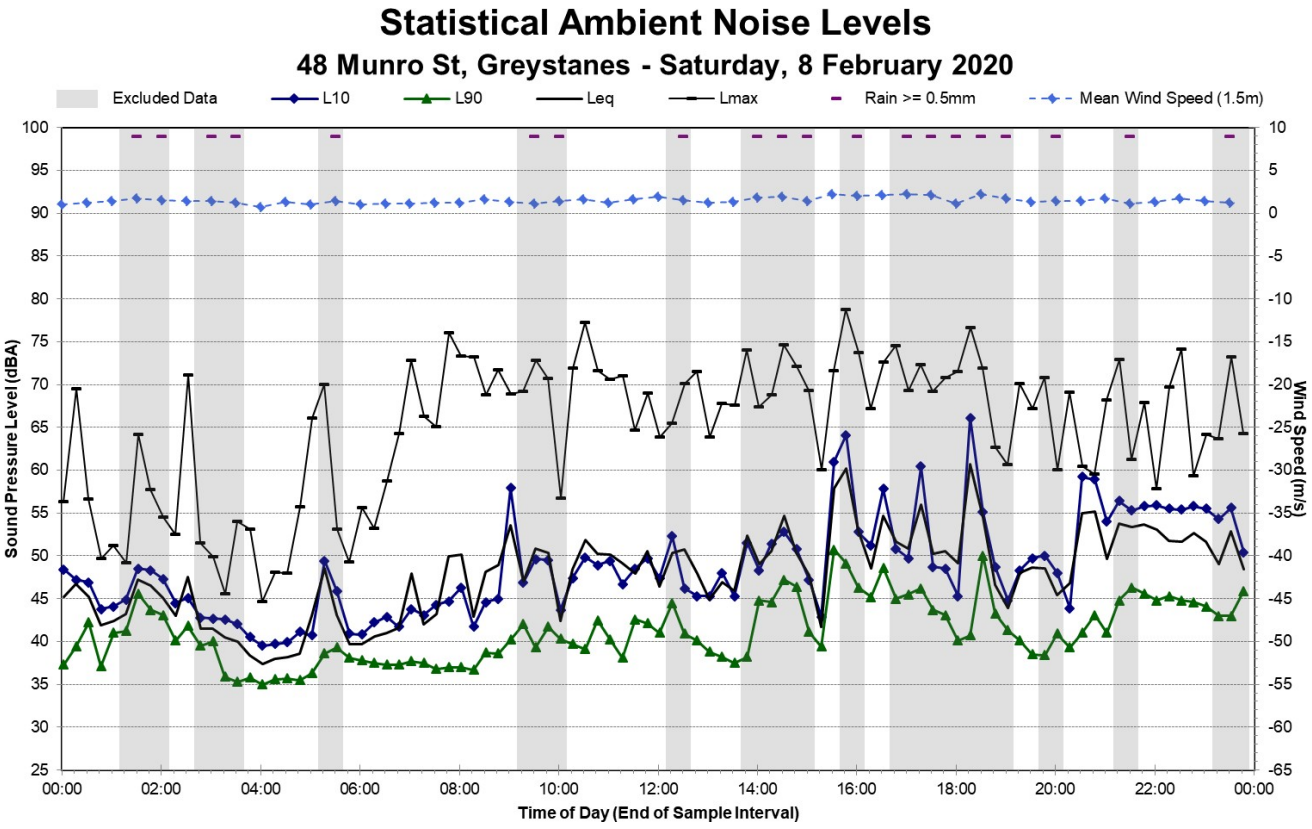

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Monday, 3 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

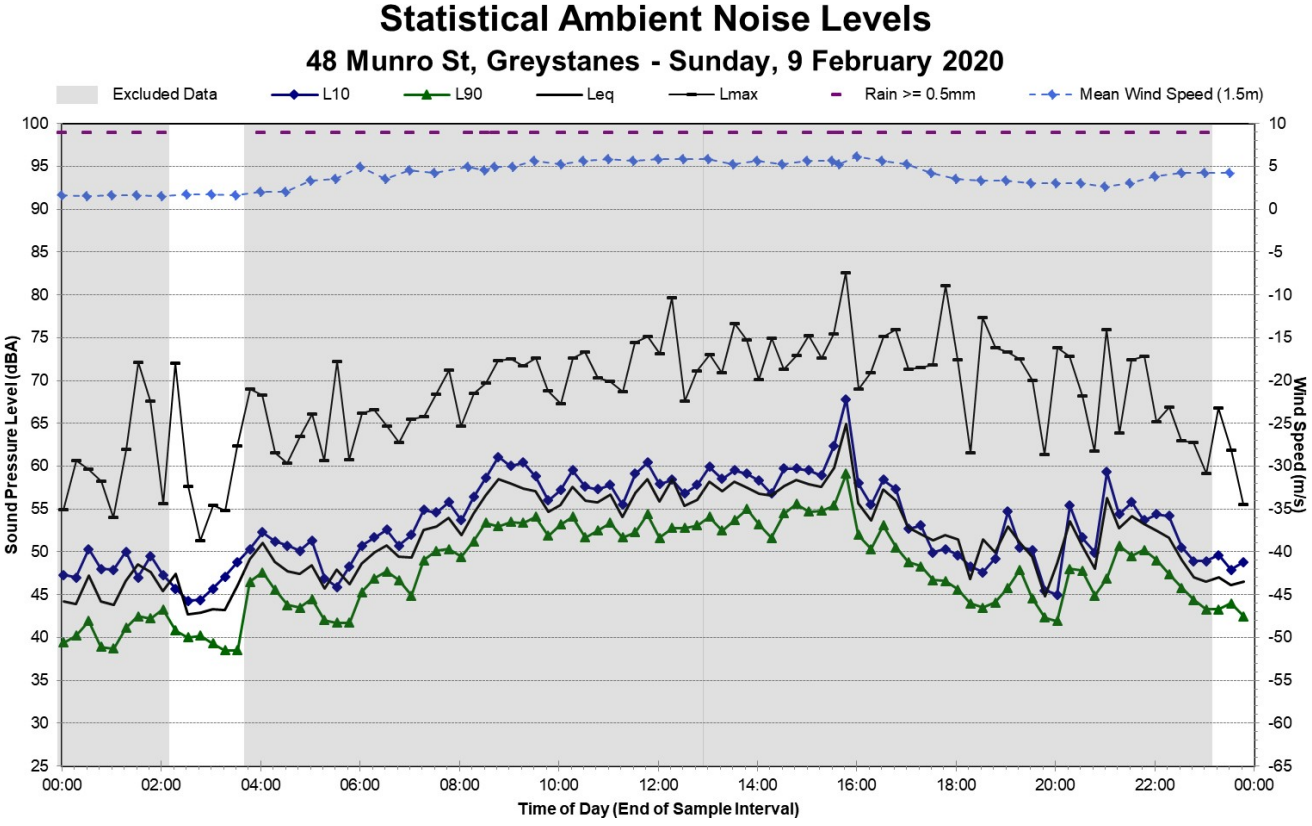

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Tuesday, 4 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

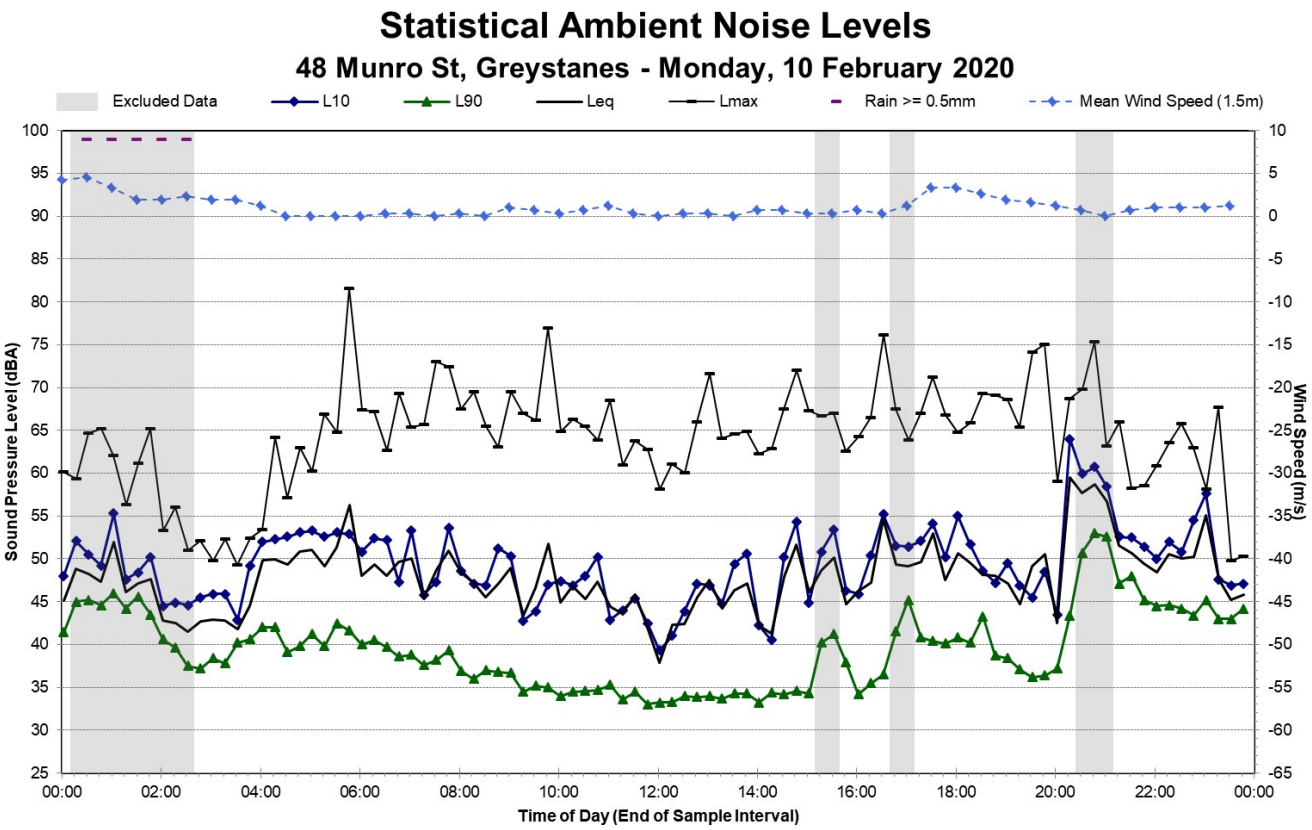

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Wednesday, 5 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

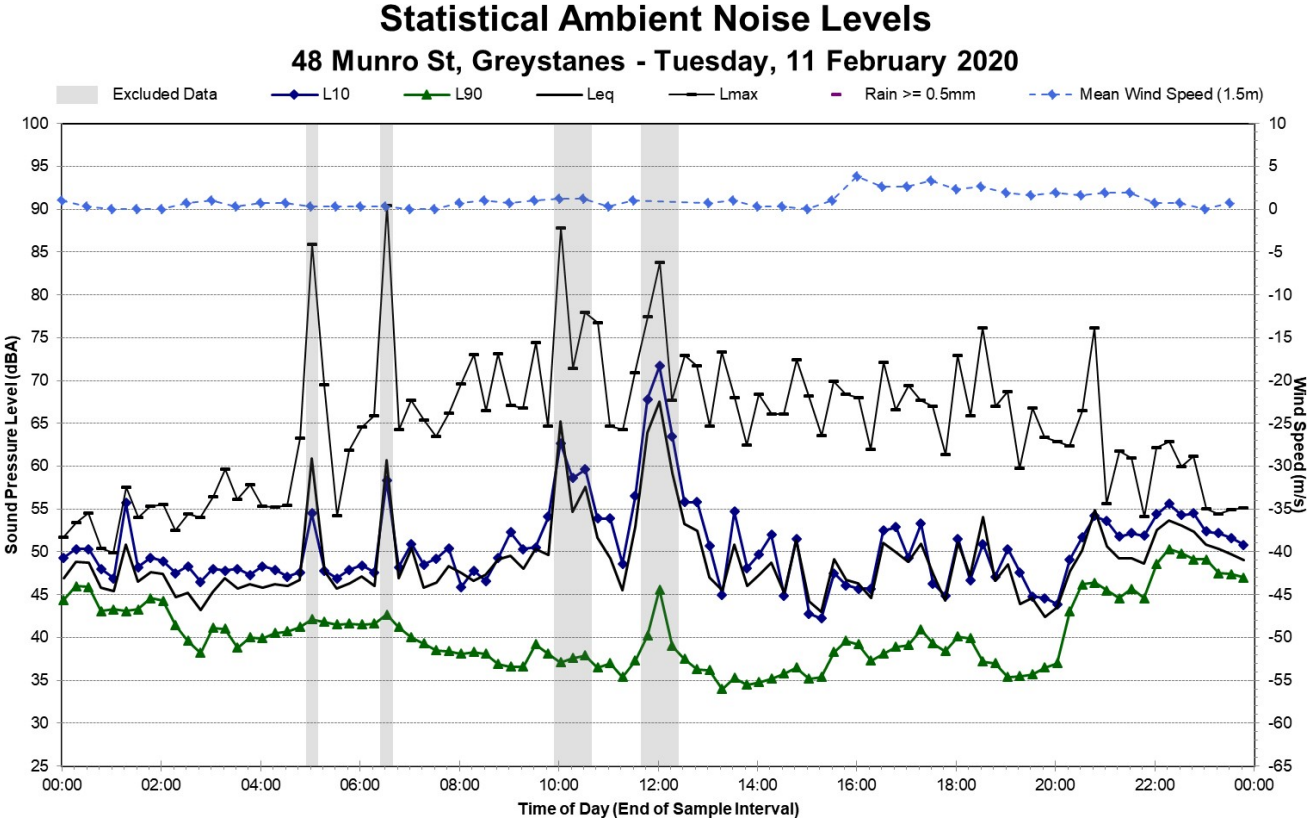

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Thursday, 6 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

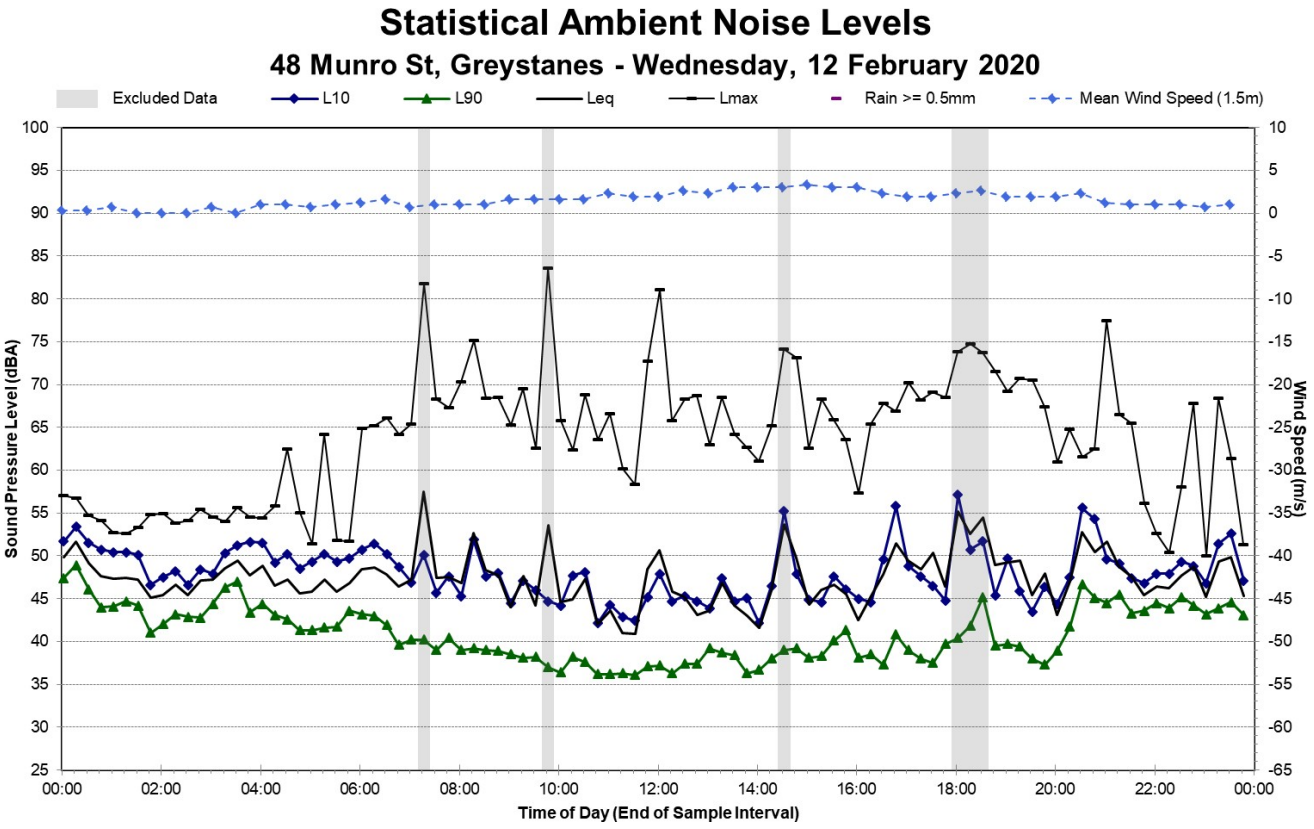

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Friday, 7 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

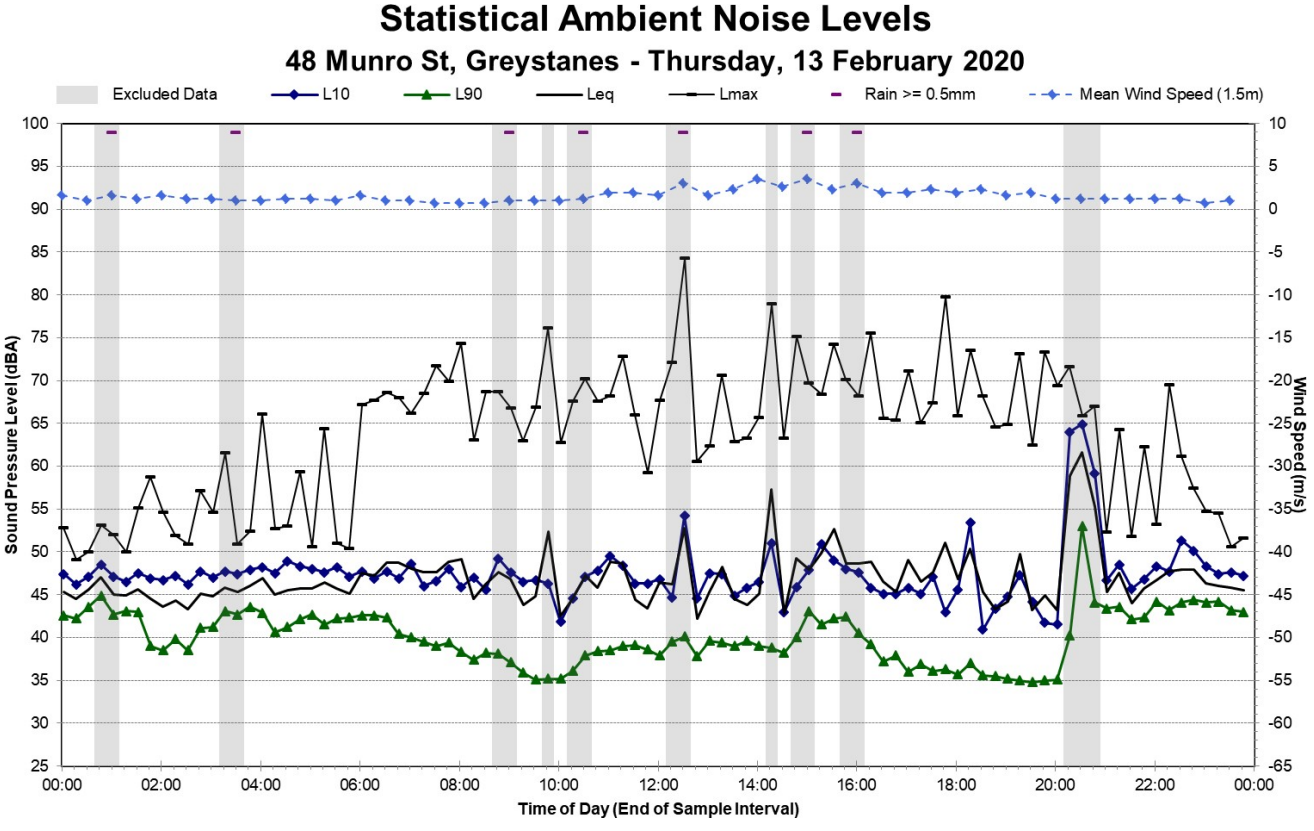

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Saturday, 8 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

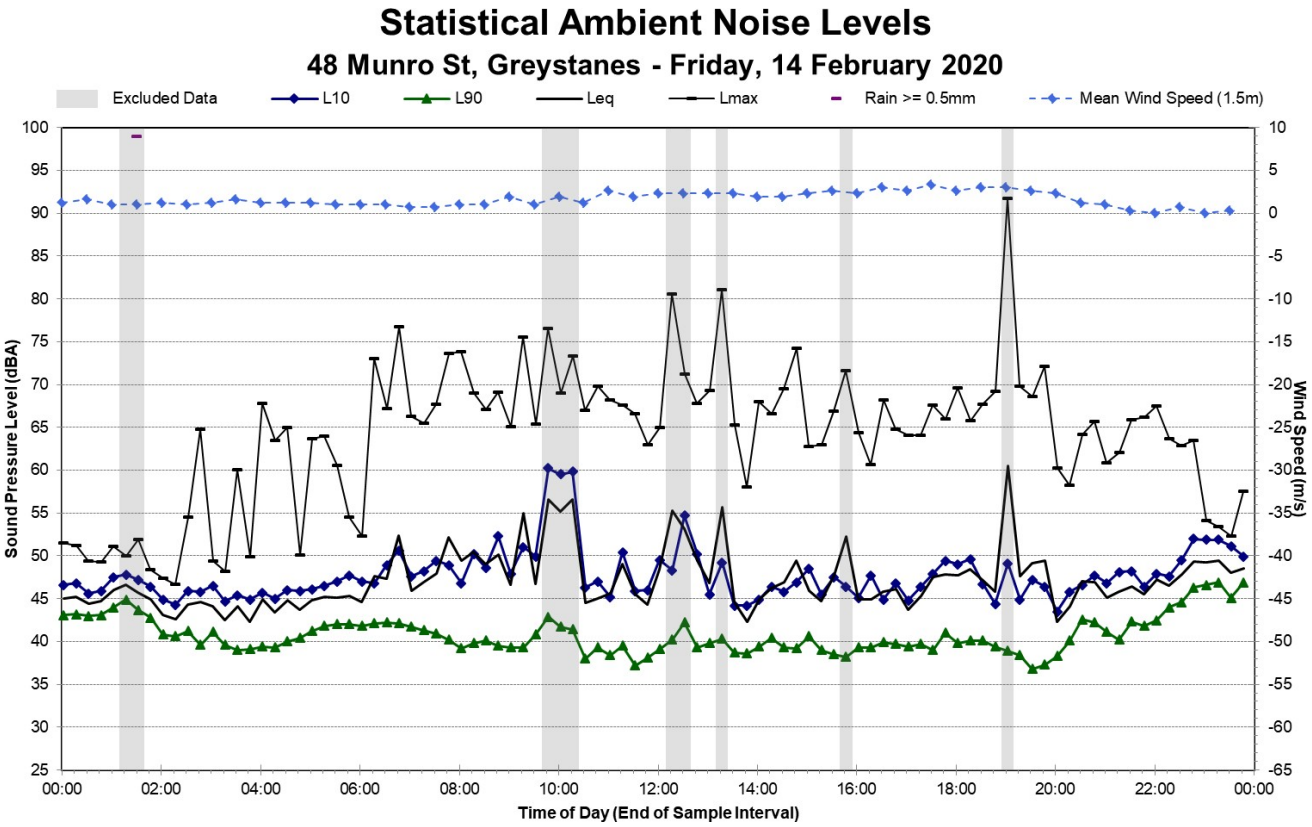

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Sunday, 9 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

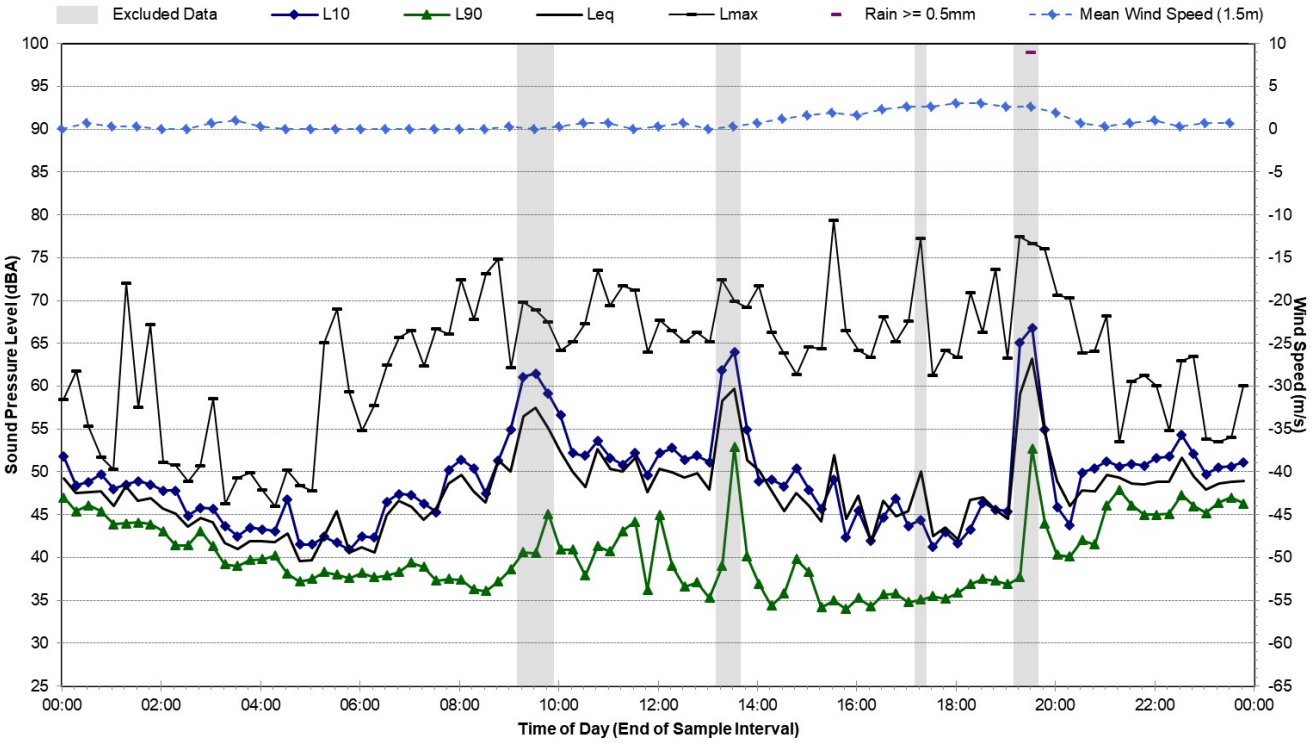

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Monday, 10 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

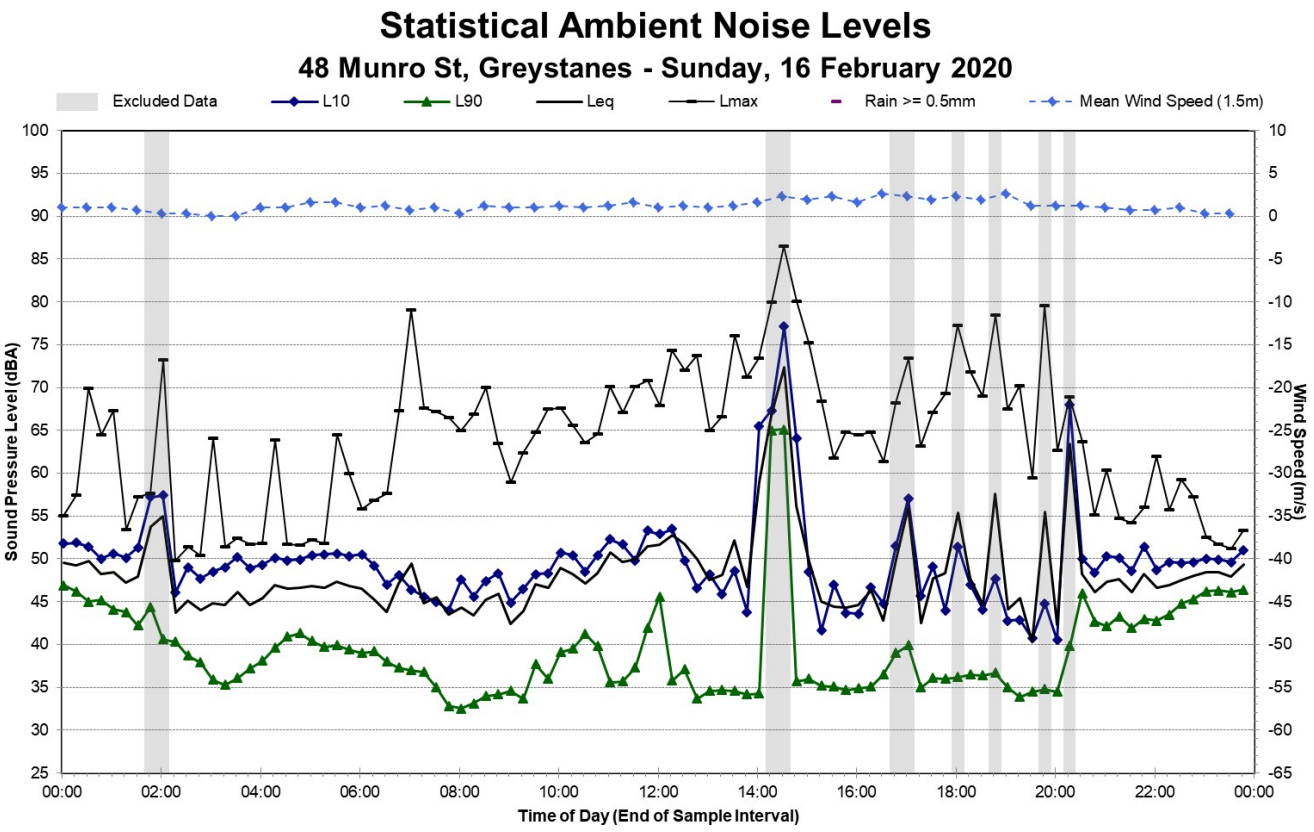

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Tuesday, 11 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

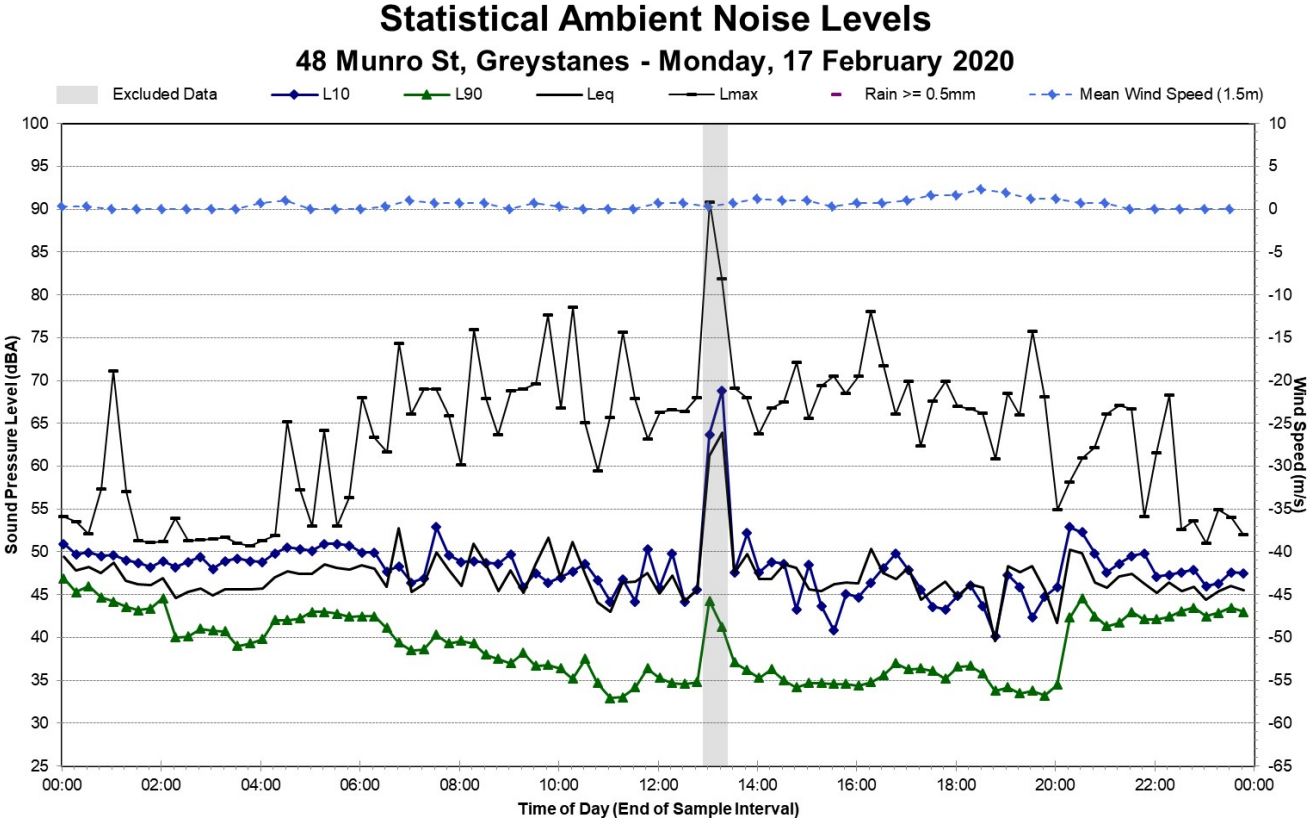

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Wednesday, 12 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

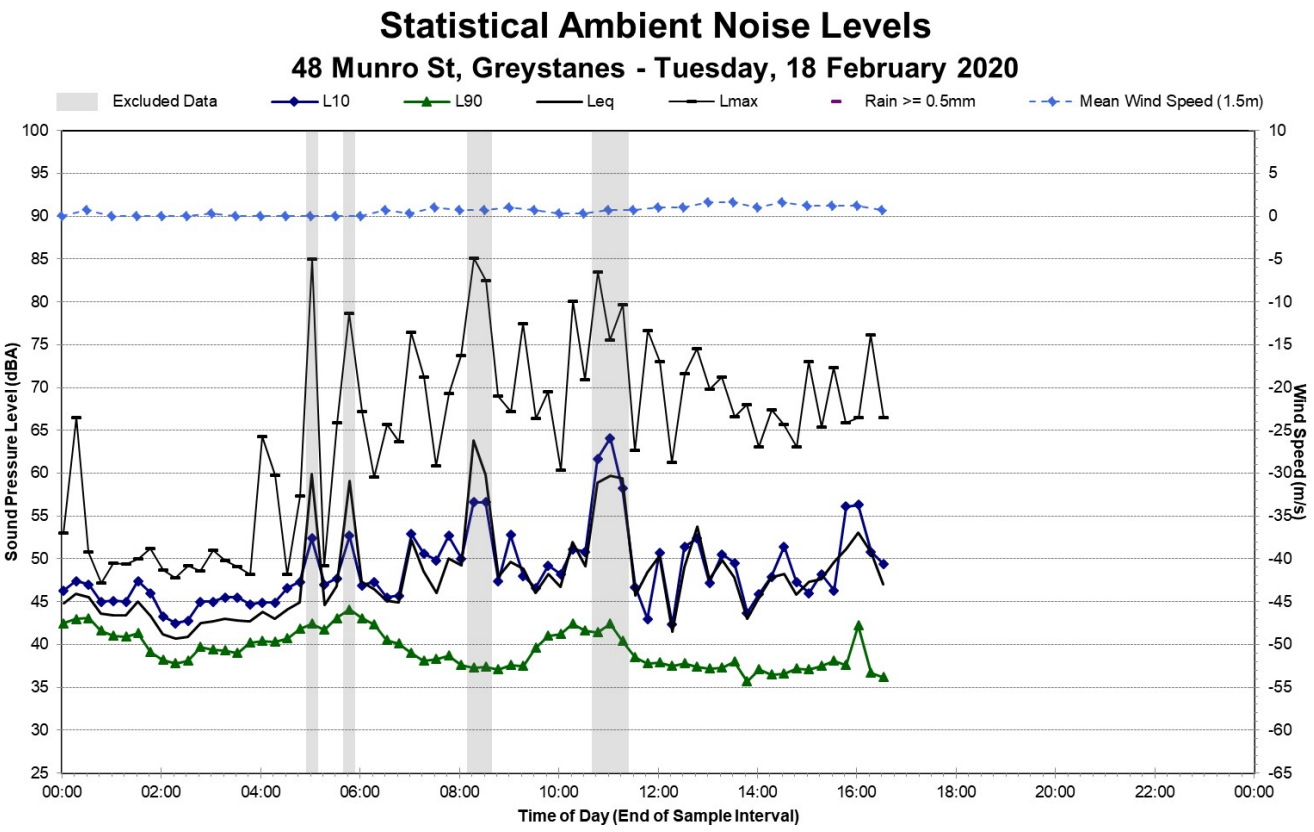

Statistical Ambient Noise Levels
48 Munro St, Greystanes - Thursday, 13 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
48 Munro St, Greystanes - Friday, 14 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
48 Munro St, Greystanes - Saturday, 15 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
48 Munro St, Greystanes - Sunday, 16 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
48 Munro St, Greystanes - Monday, 17 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
48 Munro St, Greystanes - Tuesday, 18 February 2020
Excluded Data
L10
L90
Leq
Lmax
Rain >= 0.5mm
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
10
5
0
-5
-10
-15
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02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00

Noise Monitoring Location	L.05
Noise Monitoring Address	**51 Pikes Lane, Eastern Creek**

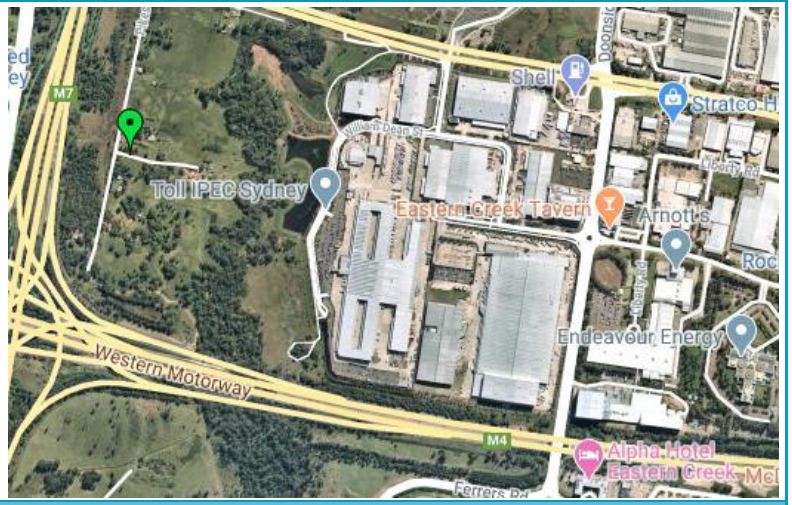
Logger Device Type: Svantek 957, Logger Serial No: 23247
Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2414604

Ambient noise logger deployed at residential address 51 Pikes Lane, Eastern Creek. Logger located in an open area approximately 250 m east of M7 Motorway, 450 m north of M4 Motorway and 500 m south of Great Western Highway.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from M7 Motorway, M4 Motorway and Great Western Highway. Nearby animals (birds, rooster) at the property also contribute to the L_{Aeq} at this location.

Recorded Noise Levels (L_{Amax}):
06/12/2018: Road traffic M4/M7/Great Western Hwy: 50-59 dBA, Motorcycle: 61 dBA, Birds: 60-70 dBA, Animals: 55-59 dBA

Map of Noise Monitoring Location



Ambient Noise Logging Results – NPfI Defined Time Periods

Monitoring Period 06/12/2018 - 17/12/2018	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	47	52	53	57
Evening	47	51	52	56
Night-time	41	52	50	54

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period 06/12/2018 - 17/12/2018	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	52	54
Night-time (10pm-7am)	53	57

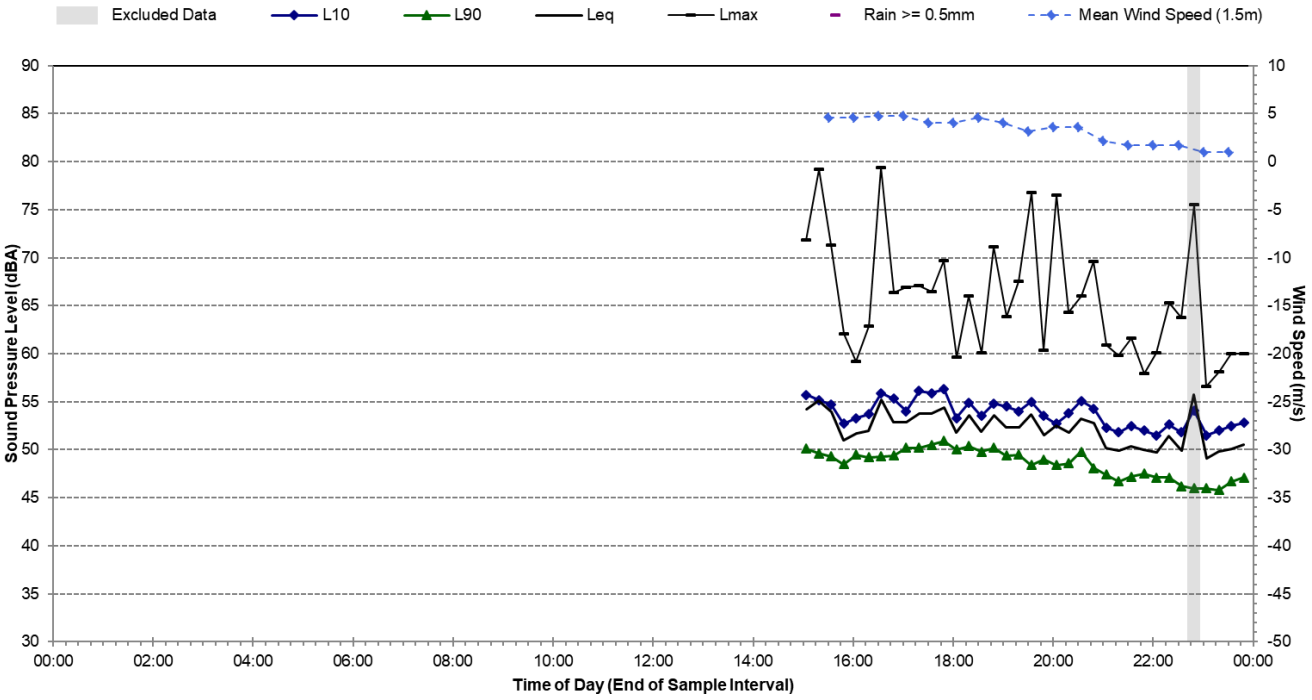
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
06/12/2018	15:12	50	53	70

Photo of Noise Monitoring Location

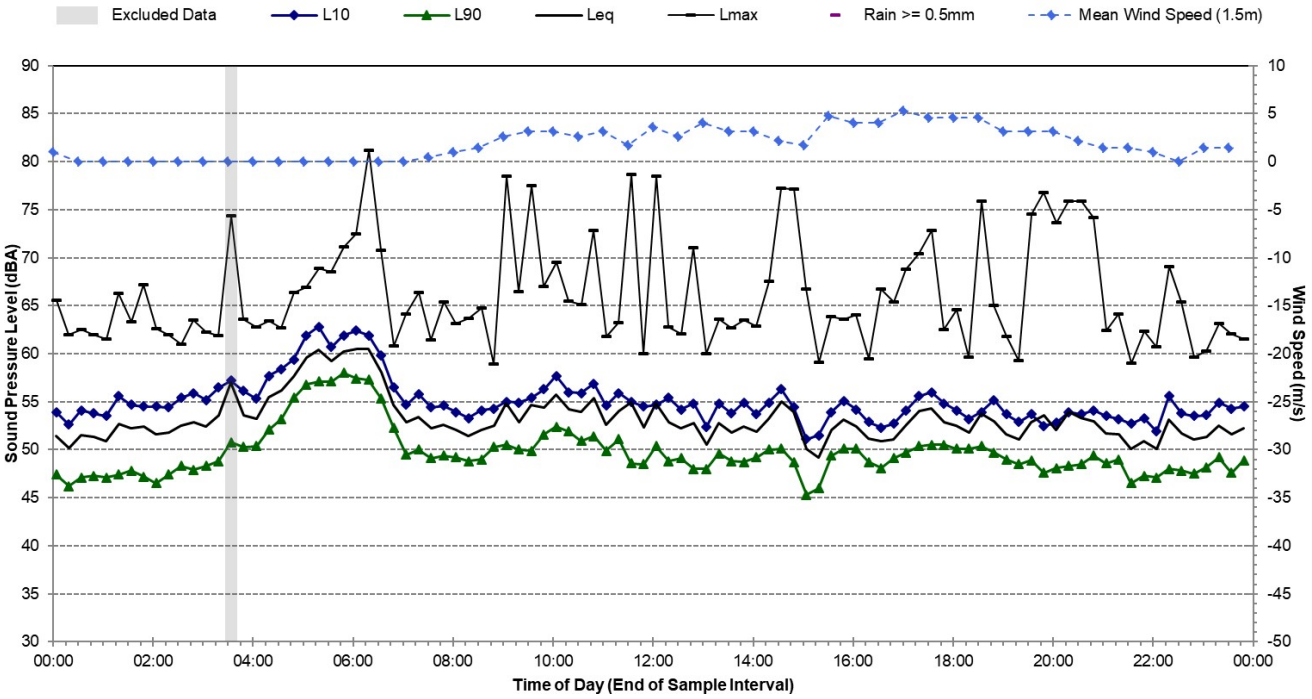
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Thursday, 6 December 2018



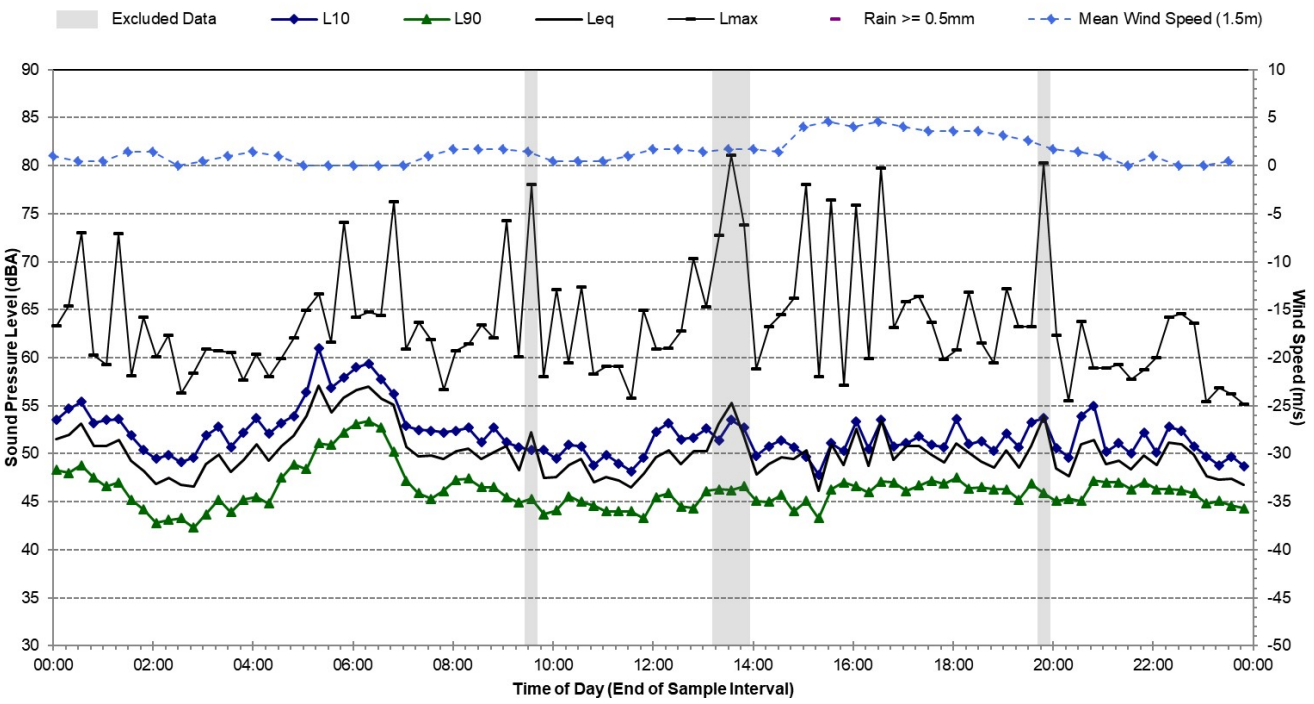
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Friday, 7 December 2018



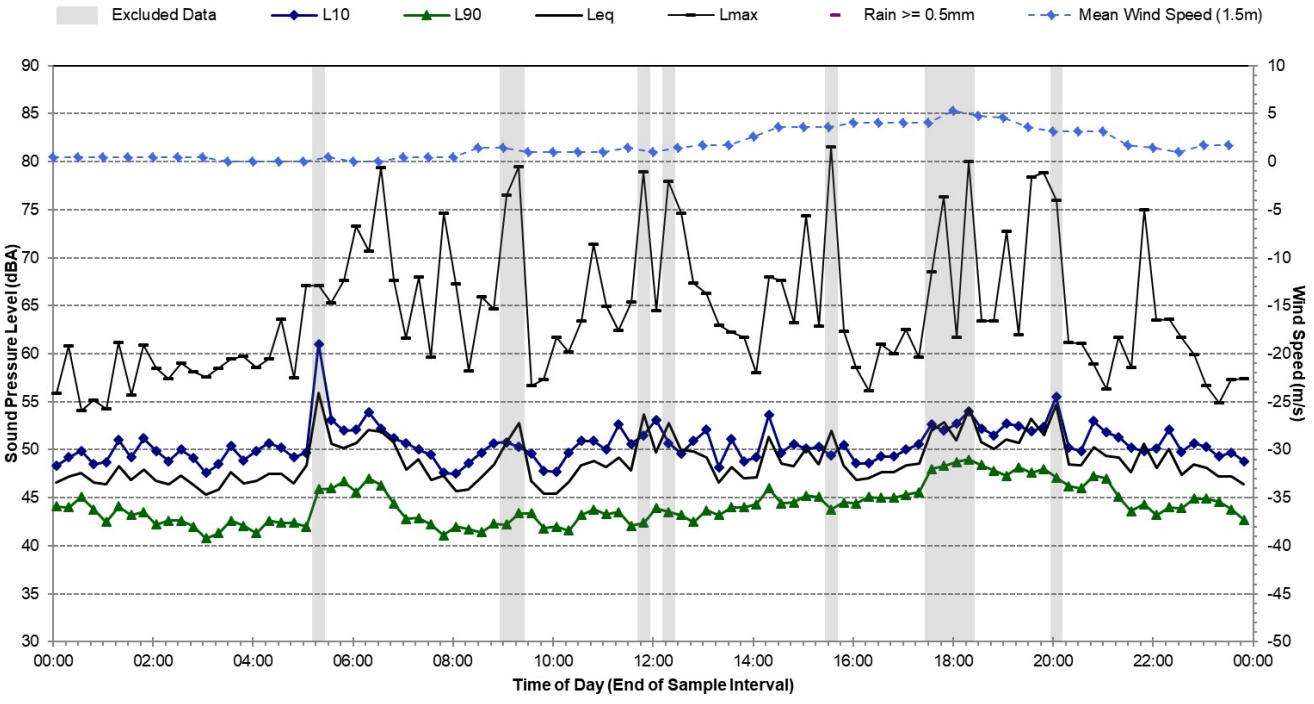
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Saturday, 8 December 2018



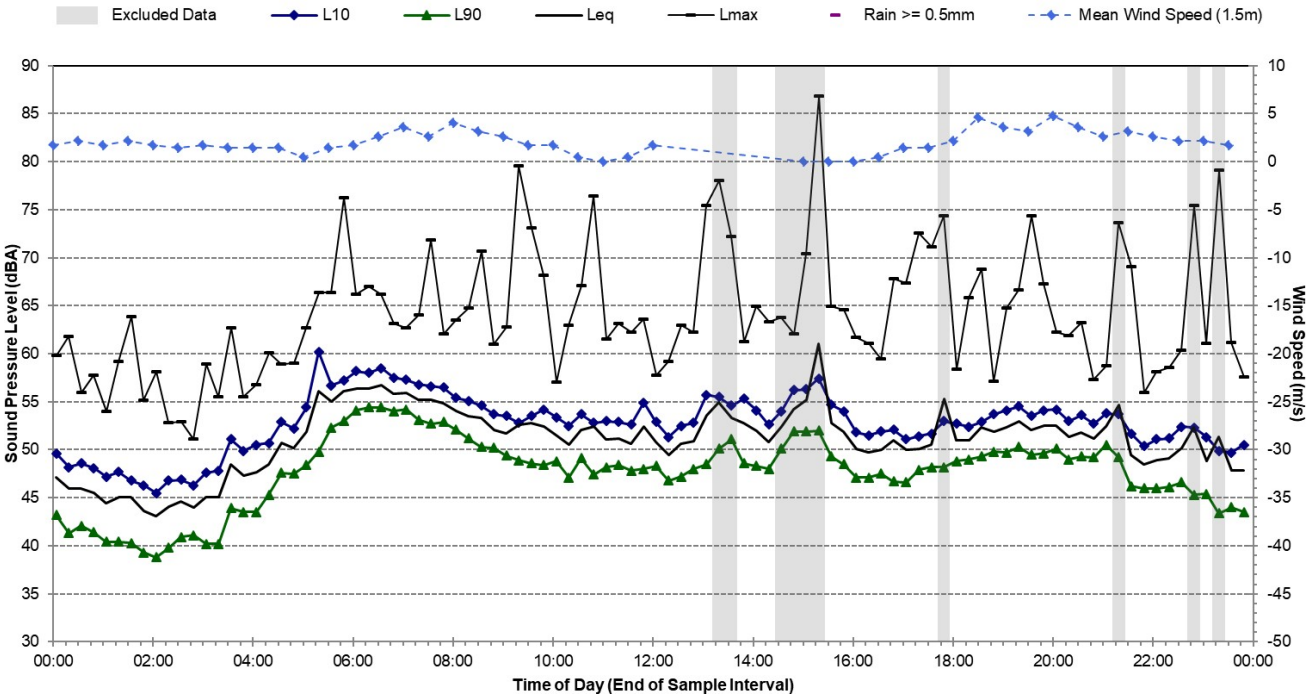
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Sunday, 9 December 2018



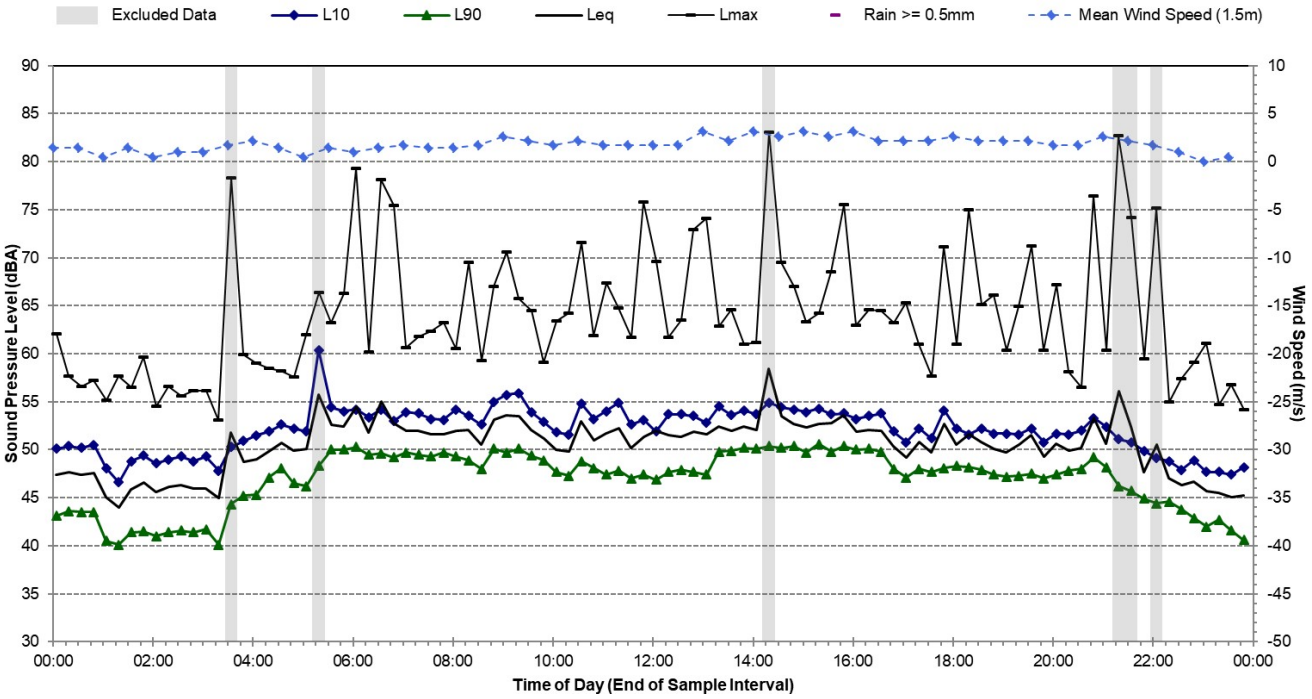
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Monday, 10 December 2018



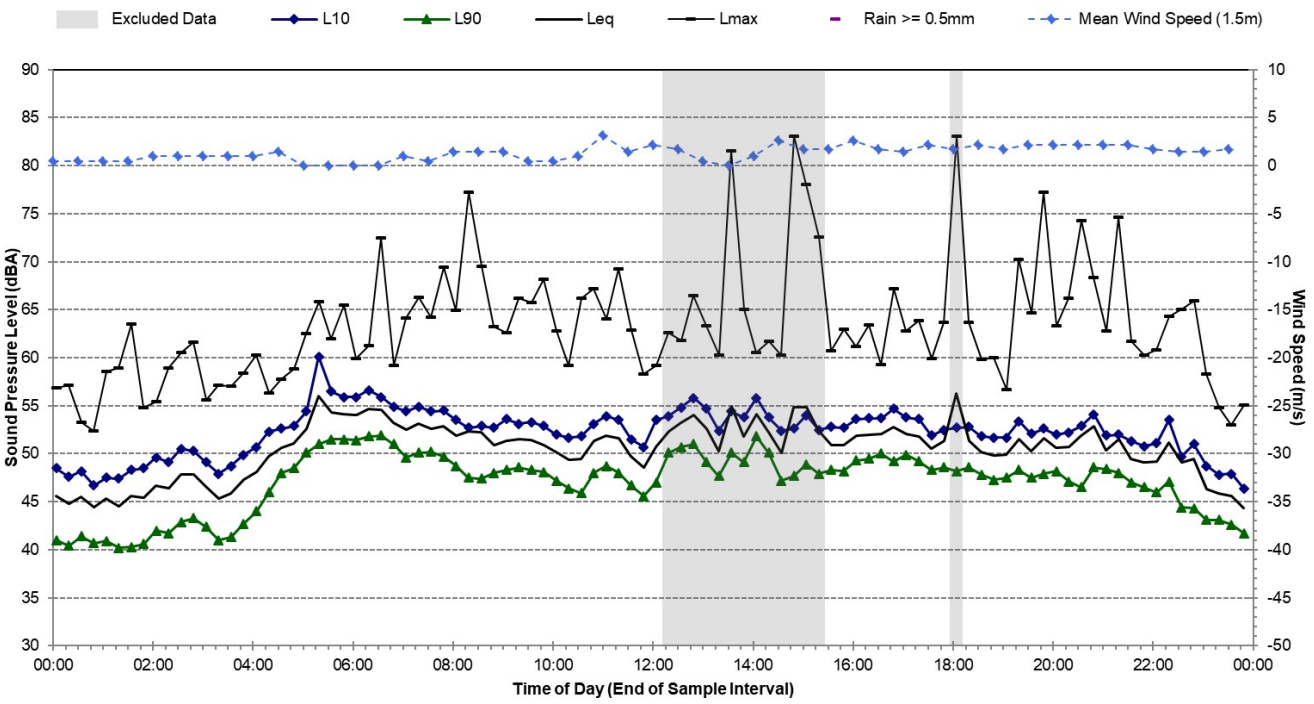
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Tuesday, 11 December 2018



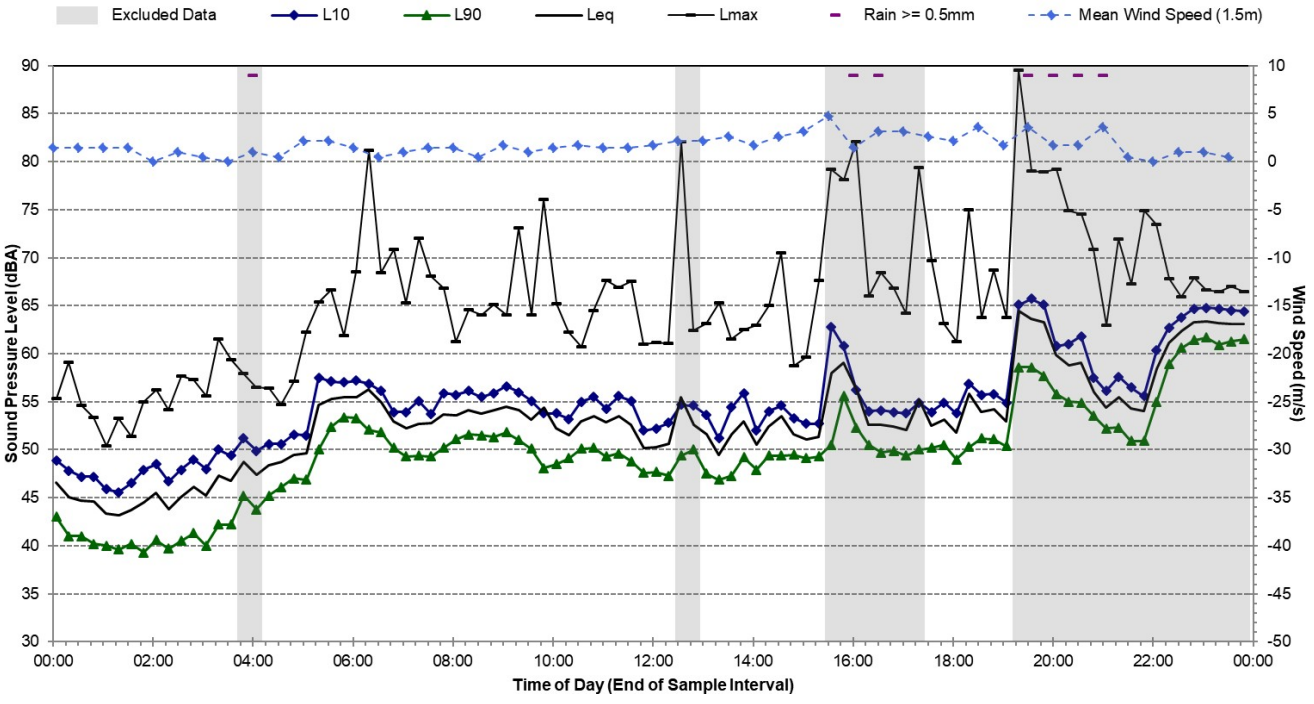
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Wednesday, 12 December 2018



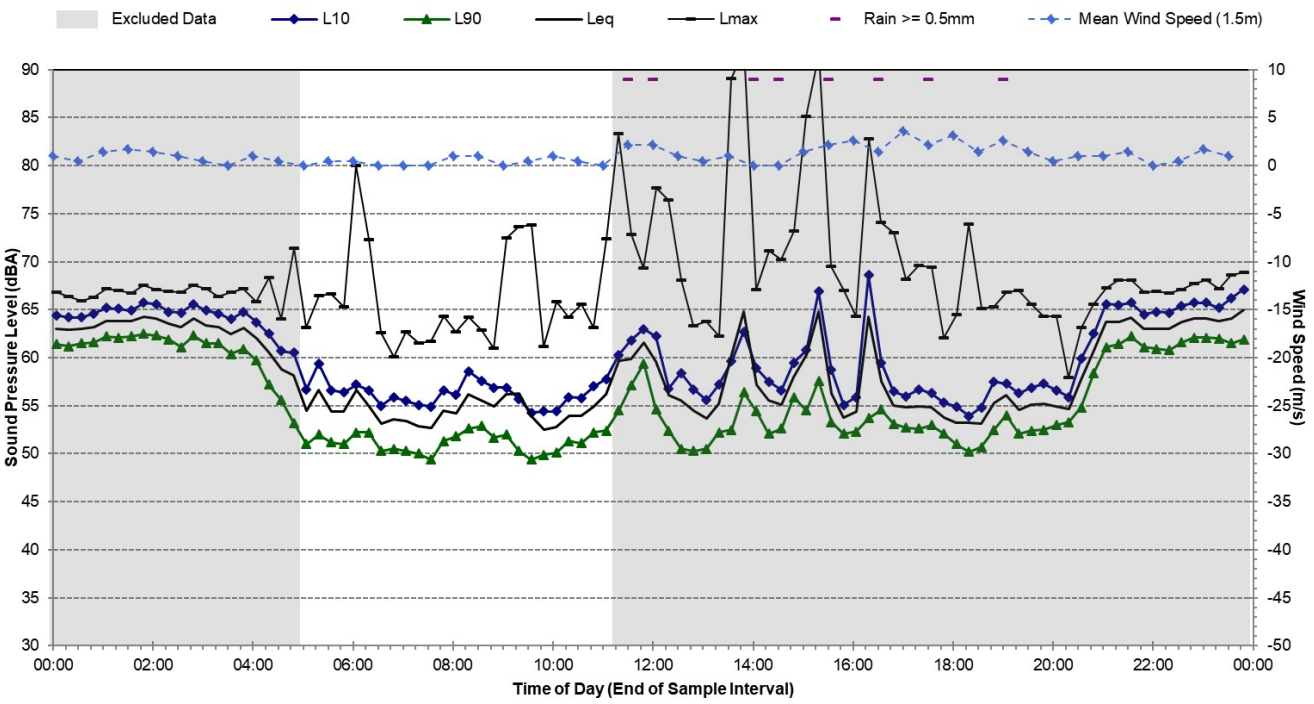
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Thursday, 13 December 2018



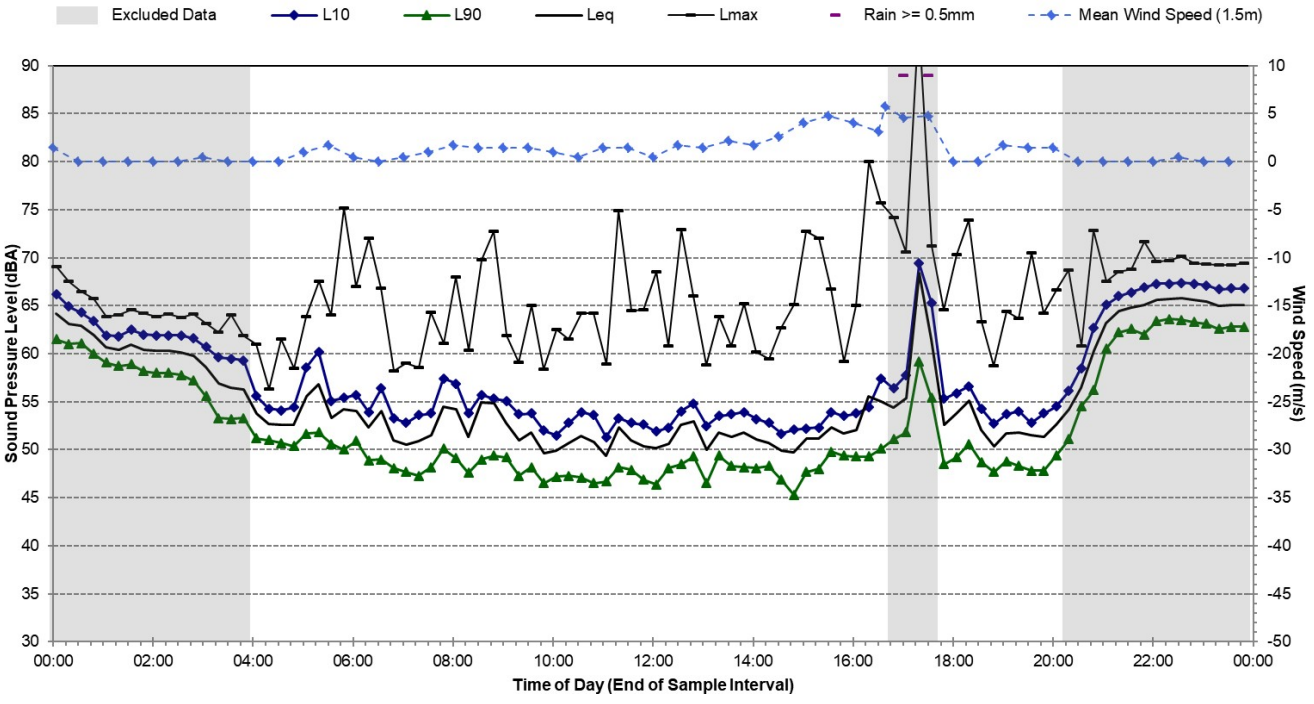
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Friday, 14 December 2018



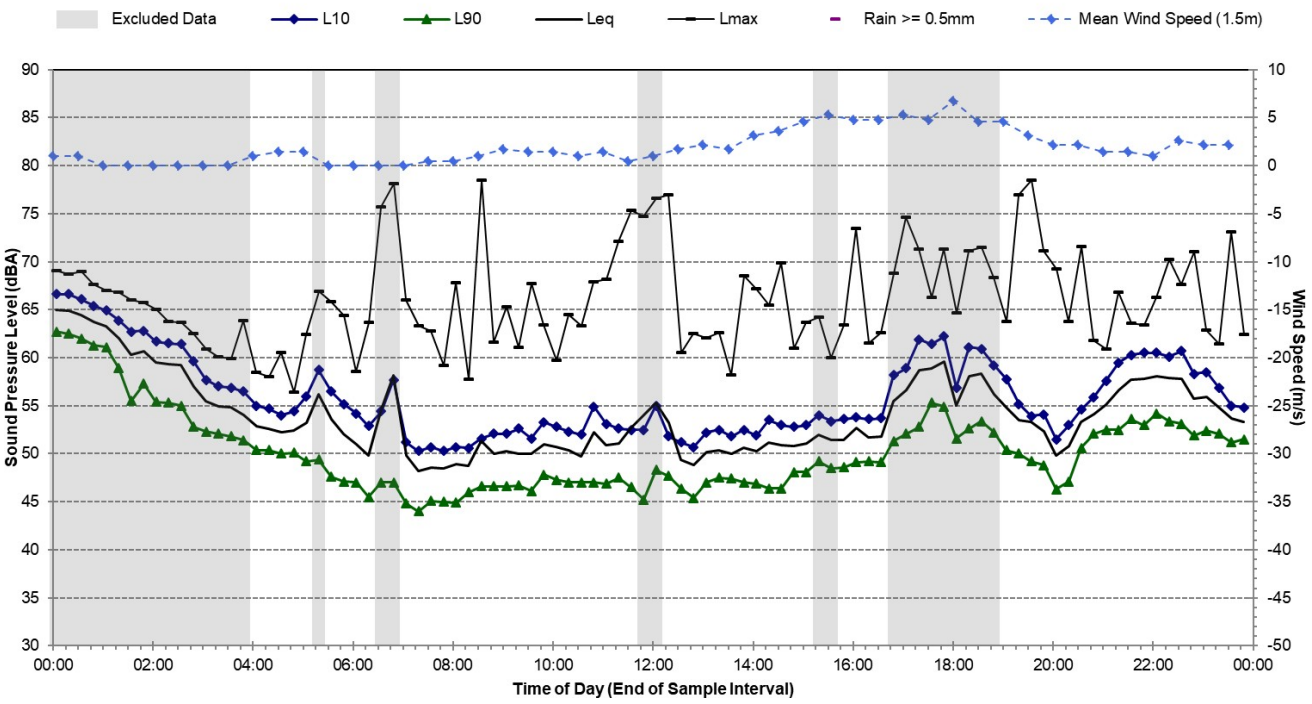
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Saturday, 15 December 2018



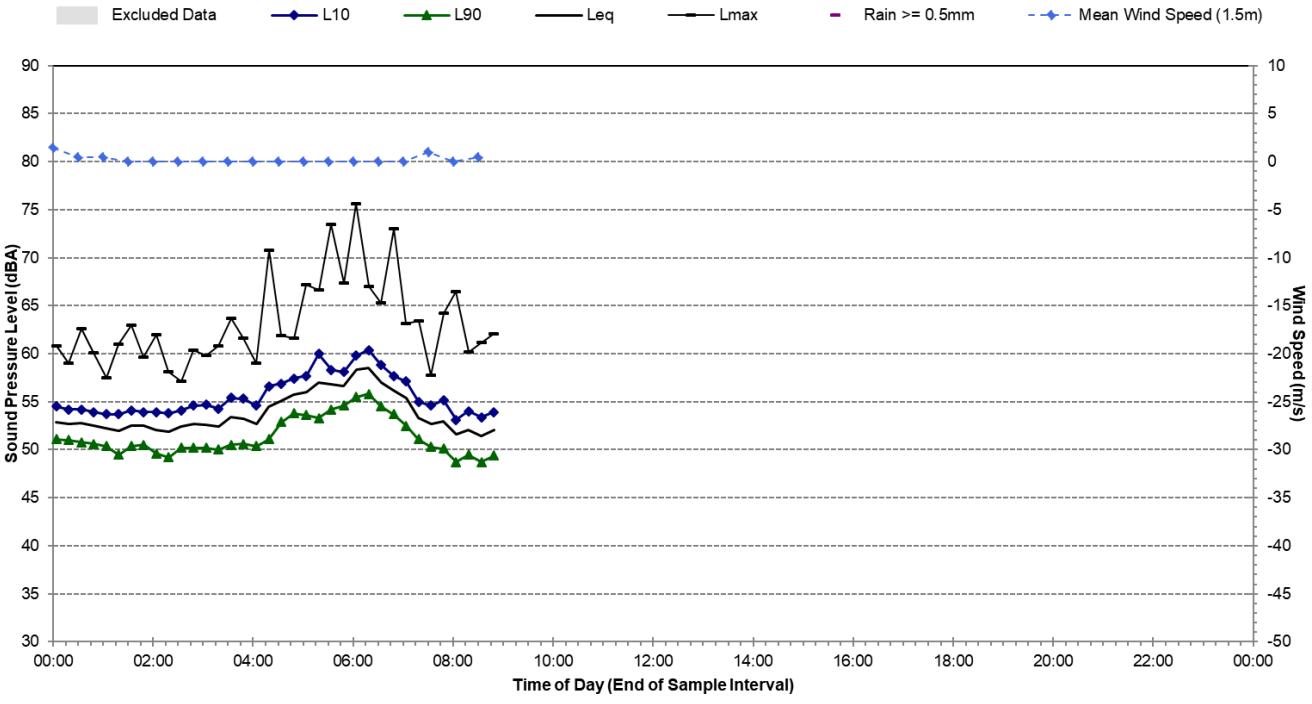
Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Sunday, 16 December 2018



Statistical Ambient Noise Levels

51 Pikes Lane, Eastern Creek - Monday, 17 December 2018



APPENDIX C

Weather Analysis

Adverse weather conditions such as wind and temperature inversions have the potential to increase noise levels from industrial or road noise sources at nearby receivers.

In order to determine the prevailing weather conditions for the Sydney International Speedway, 12 months of weather data (January 2019 to December 2019) was obtained from the Bureau of Meteorology automatic weather station at Horsley Park, which is approximately 3.5 kilometres to the south of the project site. This data was analysed to determine the frequency of noise enhancing wind and temperature inversion conditions which may affect noise levels at the site.

Wind

Wind has the potential to increase noise at a receiver when wind is light and stable, and blows from the direction of the source of noise to the receiver. At higher wind speeds, the noise produced by the wind can obscure noise generated from industrial and transport sources.

Wind effects need to be considered where wind is a feature of the project area. The NPfI states that where wind blows from the source to the receiver at speeds up to three metres per second for more than 30 per cent of the daytime, evening or night-time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

The measured weather data was analysed to determine the frequency of occurrence of wind speeds up to three metres per second in each period. The results of the wind analysis for the daytime, evening and night-time periods are presented in **Table A3-1**, **Table A3-2** and **Table A3-3**, respectively. In each table, the wind direction and percentage occurrence are those dominant during each season.

Table A3-1 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Daytime

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	N	9.6	13.5	6.5	20.1
Summer	NNE	9.0	12.2	8.8	21.0
Autumn	N	12.8	16.0	7.1	23.0
Winter	WNW	11.5	16.4	5.3	21.7
Spring	N	5.1	12.5	8.0	20.5

Table A3-2 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Evening

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	S	16.6	11.0	8.5	19.5
Summer	E	6.3	12.6	14.7	27.3
Autumn	S	24.4	13.0	8.1	21.1
Winter	SW, SSW, WSW	20.4	16.9, 15.5, 17.1	16, 15.9, 13.8	32.9, 31.4, 30.9
Spring	SE	15.2	13.4	9.3	22.7

Table A3-3 Seasonal Frequency of Occurrence of Wind Speed Intervals in 2019 – Night-time

Season	Dominant Wind Direction	Frequency of Occurrence (per cent)			
		Calm	0.5 to 2 metres per second	2 to 3 metres per second	0.5 to 3 metres per second
Annual	SW	35.6	17.7	11.4	29.1
Summer	S	36.2	18.4	9.1	27.5
Autumn	SW, WSW	43.0	19.3, 19.5	12.8, 11.3	32.1, 30.8
Winter	WSW, SW, W	26.1	20.4, 18.0, 19.3	18.4, 18.8, 12.5	38.8, 36.8, 31.8
Spring	SW	37.3	19.0	8.5	27.5

The above analysis of prevailing wind conditions indicates that during the daytime periods, winds of up to 3 metres per second did not exceed the 30 per cent threshold during any season. However, the 30 per cent threshold was exceeded during the night-time period in Autumn in both the south-west and west-south-west directions, as well as during the evening and night-time period in winter, in the south-west, west and west-south-west directions.

Based on the prevailing wind analysis conducted for the 2019 weather data, wind was found to be a feature of the area during the evening and night-time periods.

Temperature Inversions

Temperature inversions have the ability to increase noise levels by focusing sound waves towards sensitive receivers. Temperature inversions occur predominantly at night-time when the atmosphere is stable and temperatures are cooler. For a temperature inversion to be a significant characteristic of the area, the NPfI defines that it needs to occur for approximately 30 per cent of the total night-time during winter. This equates to approximately two nights per week.

The Pasquill-Gifford assignment scheme identifies seven Stability Classes – A to G – to categorise the degree of atmospheric stability, as shown in **Table A3-4**.

Table A3-4 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Extremely unstable
B	Moderately unstable
C	Slightly unstable
D	Neutral
E	Slightly stable
F	Moderately stable
G	Extremely stable

The measured weather data has been analysed to determine the frequency of each stability class and is presented in **Table A3-5**. Noise enhancing temperature inversions are categorised as atmospheric stability Class F or Class G.

Table A3-5 Night-time Stability Class Distribution – 2019

Stability Class	Frequency of Occurrence (per cent)				
	Annual	Summer	Autumn	Winter	Spring
A	0.0	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0
D	45.1	49.3	40.2	49.4	41.8
E	12.1	13.5	11.5	10.3	13.2
F	12.2	10.9	10.3	14.3	13.2
G	30.6	26.3	38.0	26.0	31.9
F+G	42.7	37.2	48.3	40.3	45.1

The above analysis indicates that temperature inversions of Class F or Class G occur more than 30 per cent of the night-time period during all four seasons.

Based on this analysis of the 2019 weather data, temperature inversions are a feature of the area during the night-time period.

APPENDIX D

Construction Information

Table 1 Equipment Lists and Sound Power Levels

Equipment			Asphalt Milling Machine[1]	Back Hoe (7.5 tonne JCB)	Bitumen Spray Truck	Bobcat	Chipper	Concrete Mixer Truck	Concrete Pump	Concrete Saw[1]	Concrete Vibrator	Dozer	Dump Truck (approx. 15 tonne)	Elevated Working Platform	Excavator (22 tonne)	Front End Loader	Generator	Grader	Hand Tools	Line Marking Plant	Mobile Crane (100 tonne)	Mobile Crane (35 tonne)	Piling - Bored	Road Sweeper	Roller - Vibratory (12 tonne)[1]	Semi Trailer	Slip Form Machine	Truck	Ute	Wacker Rammer[1]	Water Tanker (8000 litre)	Scraper	Jackhammer
Sound Power Level[2]			116	102	100	104	120	103	106	124	102	114	107	97	105	110	102	108	94	98	100	98	111	98	114	106	102	108	98	113	98	113	113
ID	**Scenario**	**Activity**																															
1a	Temporary Works	Establish site compound						X							X	X	X					X							X	X			
1b		Enabling works						X							X	X	X					X							X	X			
2a	Stage 1 – Areas 1, 5, 6 and 7	Site clearance					X					X	X		X	X		X											X	X		X	X	
3b		Earthworks										X	X		X	X		X							X				X	X		X	X	
3c		Drainage works													X				X						X				X	X	X			
3d		Utilities connections		X				X		X			X	X	X	X													X	X				X
3e		Construction of racing infrastructure						X	X		X			X	X						X				X		X	X		X				
3f		Construction of event support infrastructure						X	X			X	X	X	X						X		X			X			X					
3g		Construction of internal road			X			X				X			X			X		X					X		X	X	X					
3h		Construction of carparks			X			X				X			X			X							X		X	X	X	X				
4a	Stage 2 – Areas 2, 4 and 7	Site clearance					X					X	X		X	X		X											X	X		X	X	
4b		Earthworks										X	X		X	X		X							X				X	X		X	X	
4c		Drainage works													X				X						X				X	X	X			
4d		Construction of carparks			X			X				X			X			X							X		X	X	X	X				
5a	Stage 3 – Area 3	Site clearance					X					X	X		X	X		X											X	X		X	X	
5b		Earthworks										X	X		X	X		X							X				X	X		X	X	
5c		Drainage works													X				X						X				X	X	X			
5d		Construction of carparks						X				X			X			X		X					X		X	X	X	X				

Equipment			Asphalt Milling Machine[1]	Back Hoe (7.5 tonne JCB)	Bitumen Spray Truck	Bobcat	Chipper	Concrete Mixer Truck	Concrete Pump	Concrete Saw[1]	Concrete Vibrator	Dozer	Dump Truck (approx. 15 tonne)	Elevated Working Platform	Excavator (22 tonne)	Front End Loader	Generator	Grader	Hand Tools	Line Marking Plant	Mobile Crane (100 tonne)	Mobile Crane (35 tonne)	Piling - Bored	Road Sweeper	Roller - Vibratory (12 tonne)[1]	Semi Trailer	Slip Form Machine	Truck	Ute	Wacker Rammer[1]	Water Tanker (8000 litre)	Scraper	Jackhammer
Sound Power Level[2]			116	102	100	104	120	103	106	124	102	114	107	97	105	110	102	108	94	98	100	98	111	98	114	106	102	108	98	113	98	113	113
ID	**Scenario**	**Activity**																															
6a		Asphalting	X		X	X							X											X	X			X	X	X			X
6b		Landscaping				X						X	X		X	X			X									X	X		X		
6c		Signage and Line marking													X				X	X		X						X	X	X			
7a	Southern Area Stockpiling	Earthworks										X			X			X							X			X			X		

Note 1: Equipment classed as 'annoying' in the ICNG, due to being highly noise intensive, tonal and/or intermittent, and requires an additional 5 dB correction.

Note 2: Sound power level data is taken from the DEFRA Noise Database, RMS *Construction and Vibration Guideline* and TfNSW *Construction Noise and Vibration Strategy*.

Table 2 Predicted NML Exceedances, All Receiver Types – NCA01

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	397	-	-	-	-	2	-	-	2	-	-	2	-	-	2	-	-
Stage 2 - Carpark A1 & D2	Drainage works	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	397	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA02

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	233	-	-	-	-	1	-	-	1	-	-	1	-	-	1	-	-
Stage 2 - Carpark A1 & D2	Drainage works	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	233	-	-	-	-	1	-	-	1	-	-	1	-	-	1	-	-
Stage 3 - Carpark C	Drainage works	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA03

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2 - Carpark A1 & D2	Drainage works	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	913	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA04

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2 - Carpark A1 & D2	Drainage works	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA05

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2 - Carpark A1 & D2	Drainage works	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA06

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2 - Carpark A1 & D2	Drainage works	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	1823	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

Predicted NML Exceedances, All Receiver Types – NCA07

Scenario	Activity	Number of Receivers																
		Total	HNA[1]	With NML Exceedance[2]														
				Standard Daytime			Out of Hours Works[3]											
							Daytime OOH			Evening			Night-time			Sleep Disturbance		
				1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Temporary Works	Establish site compound/Enabling Works	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 - Carpark A2, D1 & Speedway area	Stadium and buildings	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2 - Carpark A1 & D2	Drainage works	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 3 - Carpark C	Drainage works	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Clear & Grub	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 4 - main site (A1, A2 and speedway area)	Signage & Line marking	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Asphalting	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Area Stockpiling works	Earthworks	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).
Note 2: Based on worst-case predicted noise levels.
Note 3: OOH = Out of hours.

The actions set out in the summary of the standard mitigation measures below must be implemented on all Sydney Metro construction projects.

Table 3 CNVS Summary of the Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management measures		
Implementation of any project specific mitigation measures required	Airborne noise Ground-borne noise and vibration	In addition to the measures set out in this table, any project specific mitigation measures identified in the environmental assessment documentation (e.g. EA, REF, submissions or representations report) or approval or licence conditions must be implemented.
Implement community consultation measures	Airborne noise Ground-borne noise and vibration	Periodic Notification (monthly letterbox drop)1 Website Project information and construction response telephone line Email distribution list Place Managers
Register of Noise Sensitive Receivers	Airborne noise Ground-borne noise and vibration	A register of all noise and vibration sensitive receivers (NSRs) would be kept on site. The register would include the following details for • Address of receiver • Category of receiver (e.g. Residential, Commercial etc.) • Contact name and phone number
Site inductions	Airborne noise Ground-borne noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios; on site. No dropping of materials from height; throwing of metal items; and slamming of doors. No excessive revving of plant and vehicle engines Controlled release of compressed air.
Monitoring	Airborne noise Ground-borne noise and vibration	A noise monitoring program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.

[1] Detailing all upcoming construction activities at least 14 days prior to commencement of relevant works

Action Required	Applies To	Details
Attended vibration measurements	Ground-borne vibration	Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria further vibration site law investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.
Source controls		
Construction hours and scheduling	Airborne noise Ground-borne noise and vibration	Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods.
Construction respite period	Ground-borne noise and vibration Airborne noise	High noise and vibration generating activities[2] may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block[3].
Equipment selection	Airborne noise Ground-borne noise and vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits.
Maximum noise levels	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power Levels compliant with the criteria in Table 11 of the CNVS.
Rental plant and equipment	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 11 of the CNVS.
Plan worksites and activities to minimise noise and vibration	Airborne noise Ground-borne vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Minimise disturbance arising from delivery of goods to construction sites	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from NSRs Select site access points and roads as far as possible away from NSRs Dedicated loading/unloading areas to be shielded if close to NSRs Delivery vehicles to be fitted with straps rather than chains for unloading, wherever feasible and reasonable

[2] Includes jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling.

[3] "Continuous" includes any period during which there is less than a 60 minutes respite between ceasing and recommencing any of the work.

Action Required	Applies To	Details
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.

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