# THE NEW SYDNEY FISH MARKET

## SSDA Noise Impact Assessment

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# BASIS OF REPORT

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# DOCUMENT CONTROL

| Reference | Date | Prepared | Checked | Authorised |
|---|---|---|---|---|
| 610.17565-R01-v1.7 | 1 April 2019 | Joshua Ridgway & Alex Campbell | Antony Williams | Alex Campbell |
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# CONTENTS

**1 INTRODUCTION ..... 7**

**2 PROJECT BACKGROUND AND OVERVIEW ..... 7**

2.1 Background ..... 7
2.2 Site and Context ..... 7
2.3 Approval Strategy ..... 8
2.4 Summary of the Development ..... 8
2.4.1 Concept Development Application 9
2.4.2 Main Works Development Application 9
2.5 Purpose of this Report ..... 10
2.6 Proposed Works ..... 11
2.6.1 Early Works 11
2.6.2 New Construction 11
2.7 Potentially Affected Receivers ..... 11

**3 AMBIENT NOISE ENVIRONMENT ..... 15**

3.1.1 Road Traffic Noise 15
3.1.2 Railway Noise 15
3.1.3 Industrial Noise Sources 15
3.2 Unattended Noise Monitoring ..... 15
3.3 Attended Noise Monitoring ..... 17

**4 ASSESSMENT CRITERIA ..... 18**

4.1 Secretary's Environmental Assessment Requirements (SEARs) ..... 18
4.2 Summary of Adopted Assessment Criteria ..... 19
4.3 NSW Interim Construction Noise Guideline ..... 19
4.3.1 Residential Receivers 19
4.3.1.1 Commercial and Industrial Premises ..... 20
4.3.1.2 Other Sensitive Land Uses ..... 20
4.3.2 NML Summary 21
4.4 Construction Vibration Guidelines ..... 22
4.4.1 Human Comfort Vibration 23
4.4.2 Effects on Building Contents 23
4.4.3 Structural Damage Vibration 23

# CONTENTS

4.4.4 General Vibration Screening Criterion 24
4.4.5 Heritage 24
4.5 Operational Noise - Industrial Noise Sources ..... 25
4.5.1 Assessing Intrusiveness 25
4.5.2 Assessing Amenity 25
4.5.3 Modifying Factors 26
4.5.4 NPfI Assessment of Prevailing Weather Conditions 27
4.5.5 Shoulder Periods 27
4.5.6 Development Specific Operational Noise Trigger Levels 27
4.6 Operational Noise – Patron Areas ..... 29
4.7 Operational Noise – Road Noise on Surrounding Network ..... 30

**5 NOISE IMPACT ASSESSMENT ..... 31**
5.1 Noise Model ..... 31
5.2 Construction Assessment ..... 31
5.2.1 Working Hours 31
5.2.2 Source Location 31
5.2.3 Calculation Type 32
5.2.4 Noise Sources 32
5.2.5 Results 33
5.2.6 Piling Noise Detailed Assessment 34
5.2.6.1 Main development piling ..... 34
5.2.6.2 Sheet piling ..... 36
5.2.7 Construction Noise Mitigation and Management 36
5.2.7.1 Consultation with Key Stakeholders ..... 37
5.2.7.2 Noise Monitoring Procedures ..... 37
5.2.7.3 Site Contact / Complaints Process ..... 37
5.2.8 Construction Vibration Impacts 37
5.2.9 Vibration Assessment 38
5.2.10 Vibration Mitigation 38
5.3 Operational Noise Assessment ..... 39
5.3.1 Operational Noise Sources 39
5.3.2 Predicted Noise Levels 40

# CONTENTS

5.3.3 Mitigation Assessment – Loading Dock 41
5.3.4 Post Mitigation Noise Levels 42
5.3.5 Mitigation – Mechanical Plant 43
5.3.6 Residual Exceedances 44
5.4 Patron Noise Assessment ..... 45
5.4.1 Patron Activity Noise Sources 46
5.4.2 Predicted Noise Levels 46
5.4.3 Road Noise – Impacts on Surrounding Road Network 48

**6 CONCLUSION ..... 49**
6.1 Construction Noise and Vibration Impacts ..... 49
6.2 Operational Noise and Vibration Impacts ..... 49

# DOCUMENT REFERENCES

## TABLES

Table 1 Identified Surrounding Receivers ..... 13
Table 2 Ambient Noise Logger Overview ..... 16
Table 3 Measured Ambient Noise Levels Corresponding to NPfI Assessment Time Periods ..... 17
Table 4 Project Related Noise and Vibration SEARs – SSDA 8924 ..... 18
Table 5 Project Related Noise and Vibration SEARs – SSDA 8925 ..... 18
Table 6 Noise and Vibration Guidelines and Policies ..... 19
Table 7 Determination of NMLs for Residential Receivers ..... 20
Table 8 NMLs for Other Sensitive Receivers ..... 21
Table 9 Receiver NMLs for Construction ..... 22
Table 10 Preferred and Maximum Vibration Dose Values for Intermittent Vibration ..... 23
Table 11 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage ..... 24
Table 12 Recommended Maximum LAeq Noise Levels from Industrial Noise Sources ..... 26
Table 13 Modifying Factors from NPfI Table C1 ..... 27
Table 14 Project Noise Trigger Levels ..... 28
Table 15 Project Specific Noise Limits – Patron Areas ..... 29
Table 16 Construction Noise Sources – Sound Power Levels ..... 32
Table 17 Summary of Construction Noise Assessment – Daytime ..... 33
Table 18 Construction Noise Sources – Typical Piling Day Noise Levels ..... 34
Table 19 Recommended Safe Working Distances for Construction Equipment ..... 37
Table 20 Loading Dock Source Noise Levels ..... 39
Table 21 Maritime Source Noise Levels ..... 40
Table 22 Operational Noise Levels – Cumulative Impacts of Loading Dock, Maritime Loading / Unloading, Plant Equipment – Unmitigated ..... 41
Table 23 Loading Dock Mitigation Assessment ..... 42

# CONTENTS

Table 24 Post Mitigation Operational Noise Levels – Cumulative Impacts of Loading Dock, Maritime Loading / Unloading, Plant Equipment – Mitigated Loading Dock ..... 43
Table 25 - NPfI Classification of Residual Exceedances ..... 44
Table 26 - Examples of potential treatment for residual exceedances ..... 45
Table 27 Summary of Primary Patron Areas ..... 46
Table 28 Patron Source Noise Levels - 100% Occupancy ..... 46
Table 29 Patron dining noise at 100% occupancy ..... 47

## FIGURES

Figure 1 Site Plan – Surrounding Receivers, NCAs and Noise Logging Locations ..... 12
Figure 2 Illustration of Works Areas ..... 32
Figure 3 - Typical Worst-case Daily Noise Profile - Screw Piling ..... 35
Figure 4 - Typical Worst-case Daily Noise Profile - Driven Piling ..... 35

## APPENDICES

Appendix A Acoustic Terminology
Appendix B Ambient Noise Monitoring Results
Appendix C Grid Noise Maps

# 1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Urban Growth NSW Development Corporation to prepare a Noise Impact Assessment (NIA) for the new Sydney Fish Market project. The NIA will be submitted as part of the State Significant Development Application (SSDA) for the proposed new Sydney Fish Market.

This NIA addresses relevant considerations contained in the State Significant Development Application (SSDA 8924 and 8925) Secretary's Environmental Assessment Requirements (SEARs), dated 22 December 2017. The Project is seeking full SSDA approval for both concept SSDA and built form approval for the new Sydney Fish Market.

This report presents the study methodology, assessment criteria, assessment of noise emissions and noise mitigation recommendations in relation to the following specific areas of acoustic significance:

- Potential noise and vibration emissions during the construction stage
- Operational noise emissions from onsite mechanical plant and equipment
- Operational noise emissions from carpark and loading dock activities
- Operational noise emissions from patron areas.

A glossary of acoustic terminology is included as **Appendix A**.

# 2 Project Background and Overview

## 2.1 Background

Sydney Fish Market is the largest of its kind in the Southern Hemisphere and among the three largest seafood markets in terms of variety in the world. The market sources product both nationally and internationally and trades approximately 14,500 tonnes of seafood annually with up to one hundred sustainable seafood species traded every day and approximately 500 species traded annually. The site attracts over 3 million visits each year.

In November 2016 the NSW Premier announced a new fish market would be built at the head of Blackwattle Bay, adjacent to the existing fish market. In June 2017 the Premier of NSW announced the appointment of Danish architects 3XN to lead the design team that includes Sydney firms BVN and Aspect Studios. They have been working with key stakeholders, including UrbanGrowth NSW Development Corporation (UrbanGrowth NSW) and Sydney Fish Market Pty Ltd (SFM), to develop the design for the new fish market. As announced by the NSW Premier, works are planned to commence in 2019.

## 2.2 Site and Context

The site is located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe, situated less than 2km west of Sydney's CBD and is partially within the City of Sydney Local Government Area.

The land to which the development application relates comprises Lots 3 - 5 in DP 1064339 part of lot 107 in DP 1076596 and part Lot 1 in DP835794. Works to connect to the existing waterfront promenade to the west of the site are located on Lot 3 in DP1018801. The development footprint is irregular in shape and has an area of

approximately 36,800m$^2$. The site is partly on land above mean high water mark and partly on water below mean high water mark.

The site has a frontage to Bridge Road to the south and Blackwattle Bay to the north. Pyrmont Bridge Road is an arterial road that links to the Anzac Bridge to the north west of the site. Sydney Secondary College Blackwattle Bay Campus is immediately south west of the site and the existing fish market immediately north east. Located directly opposite the site to the south is Wentworth Park, separated by Bridge Road.

Located approximately 400m walking distance from the site are the Fish Market, Wentworth Park, and Glebe Light Rail stops which are serviced by the Dulwich Hill Line which is a 23 stop, 12.8-kilometre route running from Dulwich Hill to Central station via Pyrmont.

The site contains one heritage item being the heritage stormwater culvert. The site is also near a number of heritage items.

The site's current uses include a concrete batching plant at the Western end and concrete hardstand and wharf area at the Eastern end, which is currently vacant. The site includes wharves and land-based structures. Part of the site is the water of Blackwattle Bay. Works will be undertaken on Bridge Road and its intersections with Wattle Street and Wentworth Park Road.

## 2.3 Approval Strategy

Pursuant to the provisions of the *Environmental Planning and Assessment Act 1979* and *State Environmental Planning Policy (State and Regional Development) 2011* ("SEPP SRD") the new fish market development is State Significant Development and the Minister for Planning is the consent authority.
To deliver the new fish market, the following applications will be lodged:

1. A concept development application seeking approval for concept proposals for the new fish market. This is to meet the requirements for a master plan contained in clause 40 of SREP26. This concept development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall;
2. A development application for the construction of the new fish market;
3. An application to amend the planning controls applying to the site to enable the proposed development to be a permissible use on all of the site. This is to be achieved by an amendment to *Sydney Regional Environmental Plan No 26—City West* ("SREP26").

These applications are lodged concurrently.

## 2.4 Summary of the Development

The proposal is to build a new fish market with a contemporary urban design, provide unique experiences for visitors and world-class auction and wholesale facilities. The new facility will be set within an improved public domain including the creation of a waterfront promenade with improved access to Blackwattle Bay and linking to surrounding areas and to public transport.
The development will expand and improve the functions of the existing in a new setting designed to achieve design excellence, functional performance and environmental sustainability.

The new fish market will include retail and food and beverage premises, wholesale facilities and auction rooms, offices and commercial space, Sydney Seafood Schools, back-of-house facilities and car, truck and coach parking spaces. The new facility is to include a new foreshore promenade and wharves. The new fish market will be purpose built and will be supported by a state of the art back-of-house plant and recycling/waste management facilities.

### 2.4.1 Concept Development Application

The Concept development application seeks approval for:

1. The use of the site for the fish market, including waterfront commercial and tourist facilities and ancillary uses
2. A gross floor area of approximately 58,000m$^2$ contained within a defined building envelope
3. Waterfront structures such as wharves
4. Concepts for improvements to the public domain including promenades, access to Blackwattle Bay and landscaping
5. Pedestrian cycle and road access and circulation principles
6. Principles for infrastructure provision and waste management.

This concept development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall.

### 2.4.2 Main Works Development Application

The Main Works development application seeks approval for:

1. the construction of a new fish market including land and water-based structures.
2. the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
3. a gross floor area of approximately 26,000m2 as calculated according to the definition of GFA under SREP 26 (approximately 25,600m2 as calculated according to the definition of GFA under the Standard Instrument).
4. public domain works including promenades access to Blackwattle Bay and landscaping;
5. pedestrian, cycle and road access and circulation;
6. infrastructure provision and waste management;
7. associated works as required.
8. The proposed uses comprise:

#### Below Ground Level

- Parking for service and delivery, and private vehicles up to approximately 417 vehicles;
- Plant and storage;
- Waste Management facilities; and

- End of journey facilities.

### Ground Level - Outside of Building Envelope

- Up to three operational wharves for fishing fleet servicing and product unloading/loading, multi-purpose wharf space, private-operated ferry stop, recreational vehicles and the like;
- Vehicular access driveways; and
- Publicly accessible promenade.

### Ground Level - Within Building Envelope

- Wholesale services space including product storage and processing; and
- Auction floor and associated refrigeration and handling space.
- Loading dock including time-limited delivery and service vehicle parking area;
- Waste management facilities;
- Office space including buyers room;
- Staff amenities, plant and storage.

### Upper Ground Level (L1)

- Retail premises including fresh food retail, food and drink premises including harbourside dining;
- External/shared dining space;
- Ancillary back of house space and staff amenities; and
- Circulation areas.

### Upper Level 2

- Catering space;
- The Sydney Seafood School;
- Tenant and subtenant office space; and
- Plant and storage space.

## 2.5 Purpose of this Report

The purpose of this report is to address the SEARs pertaining to noise and vibration from operational and construction sources associated with the site. The following is taken from section 14 of the SEARs for SSD 8925 (see **Section 4.1**). The potential noise and vibration impacts which may arise as a result of the proposed works which are considered by this report include:

- Early works, remediation and construction activities
- Loading dock and marine unloading activities including reverse alarms
- Patrons in outdoor and terrace areas
- Use of the new Waterpark

- Mechanical plant.

## 2.6 Proposed Works

The project involves and early works phase and a new construction phase.

### 2.6.1 Early Works

This component of the project involves the demolition of this existing concrete batching plant, removal of existing piles and repairs to the existing sea well.

### 2.6.2 New Construction

The construction of the new Fish Market building which includes both land and water-borne structures and remediation of the surrounding area.

## 2.7 Potentially Affected Receivers

The surrounding environment comprises of Blackwattle bay to the north, the existing Fish Market to the East, residential apartments to the South East, Wentworth Park and residential dwellings to the South, Sydney Secondary College to the West and residential dwellings with frontage to Blackwattle Bay to the North West. The site is in close proximity to the Anzac Bridge and the Western Distributor.

The sensitive receivers identified in the vicinity of the Project are shown in **Figure 1**. A number of Noise Catchment Areas (NCAs) that reflect the changing land use around the project site have been defined and are also shown in the figure. Details regarding the nearest receivers are provided in **Table 1**.

## Figure 1 Site Plan – Surrounding Receivers, NCAs and Noise Logging Locations

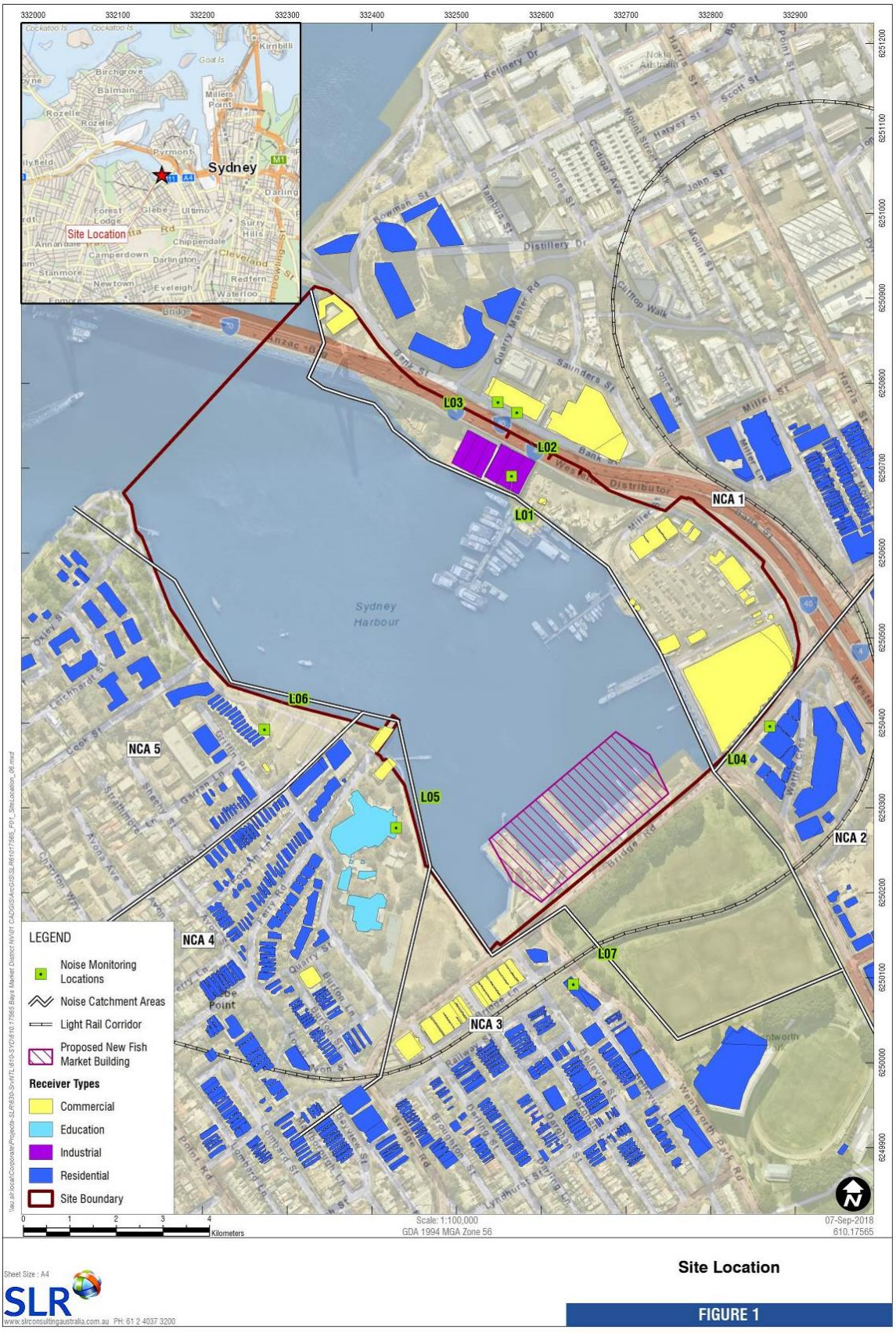


**Table 1 Identified Surrounding Receivers**

| Receiver ID | Address | Noise Catchment Area | Receiver Type |
|---|---|---|---|
| R01 | Commercial receivers east of development | NCA1 | Commercial |
| R02 | 1 Wattle Crescent, Pyrmont | NCA2 | Residential |
| R03 | 6-10 Wattle Street, Pyrmont | | Residential |
| R04 | Trojan Recruitment Group, 22 Bridge Road, Glebe | NCA3 | Commercial |
| R05 | Reece Plumbing, 20 Bridge Road, Glebe | | Commercial |
| R06 | Quro Health Studio, 18 Bridge Road, Glebe | | Commercial |
| R07 | BWS Glebe, 14 Bridge Road, Glebe | | Commercial |
| R08 | Unknown Tenancy, 10-12 Bridge Road, Glebe | | Commercial |
| R09 | Hello Happy Holdings, 8 Bridge Road, Glebe | | Commercial |
| R10 | Flat, 4-6 Bridge Road, Glebe | | Commercial |
| R11 | Kauri Foreshore Hotel, 2 Bridge Road, Glebe | | Commercial |
| R12 | The Binocular & Telescope Shop and residential shop-top dwelling, 84 Wentworth Park Road | | Commercial ground floor, residential first floor |
| R13 | 82 Wentworth Park Road, Glebe | | Residential |
| R14 | Polyglot Group, 25 Burton Street, Glebe | NCA4 | Commercial |
| R15 | 23 Burton Street, Glebe | | Residential |
| R16 | 21 Burton Street, Glebe | | Residential |
| R17 | 19 Burton Street, Glebe | | Residential |
| R18 | 17 Burton Street, Glebe | | Residential |
| R19 | 15 Burton Street, Glebe | | Residential |
| R20 | 13 Burton Street, Glebe | | Residential |
| R21 | 11 Burton Street, Glebe | | Residential |
| R22 | 9 Burton Street, Glebe | | Residential |
| R23 | 7 Burton Street, Glebe | | Residential |
| R24 | 5 Burton Street, Glebe | | Residential |
| R25 | 3 Burton Street, Glebe | | Residential |
| R26 | 1 Burton Street, Glebe | | Residential |
| R27 | 1A Burton Street, Glebe | | Residential |
| R28 | 11 Bridge Road, Glebe | | Residential |
| R29 | Sydney Secondary College, Taylor Street, Glebe | | Educational |

| Receiver ID | Address | Noise Catchment Area | Receiver Type |
|---|---|---|---|
| R30 | Sydney University Boat House, 123 Ferry Road, Glebe | NCA4 | Commercial |
| R31 | Glebe Rowing Club, End of Ferry Road, Glebe | | Commercial |
| R32 | 40 Ferry Road, Glebe | | Residential |
| R33 | 92-119 Ferry Road, Glebe | | Residential |
| R34 | 14-16 Leichhardt Street, Glebe | NCA5 | Residential |
| R35 | 26 Cook Street, Glebe | | Residential |
| R36 | 29-31 Cook Street, Glebe | | Residential |
| R37 | 13 Griffin Place, Glebe | | Residential |
| R38 | 45 Griffin Place, Glebe | | Commercial |
| R39 | Commercial Property 53 Griffin Place, Glebe | | Residential |

# 3 Ambient Noise Environment

### 3.1.1 Road Traffic Noise

The existing noise environment throughout the project area is generally controlled by road traffic noise. The major arterial road near the project is the Western Distributor/Anzac Bridge, which passes adjacent to the north of the project in an elevated location.

Other major roads near the site include Pyrmont Bridge Road, Bridge Road and Wattle Street to the south east of the site.

### 3.1.2 Railway Noise

The Dulwich Hill Light Rail line passes around the north and east of the site, with the Fish Market and Wentwork Park stops being located around 50 m and 100 m away from the proposal site, respectively. The track alignment to the north is located in a cutting whereas the track to the south east is on embankment through Wentworth Park.

Noise from light rail vehicles was audible around Wentworth Park, however it was not audible in any other areas surrounding the project due to high road traffic noise levels. While the rail noise may be audible at times in the vicinity of the elevated rail at Wentworth Park, it is unlikely to be a controlling noise source due to the significant road network nearby.

### 3.1.3 Industrial Noise Sources

Existing industry premises are located within the northern section of the proposal site, on Bank Street, and noise levels measured in the vicinity of these premises are currently influenced by industrial noise, especially where line of sight to the Western Distributor is shielded by intervening structures. Existing industrial noise is also present from the concrete batching plant on Bridge Road when operational.

## 3.2 Unattended Noise Monitoring

To quantify and characterise the existing ambient noise environment across the proposal area a baseline noise monitoring survey was undertaken in February 2018. The measured noise levels have been used to establish existing ambient noise levels throughout the project area and to develop a detailed understanding of the existing noise environment.

Noise monitoring equipment was deployed with consideration of other noise sources that may influence the measurements, accessibility and security, and with the consent of relevant land owners. The noise monitoring locations are shown in **Figure 1** and outlined in **Table 2** .

**Table 2 Ambient Noise Logger Overview**

| ID | Location | Monitoring Period | Model | Serial Number |
|---|---|---|---|---|
| L01 | 31-35 Bank Street, Pyrmont | 08/02/2018 - 15/02/2018 | ARL EL-316 | 16-004-038 |
| L02 | Goodman Building, Rooftop, 123 Bank Street, Pyrmont | 08/02/2018 - 16/02/2018 | B&K 2250L | 3005908 |
| L03 | Goodman Building, at the level of the Western Distributor, 123 Bank Street, Pyrmont | 08/02/2018 - 16/02/2018 | B&K 2250L | 3005904 |
| L04 | Unit 217, 1 Wattle Crescent, Pyrmont | 12/02/2018 - 16/02/2018 | SVAN956 | 20668 |
| L05 | Sydney Secondary College, Taylor St, Glebe | 08/02/2018 - 15/02/2018 | ARL EL-316 | 16-306-044 |
| L06 | 13 Griffin Place, Glebe | 08/02/2018 - 15/02/2018 | ARL EL-316 | 16-207-021 |
| L07 | 6/82 Wentworth Park Road, Glebe | 08/02/2018 - 15/02/2018 | ARL EL-316 | 16-203-505 |

Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in **Appendix B**. The charts present each 24 hour period by incorporating the LAmax, LAeq and LA90 noise levels for the corresponding 15 minute periods.

The measured data has been filtered to remove periods affected during adverse weather conditions following consultation of weather reports recorded at the Bureau of Meteorology (BOM) Observatory Hill weather station. The filtered data is shown in **Appendix B.**

The data obtained from the ambient noise monitoring was processed in accordance with the procedures contained in the NSW *"Noise Policy for Industry"* (NPfI) to establish Rating Background Level (RBL, background noise level) at the nearest sensitive receivers. The results of this analysis are presented in **Table 3**.

**Table 3 Measured Ambient Noise Levels Corresponding to NPfI Assessment Time Periods**

| ID | Location | Measured Noise Level (dBA) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RBL[1] | | | | LAeq(period) | | | |
| | | Daytime[2] | Evening[2] | Night-time[2] | Early Morning[2] | Daytime[2] | Evening[2] | Night-time[2] | Early Morning[2] |
| L01 | 31-35 Bank St, Pyrmont | 66 | 64 | 60 | 62 | 71 | 68 | 65 | 70 |
| L02 | 132 Bank St, Pyrmont | 70 | 70 | 61 | 66 | 75 | 74 | 70 | 75 |
| L03 | 132 Bank St, Pyrmont | 71 | 71 | 61 | 65 | 75 | 74 | 70 | 74 |
| L04 | Unit 217 1 Wattle Crescent, Pyrmont | 62 | 57 | 50 | 52 | 71 | 68 | 64 | 69 |
| L05 | Sydney Secondary College | 55 | 54 | 49 | 50 | 58 | 56 | 52 | 55 |
| L06 | 13 Griffin Place, Glebe | 50 | 51 | 46 | 48 | 54 | 54 | 50 | 52 |
| L07 | 682 Wentworth Park Road, Glebe | 54 | 50 | 42 | 44 | 67 | 64 | 58 | 63 |

Note 1: The RBL noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 2: As certain operations only occur in the 5:00 am – 7:00 am shoulder period, the following periods have been used in the assessment – for Monday to Saturday, Daytime is 7:00 am - 6:00 pm; Evening is 6:00 pm - 10:00 pm; Night-time is 10:00 pm - 5:00 am; Early Morning Shoulder Period is 5:00 am – 7:00 am.
On Sundays and Public Holidays, Daytime is 8:00 am - 6:00 pm; Evening is 6:00 pm - 10:00 pm; Night-time is 10:00 pm - 8:00 am.

## 3.3 Attended Noise Monitoring

In order to identify noise sources contributing to the ambient noise environment at the nearest sensitive receivers, operator attended spot measurements were conducted at each of the unattended logger locations.

A Brüel and Kjær 2260 sound level meter (serial number 2487418) fitted with a microphone windshield was used for the measurements. Calibration of the sound level meter was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Measurements were conducted in accordance with AS 1055.1-1997: *"Acoustics - Description and measurement of environmental noise – General procedures".*

The results of the operator attended noise measurements are summarised in detail in **Appendix B**.

# 4 Assessment Criteria

## 4.1 Secretary's Environmental Assessment Requirements (SEARs)

Condition 14 of the SEARs contains requirements which are relevant to noise and vibration impacts from the development. These are reproduced below in **Table 4** and

**Table 5** along with where each requirement has been addressed in this report.

### Table 4 Project Related Noise and Vibration SEARs – SSDA 8924

| Condition | Location Addressed in this Report |
|---|---|
| **14. Noise and vibration**<br>Provide a noise and vibration assessment in accordance with the relevant EPA guidelines that addresses the following: | - |
| - The impact of noise and vibration associated with demolition and early works on noise sensitive receivers such as surrounding residences, Sydney Secondary College, Ultimo Public School (temporary relocation site in Wentworth Park) and nearby public reserves | **Section 5.2** |
| - the cumulative noise and vibration impacts from concurrent surrounding activities during demolition and early works | **Section 5.2** |
| - the cumulative noise and vibration impacts from activities associated with the Stage 2 Main works (SSD 8925) | **Section 5.2** |
| - mitigation measures to minimise potential noise and vibration impacts during demolition and early works including recommended standard construction hours and intra-day respite periods for highly intrusive noise generating work) | **Section 5.2** |
| - the proposed noise monitoring procedures. | **Section 5.2** |

### Table 5 Project Related Noise and Vibration SEARs – SSDA 8925

| Condition | Location Addressed in this Report |
|---|---|
| **14. Noise and vibration**<br>Provide a noise and vibration assessment in accordance with the relevant EPA guidelines that addresses the following: | - |
| - the impact of noise and vibration associated with construction and operation | **Section 5.2** |
| - the cumulative noise and vibration impacts from concurrent surrounding activities during construction and operation | **Section 5.2 (cumulative construction), Section 5.3 (cumulative operational)** |
| - the cumulative noise and vibration impacts from activities associated with the Stage 1 demolition and early works (SSD 8924) | **Section 5.2** |
| - impacts of operational noise on noise sensitive receivers such as surrounding residences, the Sydney Secondary College Blackwattle Bay Campus (particularly during exam times) and nearby public reserves, including public address systems, waste collection services, dock-side operations and reversing/movement alarms on vehicles | **Section 5.3** and **Section 5.4,** |

| Condition | Location Addressed in this Report |
|---|---|
| - mitigation measures to minimise potential noise and vibration impacts during construction and operation, including recommended standard construction hours and intra-day respite periods for highly intrusive noise generating work | **Section 5.2** |
| - the proposed noise monitoring procedures. | **Section 5.2** |

## 4.2 Summary of Adopted Assessment Criteria

The following guidelines and policies, as listed in **Table 6**, have been referenced in the assessment of the potential impacts from the proposal.

**Table 6 Noise and Vibration Guidelines and Policies**

| Noise and Vibration Guidelines and Polices | Applicable to? |
|---|---|
| *Interim Construction Noise Guideline* (DECC 2009) | Assessment of airborne construction noise impacts on sensitive receivers |
| BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings* Part 2, BSI, 1993 | Assessment of construction vibration impacts on non-heritage sensitive structures (damage) |
| DIN 4150:Part 3-1999 *Structural vibration - Effects of vibration on structures*, Deutsches Institut für Normung, 1999 | Screening assessment of construction vibration impacts on heritage sensitive structures (damage) |
| *Noise Policy for Industry* (EPA 2017) | Assessment of noise impacts from mechanical plant associated with the project |

## 4.3 NSW Interim Construction Noise Guideline

The *Interim Construction Noise Guideline* (ICNG) sets out ways to assess and manage the impacts of construction noise on residences and other sensitive land uses. It does this by presenting assessment approaches that are tailored to the scale of the construction works.

The ICNG requires project specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, feasible and reasonable work practices are to be investigated to minimise noise emissions.

### 4.3.1 Residential Receivers

The ICNG provides an approach for determining $L_{Aeq(15minute)}$ NMLs at adjacent residential receivers based on measured $L_{A90(15minute)}$ rating background noise levels (RBL), as described in **Table 7**.

**Table 7 Determination of NMLs for Residential Receivers**

| Time of Day | NML $L_{Aeq(15minute)}$ | How to Apply |
|---|---|---|
| Standard hours<br>Monday to Friday<br>7:00 am to 6:00 pm<br>Saturday<br>8:00 am to 1:00 pm<br>No work on Sundays or public holidays | RBL + 10 dBA | • The noise affected level represents the point above which there may be some community reaction to noise.<br>• Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level.<br>• 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<br>75 dBA | • The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise.<br>• Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account:<br>  • 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.<br>  • If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. |
| Outside recommended standard hours | RBL + 5 dBA | • A strong justification would typically be required for works outside the recommended standard hours.<br>• The proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>• Where all feasible and reasonable practises have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. |

Note 1 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW *Industrial Noise Policy*.

#### 4.3.1.1 Commercial and Industrial Premises

The ICNG notes that due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories:

- Industrial premises: external $L_{Aeq(15minute)}$ 75 dBA
- Offices, retail outlets: external $L_{Aeq(15minute)}$ 70 dBA
- Other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

The external noise levels should be assessed at the most-affected occupied point of the premises.

#### 4.3.1.2 Other Sensitive Land Uses

The ICNG's quantitative assessment method provides NMLs for other sensitive land uses, such as educational institutes, hospitals, medical facilities and outdoor recreational areas. These land uses are considered potentially sensitive to construction noise only when the properties are in use.

The ICNG does not however provide an NML for all classifications of sensitive land use. Where sensitive land uses with no classification are identified within a construction noise catchment, the following guidance is given:

> *The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors may assist in determining relevant noise levels (Standards Australia 2000).*

The project specific $L_{Aeq(15minute)}$ NMLs for other non-residential noise sensitive receivers from the ICNG are provided in **Table 8**.

**Table 8 NMLs for Other Sensitive Receivers**

| Land Use | NML LAeq(15minute)<br>(Applied when the property is in use) |
|---|---|
| Classrooms at schools and other education institutions | Internal noise level 45 dBA |
| Hospital wards and operating theatres | Internal noise level 45 dBA |
| Places of Worship | Internal noise level 45 dBA |
| Active recreation areas<br>(characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion) | External noise level 65 dBA |
| Passive recreation areas<br>(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, eg reading, meditation) | External noise level 60 dBA |
| Community centres | Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses. |

### 4.3.2 NML Summary

Using the measured background noise levels in **Table 3**, the NMLs derived for the project are detailed in **Table 9**.

The noise monitoring locations were selected to capture background noise levels at the typically most affected receiver locations in the various catchments along the alignment. The most affected receivers are usually front row receivers which have a direct line of sight to the construction works.

Whilst background noise levels may reduce for receivers which are further back from the construction works (and nearby roads), the construction noise predictions are likely to drop off at a quicker rate meaning the level of impact would be lower than the most affected 'front row' receivers.

**Table 9 Receiver NMLs for Construction**

| NCA | Nearest Receiver Location | Representative Noise Logger Location | Standard Construction[1] (RBL+10dB) | Highly Noise Affected | Out of Hours (RBL+5dB) | | | | Sleep Disturbance Screening (RBL+15dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Daytime | Daytime | Daytime | Evening | Night-time | Morning | Night-time | Morning |
| NCA1 | 31-35 Bank Street, Pyrmont (Commercial) | L01 | 70 | n/a | 70[2] | 70[2] | 70[2] | 70[2] | n/a[3] | n/a[3] |
| NCA2 | 217/1 Wattle Crescent, Glebe | L04 | 72 | 75 | 67 | 62 | 55 | 57 | 65 | 67 |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | L04[4] | 72 | 75 | 67 | 62 | 55 | 57 | 65 | 67 |
| NCA4 | 1A Burton Street, Glebe | L07[5] | 64 | 75 | 59 | 55 | 47 | 49 | 57 | 59 |
| | Sydney Secondary College, Glebe | L05 | 65[6] | n/a | 65[2,6] | 65[2,6] | 65[2,6] | 65[2,6] | n/a[3] | n/a[3] |
| NCA5 | 13 Griffin Place, Glebe | L06 | 60 | 75 | 55 | 55[7] | 51 | 53 | 61 | 63 |

Note 1: ICNG recommended standard hours are 7.00 am to 6.00 pm Mon-Fri; 8.00 am to 1.00 pm Sat.

Note 2: Criteria is only applicable when receiver is in use.

Note 3: Sleep disturbance criteria does not apply to this receiver type.

Note 4: Due to the nearest receivers' proximity to Bridge Road, L04 has been used as the representative noise logger location.

Note 5: Based on site observations of the similarities of the surrounding road network for the nearest receiver, L07 has been used as the representative noise logger location.

Note 6: An external criterion of 65 dBA has been set for Sydney Secondary College. The ICNG sets an internal level of 45 dBA and 20 dB external to internal transmission loss is assumed.

Note 7: These values have been lowered to be no greater than the applicable OOH daytime NML, based on the approach for determining RBLs in the NPfI.

## 4.4 Construction Vibration Guidelines

The effects of vibration on buildings can be divided into the following main assessment categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed ('tactile vibration')
- Those where a building's contents may be affected (for example, the operation of vibration sensitive equipment such as microscopes in hospitals)
- Vibration affecting the buildings and structures in terms of their susceptibility to damage ('structural damage').

### 4.4.1 Human Comfort Vibration

The Department of Environment and Conservation's (DEC) *Assessing Vibration: a technical guideline* (2006) provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDVs recommended in the guideline for vibration that is intermittent nature are presented in **Table 10**.

**Table 10 Preferred and Maximum Vibration Dose Values for Intermittent Vibration**

| Building Type | Vibration Dose Value ($m/s^{1.75}$) | |
|---|---|---|
| | Preferred | Maximum |
| Critical Working Areas (eg hospital operating theatres, precision laboratories) | 0.10 | 0.20 |
| Residential Daytime | 0.20 | 0.40 |
| Residential Night-time | 0.13 | 0.26 |
| Offices, schools, educational institutions and places of worship | 0.40 | 0.80 |
| Workshops | 0.80 | 1.60 |

Note: Daytime is 7:00 am to 10:00 pm and night-time is 10:00 pm to 7:00 am.

### 4.4.2 Effects on Building Contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive. For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Where appropriate, objectives for the satisfactory operation of vibration senstive critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

### 4.4.3 Structural Damage Vibration

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives* and British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2*. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits from BS 7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are shown in **Table 11**. The vibration guide values are at the base of the building.

**Table 11 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage**

| Line | Type of Building | Peak Component Particle Velocity in Frequency Range of Predominant Pulse | |
|---|---|---|---|
| | | 4 Hz to 15 Hz | 15 Hz and Above |
| 1 | Reinforced or framed structures. Industrial and heavy commercial buildings | 50 mm/s at 4 Hz and above | |
| 2 | Unreinforced or light framed structures. Residential or light commercial type buildings | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |

### 4.4.4 General Vibration Screening Criterion

The guide values in **Table 11** relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

Rockbreaking / hammering activities are considered to have the potential to cause dynamic loading in some structures (eg residences) and it is therefore appropriate to reduce the transient values by 50%.

For construction activities involving intermittent vibration sources such as rockbreakers, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures: **25.0 mm/s**
- Unreinforced or light framed structures: **7.5 mm/s**.

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity) monitoring should be performed during construction. At these locations a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be undertaken to determine the applicable safe vibration level.

### 4.4.5 Heritage

Heritage buildings should be considered on a case by case basis. A heritage listed structure should not (unless it is structurally unsound) be assumed to be more sensitive to vibration resulting in application of the 7.5 mm/s screening criterion. Where a historic building is deemed to be sensitive to damage from vibration (following inspection), a more conservative superficial cosmetic damage criterion based on DIN 4150 should be applied.

## 4.5 Operational Noise - Industrial Noise Sources

Responsibility for the control of industrial noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA).

The EPA oversees the *Noise Policy for Industry* (NPfI). which provides a framework and processes for deriving noise criteria for sources of industrial noise.

The NPfI's objectives are:

- To establish noise trigger levels that would protect the community from excessive noise;
- To preserve the amenity for specific land uses;
- To use the noise trigger levels for deriving project specific land uses; and

To promote uniform methods to estimate and measure noise impacts including a procedure for evaluating meteorological effects.

Implementation is achieved by ensuring that:

- Noise from any single source does not intrude greatly above the prevailing background noise level. This is known as the intrusive noise criterion.
- The background noise level does not exceed the level appropriate for the particular locality and land use. This is known as the amenity criterion.

In order to satisfy the above two requirements, an intrusive and an amenity noise criterion is determined of which the lower is usually adopted as the project specific noise level.

### 4.5.1 Assessing Intrusiveness

In setting the *Intrusive* noise goal, the Rating Background Level (RBL) representative of the nearest sensitive receivers is established based on noise logging results. An 'RBL plus 5 dBA' criterion is then applied to the 15-minute $L_{Aeq}$ noise emissions of the noise source in question at the receivers of interest.

### 4.5.2 Assessing Amenity

The *Amenity* assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise.

The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. In order to determine the amenity noise goal, the maximum ambient $L_{Aeq}$ noise levels from industrial sources within an area should not normally exceed the acceptable noise levels specified in **Table 12**.

**Table 12 Recommended Maximum LAeq Noise Levels from Industrial Noise Sources**

| Receiver | Noise Amenity Area | Time of Day[1] | Recommended Amenity Noise Level $L_{Aeq(period)}$ |
|---|---|---|---|
| Residence | Rural | Day | 50 dBA |
| | | Evening | 45 dBA |
| | | Night | 40 dBA |
| | Suburban | Day | 55 dBA |
| | | Evening | 45 dBA |
| | | Night | 40 dBA |
| | Urban | Day | 60 dBA |
| | | Evening | 50 dBA |
| | | Night | 45 dBA |
| Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks | See column 4 | See column 4 | 5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day |
| School classrooms - internal | All | Noisiest 1-hour period when in use | 35 dBA |
| Hospital ward<br>internal<br>external | All | Noisiest 1-hour | <br>35<br>50 |
| Area specifically for passive recreation | All | When in use | 50 dBA |
| Active recreation area (e.g. School playground, golf course) | All | When in use | 55 dBA |
| Commercial premises | All | When in use | 65 dBA |
| Industrial premises | All | When in use | 70 dBA |
| Industrial (applicable only to residential noise amenity areas) | All | All | Add 5 dB(A) to recommended noise amenity area |

Notes 1: Time of day is defined as follows in accordance with NPI 2017:
Day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
Evening – the period from 6 pm to 10 pm
Night – the remaining periods.

The NPfI notes that the recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location. The project amenity noise level is the lower of the intrusiveness and standard amenity levels and provides the highest level of protection possible for potentially noise affected receivers.

### 4.5.3 Modifying Factors

Modifying factors are to be applied to the predicted noise levels if the source noise, at the receiver, is low frequency, tonal or intermittent in nature. **Table 13** provides a brief summary of the modifying factors found in the NPfI.

**Table 13 Modifying Factors from NPfI Table C1**

| Factor | Correction - dB |
|---|---|
| Tonal Noise | 5 |
| Low Frequency Noise | 2 - 5 |
| Intermittent | 5 |

### 4.5.4 NPfI Assessment of Prevailing Weather Conditions

*Fact Sheet D: Accounting for noise-enhancing weather conditions* of the NPfI States:

*Two options are available to a proponent to consider meteorological effects:*

1. *Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur - a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2m/s at night.*

   *Or*

2. *Determine the significance of noise enhancing conditions…*

This noise from this development has been assessed in accordance with option 1 using 'worst case' meteorological conditions in the noise modelling software used.

### 4.5.5 Shoulder Periods

The NPfI allows for the use of "shoulder periods" between the standard Day / Evening / Night periods as defined in the Policy. The use of such periods is at the discretion of the approval authority, however are considered to be appropriate when significant activity at the site being assessed occurs close to a change in the standard time periods in the Policy. In the case of the New Fish market, peak Loading Dock activity is predicted to occur at 5am. As a result, SLR recommends the implementation of a "Morning" shoulder period to assess the 5am – 7am time period between "Night" and "Day" as defined in the Policy.

### 4.5.6 Development Specific Operational Noise Trigger Levels

The noise emission trigger levels for industrial noise generated by the development are provided in **Table 14**. The Project Noise Trigger Level (PNTL) is the lowest value of the intrusiveness or amenity noise level for each period and are shown below in bold.

### Table 14 Project Noise Trigger Levels

| NCA | Nearest Receiver Location | Representative Noise Logger Location | Period | Recommended Amenity Noise Level $L_{Aeq}$ (dBA) | Measured Noise Level (dBA) | | Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | RBL[1] | $L_{Aeq(period)}$ | Intrusiveness | Amenity[2,3] |
| NCA1 | 31-35 Bank St, Pyrmont (Commercial) | L01 | When in use | 65 | 66 | 71 | n/a | **68** |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | L04 | Day | 60 | 62 | 71 | 67 | **59** |
| | | | Evening | 50 | 57 | 68 | 62 | **56**[4] |
| | | | Night | 45 | 50 | 64 | 55 | **52**[4] |
| | | | Morning | 45 | 52 | 69 | 57 | **57**[4] |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | L04[5] | Day | 60 | 62 | 71 | 67 | **59** |
| | | | Evening | 50 | 57 | 68 | 62 | **56**[4] |
| | | | Night | 45 | 50 | 64 | 55 | **52**[4] |
| | | | Morning | 45 | 52 | 69 | 57 | **57**[4] |
| NCA4 | 1A Burton Street, Glebe | L07[6] | Day | 60 | 54 | 67 | **59** | 63 |
| | | | Evening | 50 | 50 | 64 | 55 | **52** |
| | | | Night | 45 | 42 | 58 | **47** | 46 |
| | | | Morning | 45 | 44 | 63 | **49** | 51[4] |
| | Sydney Secondary College, Glebe | L05 | When in use | 55[7] | 55 | 58 | n/a | **58** |
| NCA5 | 13 Griffin Place, Glebe | L06 | Day | 60 | 50 | 54 | **55** | 63 |
| | | | Evening | 50 | 51 | 54 | 55[8] | **53** |
| | | | Night | 45 | 46 | 50 | 51 | **48** |
| | | | Morning | 45 | 48 | 52 | 53 | **48** |

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have **not** been reduced by 5 dB to give the project amenity noise levels, as outlined in the NPfI, due to no other sources of industrial noise being present in the area.

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: The measured $L_{Aeq}$ noise level was dominated by road traffic noise and exceeds the recommended amenity noise level by 10 dB or more, therefore the 'high traffic project amenity noise level' is the existing $L_{Aeq(traffic)}$ noise level minus 15 dB.

Note 5: Due to the nearest receivers' proximity to Bridge Road, L04 has been used as the representative noise logger location.

Note 6: Based on site observations of the similarities of the surrounding road network for the nearest receiver, L07 has been used as the representative noise logger location.

Note 7: An external criterion of 55 dBA has been set for Sydney Secondary College. The NPfI sets an internal level of 35 dBA and 20 dB external to internal transmission loss is assumed.

Note 8: These values have been lowered to be no greater than the applicable daytime project intrusiveness noise level, as outlined in the NPfI.

While the noise criteria apply to all sensitive receivers potentially affected by the development, the above locations have been chosen as they are representative of the most affected receiver in each noise catchment area.

## 4.6 Operational Noise – Patron Areas

The patron area noise criteria are based on standard conditions originally developed by Liquor and Gaming NSW with the "Sound Advice" factsheet. It is noted that whilst this Fact Sheet has since been withdrawn, it is nonetheless common to apply the criteria to noise emissions from licensed premises in NSW, and in particular within the City of Sydney catchment.

The following criteria have been used to assess noise from the rooftop bar area:

> *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.*
>
> *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.*
>
> *Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.*
>
> ** For the purposes of this condition, the LA10 can be taken as the average maximum deflection of the noise emission from the licensed premises.*

The criteria are applicable for all noise emissions from the venue, ie music and patrons, at all nearby noise sensitive receivers.

The above criteria are only applicable to residential receivers. In order to protect the amenity of existing commercial receivers surrounding the site, it is recommended that a similar criteria for commercial receivers is applied, with a reduction of 5 dB due to the reduced sensitivity of commercial spaces compared to residential.

Based on the above criteria and the existing measured ambient noise levels in **Section 3**, the project specific noise limits for the patron area have been established for the 7:00am - midnight period.

**Table 15 Project Specific Noise Limits – Patron Areas**

| NCA | Location | Noise Emission Criteria, dB $L_{A10}$ Octave Band Centre Frequency (Hz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| NCA1 | Commercial Receivers East of Development | 42 | 54 | 61 | 65 | 70 | 73 | 68 | 60 | 48 |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | 32 | 45 | 51 | 55 | 60 | 64 | 59 | 50 | 38 |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | 32 | 45 | 51 | 55 | 60 | 64 | 59 | 50 | 38 |
| NCA4 | 1A Burton Street, Glebe | 25 | 37 | 44 | 48 | 53 | 56 | 51 | 43 | 31 |
| | Sydney Secondary College | 30 | 43 | 49 | 54 | 58 | 62 | 57 | 48 | 36 |
| NCA5 | 13 Griffin Place, Glebe | 21 | 33 | 40 | 44 | 49 | 53 | 47 | 39 | 27 |

Note: A criterion has been set for the 7:00am - midnight period only as it is understood that this will capture all the operating hours of the new Sydney Fish Market.

## 4.7 Operational Noise – Road Noise on Surrounding Network

The NSW *Road Noise Policy* (RNP) requires consideration of noise mitigation where new land use developments increase road traffic noise by more than 2 dB.

# 5 Noise Impact Assessment

## 5.1 Noise Model

In order to predict noise levels associated with the construction and operation of the proposed development at the surrounding sensitive receivers, a SoundPLAN model was developed for the project area.

The computer model generates noise emission levels taking into account factors such as the source sound power levels, distance attenuation, ground absorption, air absorption and shielding attenuation, as well as meteorological conditions.

Heights of buildings, screens and other structures included in the noise model were estimated based on site inspection, and aerial photography.

The potential impact of the development is shown graphically for all assessed scenarios by grid noise maps in **Appendix C**.

## 5.2 Construction Assessment

### 5.2.1 Working Hours

Where possible, the construction works would be undertaken in accordance with the ICNG during the standard daytime working hours of:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays.

On this basis, the potential noise impacts have been predicted during the daytime period only.

### 5.2.2 Source Location

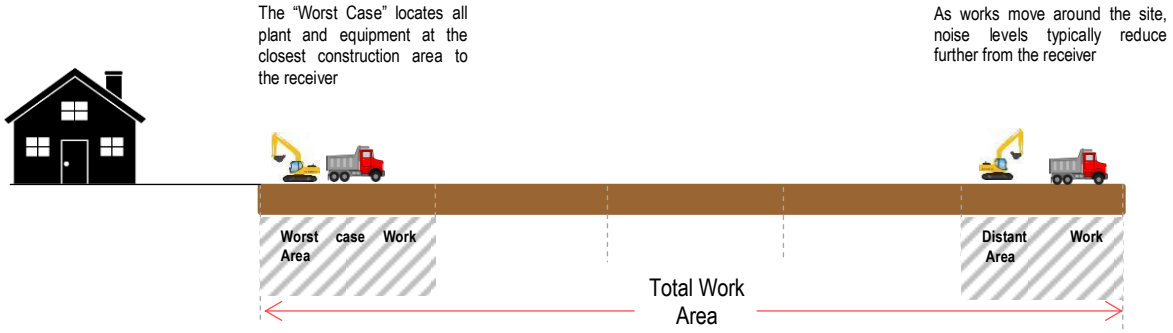
Consistent with the requirements of the ICNG, this assessment provides a 'realistic worst-case' noise impact assessment based on the required construction works within a 15-minute period. This is typically associated with works located nearest to a particular receiver.

In reality, the potential construction noise impacts at any particular location can vary greatly depending on factors including the following:

- The position of the works within the site and distance to the nearest sensitive receiver
- The overall duration of the works
- The intensity of the noise levels
- The time at which the works are undertaken
- The character of the noise.

Noise levels at sensitive receivers can also be significantly lower than the worst-case scenario when the construction works move to a more distant location in a works area. This concept is shown in **Figure 2**.

**Figure 2 Illustration of Works Areas**




The above figure illustrates that when works move away from a receiver the noise levels from the operation of the construction equipment would reduce accordingly.

### 5.2.3 Calculation Type

To quantify noise levels from the construction activities a computer noise prediction model using the CONCAWE algorithms was developed using SoundPLAN software.

Meteorological conditions were set to 'worst case' meaning there was a prevailing wind blowing at 3m/s from the source to the receiver.

### 5.2.4 Noise Sources

The activities likely to be required to construct the project would involve conventional construction equipment such as earth moving equipment, concreting equipment, piling plant, demolition equipment and cranes.

Noise sources likely to be associated with the construction and demolition works have been taken from the Construction Environment Management Plan for the new Sydney Fish Market development, prepared by Thelem Pty Ltd, and are summarised in **Table 16**.

**Table 16 Construction Noise Sources – Sound Power Levels**

| Noise Source | Sound Power Level per Item (dBA) |
|---|---|
| Concrete Sawing | 115 |
| Angle Grinders | 114 |
| Bobcat | 105 |
| Excavator / Bulldozer | 114 |
| Screw Piling | 100 |
| Hydraulic Hammering | 120 |
| Trucks | 108 |
| Concrete Pumps | 110 |
| Drilling | 94 |

| Noise Source | Sound Power Level per Item (dBA) |
|---|---|
| Electric Saw | 111 |
| Impact Drill | 105 |

To determine the potential worst-case impacts, the above noise sources were modelled throughout the construction and demolition area. No account was made for site hoarding or other mitigation in initial calculations to ensure a conservative assessment.

### 5.2.5 Results

A summary of the predicted noise levels (without additional mitigation) in each of the NCAs for the various work activities is presented in **Table 17**. The noise levels are representative of the worst-case impacts and are intended to give an overview of the likely worst-case noise levels from the construction works.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver, as the noise levels presented in this report are based on a realistic worst-case assessment.

**Table 17 Summary of Construction Noise Assessment – Daytime**

| NCA | Receiver Type | Noise Level – LAeq(15minute) (dBA) | | |
|---|---|---|---|---|
| | | NML – Standard Daytime | Worst-case Predicted | Exceedance |
| NCA1 | Commercial | 70 | 69 | - |
| NCA2 | Residential | 72 | 68 | - |
| NCA3 | Residential | 72 | **78** | 6 |
| | Commercial | 70 | **78** | 8 |
| NCA4 | Residential | 64 | 64 | - |
| | Educational | 65 | 74 | 9 |
| | Commercial | 70 | 74 | 4 |
| NCA5 | Residential | 60 | 54 | - |

Note 1: **Bold** text indicates exceedance of the "highly noise affected" NML.

When considering the predicted noise levels and NML exceedances from the project, the above tables indicate that:

- The highest impacts are generally seen in NCAs that have receivers in close proximity to the worksites, and includes NCA3 and NCA4.
- Noise levels at the nearest receiver in NCA3 are predicted to exceed the "highly noise affected" NML.
- The highest noise levels are seen during the use of noise intensive plant items such as the hydraulic hammer and concrete saw. When these items of plant are not in use, noise levels would be significantly lower.
- The receivers in closest proximity to construction in NCA4 are likely to be highly noise affected during 'worst case scenario' construction periods

### 5.2.6 Piling Noise Detailed Assessment

In addition to the overall combined noise impact assessment undertaken, different piling methods have been assessed in order to minimize the potential impact of this element of the works on the surrounding community. This assessment looked at the noise profile over a typical day from piling activity at the likely most impacted receiver.

#### 5.2.6.1 Main development piling

Two piling methodology options were considered, being screw pile and driven pile. Information provided stated that a typical day using each methodology would entail:

*Screw Pile Methodology*

1. Set Up – 2hrs
2. Slight hammering of pile to position pile – 1hr
3. Screw piling with machine – 4hrs
4. Heavy hammering to socket into rock – 1hr

*Driven Pile Methodology*

1. Set Up – 2hrs
2. Slight hammering of pile to position pile – 1hr
3. Verifying – 1hr
4. Heavy hammering to socket into rock – 4hrs

The noise levels in **Table 18** were used within the assessment for each methodology.

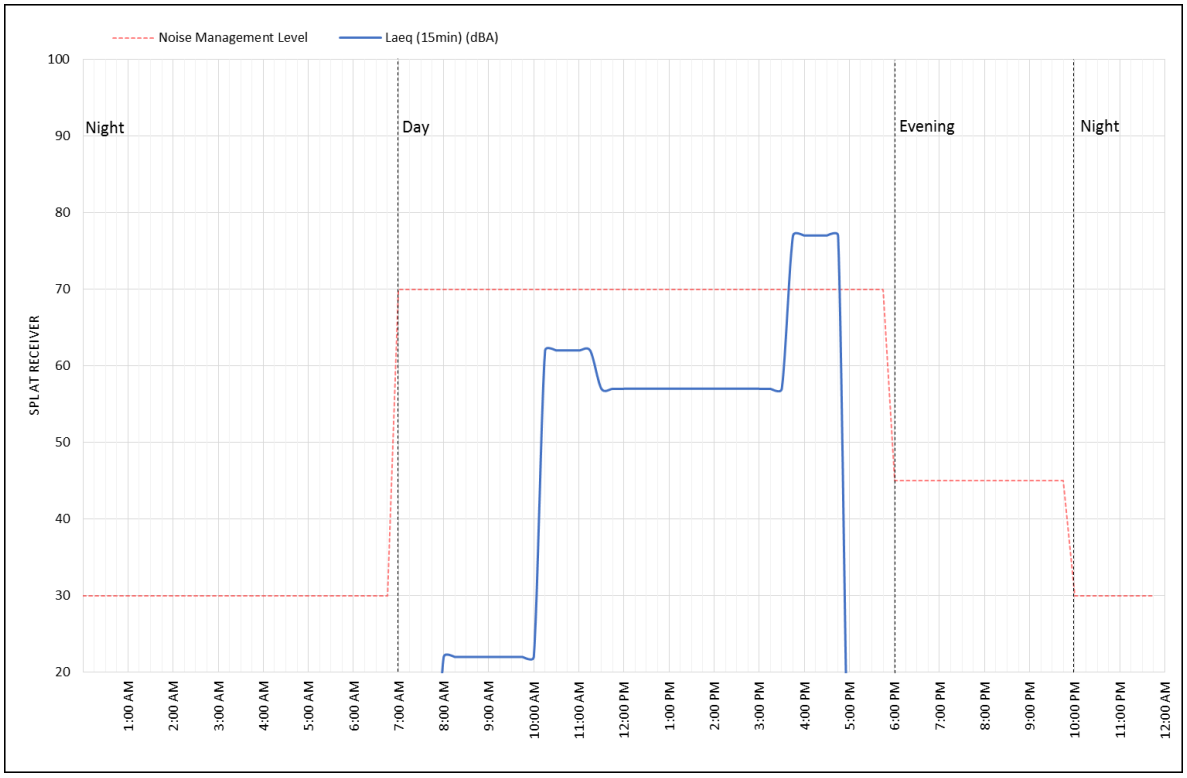
**Table 18 Construction Noise Sources – Typical Piling Day Noise Levels**

| Noise Source | Source Sound Power Level (dBA) | Modifying factor for 'annoyance' | Sound Power Level used in calculations (dBA) |
|---|---|---|---|
| Set up | 70 | *N/A* | 70 |
| Slight hammering | 105 | + 5 | 110 |
| Heavy hammering | 120 | + 5 | 125 |
| Screw piling | 100 | + 5 | 105 |
| Verifying | 70 | *N/A* | 70 |

Calculations assumed that the closest receiver was situated 100 m from the source (considered conservative based on site layout) and no account was made for screening, site hoarding or any other topology features that may reduce noise levels in order to attain a likely 'worst case' assessment.

The results from the assessment for typical worst-case daily noise profiles for screw piling and driven piling are shown in **Figure 3** and **Figure 4**.

## Figure 3 - Typical Worst-case Daily Noise Profile - Screw Piling




## Figure 4 - Typical Worst-case Daily Noise Profile - Driven Piling

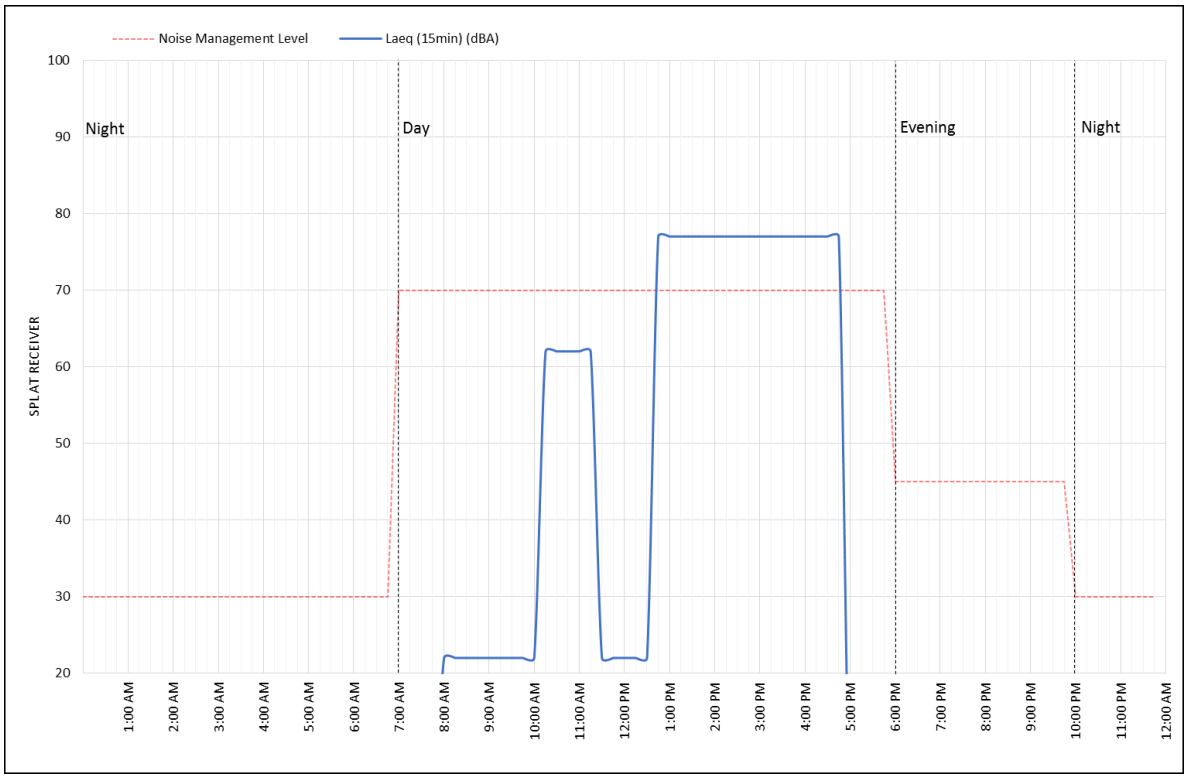


**Figure 3** shows that using a screw piling methodology, the "highly noise affected" level of 70 dBA (as defined in the ICNG) is exceeded for only one hour of the day. In contrast, **Figure 4** shows that using a driven pile methodology, the "highly noise affected" level is exceeded for four hours of each day.

#### 5.2.6.2 Sheet piling

In addition to the piling required for the main development, sheet piling is required to form a coffer dam as part of the construction process. It is understood that there are two methodology options for sheet piling, being driven pile (as per **Section 5.2.6.1**) and the option to use press-in pile technology (such as that used by the Giken manufacturer). Whilst the noise impacts for driven piling will be similar to that presented in **Section 5.2.6.1**, is it understood that a press-in pile methodology would result in much lower noise impacts. Available research on press-in piles from Cambridge University (UK) found in the *Proceedings of the International Deep Foundations Congress*. *Orlando, USA*, indicated that the highest noise generating element of the process is a "power pack" which generates 75 dBA @ 1m.

Such a noise level would not exceed the "highly noise affected" level of 70 dBA (as defined in the ICNG) at any surrounding receiver at any point of the day. As a result, if available and suitable for the specific site conditions, press-in pile methodology may be considered as an option to reduce the noise impact of the sheet piling process.

### 5.2.7 Construction Noise Mitigation and Management

The expected NML exceedances may be concerning for surrounding residents at times and particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies.

The standard suite of mitigation measures includes management measures such as community consultation, site inductions (with guidance on how to minimise noise and vibration) and the preparation of site specific construction noise and vibration management plans.

Examples of mitigation measures which may be considered appropriate for these works are:

- Judicious selection of mechanical plant and equipment (eg quieter machinery and power tools).
- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- The use of appropriate respite periods where receivers are likely to be highly noise affected.
  - For example, the RMS *Construction Noise and Vibration Guideline* states that (noise intensive) work may be carried out in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.
- Localised shielding of noisy equipment.
- Minimising consecutive works in the same locality.
- Considering periods of respite.

Once further details surrounding the proposed construction methodology, equipment and phasing is known, it is recommended that the construction contractor produces a comprehensive Construction Noise and Vibration Management Plan in accordance with the framework for compliance established in this report.

#### 5.2.7.1 Consultation with Key Stakeholders

In developing the Construction Noise and Vibration Management Plan, it is recommended that the contractor engages and consults with key noise sensitive surrounding non-residential sensitive receivers – in order to minimise the impact on these. In particular the Sydney Secondary College may have particular times of day or periods within the year (such as exam times) where the receiver has increased sensitivity to noise.

This consultation should inform the phasing and mitigation / management measures to be contained within the final Construction Noise and Vibration Management Plan. In addition, ongoing dialogue is recommended to ensure the measures adopted are effective, as well as capturing any changes to any agreed respite periods, etc.

#### 5.2.7.2 Noise Monitoring Procedures

As the project is at development application stage, details of equipment to be used, work methodologies to be employed and phasing are not known yet. Procedures and requirements for construction noise monitoring would be determined as the project progresses, with an appropriate monitoring protocol being defined in the Construction Noise and Vibration Management Plan.

#### 5.2.7.3 Site Contact / Complaints Process

It is recommended that the Construction Noise and Vibration Management Plan contains a detailed complaints handling process, and that as part of this, 24 hour site contacts are made available to all surrounding impacted noise sensitive receivers.

### 5.2.8 Construction Vibration Impacts

The level of vibration potentially experienced at a receiver is dependent upon the vibration energy generated by the source, the predominant frequencies of vibration, the localised geotechnical conditions and the interaction of structures and features which can dampen vibration.

The recommended safe working distances for construction plant in **Table 19** are referenced from the RMS *Construction Noise and Vibration Guideline*. Consistent with the guidelines for ground vibration, the recommendations provide for the practical management of potential vibration to minimise the likelihood of cosmetic damage to buildings and disturbance or annoyance in humans.

**Table 19 Recommended Safe Working Distances for Construction Equipment**

| Equipment Item | Rating/ Description | Safe Working Distance | |
|---|---|---|---|
| | | Cosmetic Damage[1] | Human Response |
| Vibratory Roller | < 50 kN (Typically 1-2 tonnes) | 5 m | 15 m to 20 m |
| | < 100 kN (Typically 2-4 tonnes) | 6 m | 20 m |
| | < 200 kN (Typically 4-6 tonnes) | 12 m | 40 m |
| | < 300 kN (Typically 7-13 tonnes) | 15 m | 100 m |

| Equipment Item | Rating/ Description | Safe Working Distance | |
|---|---|---|---|
| | | Cosmetic Damage[1] | Human Response |
| | > 300 kN (Typically 13-18 tonnes) | 20 m | 100 m |
| | > 300 kN (y > 18 tonnes) | 25 m | 100 m |
| Small Hydraulic Hammer | 300 kg – 18 to 34t excavator | 2 m | 7 m |
| Medium Hydraulic Hammer | 1,600 kg – 5 to 12t excavator | 7 m | 23 m |
| Large Hydraulic Hammer | 1,600 kg – 12 to 18t excavator | 22 m | 73 m |
| Vibratory Pile Driver | Sheet piles | 2 m to 20 m | 20 m |
| Pile Boring | ≤ 800 mm | 2 m (nominal) | 4 m |
| Jackhammer | Hand held | 1 m (nominal) | 2 m |

Note 1: Referenced from British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2.

### 5.2.9 Vibration Assessment

As this stage in the project, the requirement for vibration intensive plant is unknown. The potential vibration impacts have however been predicted assuming that a heavy rockbreaker would be required around the project site boundary.

Using the above recommended safe working distances, none of the nearby receivers are believed to be within the safe working distance for cosmetic damage for vibratory rolling, which is the worst case in **Table 19**.

As a more detailed plan of construction equipment, methodology and phasing becomes available, a more thorough assessment of potential vibration impacts can be undertaken with respect to safe working distances and plant size.

### 5.2.10 Vibration Mitigation

The potential impacts from vibration would be assessed as the project progresses through detailed design when more information is available on the schedule for the works, the equipment to be used and the localised geotechnical conditions.

In general, where vibration impacts are considered likely, mitigation measures that should be considered are summarised as follows:

- Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Use lower vibration generating items of excavation plant and equipment, such as smaller capacity rockbreakers or concrete crushers/pulverisers in place of rockbreakers.
- Use dampened rockbreakers and/or “city” rockbreakers to minimise the impacts associated with rockbreaking works.
- If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken to ensure that levels remain below the cosmetic damage criterion.
- Building condition surveys should be completed, where necessary, both before and after the works to identify existing damage and any damage due to the works.

## 5.3 Operational Noise Assessment

Details on the various future uses of the proposal are not currently known at this stage of the project and it has therefore been necessary to make certain assumptions as to the type and location of mechanical equipment. These assumptions are defined in the following sections.

### 5.3.1 Operational Noise Sources

Sources of industrial noise associated with the operation of the proposal will likely consist of the following:

- Loading dock activity noise breakout
  - The loading docks is located on the south-east corner of the development at ground level and is visible from the receivers in NCA3 on the corner of Bridge Road and Wentworth Park Road.
- Maritime loading / unloading on wharfs
  - The wharfs are located on the north side of the development and are shielded from view of the receivers in NCA3 on the North side of the development. The receivers in NCA4, including Sydney Secondary College, will have line of sight view of the maritime activities. However, the peak operating period of the maritime activities is expected to take place outside the operating hours of these facilities.
- Noise from fixed mechanical plant
  - At this stage in the project exact details of the mechanical plant are unknown and would not be confirmed until detailed design. For the purposes of this assessment, mechanical plant has been assumed to be roof mounted to ensure a conservative assessment.
- Noise from public address
  - At this stage in the project, there is no public-address system proposed for the design of the development. If future design requires such a system, it will be designed to not cause an increase in noise levels above the criteria for outdoor licenced areas set in **Section 4.6** at the surrounding noise sensitive receivers.

In order to assess the potential worst-case impacts, a combined cumulative noise model was used to assess all of the above noise sources.

#### Loading Dock Noise Levels

The following typical loading dock noise sources, as detailed in **Table 20**, have been used in the noise model as part of the industrial noise assessment. The 'NPFI Modifying Factor' column shows that a 5dB penalty (increase) in level has been applied to the airbrakes and reverse beepers due to the impulsive nature of the airbrakes and the tonal nature of the reverse beeper.

**Table 20 Loading Dock Source Noise Levels**

| Noise Source | SWL (dBA) | Expected Duration (s) | NPfI Modifying Factor (dBA) |
|---|---|---|---|
| Truck Entering and Leaving | 106 | 120 | 0 |
| Airbrakes | 115 | 2 | 5 (impulsive) |
| Truck Reversing | 102 | 30 | 0 |

| Noise Source | SWL (dBA) | Expected Duration (s) | NPfI Modifying Factor (dBA) |
|---|---|---|---|
| Reverse Beeper | 107 | 30 | 5 (tonality) |

Noise predictions have been based on the following HGV (semi-trailer) movement numbers provided by UrbanGrowth NSW:

- Day: eight per hour (equivalent to two per 15min assessment period)
- Evening: one per hour (equivalent to one per 15min assessment period)
- Night: four per hour (equivalent to one per 15min assessment period)
- Morning: four per hour (equivalent to one per 15min assessment period)

The predictions within this report are based on the number of movements above and appropriate operational management measures should be put in place to ensure these are correct to prevent actual noise emissions being higher than predicted.

#### Maritime Loading / Unloading

The following typical dock noise sources associated with maritime loading, as detailed in **Table 21,** have been used in the noise model as part of the industrial noise assessment.

**Table 21 Maritime Source Noise Levels**

| Noise Source | SWL (dBA) | Expected Duration (s) |
|---|---|---|
| Wharf Forklifts | 99 | 300 |
| People Manually Unloading Stock | 95 | 600 |

#### Fixed Mechanical Plant

The primary location of noise emissions from mechanical plant is currently proposed to be the roof top plant area.

A notional value for the SWL of fixed mechanical plant was included in the noise model in the location of proposed plant areas. This allowed a maximum permissible SWL for the plant to be determined with respect to the NPfI criteria requirements at the surrounding receivers.

### 5.3.2 Predicted Noise Levels

Operational noise levels have been predicted to the receivers surrounding the proposal. The noise levels include the cumulative impact of the currently identified sources of industrial noise, and are summarised in **Table 22**.

**Table 22 Operational Noise Levels – Cumulative Impacts of Loading Dock, Maritime Loading / Unloading, Plant Equipment – Unmitigated**

| NCA | Nearest Receiver Location | Period | $L_{Aeq(15minute)}$ Noise Level (dBA) | | | Compliance? |
|---|---|---|---|---|---|---|
| | | | Project Noise Trigger Level | Predicted | Exceedance | |
| NCA1 | 31-35 Bank St, Pyrmont (Commercial) | When in use (Day) | 68 | 38 | - | Yes |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | Day | 63 | 32 | - | Yes |
| | | Evening | 56 | 29 | - | Yes |
| | | Night | 52 | 29 | - | Yes |
| | | Morning | 57 | 29 | - | Yes |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | Day | 63 | 64 | 1 | **No** |
| | | Evening | 56 | 61 | 5 | **No** |
| | | Night | 52 | 61 | 9 | **No** |
| | | Morning | 57 | 61 | 4 | **No** |
| NCA4 | 1A Burton Street, Glebe | Day | 59 | 45 | - | Yes |
| | | Evening | 53 | 42 | - | Yes |
| | | Night | 47 | 42 | - | Yes |
| | | Morning | 49 | 42 | - | Yes |
| | Sydney Secondary College, Glebe | When in use (Day) | 58 | 60 | 2 | **No** |
| NCA5 | 13 Griffin Place, Glebe | Day | 55 | 34 | - | Yes |
| | | Evening | 53 | 31 | - | Yes |
| | | Night | 48 | 31 | - | Yes |
| | | Morning | 48 | 31 | - | Yes |

The above shows that exceedances of the PNTL are anticipated at the nearest receiver in NCA3 during all assessment periods. Minor exceedance of the PNTL is also predicted at Sydney Secondary College in NCA4 during the daytime assessment period, and at the nearest receiver in NCA4 during the night-time assessment period

### 5.3.3 Mitigation Assessment – Loading Dock

As exceedances of the PNTL are predicted, noise mitigation is required to be investigated to minimise noise emissions from the operation on the loading dock. **Table 23** summarises the potential mitigation measures that could be used to reduce noise emissions.

### Table 23 Loading Dock Mitigation Assessment

| Location | Mitigation Measure | Potential Reduction | Discussion |
|---|---|---|---|
| Source | Provide absorption to Loading Dock area to reduced reverberant noise build up | -3 dBA | Adopted. Considered feasible and reasonable. This mitigation measure will be adopted and absorption is to be applied to the entire underside of the soffit of the Loading Dock area |
| Source | Remove the need for reversing alarms within the Loading Dock | -2 dBA | Not Adopted. Not considered feasible on the grounds of safety in the Loading Dock. |
| Source | Management measure to permit only vehicles with broadband reversing alarms to use the Loading Dock | -2 dBA | Adopted. Considered feasible and reasonable. UrbanGrowth NSW have confirmed that a management policy will be in place to only permit vehicles with broadband reversing alarms in the Loading Dock |
| Source | Remove the 'airbrake' noise source contribution | -1 dBA | Not Adopted. Not considered feasible. It is not believed Semi's can operate without this gas release. |
| Path | Break line-of-sight from Loading Dock to 84 Wentworth Park Road | -5 dBA | Not Adopted. Not considered feasible. This was investigated with numerous sightline studies performed by the design team. It is not believed that line-of-sight can be broken to the receivers due to the need to access the Loading Dock from the road junction in its current location. |
| Path | Acoustically rated Roller Door on Loading Dock | -15 to -20 dBA | Not Adopted. Not considered feasible. Due to the volume of traffic entering the facility from this entrance (including smaller vans accessing basement, etc.) the roller door would be open for the vast majority of the time. Further, additional noise from semi's and other vehicles stopping to wait outside while the door opens, along with the noise of the door itself, will likely mean that potential noise reductions would be much lower than the theoretical potential |
| Receiver | Provide "at-property" treatments to 84 Wentworth Park Road to reduce internal noise impacts | TBA | Considered, see **Section 5.3.6**. |

### 5.3.4 Post Mitigation Noise Levels

With the adopted mitigation measures as per **Table 23**, the revised noise levels shown in **Table 24** are predicted from all sources of operational sources.

**Table 24 Post Mitigation Operational Noise Levels – Cumulative Impacts of Loading Dock, Maritime Loading / Unloading, Plant Equipment – Mitigated Loading Dock**

| NCA | Nearest Receiver Location | Period | LAeq(15minute) Noise Level (dBA) | | | Compliance? |
|---|---|---|---|---|---|---|
| | | | Project Noise Trigger Level | Predicted | Exceedance | |
| NCA1 | 31-35 Bank St, Pyrmont (Commercial) | When in use | 68 | 33 | - | Yes |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | Day | 63 | 27 | - | Yes |
| | | Evening | 56 | 24 | - | Yes |
| | | Night | 52 | 24 | - | Yes |
| | | Morning | 57 | 24 | - | Yes |
| NCA3 | 84 Wentworth Park Road - Corner of Wentworth Park and Bridge Road, Glebe | Day | 63 | 59 | - | Yes |
| | | Evening | 56 | 56 | - | Yes |
| | | Night | 52 | 56 | 4 | **No** |
| | | Morning | 57 | 56 | - | Yes |
| NCA4 | 1A Burton Street, Glebe | Day | 59 | 40 | - | Yes |
| | | Evening | 53 | 37 | - | Yes |
| | | Night | 47 | 37 | - | Yes |
| | | Morning | 49 | 37 | - | Yes |
| | Sydney Secondary College, Glebe | When in use | 58 | 52 | - | Yes |
| NCA5 | 13 Griffin Place, Glebe | Day | 55 | 29 | - | Yes |
| | | Evening | 53 | 26 | - | Yes |
| | | Night | 48 | 26 | - | Yes |
| | | Morning | 48 | 26 | - | Yes |

With the inclusion of the loading dock mitigation as per **Table 23**, there is a 4 dBA residual exceedance of the night-time PNTL at the residential receiver at 84 Wentworth Park Road.

### 5.3.5 Mitigation – Mechanical Plant

Based on the noise modelling, the following maximum permissible combined Sound Power Level (SWL) for noise emissions from all equipment within this area is limited to 105 dBA.

Assuming the overall SWL is achieved, compliance with NPfI is anticipated to be met at all surrounding noise sensitive receivers. Mitigation may be required to individual plant items in order to achieve the overall limiting SWL, however it is expected that this can be achieved with standard mitigation measures. Such measures may include:

- Appropriate selection of all equipment.
- Local mitigation at each item of plant if required (encasing units, applying in-duct attenuators, etc).

- Room acoustic control within enclosed plant rooms if required (acoustically absorbent finishes applied to walls)
- Appropriate selection of acoustic louvres and/or screening around plant equipment.

The requirement for noise mitigation of mechanical plant would need to be reviewed and confirmed during detailed design.

### 5.3.6 Residual Exceedances

Section 4.2 of the NPfI states that:

*"Planning decisions for proposed developments take into account social, economic and environmental factors. Noise impact is one factor taken into account and decisions can be made that result in residual noise impacts (that is, noise levels above the project noise trigger level)."*

The NPfI also rates the significance of any residual impacts as shown in **Table 25** (which is a repeat of NPfI Table 4.1) and suggests examples of potential mitigation that may be required by planning authorities to mitigate residual noise impacts as shown in **Table 26** (which is a repeat of NPfI Table 4.2).

**Table 25 - NPfI Classification of Residual Exceedances**

| If the predicted noise level minus the project noise trigger level is: | And the total cumulative industrial noise level is: | Then the significance of residual noise level is: |
|---|---|---|
| ≤ 2 dBA | Not applicable | Negligible |
| ≥ 3 but ≤ 5 dBA | < recommended amenity noise level<br>or<br>> recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB | Marginal |
| ≥ 3 but ≤ 5 dBA | > recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB | Moderate |
| > 5 dBA | ≤ recommended amenity noise level | Moderate |
| > 5 dBA | > recommended amenity noise level | Significant |

**Table 26 - Examples of potential treatment for residual exceedances**

| Significance of residual noise level | Example of potential treatment |
|---|---|
| Negligible | The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls. |
| Marginal | Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity. |
| Moderate | As for 'marginal', but also upgraded facade elements, such as windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels. |
| Significant | May include suitable commercial agreements where considered feasible and reasonable. |

The 4 dB residual exceedance for the residential apartments at 84 Wentworth Park Road, as shown in **Table 24**, is classified as "Moderate". As a result, suitable at-property mitigation to these receivers may include measures such as:

- Mechanical / Comfort ventilation
- Upgraded external building fabric (such as glazing, doors, etc).

It is understood that the residential apartments at 84 Wentworth Park Road were approved by City of Sydney Council under approval number D2004/01275. Condition 33 of this approval requires the units to be designed to achieve the internal noise levels within AS2107:1989.

There are currently high levels of external traffic noise from Bridge Road incident on 84 Wentworth Park Road (approximately 70 dBA during the daytime and 65 dBA during the night-time) and this is unlikely to have significantly changed from the time of approval. As a result, it is considered likely that in order to meet Condition 33 of the approval, the apartments are likely to have been constructed with high performance building facades as well as being provided with mechanical ventilation.

Should this be the case, any further "at property" treatments to these apartments may not result in any significant performance improvements. It is recommended that this is investigated further in detailed design, including inspection of the eligible apartments. Additional treatment should only be provided where they significantly reduce (ie ≥ 3dBA) external noise ingress.

It is understood that the new Sydney Fish Market project team are to engage with the representatives of the residential apartments at 84 Wentworth Park Road and discuss the impacts of residual exceedances and potential preferred additional mitigation measures (where possible).

## 5.4 Patron Noise Assessment

A summary of the locations and occupancies of the primary source of patron noise is presented below in **Table 27**.

### Table 27 Summary of Primary Patron Areas

| Name | Location | Level | Occupancy[1] | Line of Sight to: |
|---|---|---|---|---|
| Shared Dining | Northern Façade | Upper Ground 01 | 600 | NCA1, NCA4 |
| Shared Dining | Eastern Façade | Upper Ground 01 | 300 | NCA1, NCA2 |
| Shared Dining | Western Façade | Upper Ground 01 | 300 | NCA3, NCA4 |
| Skybar | South Eastern Corner | Upper Level 02 | 70 | NCA3, NCA4 |
| Seafood School Terrace | North Eastern Corner | Upper Level 02 | 150 | NCA1, NCA2 |

Note 1: Occupancy is assumed to be based upon an approximate capacity of 1 person per square metre.

### 5.4.1 Patron Activity Noise Sources

Noise associated with patron activity (such as dining) was calculated using the following source data shown in **Table 28.**

### Table 28 Patron Source Noise Levels - 100% Occupancy

| Noise Source – 100% Occupancy | Sound Power Level, dB ($L_{eq}$ per source) at 1/1 Octave Band | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | dBA | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| North-West terrace (facing wharves) | 102 | 81 | 86 | 92 | 98 | 102 | 98 | 92 | 87 | 79 |
| East and West terraces | 99 | 78 | 83 | 89 | 95 | 99 | 95 | 89 | 84 | 76 |
| Skybar | 96 | 74 | 79 | 85 | 91 | 95 | 91 | 85 | 80 | 72 |
| Seafood School Terrace | 93 | 71 | 76 | 82 | 88 | 92 | 88 | 82 | 77 | 69 |

Note: Source levels calculated assuming that 50% of patrons in each space will be speaking at any given time, using the "raised voice" spectrum in ANSI S3.5-1997 (R2017) "*Methods for Calculation of the Speech Intelligibility Index*".

### 5.4.2 Predicted Noise Levels

Noise levels from patron noise has been predicted to the surrounding receivers. The assessment is summarized in **Table 29**.

### Table 29 Patron dining noise at 100% occupancy

| NCA | Location | Centre Frequency (Hz) at 1/1 Octave Band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 31.5 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| | **Criteria** | | | | | | | | | |
| NCA1 | Commercial Receivers East of the Development | 81 | 81 | 77 | 74 | 73 | 73 | 67 | 59 | 49 |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | 71 | 71 | 67 | 64 | 63 | 64 | 57 | 49 | 39 |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | 71 | 71 | 67 | 64 | 63 | 64 | 57 | 49 | 39 |
| NCA4 | Sydney Secondary College | 70 | 69 | 65 | 62 | 62 | 62 | 56 | 47 | 37 |
| | 1A Burton Street, Glebe | 64 | 63 | 60 | 56 | 56 | 56 | 50 | 42 | 32 |
| NCA5 | 13 Griffin Place, Glebe | 60 | 60 | 56 | 53 | 52 | 53 | 46 | 38 | 28 |
| | **Predicted Levels – 100% Occupancy** | | | | | | | | | |
| NCA1 | Commercial Receivers East of the Development | 26 | 31 | 38 | 45 | 49 | 45 | 37 | 28 | <20 |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | 25 | 28 | 32 | 41 | 45 | 41 | 36 | 29 | <20 |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | 34 | 39 | 45 | 50 | 54 | 50 | 45 | 39 | 28 |
| NCA4 | Sydney Secondary College | 35 | 40 | 46 | 53 | 57 | 54 | 49 | 41 | 28 |
| | 1A Burton Street, Glebe | 27 | 32 | 36 | 41 | 45 | 41 | 35 | 30 | <20 |
| NCA5 | 13 Griffin Place, Glebe | 24 | 29 | 32 | 38 | 43 | 40 | 33 | 25 | <20 |
| | **Exceedances** | | | | | | | | | |
| NCA1 | Commercial Receivers East of the Development | - | - | - | - | - | - | - | - | - |
| NCA2 | 217/1 Wattle Crescent, Pyrmont | - | - | - | - | - | - | - | - | - |
| NCA3 | Corner of Wentworth Park and Bridge Road, Glebe | - | - | - | - | - | - | - | - | - |
| NCA4 | Sydney Secondary College | - | - | - | - | - | - | - | - | - |
| | 1A Burton Street, Glebe | - | - | - | - | - | - | - | - | - |
| NCA5 | 13 Griffin Place, Glebe | - | - | - | - | - | - | - | - | - |

The above shows no exceedances of the established criteria are predicted from patron noise. This is due to the largest patron area being screened to the closest receivers by the Fish Market building itself and the smaller patron areas being appreciable distances from the other sensitive receivers.

It is important to note however, that although the proposed development has been demonstrated to be able to operate in a compliant manner with respect to noise emission; various assumptions have been made as to patron behaviour.

Whilst every effort has been made to correlate predicted noise levels with measured noise data, it is regarded as a management issue to ensure that patrons behave in a reasonable manner so as not to cause undue disturbance to the acoustic amenity of any nearby noise-sensitive receivers.

### 5.4.3 Road Noise – Impacts on Surrounding Road Network

The NSW *Road Noise Policy* (RNP) requires consideration of noise mitigation where new land use developments increase road traffic noise by more than 2 dB. For a 2 dB increase in noise to be apparent a corresponding increase in traffic volumes of approximately 60 percent is required (assuming road speeds and other factors remain unchanged).

The Traffic Impact Assessment prepared by ARUP for UrbanGrowth NSW states that the overall increase in traffic to the proposed development is a 39% increase over the existing number of vehicular trips going to the existing Fish markets. Vehicular trips to the existing Fish Markets do not account for a significant proportion of traffic on the nearby traffic network because the nearby roads feed onto the Western Distributor. This means that the increase in vehicular trips to the proposed development will not generate a significant increase in traffic noise in the area.

# 6 Conclusion

An assessment of the noise impacts associated with the proposed Construction and Operation of the new Sydney Fish Markets located on Blackwattle Bay, Glebe has been completed. This assessment has been carried out in accordance with NSW regulatory requirements and will form part of the State Significant Development (SSD 8924 and 8925) application to the NSW Department of Planning and Environment in support of the development.

The assessment has addressed all aspects of Item 14 (Noise and vibration) of the SEARs issued for the development for both SSD applications.

## 6.1 Construction Noise and Vibration Impacts

A high-level assessment has been undertaken using plant and equipment representative of the likely construction methodologies as described in the project CEMP has shown:

- Receivers directly opposite the proposed development in NCA3 are likely to be "Highly Noise Affected" as defined in the ICNG under a "Worst Case" scenario. Levels experienced on a day to day basis at these locations may be lower for the majority of the construction period.
- A small number of receivers are predicted to be "Noise Affected" as defined in the ICNG

As a result, the Demolition and Construction Contractor(s) will need to develop mitigation and management strategies in consultation with the surrounding community and local authority in line with the framework of the ICNG. This report has outlined possible approaches such strategies.

No adverse vibration impacts are expected due to the separation of the site to the surrounding receivers.

## 6.2 Operational Noise and Vibration Impacts

The assessment has shown that – without any mitigation – exceedances are expected at the closest receivers in NCA3 and NCA4 from noise generated within the Loading Dock.

A study of feasible and reasonable mitigation measures has been undertaken and mitigation provided within the design to reduce noise emissions from the Loading Dock where possible. Despite this, there is a single residual exceedance of 4dB for the residential units at 84 Wentworth Park Road during the night time period.

The report recommends that potential "at property" treatments to the units at 84 Wentworth Park Road are investigated further as part of the detailed design of the new Sydney Fish Market project. Additional treatments should be provided where they significantly reduce (ie ≥ 3dBA) external noise ingress .

No exceedances are predicted from other sources of operational noise.

# APPENDIX A

Acoustic Terminology

## 1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is 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 x $10^{-5}$ 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 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA 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 (eg 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

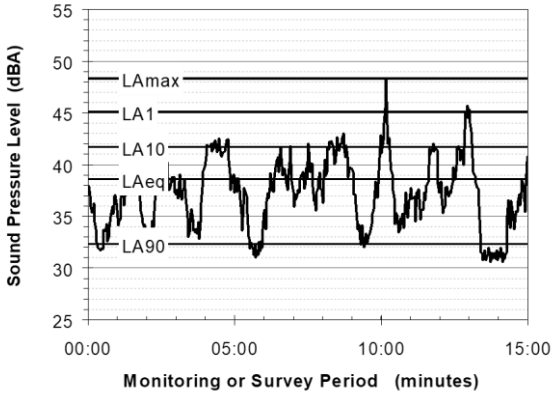
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit $10^{-12}$ W.

The relationship between Sound Power and Sound Pressure may be likened to 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 exceed 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.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (LAeq, LA10, etc).

## 5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

## 6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

## 7 Frequency Analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

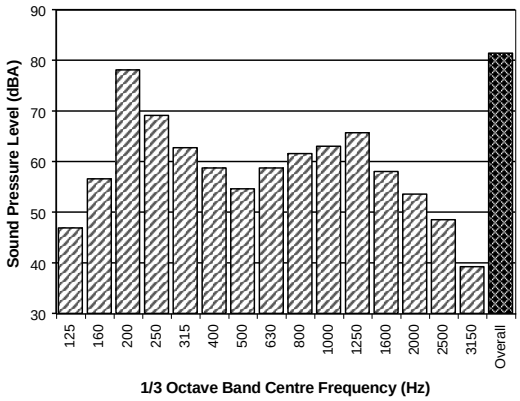
The units for frequency are Hertz (Hz), which represent the number of cycles per second.

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 (3 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.




## 8 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. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) 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 by some organizations.

## 9 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.

## 10 Over-Pressure

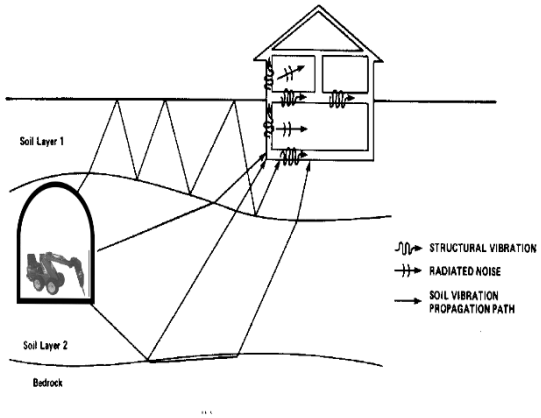
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

## 11 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 (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents 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

Ambient Noise Monitoring Results

| | |
|---|---|
| **Noise Monitoring Location:** | **L.01** |
| **Noise Monitoring Address:** | **31-35 Bank Street** |

Logger Device Type: ARL-EL 316, Logger Serial No: 16-004-038

Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2487418

Ambient noise logger deployed at commercial address 31-35 Bank Street, Pyrmont. Logger located directly beneath Western Distributor with in direct line of sight to Bank Street.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from Western Distributor and continuous operational noise emissions from nearby industrial premises. Frequent light and heavy vehicle passbys on Bank Street and intermittent transient operational noise from surrounding commercial properties also contributed to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):

08/02/2018: Light-vehicle traffic (Bank Street): 70-77 dBA, Heavy-vehicle traffic (Bank Street): 70-75 dBA, Car park alarm: 72 dBA, Heavy-vehicle traffic (Western Distributor): 72 – 78 dBA, Operational noise: 79 dBA

**Map of Noise Monitoring Location**


**Ambient Noise Logging Results – NPfI Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 66 | 71 |
| Evening | 64 | 68 |
| Night-time | 60 | 65 |
| Early Morning | 62 | 70 |

**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | $L_{Aeq(Period)}$ | $L_{Aeq(1hour)}$ |
| Daytime (7am-10pm) | 70 | 71 |
| Night-time (10pm-7am) | 67 | 72 |

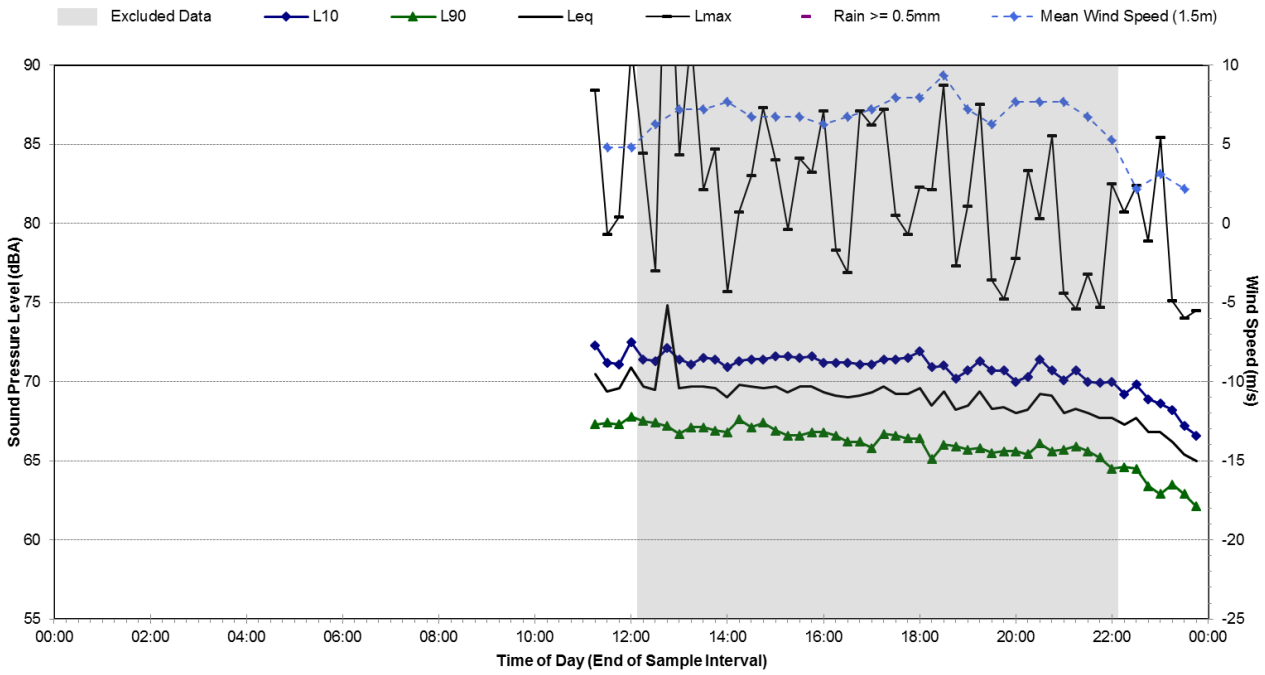
**Attended Noise Measurement Results**

| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 08/02/2018 | 9:39am | 67 | 69 | 79 |

**Photo of Noise Monitoring Location**

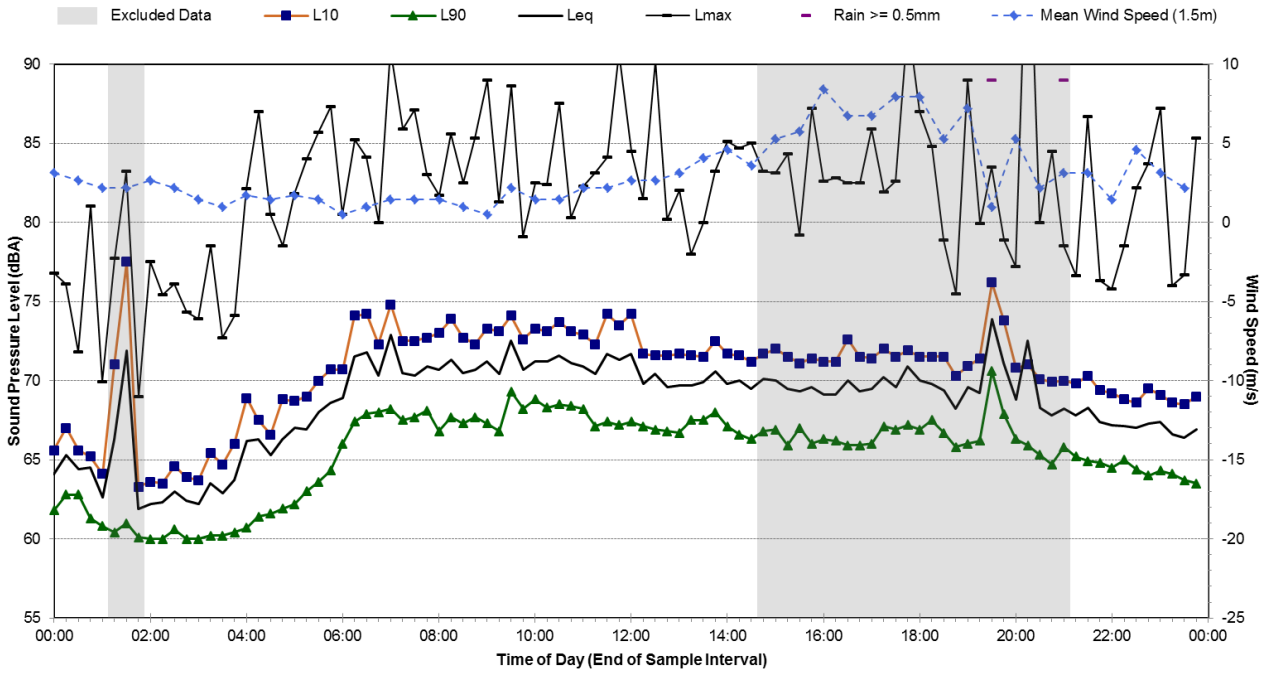
## Statistical Ambient Noise Levels

### L01 31-35 Bank St - Thursday, 8 February 2018

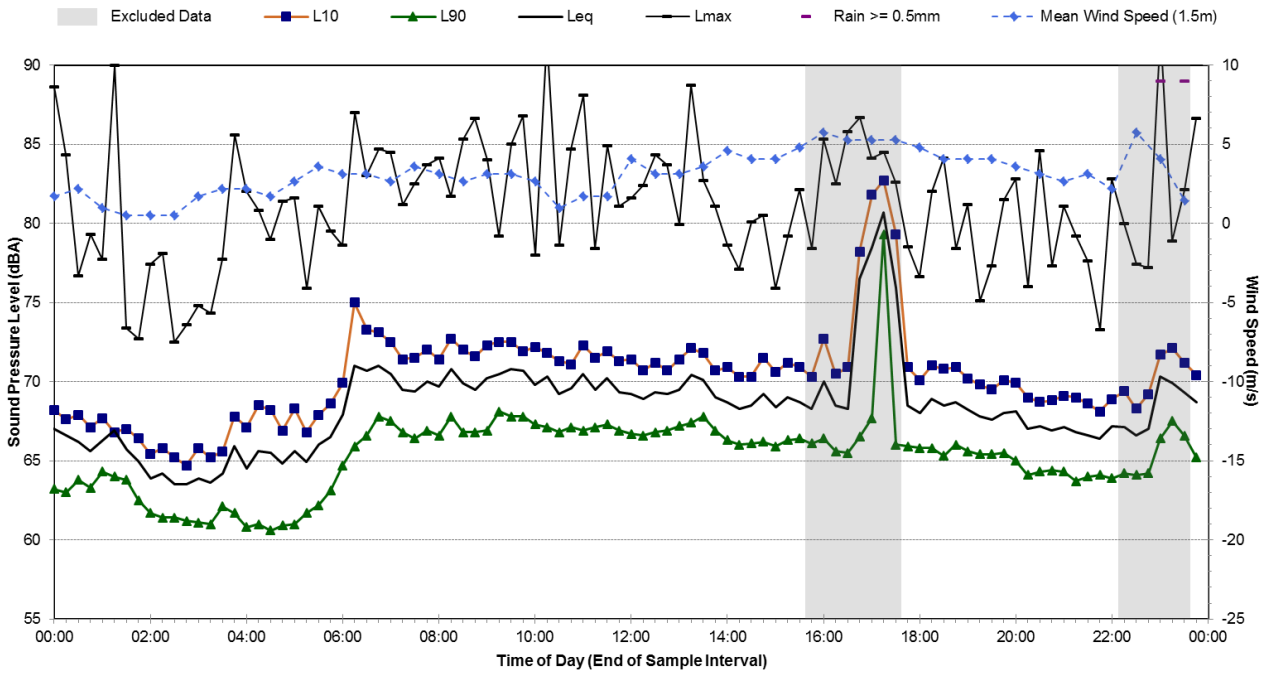



## Statistical Ambient Noise Levels

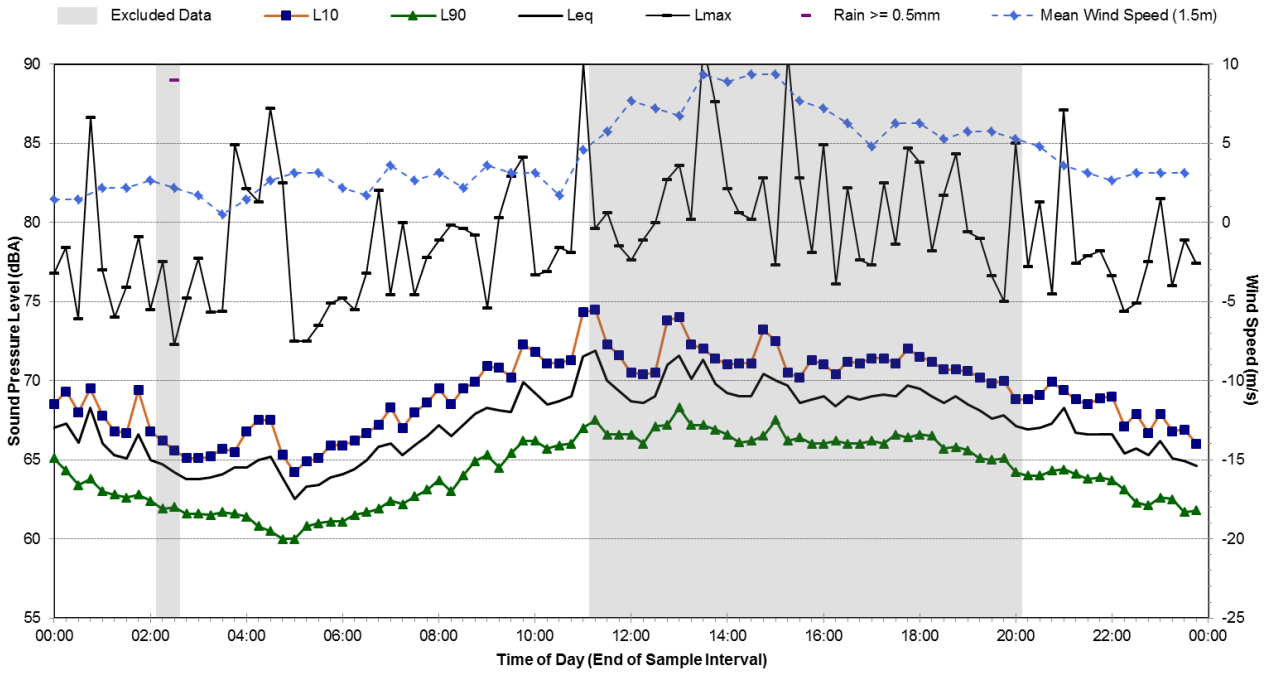
### L01 31-35 Bank St - Friday, 9 February 2018



## Statistical Ambient Noise Levels
### L01 31-35 Bank St - Saturday, 10 February 2018

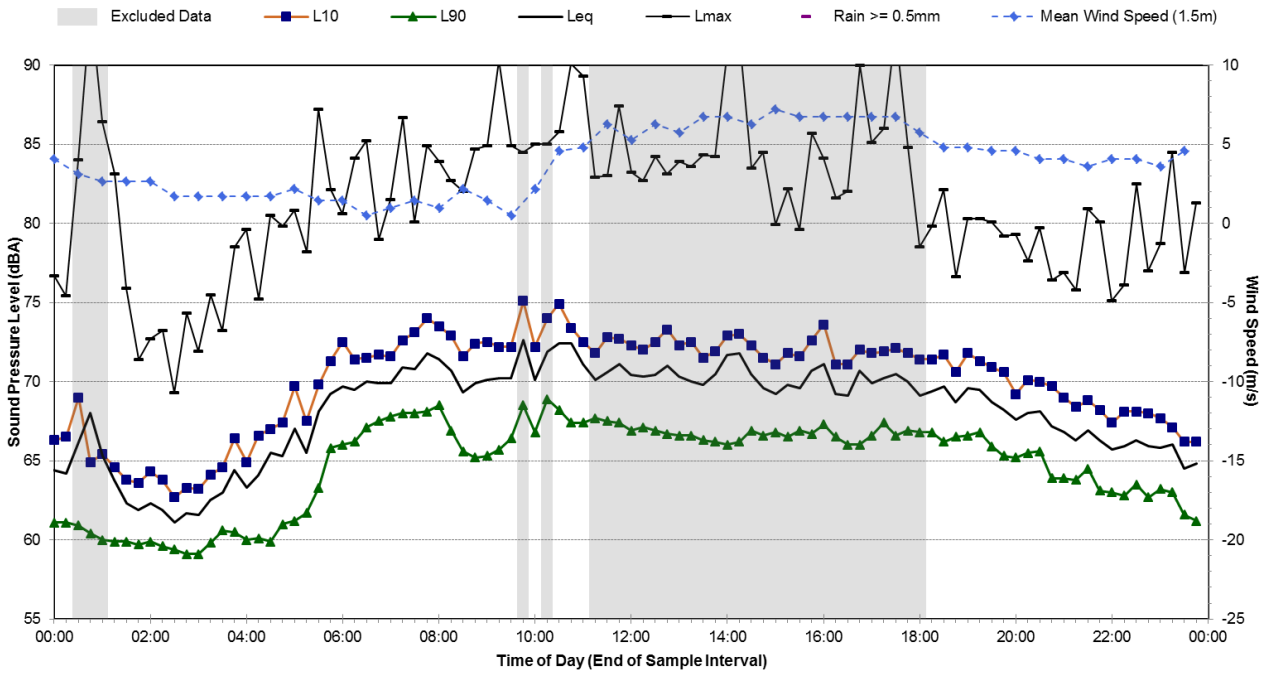



## Statistical Ambient Noise Levels
### L01 31-35 Bank St - Sunday, 11 February 2018



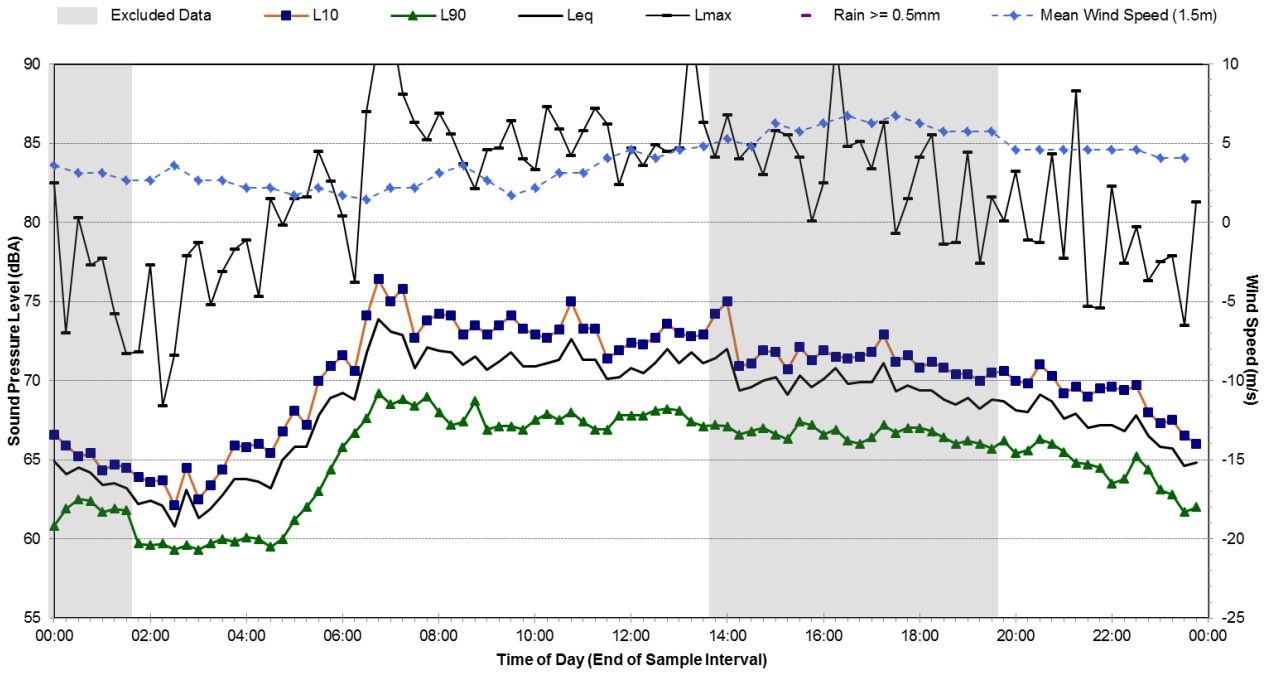
## Statistical Ambient Noise Levels

### L01 31-35 Bank St - Monday, 12 February 2018



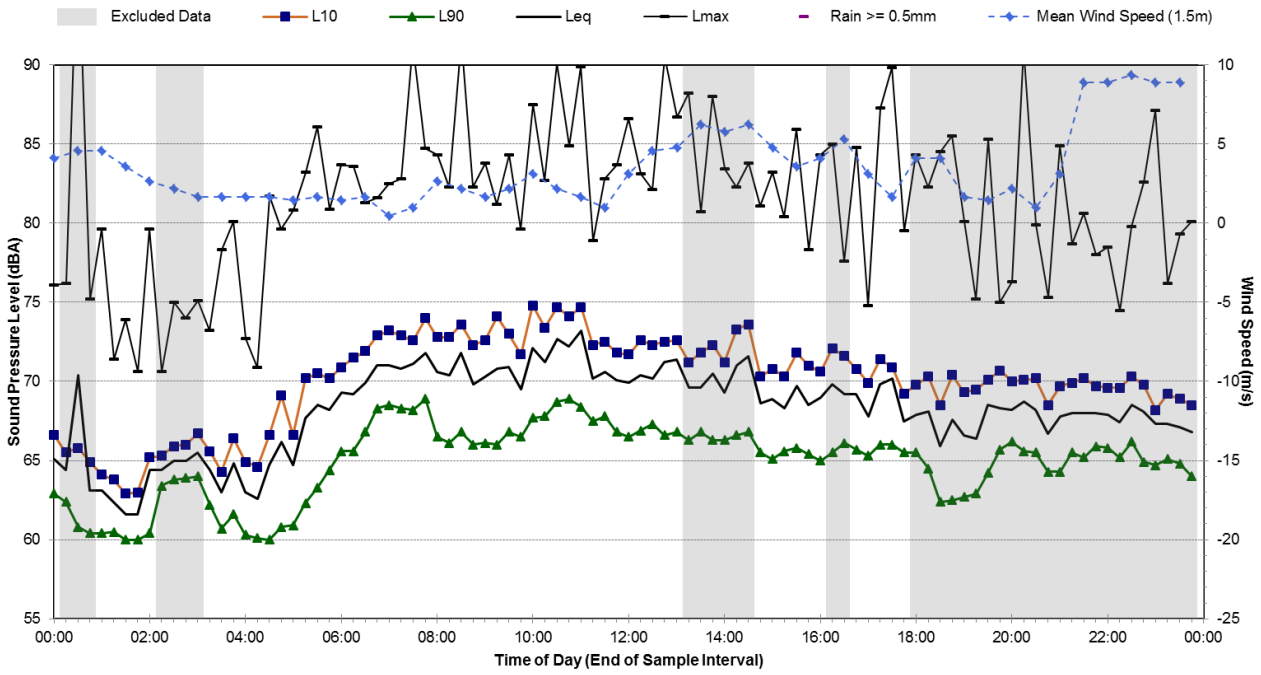

## Statistical Ambient Noise Levels

### L01 31-35 Bank St - Tuesday, 13 February 2018



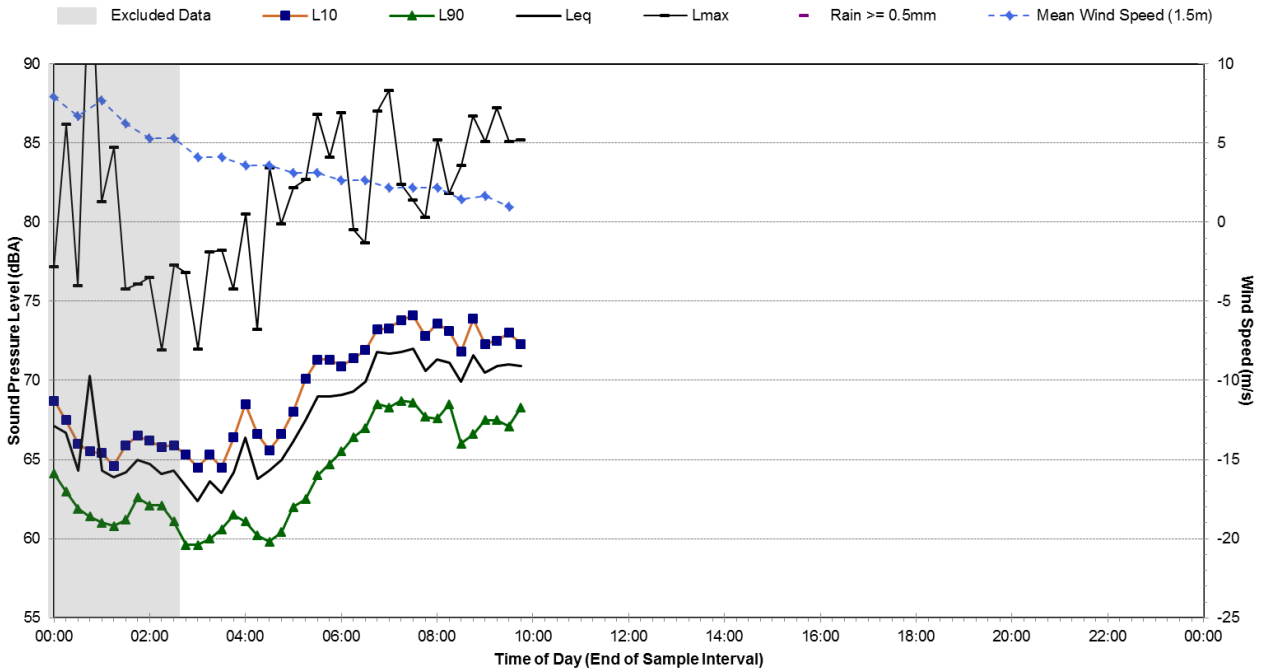
## Statistical Ambient Noise Levels

### L01 31-35 Bank St - Wednesday, 14 February 2018




## Statistical Ambient Noise Levels

### L01 31-35 Bank St - Thursday, 15 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.02** |
| **Noise Monitoring Address:** | **132 Bank Street** |

Logger Device Type: Brüel and Kjær 2250, Logger Serial No: 3005908

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 2487418

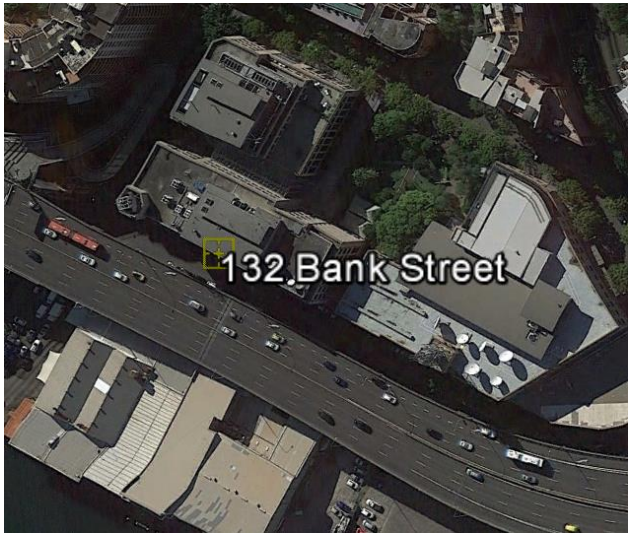
Ambient noise logger deployed at commercial address 132 Bank Street, Pyrmont. Logger located at Goodman, Level 2, in line with the height of the Western Distributor.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Western Distributor with intermittent operational noise emissions from nearby industrial premises at ground level also contributed to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):

15/02/18: Light-vehicle traffic (Bank Street): 72 - 73 dBA, Heavy-vehicle traffic (Bank Street): 78 dBA, Light-vehicle traffic (Western Distributor): 75 – 82 dBA, Heavy-vehicle traffic (Western Distributor): 81 – 82 dBA, Operational noise: 75 76 dBA

**Map of Noise Monitoring Location**




**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 70 | 75 |
| Evening | 70 | 74 |
| Night-time | 61 | 70 |
| Early Morning | 66 | 75 |

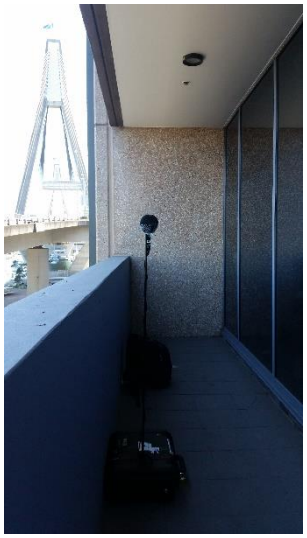
**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | LAeq(Period) | LAeq(1hour) |
| Daytime (7am-10pm) | 74 | 76 |
| Night-time (10pm-7am) | 72 | 76 |

**Attended Noise Measurement Results**

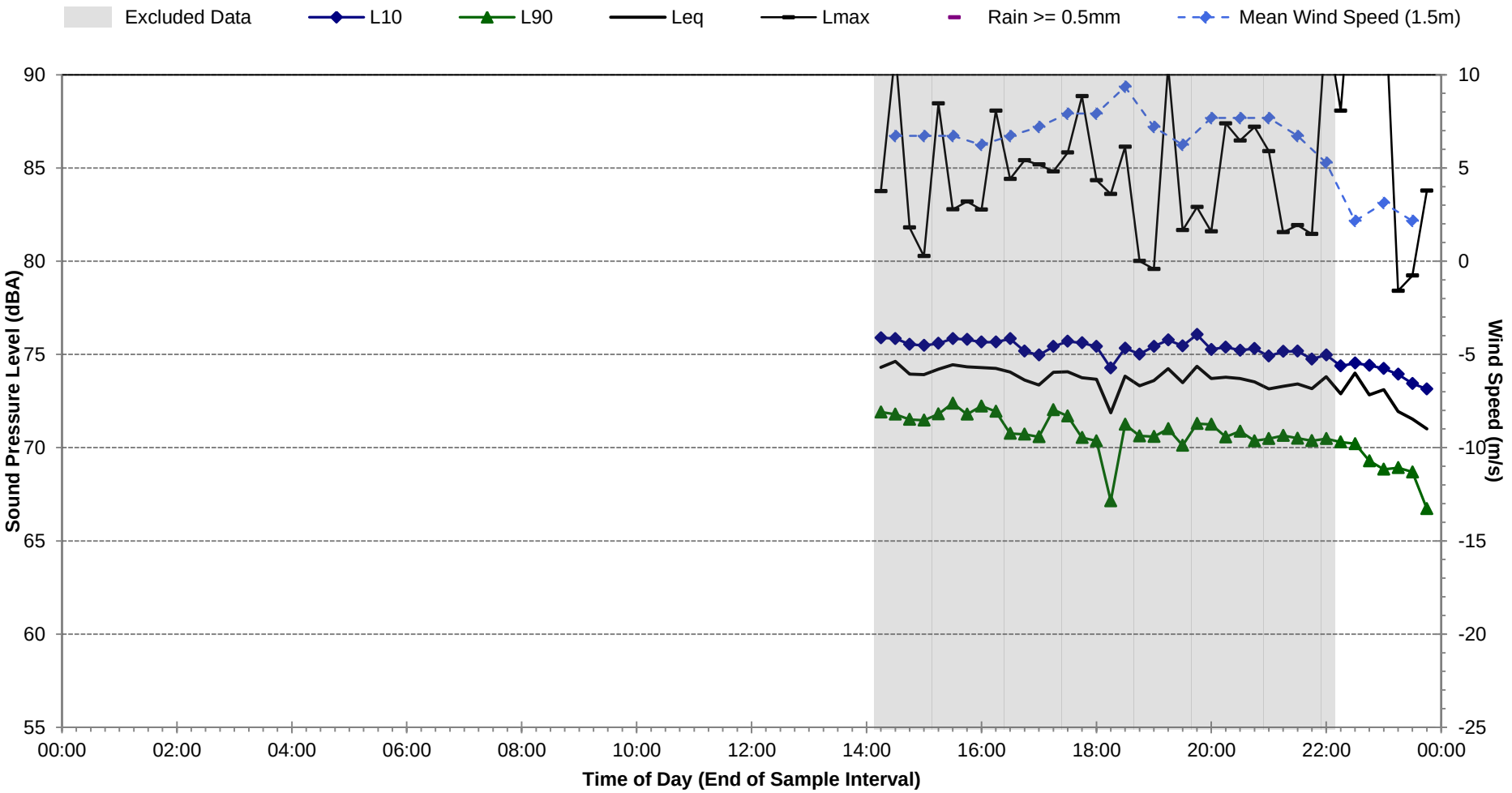
| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 15/02/2018 | 7:40am | 67 | 71 | 82 |

**Photo of Noise Monitoring Location**



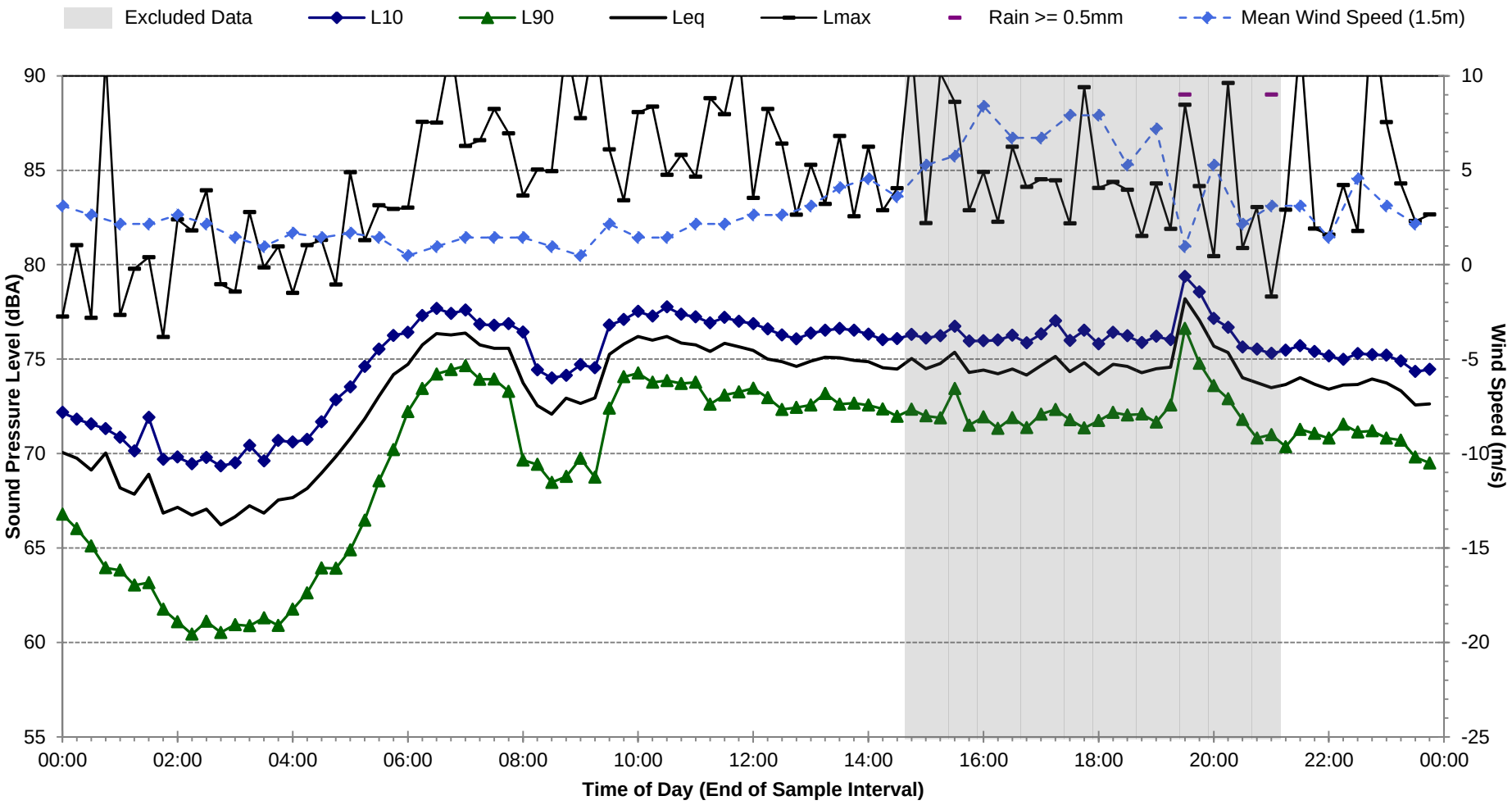
# Statistical Ambient Noise Levels

## 132 Bank Street - Thursday, 8 February 2018



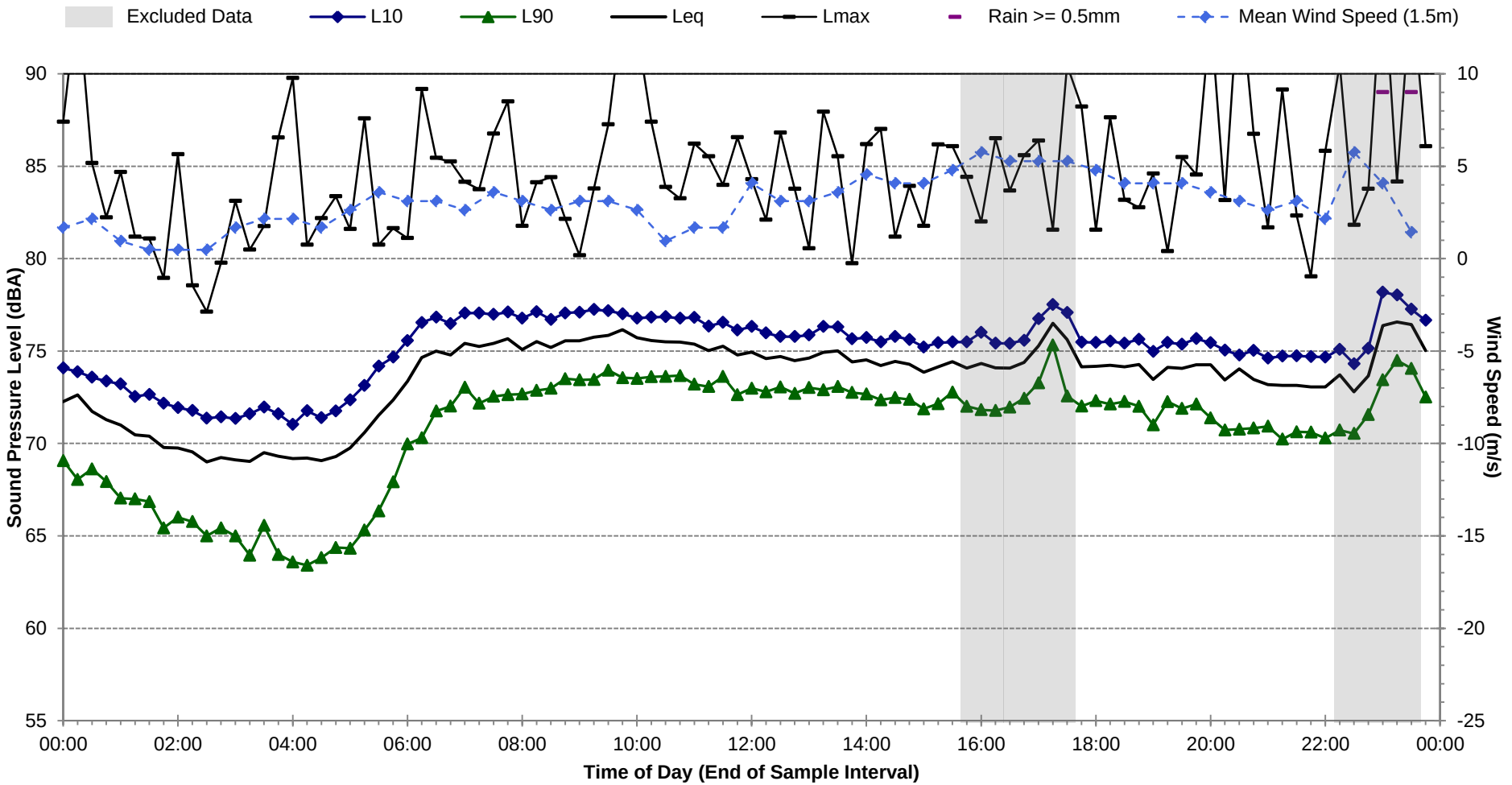
# Statistical Ambient Noise Levels

## 132 Bank Street - Friday, 9 February 2018



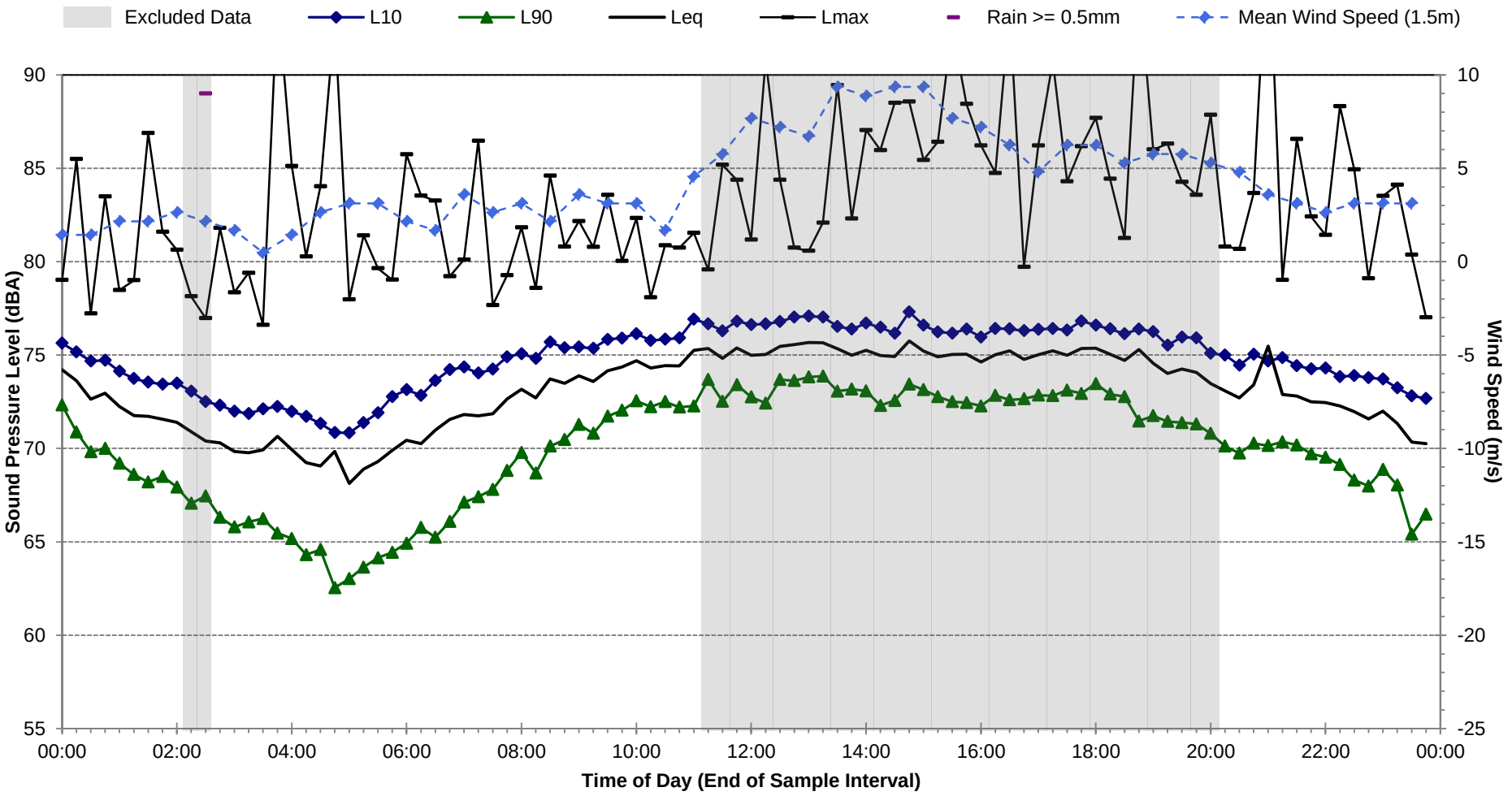
# Statistical Ambient Noise Levels

## 132 Bank Street - Saturday, 10 February 2018



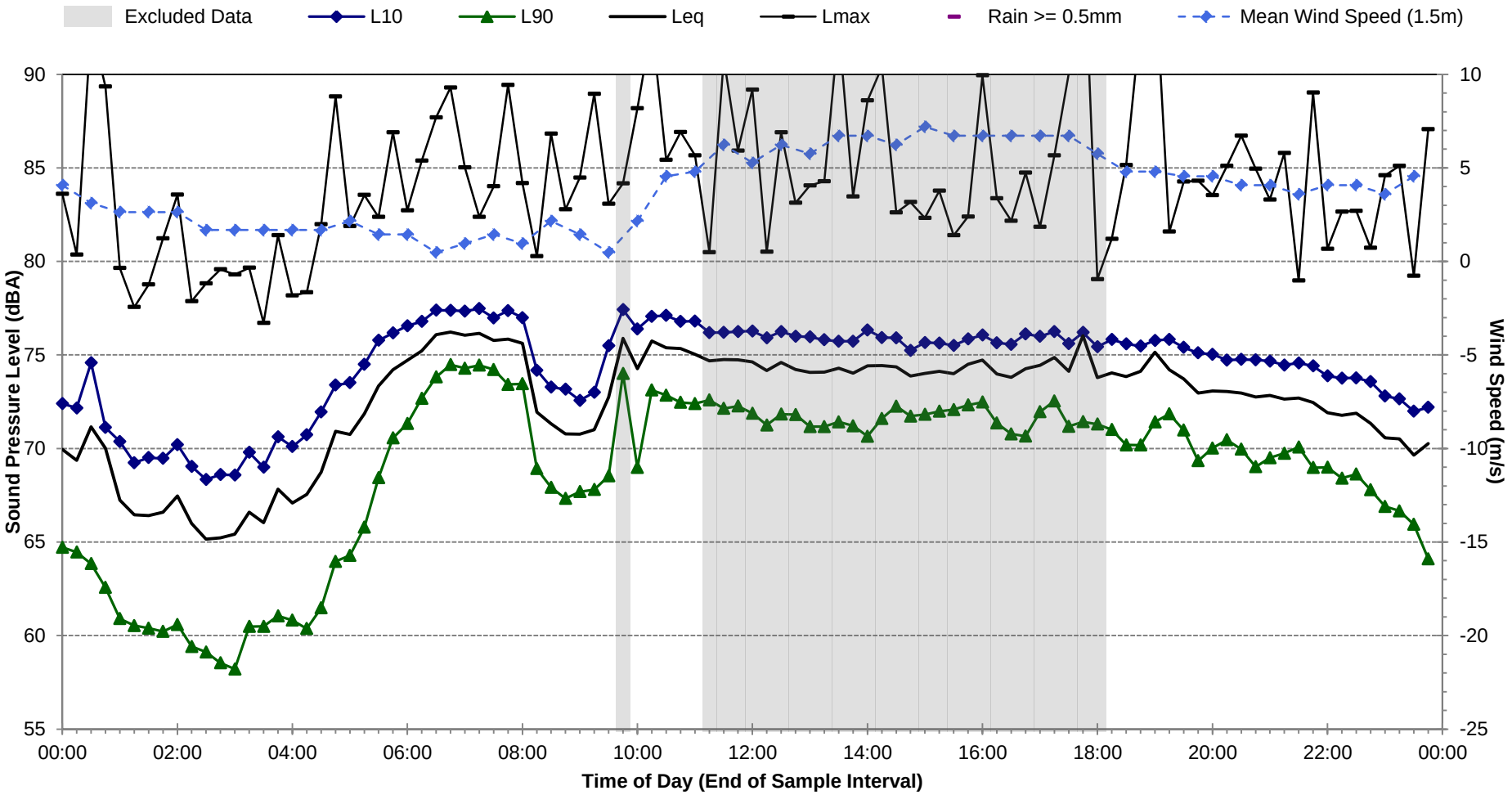
# Statistical Ambient Noise Levels

## 132 Bank Street - Sunday, 11 February 2018



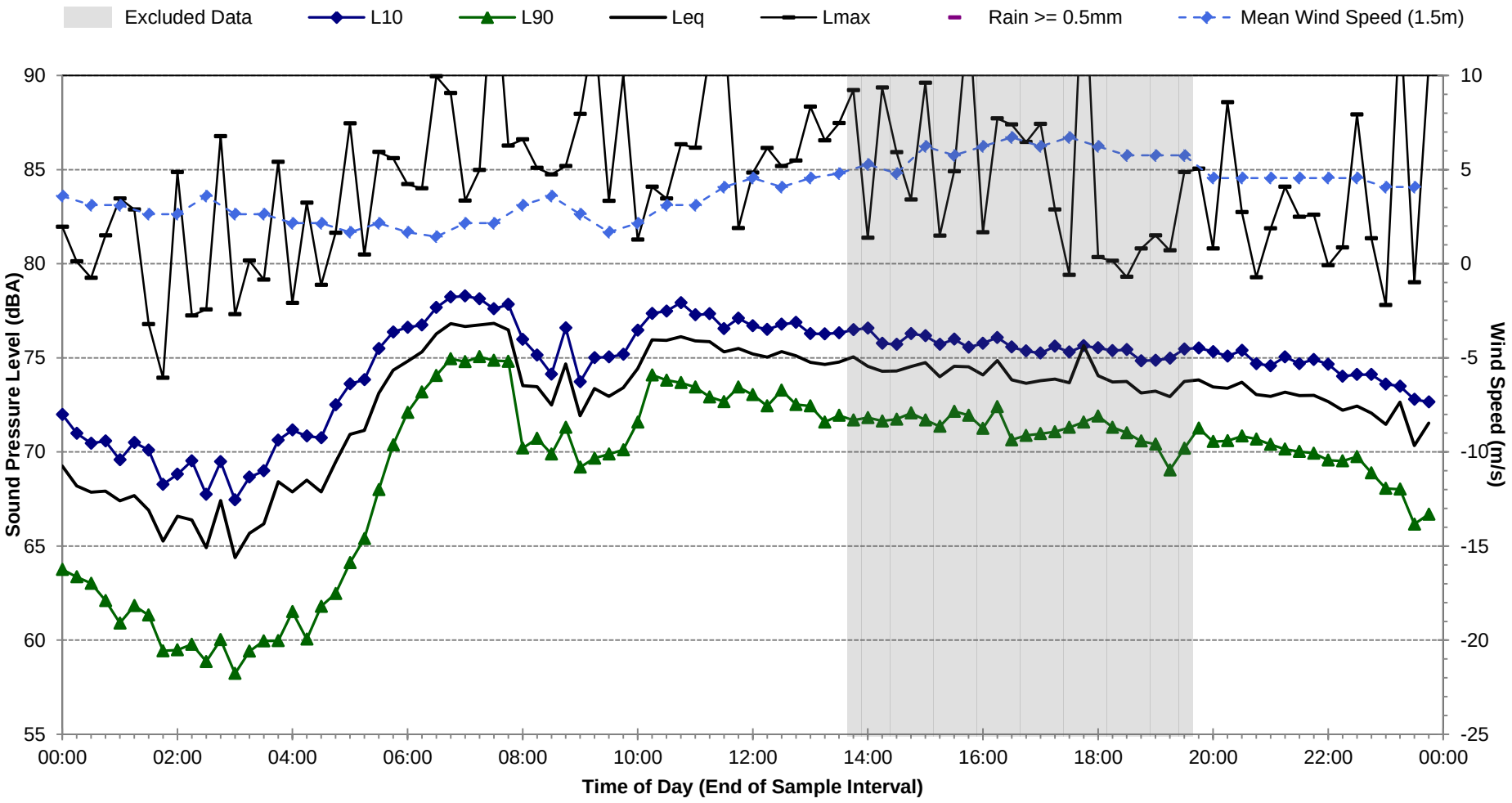
# Statistical Ambient Noise Levels

## 132 Bank Street - Monday, 12 February 2018

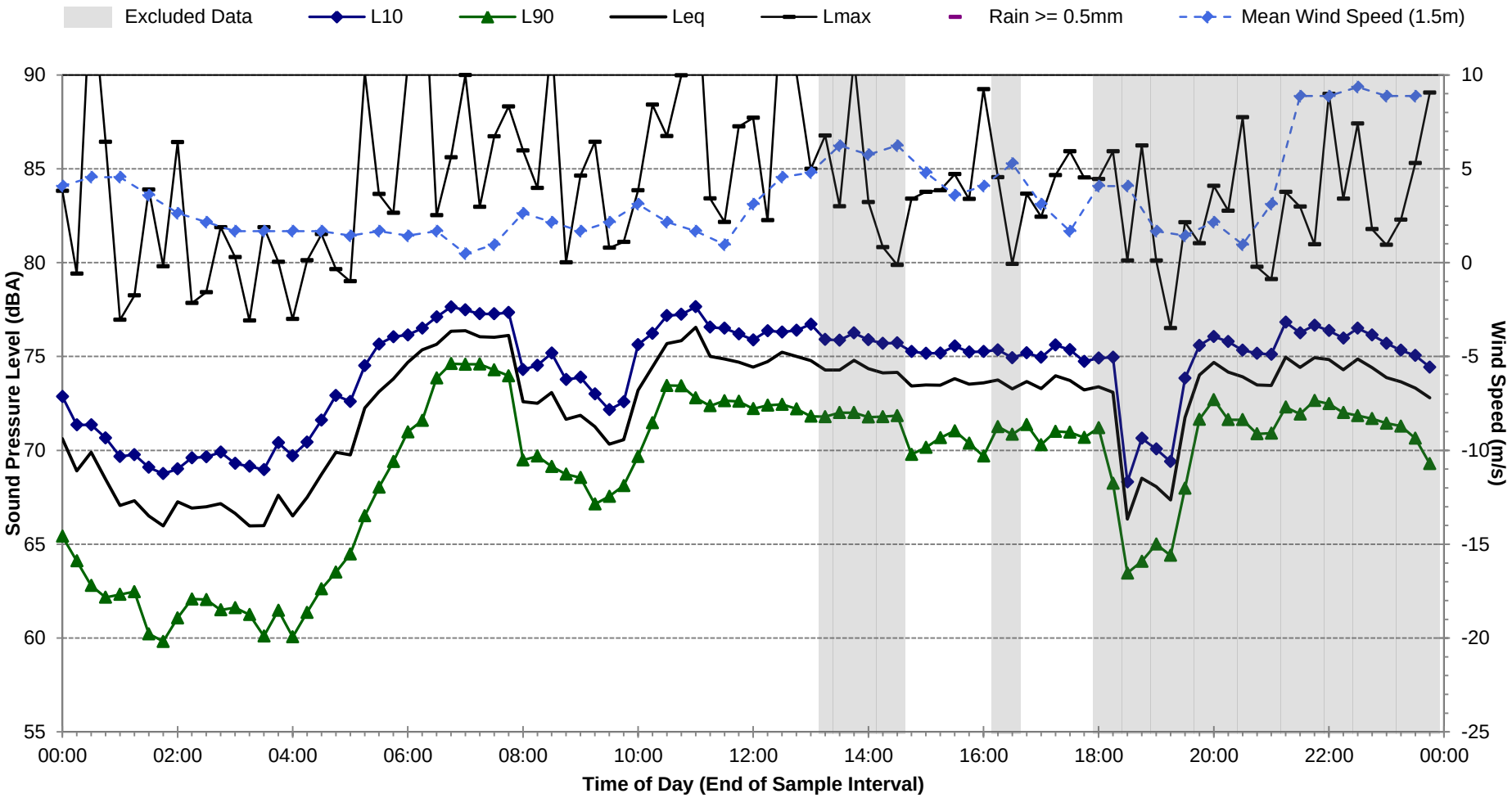


# Statistical Ambient Noise Levels

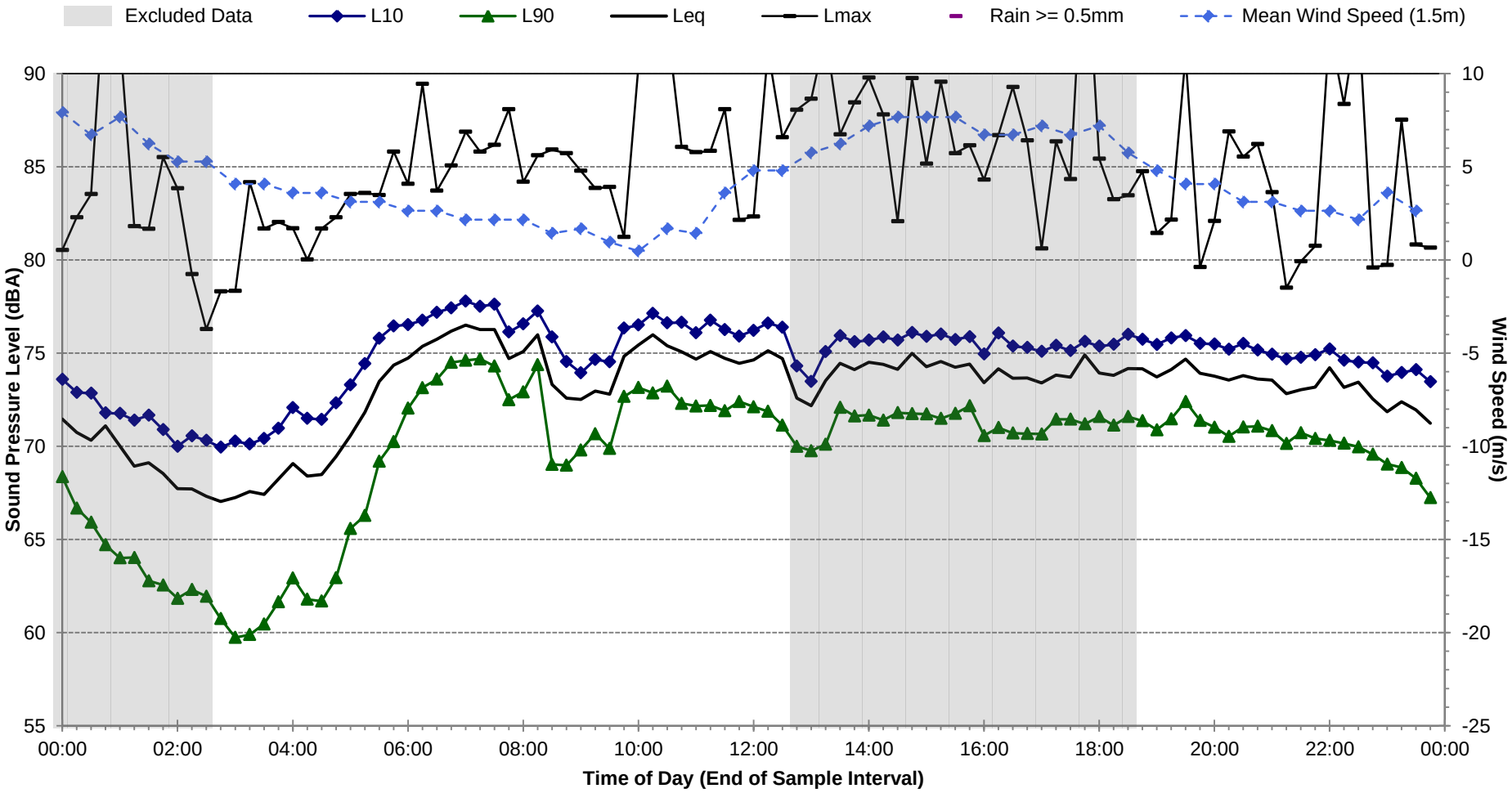
## 132 Bank Street - Tuesday, 13 February 2018



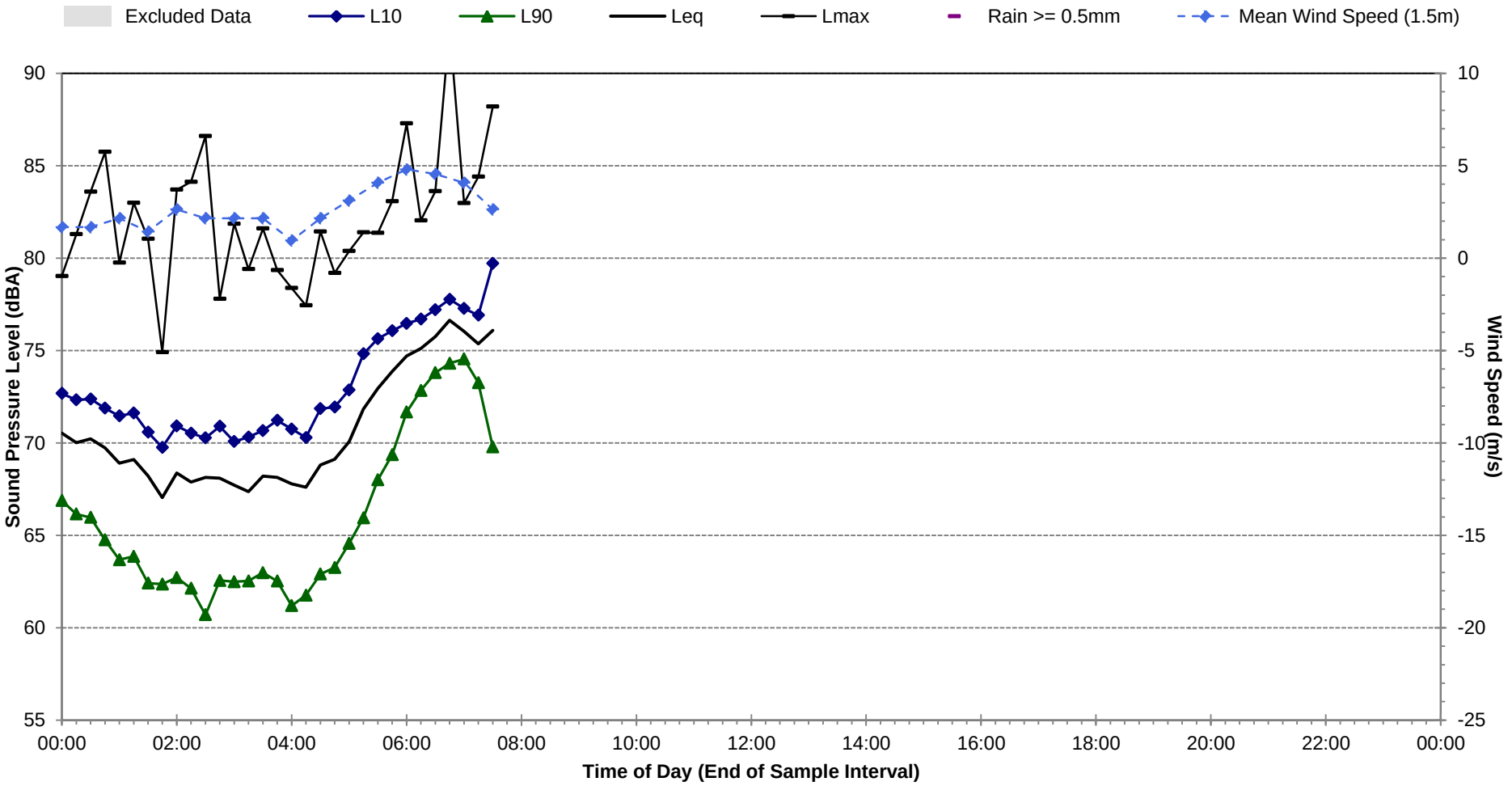
# Statistical Ambient Noise Levels
## 132 Bank Street - Wednesday, 14 February 2018



# Statistical Ambient Noise Levels
## 132 Bank Street - Thursday, 15 February 2018



# Statistical Ambient Noise Levels
## 132 Bank Street - Friday, 16 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.03** |
| **Noise Monitoring Address:** | **132 Bank Street** |

Logger Device Type: Brüel and Kjær 2250, Logger Serial No: 3005904

Sound Level Meter Device Type: Brüel and Kjær 2260, Sound Level Meter Serial No: 2487418

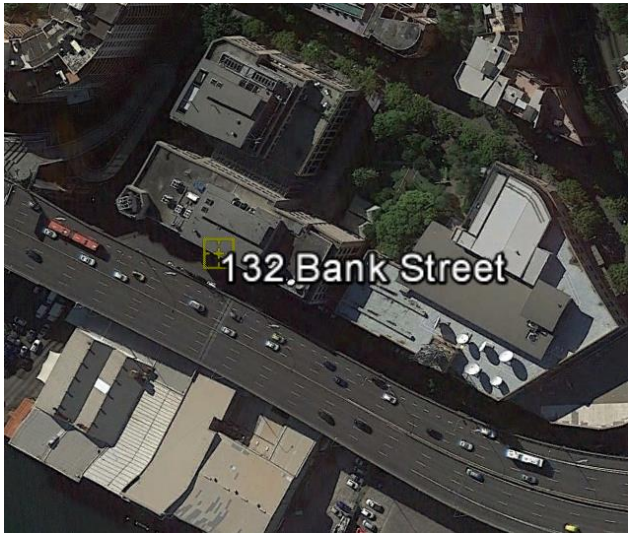
Ambient noise logger deployed at commercial address 132 Bank Street, Pyrmont. Logger located at Goodman, Rooftop, above the Western Distributor, with direct line of sight.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Western Distributor, inbound to the city.

Recorded Noise Levels: (LAmax):

15/02/18: Light-vehicle traffic (Western Distributor): 73 – 81 dBA, Heavy-vehicle traffic (Western Distributor): 75 – 87 dBA, MC traffic (Western Distributor): 74 – 81 dBA, Car horn: 74 dBA

**Map of Noise Monitoring Location**




**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 71 | 75 |
| Evening | 71 | 74 |
| Night-time | 61 | 70 |
| Early Morning | 65 | 74 |

**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | $L_{Aeq(Period)}$ | $L_{Aeq(1hour)}$ |
| Daytime (7am-10pm) | 75 | 76 |
| Night-time (10pm-7am) | 71 | 75 |

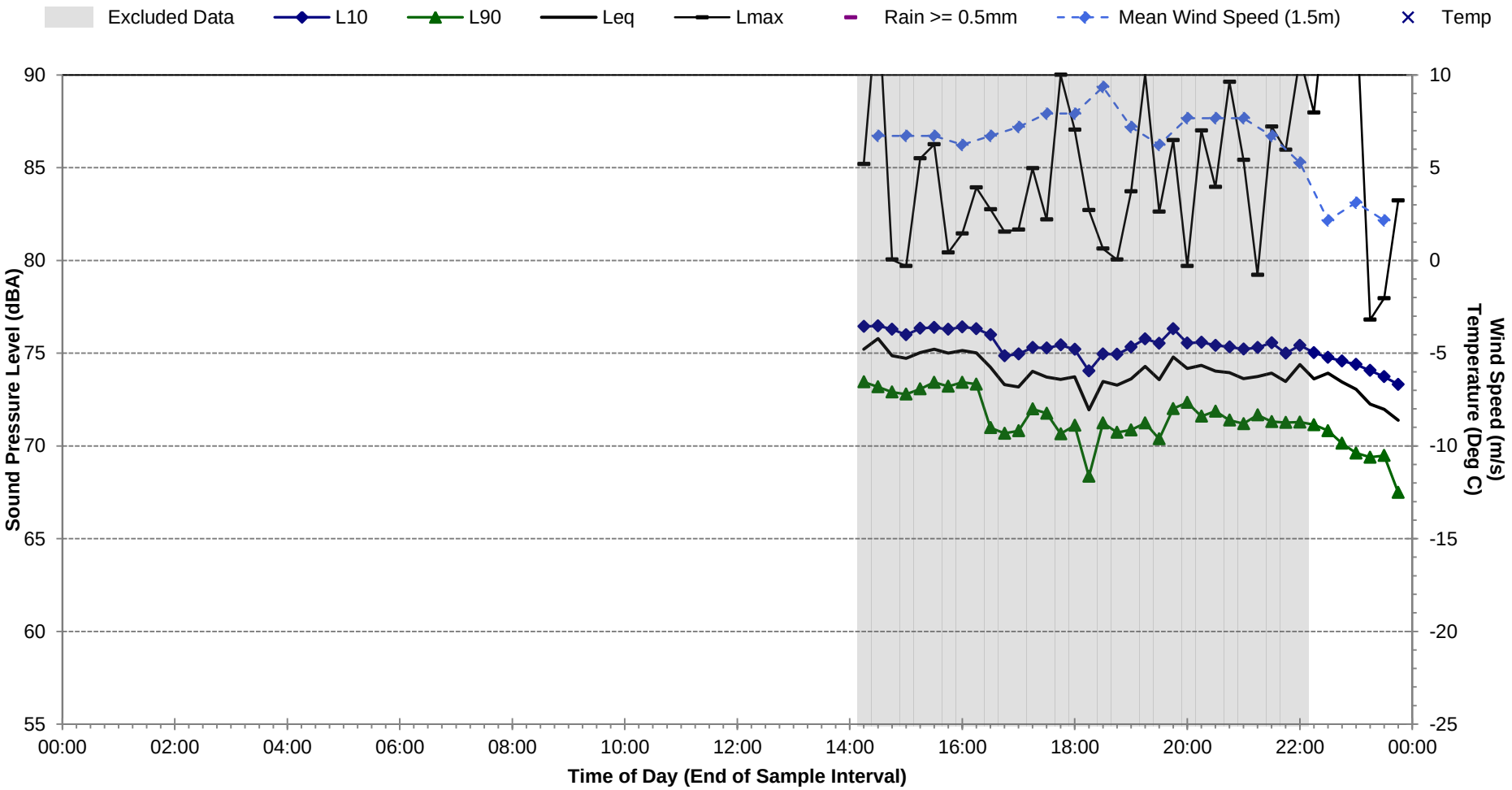
**Attended Noise Measurement Results**

| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 15/02/2018 | 7:40am | 70 | 73 | 87 |

**Photo of Noise Monitoring Location**

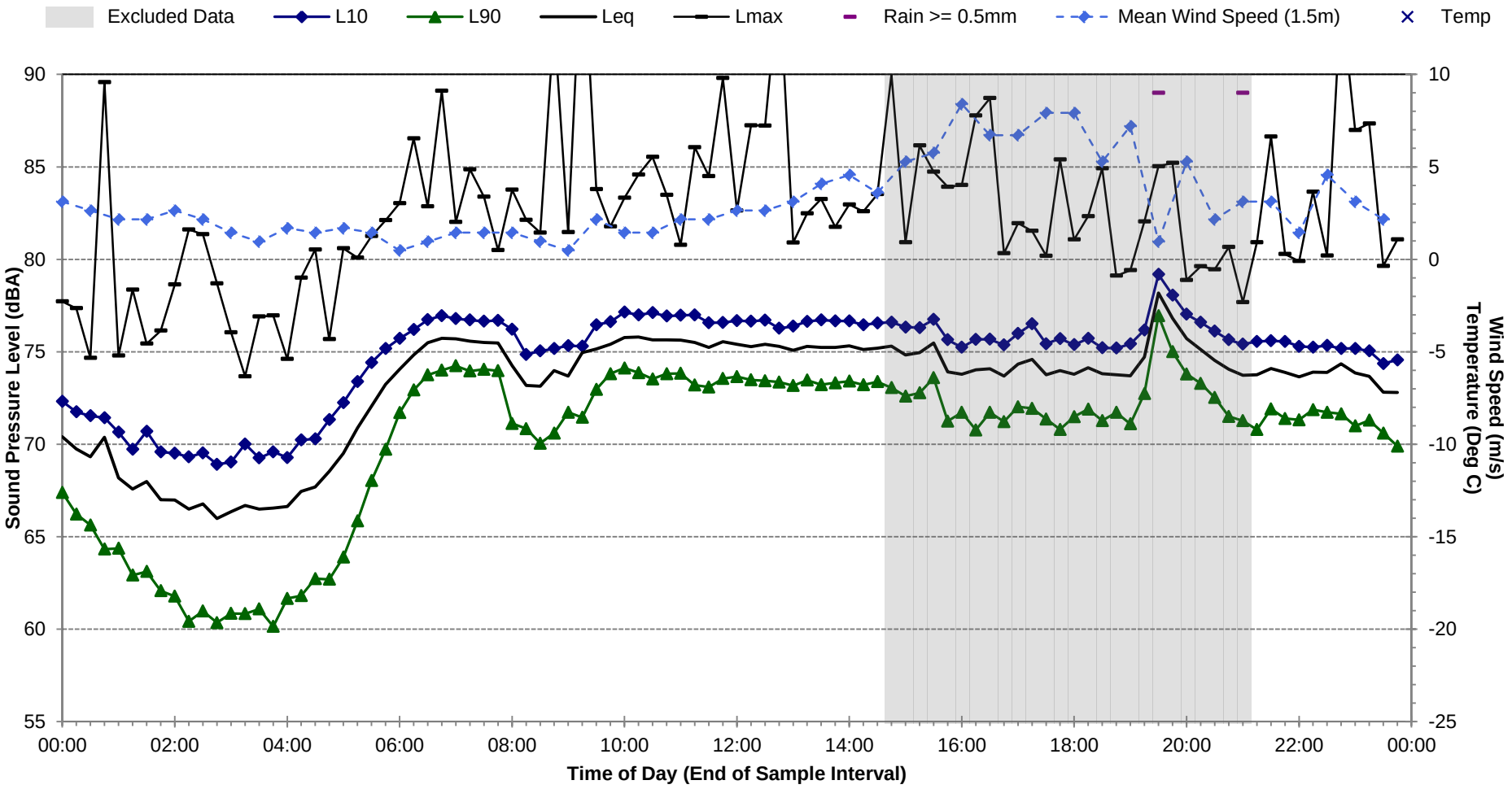
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Thursday, 8 February 2018



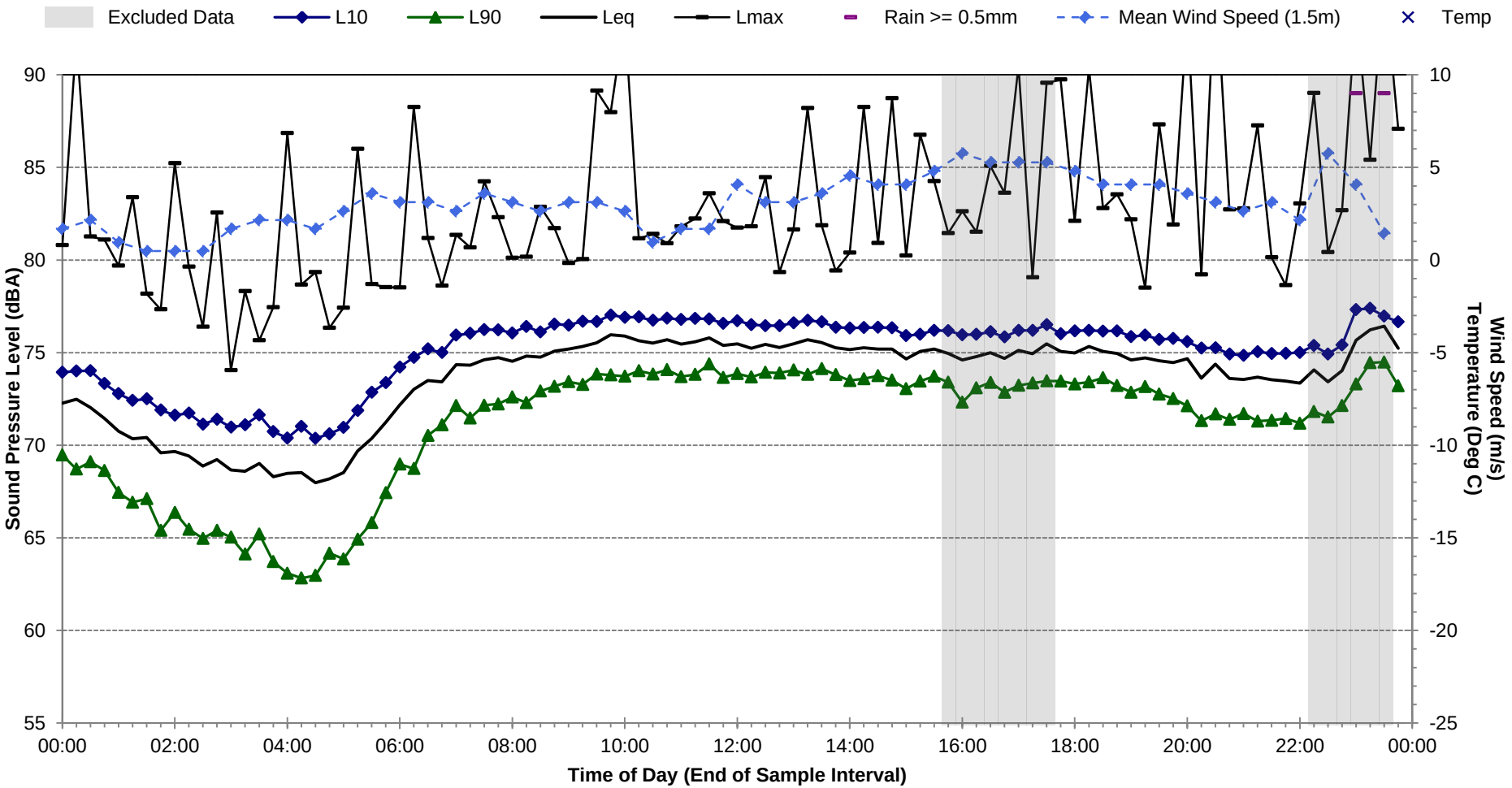
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Friday, 9 February 2018



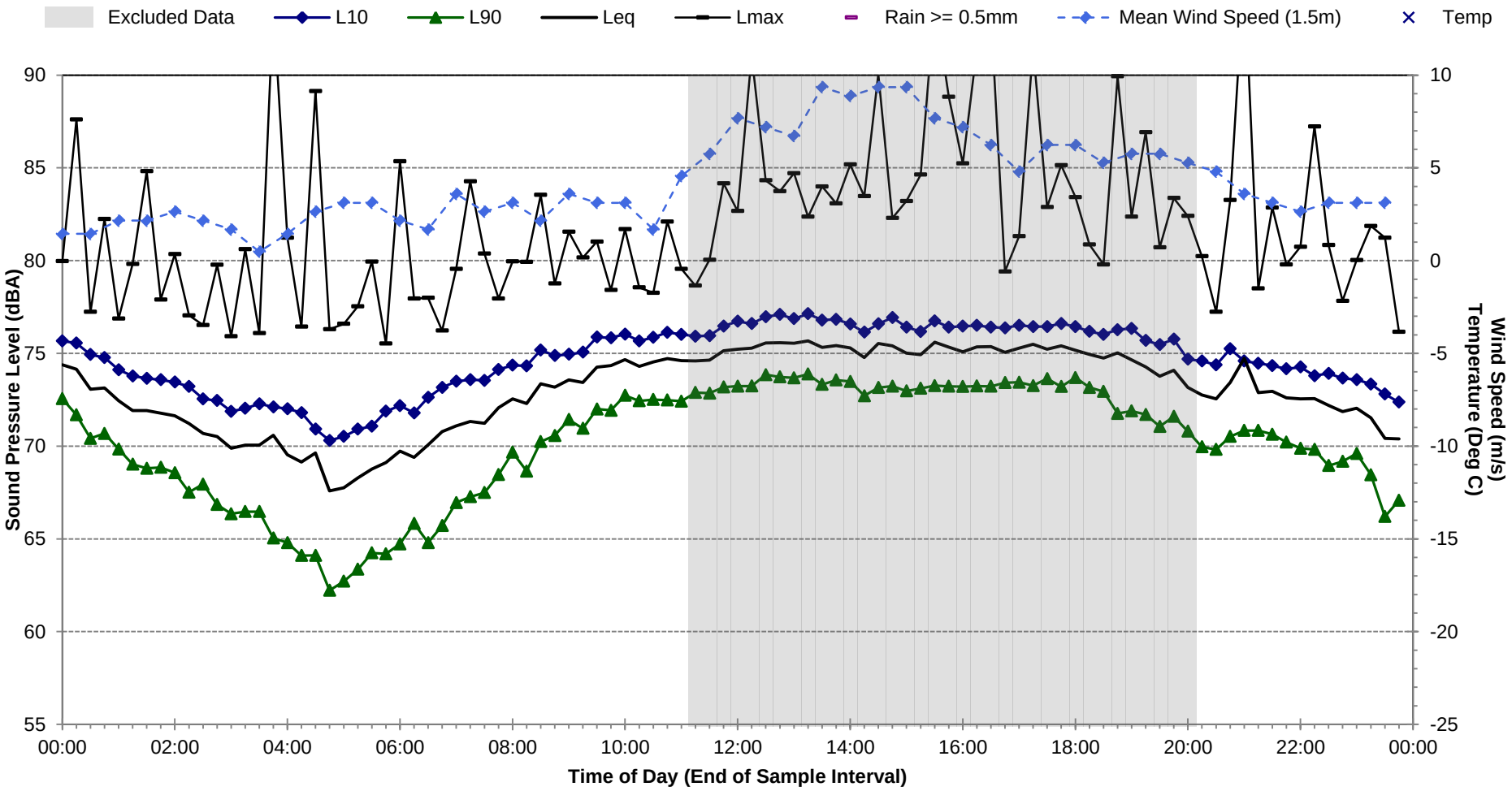
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Saturday, 10 February 2018



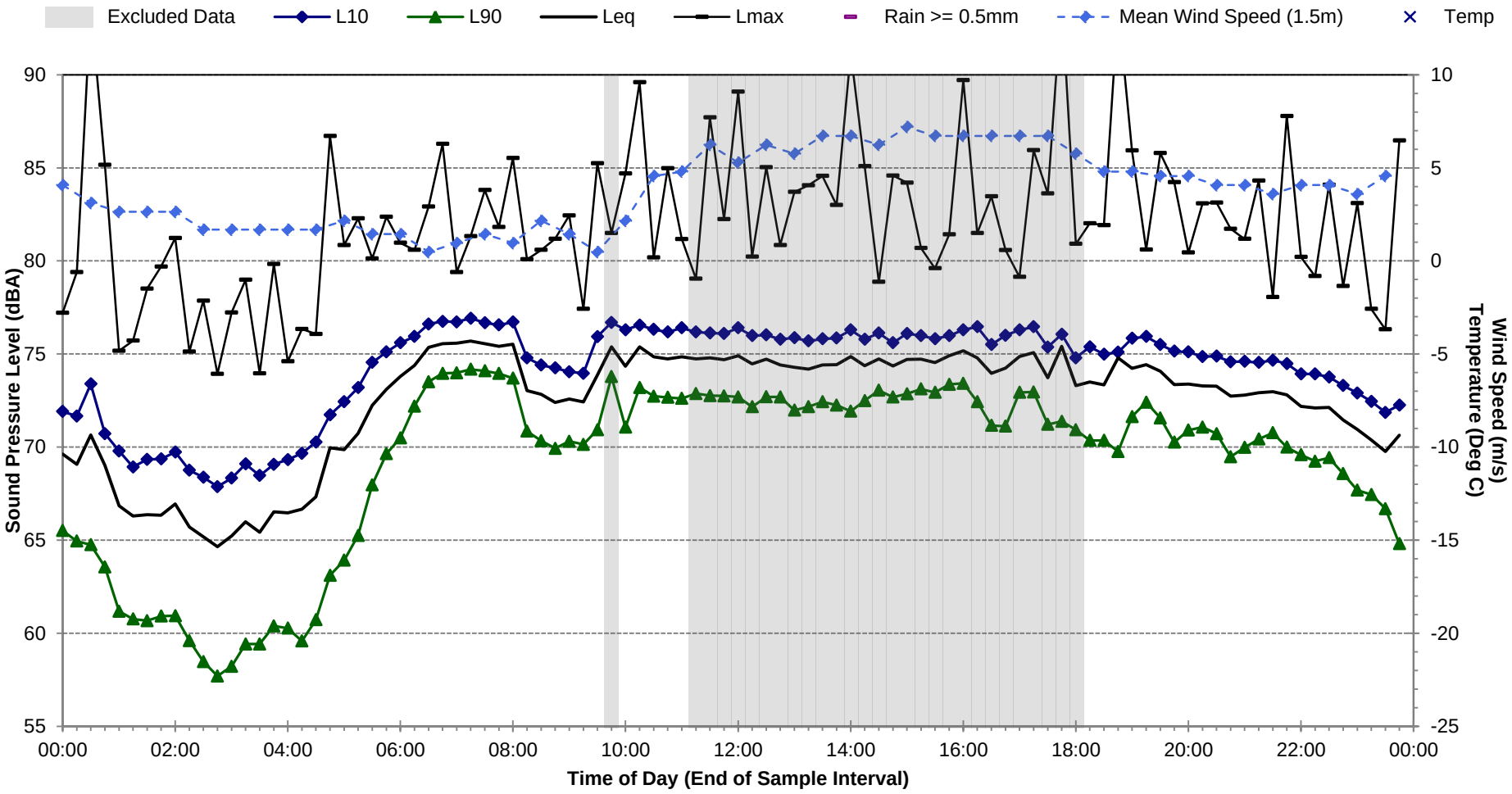
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Sunday, 11 February 2018



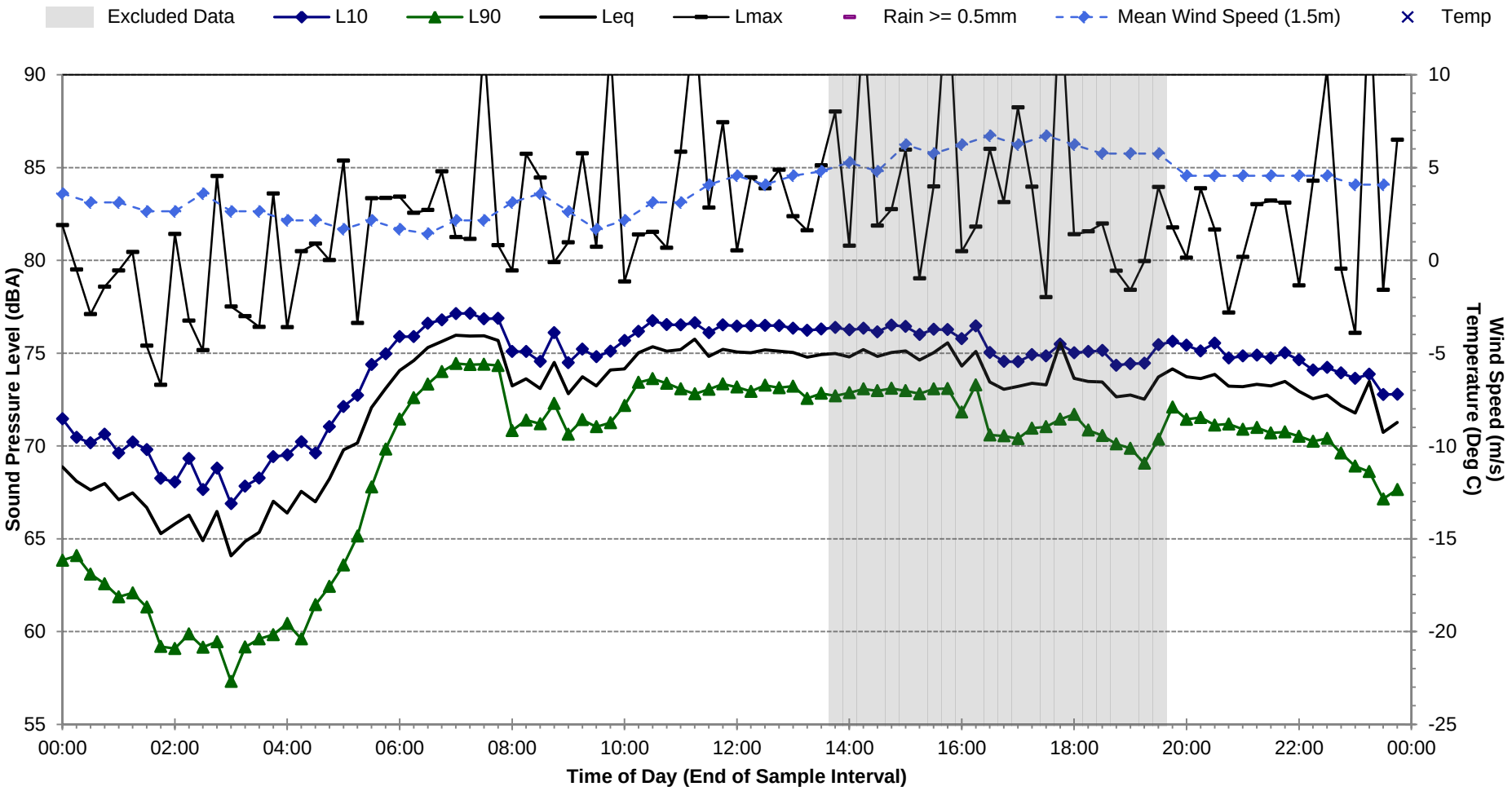
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Monday, 12 February 2018



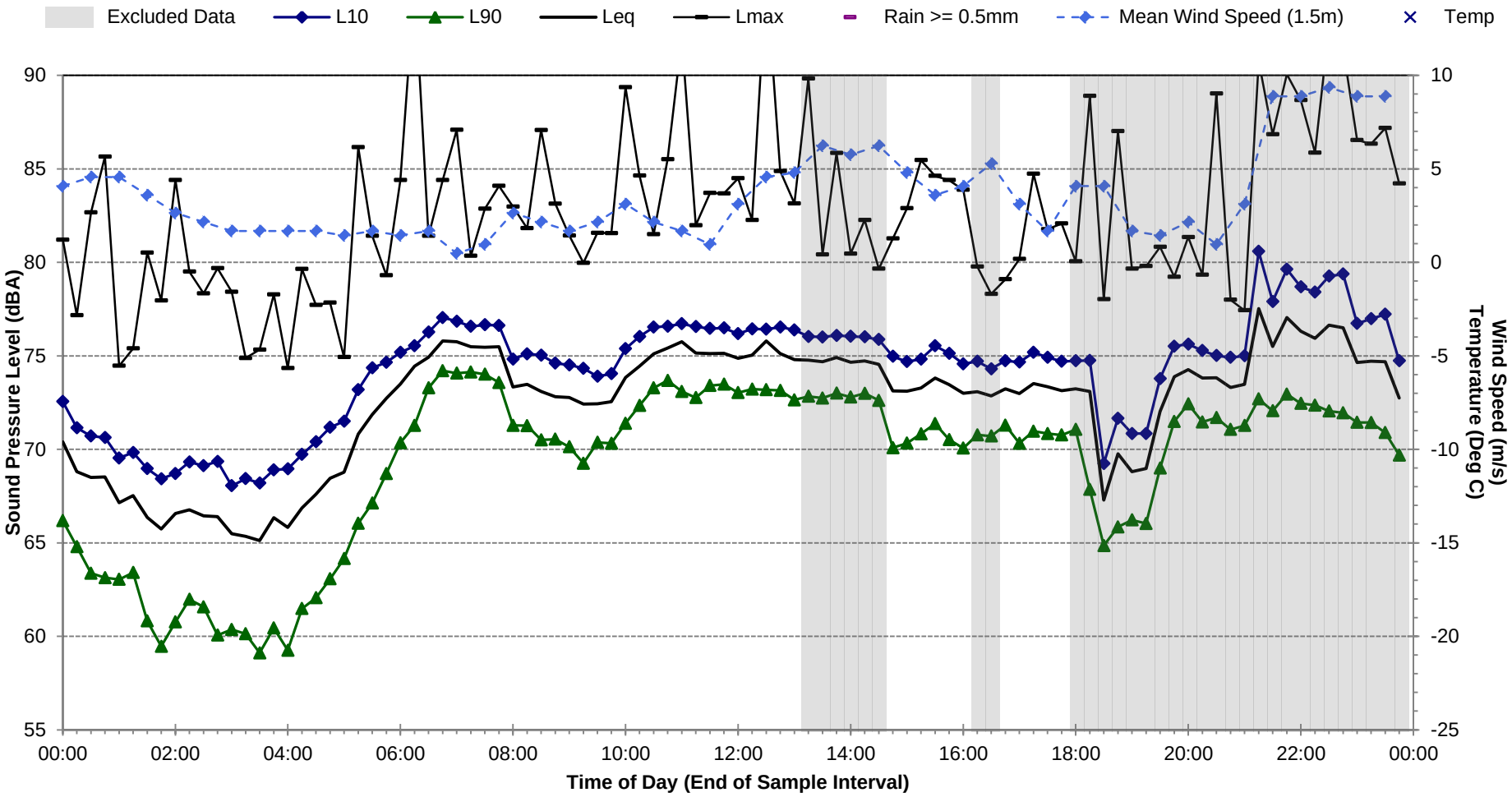
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Tuesday, 13 February 2018



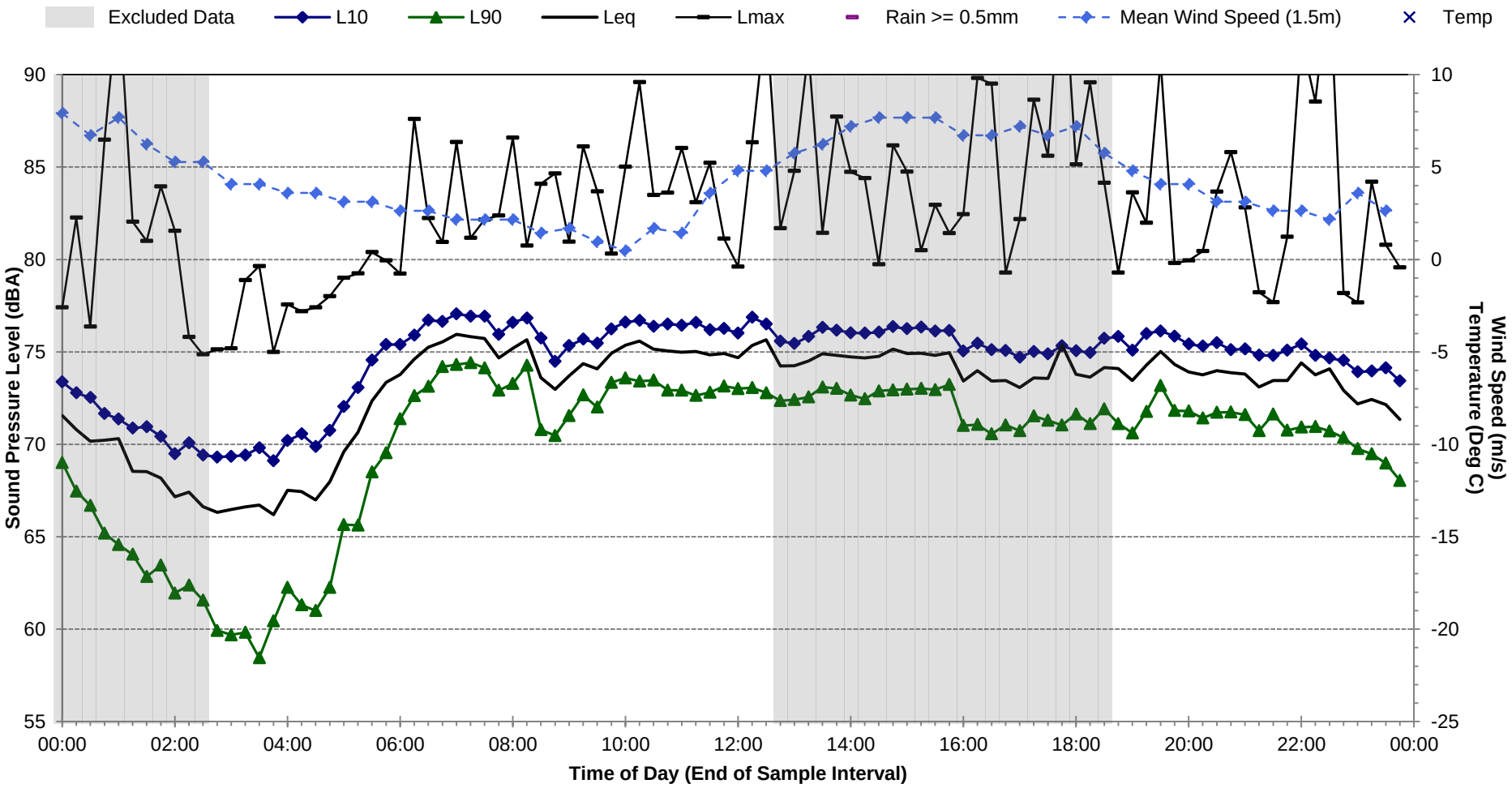
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Wednesday, 14 February 2018



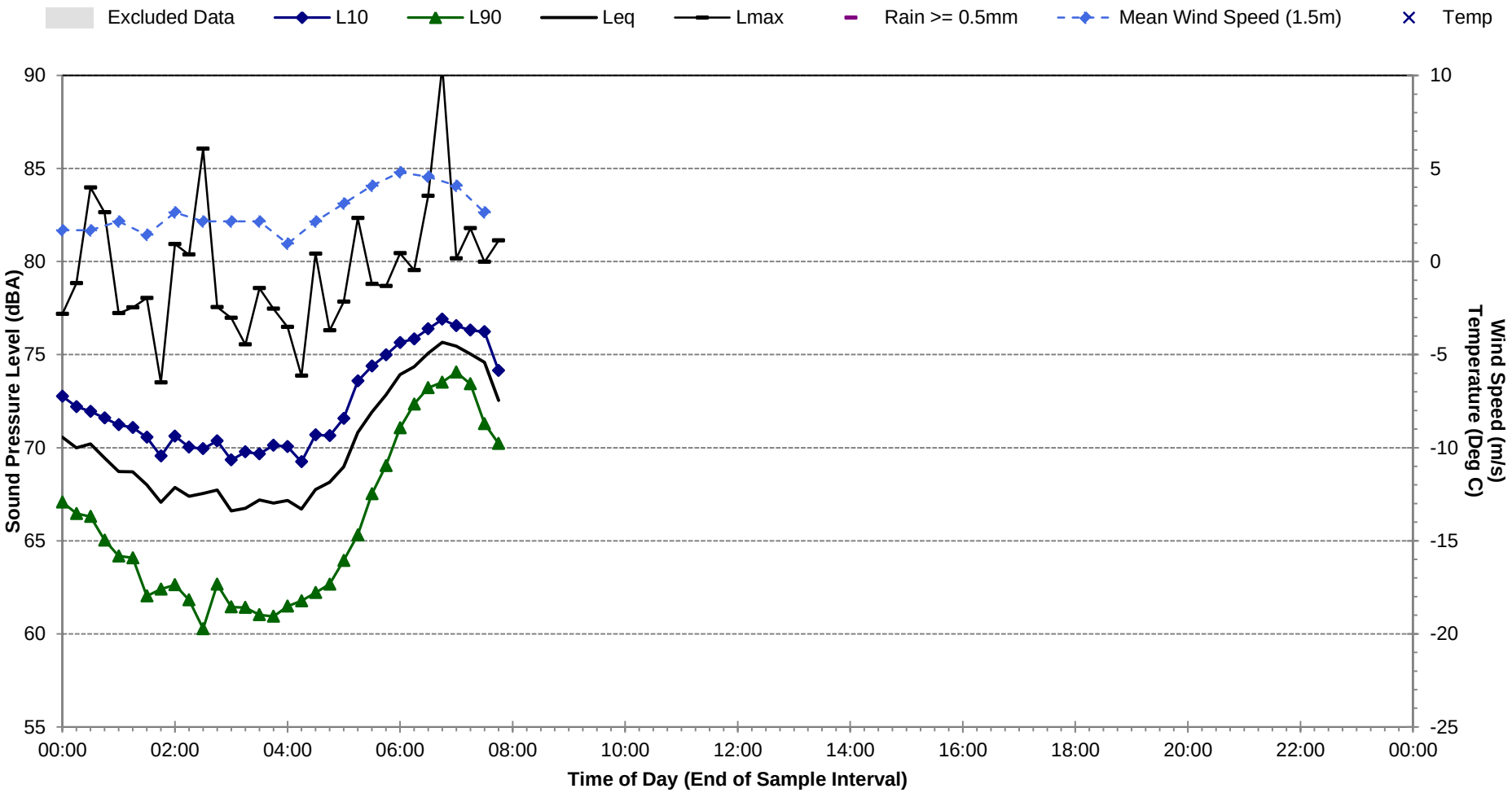
# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Thursday, 15 February 2018



# Statistical Ambient Noise Levels

## 132 Bank Street, Rooftop - Friday, 16 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.04** |
| **Noise Monitoring Address:** | **Unit 217, 1 Wattle Crescent** |

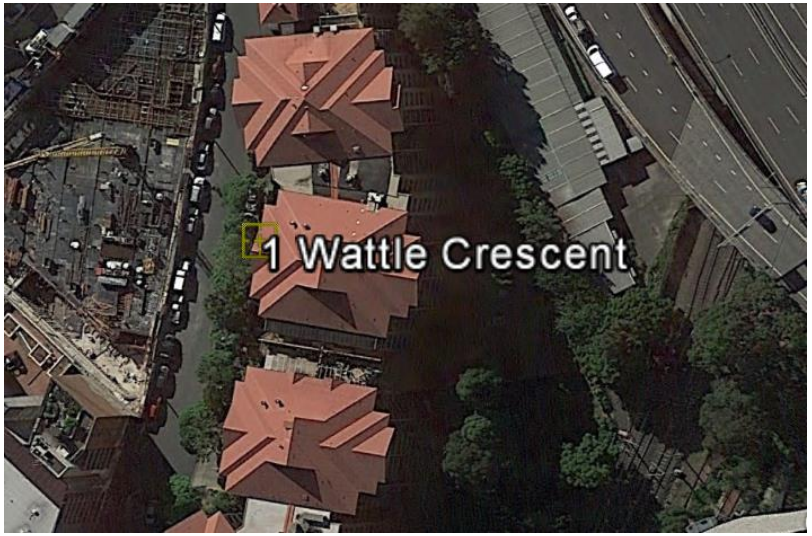
Logger Device Type: Brüel and Kjær 2250, Logger Serial No: 20668
Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 2414608

Ambient noise logger deployed at residential address Unit 217, 1 Wattle Crescent, Pyrmont. Logger located Unit 217, 1 Wattle Crescent, Pyrmont with obstructed view of the Western Distributor from a temporary noise wall, and direct line of sight to Pyrmont Bridge Road below.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Pyrmont Bridge Road, including frequent heavy vehicle passbys travelling east, with infrequent bird calls and pedestrian noise also contributing to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):
15/02/18: Light-vehicle traffic (Pyrmont Bridge Road): 68 – 81 dBA, Heavy-vehicle traffic (Pyrmont Bridge Road): 65 - 89 dBA, Brake squeal: 91 dBA, Motorcycle traffic (Pyrmont Bridge Road): 83 – 84 dBA, Padestrian noise: 66 dBA

**Map of Noise Monitoring Location**




**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 62 | 71 |
| Evening | 57 | 68 |
| Night-time | 50 | 64 |
| Early Morning | 52 | 69 |

**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | $L_{Aeq(Period)}$ | $L_{Aeq(1hour)}$ |
| Daytime (7am-10pm) | 71 | 72 |
| Night-time (10pm-7am) | 65 | 70 |

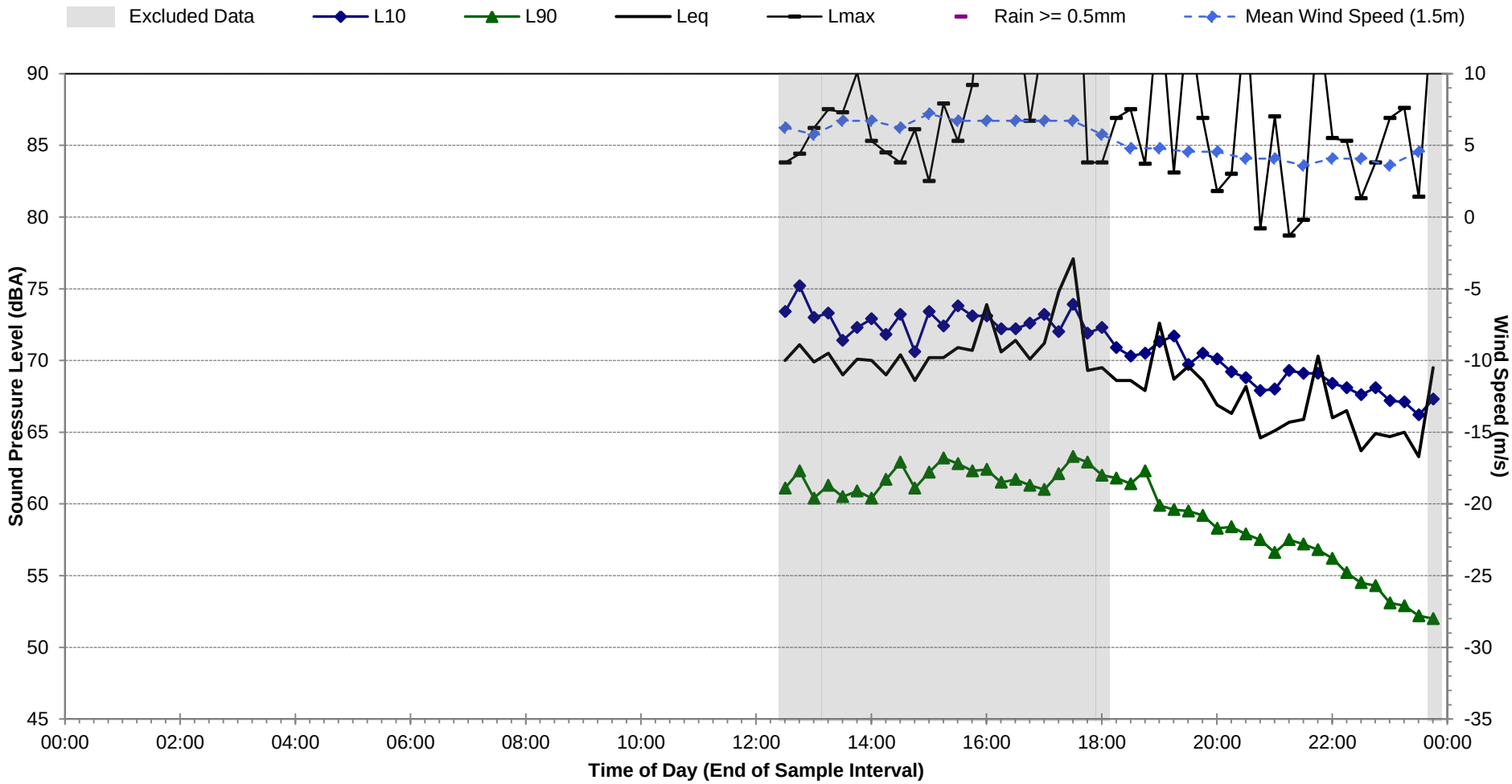
**Attended Noise Measurement Results**

| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 15/02/2018 | 7:40am | 61 | 71 | 91 |

**Photo of Noise Monitoring Location**

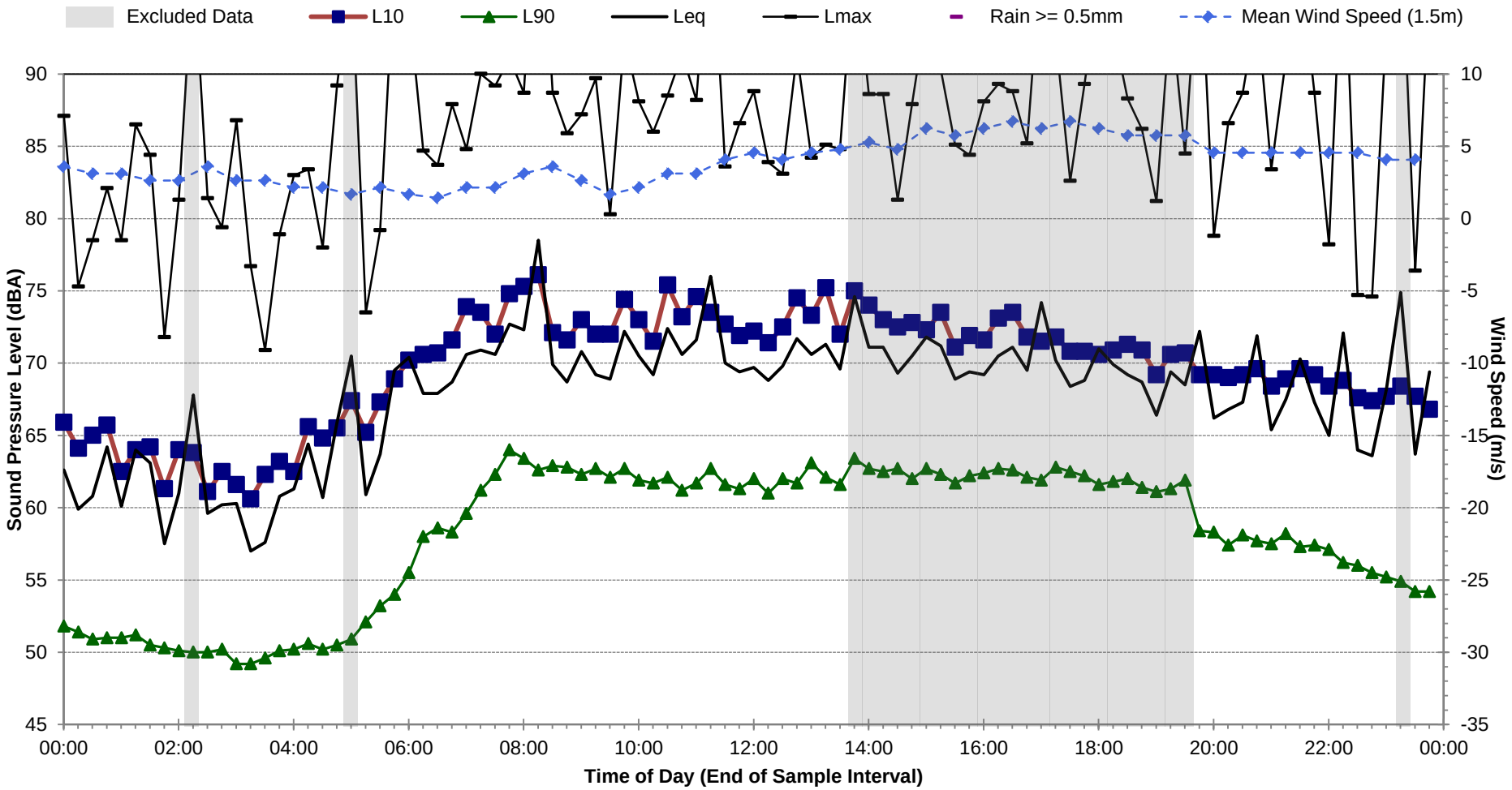
# Statistical Ambient Noise Levels

## Unit 217, 1 Wattle Crescent - Monday, 12 February 2018



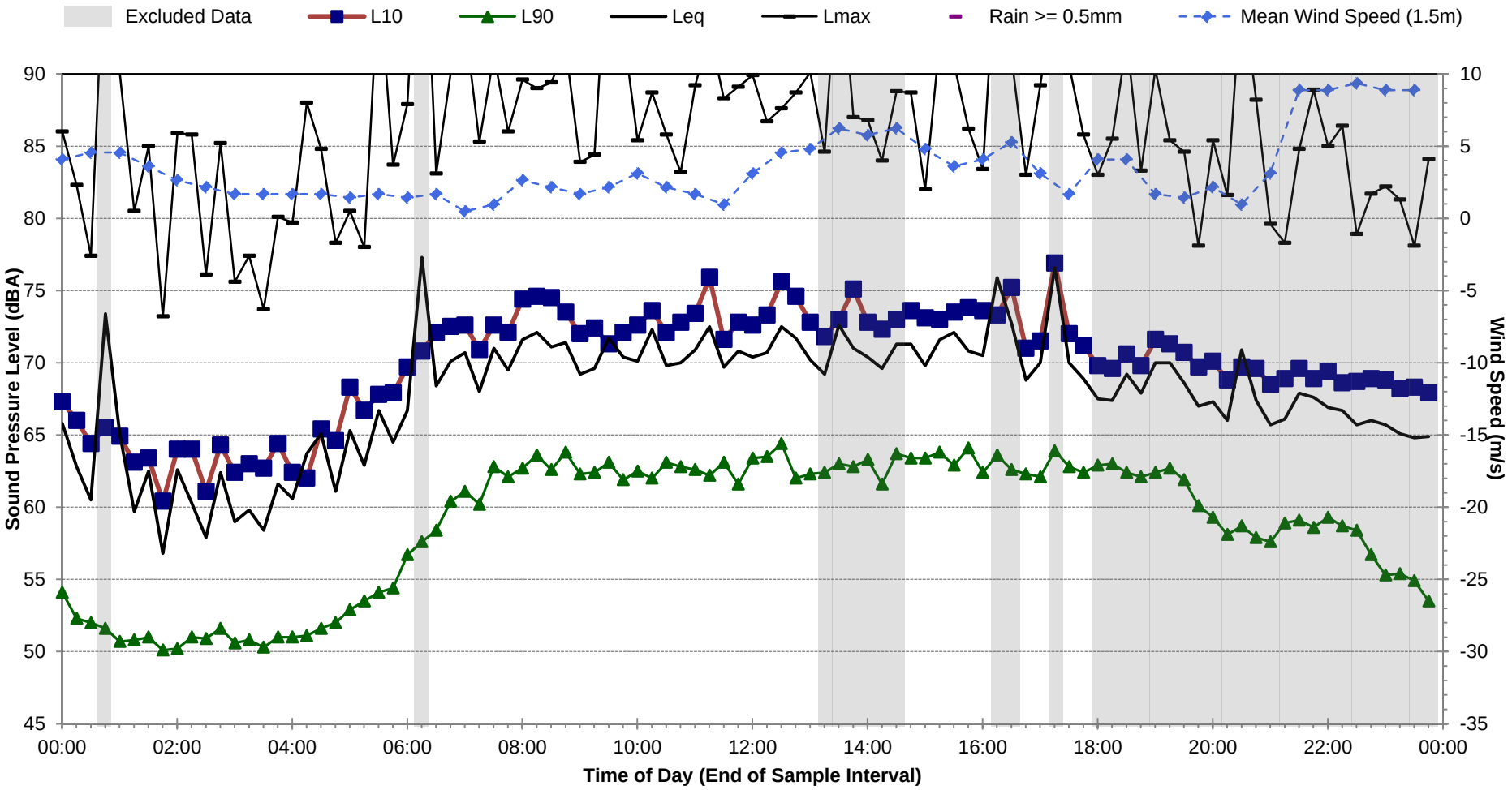
# Statistical Ambient Noise Levels

## Unit 217, 1 Wattle Crescent - Tuesday, 13 February 2018



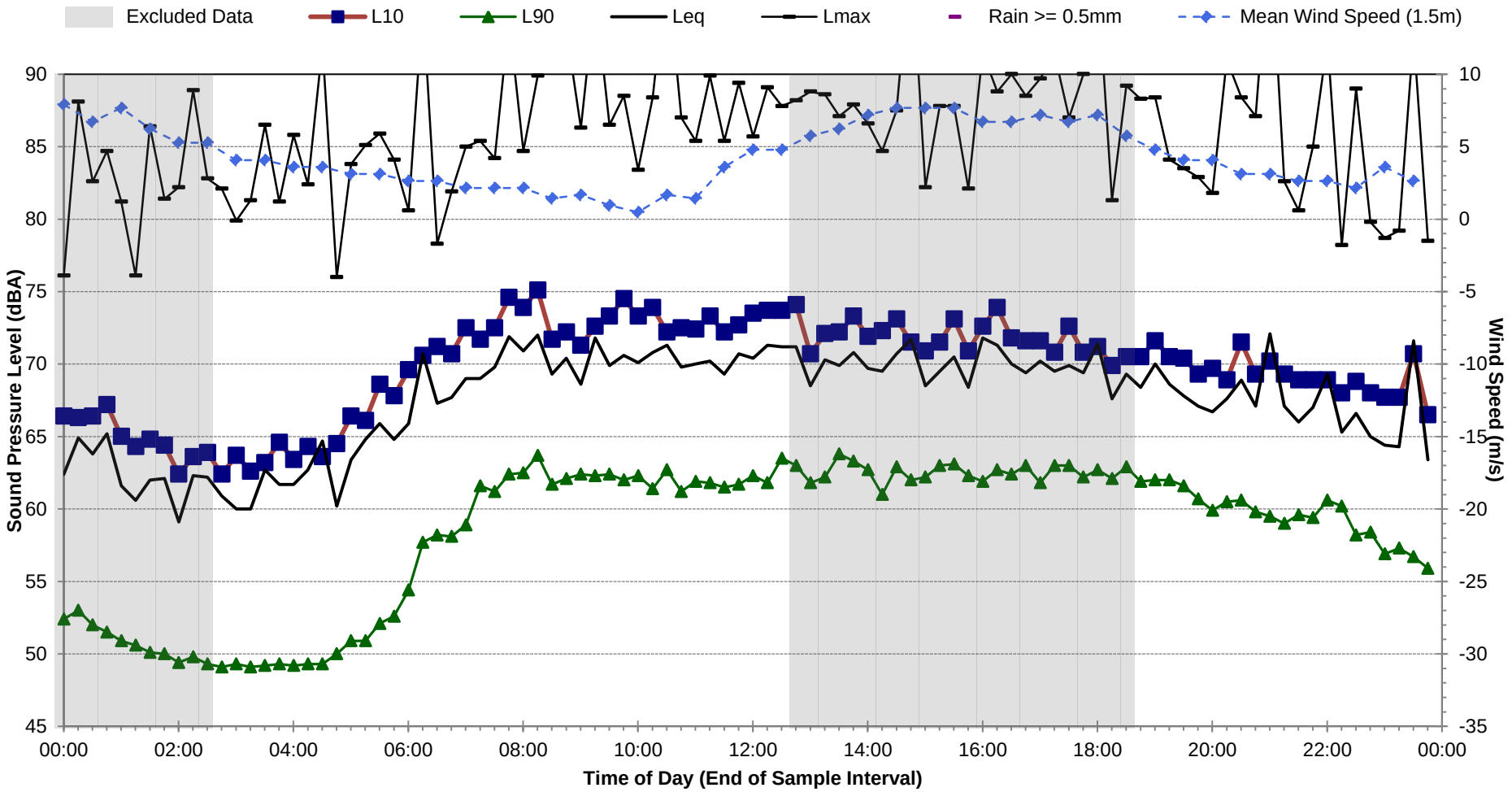
# Statistical Ambient Noise Levels

## Unit 217, 1 Wattle Crescent - Wednesday, 14 February 2018



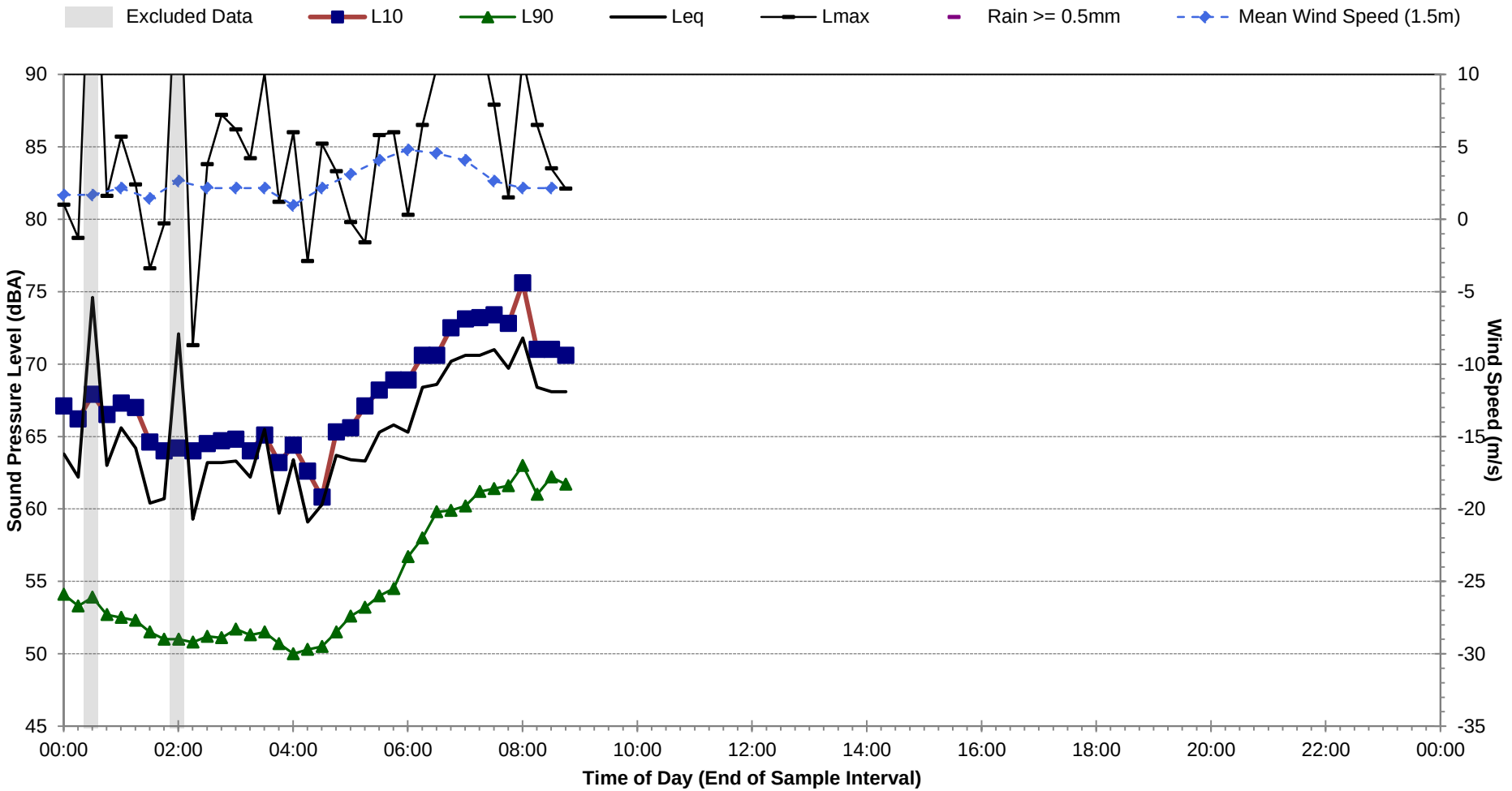
# Statistical Ambient Noise Levels

## Unit 217, 1 Wattle Crescent - Thursday, 15 February 2018



# Statistical Ambient Noise Levels

## Unit 217, 1 Wattle Crescent - Friday, 16 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.05** |
| **Noise Monitoring Address:** | **Blackwattle Bay Campus, Taylor Street, Glebe** |

Logger Device Type: ARL-EL 316, Logger Serial No: 16 – 306 - 044

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 2487418

Ambient noise logger deployed at commercial address Blackwattle Bay Campus, Taylor Street, Glebe. Logger located along pedestrian walkway, facing Blackwattle Bay.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Western Distributor with continuous operational noise emissions from nearby industrial premises at ground level also contributing to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):

08/02/18: Heavy & Light-vehicle traffic (Western Distributor): 58 - 60 dBA, Distributor): 75 – 82 dBA, School Bell: 62 dBA, Aeroplane: 69 dBA, Wind gusts: 60 dBA, Operational noise: 62 – 71 dBA, Pedestrian Noise: 61 – 64 dBA

**Map of Noise Monitoring Location**


**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 55 | 58 |
| Evening | 54 | 56 |
| Night-time | 49 | 52 |
| Early Morning | 50 | 55 |

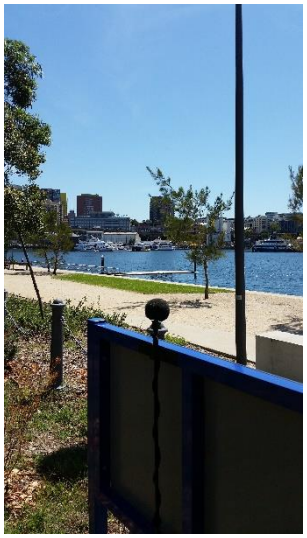
**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | $L_{Aeq(Period)}$ | $L_{Aeq(1hour)}$ |
| Daytime (7am-10pm) | 57 | 58 |
| Night-time (10pm-7am) | 53 | 56 |

**Attended Noise Measurement Results**

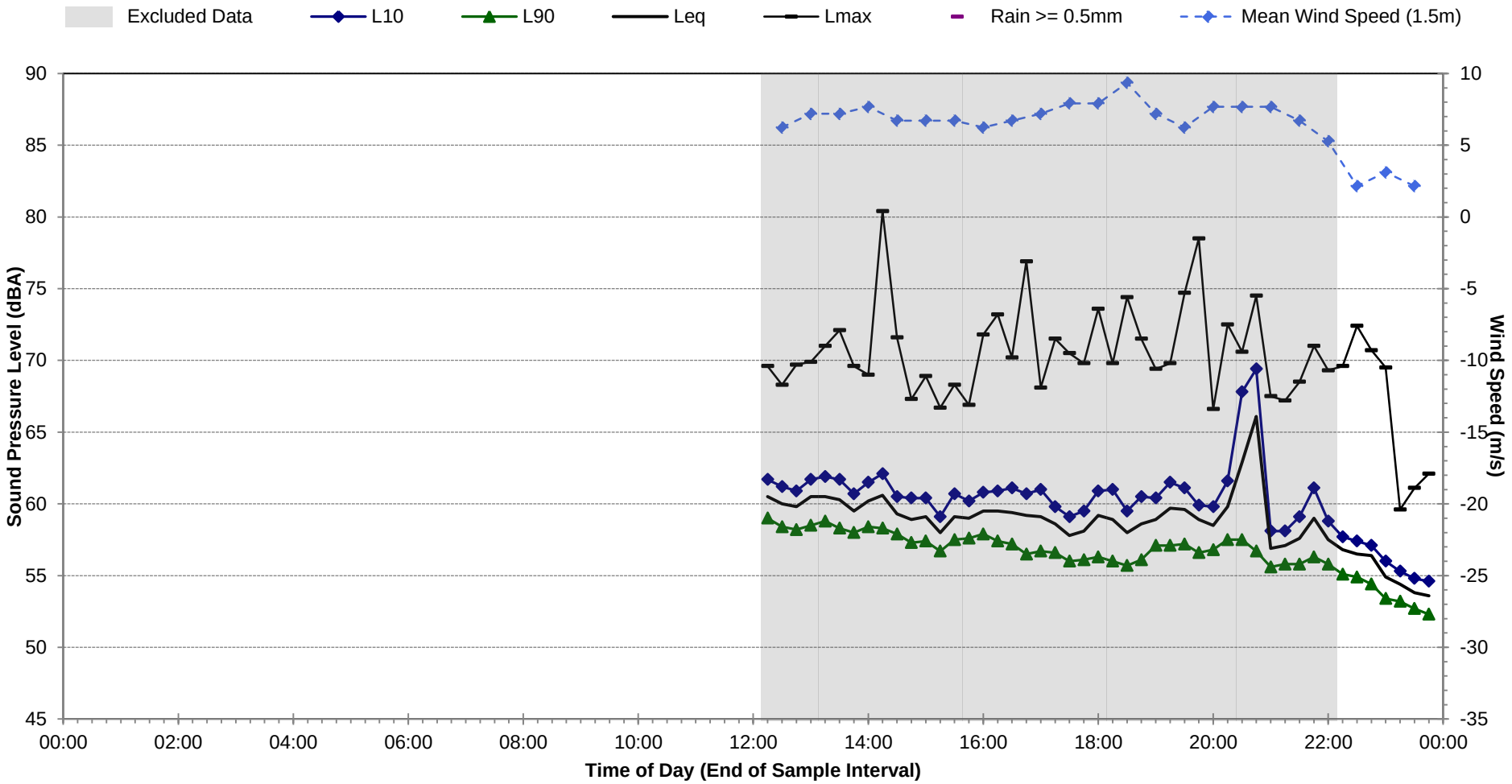
| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 08/02/2018 | 11:38am | 57 | 59 | 71 |

**Photo of Noise Monitoring Location**



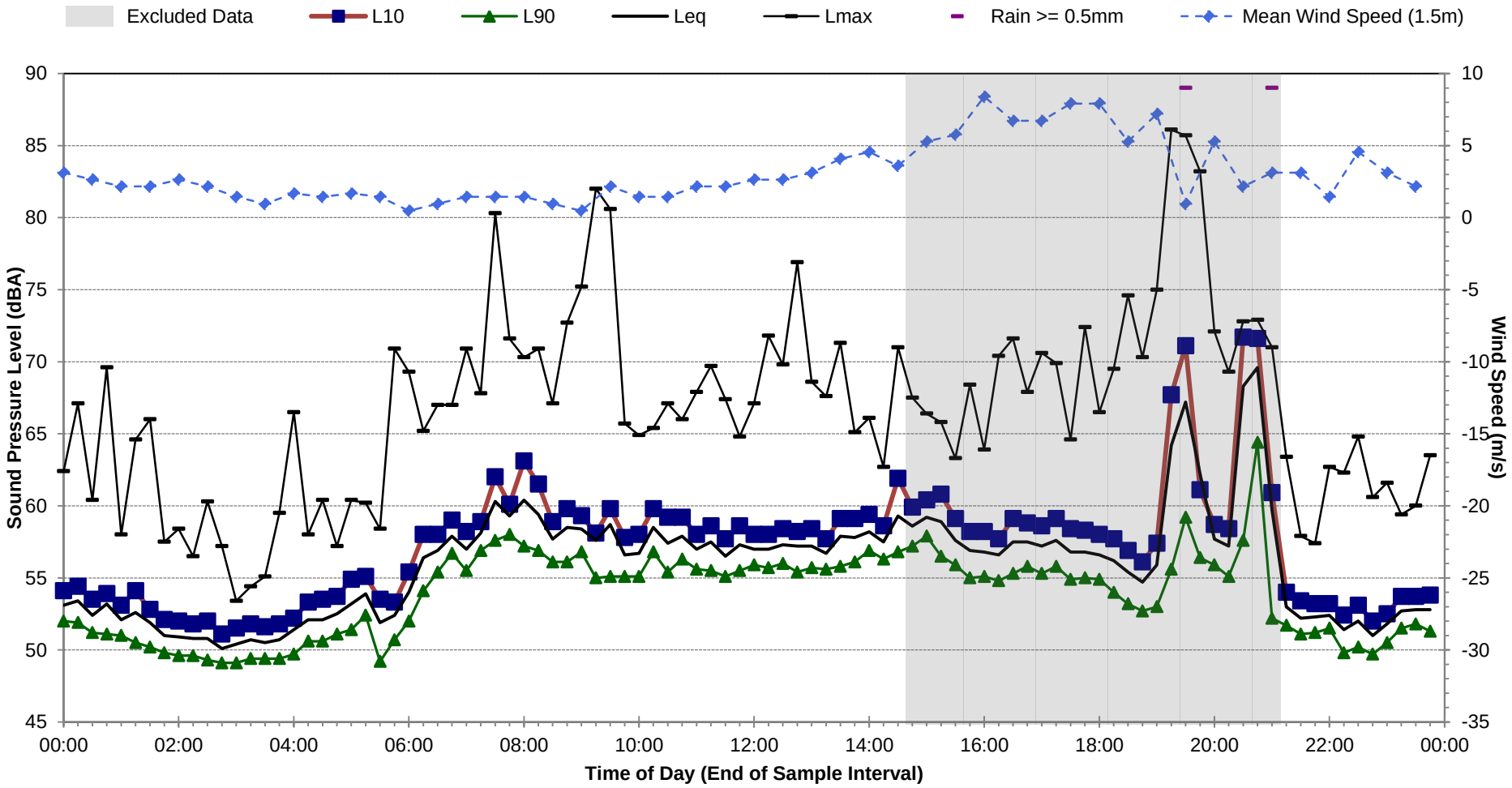
# Statistical Ambient Noise Levels

## Sydney Secondary College - Thursday, 8 February 2018



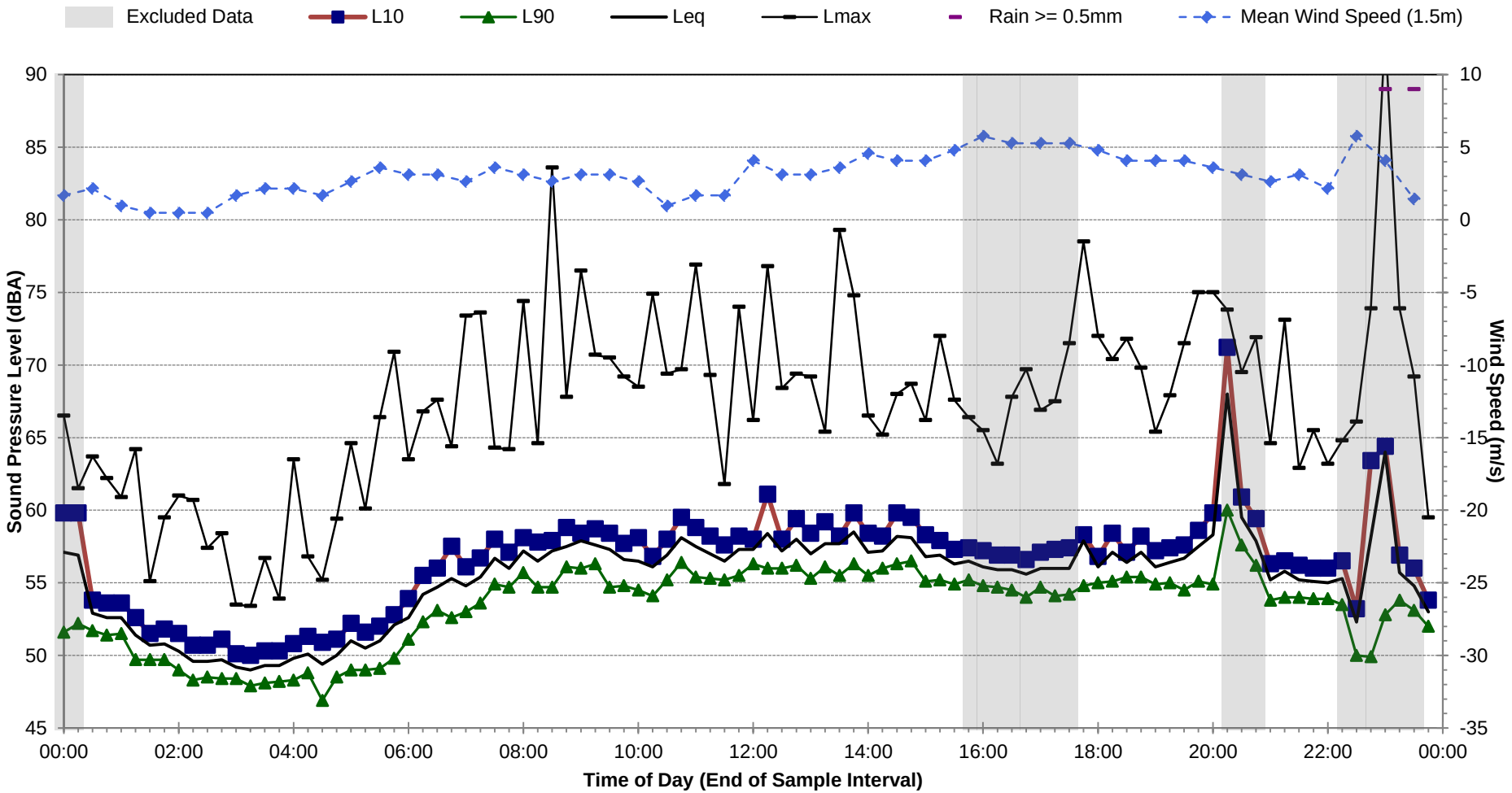
# Statistical Ambient Noise Levels

## Sydney Secondary College - Friday, 9 February 2018



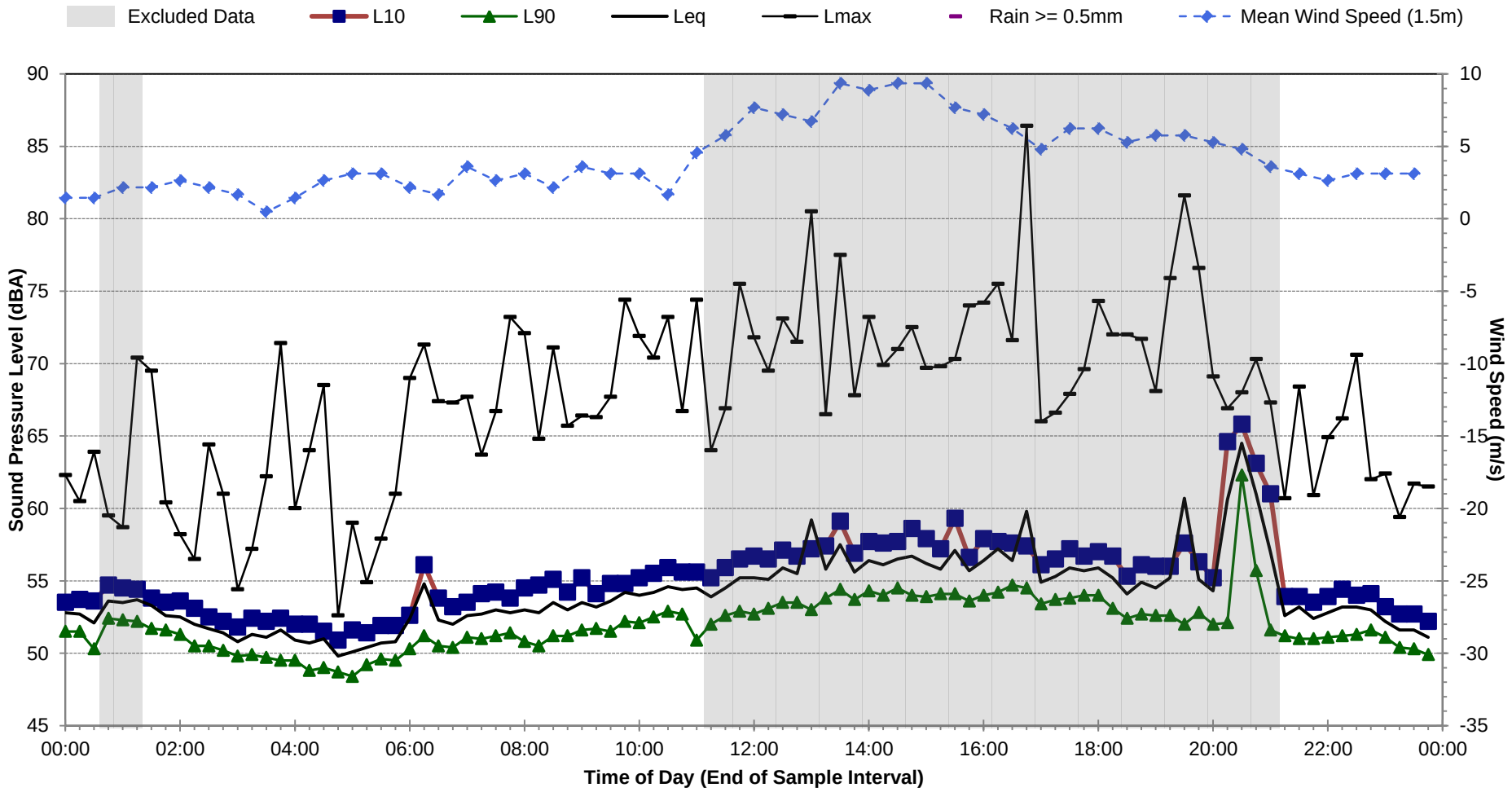
# Statistical Ambient Noise Levels

## Sydney Secondary College - Saturday, 10 February 2018



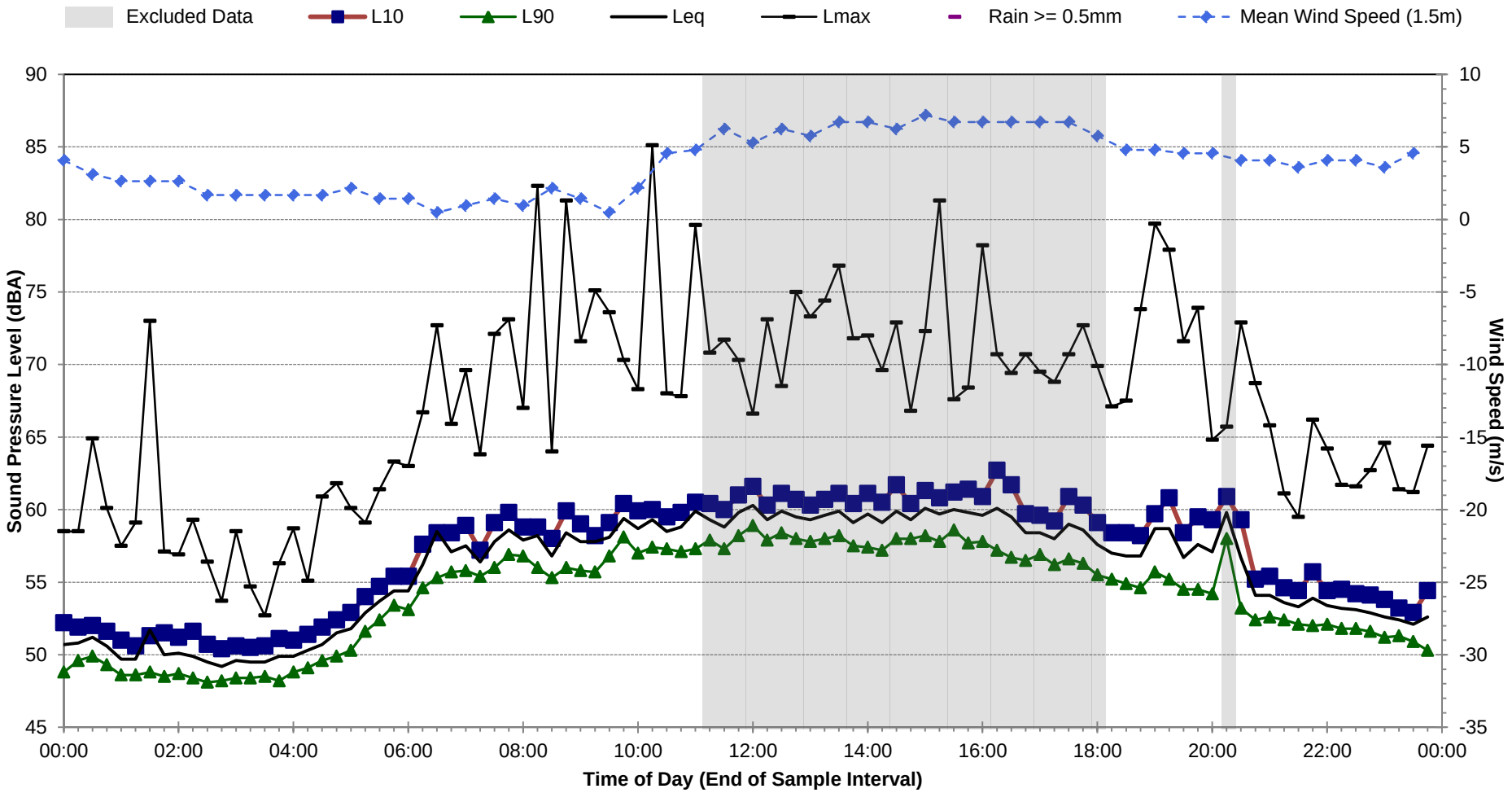
# Statistical Ambient Noise Levels

## Sydney Secondary College - Sunday, 11 February 2018



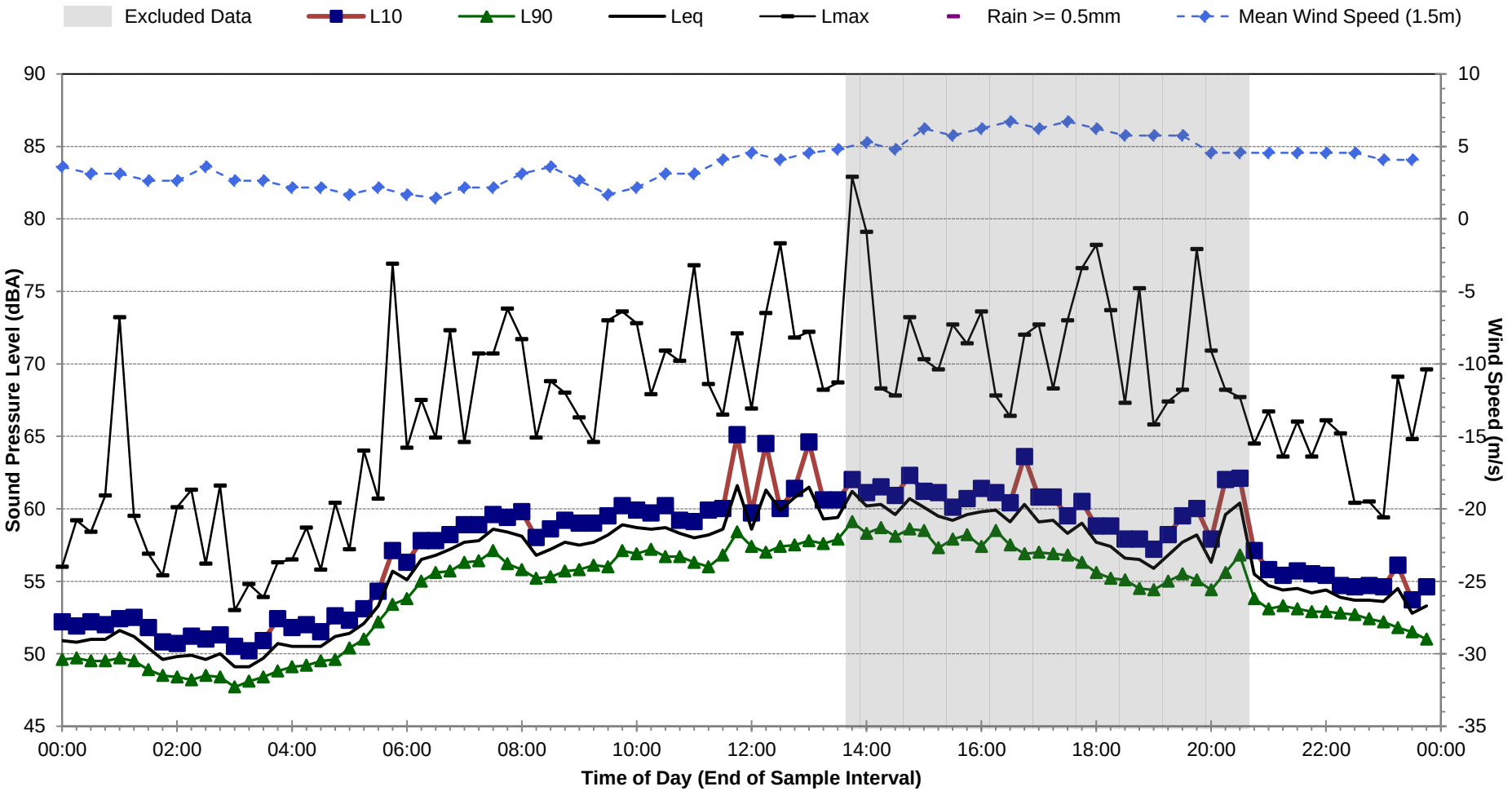
# Statistical Ambient Noise Levels

## Sydney Secondary College - Monday, 12 February 2018



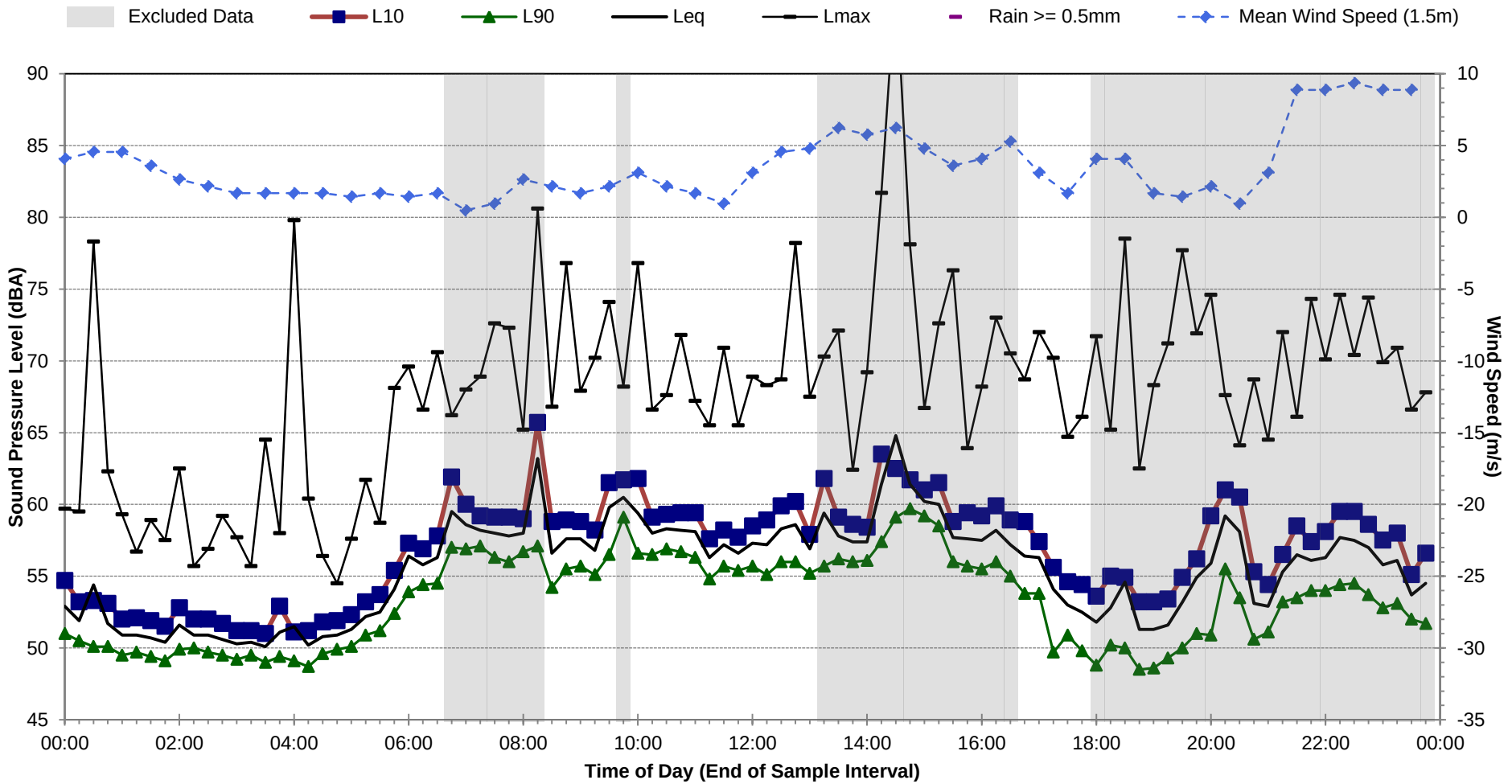
# Statistical Ambient Noise Levels

## Sydney Secondary College - Tuesday, 13 February 2018



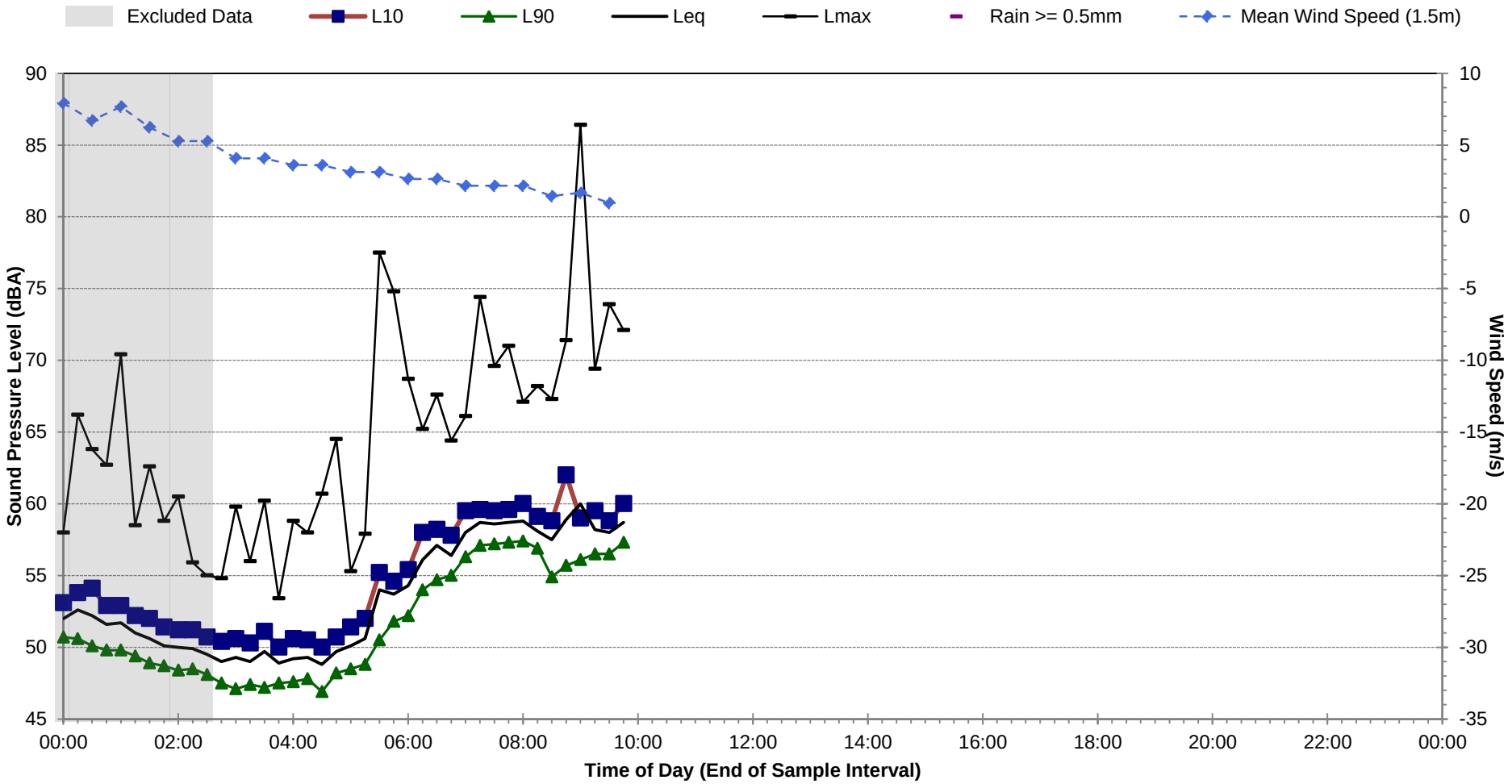
# Statistical Ambient Noise Levels

## Sydney Secondary College - Wednesday, 14 February 2018



# Statistical Ambient Noise Levels

## Sydney Secondary College - Thursday, 15 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.06** |
| **Noise Monitoring Address:** | **13 Griffin Place, Glebe** |

Logger Device Type: ARL-EL 316, Logger Serial No: 16 – 203 - 528
Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 2487418

Ambient noise logger deployed at residential address 13 Griffin Place, Glebe. Logger located in grassed area, with direct line of sight to Blackwattle Bay.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Western Distributor with transient operational noise emissions from nearby industrial premises and intermittent bird calls also contributing to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):
15/02/18: Heavy & Light-vehicle traffic (Western Distributor): 60 – 63 dBA, Ambient noise: 54 dBA, Bird calls: 62 – 66 dBA, Aeroplane: 58 - 59 dBA, Operational noise: 58 dBA, Pedestrian Noise: 64 dBA

**Map of Noise Monitoring Location**


**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | RBL | LAeq |
| Daytime | 50 | 54 |
| Evening | 51 | 54 |
| Night-time | 46 | 50 |
| Early Morning | 48 | 52 |

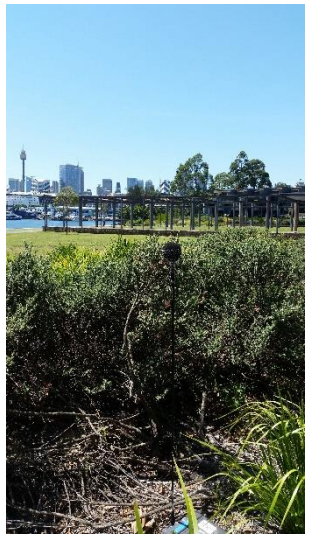
**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | $L_{Aeq(Period)}$ | $L_{Aeq(1hour)}$ |
| Daytime (7am-10pm) | 54 | 55 |
| Night-time (10pm-7am) | 50 | 54 |

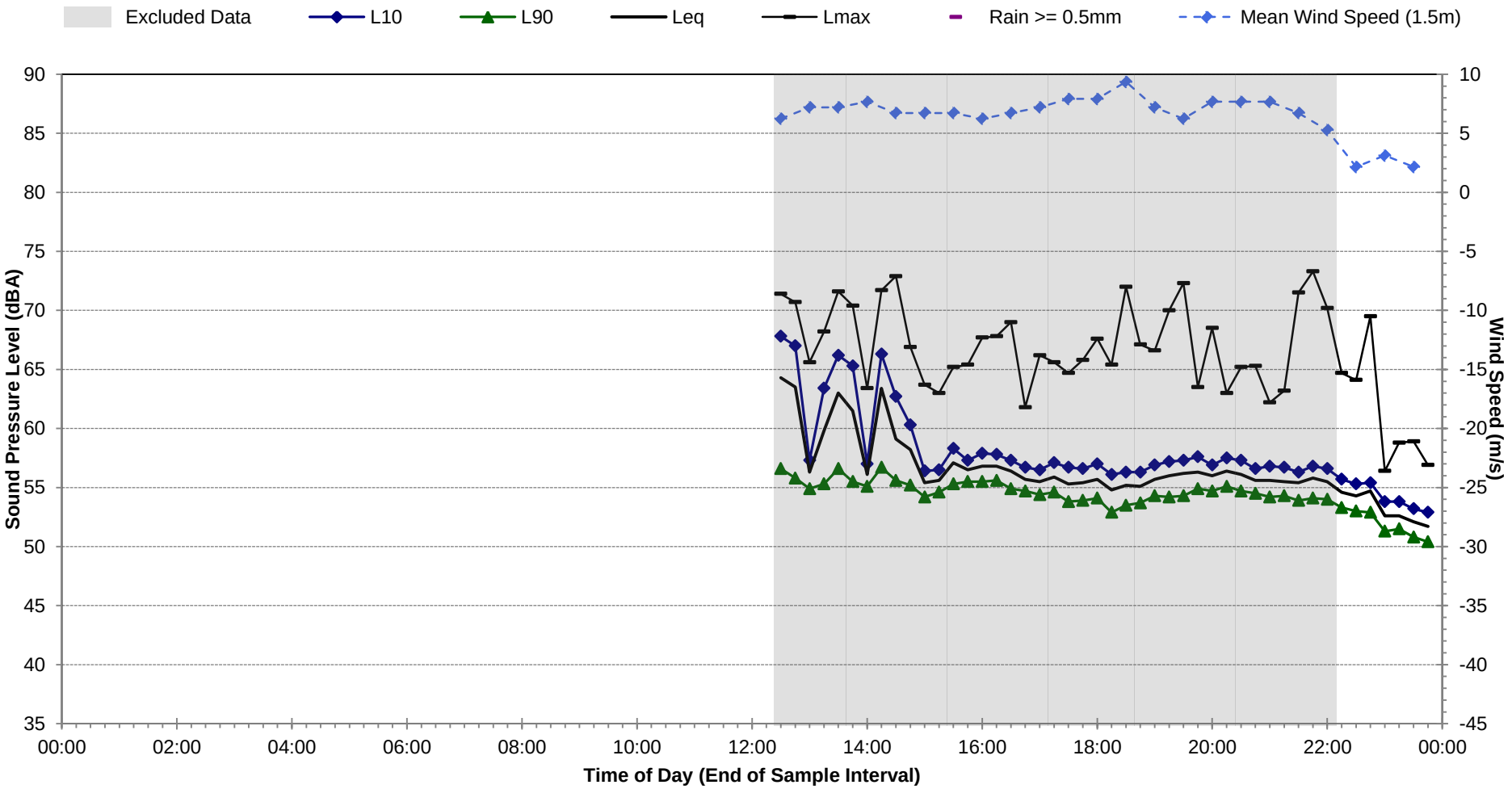
**Attended Noise Measurement Results**

| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | LA90 | LAeq | LAmax |
| 15/02/2018 | 9:59am | 54 | 56 | 66 |

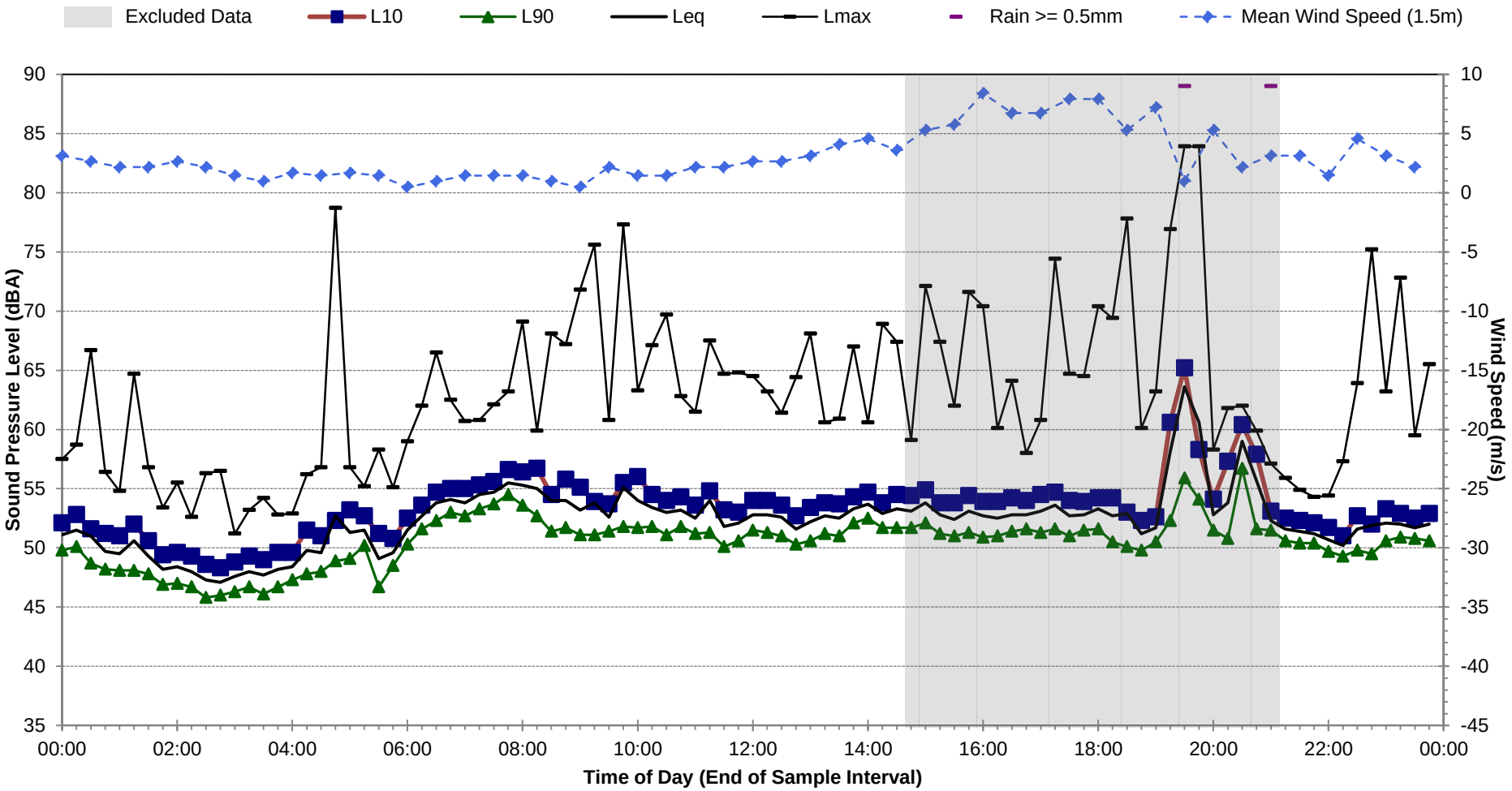
**Photo of Noise Monitoring Location**



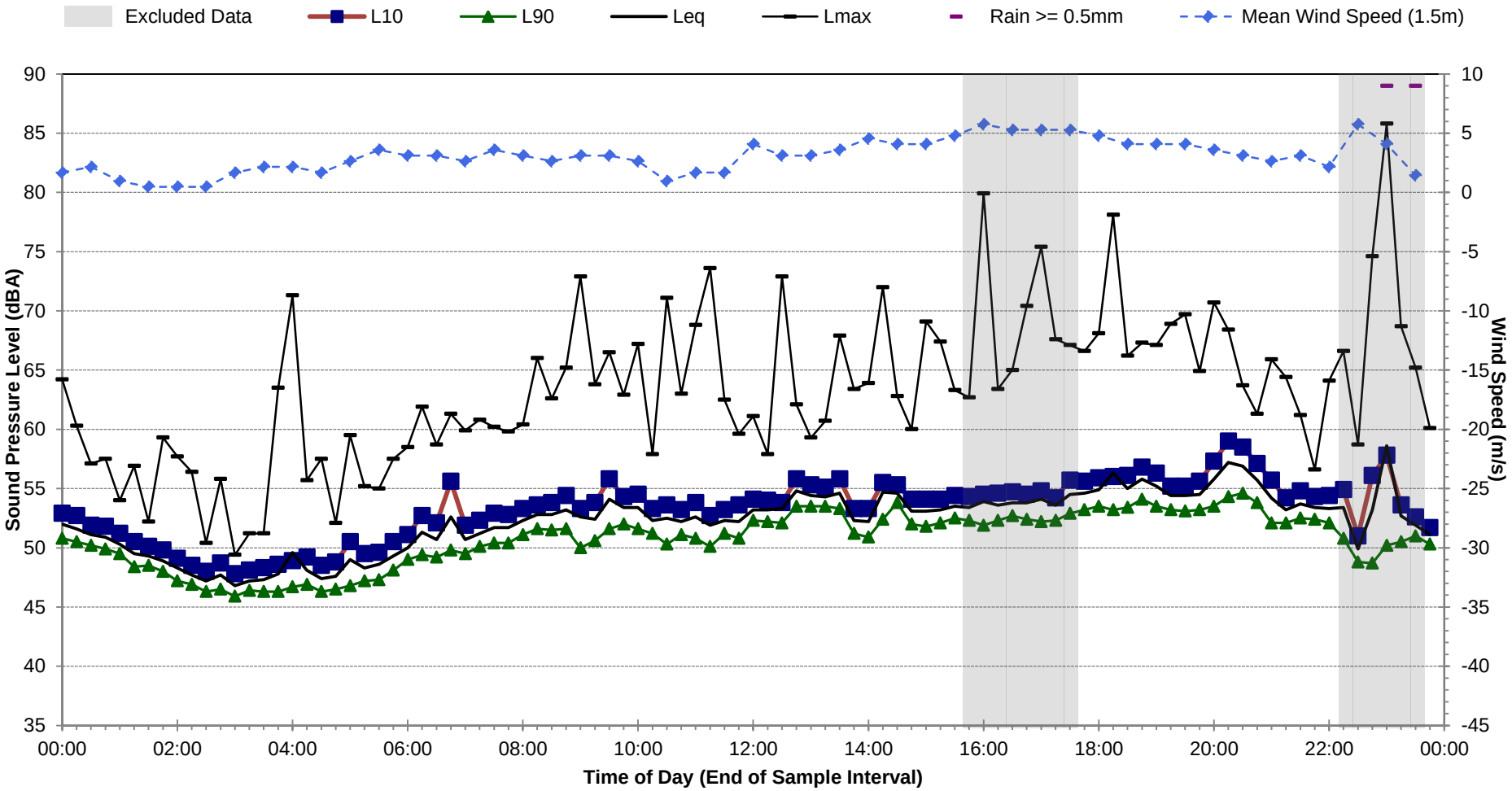
# Statistical Ambient Noise Levels
## 13 Griffin Place - Thursday, 8 February 2018



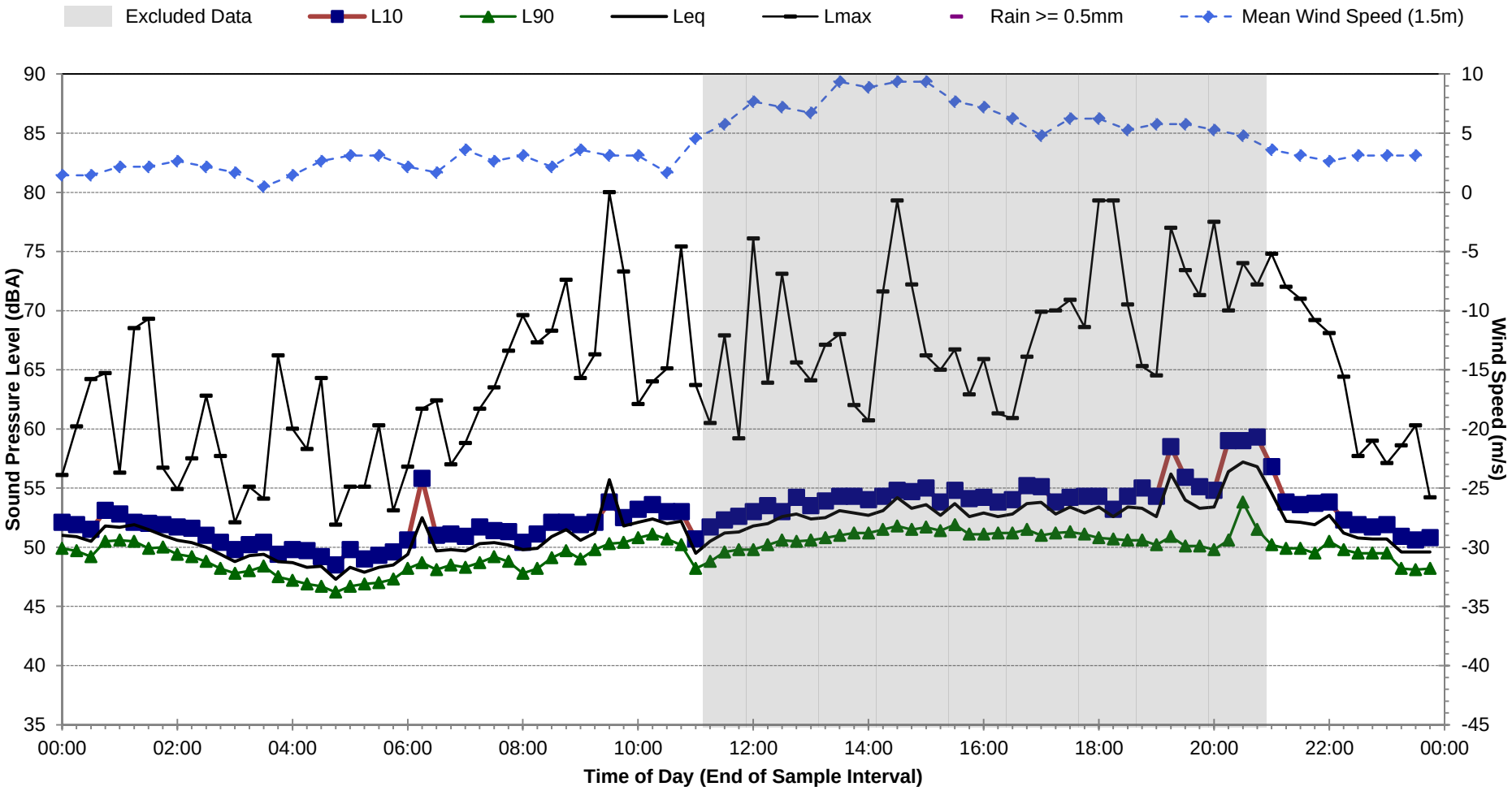
# Statistical Ambient Noise Levels
## 13 Griffin Place - Friday, 9 February 2018



# Statistical Ambient Noise Levels
## 13 Griffin Place - Saturday, 10 February 2018

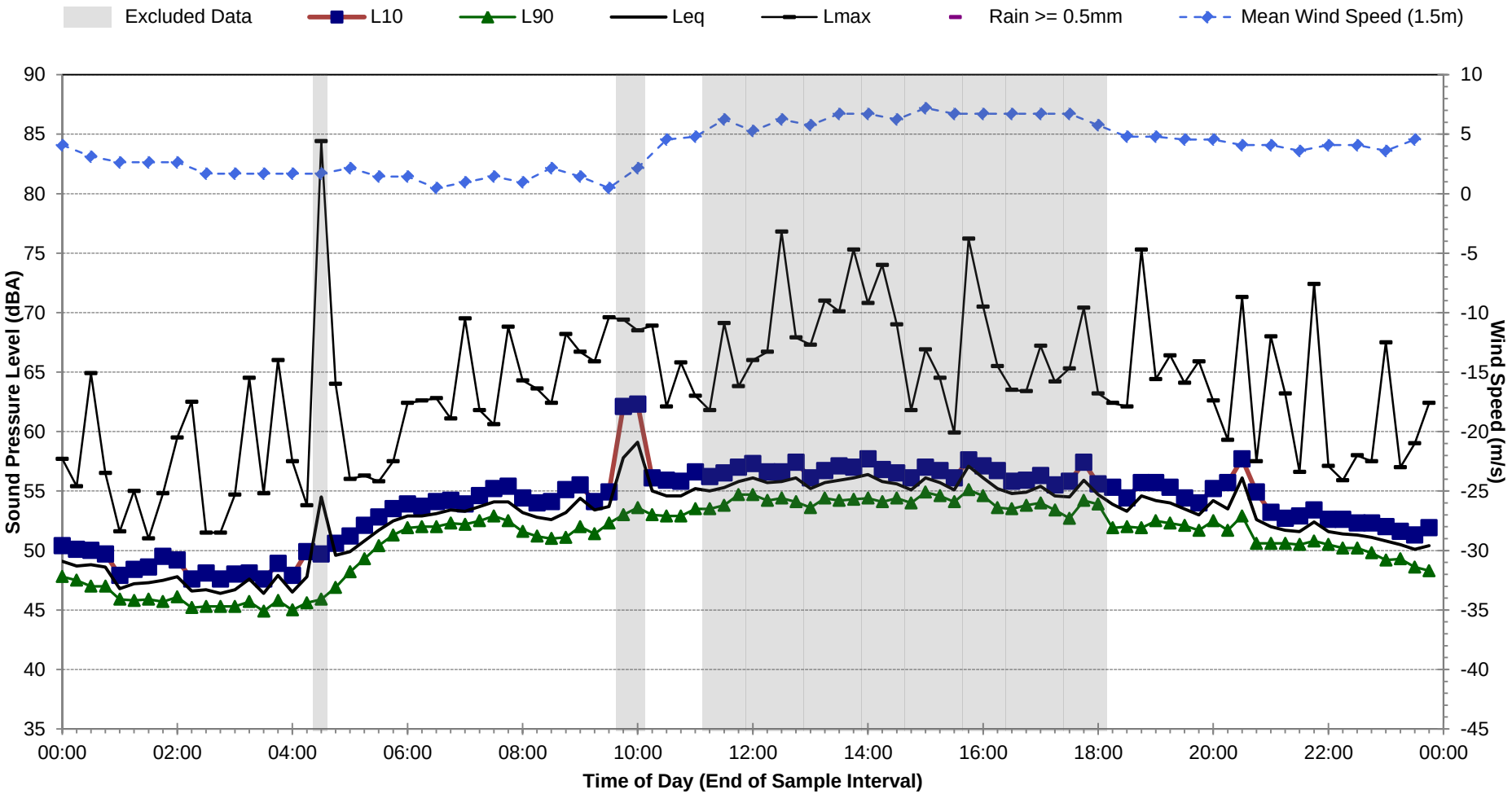


# Statistical Ambient Noise Levels
## 13 Griffin Place - Sunday, 11 February 2018

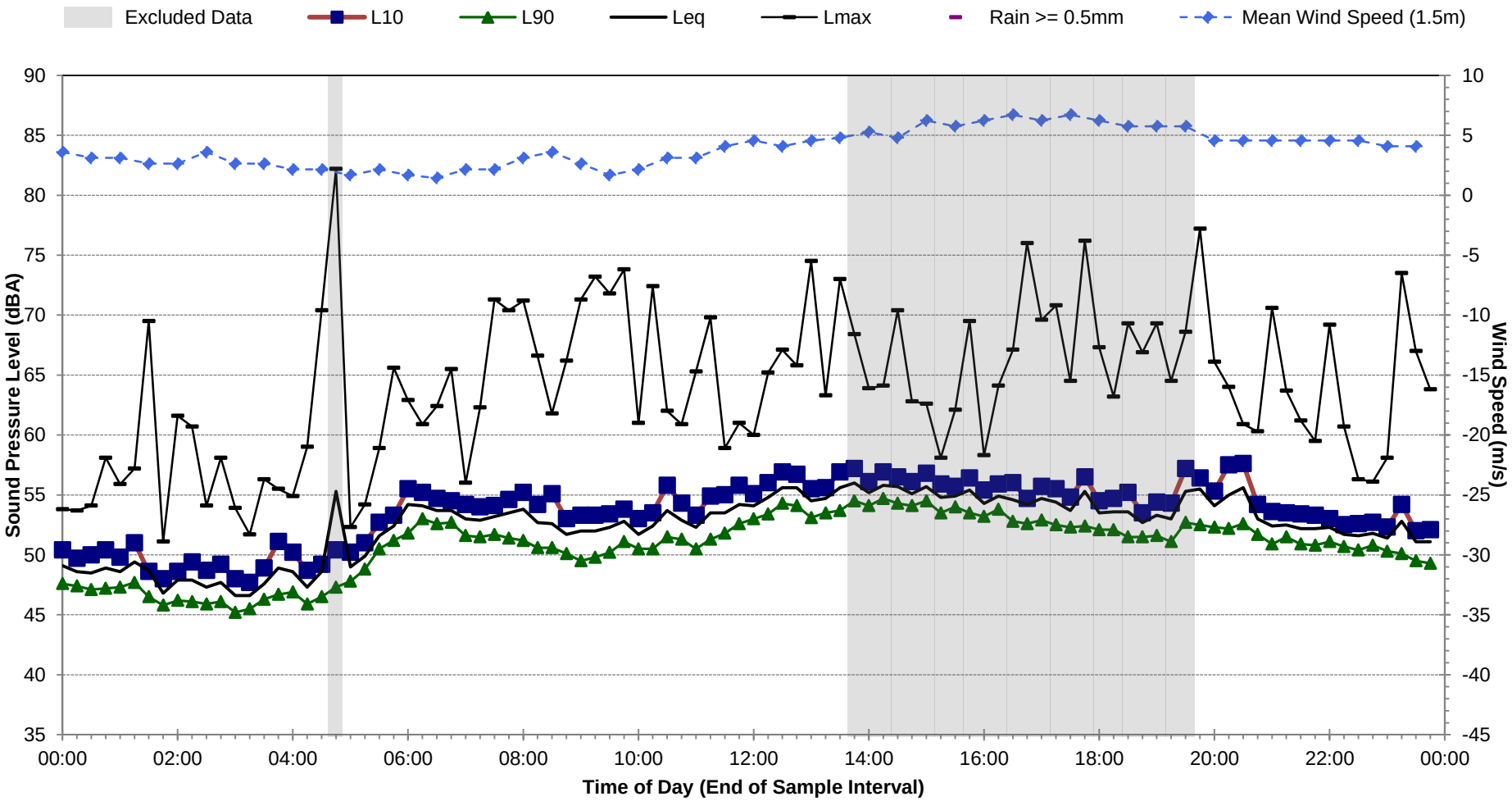


# Statistical Ambient Noise Levels

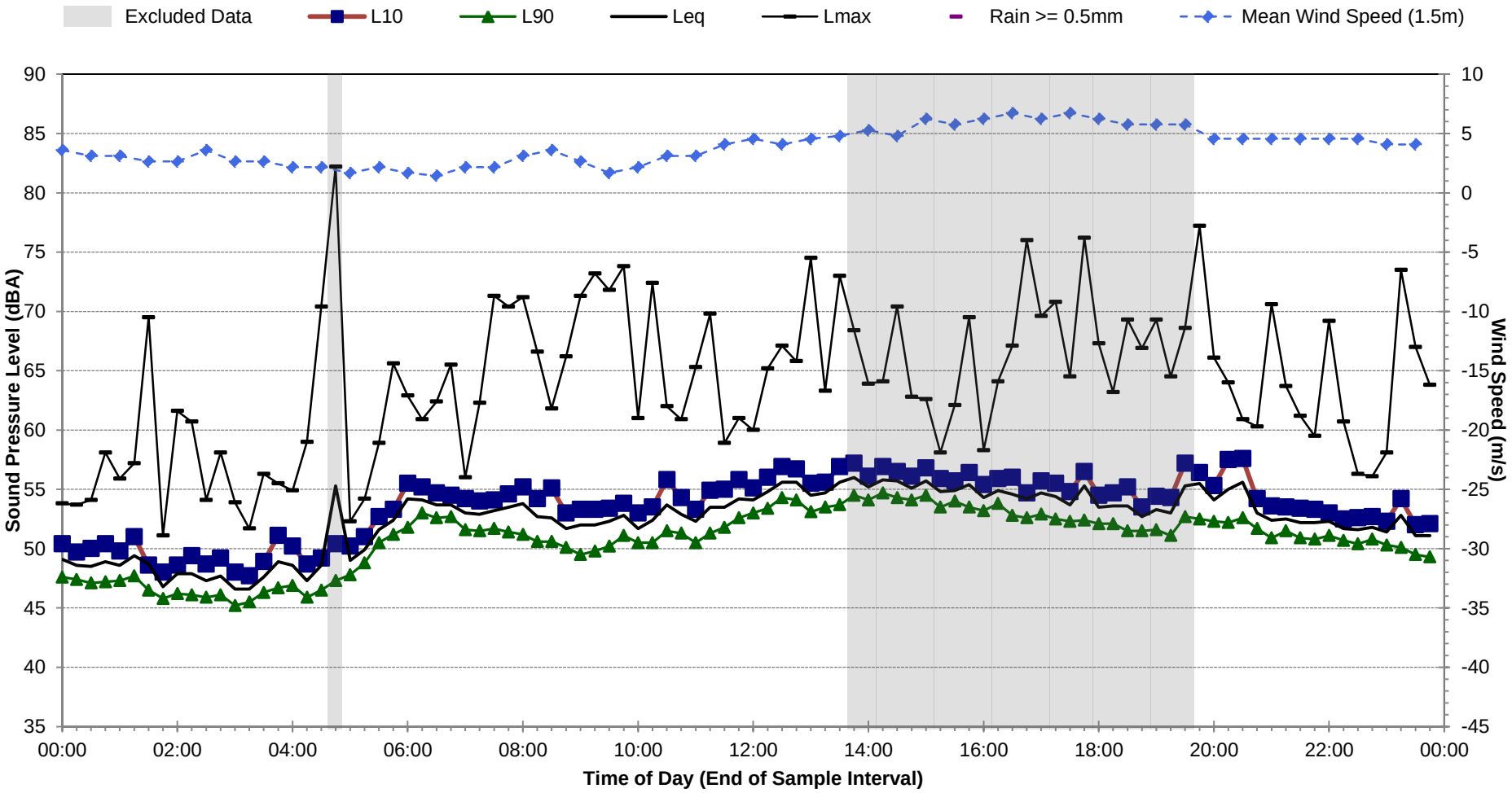
## 13 Griffin Place - Monday, 12 February 2018



# Statistical Ambient Noise Levels
## 13 Griffin Place - Tuesday, 13 February 2018

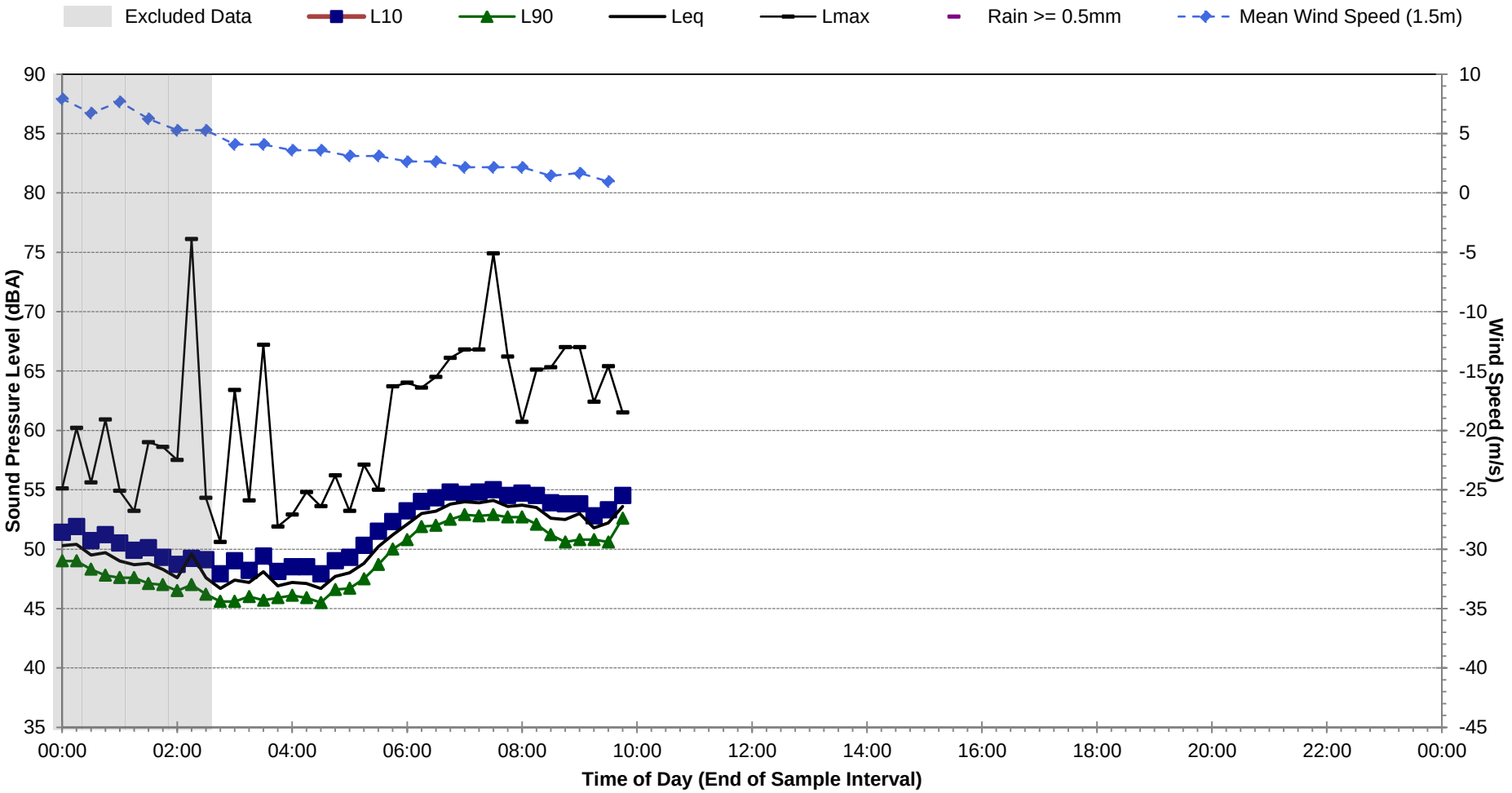


# Statistical Ambient Noise Levels
## 13 Griffin Place - Tuesday, 13 February 2018



# Statistical Ambient Noise Levels

## 13 Griffin Place - Thursday, 15 February 2018



| | |
|---|---|
| **Noise Monitoring Location:** | **L.07** |
| **Noise Monitoring Address:** | **6/82 Wentworth Park Road** |

Logger Device Type: ARL-EL 316, Logger Serial No: 16 – 203 - 505

Sound Level Meter Device Type: Brüel and Kjær 2250, Sound Level Meter Serial No: 2487418

Ambient noise logger deployed at residential address 6/82 Wentworth Park Road, Glebe. Logger located at footpath boundary directly facing Wentworth Park Road.

Attended noise measurements indicate the ambient noise environment at this location is dominated by continuous road traffic noise from Wentworth Park Road with transient operational noise emissions from nearby industrial premises and intermittent bird calls also contributing to the LAeq at this monitoring position.

Recorded Noise Levels: (LAmax):

08/02/18: Heavy-vehicle traffic (Wentworth Park Road): 72 - 82 dBA, Light-vehicle traffic (Wentworth Park Road): 66 – 77 dBA, Ambient noise: 56 - 57 dBA, Motorcycle traffic: 68 – 82 dBA, Light rail: 62 dBA, Operational noise: 55 - 57 dBA

**Map of Noise Monitoring Location**


**Ambient Noise Logging Results – NPfl Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | **RBL** | **LAeq** |
| **Daytime** | 54 | 67 |
| **Evening** | 50 | 64 |
| **Night-time** | 42 | 58 |
| **Early Morning** | 44 | 63 |

**Ambient Noise Logging Results – RNP Defined Time Periods**

| Monitoring Period | Noise Level (dBA) | |
|---|---|---|
| | **$L_{Aeq(Period)}$** | **$L_{Aeq(1hour)}$** |
| **Daytime (7am-10pm)** | 66 | 68 |
| **Night-time (10pm-7am)** | 59 | 66 |

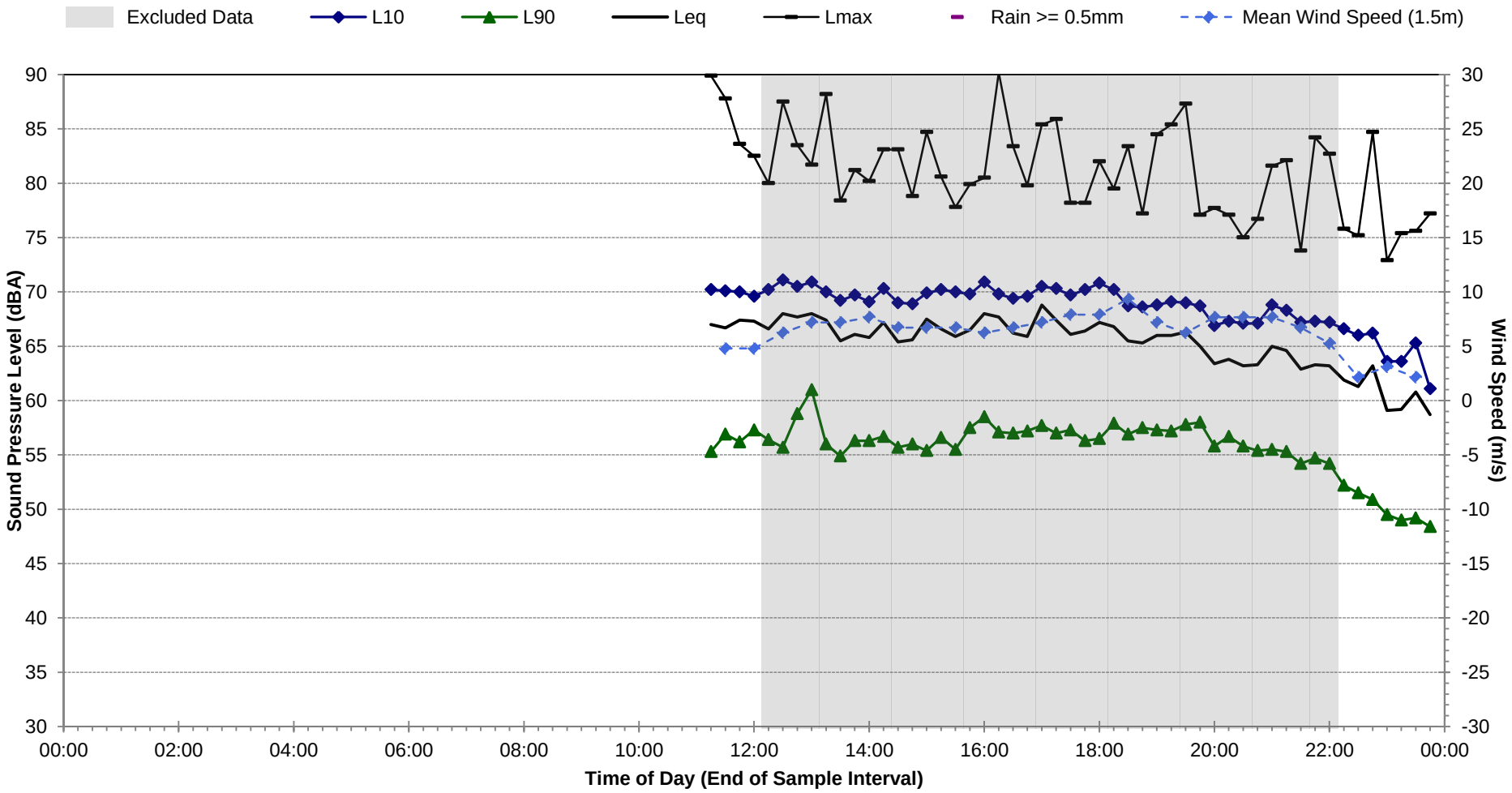
**Attended Noise Measurement Results**

| Date | Start Time | Measured Noise Level (dBA) | | |
|---|---|---|---|---|
| | | **LA90** | **LAeq** | **LAmax** |
| 08/02/2018 | 10:49am | 56 | 66 | 82 |

**Photo of Noise Monitoring Location**

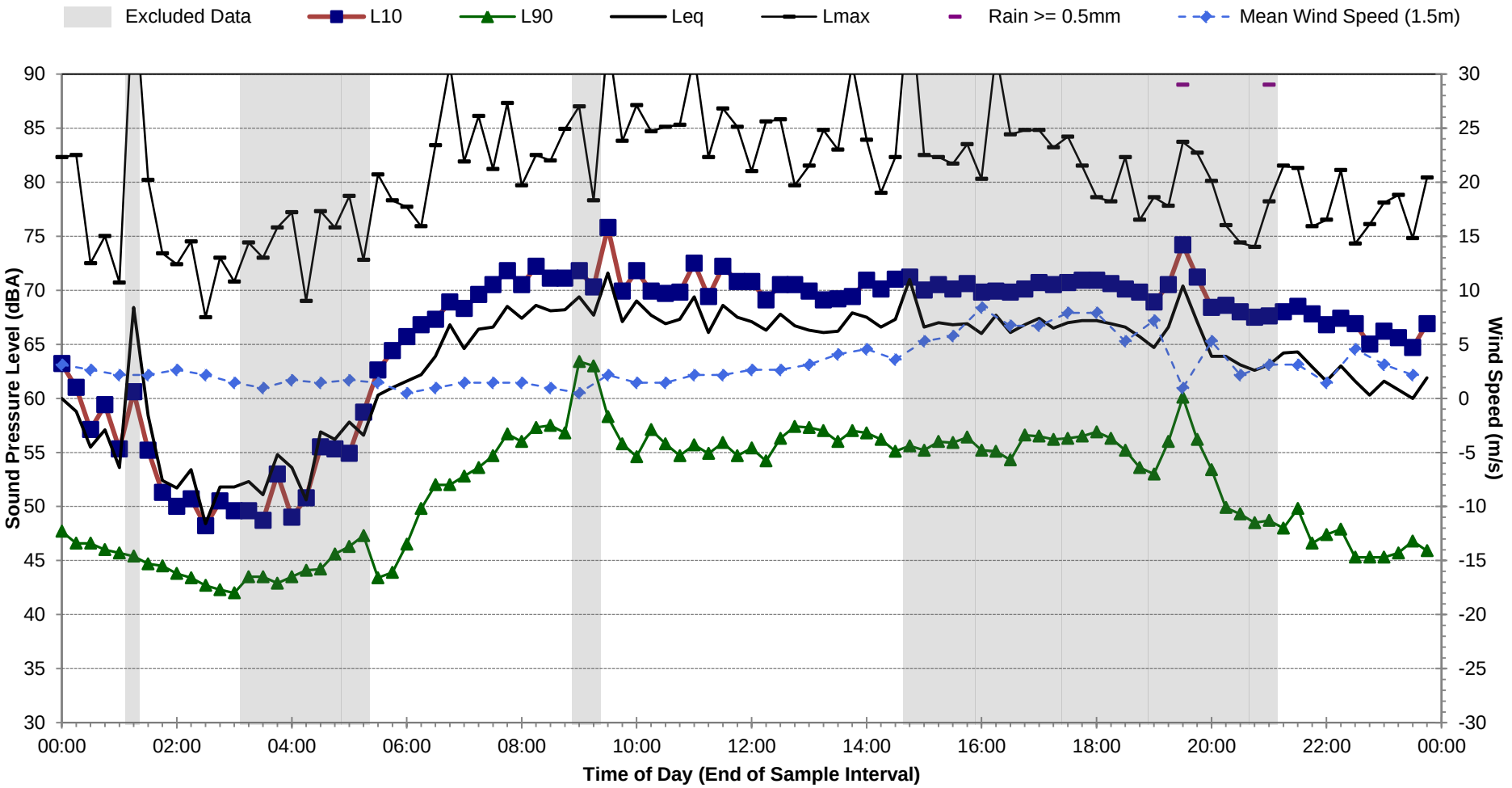
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Thursday, 8 February 2018



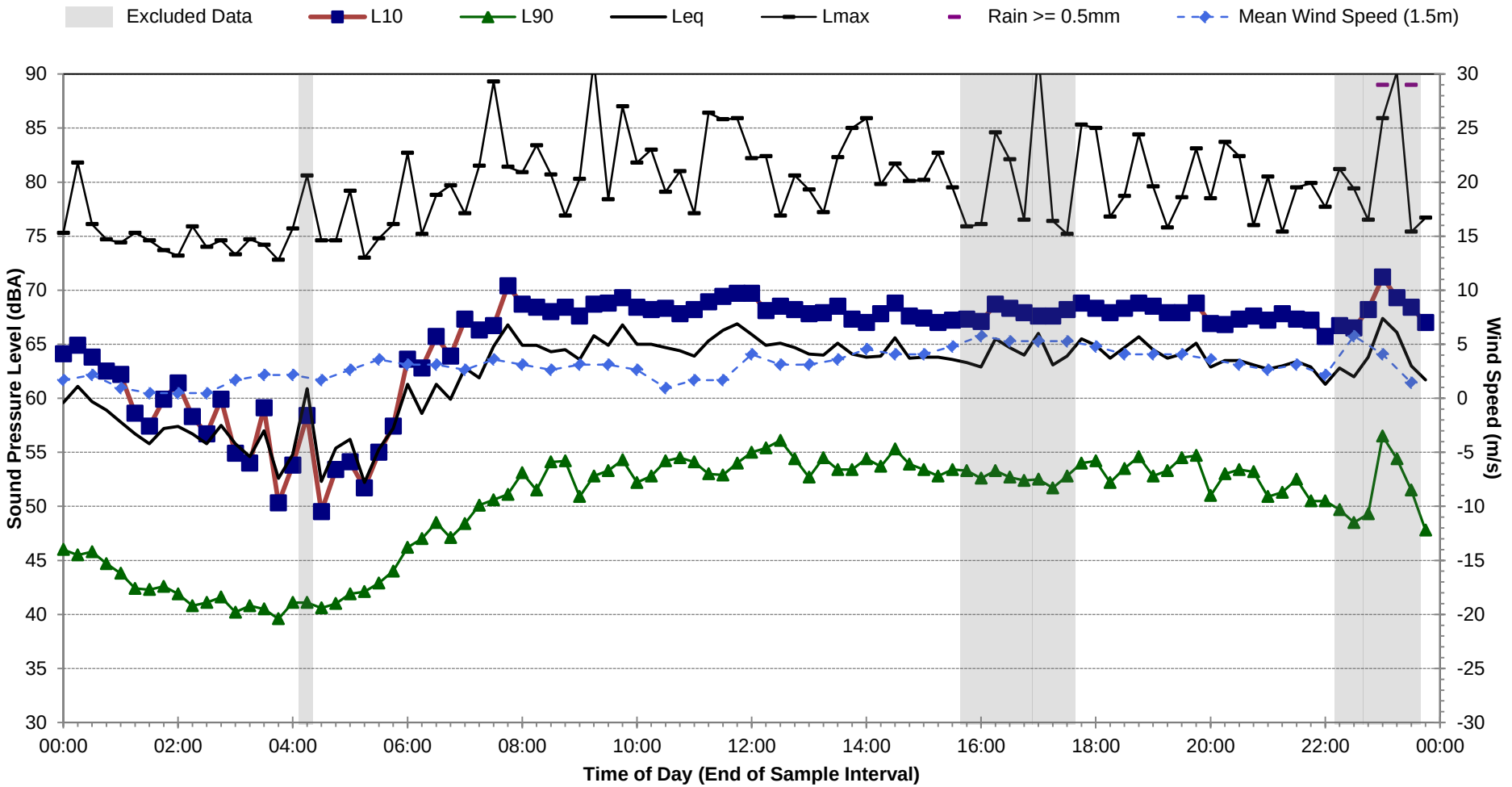
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Friday, 9 February 2018



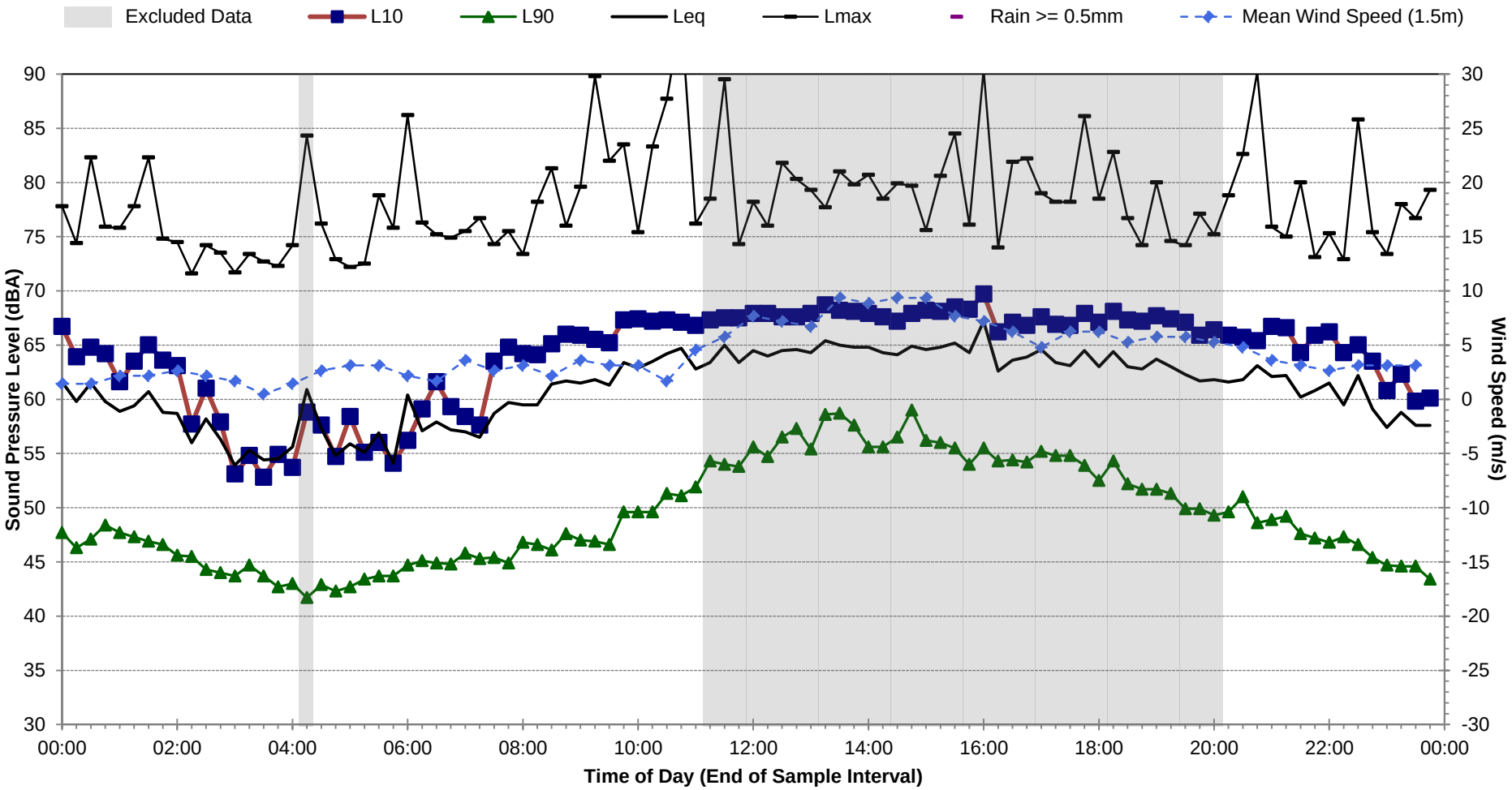
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Saturday, 10 February 2018



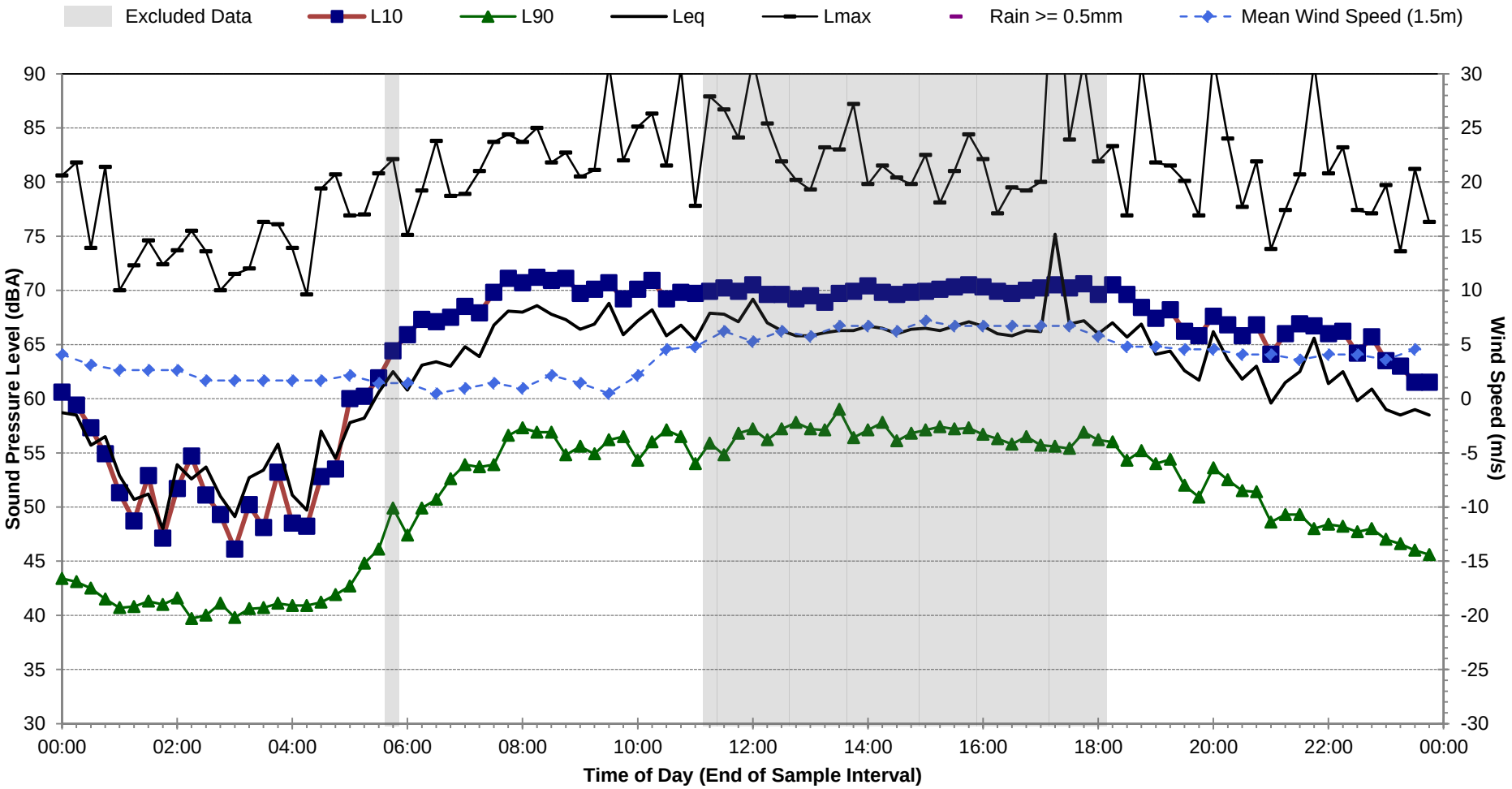
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Sunday, 11 February 2018



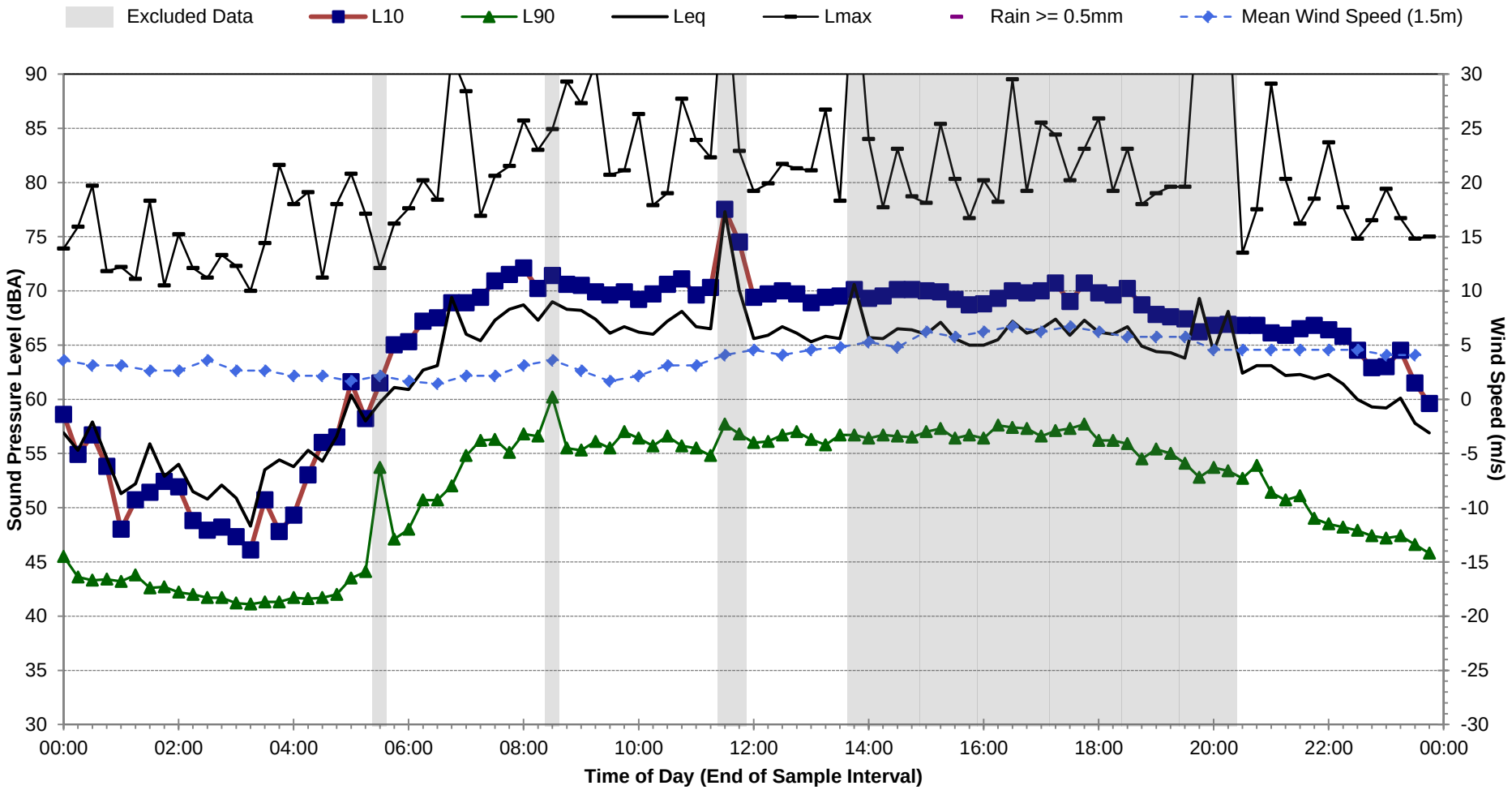
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Monday, 12 February 2018



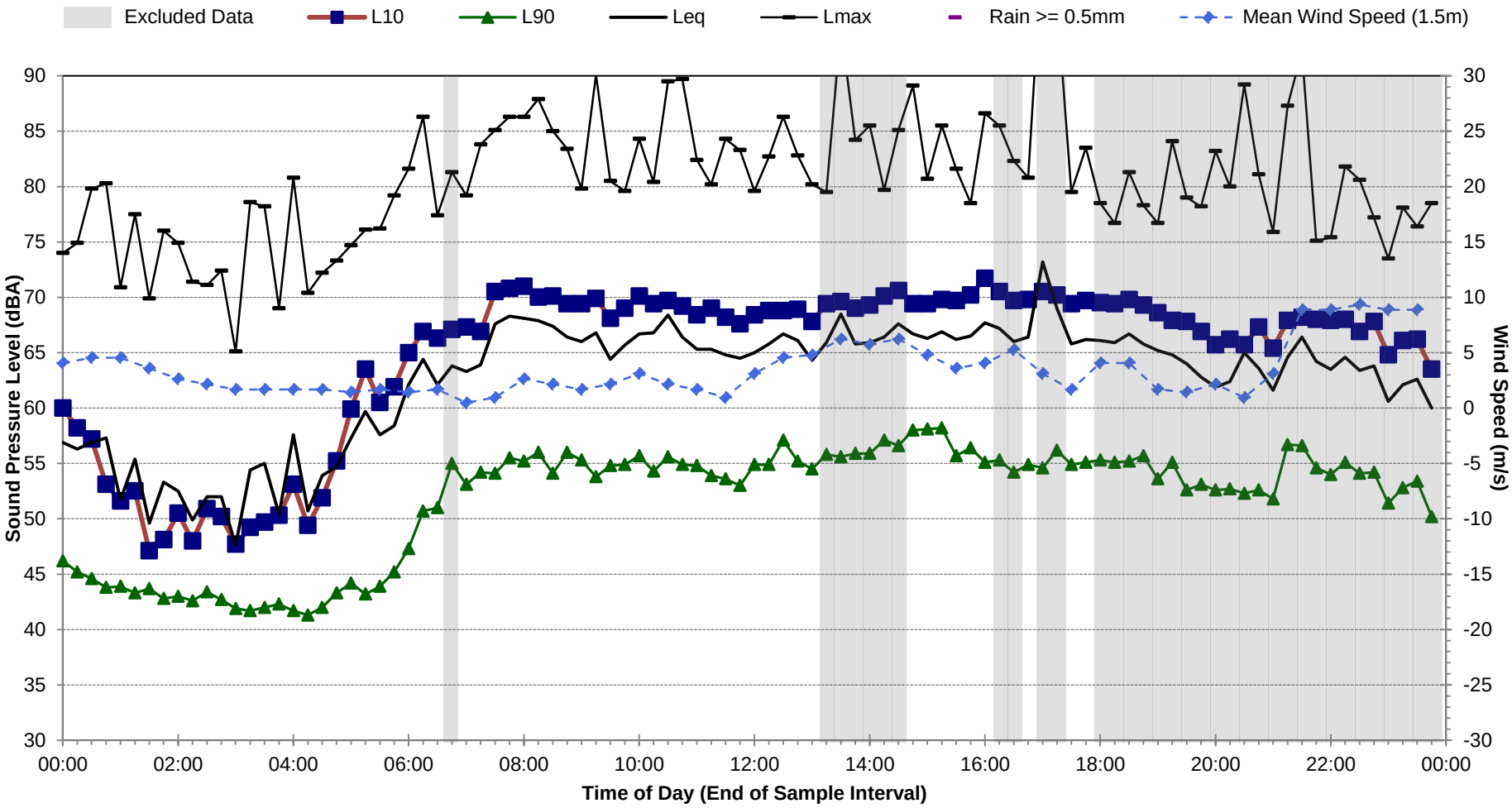
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Tuesday, 13 February 2018



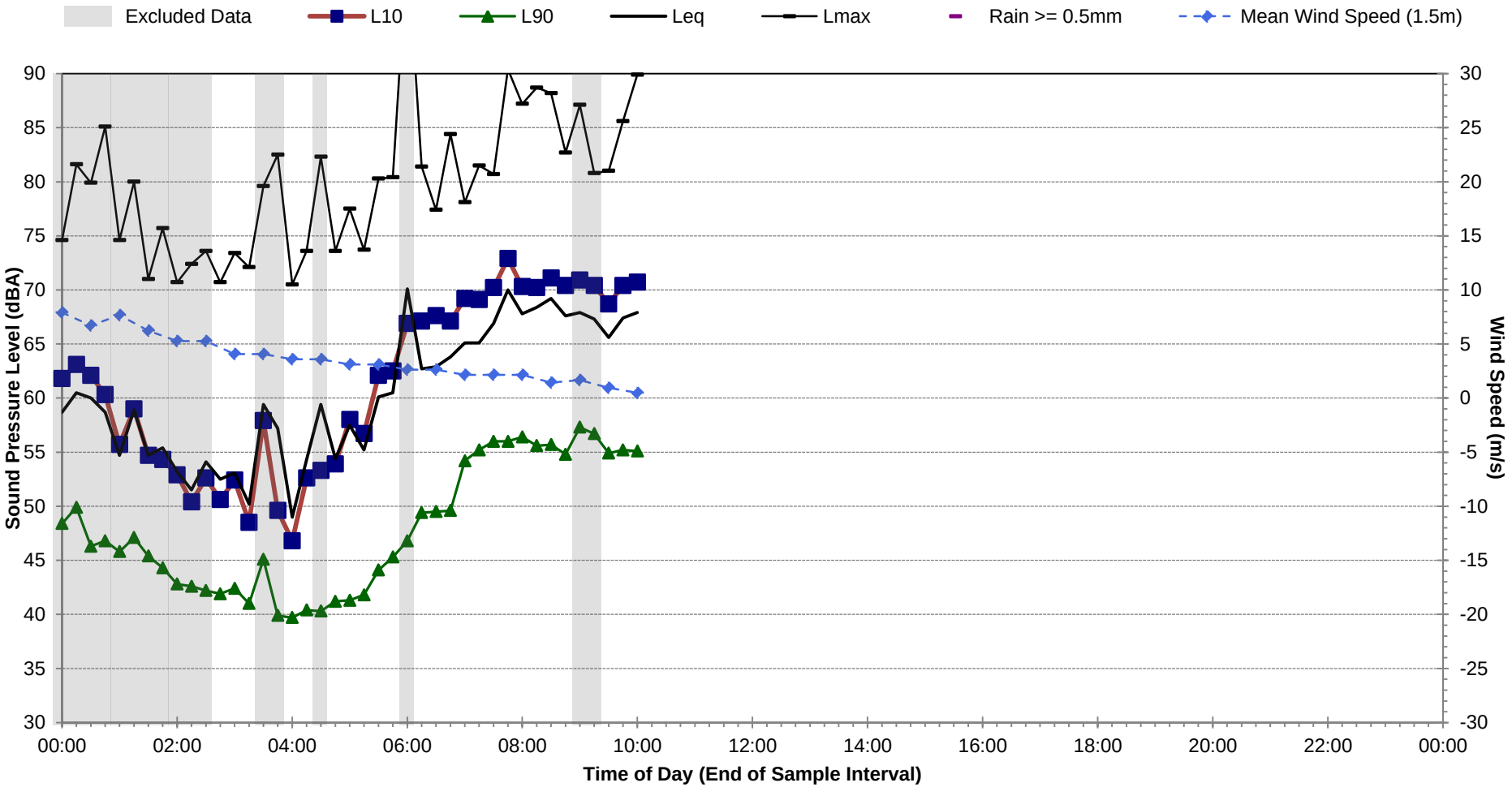
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Wednesday, 14 February 2018



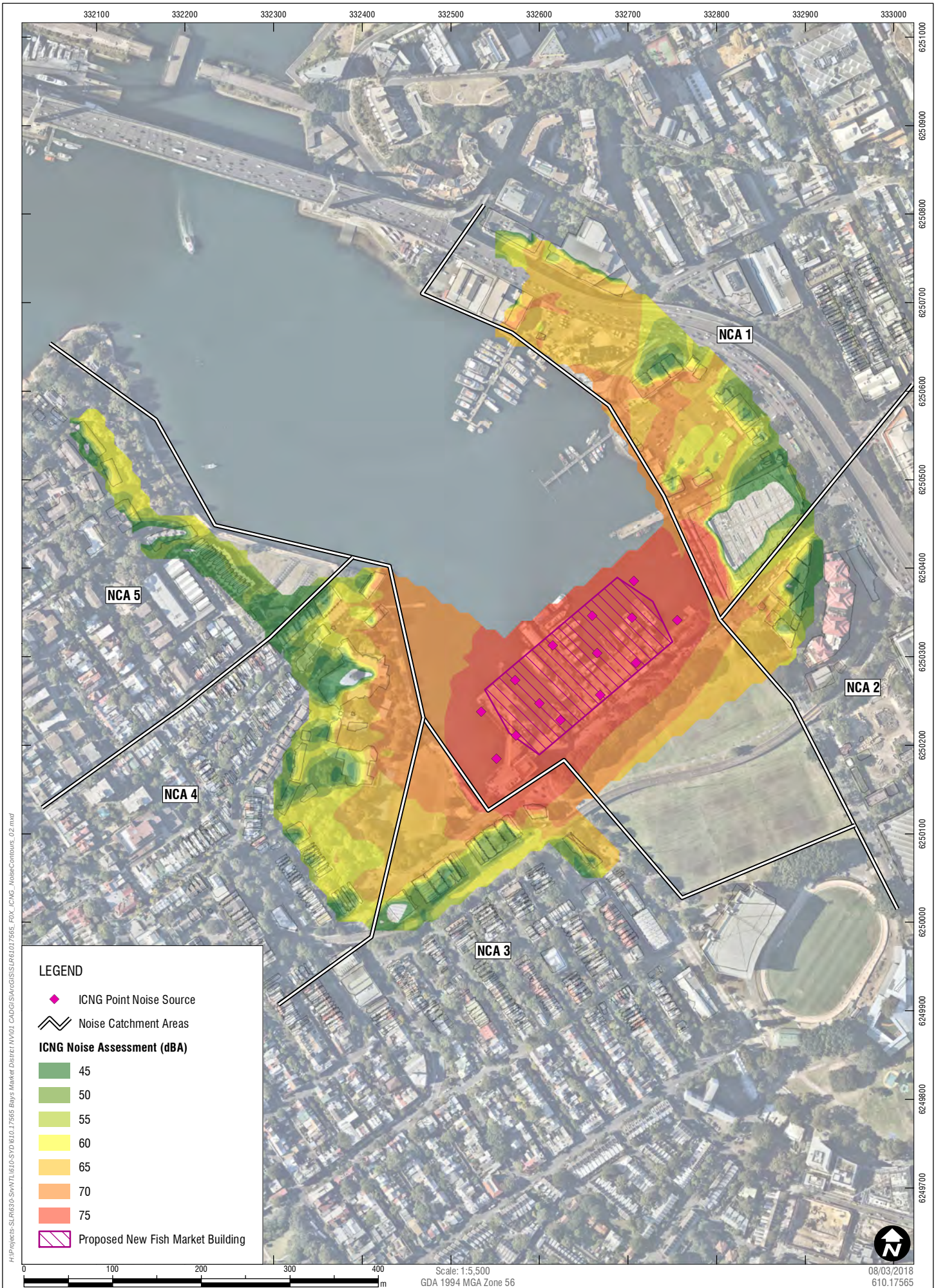
# Statistical Ambient Noise Levels

## L07 6/82 Wentworth Park Road - Thursday, 15 February 2018



# APPENDIX C

Grid Noise Maps

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08/03/2018
610.17565

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SLR

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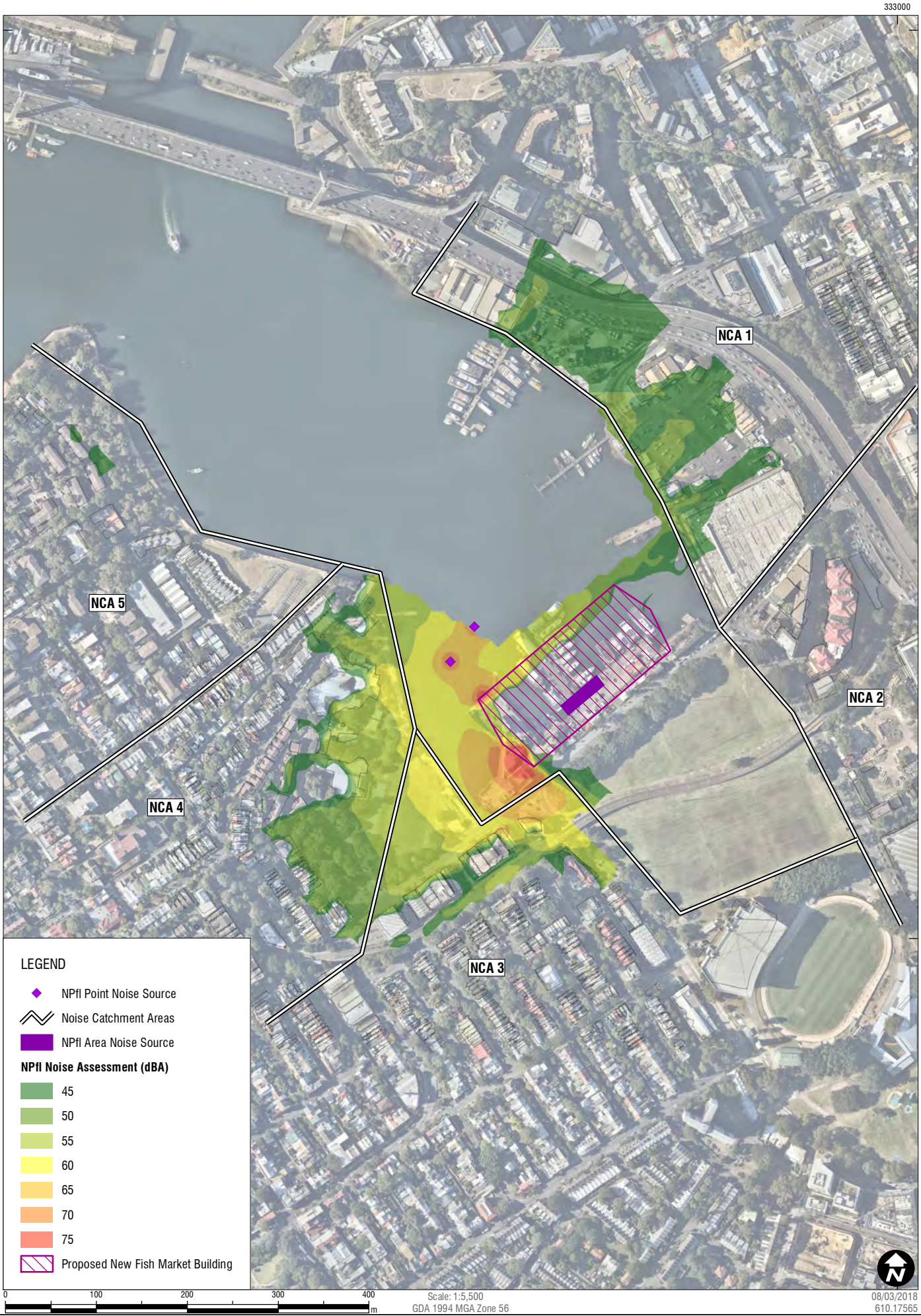
## ICNG Noise Assessment

**APPENDIX C**

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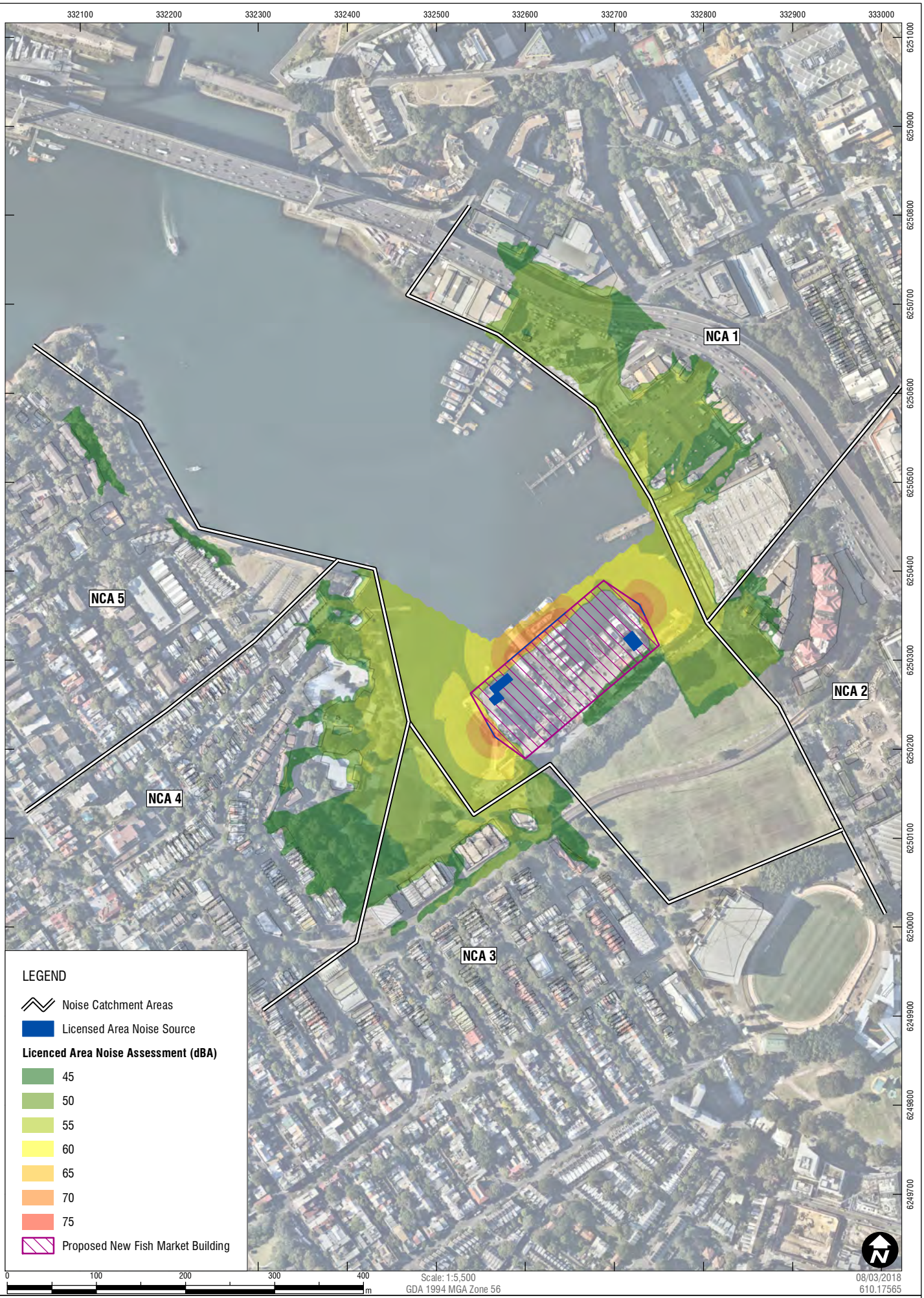
## NPfl Noise Assessment

**APPENDIX C**

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Sheet Size : A4

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## Licensed Area Noise Assessment

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