

Noise Assessment

Proposed Modification to Operating Hours

McDonald's Operation

St Clair Shopping Centre

Corner of Bennett Road and Endeavour Avenue

St Clair, NSW.

Document Information

Noise Assessment

Proposed Modification to Operating Hours

McDonald's Operation

St Clair Shopping Centre

Corner of Bennett Road and Endeavour Avenue, St Clair, NSW.

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by KDC Pty Ltd (KDC) to prepare a Noise Assessment (NA) to quantify emissions from the proposed McDonald's 24hour Operation (the 'operation') at the St Clair Shopping Centre, Corner of Bennett Road and Endeavour Avenue, St Clair, NSW.

The NA has quantified potential operational and sleep disturbance noise emissions from the operation and recommends reasonable and feasible noise controls where required.

The assessment has been undertaken in accordance with the following documents:

- Environment Protection Authority (EPA), NSW Noise Policy for Industry (NPI) 2017;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures; and
- International Standard ISO 9613:1993 - Acoustics - Attenuation of sound during propagation outdoors.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

1.1 Proposal

Current approved trading hours of the operation are between 6am to 11pm, seven days. Approval is being sought to extend operating hours to 24 hours, seven days.

The NA has quantified potential operational noise emissions pertaining to customer vehicles using the drive-thru and car park, the customer ordering displays (CODs) and mechanical plant to surrounding residential receivers.

It is noted that delivery/collection vehicles remain unchanged as part of the operation, therefore have not been included in this assessment.

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2 Project Description

2.1 General

The operation is located at the Corner of Bennett Road and Endeavour Avenue, St Clair, NSW. This locality comprises primarily commercial and residential land uses. It is noted that the commercial receivers are not anticipated to be affected as a result of the operation as they will be unoccupied during the night assessment period.

2.2 Receiver Review

A review of residential receivers in close proximity to the operation has been completed and are summarised in **Table 1**. **Figure 1** provides a locality plan showing the position of these receivers in relation to the operation. All receiver heights were set to 1.5m and 4.0m above relative ground level for ground floor and first floor receivers.

| Table 1 Receiver Locations | | | | |
|----------------------------|-------------|---------|-----------------|---------------|
| Receiver | Coordinates | | Receiver Height | Receiver Type |
| R1 | 295450 | 6258497 | 1.5m | Residential |
| R2 | 295448 | 6258475 | 1.5m | Residential |
| R3 | 295487 | 6258490 | 1.5m | Residential |
| R4 | 295487 | 6258470 | 1.5m | Residential |
| R5 | 295536 | 6258461 | 1.5m | Residential |
| R6 | 295540 | 6258402 | 1.5m | Residential |
| R7 | 295465 | 6258344 | 1.5m | Residential |
| R8 | 295436 | 6258329 | 1.5m/4.0m | Residential |
| R9 | 295441 | 6258307 | 1.5m | Residential |
| R10 | 295410 | 6258277 | 1.5m | Residential |

2.3 Proposed Activities

There are several key activities associated with the operation that have the potential to generate acoustic impacts on nearby receivers. **Table 2** provides a summary of operation noise sources and the assessment period in which they propose to occur.

| Table 2 Noise Generating Activities | | |
|-------------------------------------|---------------------|-------------|
| Activity/Source | Period ¹ | Operational |
| Customer light vehicles (customers) | Night | ✓ |
| Drive-Thru Operations | Night | ✓ |
| Mechanical Plant | Night | ✓ |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.







FIGURE 1

LOCALITY PLAN

REF: MAC190847



| KEY | |
|---|---------------------|
|  | RECEIVER LOCATION |
|  | LOGGER LOCATION |
|  | ATTENDED MONITORING |
|  | SITE LOCATION |



3 Noise Policy and Guidelines

3.1 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997. The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term and long term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, taking into account the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.
6. Monitor and report environmental noise levels from the development.

3.1.1 Project Noise Trigger Levels

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) value of the **Project Intrusiveness Noise Level (PINL)** and **Project Amenity Noise Level (PANL)** determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.1.2 Project Intrusiveness Noise Level

The PINL (LA_{eq}(15min)) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels needs to be measured.

3.1.3 Project Amenity Noise Level

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area.
- **Project Amenity Noise Levels (PANL)** – is the recommended levels for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: “*to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise levels applies for each new source of industrial noise as follows*”:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

The NPI states with respect to high traffic noise areas:

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the LAeq noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the LAeq, period(traffic) minus 15 dB(A).

Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level).

The recommended amenity noise levels as per Table 2.2 of the NPI reproduced in **Table 3**.

| Table 3 Amenity Criteria | | | |
|--------------------------|--------------------|-------------|---|
| Receiver Type | Noise Amenity Area | Time of day | Recommended amenity noise level dB LAeq |
| Residential | Urban | Day | 60 |
| | | Evening | 50 |
| | | Night | 45 |

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7.

Time of day is defined as follows: (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

• day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays. • evening – the period from 6pm to 10pm. • night – the remaining periods.

3.1.4 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed:

- LAeq(15min) 40dBA or the prevailing RBL plus 5dB, whichever is the greater, and/or
- LAmax 52dBA or the prevailing RBL plus 15dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

4 Noise Criteria

4.1 Background Noise Environment

4.1.1 Unattended Noise Monitoring

To quantify the existing background noise environment of the area, unattended noise monitoring was conducted at the Corner of Bennett Road and Endeavour Avenue, St Clair, NSW (L1). The selected monitoring location is shown in **Figure 1** and is considered representative of surrounding receivers as per Fact Sheet B1.1 of the NPI.

The unattended noise survey was conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise".

The measurements were carried out using one Svantek 957 noise analyser from Tuesday 30 April 2019 to Wednesday 8 May 2019. Observations on-site identified the surrounding locality was typical of an urban environment, with residential, birds, traffic and commercial noise audible. Calibration of all instrumentation 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.

Data affected by adverse meteorological conditions have been excluded from the results in accordance with methodologies provided in Fact Sheet A4 of the NPI. Residential receptors situated in surrounding area have been classified under the EPA's urban amenity category. This criterion is used in conjunction with the intrusiveness criteria to determine the limiting criteria. The results of long-term unattended noise monitoring are provided in **Table 4**. The noise monitoring charts for the background monitoring assessment are provided in **Appendix B**.

Table 4 Background Noise Monitoring Summary

| Location | Measured background noise level, dB RBL | | | Measured, dB LAeq | | |
|----------|---|-------------|-------------|-------------------|-------------|-------------|
| | Day | Evening | Night | Day | Evening | Night |
| | 7am to 6pm | 6pm to 10pm | 10pm to 7am | 7am to 6pm | 6pm to 10pm | 10pm to 7am |
| L1 | 55 | 52 | 40 | 65 | 65 | 63 |

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station Penrith Lakes AWS 33.72S 150.68E 25m AMSL.

4.1.2 Attended Noise Monitoring

Attended noise measurements for the operation were completed at one location on Wednesday 8 May 2019 at A1 (see **Figure 1**) to quantify the site contribution at nearby receivers. The results of the short-term noise measurement and observations are summarised in **Table 5**.

Attended noise measurements were used to assess the level of industrial noise from the operation and neighbouring commercial premises as well as traffic noise from Bennett Road and Endeavour Avenue.

Table 5 Operator-Attended Noise Survey Results

| Location | Time (hrs) | Primary Noise Descriptor (dBA re 20 µPa) | | | Observations and SPL, dBA |
|-------------------------------|------------|--|------------------|------------------|--|
| | | L _{Amax} | L _{Aeq} | L _{A90} | |
| A1 – St Clair Shopping Centre | 15:30 | 84 | 64 | 61 | Traffic Noise 60-65 Children in Playground 50-60 Shopping Centre Plant 55-60 |

4.2 Operational Noise Criteria

4.2.1 Project Intrusiveness Noise Levels

The Project Intrusiveness Noise Levels (PINLs) for the project are presented in **Table 6** and have been determined based on the RBL +5dBA and applies to residential receivers only.

Table 6 Intrusiveness Noise Levels

| Receiver | Period ¹ | Measured RBL | PINL |
|----------|---------------------|---------------------|-----------------------------|
| | | dB L _{A90} | dB L _{Aeq} (15min) |
| R1-R10 | Night | 40 | 45 |

Note: As per Section 2.1 of the NPI, Intrusiveness Noise Levels only apply to residences.

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Project Amenity Noise Levels

The Project Amenity Noise Levels (PANLs) for residential receivers potentially affected by the project are presented in **Table 7**.

Table 7 Amenity Noise Levels and Project Amenity Noise Levels

| Receiver Type | Noise Amenity | Assessment | Recommended ANL | PANL | PANL |
|---------------|---------------|---------------------|---|---|---------------------------------------|
| | Area | Period ¹ | dB L _{Aeq} (period) ² | dB L _{Aeq} (period) ³ | L _{Aeq} (15min) ⁴ |
| R1-R10 | Urban | Night | 45 | 48 | 51 |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Recommended amenity noise levels as per Table 2.2 of the NPI.

Note 3: L_{Aeq,period}(traffic) as per section 2.4.1 of the NPI (i.e. existing L_{Aeq} traffic -15dB).

Note 4: Includes a +3dB adjustment to the amenity period level to convert to a fifteen-minute assessment period as per Section 2.2 of the NPI

4.2.3 Project Noise Trigger Levels

The Project Noise Trigger Levels (PNTLs) are the lower of either the PINL or the PANL. **Table 8** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

| Table 8 Project Noise Trigger Levels | | | | |
|---|---------------------|------------------------|------------------------|------------------------|
| Receiver | Period ¹ | PINL dB LAeq(15min) | PANL dB LAeq(15min) | PNTL dB LAeq(15min) |
| R1-R10 | Night | 45 | 51 | 45 |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Maximum Noise Level Assessment Criteria

The maximum noise level screening criteria shown in **Table 9** is based on night time RBLs and trigger values as per Section 2.5 of the NPI.

| Table 9 Maximum Noise Level Assessment Screening Criteria | | | |
|--|-----------|--------------------------|-----------|
| Residential Receivers R1-R10 | | | |
| LAeq(15min) | | LAmax | |
| 40dB LAeq(15min) or RBL + 5dB | | 52dB LAmax or RBL + 15dB | |
| Trigger | 40 | Trigger | 52 |
| RBL40+5dB | 45 | RBL40+15dB | 55 |
| Highest | 45 | Highest | 55 |

Note 1: As per Section 2.5 of the NPI, the highest of each metric are adopted as the screening criteria.

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5 Noise Assessment Methodology

DGMR (iNoise, Version 2019) noise modelling software was used to assess potential noise impacts from the operation. The model incorporated three-dimensional ground contours and buildings within the operation site and the surrounding locality. Plant and equipment were modelled at various locations and heights, representative of realistic operating conditions for assessed scenarios. The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'.

5.1 Sound Power Levels

Table 10 presents the sound power level for each noise source modelled in this assessment. It is noted that sound power levels were sourced from manufacturer's specifications or from in-field measurements at similar project sites. The sound power levels have been adjusted to account for duration over a fifteen-minute period.

| Table 10 Acoustically Significant Sources - Sound Power Levels (re 10-12 Watts) | | | |
|--|---|---|-------------------------------|
| Item and number modelled per 15 minutes | Individual Sound Power Level, dB LAeq(15min) | Total source Sound Power Level, dB LAeq(15min) | Source Height ¹ |
| Operation | | | |
| Fan CGD404 (x2) | 77 | 80 | 0.5m |
| AC Plant PKY620T-6Q1 (x2) | 81 | 84 | 1.5m |
| AC Plant PCG290L/R (x1) | 78 | 78 | 1.5m |
| Customer Ordering Displays (x2) | 75 | 78 | 1.0m |
| Car idle, and drive off (x10) | 73 | 83 | 0.5m |
| Sleep disturbance assessment (LAmax), Night time periods (10pm to 7am) | | | |
| Customer Yelling (at waiting bay) | | 92 | 1.0m |
| Car Door Slam in Car Park | | 85 | 1.0m |

Note 1: Height above the relative ground or building below source.

5.2 Noise Attenuation Assumptions

The noise model incorporated the following controls:

- the mechanical plant is located in the service yard of the operation and shielded to receivers by the 1.8m service bay wall;
- mechanical plant are assumed to operate within the rooftop plant deck of the operation and will be shielded to receivers by the parapet of the building and the rooftop noise barrier; and
- the COD's are assumed to be set at the lowest volume setting.

6 Noise Assessment Results

This assessment has quantified operational noise levels at the nearest receivers combining the simultaneous occurrence of all the following sources:

- customer car noise (driving around site / parking);
- COD's, customers and passbys; and
- mechanical plant.

It is noted that the potential for maximum noise level events to occur simultaneously is unlikely for this operation as the majority of vehicles in any fifteen-minute period would be parked and not operational.

6.1 Operational Noise Results

Noise predictions from all sources have been quantified at surrounding residential receivers to the operation site and are presented in **Table 11**. The coincidence of all plant occurring onsite simultaneously for an entire fifteen-minute period is unlikely.

However, it is probable that several plant may operate simultaneously on occasion for a limited duration. To account for this, modelling has adopted the LAeq(15min) contribution of sources which were derived from in-field measurements of operation sources or activities. Noise levels from combined activities are predicted to satisfy the relevant NPI criteria at all nearest receivers.

Table 11 Combined Noise Predictions

| Receiver | Period ¹ | Predicted Noise Level | PNTL | Compliant |
|----------|---------------------|-----------------------|----------------|-----------|
| | | dB LAeq(15min) | dB LAeq(15min) | |
| R1 | Night | <35 | 45 | ✓ |
| R2 | Night | <35 | 45 | ✓ |
| R3 | Night | <35 | 45 | ✓ |
| R4 | Night | <35 | 45 | ✓ |
| R5 | Night | <35 | 45 | ✓ |
| R6 | Night | <35 | 45 | ✓ |
| R7 | Night | <35 | 45 | ✓ |
| R8 | Night | 35 | 45 | ✓ |
| R9 | Night | <35 | 45 | ✓ |
| R10 | Night | <35 | 45 | ✓ |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

6.2 Maximum Noise Levels Assessment Results

In assessing maximum noise events, typical L_{Amax} noise levels from transient events were assessed to the nearest residential receivers. For the maximum noise assessment, a sound power level of 92dBA for customer yelling noise and 85dBA for car door slams is adopted for this assessment with the night-time operational scenario adopted for the awakenings assessment.

Predicted noise levels from L_{Aeq}(15min) and L_{Amax} events for assessed receivers are presented in **Table 12**. Results identify that the maximum noise events screening criterion will be satisfied for all assessed receivers.

Table 12 Maximum Noise Levels Assessment (Night)¹

| Receiver | Predicted Noise Level | | | Screening Criteria | | Compliant |
|----------|-----------------------------|----------------------|---------------|-----------------------------|----------------------|-----------|
| | dB L _{Aeq} (15min) | dB L _{Amax} | | dB L _{Aeq} (15min) | dB L _{Amax} | |
| | | Customer Yelling | Car Door Slam | | | |
| R1 | <35 | 39 | <35 | 45 | 55 | ✓ |
| R2 | <35 | 40 | <35 | 45 | 55 | ✓ |
| R3 | <35 | 36 | <35 | 45 | 55 | ✓ |
| R4 | <35 | 37 | <35 | 45 | 55 | ✓ |
| R5 | <35 | <35 | <35 | 45 | 55 | ✓ |
| R6 | <35 | <35 | <35 | 45 | 55 | ✓ |
| R7 | <35 | 35 | <35 | 45 | 55 | ✓ |
| R8 | 35 | <35 | 39 | 45 | 55 | ✓ |
| R9 | <35 | <35 | <35 | 45 | 55 | ✓ |
| R10 | <35 | <35 | <35 | 45 | 55 | ✓ |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

7 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Assessment to quantify emissions from the proposed 24hr operation of the McDonald's Operation located at the Corner of Bennett Road and Endeavour Avenue, St Clair, NSW.

The results of the Noise Assessment demonstrate that emissions from the operation would satisfy the relevant PNTLs at all assessed receivers for the proposed extension of operational hours based on the current designs and noise controls that have been established at the operation site.

Furthermore, sleep disturbance is not anticipated, as emissions from impact noise are predicted to remain below the EPA Guideline for maximum noise level screening criteria.

Based on the Noise Assessment results, there are no noise related issues which would prevent Council approving the proposed operation. Additionally, the results of the assessment show compliance with the relative EPA guidelines and criteria, accordingly, no additional ameliorative measures to those already implemented would be required.

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Appendix A – Glossary of Terms

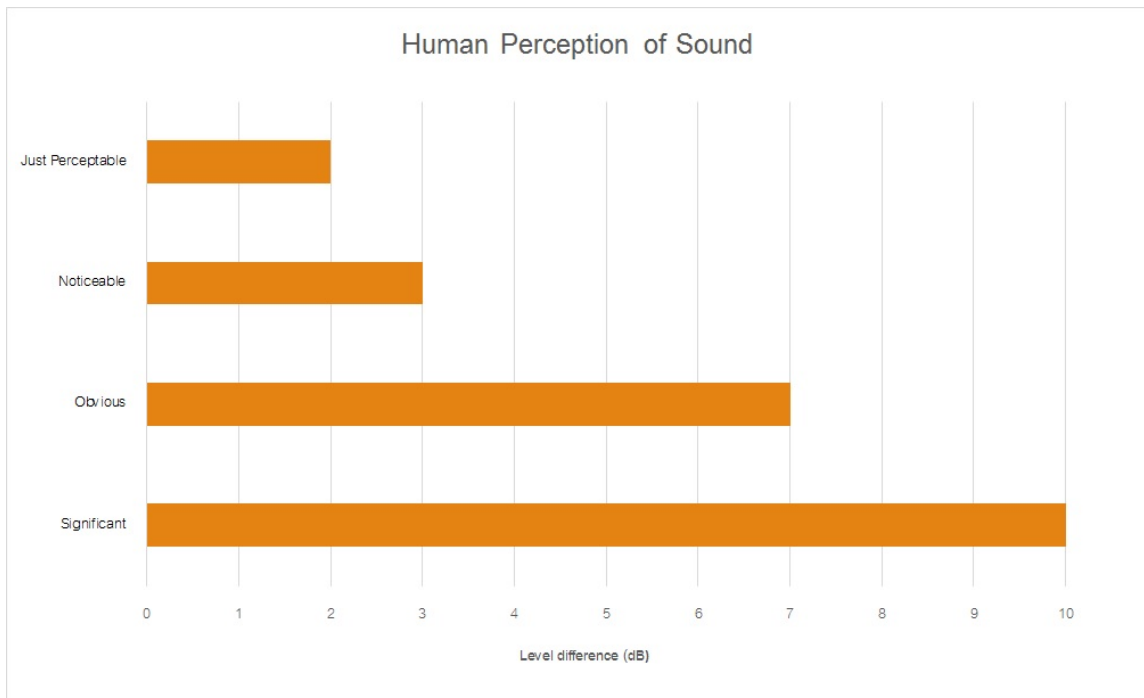
A number of technical terms have been used in this report and are explained in **Table A1**.

| Table A1 Glossary of Terms | |
|----------------------------|--|
| Term | Description |
| 1/3 Octave | Single octave bands divided into three parts |
| Octave | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. |
| ABL | Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels. |
| Ambient Noise | The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant. |
| Extraneous Noise | Noise resulting from activities that are not typical of the area. Atypical activities include sources such as construction and holiday period traffic. |
| A Weighting | A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. |
| dBA | Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear. |
| dB(Z), dB(L) | Decibels Linear or decibels Z-weighted. |
| Hertz (Hz) | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz. |
| LA10 | A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels. |
| LA90 | Commonly referred to as the background noise, this is the level exceeded 90 % of the time. |
| LAeq | The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period. |
| LAmx | The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval. |
| RBL | The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's. |
| Sound power level (LW) | This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where: W is the sound power in watts and W ₀ is the sound reference power at 10-12 watts. |

Table A2 provides a list of common noise sources and their typical sound level.

| Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA | |
|--|---------------------|
| Source | Typical Sound Level |
| Threshold of pain | 140 |
| Jet engine | 130 |
| Hydraulic hammer | 120 |
| Chainsaw | 110 |
| Industrial workshop | 100 |
| Lawn-mower (operator position) | 90 |
| Heavy traffic (footpath) | 80 |
| Elevated speech | 70 |
| Typical conversation | 60 |
| Ambient suburban environment | 40 |
| Ambient rural environment | 30 |
| Bedroom (night with windows closed) | 20 |
| Threshold of hearing | 0 |

Figure A1 – Human Perception of Sound



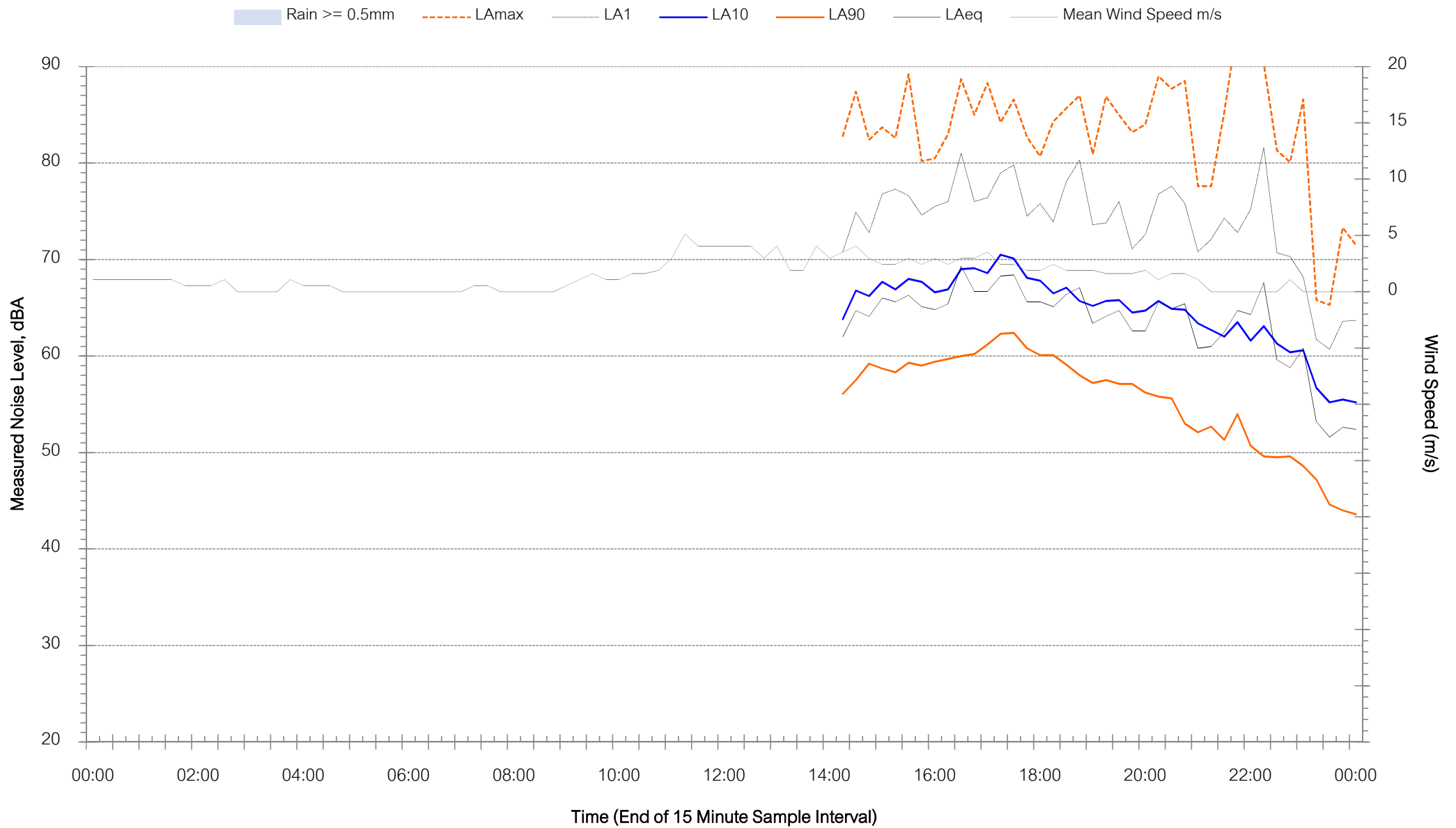
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Appendix B – Noise Monitoring Charts



Background Noise Levels

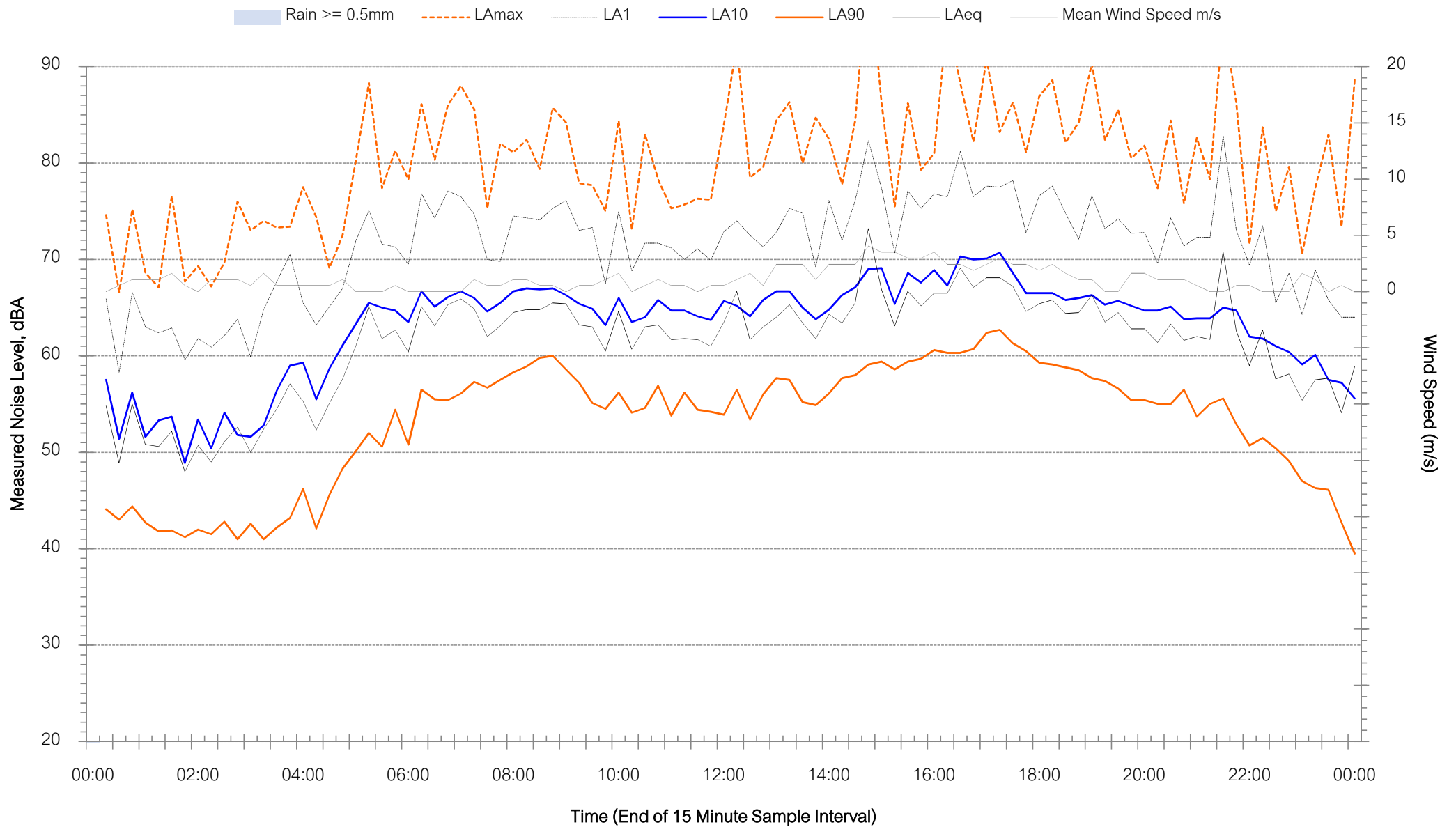
Corner of Endeavour Avenue and Bennett Road - Tuesday 30 April 2019





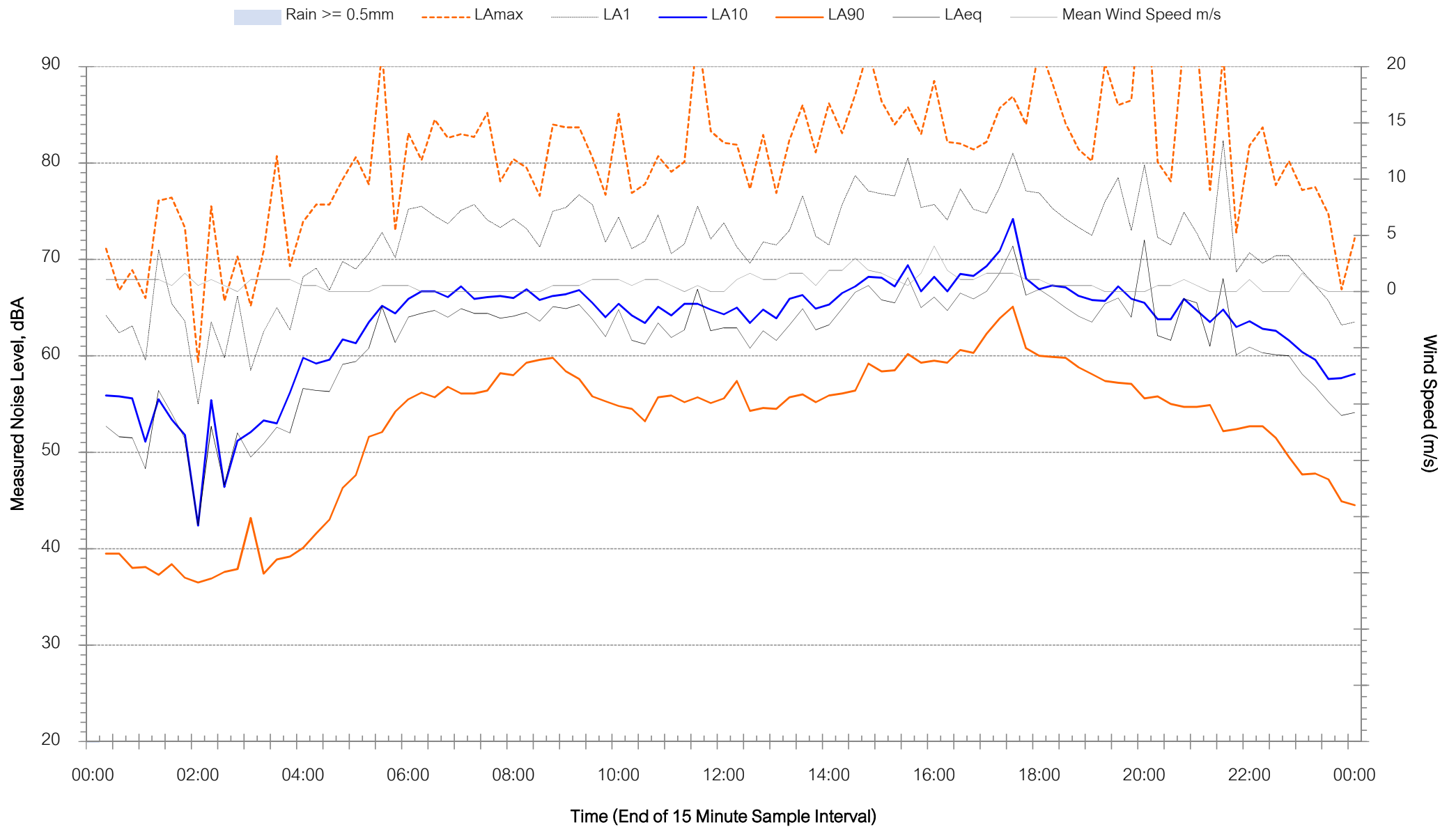
Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Wednesday 1 May 2019



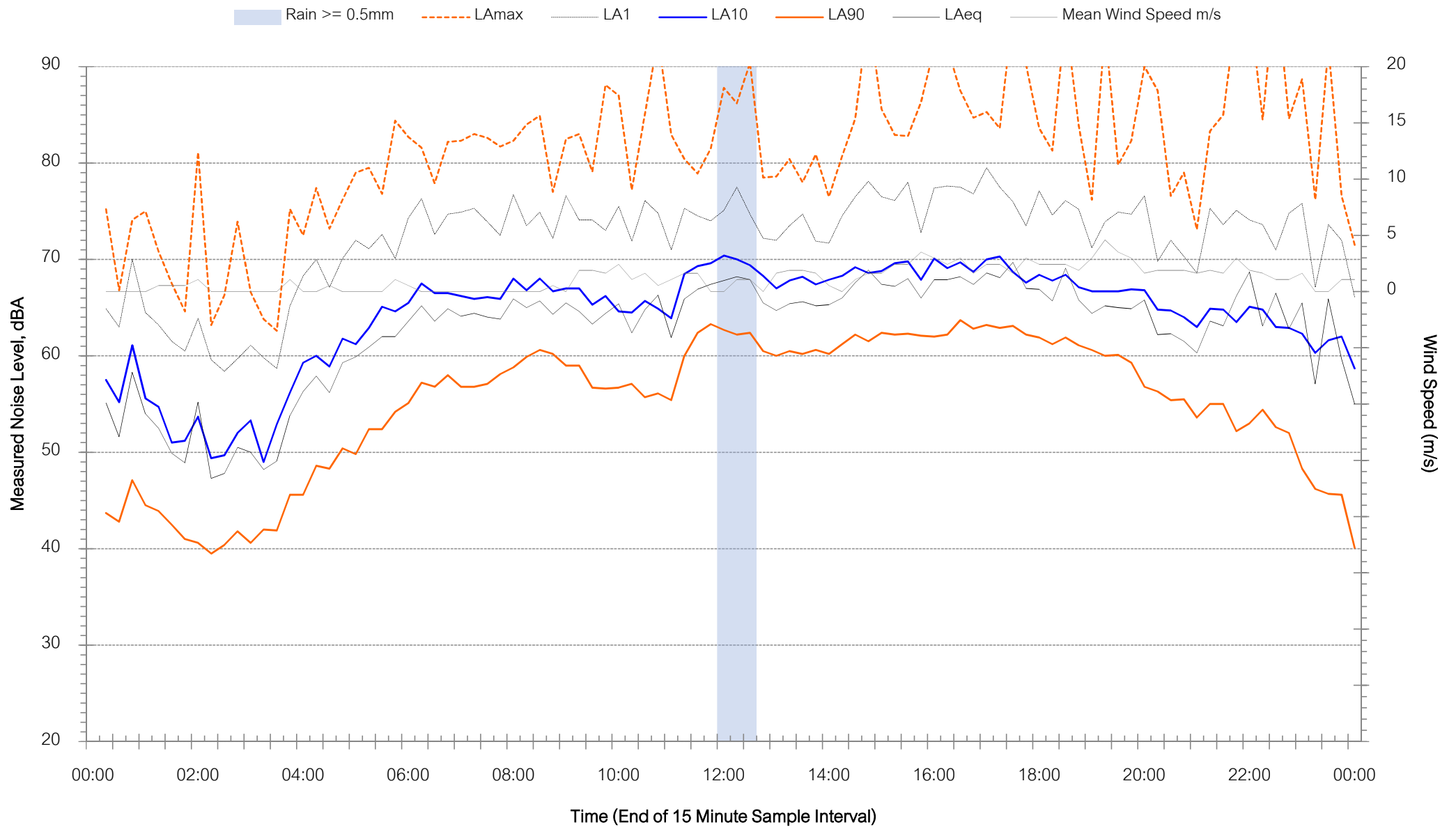
Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Thursday 2 May 2019



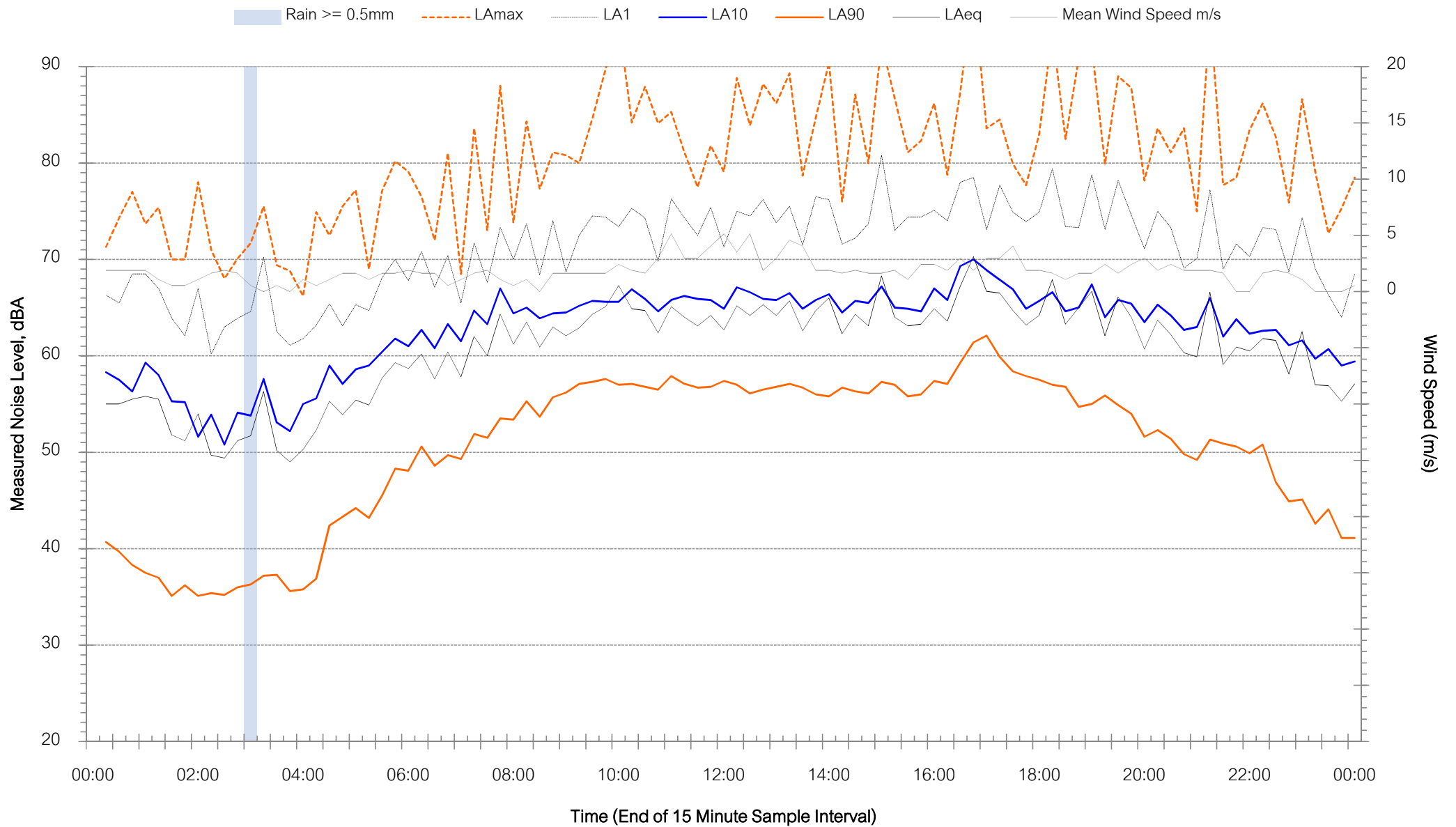
Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Friday 3 May 2019



Background Noise Levels

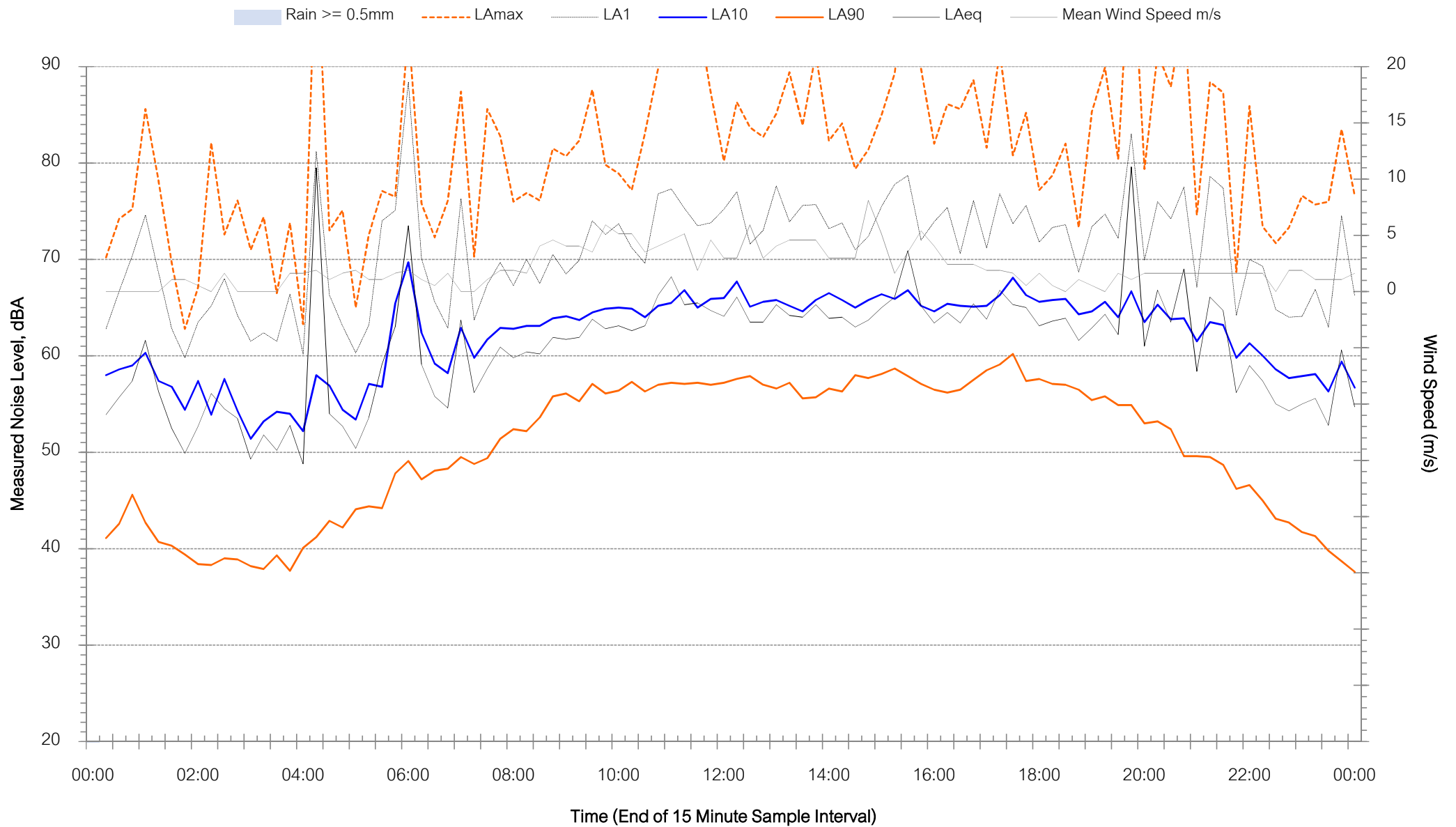
Corner of Endeavour Avenue and Bennett Road - Saturday 4 May 2019





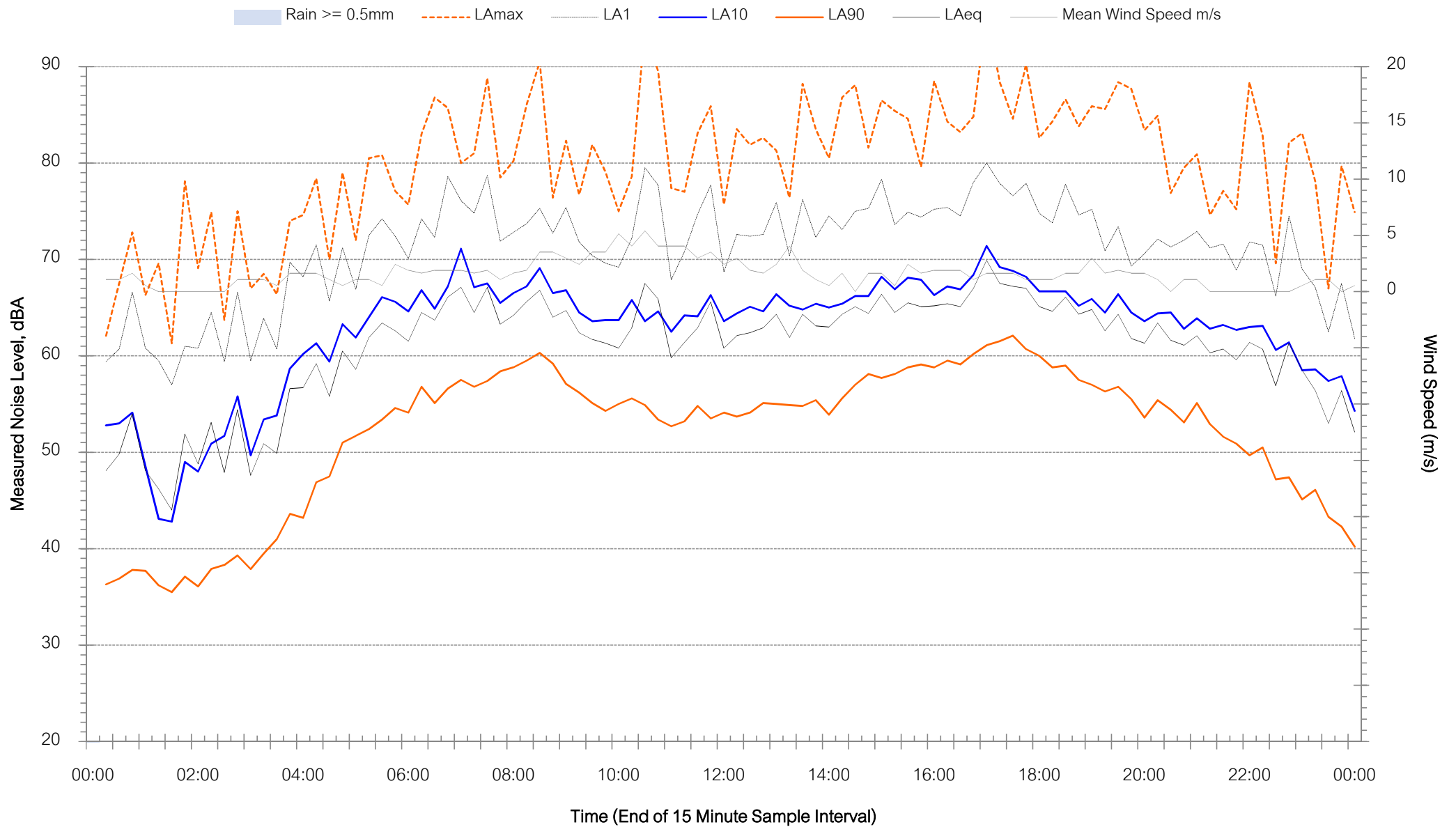
Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Sunday 5 May 2019



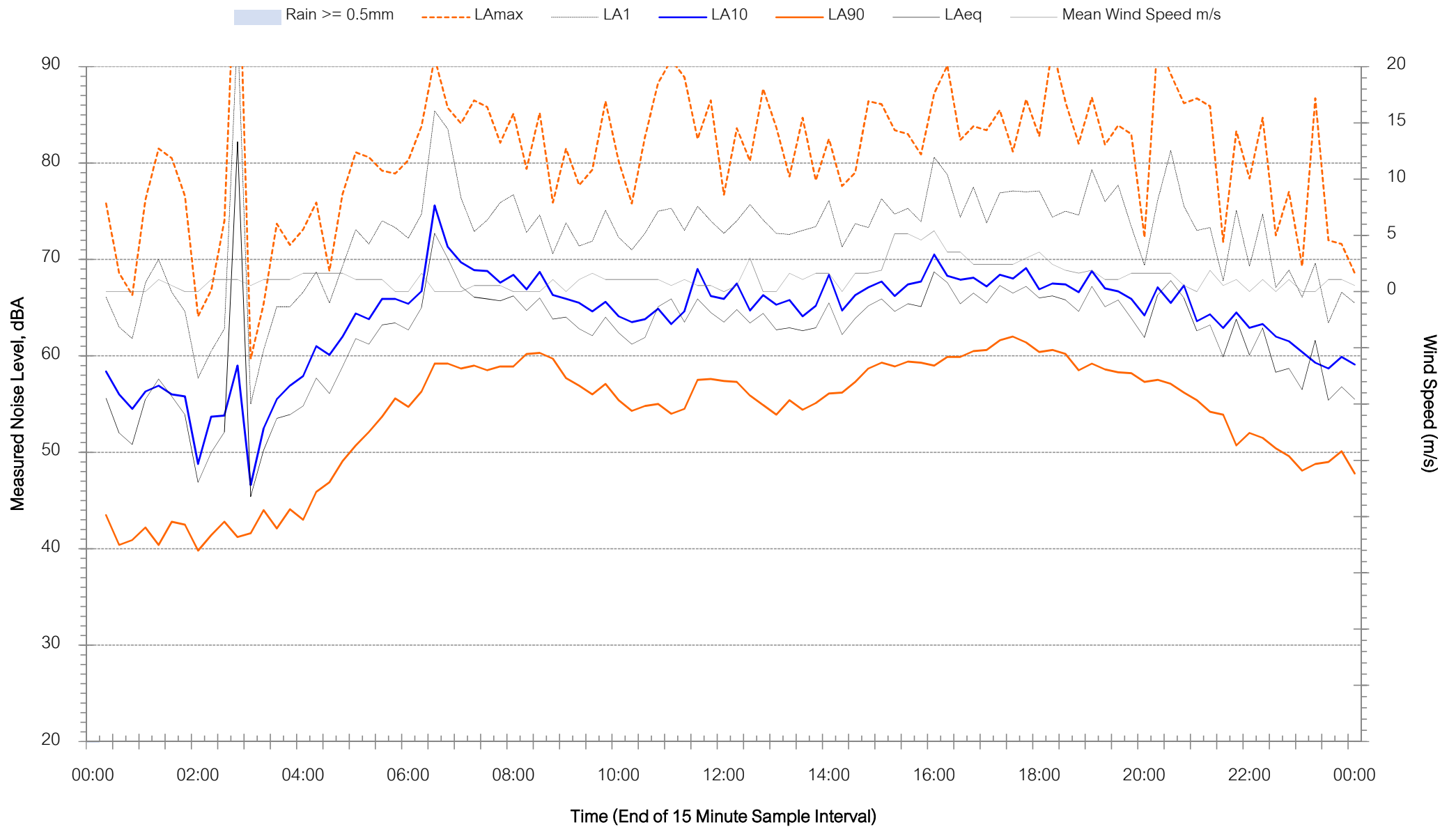
Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Monday 6 May 2019



Background Noise Levels

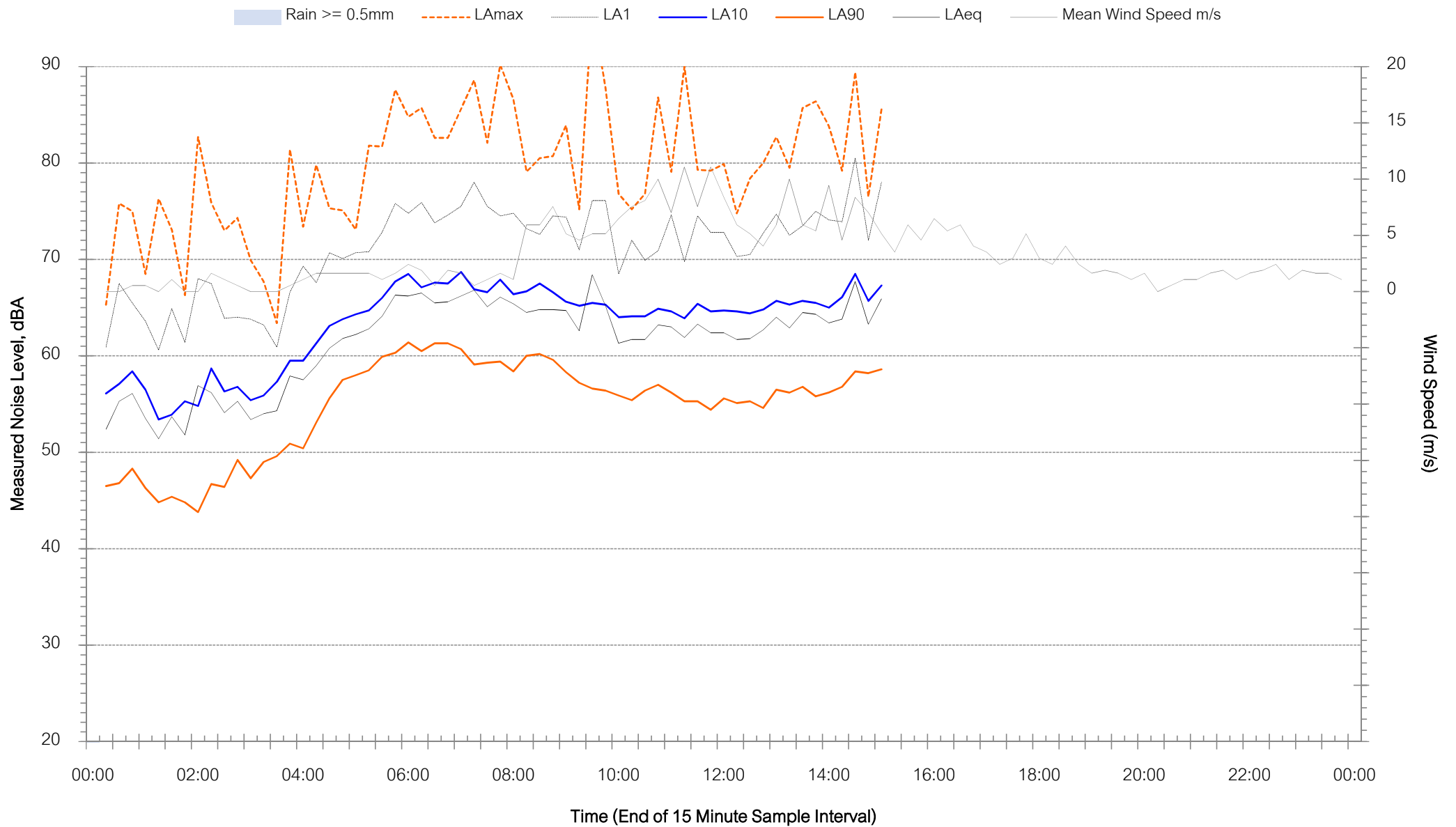
Corner of Endeavour Avenue and Bennett Road - Tuesday 7 May 2019





Background Noise Levels

Corner of Endeavour Avenue and Bennett Road - Wednesday 8 May 2019



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