

# Noise Monitoring Assessment

Northparkes Mines

Quarter 3, 2019



# Document Information

## Noise Monitoring Assessment

### Northparkes Mines

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# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by CMOC Mining Services Pty Limited (CMOC) to complete a Noise Monitoring Assessment (NMA) for Northparkes Mines (NPM), 27km North West of Parkes, NSW. The NMA has been completed to quantify operational noise emissions as per Conditions 1 to 5 of Schedule 3 of the NSW Project Approval Conditions (PA11\_110060) and the Northparkes Noise Management Plan (NMP, 2019).

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

- NSW Environment Protection Authority (EPA) 2017, Noise Policy for Industry (NPI); and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

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

## 2 Noise Criteria

### 2.1 Operational Noise Criteria

This assessment has adopted criteria as per Conditions 1 to 5 of Schedule 3 of the NSW Project Approval Conditions (PA11\_110060) and the Northparkes Noise Management Plan (NMP, 2019) (see **Appendix B**) and is summarised below in **Table 1**.

| Table 1 Noise Criteria   |             |             |             |           |
|--------------------------|-------------|-------------|-------------|-----------|
| Location                 | Criteria    |             |             |           |
|                          | Day         | Evening     | Night       |           |
|                          | LAeq(15min) | LAeq(15min) | LAeq(15min) | LA1(1min) |
| All privately-owned land | 35          | 35          | 35          | 45        |

Additionally, the conditions state:

*Operational Noise generated by the project will be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy.*

*These limits apply under all meteorological conditions except the following:*

- *during periods of rain or hail;*
- *average wind speeds at microphone height exceeds 5 m/s;*
- *wind speeds greater than 3 m/s at 10 metres above ground level; or*
- *temperature inversion conditions of up to 3 °C/100m or alternatively a stability class of G.*

*Except for wind speed at the microphone height, the data to be used for determining meteorological conditions will be that recorded by the meteorological station located onsite. Operational noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 5 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

*These limits do not apply if NPM have an agreement with the relevant owner/s of the residences or land to generate higher noise levels, and NPM has advised the Department in writing of the terms of the agreement.*

### 3 Assessment Methodology

All attended noise monitoring surveys for this assessment were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the NMP.

The acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA.

#### 3.1 Operational Noise Measurement Methodology

The locality surrounding the mine is primarily rural/residential. In accordance with the NMP, four representative receivers were selected for this assessment and are summarised in **Table 2**.

| Table 2 Noise Monitoring Locations |             |                             |          |
|------------------------------------|-------------|-----------------------------|----------|
| ID                                 | Location    | Coordinate Locations, MGA55 |          |
|                                    |             | Easting                     | Northing |
| NM1                                | Hubberstone | 600687                      | 6360754  |
| NM2                                | Lone Pine   | 593669                      | 6358933  |
| NM3                                | Milpose     | 594827                      | 6352971  |
| NM4                                | Hillview    | 602993                      | 6353469  |

Monitoring locations with respect to the mine site are shown visually in **Figure 1**.

The measurements were carried out using a Svantek Type 1, 977 noise analyser from Tuesday 27 August 2019 to Wednesday 28 August 2019. The monitoring regime consisted of three 15-minute measurements during the day, evening and night periods at each monitoring location. Where possible throughout each survey, the operator quantified the contribution of any significant noise sources.





A horizontal scale bar with alternating black and white segments. The left end is labeled '0' and the right end is labeled '2km'.



## 4 Results

### 4.1 Operational Noise Results

The monitoring and assessment results are presented in separate tables for each monitoring location. The results of the overall attended noise measurements for Tuesday 27 August 2019 to Wednesday 28 August 2019 for day, evening and night periods for each location are summarised in **Table 3** to **Table 6** respectively.

**Table 3 Operator-Attended Noise Survey Results – Location NM1, Hubberstone**

| Date/Time (hrs)                            | Primary Noise Descriptor (dBA re 20 µPa) |                   |                   | Meteorology  | Description and SPL, dBA  |
|--|--|-------------------|-------------------|--------------|---------------------------|
|  | L <sub>A</sub> max                       | L <sub>A</sub> eq | L <sub>A</sub> 90 |              |                           |
| Day  |  |                   |                   |              |                           |
| 28/08/2019                                 |  |                   |                   |              |                           |
| 16:17                                      | 64                                       | 43                | 32                |              | Wind 34-54                |
| 15 min duration                            |  |                   |                   |              | Birds 34-54               |
| 28/08/2019                                 |  |                   |                   | WS: 2-3m/s   | Livestock 41-50           |
| 16:33                                      | 66                                       | 44                | 33                | WD: SW       | Residential vehicle 33-44 |
| 15 min duration                            |  |                   |                   | Rain: Nil    | Aircraft 30-40            |
| 28/08/2019                                 |  |                   |                   |              | Mine inaudible            |
| 16:49                                      | 62                                       | 42                | 35                |              |                           |
| 15 min duration                            |  |                   |                   |              |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |              | <25                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |              | <25                       |
| Evening                                    |  |                   |                   |              |                           |
| 28/08/2019                                 |  |                   |                   |              |                           |
| 19:04                                      | 51                                       | 32                | 24                |              |                           |
| 15 min duration                            |  |                   |                   |              |                           |
| 28/08/2019                                 |  |                   |                   | WS: 0.5-1m/s | Livestock 26-30           |
| 19:19                                      | 50                                       | 30                | 23                | WD: SW       | Residential vehicle 36-46 |
| 15 min duration                            |  |                   |                   | Rain Nil     | Plant alarm 26            |
| 28/08/2019                                 |  |                   |                   |              | Mine hum 23-28            |
| 19:34                                      | 47                                       | 25                | 22                |              |                           |
| 15 min duration                            |  |                   |                   |              |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |              | <20                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |              | <20                       |
| Night                                      |  |                   |                   |              |                           |
| 28/08/2019                                 |  |                   |                   |              |                           |
| 00:05                                      | 61                                       | 37                | 25                |              |                           |
| 15 min duration                            |  |                   |                   |              |                           |
| 28/08/2019                                 |  |                   |                   | WS: 2-2.5m/s | Livestock 30-50           |
| 00:21                                      | 70                                       | 41                | 25                | WD: SSE      | Ambient 24-32             |
| 15 min duration                            |  |                   |                   | Rain: Nil    | Mine inaudible            |
| 28/08/2019                                 |  |                   |                   |              |                           |
| 00:36                                      | 50                                       | 28                | 23                |              |                           |
| 15 min duration                            |  |                   |                   |              |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |              | <20                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |              | <20                       |

**Table 4 Operator-Attended Noise Survey Results – Location NM2, Lone Pine**

| Date/Time (hrs)                            | Primary Noise Descriptor (dBA re 20 µPa) |                  |                  | Meteorology | Description and SPL, dBA |
|--|--|------------------|------------------|-------------|--------------------------|
|  | L <sub>Amax</sub>                        | L <sub>Aeq</sub> | L <sub>A90</sub> |             |                          |
| Day  |  |                  |                  |             |                          |
| 28/08/2019                                 |  |                  |                  |             |                          |
| 15:18                                      | 62                                       | 47               | 41               |             |                          |
| 15 min duration                            |  |                  |                  |             | Wind 32-48               |
| 28/08/2019                                 |  |                  |                  | WS: 3-5m/s  | Birds 30-55              |
| 15:33                                      | 64                                       | 47               | 40               | WD: SW      | Aircraft 35-40           |
| 15 min duration                            |  |                  |                  | Rain: Nil   | Road traffic 35-70       |
| 28/08/2019                                 |  |                  |                  |             | Mine inaudible           |
| 15:49                                      | 70                                       | 49               | 38               |             |                          |
| 15 min duration                            |  |                  |                  |             |                          |
| Site L <sub>Aeq</sub> (15min) Contribution |  |                  |                  |             | <30                      |
| Site L <sub>A1</sub> (1min) Contribution   |  |                  |                  |             | <30                      |
| Evening                                    |  |                  |                  |             |                          |
| 28/08/2019                                 |  |                  |                  |             |                          |
| 20:03                                      | 68                                       | 43               | 22               |             |                          |
| 15 min duration                            |  |                  |                  |             |                          |
| 28/08/2019                                 |  |                  |                  | WS: 0.5m/s  | Road traffic 23-68       |
| 20:18                                      | 43                                       | 23               | 20               | WD: SW      | Dogs                     |
| 15 min duration                            |  |                  |                  | Rain: Nil   | Mine hum 21-25           |
| 28/08/2019                                 |  |                  |                  |             |                          |
| 20:34                                      | 69                                       | 43               | 19               |             |                          |
| 15 min duration                            |  |                  |                  |             |                          |
| Site L <sub>Aeq</sub> (15min) Contribution |  |                  |                  |             | <20                      |
| Site L <sub>A1</sub> (1min) Contribution   |  |                  |                  |             | <20                      |
| Night                                      |  |                  |                  |             |                          |
| 27/08/2019                                 |  |                  |                  |             |                          |
| 23:04                                      | 58                                       | 35               | 31               |             |                          |
| 15 min duration                            |  |                  |                  |             |                          |
| 27/08/2019                                 |  |                  |                  | WS: 2-3m/s  | Wind 30-81               |
| 23:19                                      | 81                                       | 53               | 35               | WD: SSE     | Aircraft 40              |
| 15 min duration                            |  |                  |                  | Rain: Nil   | Mine hum <20             |
| 27/08/2019                                 |  |                  |                  |             |                          |
| 23:34                                      | 52                                       | 34               | 32               |             |                          |
| 15 min duration                            |  |                  |                  |             |                          |
| Site L <sub>Aeq</sub> (15min) Contribution |  |                  |                  |             | <25                      |
| Site L <sub>A1</sub> (1min) Contribution   |  |                  |                  |             | <25                      |

**Table 5 Operator-Attended Noise Survey Results – Location NM3, Milpose**

| Date/Time (hrs)                            | Primary Noise Descriptor (dBA re 20 µPa) |                   |                   | Meteorology | Description and SPL, dBA  |
|--|--|-------------------|-------------------|-------------|---------------------------|
|  | L <sub>A</sub> max                       | L <sub>A</sub> eq | L <sub>A</sub> 90 |             |                           |
| Day  |  |                   |                   |             |                           |
| 28/08/2019                                 |  |                   |                   |             |                           |
| 14:11                                      | 55                                       | 39                | 31                |             |                           |
| 15 min duration                            |  |                   |                   |             | Wind 29-54                |
| 28/08/2019                                 |  |                   |                   | WS: 2-4m/s  | Birds 32-38               |
| 14:26                                      | 55                                       | 35                | 27                | WD: SW      | Aircraft 36-43            |
| 15 min duration                            |  |                   |                   | Rain: Nil   | Residential vehicle 33-38 |
| 28/08/2019                                 |  |                   |                   |             | Mine inaudible            |
| 14:43                                      | 57                                       | 36                | 27                |             |                           |
| 15 min duration                            |  |                   |                   |             |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <20                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <20                       |
| Evening                                    |  |                   |                   |             |                           |
| 28/08/2019                                 |  |                   |                   |             |                           |
| 21:07                                      | 38                                       | 19                | 13                |             |                           |
| 15 min duration                            |  |                   |                   |             |                           |
| 28/08/2019                                 |  |                   |                   | WS: <0.5m/s | Livestock 17-22           |
| 21:23                                      | 56                                       | 36                | 13                | WD: SE      | Aircraft 25-44            |
| 15 min duration                            |  |                   |                   | Rain: Nil   | Mine inaudible            |
| 28/08/2019                                 |  |                   |                   |             |                           |
| 21:39                                      | 47                                       | 18                | 13                |             |                           |
| 15 min duration                            |  |                   |                   |             |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <20                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <20                       |
| Night                                      |  |                   |                   |             |                           |
| 27/08/2019                                 |  |                   |                   |             |                           |
| 22:00                                      | 40                                       | 19                | 16                |             |                           |
| 15 min duration                            |  |                   |                   |             | Aircraft 18               |
| 27/08/2019                                 |  |                   |                   | WS: <0.5m/s | Residential vehicle 18-25 |
| 22:15                                      | 38                                       | 18                | 16                | WD: SSE     | Livestock 17-25           |
| 15 min duration                            |  |                   |                   | Rain: Nil   | Ambient 15-20             |
| 27/08/2019                                 |  |                   |                   |             | Mine inaudible            |
| 22:30                                      | 36                                       | 19                | 17                |             |                           |
| 15 min duration                            |  |                   |                   |             |                           |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <20                       |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <20                       |

**Table 6 Operator-Attended Noise Survey Results – Location NM4, Hillview**

| Date/Time (hrs)                            | Primary Noise Descriptor (dBA re 20 µPa) |                   |                   | Meteorology | Description and SPL, dBA |
|--|--|-------------------|-------------------|-------------|--------------------------|
|  | L <sub>A</sub> max                       | L <sub>A</sub> eq | L <sub>A</sub> 90 |             |                          |
| Day  |  |                   |                   |             |                          |
| 28/08/2019                                 |  |                   |                   |             |                          |
| 12:52                                      | 64                                       | 42                | 35                |             | Wind 36-51               |
| 15 min duration                            |  |                   |                   |             | Birds 30-58              |
| 28/08/2019                                 |  |                   |                   | WS: 2-3m/s  | Road traffic 30-55       |
| 13:07                                      | 66                                       | 44                | 33                | WD: SW      | Gate closing 43          |
| 15 min duration                            |  |                   |                   | Rain: Nil   | Site vehicle 34-55       |
| 28/08/2019                                 |  |                   |                   |             | Mine inaudible           |
| 13:23                                      | 59                                       | 43                | 32                |             |                          |
| 15 min duration                            |  |                   |                   |             |                          |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <25                      |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <25                      |
| Evening                                    |  |                   |                   |             |                          |
| 28/08/2019                                 |  |                   |                   |             |                          |
| 18:04                                      | 63                                       | 47                | 27                |             | Wind 24-31               |
| 15 min duration                            |  |                   |                   |             | Road traffic 40-61       |
| 28/08/2019                                 |  |                   |                   | WS: <1.0m/s | Dogs 28                  |
| 18:19                                      | 58                                       | 45                | 27                | WD: SW      | Livestock 27-29          |
| 15 min duration                            |  |                   |                   | Rain: Nil   | Aircraft 30-35           |
| 28/08/2019                                 |  |                   |                   |             | Mine inaudible           |
| 18:34                                      | 58                                       | 44                | 26                |             |                          |
| 15 min duration                            |  |                   |                   |             |                          |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <20                      |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <20                      |
| Night                                      |  |                   |                   |             |                          |
| 28/08/2019                                 |  |                   |                   |             |                          |
| 01:10                                      | 61                                       | 41                | 25                |             | Wind 26                  |
| 15 min duration                            |  |                   |                   |             | Road traffic 31-54       |
| 28/08/2019                                 |  |                   |                   | WS: <0.5m/s | Mine inaudible           |
| 01:25                                      | 41                                       | 29                | 27                | WD: SSE     |                          |
| 15 min duration                            |  |                   |                   | Rain: Nil   |                          |
| 28/08/2019                                 |  |                   |                   |             |                          |
| 01:40                                      | 41                                       | 29                | 27                |             |                          |
| 15 min duration                            |  |                   |                   |             |                          |
| Site L <sub>A</sub> eq(15min) Contribution |  |                   |                   |             | <20                      |
| Site L <sub>A</sub> 1(1min) Contribution   |  |                   |                   |             | <20                      |

## 4.2 Road Noise Results

As an additional initiative to operational attended noise monitoring, NPM include two 1-hour attended noise monitoring measurements at the Hillview monitoring location (NM4) to quantify NPM road noise levels associated concentrate trucks movements and shift change traffic flows. **Table 7** presents the results of the road traffic noise measurements with a comparison against the road noise criteria outlined in the NMP which is consistent with the NSW Road Noise Policy (DECCW 2011).

**Table 7 Operator-Attended Road Noise Survey Results – Location NM4, Hillview**

| Time (hrs)      | Primary Noise Descriptor (dBA re 20 μPa) | Meteorology | Criteria               | Description and SPL |
|-----------------|--|-------------|------------------------|---------------------|
|                 | L <sub>Aeq</sub>                         |             | L <sub>Aeq</sub> (1hr) | dBA                 |
| Day             |  |             |                        |                     |
| 28/08/2019      |  | WS: 2.3m/s  |                        | Road traffic 46-62  |
| 12:52           | 44                                       | WD: SW      | 55                     | Birds 34-58         |
| 60 min duration |  | Rain: Nil   |                        | Wind 33-43          |
|                 |  |             |                        | Mine inaudible      |
|                 |  |             |                        | Road traffic 46-62  |
| 28/08/2019      |  | WS: <1m/s   |                        | Birds 34-41         |
| 17:48           | 47                                       | WD: SW      | 55                     | Wind 28-31          |
| 60 min duration |  | Rain: Nil   |                        | Dogs 28             |
|                 |  |             |                        | Livestock 27-29     |
|                 |  |             |                        | Mine inaudible      |

Results of the road noise survey identify that the LAeq(1hr) noise contribution at NM4 is between 44dBA to 47dBA, and hence satisfies the relevant road noise criteria as outlined in the NMP and the RNP.

### 4.3 Unattended Noise Results

Unattended noise monitors are installed at the four attended monitoring locations. Data from the unattended monitors provide a real time method for monitoring noise events, although it is noted that the results include all noise sources (ie project noise and extraneous noise sources). The results are used as a management tool for the project site.

It is noted for this quarter unattended results for NM2 - Lone Pine appear to be representative of the units noise floor and have been omitted from this report. Additionally, no LA1(1min) metrics for NM3 and NM4 for the monitoring period were available, accordingly no result has been recorded for these monitoring locations.

Averaged results of the LAeq(15min) and LA1(1min) metrics from Saturday 24 August 2019 to Saturday 31 August 2019 for NM1, NM3 and NM4 are summarised in **Table 8**. **Appendix C** presents the unattended results in chart format.

| <b>Table 8 Unattended Noise Survey Results</b> |  |                          |
|--|--|--------------------------|
| Period   | Primary Noise Descriptor (dBA re 20 µPa) |                          |
|  | Weekly Average LAeq(15min)               | Weekly Average LA1(1min) |
| <b>Location NM1, Hubberstone</b>               |  |                          |
| Day  | 59                                       | N/A                      |
| Evening  | 47                                       | N/A                      |
| Night  | 49                                       | 53                       |
| <b>Location NM3, Milpose</b>                   |  |                          |
| Day  | 40                                       | N/A                      |
| Evening  | 33                                       | N/A                      |
| Night  | 33                                       | N/A                      |
| <b>Location NM4, Hillview</b>                  |  |                          |
| Day  | 46                                       | N/A                      |
| Evening  | 43                                       | N/A                      |
| Night  | 43                                       | N/A                      |

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.



## 5 Discussion

### 5.1 Operational Noise Discussion

#### 5.1.1 Discussion of Results – Location NM1, Hubberstone

Attended measurement results for monitoring conducted at NM1, Hubberstone, for the August 2019 noise survey identified that NPM remained inaudible during all day and night measurements, and audible during the evening measurement, although remained below the relevant noise criteria. Generally, birds, wind, aircraft, traffic and livestock activities were the dominant sources.

In summary, the noise contribution from NPM satisfied the relevant noise criteria for all monitored assessment periods at Location NM1.

#### 5.1.2 Discussion of Results – Location NM2, Lone Pine

The results of monitoring conducted at NM2, Lone Pine during the August 2019 noise assessment were influenced primarily by wind, birds, traffic and aircraft. Noise from the NPM was inaudible throughout day and night measurements. The site was audible during the evening period, although remained below the relevant criteria at the monitoring location.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for all the attended measurements at NM2.

#### 5.1.3 Discussion of Results – Location NM3, Milpose

Results of monitoring conducted at NM3 for August 2019, Milpose, identified that the NPM was inaudible throughout all measurements, therefore remained below relevant noise criteria. Noise measurements were influenced primarily by wind birds, aircraft, traffic and livestock.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for all the attended measurements at NM3.

#### 5.1.4 Discussion of Results – Location NM4, Hillview

Attended measurement results for monitoring conducted at NM4, Hillview, for the August 2019 noise survey identified that NPM remained inaudible during all measurements therefore remained below relevant noise criteria. Generally, birds, wind, traffic, aircraft and agricultural noise were the dominant sources.

In summary, the noise contribution from the mine satisfied the relevant noise criteria for all the attended measurements at NM4.

## 6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of CMOC Mining Services Pty Limited (CMOC). The assessment was completed to quantify site noise emissions against relevant noise criteria pertaining to NPM operations in accordance with Conditions 1 to 5 of Schedule 3 of the NSW Project Approval Conditions (PA11\_110060) and the Northparkes Noise Management Plan (NMP, 2019) for Quarter 3, ending September 2019.

Road noise monitoring identified that concentrate trucks and light vehicle movements associated with shift change generate levels below the relevant road noise criteria specified in the RNP and NMP.

Attended monitoring has identified that operational emissions generated by NPM comply with relevant statutory noise criteria at all monitoring locations for all assessment periods. Furthermore, project related noise emissions generally remain inaudible at monitoring locations and are masked by dominant extraneous non-mine sources such as traffic and localised noise sources such as wildlife, agriculture and livestock.

# Appendix A – Glossary of Terms

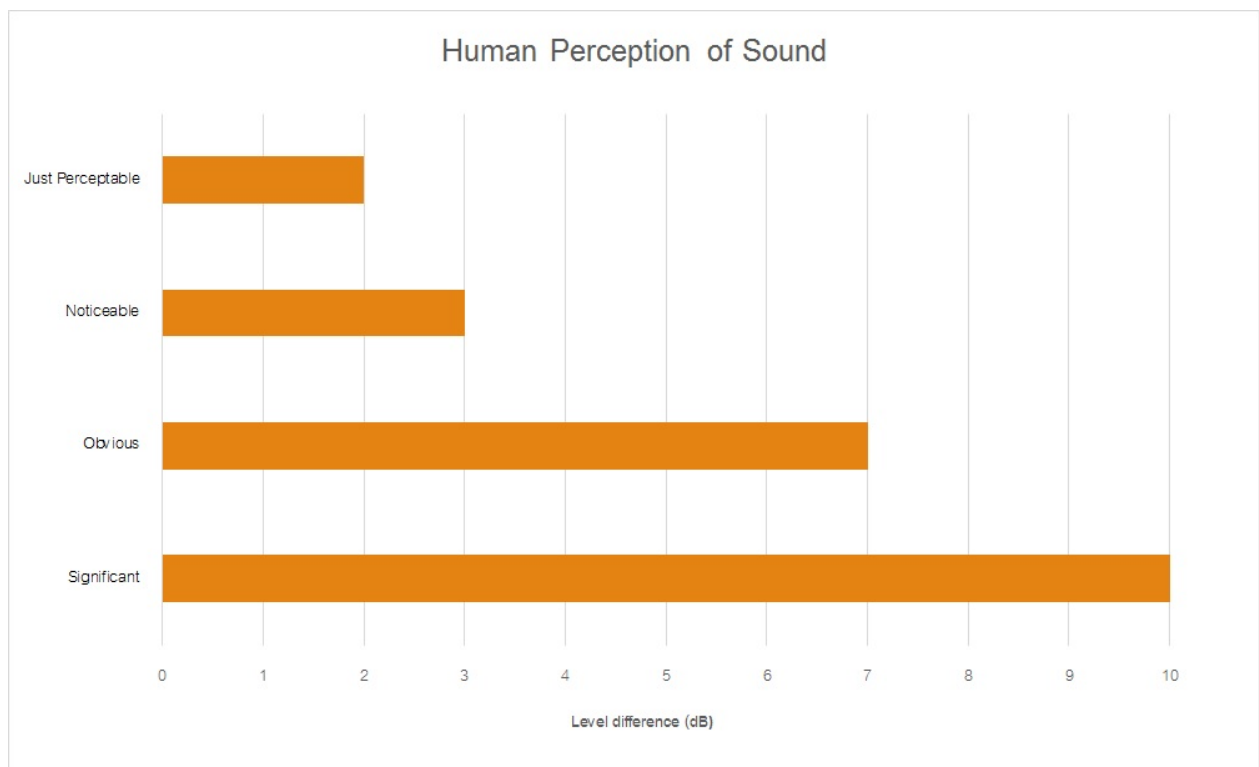
Table A1 provides a number of technical terms have been used in this report.

| 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.  |
| Adverse Weather            | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).   |
| 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.   |
| 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.   |
| LAm <sub>ax</sub>          | 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)     | <p>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 :</p> $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W<sub>0</sub> is the sound reference power at 10-12 watts.</p> |

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



## Appendix B – Regulatory Noise Limits

|                      |                      |                      |                               |
|----------------------|----------------------|----------------------|-------------------------------|
| Doc ID No.<br>3-3718 | Version No.<br>No.14 | Owner<br>PSE Manager | Next Review Date<br>29 Feb 20 |
|----------------------|----------------------|----------------------|-------------------------------|

**Table 1** NSW Development Consent Conditions – Schedule 3

| Condition   |                 |                    |                        |                                |    | Related Section in NMP   |
|---|-----------------|--------------------|------------------------|--------------------------------|----|--|
| Noise Criteria  |                 |                    |                        |                                |    |  |
| 1. The Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.   |                 |                    |                        |                                |    | Section 5.4.1  |
| Table 2 Noise impact assessment criteria dB(A)  |                 |                    |                        |                                |    |  |
| Property  |                 | Day<br>LAeq(15min) | Evening<br>LAeq(15min) | Night<br>LAeq(15min) LA1(1min) |    |  |
| All land  | privately-owned | 35                 | 35                     | 35                             | 45 |  |
| Note: To interpret the land referred to in Table 1, see the applicable figures in Appendix 4.   |                 |                    |                        |                                |    |  |
| Operational noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 5 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.   |                 |                    |                        |                                |    |  |
| 2. The Proponent shall only carry out the construction works associated with the upgrade of McClintocks Lane, the construction of the McClintocks Lane access road and the upgrade of the intersection of McClintocks Lane and Bogan Road during the day.   |                 |                    |                        |                                |    | Section 5.4.1  |
| 3. During construction of the works referred to in condition 2 of schedule 3, the noise criteria in Table 1 do not apply to the residences located in the vicinity of the works. The Proponent shall implement all reasonable and feasible measures to minimise construction noise impacts on the residences in the vicinity of these works.  |                 |                    |                        |                                |    | Section 6  |
| 4. The Proponent shall:<br>a) implement best management practice to minimise the construction, operational and road noise of the project;<br>b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;<br>c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 5); and<br>d) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval,<br>To the satisfaction of the Secretary.  |                 |                    |                        |                                |    | Section 6 & Section 7  |
| 5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:<br>a) be prepared in consultation with the EPA, and submitted to the Secretary prior to the commencement of construction;<br>b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;<br>c) describe the proposed noise management system in detail; and<br>d) include a monitoring program that:<br>• evaluates and reports on:<br>– the effectiveness of the noise management system;<br>– compliance against the noise criteria in this approval; and<br>– compliance against the noise operating conditions;<br>• includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and<br>• defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents |                 |                    |                        |                                |    | Section 6 & Section 7<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br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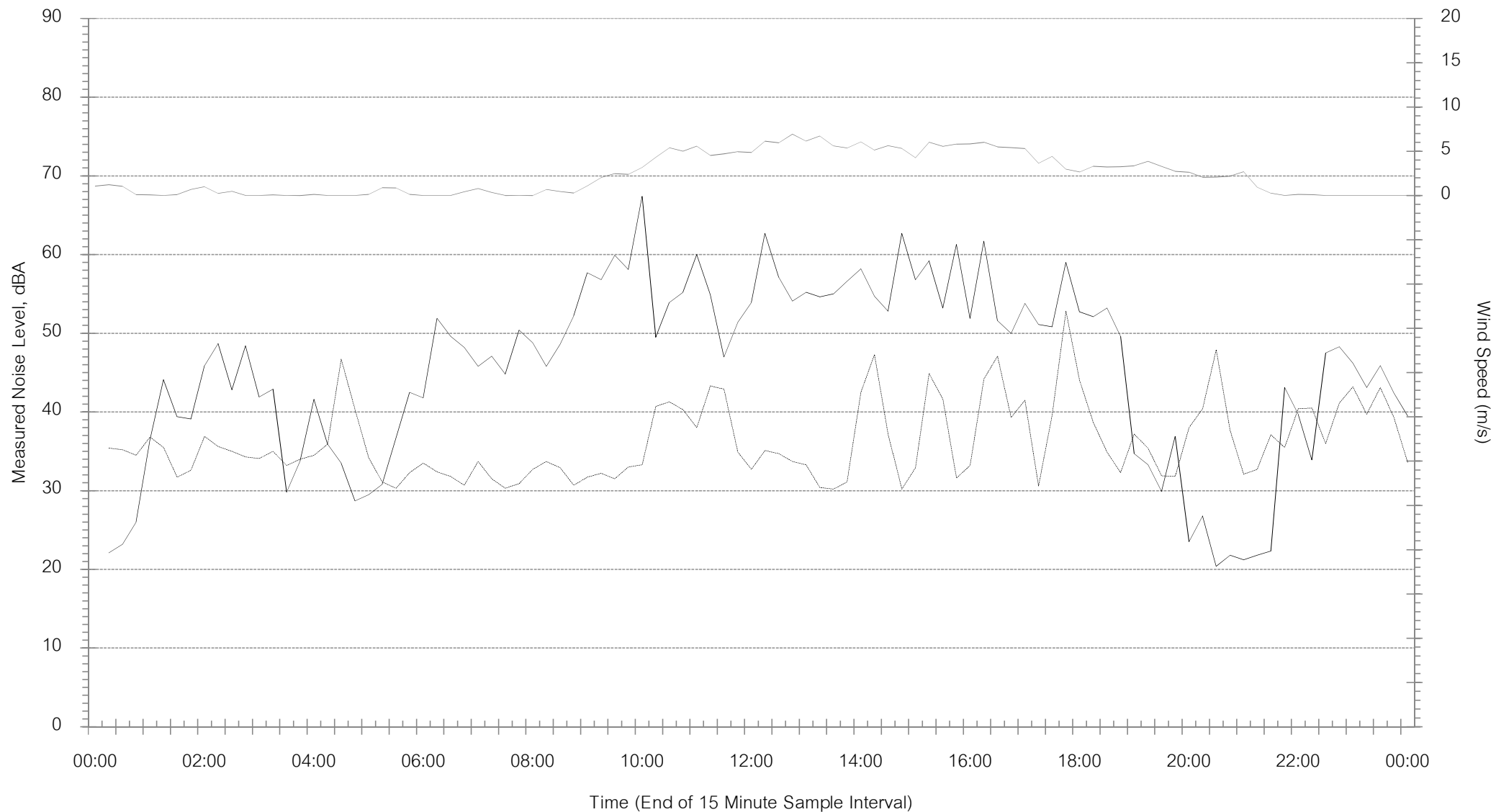


# Appendix C – Unattended Monitoring Charts

# Background Noise Levels

## Hubberstone - Saturday 24 August 2019

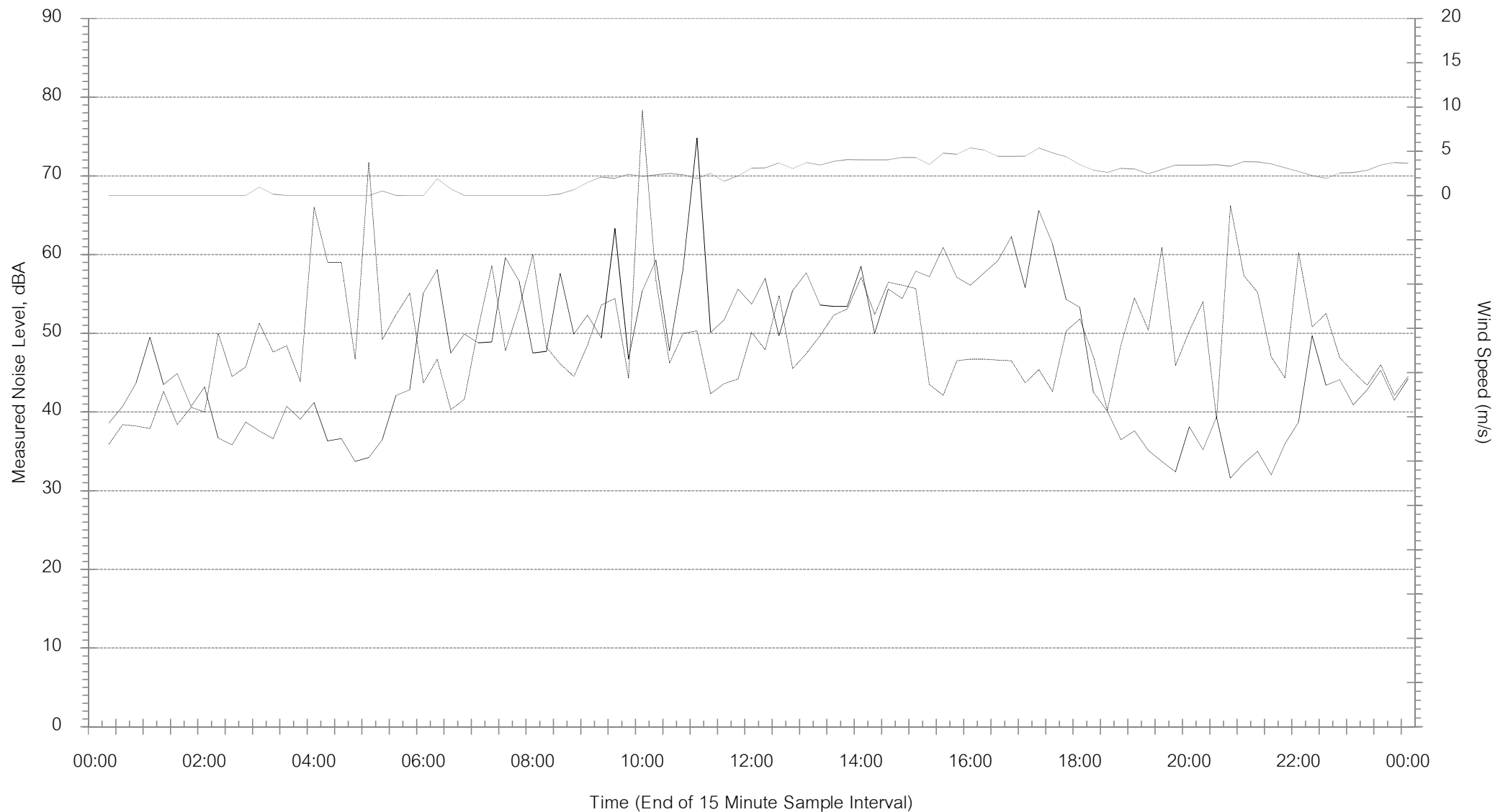
Rain  $\geq 0.5\text{mm}$ 
 LA1
  LAeq
  Mean Wind Speed m/s



# Background Noise Levels

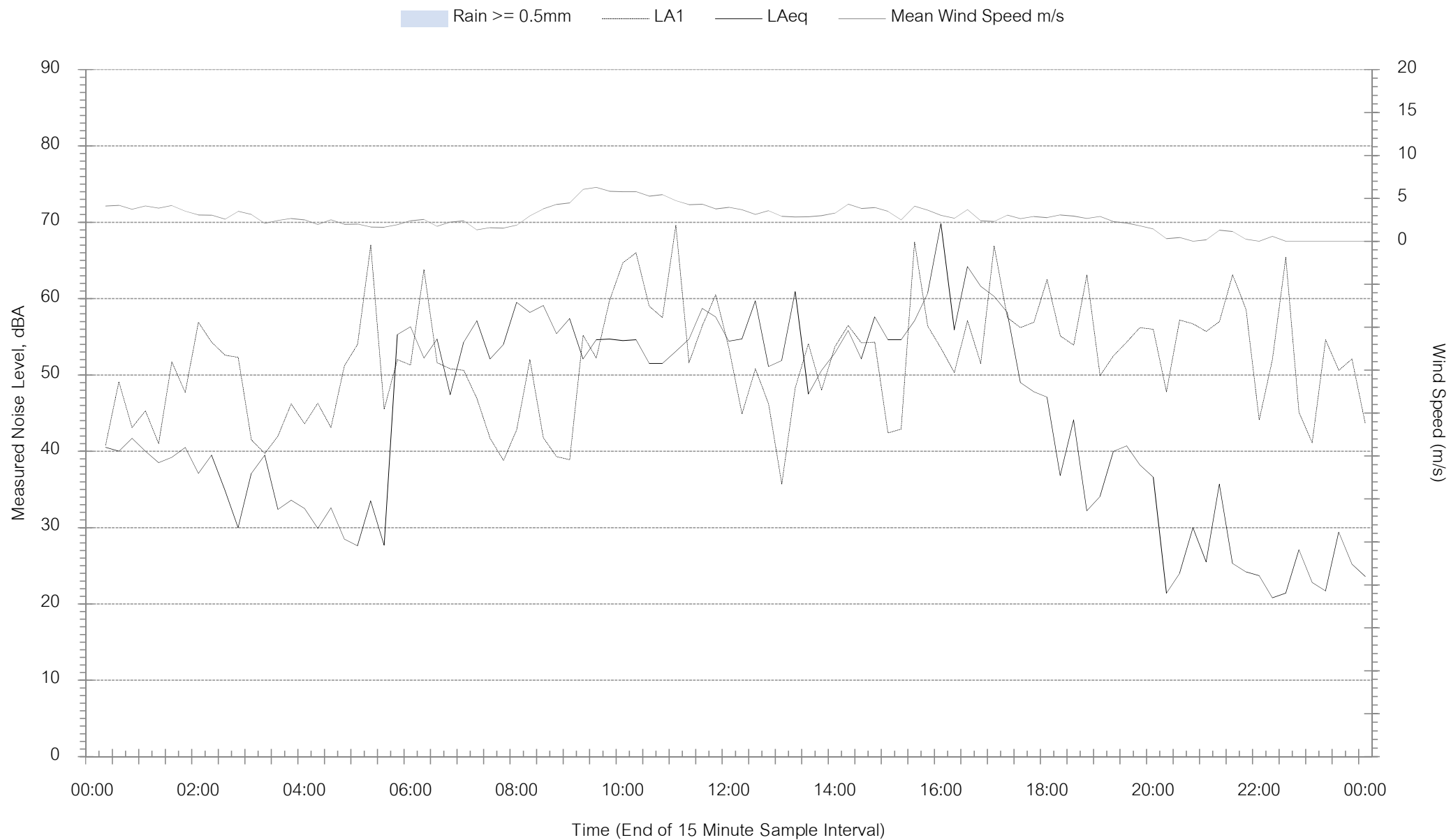
## Hubberstone - Sunday 25 August 2019

Rain  $\geq 0.5\text{mm}$ 
 LA1
  LAeq
  Mean Wind Speed m/s



# Background Noise Levels

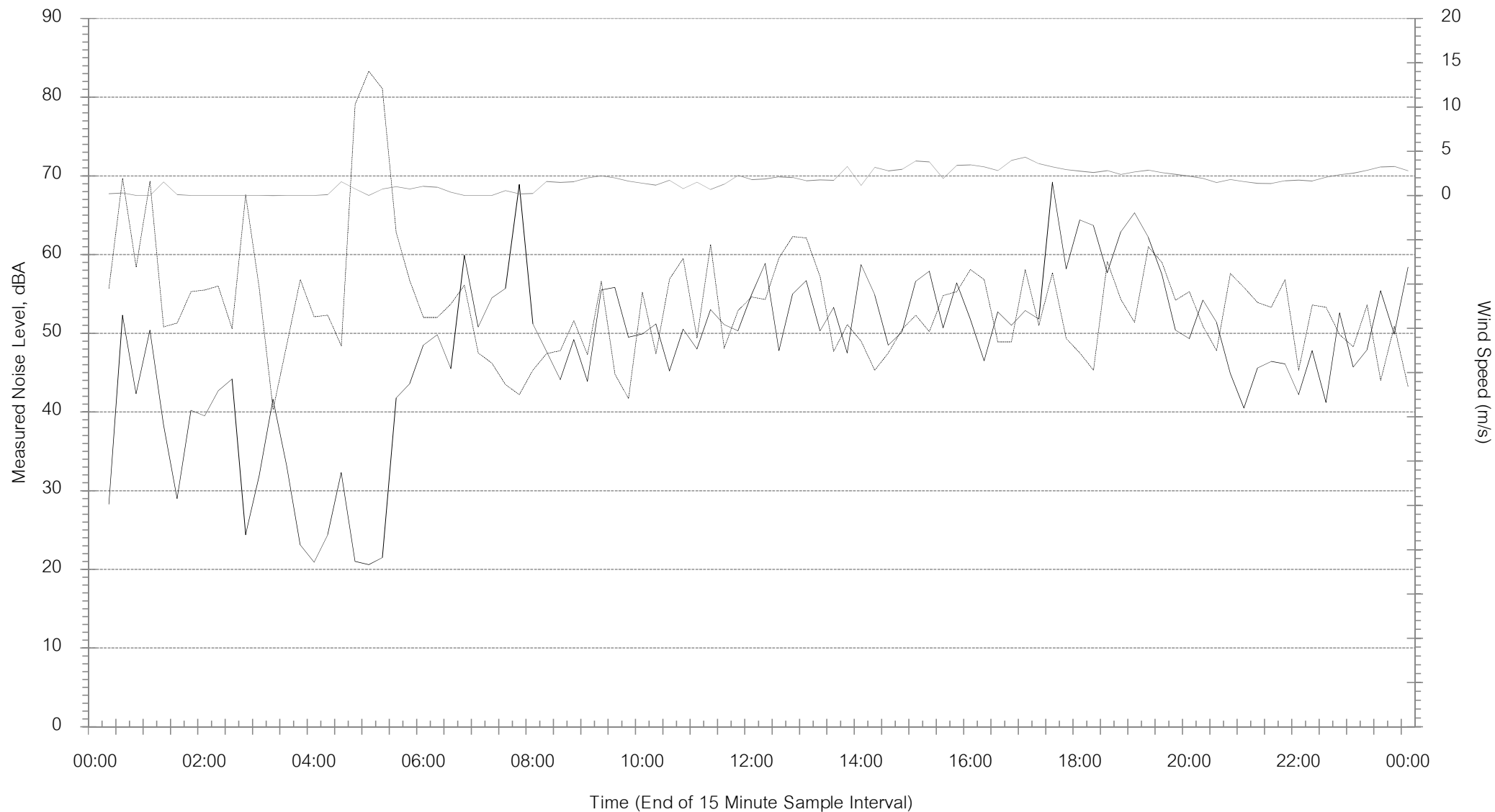
## Hubberstone - Monday 26 August 2019



# Background Noise Levels

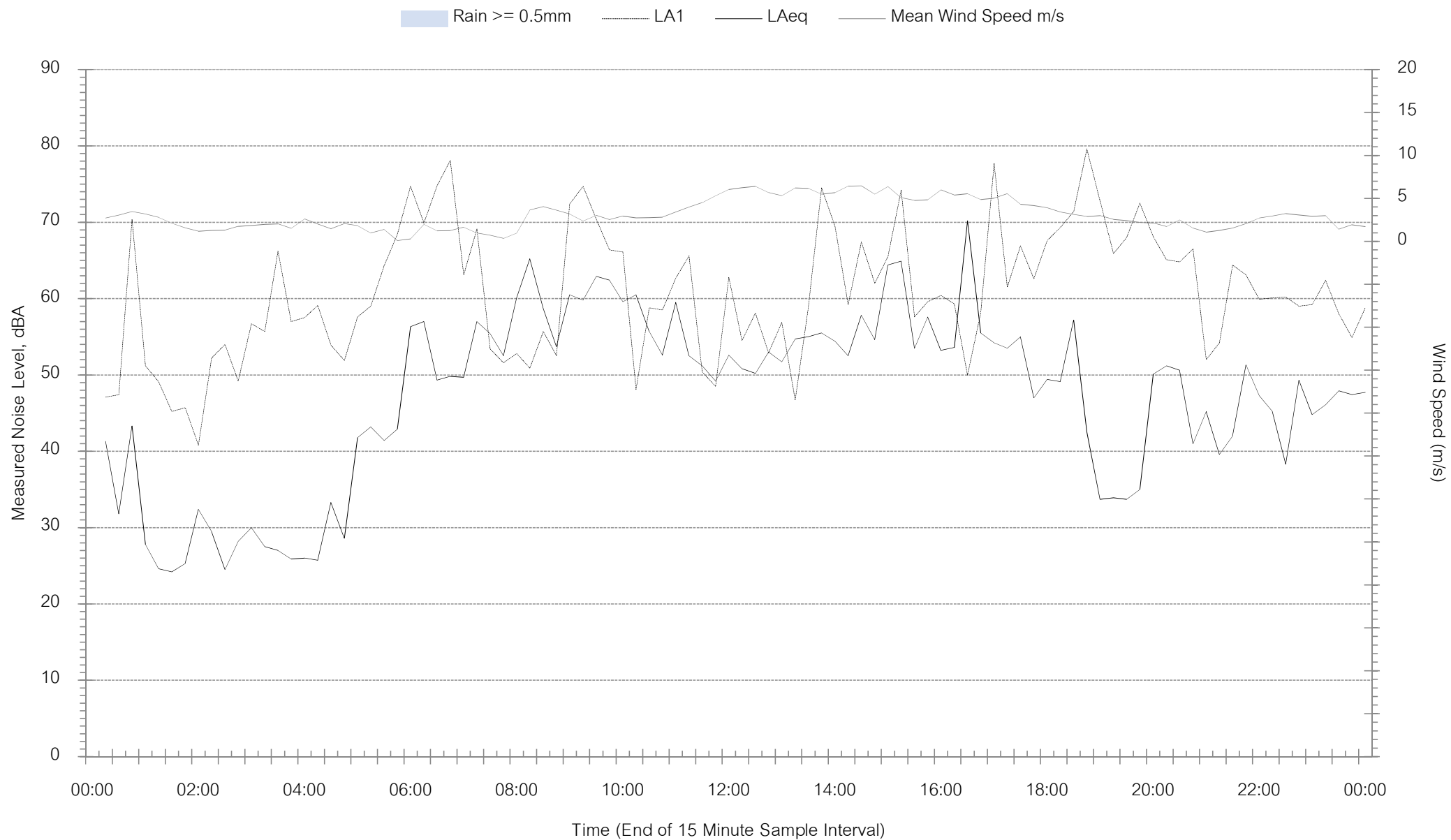
## Hubberstone - Tuesday 27 August 2019

Rain  $\geq 0.5\text{mm}$ 
 LA1
  LAeq
  Mean Wind Speed m/s



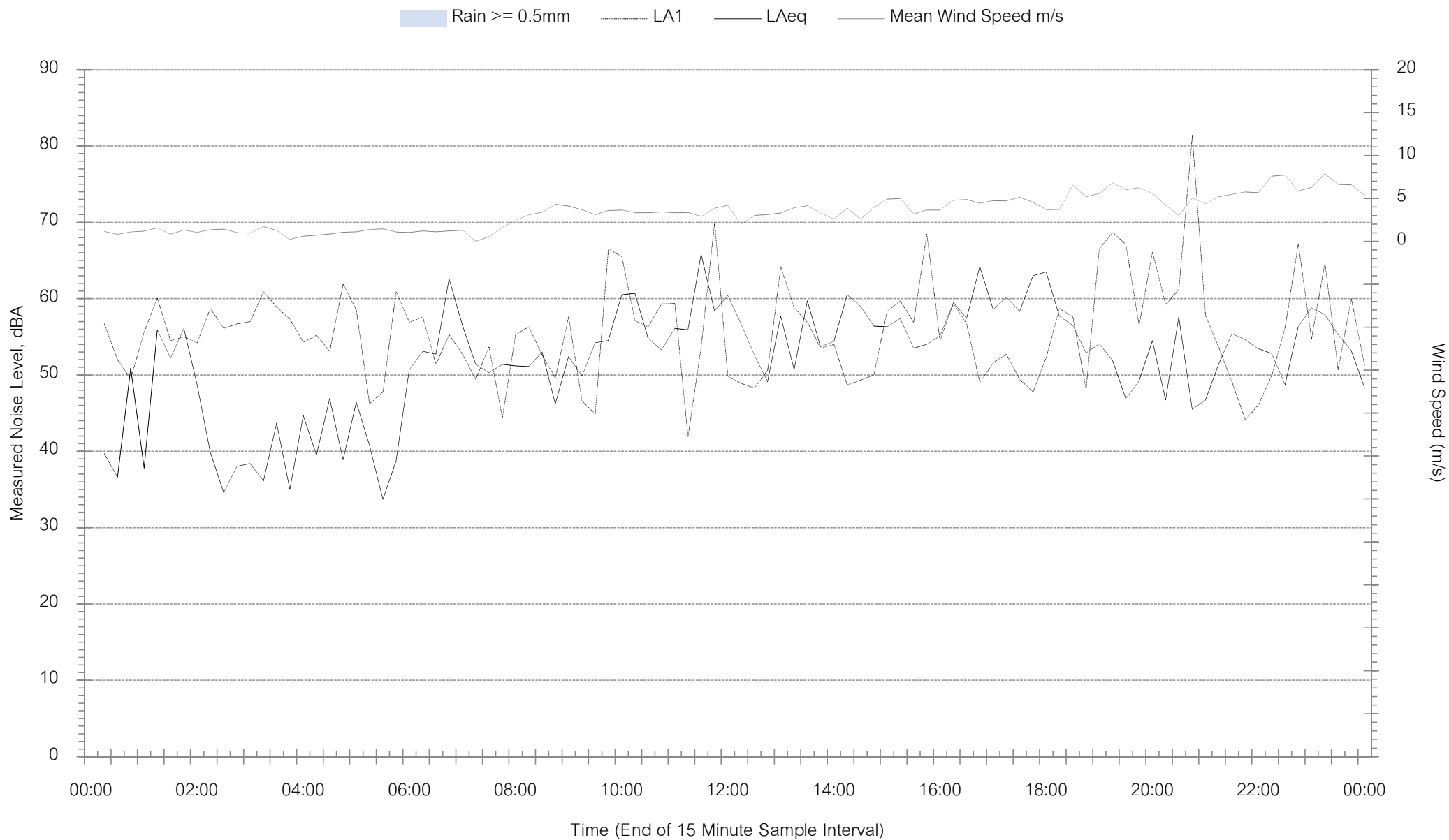
# Background Noise Levels

## Hubberstone - Wednesday 28 August 2019



# Background Noise Levels

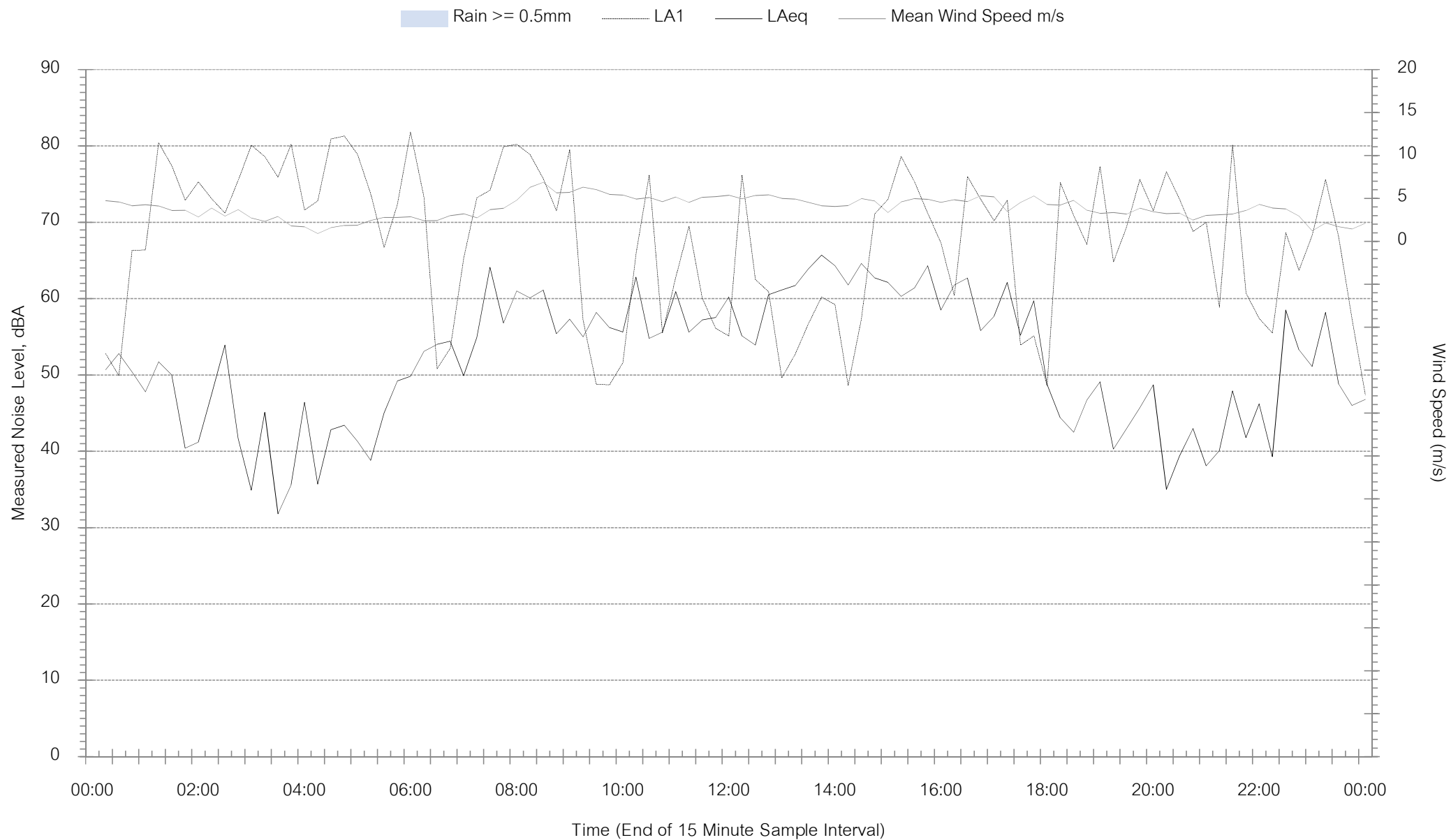
## Hubberstone - Thursday 29 August 2019





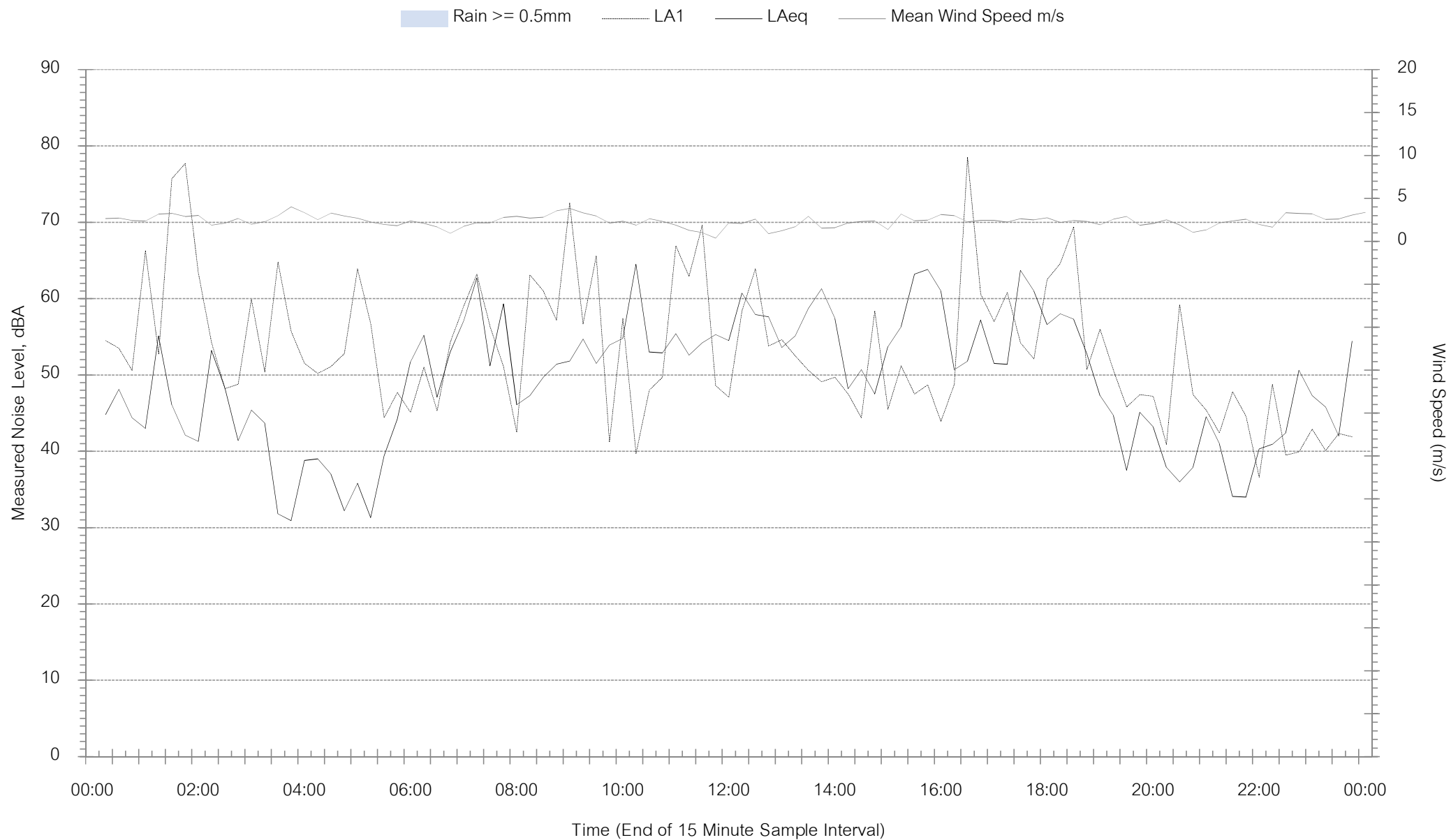
# Background Noise Levels

## Hubberstone - Friday 30 August 2019

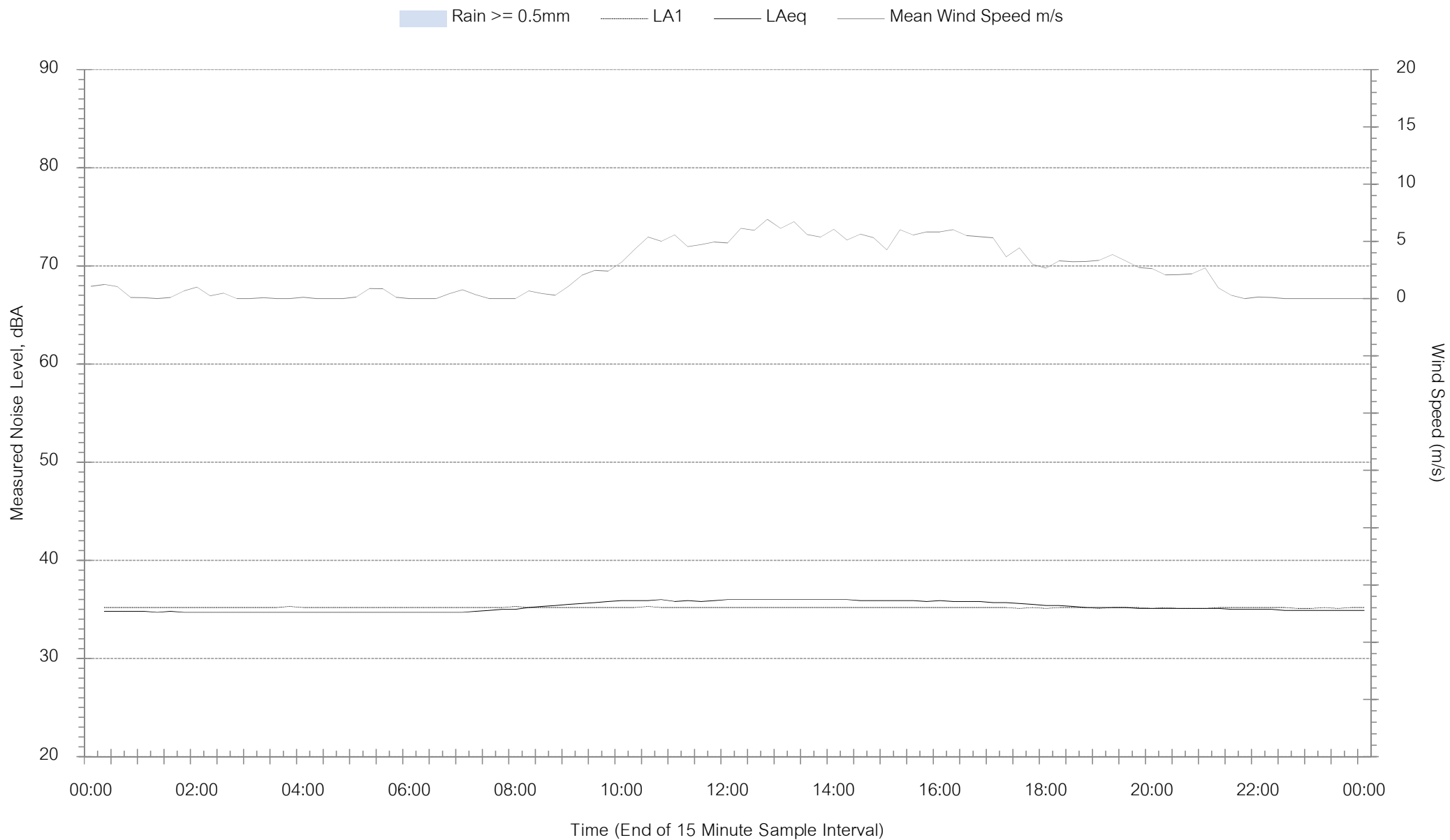


# Background Noise Levels

## Hubberstone - Saturday 31 August 2019



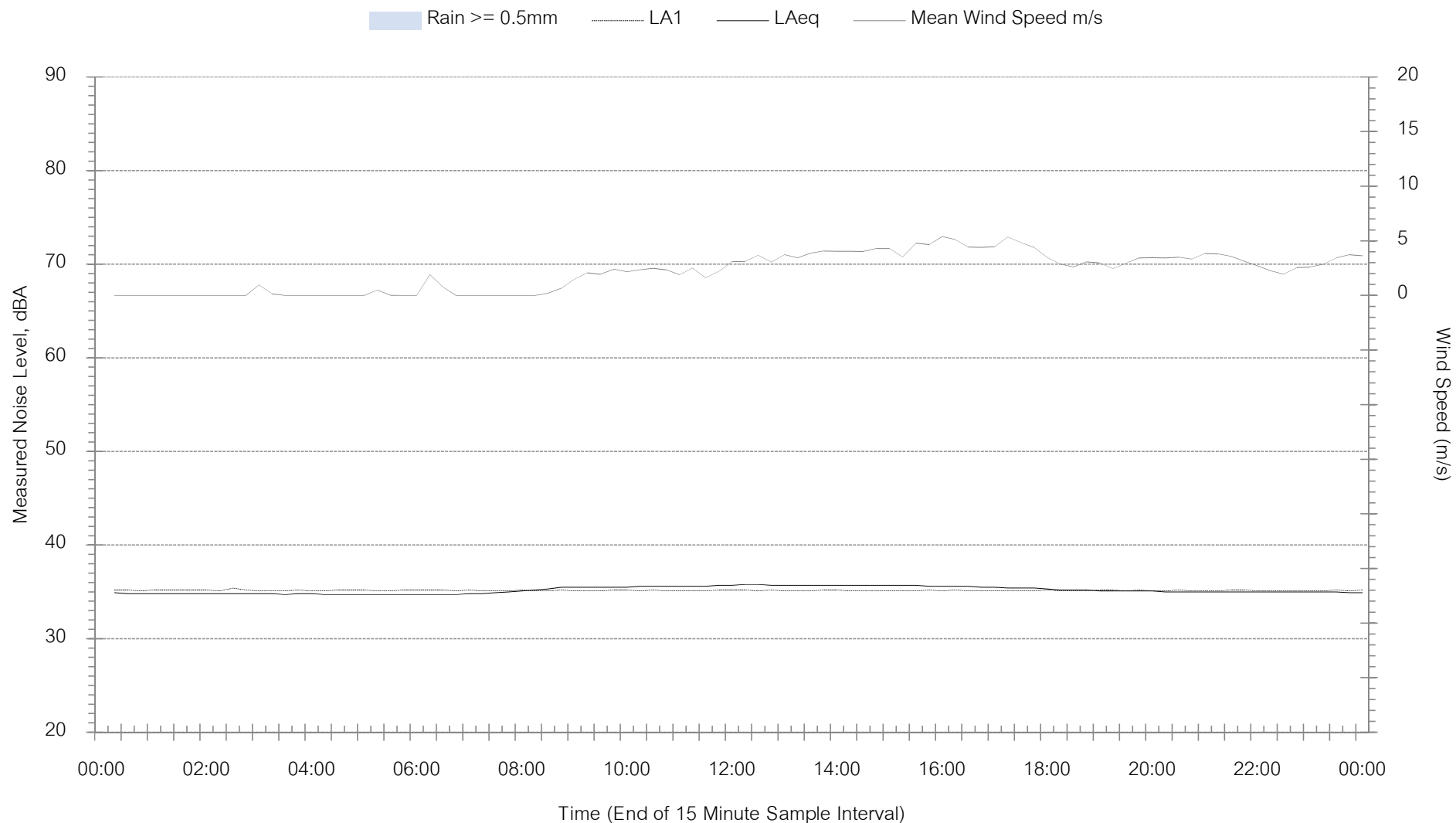
Background Noise Levels  
Lone Pine - Saturday 24 August 2019





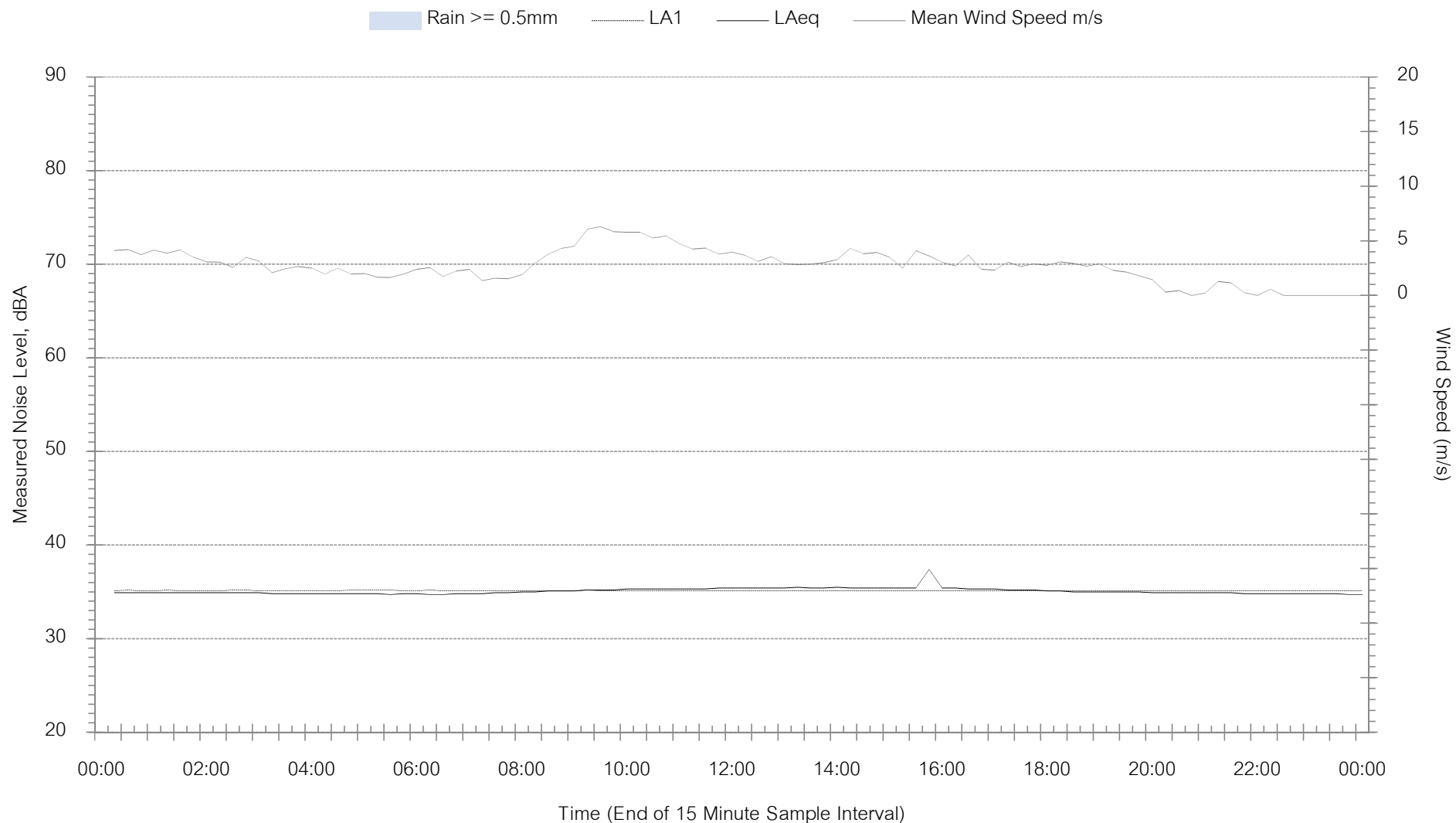
# Background Noise Levels

## Lone Pine - Sunday 25 August 2019



# Background Noise Levels

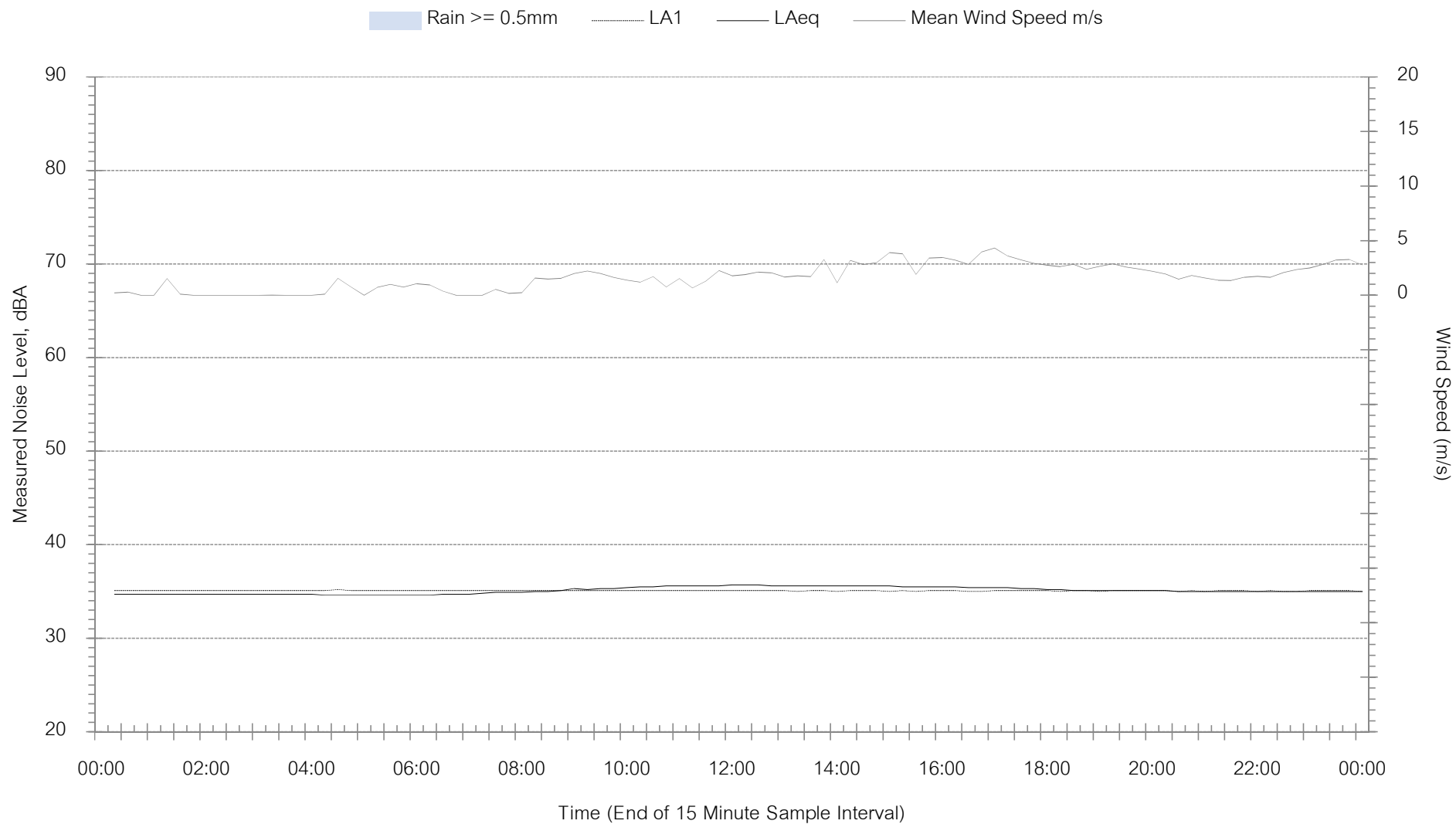
## Lone Pine - Monday 26 August 2019





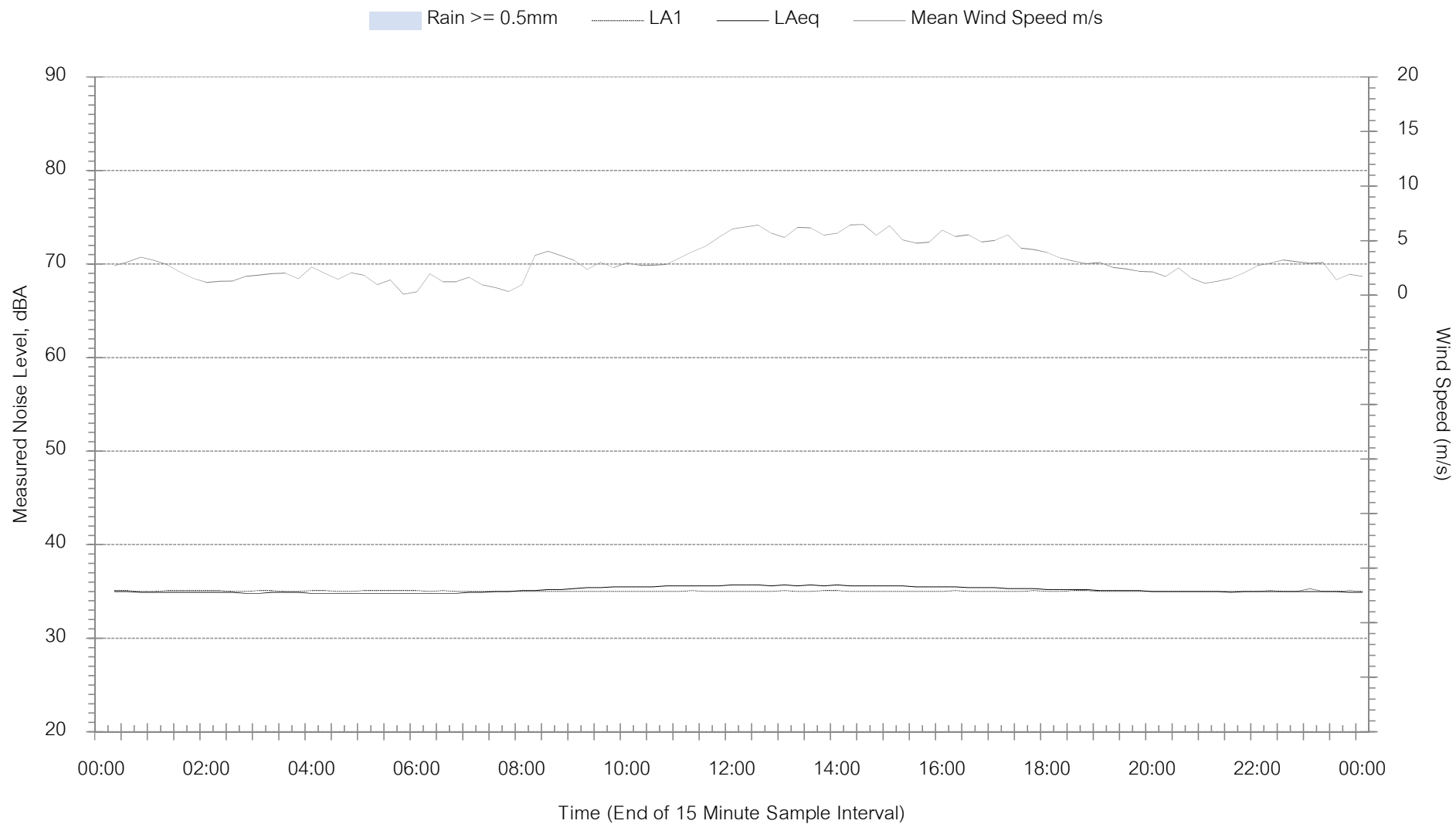
# Background Noise Levels

## Lone Pine - Tuesday 27 August 2019



# Background Noise Levels

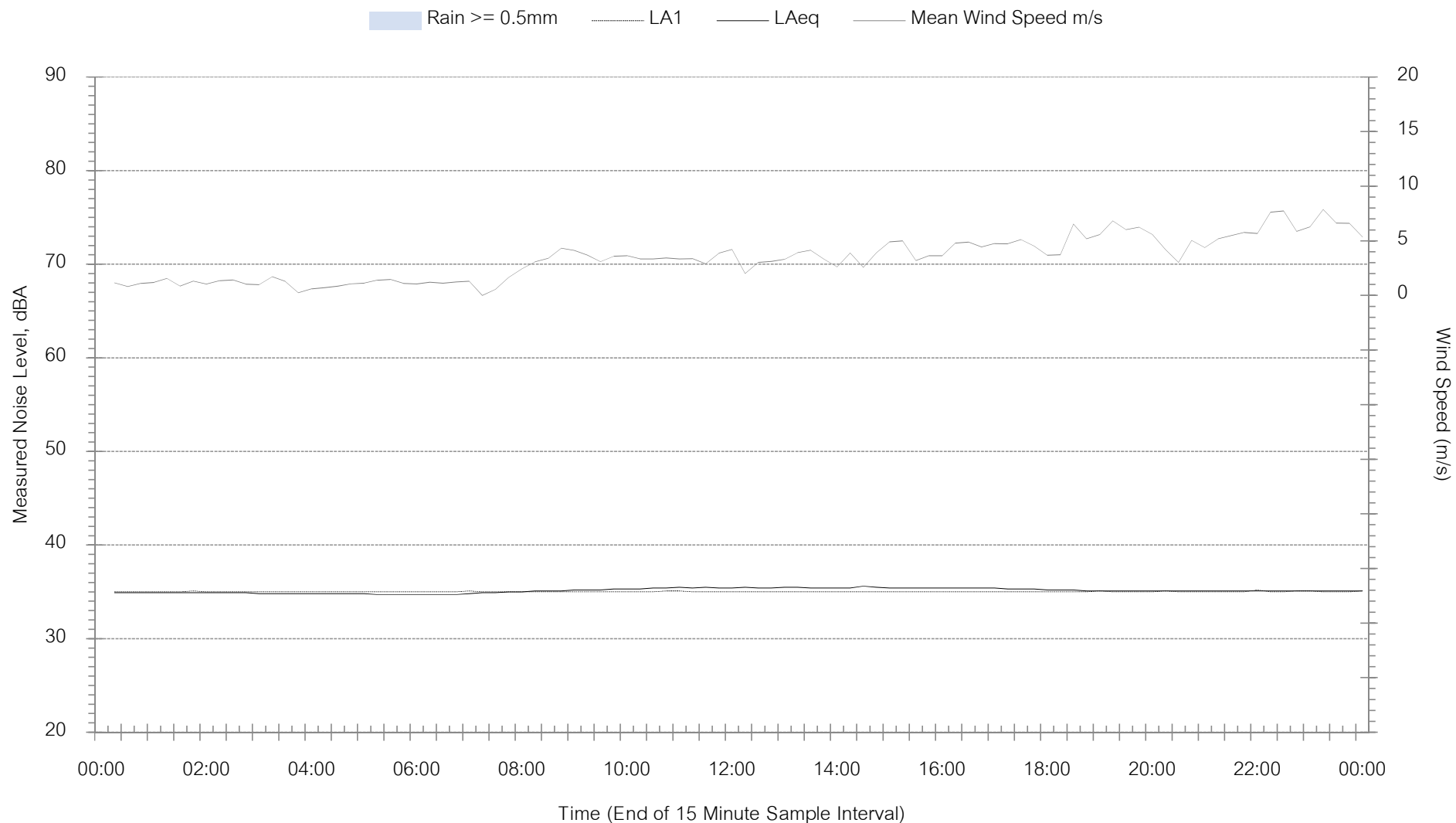
## Lone Pine - Wednesday 28 August 2019





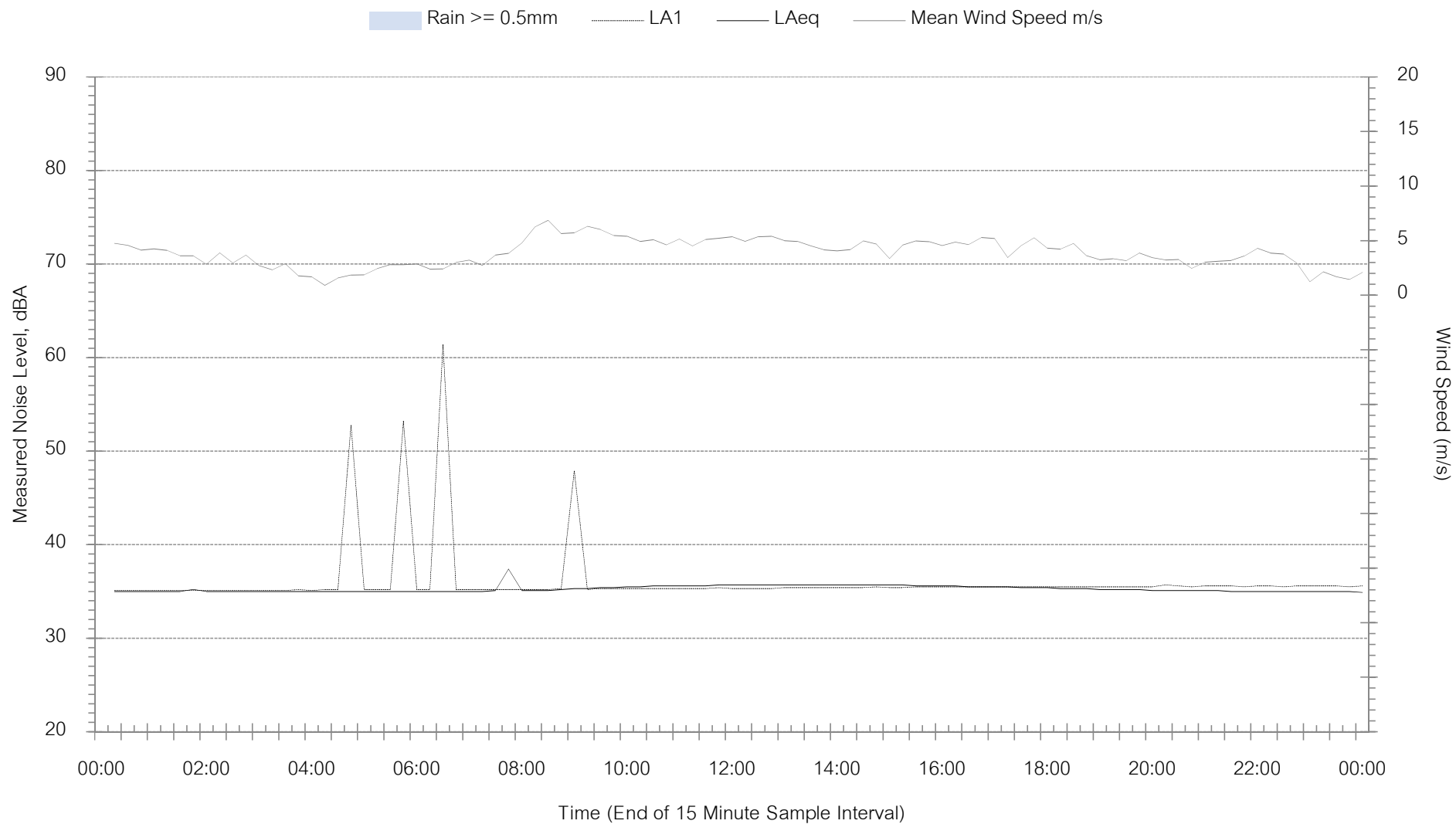
# Background Noise Levels

## Lone Pine - Thursday 29 August 2019



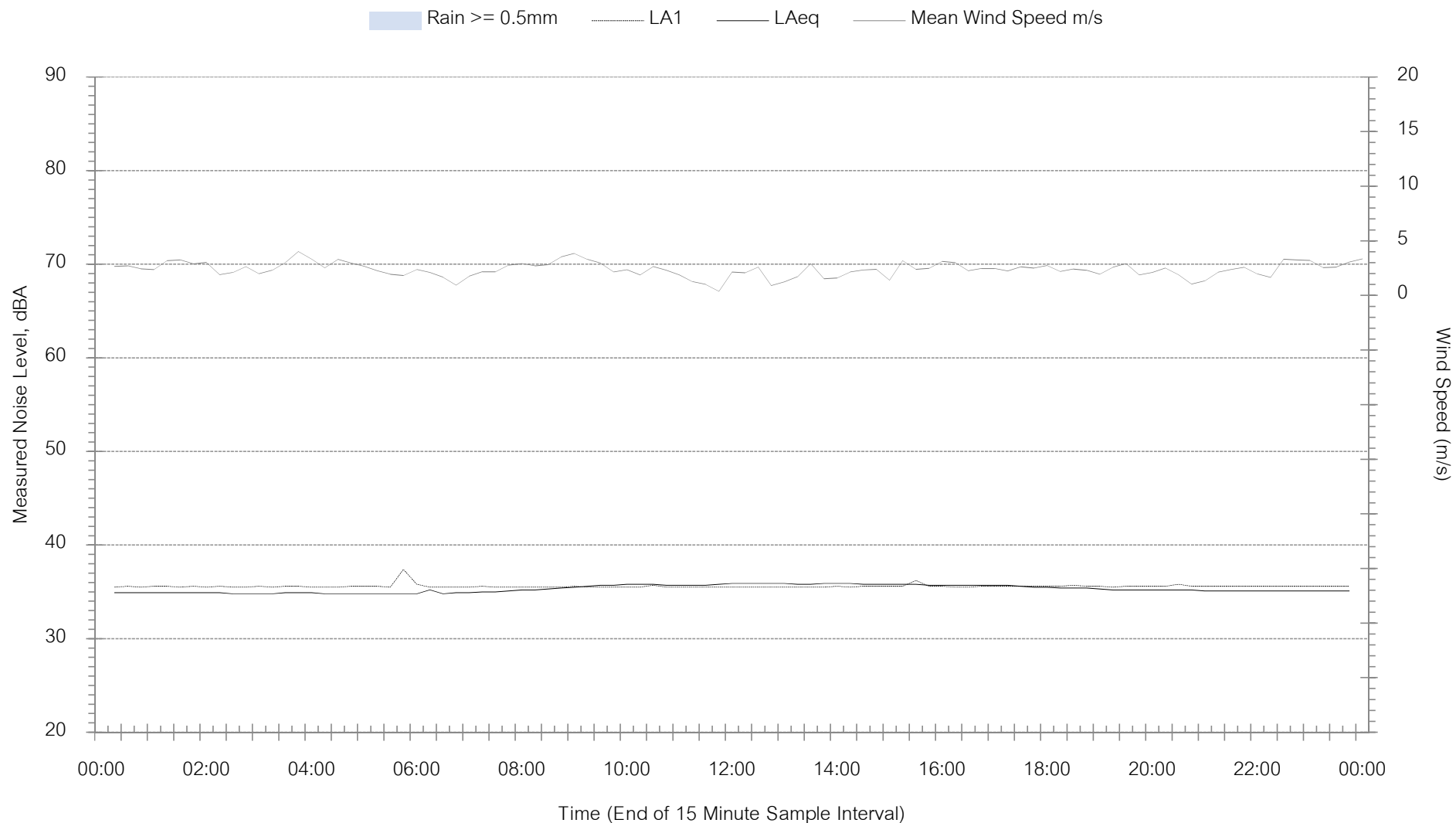
# Background Noise Levels

## Lone Pine - Friday 30 August 2019



# Background Noise Levels

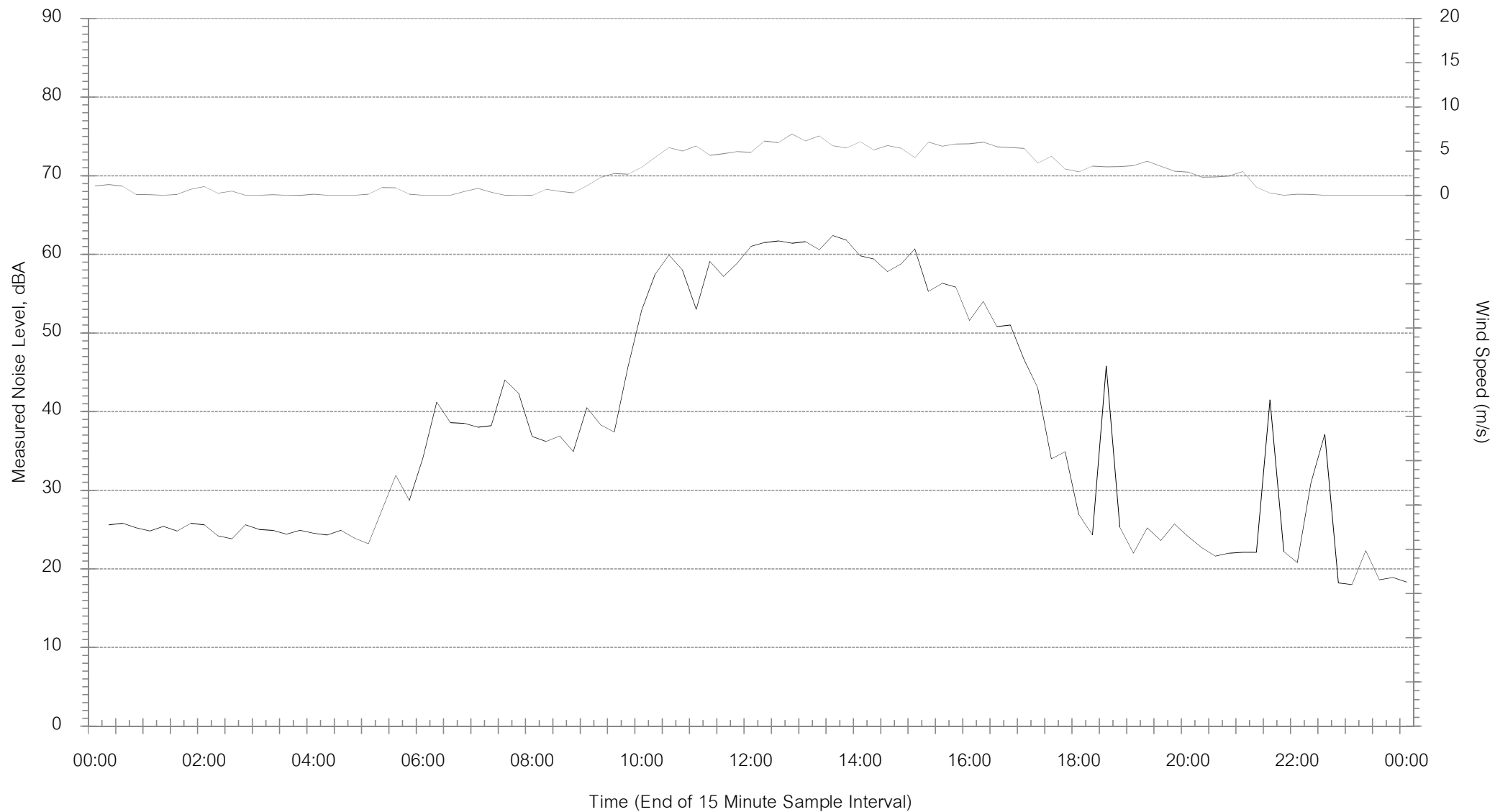
## Lone Pine - Saturday 31 August 2019



# Background Noise Levels

## Milpose - Saturday 24 August 2019

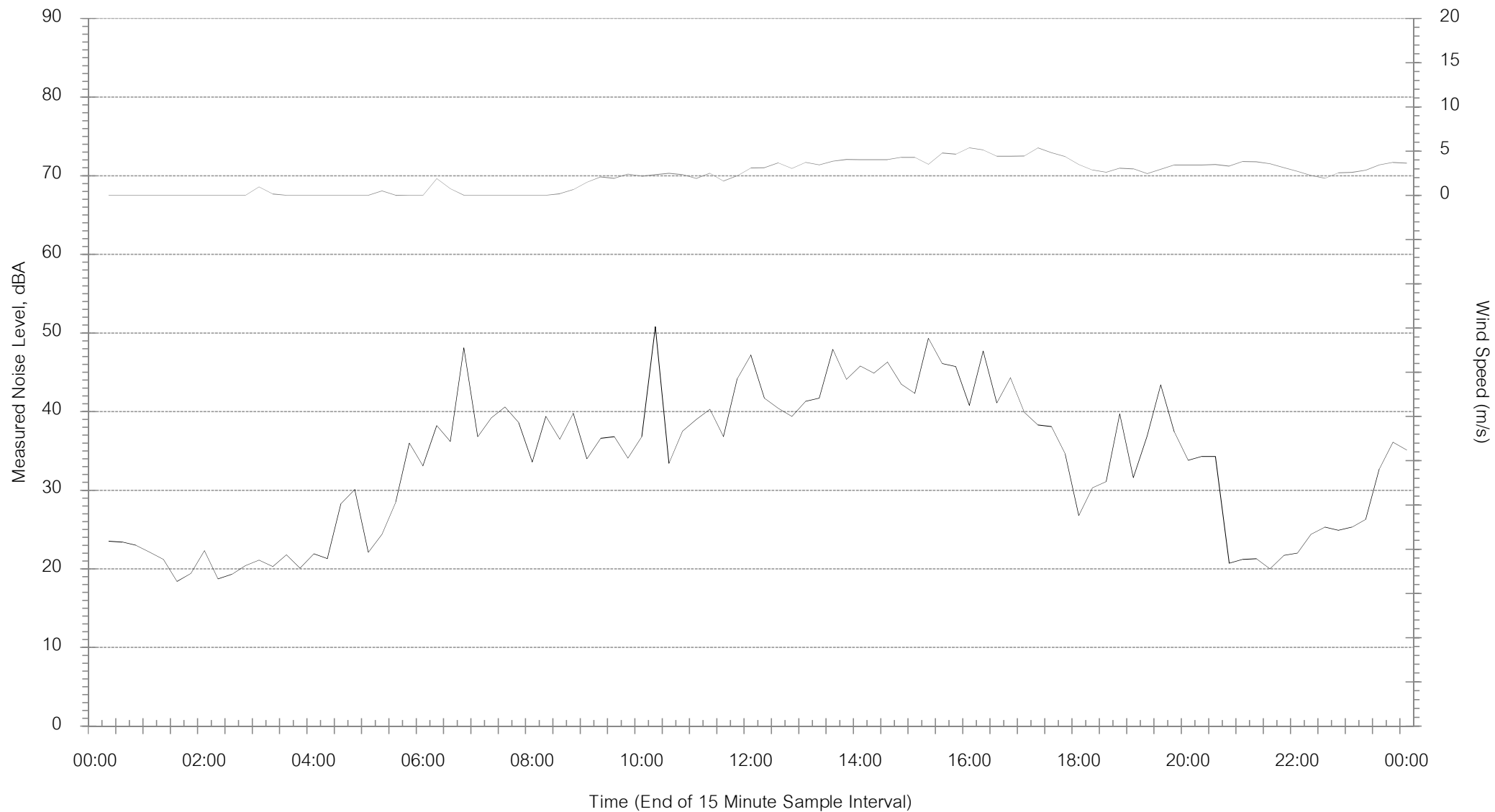
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Milpose - Sunday 25 August 2019

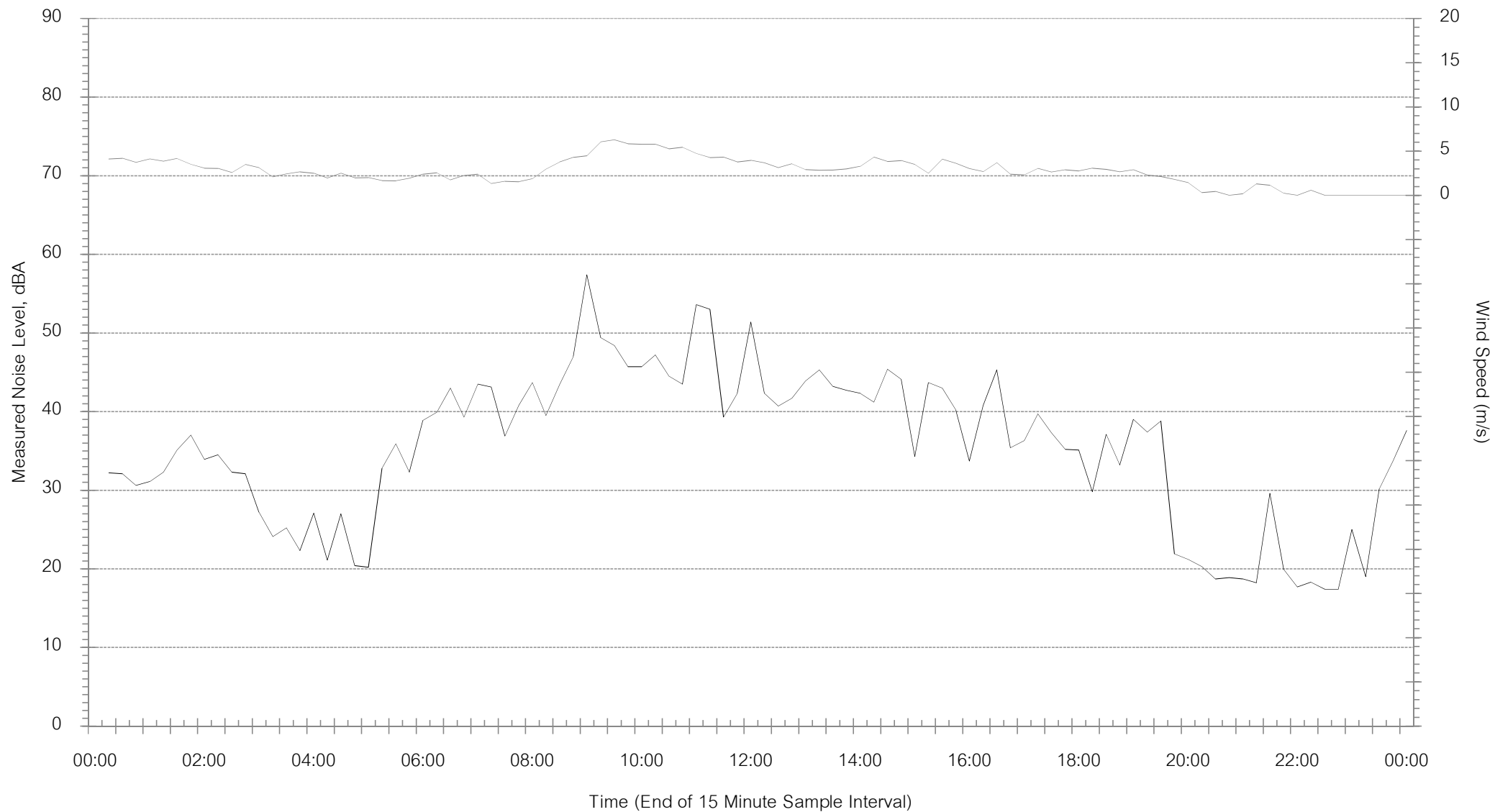
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

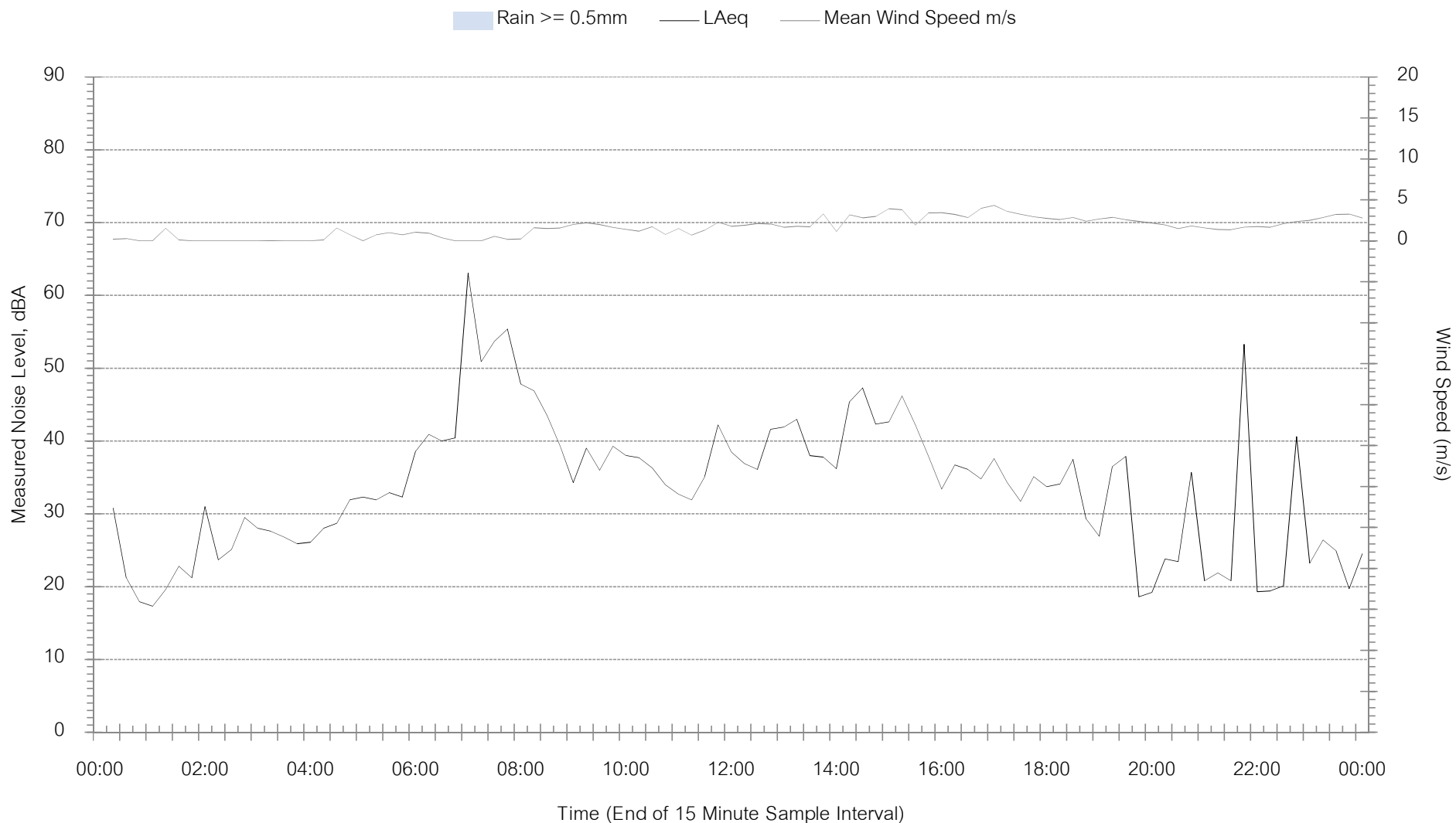
## Milpose - Monday 26 August 2019

Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

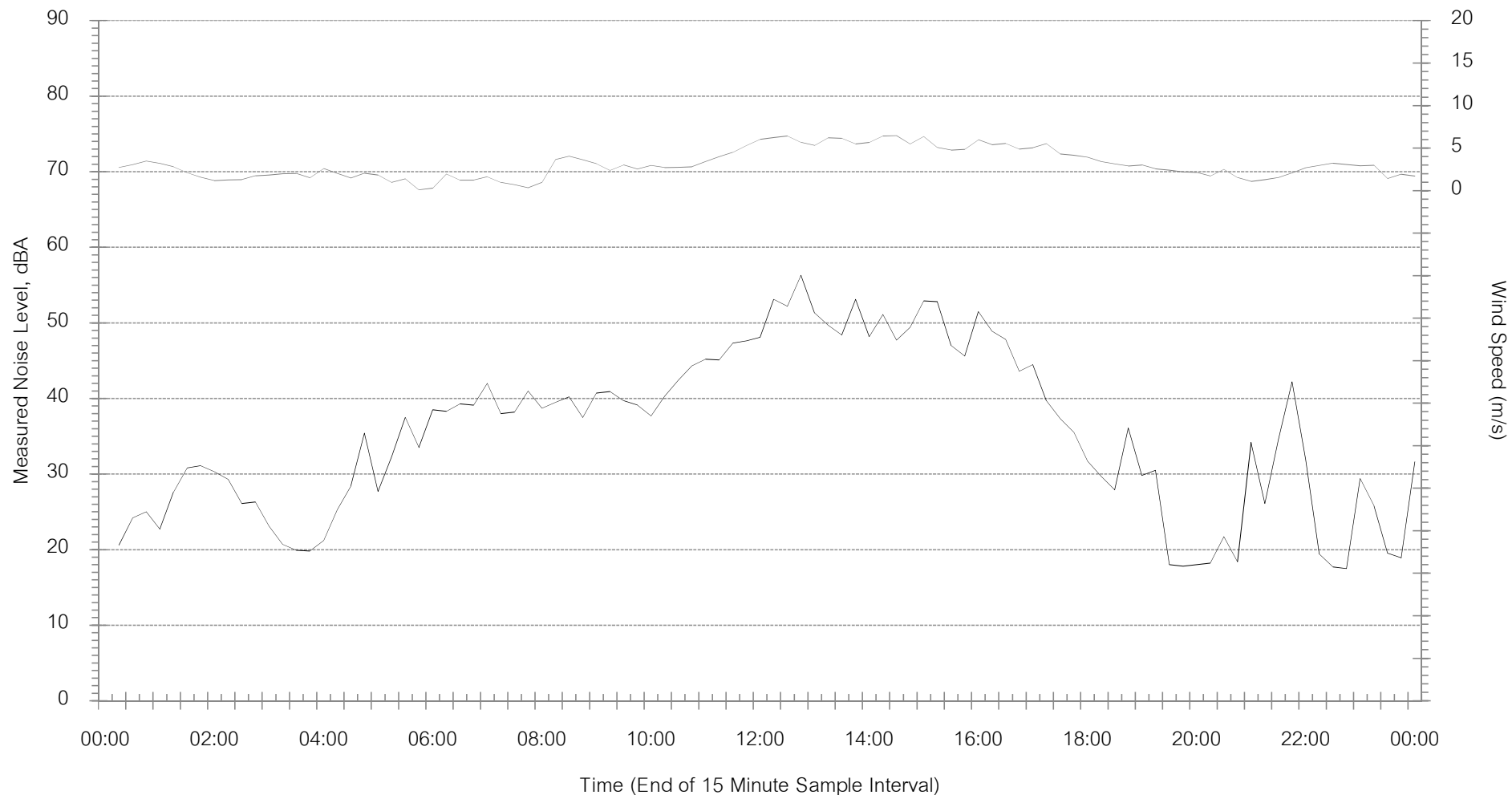
## Milpose - Tuesday 27 August 2019



# Background Noise Levels

## Milpose - Wednesday 28 August 2019

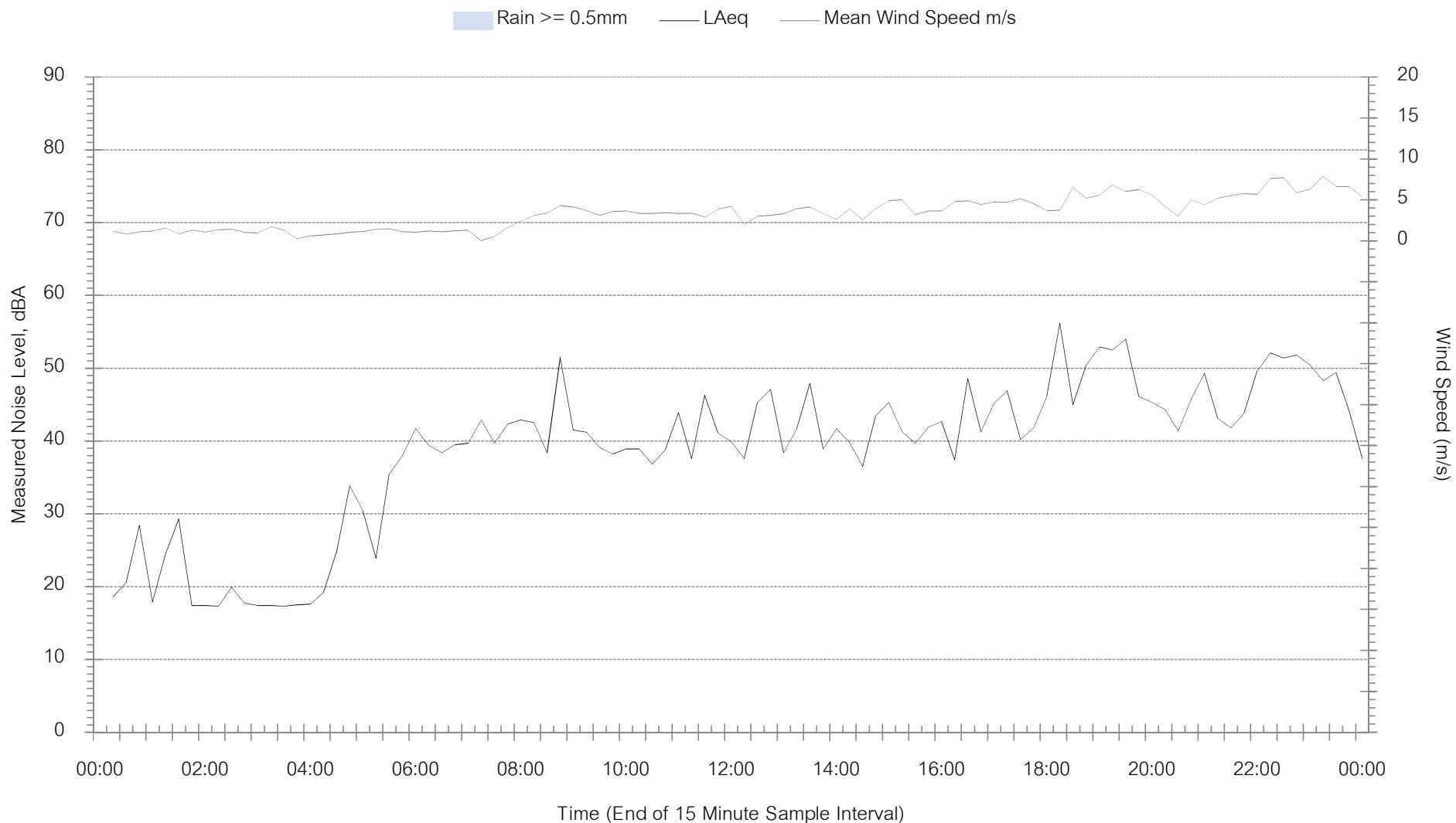
Rain  $\geq 0.5\text{mm}$     LAeq    Mean Wind Speed m/s





# Background Noise Levels

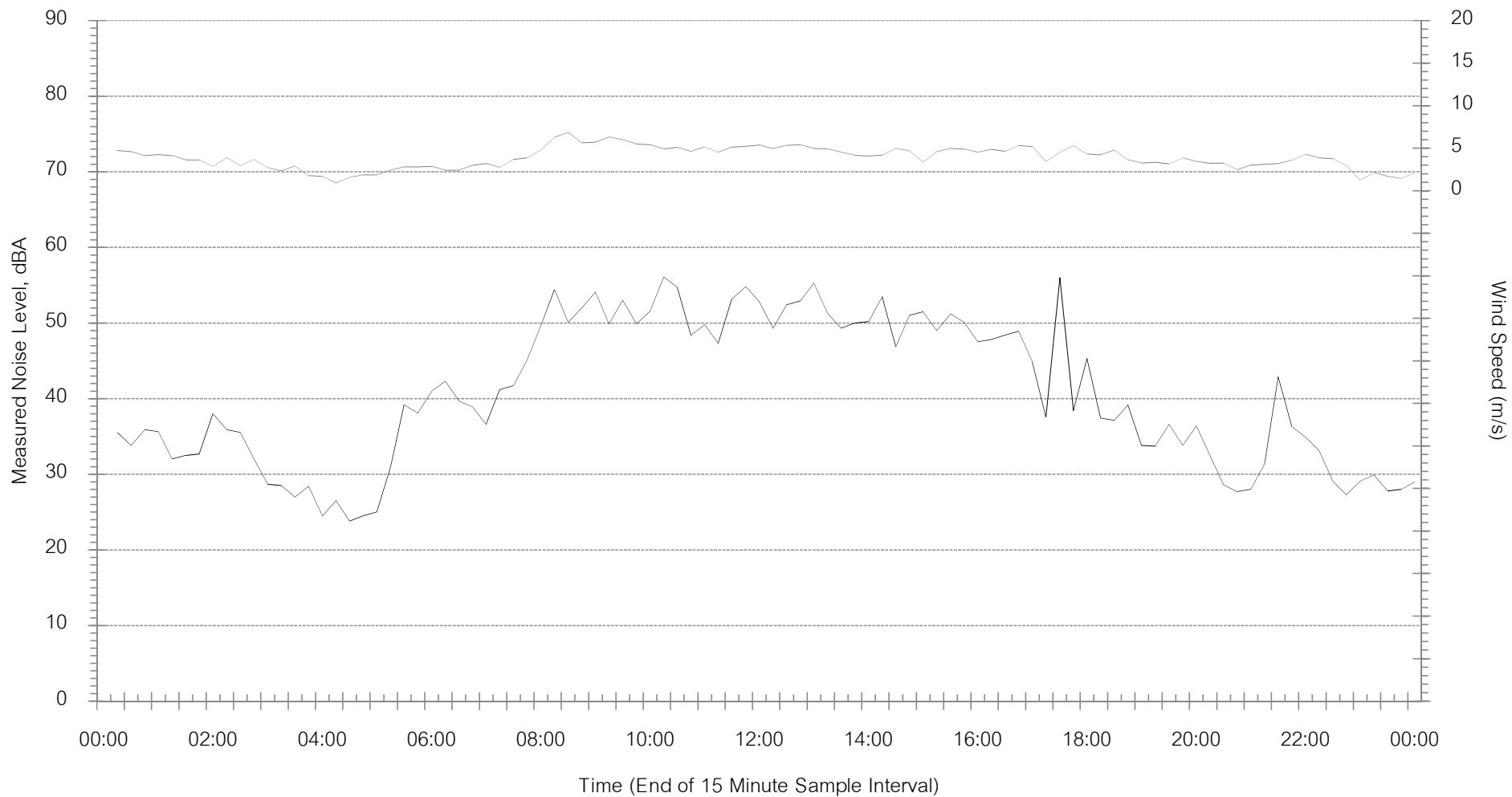
## Milpose - Thursday 29 August 2019



# Background Noise Levels

## Milpose - Friday 30 August 2019

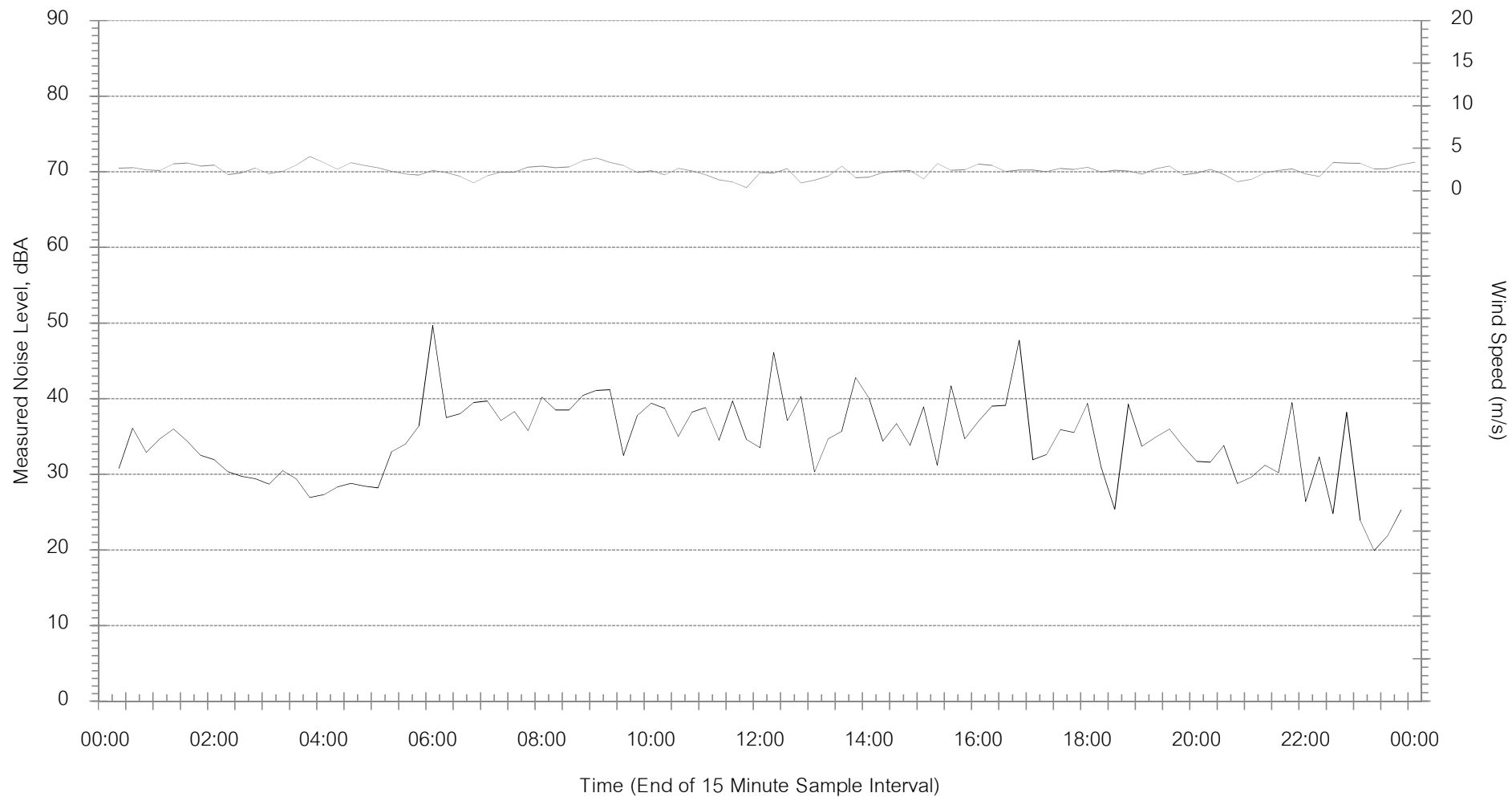
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Milpose - Saturday 31 August 2019

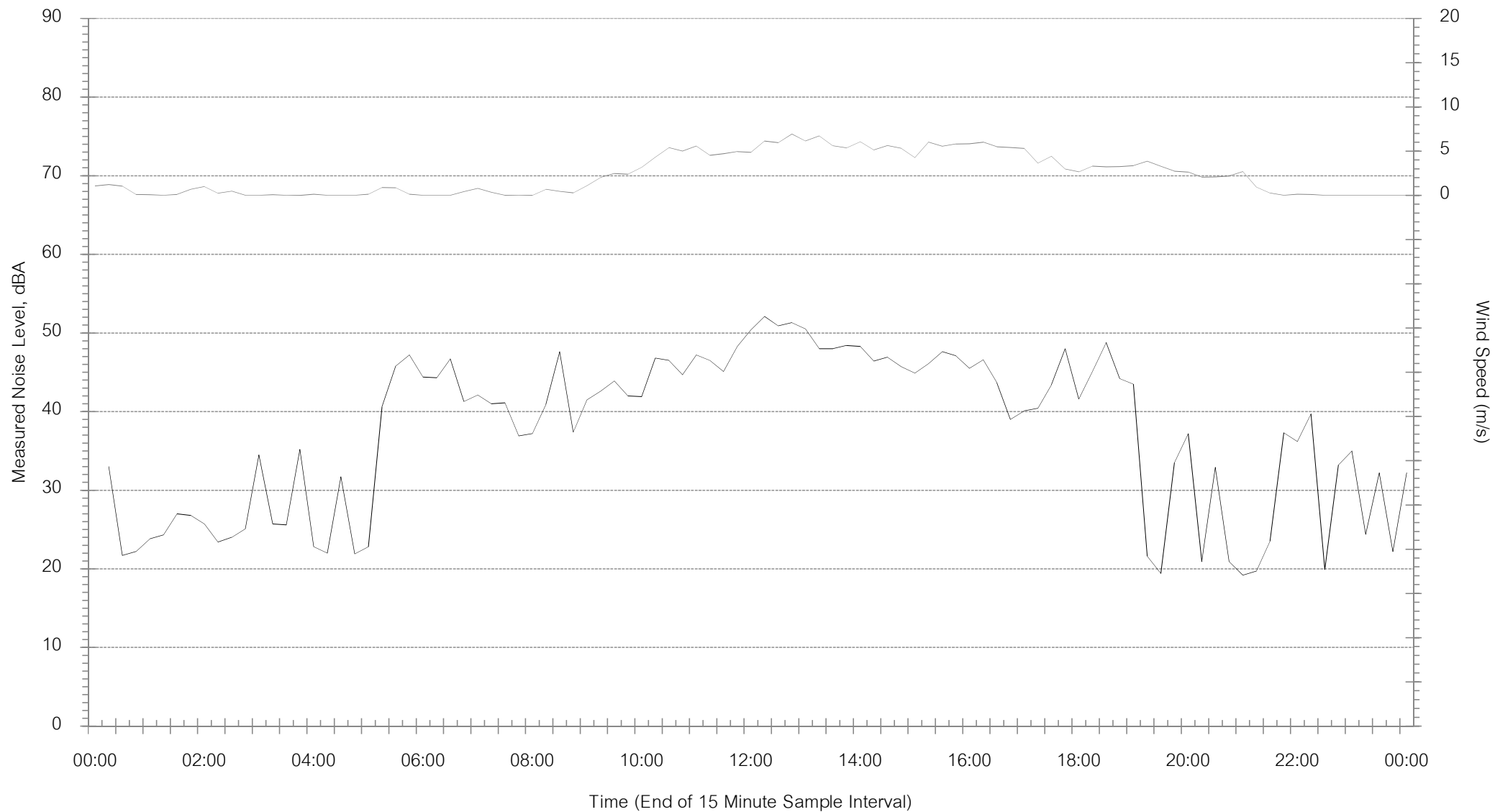
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Saturday 24 August 2019

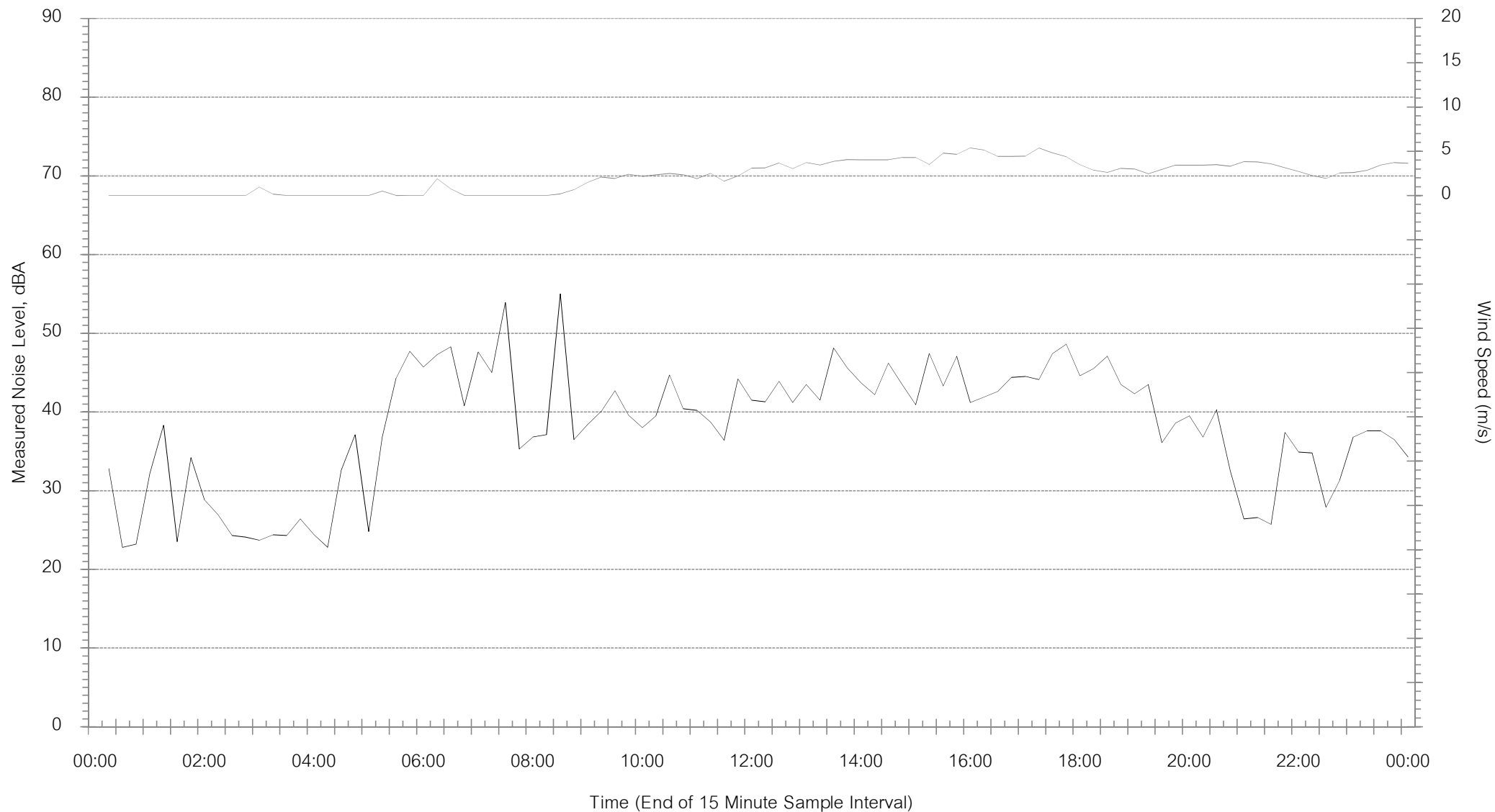
Rain  $\geq 0.5\text{mm}$     LAeq    Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Sunday 25 August 2019

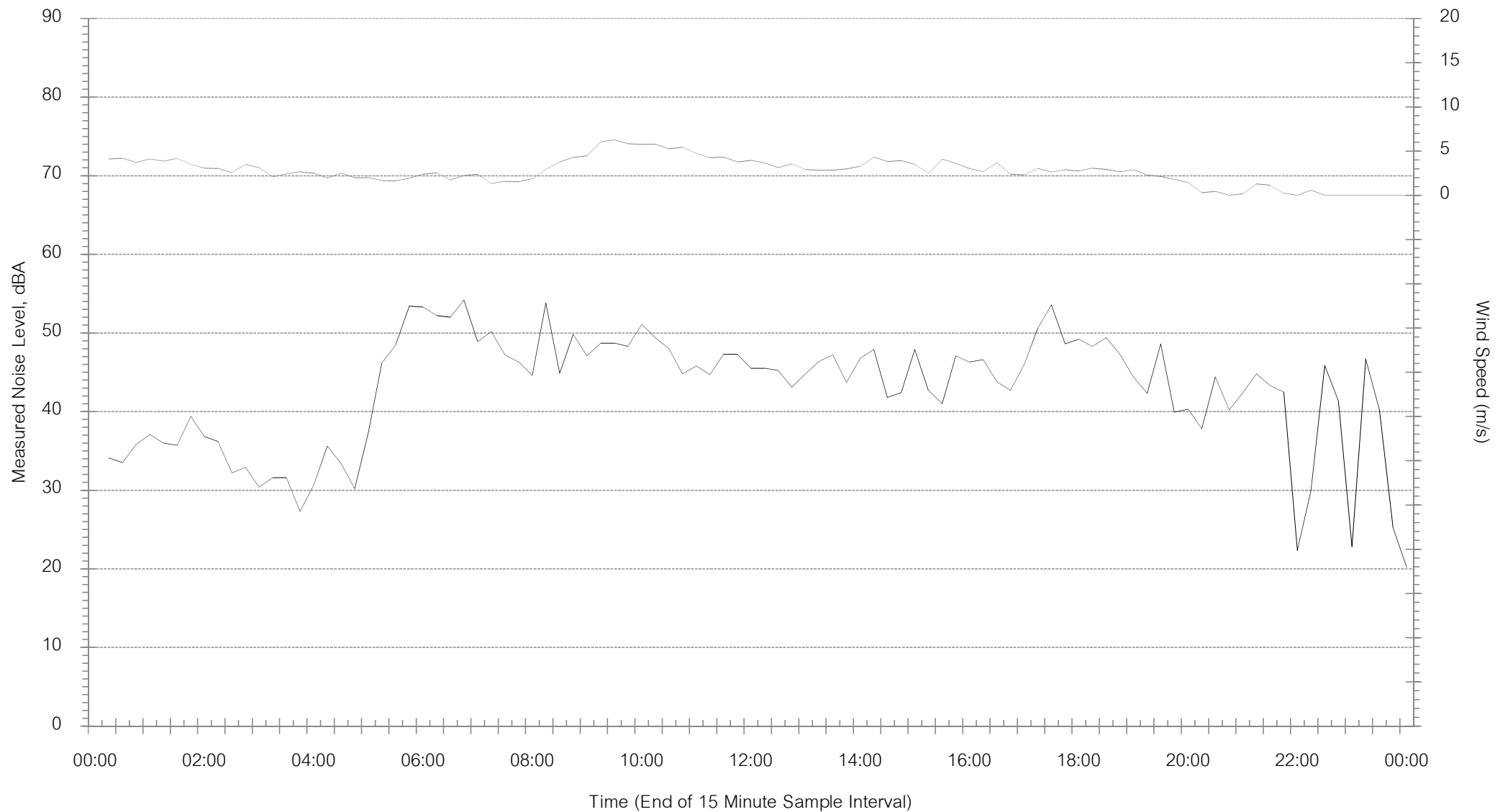
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Monday 26 August 2019

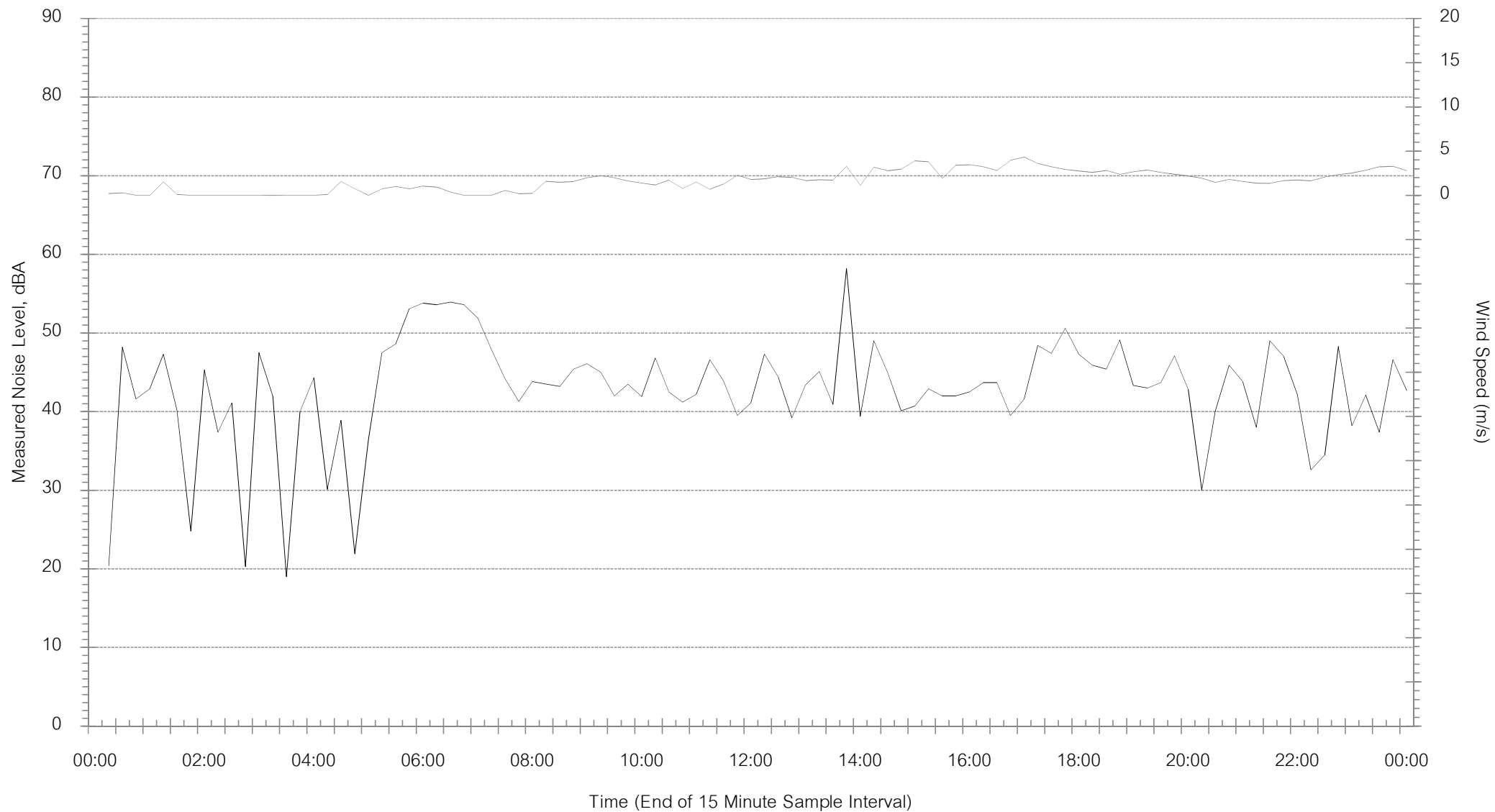
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Tuesday 27 August 2019

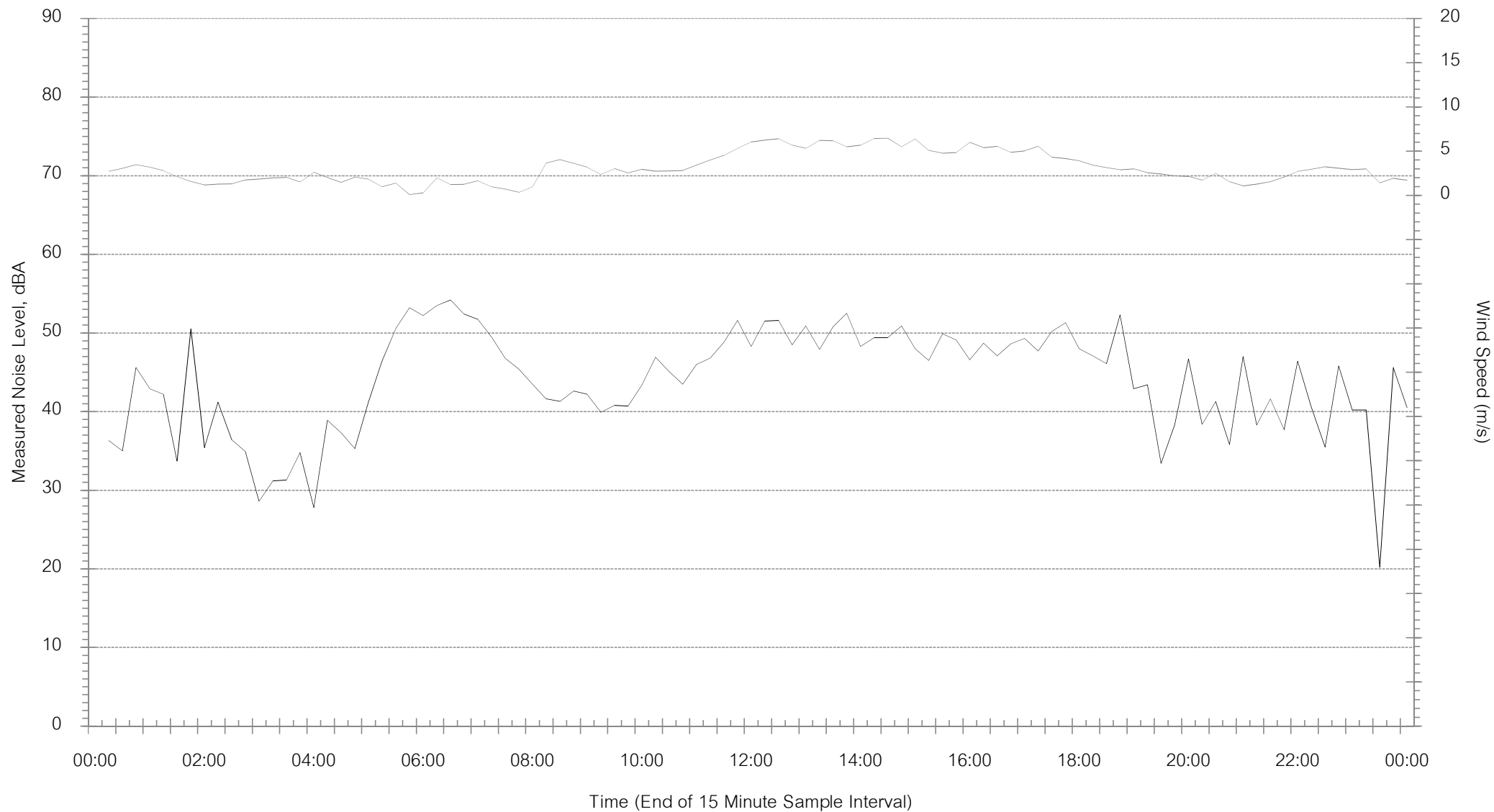
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Wednesday 28 August 2019

Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s

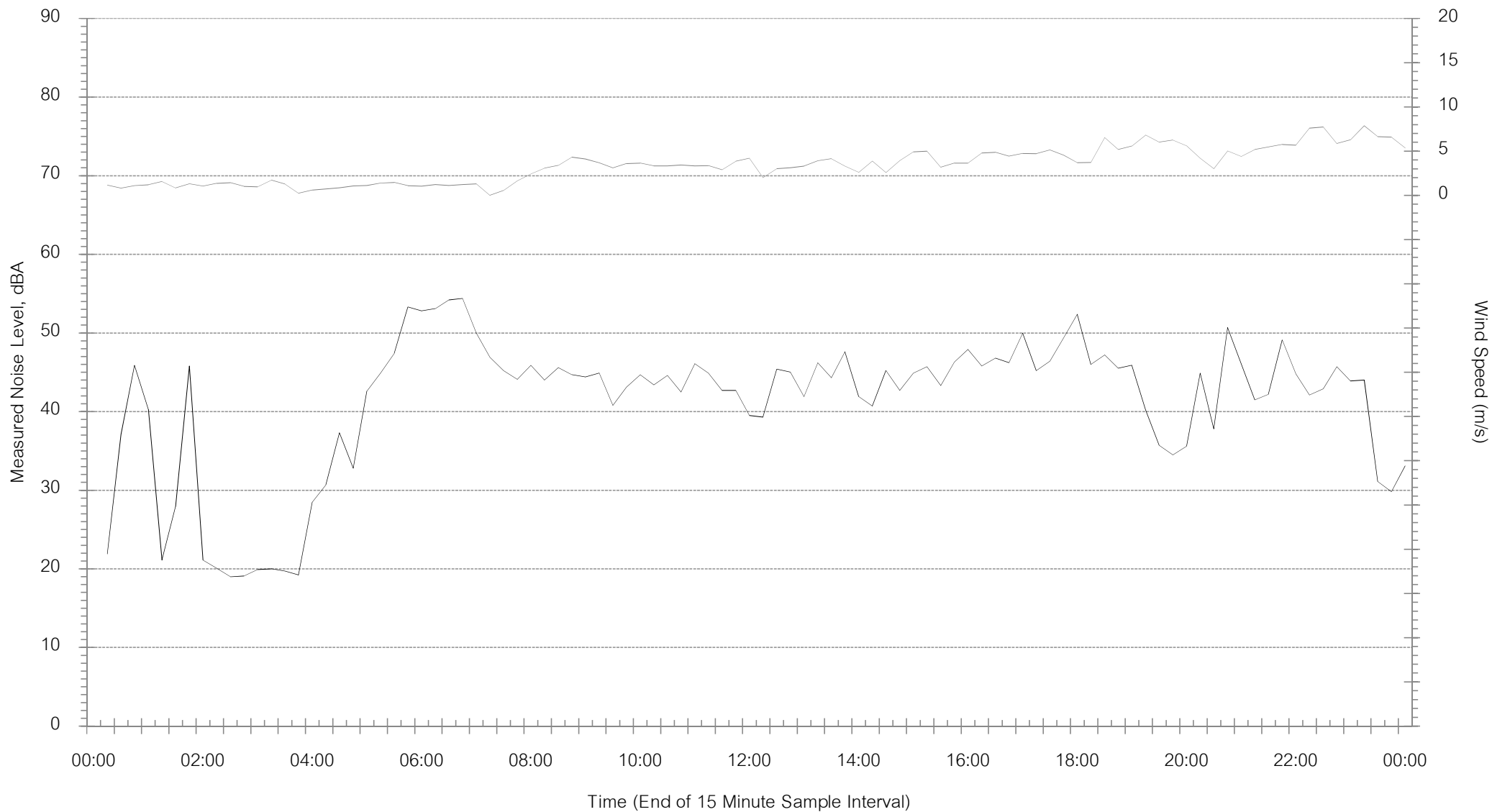




# Background Noise Levels

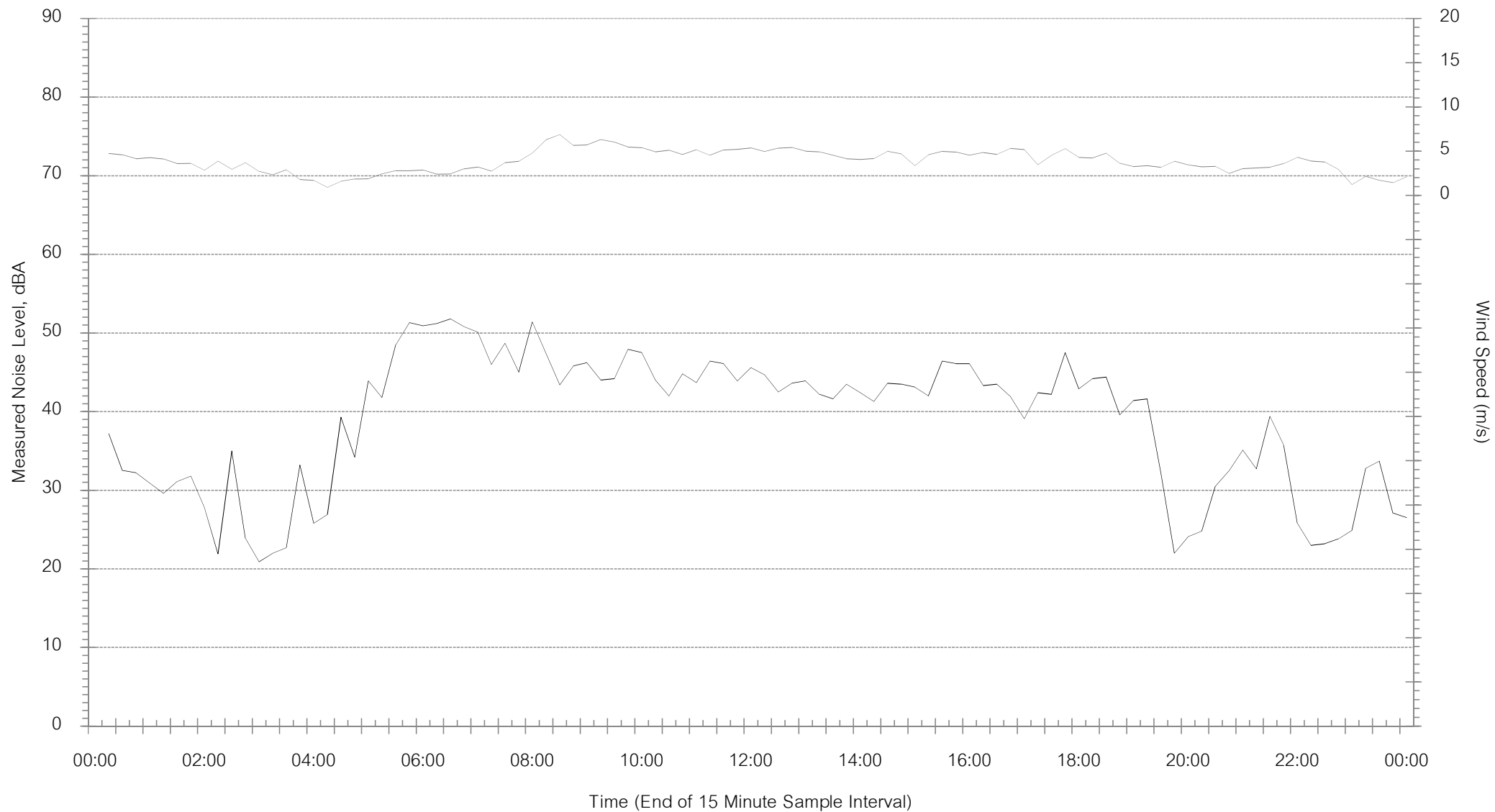
## Hillview - Thursday 29 August 2019

Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



Background Noise Levels  
Hillview - Friday 30 August 2019

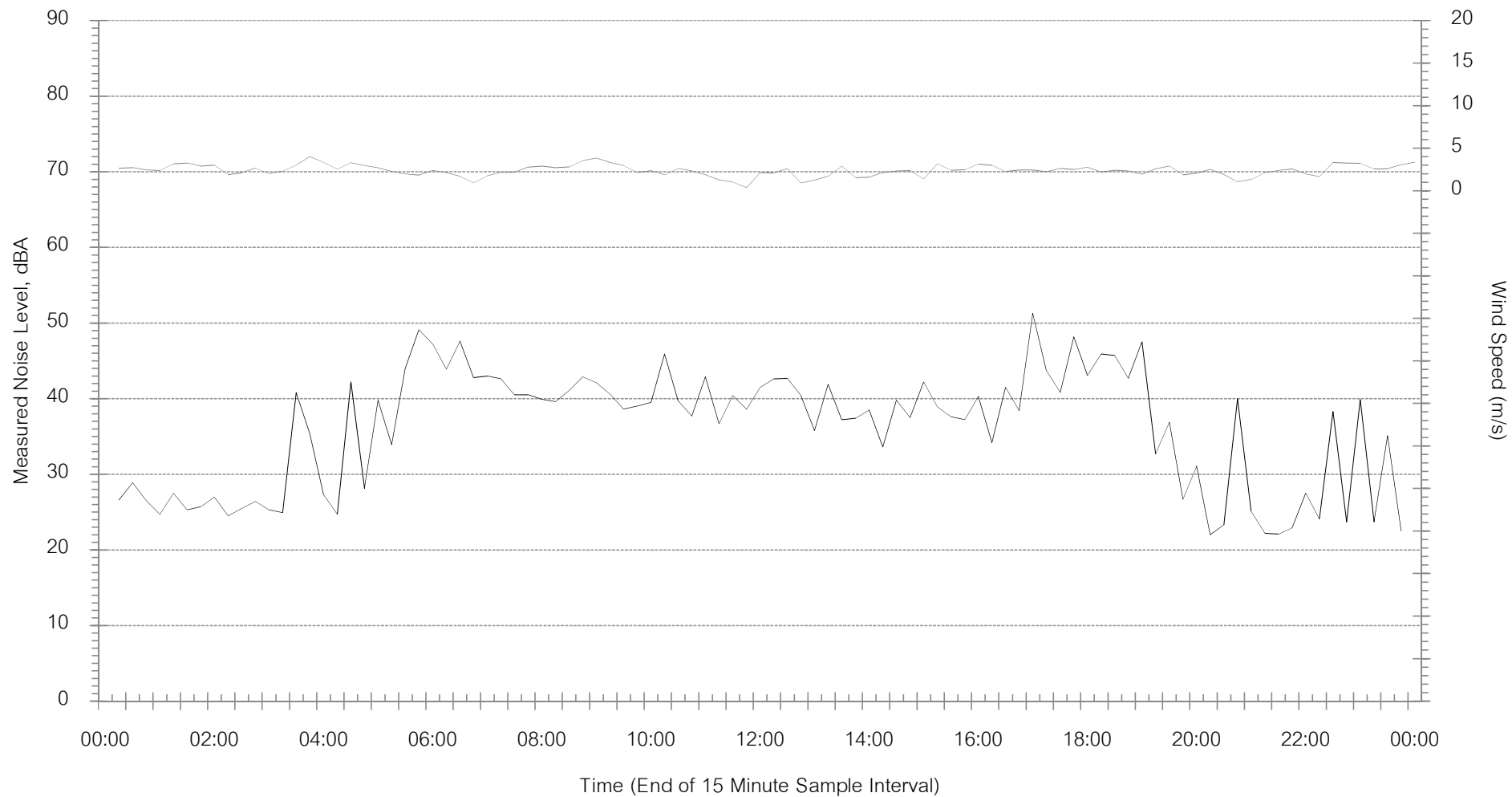
Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



# Background Noise Levels

## Hillview - Saturday 31 August 2019

Rain  $\geq 0.5\text{mm}$  LAeq Mean Wind Speed m/s



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