

Noise Impact Assessment

Werris Creek Intermodal Freight Terminal

Prepared for: Crawfords Freightlines Pty Ltd
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MAC190870-02RP1



Document Information

Noise Impact Assessment

Werris Creek Intermodal Freight Terminal

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by Crawford's Freightlines Pty Ltd (Crawford's) to complete a Noise Impact Assessment (NIA) for the proposed extension of hours of the Werris Creek Intermodal Freight Terminal at Werris Creek, NSW (the 'project'). This report presents the methodology and findings of the NIA for the operation of the project during the extended hours.

1.1 Purpose and Objectives

A NIA is required as part of the Development Application and Statement of Environmental Effects (SoEE) for the project. The purpose of the NIA is to quantify potential environmental noise levels associated with the operation of the project during the extended hours proposed. Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

1.2 Scope of the Assessment

The NIA includes the following key tasks:

- review operating activities to identify noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receptors situated within the area of influence to the project;
- quantify the existing noise environment by conducting unattended noise monitoring at locations representative of the closest and/or potentially most affected receptors;
- undertake 3D noise modelling to predict noise levels that may occur as a result of the operation of the project at the closest and/or potentially most affected receptors;
- assess the potential noise and vibration impacts associated with operation of the project; and
- provide feasible and reasonable noise and vibration mitigation and management measures, and monitoring options, where criteria may be exceeded.

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

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2 Project Description

2.1 Background

Crawfords propose to extend the operating hours of the Werris Creek Intermodal Freight Terminal, situated on the western edge of township, adjacent to existing railway lines and operations. The project includes extension of currently approved operations and additional weekday activities as described below and summarised in **Table 1. Figure 1** presents the general project overview and site layout.

2.1.1 Current Activities & Operating Hours

The current approved operating hours are from 7am to 6pm Monday – Friday and 8am to 1pm on Saturdays for the following activities:

- Loading/Unloading of trains;
- Loading/Unloading of trucks;
- Container Movements (via prime mover and trailers);
- Rail movements in and out of the site;
- Heavy vehicle access to site and log delivery (from 6am); and
- Cooling/refrigeration of containers (from 6am).

2.1.2 Proposed Weekend Operations

Crawford's propose to extend currently approved Saturday operations (8am to 1 pm) to 7am to 6pm Saturday and 8am to 6pm Sunday.

Technical Note: Saturday and Sunday daytime periods are assessed in the same manner as the daytime period for weekdays in accordance with Noise Policy for Industry (NPI) methodology. Therefore, a change in operating hours for these activities is assessed no differently to operating hours for weekdays.

Hence, there is no requirement in accordance with the NPI to assess the extension of hours for current operations.

2.1.3 Proposed Weekday Activities

Therefore, the scope of this assessment is limited to the proposed additional heavy vehicle loading and unloading between 6pm to 7am Monday – Friday.

The proposed activities will involve transferring shipping containers to and from heavy vehicles and placing the shipping containers in their relevant storage areas. These activities will involve a mixture of Semi Trailer, B Double and Side Loader heavy vehicle combinations and container forklifts.

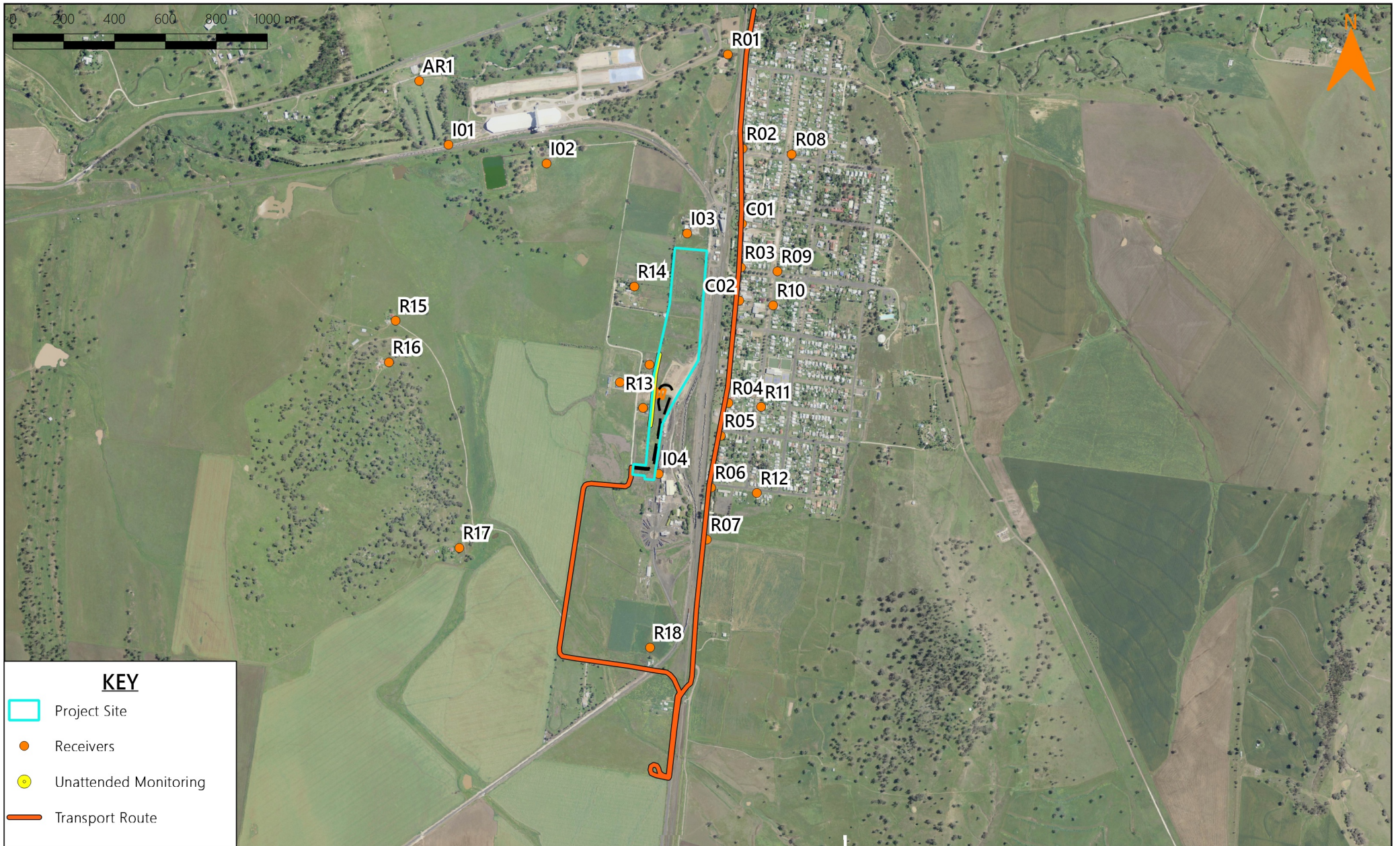
There will be approximately 8 trucks in and out of the site (6pm to 7am) for typical (off peak) operations with one forklift operating and 20 trucks in and out of the site (6pm to 7am) during peak (harvest season) with one forklift operating.

| Table 1 Current Approved Operations & Proposed Activities | | | | | | | | | | |
|---|-----------------|---|----|----|----------|----|----|---------------------------|----|----|
| Activity | Monday - Friday | | | | Saturday | | | Sundays & Public Holidays | | |
| | 6am-7am | D | E | N | D | E | N | D | E | N |
| Train Loading/Unloading | -- | ✓ | -- | -- | ✓ | -- | -- | ✓ | -- | -- |
| Truck Loading/Unloading | -- | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Container Movements/Stack | -- | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rail Movements in/out of site | -- | ✓ | -- | -- | ✓ | -- | -- | ✓ | -- | -- |
| Service Train Loading | -- | ✓ | -- | -- | ✓ | -- | -- | ✓ | -- | -- |
| Log Delivery | ✓ | ✓ | -- | -- | ✓ | -- | -- | ✓ | -- | -- |
| Container Cooling/Refrigeration | ✓ | ✓ | -- | -- | ✓ | -- | -- | ✓ | -- | -- |

✓ Current Approved Operations ✓ Extension of Hours (Approved Activities) ✓ Additional Activities

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.



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3 Policy and Guidelines

This NA has been conducted in accordance with the following key policy and guidelines:

- Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017; and
- NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011.

The assessment has also considered and applied the following additional policy, guidelines and standards where relevant:

- Australian Standard AS1055:2018 (AS1055) – Description and Measurement of Environmental Noise;
- Australian Standard AS IEC 61672.1–2019 (AS61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring; and
- Australian Standard AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard – Electroacoustics – Sound Calibrators.

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 are 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, 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 PNTLs, 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 need to be measured.

3.1.3 Project Amenity Noise Level

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) and are reproduced in **Table 2** (the receiver types used in this assessment are shown as shaded rows). 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*”: PANL = recommended ANL minus 5dB.

The following exceptions apply when deriving the PANL:

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

Furthermore, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

Table 2 Amenity Criteria

| Receiver Type | Noise Amenity Area | Time of day | Recommended amenity noise level LAeq, dBA |
|---|--------------------|------------------------------------|--|
| Residential | Rural | Day | 50 |
| | | Evening | 45 |
| | | Night | 40 |
| | Suburban | Day | 55 |
| | | Evening | 45 |
| | | Night | 40 |
| | Urban | Day | 60 |
| | | Evening | 50 |
| | | Night | 45 |
| Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks | See column 4 | See column 4 | 5dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day |
| School classroom – internal | All | Noisiest 1-hour period when in use | 35 |
| Hospital ward | | | |
| - internal | All | Noisiest 1 hour | 35 |
| - external | | Noisiest 1 hour | 50 |
| Place of worship – internal | All | When in use | 40 |
| Area specifically reserved for passive recreation (e.g. national park) | All | When in use | 50 |
| Active recreation area (e.g. school playground, golf course) | All | When in use | 55 |
| Commercial premises | All | When in use | 65 |
| Industrial premises | All | When in use | 70 |

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.

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40dB LAeq(1hr).

3.2 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events 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 the following criteria, a detailed maximum noise level event assessment should be undertaken:

- $L_{Aeq}(15min)$ 40dB or the prevailing RBL plus 5dBA, whichever is the greater, and/or
- L_{Amax} 52dB or the prevailing RBL plus 15dBA, whichever is the greater,

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.

The NPI defines a residence as a lawful and permanent structure in a land use zone that permits for residential use and is not associated with a commercial undertaking such as a motel or hotel. Notwithstanding, to ensure temporary occupants within commercial residences, such as motels, hotels and holiday parks, are not affected by sleep disturbance a maximum noise level assessment should be undertaken.

The NPI outlines that additional guidance on maximum noise level assessments may be sourced from the EPA NSW Road Noise Policy (RNP). Section 5.4 of the RNP outlines that a maximum internal noise level of 50-55dBA is unlikely to awaken people from sleep. Taking into account a 10dB loss for a partially open window an external level of 65dBA is unlikely to awaken internal occupants. This level has been adopted to assess the impact of maximum noise events on occupants of commercial residential land uses to safeguard against sleep disturbance. The recommended amenity noise level for the night period will be adopted for awakening assessment for these receivers.

3.3 Road Noise Policy

The road traffic noise criteria are provided in the Department of Environment, Climate Change and Water NSW (DECCW), Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts.

Road noise criteria relevant to this assessment are presented in detail in **Section 5.3** and the operational road traffic assessment results are presented in **Section 7.3**.

4 Existing Environment

A key element in assessing environmental noise impacts is understanding the existing ambient environment and background noise levels at the closest and/or potentially most affected receivers to the project.

4.1 Potentially Sensitive Receivers

MAC has identified the following receivers that may be affected by noise from the project. **Table 3** presents a summary of receiver identification, type, address and coordinates. These are reproduced visually in **Figure 1**.

| Table 3 Noise Sensitive Receivers | | | | | |
|-----------------------------------|----------------------|--------------------------|-----------------------------|----------------------|----------|
| ID | Type | Previous ID ¹ | Description Address | Coordinates (MGA 55) | |
| | | | | Easting | Northing |
| R01 | | R-NCA02-B | 25 Silo Rd | 276123 | 6529930 |
| R02 | | R-NCA03 | 35 Single St Cnr North St | 276181 | 6529560 |
| R03 | | R-NCA06-A | 73 Coronation Ave | 276174 | 6529092 |
| R04 | | R-NCA09-B | 99 Single St | 276125 | 6528559 |
| R05 | | R-NCA09-C | 105 Single St Cnr Gordon St | 276095 | 6528430 |
| R06 | | R-NCA12 | Cnr Single St/Kurrara St | 276057 | 6528226 |
| R07 | | R-NCA14 | 1758 Werris Creek Rd | 276040 | 6528022 |
| R08 | Suburban Residential | R-NCA04 | 42 Henry St | 276374 | 6529537 |
| R09 | | R-NCA07 | 86 Coronation Ave | 276318 | 6529077 |
| R10 | | R-NCA10-A | 96 Henry St | 276301 | 6528943 |
| R11 | | R-NCA10-B | 142 Henry St | 276254 | 6528544 |
| R12 | | R-NCA13 | 17 Kurrara St | 276237 | 6528205 |
| R13 | | R-NCA08-B | 43 Downton St | 275729 | 6528633 |
| R14 | | R-NCA08-A | 174 Loco St | 275755 | 6529017 |
| R18 | | R-NCA11-B | 16 West St | 276123 | 6529930 |
| R15 | | R-NCA15-B | 21 West St | 274816 | 6528883 |
| R16 | Rural Residential | R-NCA15-C | 19 West St | 274790 | 6528719 |
| R17 | | R-NCA15-D | 274 Escott Rd | 275067 | 6527989 |

Table 3 Noise Sensitive Receivers

| ID | Type | Previous ID ¹ | Description Address | Coordinates (MGA 55) | |
|------|-------------------|--------------------------|-----------------------|----------------------|----------|
| | | | | Easting | Northing |
| C01 | Commercial | R-NCA06-B | Commercial/Shops | 276179 | 6529264 |
| C02 | | R-NCA09-A | Commercial Hotel | 276168 | 6528962 |
| I01 | Industrial | R-NCA01-A | Railway | 275024 | 6529575 |
| I02 | | R-NCA15-A | Water Treatment Plant | 275410 | 6529501 |
| I03 | | R-NCA05 | Railway Yard | 275963 | 6529226 |
| I04 | | R-NCA11-A | ARTC | 275856 | 6528277 |
| AR01 | Active Recreation | R-NCA01-B | Golf Club | 274909 | 6529826 |

Note 1: Identifier in historic assessment (ERM Report 0452237RP01_F05 September 2018).

4.2 Historic Noise Monitoring

Background noise levels were sourced from the historic assessment (ERM Report 0452237RP01_F05 September 2018) and are reproduced in **Table 4**.

Table 4 Unattended Noise Monitoring Results

| Monitoring Location | Period ¹ | Measured Background Level | Measured Ambient Noise Level |
|---------------------|---------------------|---------------------------|------------------------------|
| | | RBL dB LA90 | dB LAeq |
| L01 Single St | Day | 37 | 47 |
| | Evening | 33 | 43 |
| | Night | 31 ¹ | 43 |
| L02 Downton St | Day | 27 | 44 |
| | Evening | 34 | 45 |
| | Night | 41 | 48 |

Note 1: Reported value in the historic report was 30.45dBA. Typically, values are not reported to more than one decimal place which results in 31dBA when rounded to the nearest whole number as required by NPI methodology.

4.3 Supplementary 2019 Noise Monitoring

Additional unattended noise monitoring was conducted in October 2019 to measure background noise levels at receivers without line of sight to be affected by road traffic on Werris Creek Road/Single Street and rail noise.

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". Measurements were carried out using a Svantek 977 noise analyser from Tuesday 8 October 2019 to Tuesday 15 October 2019. 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 receivers in the area have been classified under the EPA's suburban amenity category. This criterion is used in conjunction with the intrusiveness criteria to determine the limiting criteria. A summary of measured background noise levels and are summarised in in **Table 5**.

| Table 5 Unattended Noise Monitoring Results | | | |
|--|---------------------|---------------------------|------------------------------|
| Monitoring Location | Period ¹ | Measured Background Level | Measured Ambient Noise Level |
| | | RBL dB LA90 | dB LAeq |
| L03 Dewhurst St | Day | 31 | 48 |
| | Evening | 27 | 45 |
| | Night | 23 | 43 |

Detailed results for historic and supplementary unattended noise monitoring including Assessment Background Levels (ABLs) are contained in **Appendix B**.

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5 Assessment Criteria

5.1 Operational Noise Criteria

5.1.1 Project Intrusiveness Noise Levels

The PINLs for the residential receivers are presented in **Table 6** and have been determined based on the review of the historic monitoring data. PINLs are not applicable to non residential receivers including hotels and motels.

Table 6 Intrusiveness Noise Levels

| Receiver | Period ¹ | Ref Meas Data | Measured RBL dB LA90 | Adopted RBL ² dB LA90 | PINL dB LAeq(15min) |
|---|---------------------|---------------|-------------------------|-------------------------------------|------------------------|
| Rural | Day | | n/a | 35 | 40 |
| Residential Receivers R15-R17 | Evening | NPI Default | n/a | 30 | 35 |
| | Night | | n/a | 30 | 35 |
| Suburban Residential Receivers Single St R02-R07 | Day | | 37 | 37 | 42 |
| | Evening | L01 | 33 | 33 | 38 |
| | Night | | 31 | 31 | 36 |
| Suburban Residential Receivers Henry St R08-R12 | Day | | 31 | 31 | 36 |
| | Evening | L03 | 27 | 30 ² | 35 |
| | Night | | 23 | 30 ² | 35 |
| Suburban Residential Receivers R01, R13, R14, R18 | Day | | 27 | 35 ² | 40 |
| | Evening | L02 | 34 | 34 | 39 |
| | Night | | 41 | 34 ³ | 39 |

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: Where the measured RBL is less than 35dBA for the day period, is set to 35dBA, and where the measured RBL is less than 30dBA for the evening and night, is set to 30dBA.

Note 3: Section 2.3 of the NPI recommends that the PINL for evening be set at no greater than the PINL for daytime and that the PINL for night-time should be no greater than the PINL for day or evening.

5.1.2 Project Amenity Noise Levels

The PANLs for residential receivers potentially affected by the project are presented in **Table 7**.

| Table 7 Project Amenity Noise Levels | | | | | |
|--------------------------------------|--------------------|--------------------------------|---|--------------------------------------|-------------------------------------|
| Receiver Type | Noise Amenity Area | Assessment Period ¹ | Recommended ANL dB LAeq(period) ² | PANL dB LAeq(period) ³ | PANL dB LAeq(15min) ⁴ |
| Residential Receivers | Rural | Day | 50 | 45 | 48 |
| | | Evening | 45 | 40 | 43 |
| | | Night | 40 | 35 | 38 |
| Residential Receivers | Suburban | Day | 55 | 50 | 53 |
| | | Evening | 45 | 40 | 43 |
| | | Night | 40 | 35 | 38 |
| Hotels, Motels, caretakers | Suburban | Day | 60 | 55 | 58 |
| | | Evening | 55 | 50 | 53 |
| | | Night | 45 | 40 | 43 |
| Industrial | Industrial | When in Use | 70 | 65 | 68 |
| Commercial | Commercial | When in Use | 65 | 60 | 63 |
| Active Recreation | Active Recreation | When in Use | 55 | 50 | 53 |

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: PANL equals ANL minus 5dB.

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.

5.1.3 Project Noise Trigger Levels

The 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 Type | Assessment Period ¹ | PINL | PANL | PNTL |
| | | dB LAeq(15min) | dB LAeq(15min) | dB LAeq(15min) |
| Rural | Day | 40 | 48 | 40 |
| Residential Receivers R15-R17 | Evening | 35 | 43 | 35 |
| | Night | 35 | 38 | 35 |
| Suburban Residential Receivers Single St R02-R07 | Day | 42 | 53 | 42 |
| | Evening | 38 | 43 | 38 |
| | Night | 36 | 38 | 36 |
| Suburban Residential Receivers Henry St R08-R012 | Day | 36 | 53 | 36 |
| | Evening | 35 | 43 | 35 |
| | Night | 35 | 38 | 35 |
| Suburban Residential Receivers R01, R13, R14, R18 | Day | 40 | 53 | 40 |
| | Evening | 39 | 43 | 39 |
| | Night | 39 | 38 | 38 |
| Hotels, Motels, caretakers | Day | n/a | 58 | 58 |
| | Evening | n/a | 53 | 53 |
| | Night | n/a | 43 | 43 |
| Commercial | When in Use | N/A | 63 | 63 |
| Industrial | When in Use | N/A | 68 | 68 |
| Active Recreation | When in Use | N/A | 53 | 53 |

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.

5.2 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 and guidance provided in the RNP.

| Table 9 Maximum Noise Level Assessment Screening Criteria | | | |
|---|-----------|--------------------------|-----------|
| Rural Residential Receivers (R15-R17) and Suburban Residential Receivers Henry St (R08-R12) | | | |
| LAeq(15min) | | LAmax | |
| 40dB LAeq(15min) or RBL + 5dB | | 52dB LAmax or RBL + 15dB | |
| Trigger | 40 | Trigger | 52 |
| RBL30+5dB | 35 | RBL30+15dB | 45 |
| Highest | 40 | Highest | 52 |
| Suburban Residential Receivers Single St (R02-R07) | | | |
| LAeq(15min) | | LAmax | |
| 40dB LAeq(15min) or RBL + 5dB | | 52dB LAmax or RBL + 15dB | |
| Trigger | 40 | Trigger | 52 |
| RBL31+5dB | 36 | RBL31+15dB | 46 |
| Highest | 40 | Highest | 52 |
| Suburban Residential Receivers (R01, R13, R14, R18) | | | |
| LAeq(15min) | | LAmax | |
| 40dB LAeq(15min) or RBL + 5dB | | 52dB LAmax or RBL + 15dB | |
| Trigger | 40 | Trigger | 52 |
| RBL34+5dB | 39 | RBL34+15dB | 49 |
| Highest | 40 | Highest | 52 |
| Non-Residential Receivers (C02) | | | |
| LAmax | | | |
| 65 | | | |

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

5.3 Road Traffic Noise Criteria

The road traffic noise criteria are provided in the RNP. For this assessment, the 'local road' category, as specified in the RNP, has been adopted for West Street and Loco Street, and the 'arterial road' category has been adopted for Werris Creek Road/Single Street. Road noise criteria relevant to this assessment are presented in **Table 10** for residential receivers.

| Table 10 Road Traffic Noise Assessment Criteria for Residential Land Uses | | | | |
|---|----------------------------------|--|---------------------------|--------------------------|
| Road category | Road Name | Type of Project/Development | Assessment Criteria - dBA | |
| | | | Day (7am to 10pm) | Night (10pm to 7am) |
| Local Roads | West Street | Existing residences affected by additional traffic on existing local roads generated by land use developments | 55dBA LAeq(1hr) external | 50dBA LAeq(1hr) external |
| | Loco Street | | | |
| Freeway/arterial/sub-arterial road | Werris Creek Road/Single Street. | Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments | 60dBA LAeq(15hr) external | 55dBA LAeq(9hr) external |
| | | | | |

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dB, which is generally accepted as the threshold of perceptibility to a change in noise level.

5.3.1 Relative Increase Criteria

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers experiencing increases in total traffic noise levels above those presented in **Table 11** due to the addition of project vehicles on Werris Creek Road should be considered for mitigation. As discussed in the RNP, the relative increase criteria is not applicable to local roads.

| Table 11 Increase Criteria for Residential Land Uses | | | |
|--|---|--|---|
| Road Category | Type of Project/Development | Total Traffic Noise Level Increase, dBA | |
| | | Day (7am to 10pm) | Night (10pm to 7am) |
| Freeway/arterial/sub-arterial roads and transit ways | New road corridor/redevelopment or existing road/land use development with the potential to generate additional traffic on existing road. | Existing traffic LAeq(15hr) +12dB (external) | Existing traffic LAeq(9hr) +12dB (external) |

Note 1: Relative increase criteria is not applicable to local roads.

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6 Assessment Methodology

A computer model was developed to determine the impact of project noise emissions to neighbouring receivers for typical operations and activities. DGMR's iNoise (Version 2019.1) noise modelling software was used to assess potential noise impacts associated with the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at locations representative of realistic operational conditions for the project. Locations of modelled plant and equipment are presented in **Figure 2**.

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'.

6.1 Modelling Parameters & Assumed Mitigation

Mobile equipment sound power levels (L_w) were sourced from the historic assessment (ERM Report 0452237RP01_F05 September 2018). **Table 12** presents the equipment activity, quantity and L_w for each assessment scenario.

| Table 12 Equipment Sound Power Levels, L _w dBA re 10 ⁻¹² W | | | |
|--|-------------|----------------------------------|---------------------|
| Noise Source/Item | Utilisation | Quantity | Item L _w |
| Heavy Vehicle pass by | 66% | 2 per 15 minutes (1 in/1 out) | 96 |
| Heavy Vehicle at idle while unloading/loading | 33% | 1 | 94 |
| Container Forklift | 100% | 3 | 100 |
| Generator ¹ | 100% | 1 | 85 |
| Container Refrigeration (AC Power) | 100% | 4 | 88 |

Note 1: L_w 85dBA Atlas Copco Technical Data Sheet QAS 5 Series Portable Generators.

The noise barrier proposed in the historic assessment (ERM Report 0452237RP01_F05 September 2018) along the western boundary has been included in all calculations.



FIGURE 2
EQUIPMENT LOCATIONS
REF: MAC190870

6.1.1 Off Peak Extended Hours Truck Unloading and Loading

For normal operations, between 6am and 6pm, approximately eight trucks will enter the site, travel via the weighbridge to the loading/unloading area where a forklift will remove and replace a container before the truck exits via the weighbridge and onto Downton Street. Considering that the assessment period is 15 minutes, noise modelling has calculated the emissions from one truck entry and exit for a duration of ten minutes and the unloading and loading operation (with truck idling) occurring for five minutes for one forklift.

6.1.2 Peak (Harvest) Extended Hours Truck Unloading and Loading

For peak (harvest season) operations between 6am and 6pm, approximately 20 trucks will enter the site, travel via the weighbridge to the loading/unloading area where a forklift will remove and replace a container before the truck exits via the weighbridge and onto Downton Street. The potential for noise emissions for this scenario is the same as for the off peak scenario except that the arrival, unloading loading and departure cycle will occur for two 15 minute periods during any hour between 6pm and 6am.

6.1.3 Meteorological Parameters

Noise emissions from industry can be significantly affected by prevailing weather conditions. Wind has the potential to increase noise at a receiver when it is at low velocities and travels from the direction of the noise source. As the strength of the wind increases, the noise produced by the wind will mask the audibility of most industrial sources. Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions (night only). This assessment has adopted the meteorological conditions used in the historic assessment (ERM) and are summarised in **Table 13**.

| Table 13 Meteorological Conditions for Noise Modelling | | | | | |
|--|-------------|-----------------------|-------------------|-----------------|---|
| Assessment Period | Temperature | Wind Speed /Direction | Relative Humidity | Stability Class | |
| Standard Conditions | Daytime | 20°C | | | |
| | Evening | 16°C | Calm | 60% | D |
| | Night | 10°C | | | |
| Noise Enhancing Conditions | Daytime | 20°C | | | |
| | Evening | 16°C | S 3m/s | 60% | D |
| | Evening | 16°C | SE 3m/s | 60% | D |
| | | | S 3m/s | 60% | D |
| | Night | 10°C | SE 3m/s | 60% | D |
| | | SE 2m/s (Drainage) | 60% | F | |

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7 Results

7.1 Predicted Noise Levels

Noise levels were predicted at each receiver at a height of 1.5m above ground level. As discussed in Section 6.1.1 and 6.1.2, noise emission levels from either off peak or peak operations are the same for any 15-minute period during the evening and night time period (6pm to 6am). Predicted evening and night time noise levels for standard conditions for the proposed operational scenarios (off peak and peak) are below the PNTLs for all assessed receivers and are presented in **Table 14**.

Table 14 Predicted Operational Noise Levels –Standard Conditions

| ID | Predicted Noise Level | PNTL Evening | PNTL Night | Compliance Achieved |
|------|-----------------------|----------------|----------------|------------------------|
| | dB LAeq(15min) | dB LAeq(15min) | dB LAeq(15min) | |
| R01 | <30 | 39 | 38 | Yes |
| R02 | <30 | 38 | 36 | Yes |
| R03 | <30 | 38 | 36 | Yes |
| R04 | 33 | 38 | 36 | Yes |
| R05 | 33 | 38 | 36 | Yes |
| R06 | 30 | 38 | 36 | Yes |
| R07 | <30 | 38 | 36 | Yes |
| R08 | <30 | 35 | 35 | Yes |
| R09 | <30 | 35 | 35 | Yes |
| R10 | 30 | 35 | 35 | Yes |
| R11 | 30 | 35 | 35 | Yes |
| R12 | <30 | 35 | 35 | Yes |
| R13 | 37 | 39 | 38 | Yes |
| R14 | <30 | 39 | 38 | Yes |
| R15 | <30 | 35 | 35 | Yes |
| R16 | <30 | 35 | 35 | Yes |
| R17 | <30 | 35 | 35 | Yes |
| R18 | <30 | 39 | 38 | Yes |
| C01 | <30 | 63 | 63 | Yes |
| C02 | 31 | 53 | 43 | Yes |
| I01 | <30 | 68 | 68 | Yes |
| I02 | <30 | 68 | 68 | Yes |
| I03 | <30 | 68 | 68 | Yes |
| I04 | 39 | 68 | 68 | Yes |
| AR01 | <30 | 53 | 53 | Yes |

The highest predicted evening and night time noise levels for noise enhancing conditions (prevailing winds or temperature inversion with drainage) for the proposed operational scenario are below the PNTLs for all assessed receivers and are presented in **Table 15**.

It is noted that to avoid exceedance of the PNTL, only one truck and one forklift can operate during the night time period.

Table 15 Predicted Operational Noise Levels –Noise Enhancing Conditions

| ID | Predicted Noise Level dB LAeq(15min) | PNTL Evening dB LAeq(15min) | PNTL Night dB LAeq(15min) | Compliance Achieved |
|------|---|--------------------------------|------------------------------|------------------------|
| R01 | <30 | 39 | 38 | Yes |
| R02 | <30 | 38 | 36 | Yes |
| R03 | 32 | 38 | 36 | Yes |
| R04 | 34 | 38 | 36 | Yes |
| R05 | 33 | 38 | 36 | Yes |
| R06 | 30 | 38 | 36 | Yes |
| R07 | <30 | 38 | 36 | Yes |
| R08 | <30 | 35 | 35 | Yes |
| R09 | 31 | 35 | 35 | Yes |
| R10 | 32 | 35 | 35 | Yes |
| R11 | 30 | 35 | 35 | Yes |
| R12 | <30 | 35 | 35 | Yes |
| R13 | 38 | 39 | 38 | Yes |
| R14 | 32 | 39 | 38 | Yes |
| R15 | <30 | 35 | 35 | Yes |
| R16 | <30 | 35 | 35 | Yes |
| R17 | <30 | 35 | 35 | Yes |
| R18 | <30 | 39 | 38 | Yes |
| C01 | 30 | 63 | 63 | Yes |
| C02 | 34 | 53 | 43 | Yes |
| I01 | <30 | 68 | 68 | Yes |
| I02 | <30 | 68 | 68 | Yes |
| I03 | 32 | 68 | 68 | Yes |
| I04 | 39 | 68 | 68 | Yes |
| AR01 | <30 | 53 | 53 | Yes |

7.2 Maximum Noise Level 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 112dBA was adopted to represent potential container impacts during unloading or loading activities.

Predicted noise levels from L_{Aeq}(15min) and L_{Amax} events for assessed receivers are presented in **Table 16**. Results identify that the maximum noise events screening criterion will be satisfied for all assessed receivers.

Table 16 Maximum Noise Level Assessment (Night)¹

| Receiver | Predicted Noise Level | | Screening Criteria | | Compliant |
|----------|-----------------------------|----------------------|-----------------------------|----------------------|-----------|
| | dB L _{Aeq} (15min) | dB L _{Amax} | dB L _{Aeq} (15min) | dB L _{Amax} | |
| R01 | <30 | 32 | 40 | 52 | ✓ |
| R02 | <30 | 35 | 40 | 52 | ✓ |
| R03 | <30 | 44 | 40 | 52 | ✓ |
| R04 | 33 | 46 | 40 | 52 | ✓ |
| R05 | 33 | 45 | 40 | 52 | ✓ |
| R06 | 30 | 41 | 40 | 52 | ✓ |
| R07 | <30 | 38 | 40 | 52 | ✓ |
| R08 | <30 | 34 | 40 | 52 | ✓ |
| R09 | <30 | 43 | 40 | 52 | ✓ |
| R10 | 30 | 45 | 40 | 52 | ✓ |
| R11 | 30 | 42 | 40 | 52 | ✓ |
| R12 | <30 | 39 | 40 | 52 | ✓ |
| R13 | 37 | 50 | 40 | 52 | ✓ |
| R14 | <30 | 45 | 40 | 52 | ✓ |
| R15 | <30 | 34 | 40 | 52 | ✓ |
| R16 | <30 | 34 | 40 | 52 | ✓ |
| R17 | <30 | 35 | 40 | 52 | ✓ |
| R18 | <30 | 36 | 40 | 52 | ✓ |
| C02 | 31 | 47 | N/A | 65 | ✓ |

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.

7.3 Road Traffic Noise Results

The proposed transport route will be from Werris Creek Road, either from the north (using the proposed U-turn) or the south onto West Street to Loco Street where they enter the site. Predicted LAeq(1hr) noise levels from project related traffic at the closest receiver on all roads on the route has been completed using the United States (US) Environment Protection Agency's road traffic calculation method and are presented in **Table 17** (off peak) and **Table 18** (peak).

Table 17 Predicted Road Traffic Noise Levels – Off Peak

| Road Name | Nearest Offset | | Period | Predicted Noise Level | RTN Criteria | Comply |
|-------------------------------------|----------------------|--|--------|-----------------------|----------------|--------|
| | Distance to Receiver | | | | | |
| West Street/Loco Street | 10m | | Night | 44dB LAeq(1hr) | 50dB LAeq(1hr) | Yes |
| Werris Creek Road/ Single Street | 10m | | Night | 43dB LAeq(9hr) | 55dB LAeq(9hr) | Yes |

Table 18 Predicted Road Traffic Noise Levels – Peak (Harvest)

| Road Name | Nearest Offset | | Period | Predicted Noise Level | RTN Criteria | Comply |
|-------------------------------------|----------------------|--|--------|-----------------------|----------------|--------|
| | Distance to Receiver | | | | | |
| West Street/Loco Street | 10m | | Night | 47dB LAeq(1hr) | 50dB LAeq(1hr) | Yes |
| Werris Creek Road/ Single Street | 10m | | Night | 48dB LAeq(9hr) | 55dB LAeq(9hr) | Yes |

Results demonstrate that project related road traffic noise levels would satisfy the relevant RNP criteria.

8 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by Crawford's Freightlines Pty Ltd (Crawford's) to complete a Noise Impact Assessment (NIA) for the proposed extension to operating hours for the Werris Creek Intermodal Freight Terminal at Werris Creek, NSW.

The assessment has quantified potential noise emissions associated with the operation of the project. The results of the assessment shows that noise levels associated with the proposed activities are expected to satisfy the NPI PNTLs at all assessed receivers.

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

Additionally, the NIA demonstrates that the road noise criteria as specified in the RNP will be satisfied at all receivers on the proposed transport route.

Based on the NIA results, there are no noise related issues which would prevent the approval of the project.

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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.

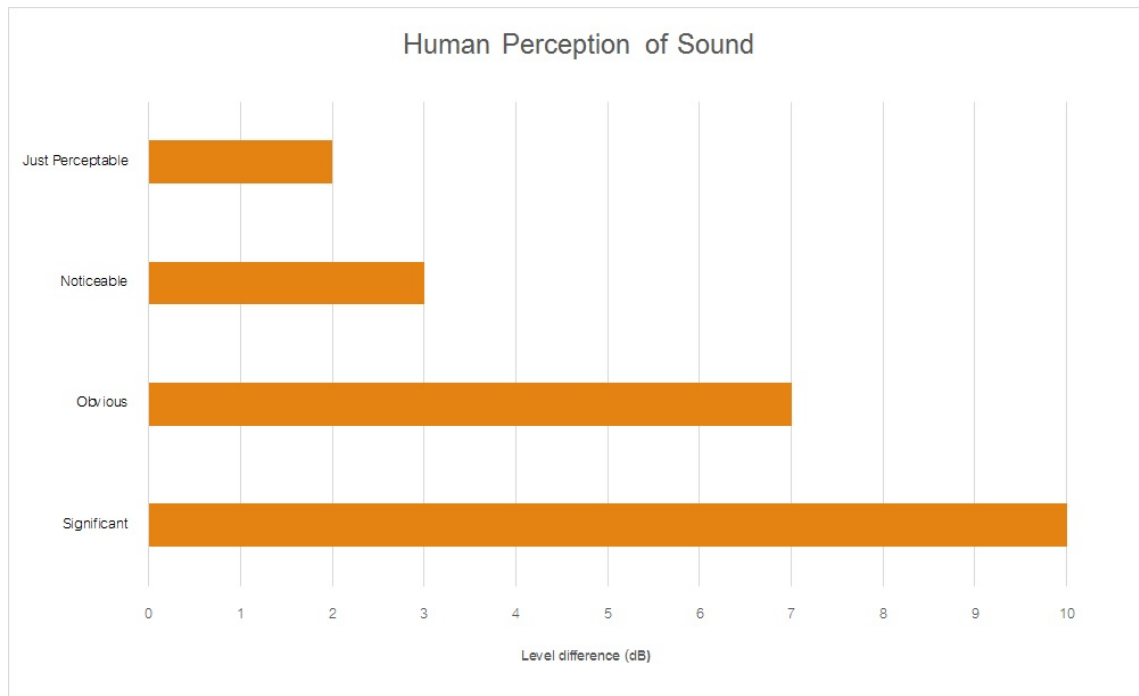
| Table A1 Glossary of Terms | |
|-------------------------------------|---|
| Term | Description |
| 1/3 Octave | Single octave bands divided into three parts |
| Octave | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. |
| 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 L90 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. |
| 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 _{ax} | 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 and Vibration Assessment purposes and is the median of the ABL's. |
| Sound power level (L _w) | 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 : $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W₀ 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



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Appendix B – Unattended Noise Monitoring Data

B1 Historic Unattended Noise Monitoring Results (ERM Report 0452237RP01_F05)

Table 3.2 Unattended Noise Logging (L01)

| Date | Measured Existing Noise Levels, in dBA | | | | | | | | |
|--------------------------------------|--|--------------------------|-----------------------------|---------------------------|--------------------------|-----------------------------|---------------------------|--------------------------|-----------------------------|
| | L90, 11 hour (Daytime) | L90, 4 hour (Evening) | L90, 9 hour (Night-time) | Leq, 11 hour (Daytime) | Leq, 4 hour (Evening) | Leq, 9 hour (Night-time) | Leq, 15 hour (Daytime) | Leq, 1 hour (Daytime) | Leq, 1 hour (Night-time) |
| Wednesday, 14 March 2018 | - | 31.20 | 28.86 | - | 42.77 | 43.00 | 45.54 | 48.00 | 45.43 |
| Thursday, 15 March 2018 | 37.40 | 34.45 | 28.60 | 47.10 | 44.05 | 41.84 | 46.47 | 47.61 | 43.47 |
| Friday, 16 March 2018 | 36.42 | 31.65 | 30.56 | 46.24 | 43.63 | 43.07 | 45.66 | 47.56 | 46.05 |
| Saturday, 17 March 2018 | 35.21 | 32.65 | 31.80 | 45.82 | 42.54 | 42.44 | 45.14 | 47.31 | 44.00 |
| Sunday, 18 March 2018 | (35.62) | 32.45 | 31.02 | (46.72) | 43.69 | 43.68 | 45.70 | 47.15 | 46.25 |
| Monday, 19 March 2018 | 37.13 | 34.95 | 32.18 | 47.67 | - | 43.78 | 47.00 | - | 46.59 |
| Tuesday, 20 March 2018 | (37.66) | - | (30.34) | (48.87) | (42.92) | (44.34) | - | - | 47.35 |
| Wednesday, 21 March 2018 | - | (32.73) | - | - | (38.60) | - | 45.64 | 47.58 | - |
| Thursday, 22 March 2018 | - | - | 27.65 | - | - | 41.26 | - | - | 42.66 |
| Friday, 23 March 2018 | (36.90) | - | - | (47.25) | - | - | 47.25 | 48.25 | - |
| Overall L90 and Leq Values | 36.78 | 32.65 | 30.45 | 47.19 | 42.87 | 43.03 | 46.11 | 48.11 | 46.36 |
| Assessment L90 and Leq Values | 37.00 | 33.00 | 30.00 | 47.00 | 43.00 | 43.00 | 46.00 | 48.00 | 46.00 |

1. Brackets e.g. "(35.0)" indicate that a full dataset was not captured for the entire period but the value recorded is considered representative. Dash "-" indicates that either a) the data has been excluded (due to weather or other influences) or b) no data was recorded.

Table 3.3 Unattended Noise Logging (L02)

| Date | Measured Existing Noise Levels, in dBA | | | | | | | | |
|--------------------------------------|--|--------------------------|-----------------------------|---------------------------|--------------------------|-----------------------------|---------------------------|--------------------------|-----------------------------|
| | L90, 11 hour (Daytime) | L90, 4 hour (Evening) | L90, 9 hour (Night-time) | Leq, 11 hour (Daytime) | Leq, 4 hour (Evening) | Leq, 9 hour (Night-time) | Leq, 15 hour (Daytime) | Leq, 1 hour (Daytime) | Leq, 1 hour (Night-time) |
| Wednesday, 14 March 2018 | (26.85) | 36.80 | 40.96 | (40.09) | - | 48.36 | - | 51.22 | 49.44 |
| Thursday, 15 March 2018 | 26.90 | 35.15 | 41.26 | 42.00 | 47.51 | 46.76 | 44.26 | 47.89 | 48.34 |
| Friday, 16 March 2018 | 27.07 | 34.25 | - | - | 44.07 | - | 45.70 | 58.59 | 51.43 |
| Saturday, 17 March 2018 | 28.92 | 31.40 | 41.20 | - | 42.49 | 49.05 | 44.95 | 58.80 | 50.77 |
| Sunday, 18 March 2018 | (29.62) | 31.75 | 39.08 | (44.79) | 46.86 | 46.87 | 46.78 | 50.78 | 49.31 |
| Monday, 19 March 2018 | 27.01 | 29.60 | 40.82 | 42.04 | 46.35 | 48.99 | 43.71 | 46.82 | 52.30 |
| Tuesday, 20 March 2018 | (29.22) | (38.16) | - | (44.89) | (42.53) | - | 44.59 | 44.48 | 53.59 |
| Wednesday, 21 March 2018 | - | - | (37.44) | (44.30) | (42.05) | (47.50) | 42.94 | 43.86 | 51.58 |
| Thursday, 22 March 2018 | - | - | 31.05 | - | - | 44.85 | - | - | 48.98 |
| Friday, 23 March 2018 | - | - | - | (46.84) | - | - | 46.84 | 48.95 | - |
| Overall L90 and Leq Values | 27.07 | 34.25 | 40.82 | 44.06 | 45.08 | 47.69 | 45.17 | 49.32 | 49.99 |
| Assessment L90 and Leq Values | 35.00² | 30.00² | 30.00² | 44.00 | 45.00 | 48.00 | 45.00 | 49.00 | 50.00 |

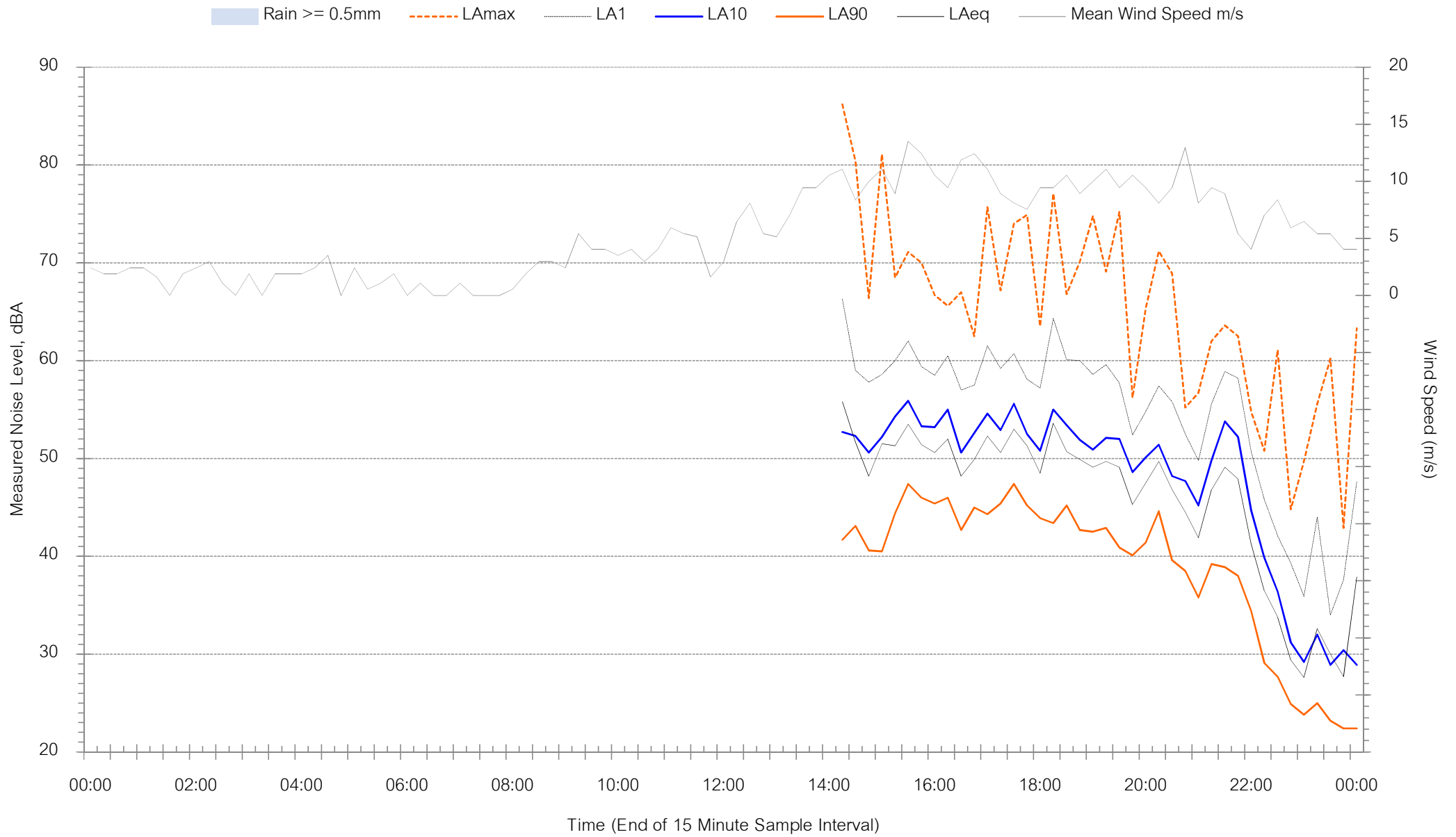
1. Brackets "(35.0)" indicate that a full dataset was not captured for the entire period but the value recorded is considered representative. Dash "-" indicates that either a) the data has been excluded (due to weather or other influences) or b) no data was recorded.
2. The NPI, 2017 minimum assumed rating background noise level applies.

| Supplementary Unattended Monitoring October 2019 (MAC 2019) | | | | | | |
|--|-------------|-----------------|---------------|-----------|-------------|-----------|
| Measured Noise Levels, dBA | | | | | | |
| Date | ABL Day L90 | ABL Evening L90 | ABL Night L90 | Leq Day | Leq Evening | Leq Night |
| Tuesday-8-Oct-19 | -- | 36.0 | 23.2 | -- | 48.8 | 43.6 |
| Wednesday-9-Oct-19 | 31.0 | 26.7 | 23.2 | 47.5 | 43.3 | 43.1 |
| Thursday-10-Oct-19 | 29.0 | 26.4 | 23.2 | 46.7 | 42.7 | 42.0 |
| Friday-11-Oct-19 | 30.9 | 28.6 | 26.2 | 49.9 | 46.2 | 40.6 |
| Saturday-12-Oct-19 | 30.4 | 24.3 | 22.3 | 46.0 | 48.2 | 42.2 |
| Sunday-13-Oct-19 | 29.3 | 25.8 | 23.5 | 47.5 | 46.5 | 42.2 |
| Monday-14-Oct-19 | 32.1 | 28.9 | 27.6 | 48.7 | 46.3 | 47.0 |
| Tuesday-15-Oct-19 | 31.8 | -- | -- | 51.7 | -- | -- |
| RBL and Leq Overall | 31 | 27 | 23 | 48 | 45 | 43 |



Background Noise Levels

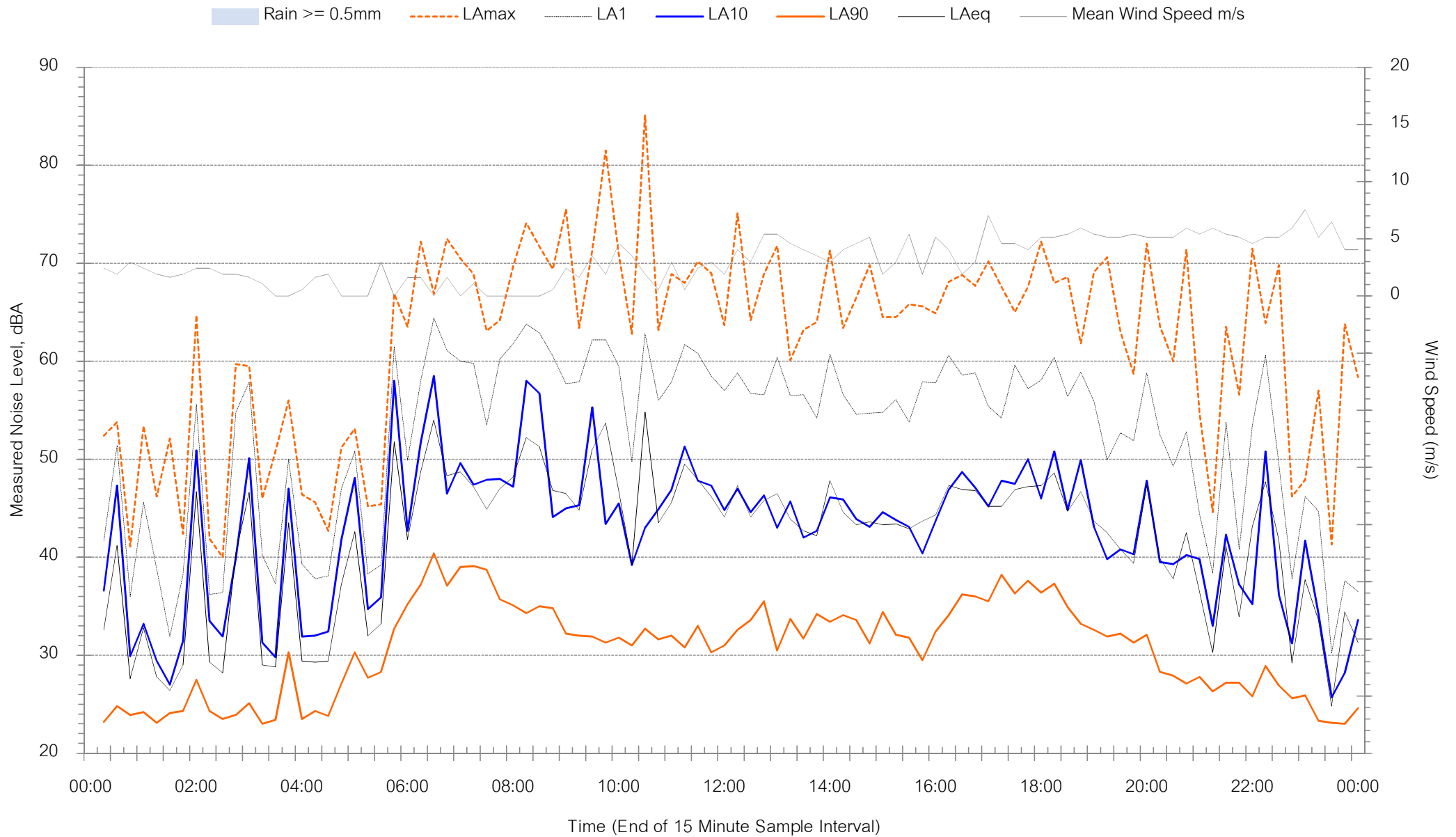
96a Dewhurst Street - Tuesday 8 October 2019





Background Noise Levels

96a Dewhurst Street - Wednesday 9 October 2019

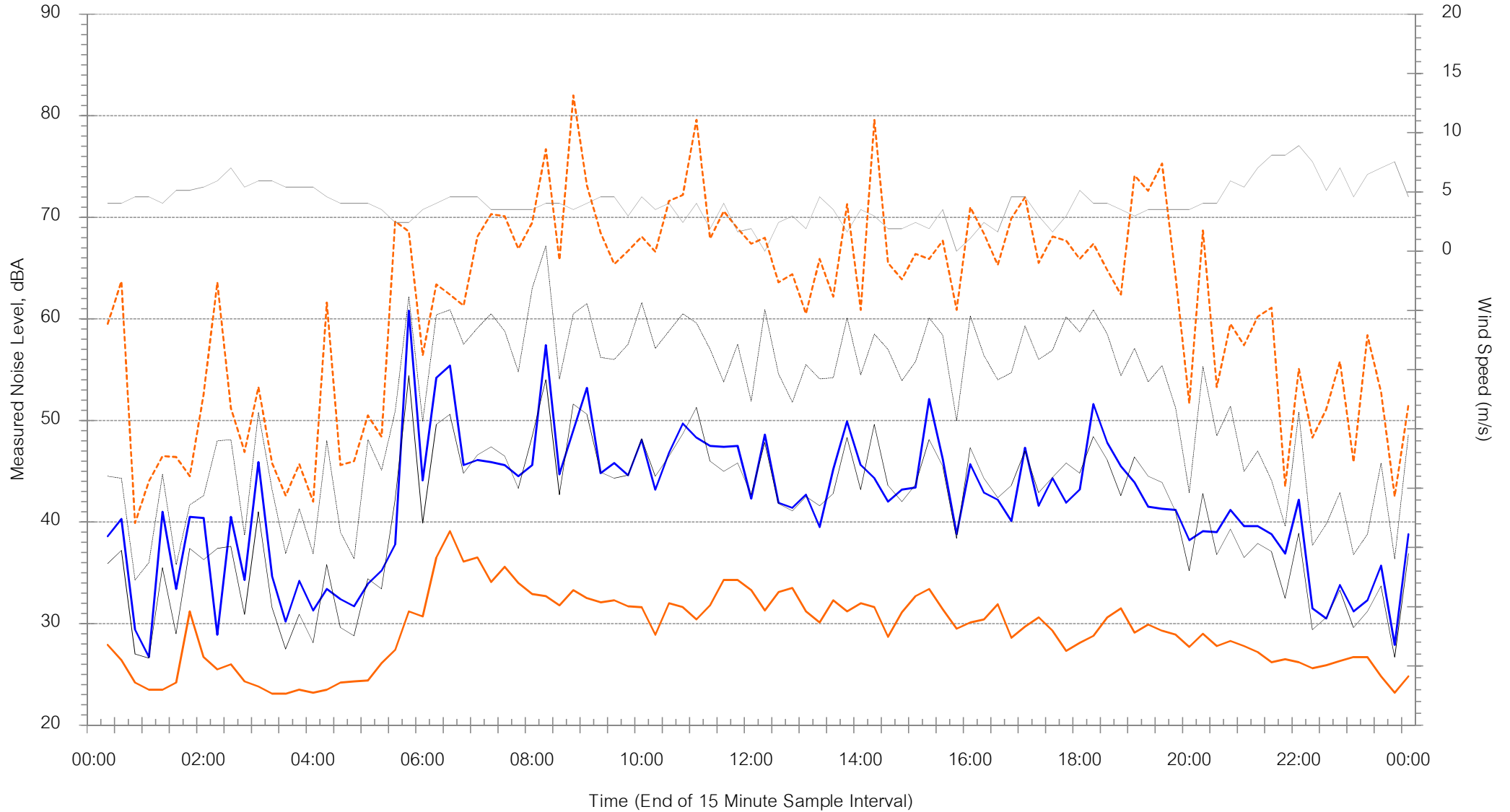




Background Noise Levels

96a Dewhurst Street - Thursday 10 October 2019

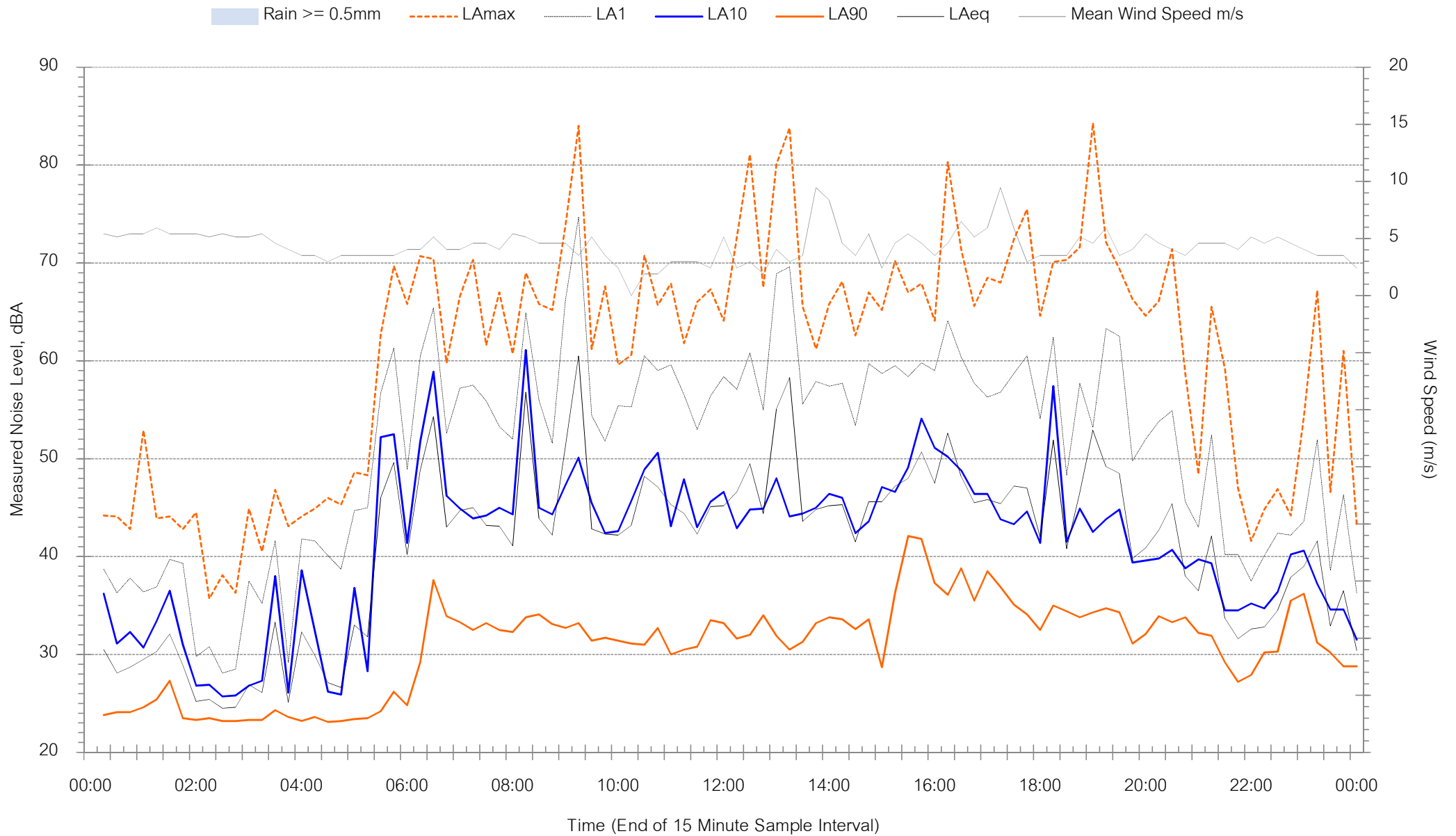
Rain >= 0.5mm LAmx LA1 LA10 LA90 LAeq Mean Wind Speed m/s





Background Noise Levels

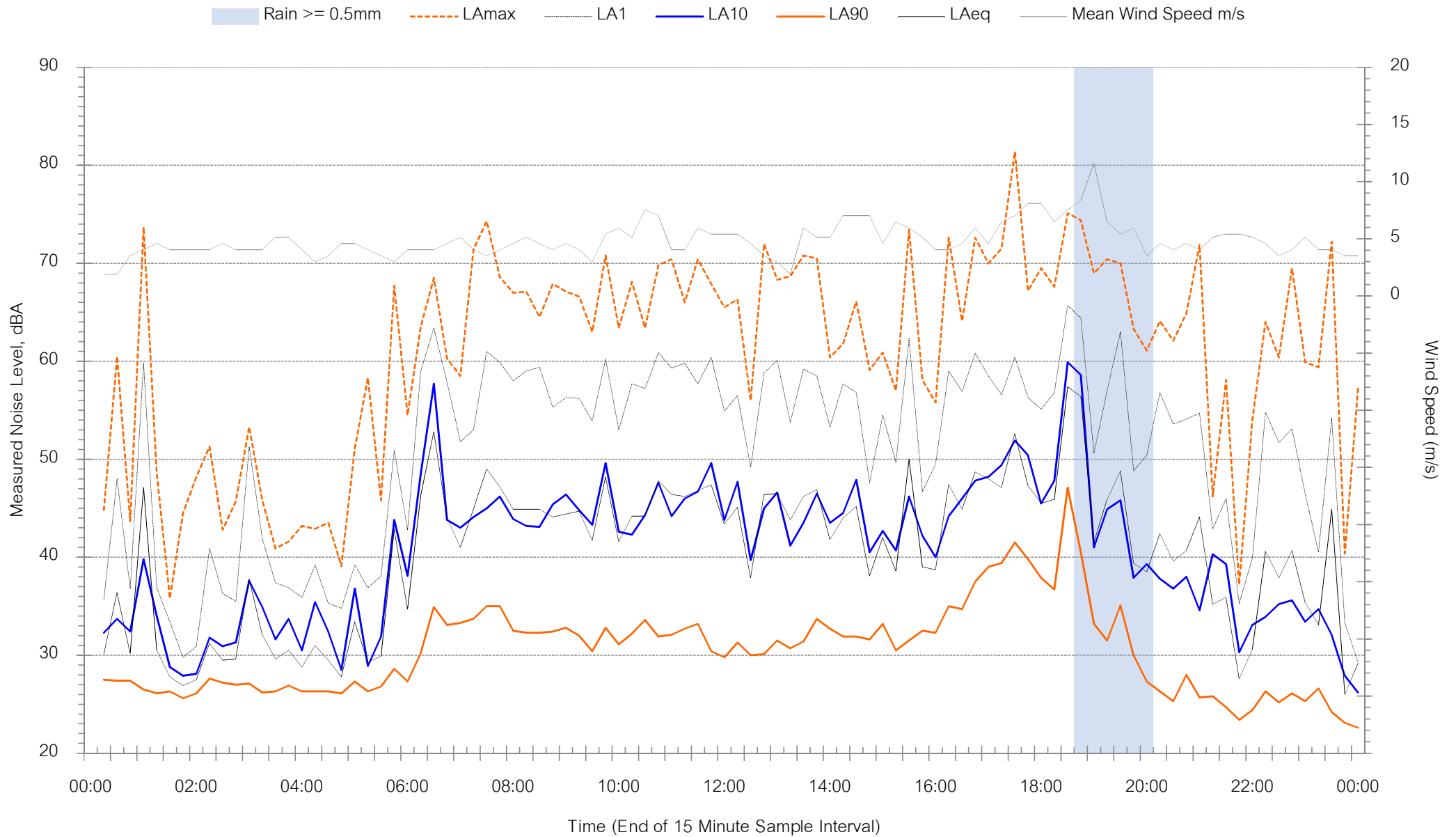
96a Dewhurst Street - Friday 11 October 2019





Background Noise Levels

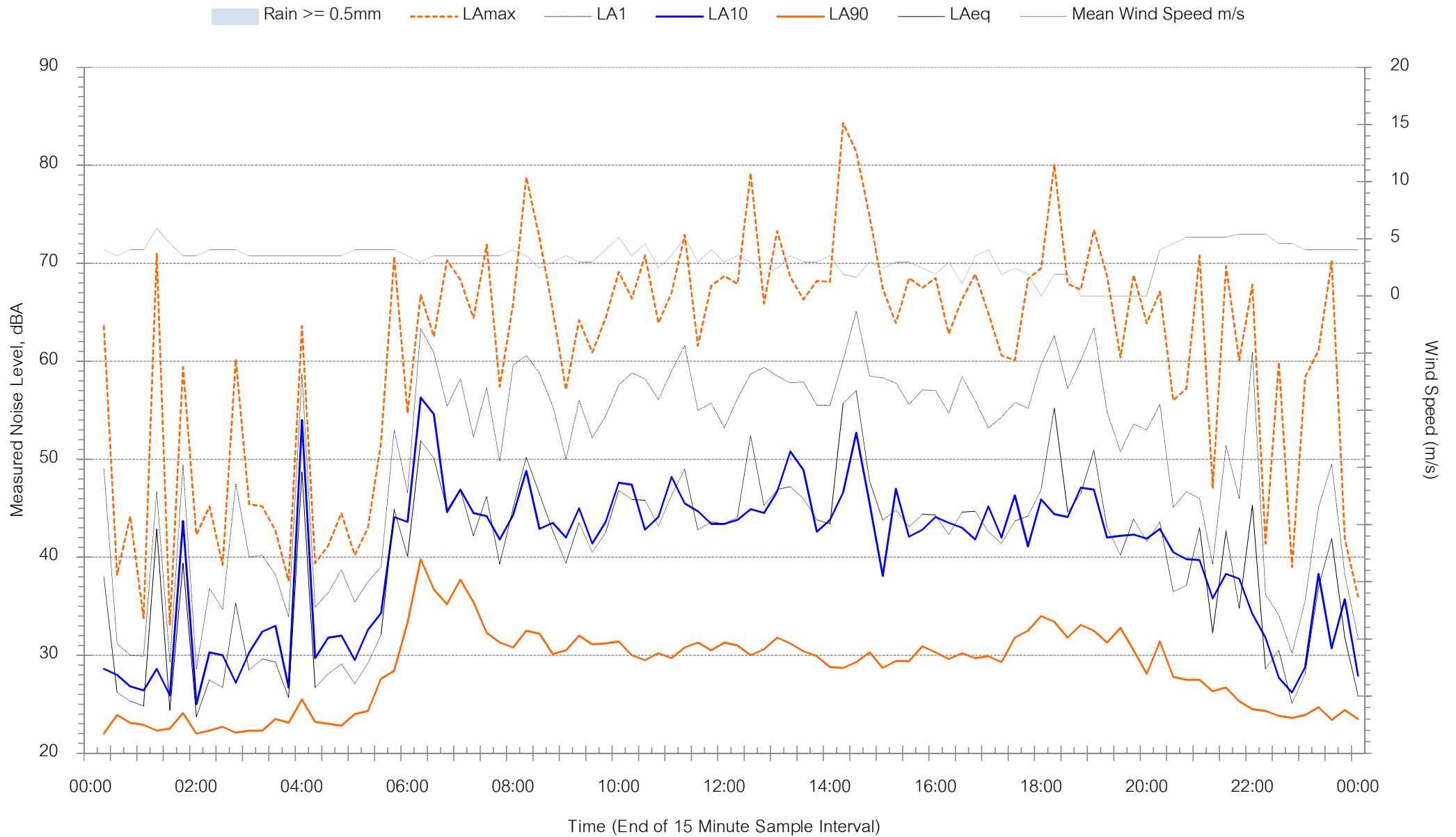
96a Dewhurst Street - Saturday 12 October 2019





Background Noise Levels

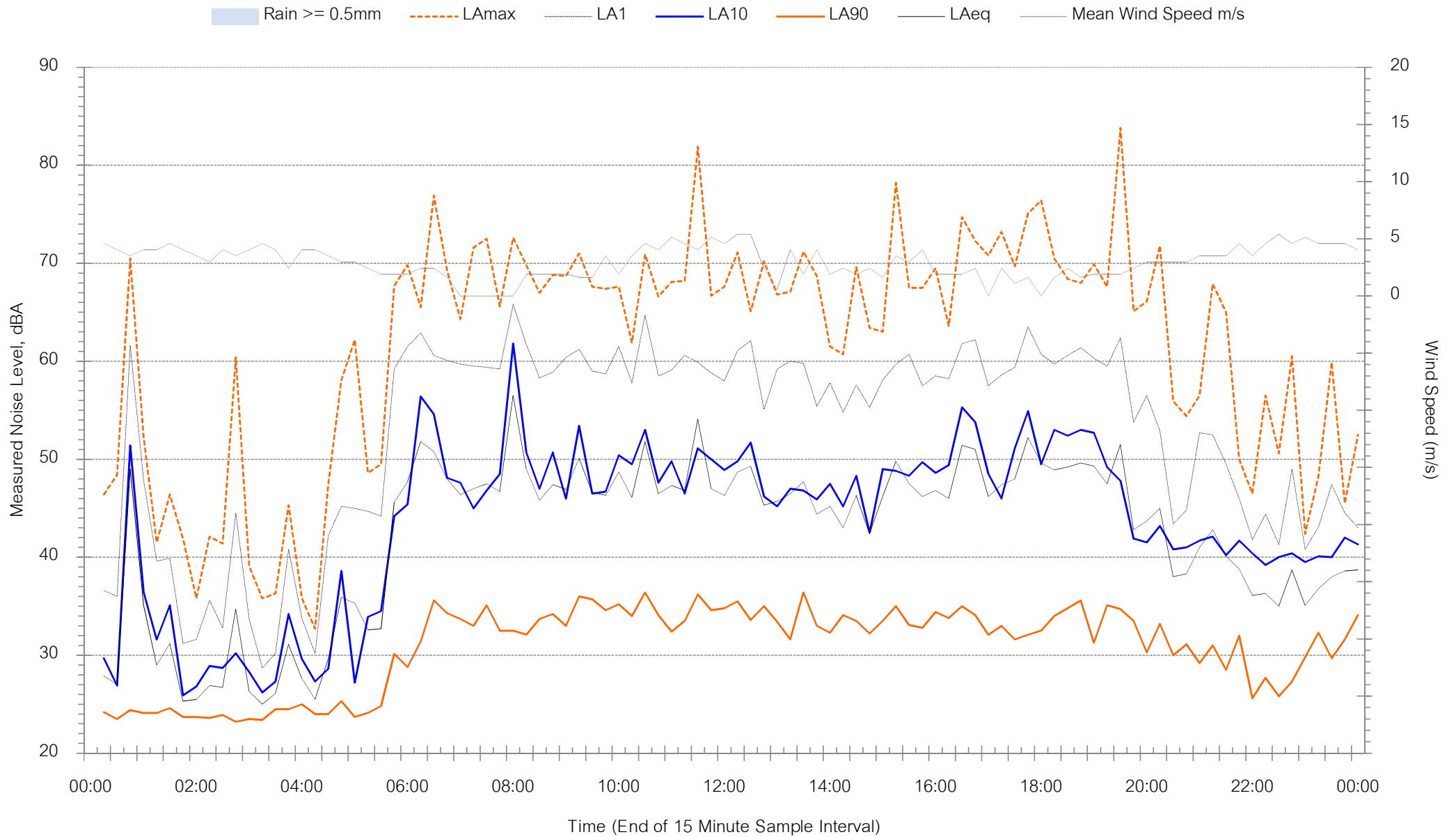
96a Dewhurst Street - Sunday 13 October 2019





Background Noise Levels

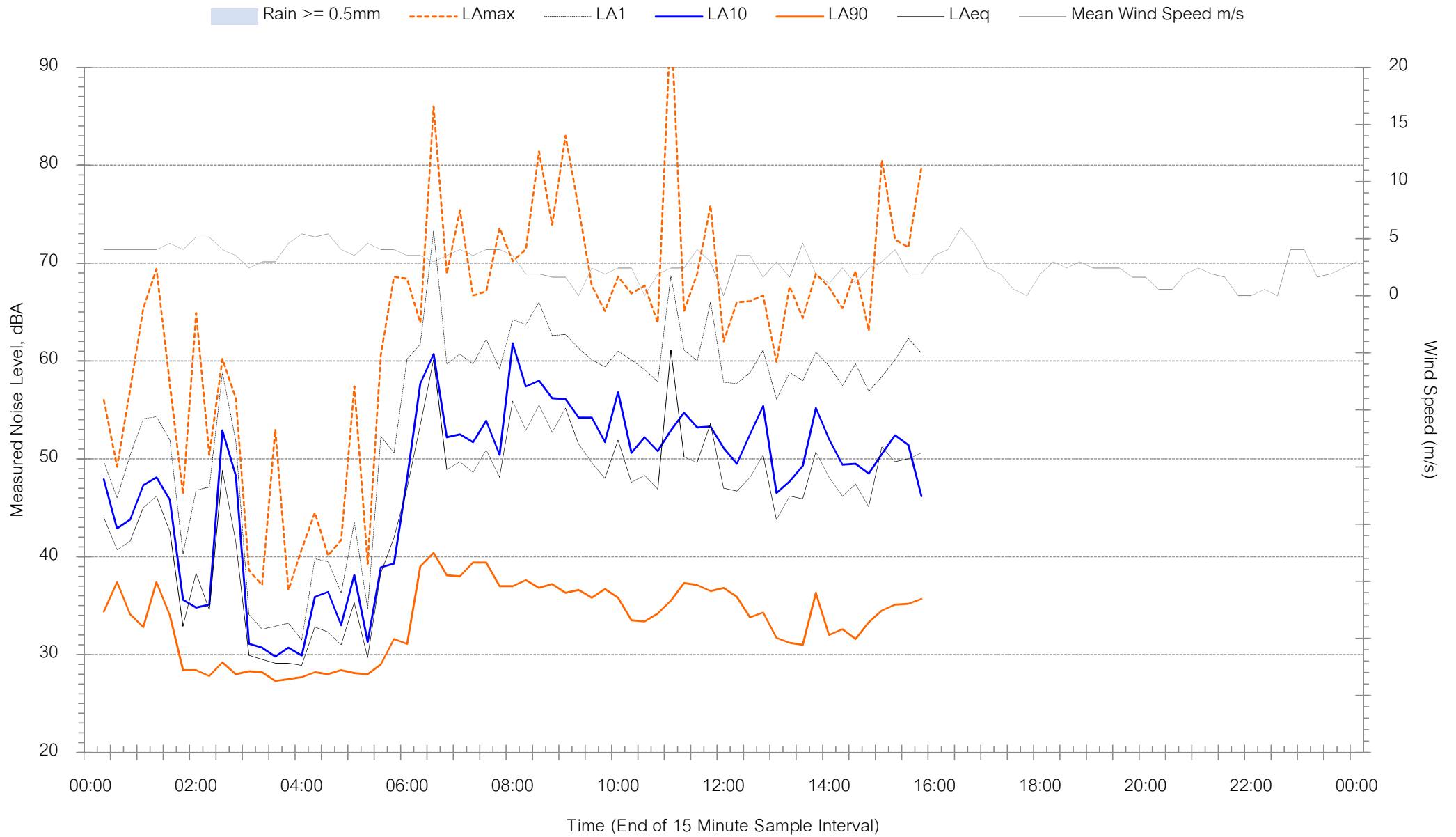
96a Dewhurst Street - Monday 14 October 2019





Background Noise Levels

96a Dewhurst Street - Tuesday 15 October 2019



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