

# DONALDSON AND ABEL COAL MINES

**Quarterly Noise Monitoring  
Quarter Ending March 2019**

**Prepared for:**

Donaldson Coal Pty Ltd  
PO Box 675  
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## BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Donaldson Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

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## DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
Q73-630.01053-R1D1	24 January 2020	Jordan Murray	Martin Davenport	Martin Davenport

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# 1 Introduction

## 1.1 Background

Donaldson Coal Pty Ltd has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct quarterly noise monitoring surveys for the Donaldson Coal Mine and Abel Coal Mine during the December 2018 quarter in accordance with the Abel Mine Project Noise Monitoring Program, dated 12 August 2014.

## 1.2 Objectives of this Report

The objectives of the noise monitoring survey for this operating quarter were as follows:

- Measure the ambient noise levels at six focus receptor locations (potentially worst affected) surrounding Donaldson Coal Mine and Abel Coal Mine.
- Qualify all sources of noise within each of the attended surveys, including estimated contribution or maximum level of individual noise sources.
- Assess the noise emissions of Donaldson Coal Mine and Abel Coal Mine with respect to the limits contained in the Development Consent.

## 1.3 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

# 2 Development Consent Project Approval

Development consent was obtained by Donaldson Coal Pty Ltd for the Donaldson Mine in October 1999 following a Commission of Inquiry. Development Consent number N97/00147 was issued by the Minister for Urban Affairs pursuant to Section 101 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Project Approval (Application No. 05\_0136) granted by the Minister of Planning was obtained by Donaldson Coal Pty Ltd for Abel Coal Mine in 2007.

## 2.1 Donaldson Coal Mine Development Consent Conditions

The Development Consent nominates hours of operation and mine noise emission goals in the Sections entitled “*Operation of Development, Condition No. 3(1) and 3(2)*”, and “*Noise and Vibrational Noise Limits: Condition No. 15*” as follows:

3.(1) *Subject to (2) the approved hours of operation are as follows:*

<i>Works</i>	<i>Period</i>	<i>Hours</i>
<i>Construction, including construction of any bunds</i>	<i>Monday to Friday Saturday</i>	<i>7 am to 6 pm 8 am to 1 pm</i>
<i>Mining operations, including mining, haulage of waste to dumps and coal processing</i>	<i>Monday to Friday Saturday, Sunday</i>	<i>24 hours per day 7 am to 6 pm</i>
<i>Road Transportation and stockpiling of coal</i>	<i>7 days per week</i>	<i>24 hours per day</i>
<i>Rail loading of coal</i>	<i>7 days per week</i>	<i>7 am to 10 pm</i>
<i>Maintenance of mobile and fixed plant</i>	<i>7 days per week</i>	<i>24 hours per day</i>
<i>Blasting, not involving closure of John Renshaw Drive</i>	<i>Monday to Saturday</i>	<i>7 am to 5 pm</i>
<i>Blasting, involving closure of John Renshaw Drive</i>	<i>Monday to Saturday</i>	<i>10 am to 2 pm</i>

Notes: *Restrictions on Public Holidays are the same as Sundays*

(2) *The Applicant shall submit a report to the Director-General’s satisfaction demonstrating the noise limits in Condition 15 can be met while rail loading of coal is occurring during the period from 6 pm to 10 pm. If that report does not demonstrate that the noise limits can be met to the Director-General’s satisfaction, then the hours of operation for rail loading of coal shall be restricted to 7 am to 6 pm.”*

15. Unless subject to a negotiated agreement in accordance with Condition 23, the Applicant shall ensure that the noise emission from construction or mining operations, when measured or computed at the boundary of any dwelling not owned by the applicant (or within 30 metres of the dwelling, if the boundary is more than 30 metres from the dwelling), shall not exceed the following noise limits:

Location	LA10(15minute) Noise Limits (dBA)	
	Daytime	Night-time
Beresfield area (residential)	45	35
Steggles Poultry Farm	50	40
Ebenezer Park Area	46	41
Black Hill Area	40	38
Buchanan and Louth Park Area	38	36
Ashtonfield Area	41	35
Thornton Area	48	40

Note: Daytime is 7 am to 10 pm Monday-Saturday, and 8 am to 10 pm Sundays and Public Holidays. Night-time is 10 pm to 7 am Monday-Saturday, and 10 pm to 8 am Sundays and Public Holidays.

*The noise limits apply for prevailing meteorological conditions (winds up to 3 m/s), except under conditions of temperature inversions.”*

Other Conditions of Consent relevant to noise are as follows:

18. The applicant shall survey and investigate noise reduction measures from plant and equipment and set targets for noise reduction in each Annual Environmental Management Report (AEMR), taking into consideration valid noise complaints received in the previous year. The Report shall also include remedial measures.
19. The Applicant shall revise the Noise Management Plan as necessary and provide an updated Plan five years after commencement of mining to the Director-General, the independent noise expert (Condition 48), EPA, Councils and the Community Consultative Committee.

## 2.2 Abel Coal Mine – Project Approval

### Approved Operations

The following operations are approved under the Abel Coal Mine Project Approval:

- Extraction of up to 6.1 Mtpa of Run of Mine (ROM) coal from the Abel Underground Coal Mine.
- Transport coal to the existing Bloomfield Coal Handling and Preparation Plant by private haul roads, or by coal conveyor, or by a combination of both methods.
- Operate the Bloomfield Coal Handling Processing Plant (CHPP) to process coal extracted from the Abel Coal Mine and the Bloomfield and Donaldson Coal Mines.
- Transportation of product coal from the Bloomfield site by rail via the Bloomfield rail loading facility.

The Project Approval was modified in June 2010 (05\_0136 MOD 1) allowing construction and operation of a downcast ventilation fan. In May 2011 the Project Approval was modified again (05\_0136 MOD 2) to allow the construction and operation of an upcast ventilation fan (and associated facilities). In December 2013 the Project Approval was further modified (05\_0136 MOD3) to account for the increase in coal extracted including the upgrade of the Bloomfield CHPP.

### Consent Conditions

The relevant conditions relating to noise from the Abel Coal Mine approval are reproduced below.

#### Schedule 4

#### NOISE

#### Operational Noise Criteria

1. The Proponent shall ensure that the noise generated by the Project does not exceed the criteria in Table 4 at any residence on privately-owned land.

Table 4: Operational Noise Criteria dB(A)

Location	Receiver Area	Day	Evening	Night	
		LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
Location I	Lord Howe Drive, Ashtonfield	36	36	36	45
Location K	Catholic Diocese Land	37	37	37	45
Location L	Kilshanny Avenue Ashtonfield	40	40	40	47
All other Locations	All other privately owned Residences	35	35	35	45

Notes:

- To interpret the locations referred to in Table 4, see plan in Appendix 3 (Appendix A).
- Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

These noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.



### Construction Noise Criteria

- The proponent shall ensure that the noise generated during the construction of the downcast ventilation shaft as described in EA (MOD3) does not exceed the criteria in Table 5.

Table 5: Construction Noise Criteria dB(A)

Location	Receiver	Day
		LAeq(15minute)
Location R	281 Lings Road, Buttai	50
Location S	189 Lings Road, Buttai	43

Notes:

- The criteria in Table 5 apply only whilst the downcast ventilation shaft is being constructed, and for a maximum of 12 weeks from the commencement of construction.
- To interpret the locations referred to in Table 5, see plan in Appendix 3 (attached to this report as **Appendix A**).
- Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.

However, these noise criteria do not apply if the Proponent has an Agreement with the relevant landowner to generate higher noise levels, and the proponent has advised the Department in writing of the terms of this agreement.

### Rail Noise Criteria

- The proponent shall ensure that the noise from rail movements on the Bloomfield Rail Spur does not exceed the limits in Table 6 at any residence on privately owned land.

Table 6: Rail Spur noise criteria dB (A)

Location	Day	Evening	Night
	LAeq(period)		
All privately-owned land	55	45	40

### Cumulative Noise Criteria

- The proponent shall implement all reasonable and feasible measures to ensure that the noise generated by the project combined with noise generated by other mines does not exceed the criteria in Table 7 at any residence on privately-owned land.

Table 7: Cumulative noise criteria dB (A)

Location	Day	Evening	Night
	LAeq(period)		
All privately-owned land	55	45	40

Notes: Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including meteorological conditions), of the NSW Industrial Noise Policy. Appendix 4 sets out the metrological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

## **Operating Conditions**

1. *The proponent shall:*
  - a. *Implement best management practise to minimise the construction, operational, road and rail noise of the project;*
  - b. *Operate an on-site noise management system to ensure compliance with the relevant conditions of this approval;*
  - c. *Minimise the noise impacts of the project during meteorological conditions under which the noise limits in this consent do not apply (see Appendix 4);*
  - d. *Only receive and/or dispatch locomotives and rolling stock either on or from the site that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL (No. 3142);*
  - e. *Carry out regular monitoring to determine whether the project is complying with the noise criteria and other relevant conditions of approval, to the satisfaction of the Director-General.*

## **Noise Management Plan**

2. *The proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:*
  - a. *Be prepared in consultation with the EPA, and be submitted to the Director-General for approval within 6 months of the date of approval of MOD 3;*
  - b. *Describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval; Describe the proposed noise management system in detail; and*
  - c. *Include a monitoring program that:*
    - *Uses attended monitoring to evaluate the compliance of the project against the noise criteria in this approval;*
    - *Evaluates and reports on:*
      - *The effectiveness of the on-site noise management system; and*
      - *Compliance against the noise operating conditions; and*

*Defines what constitutes a noise incident, and includes protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents. Appendix 4*

## **Noise Compliance Assessment**

### **Applicable Meteorological Conditions**

1. *The noise criteria in Tables 4 and 7 are to apply under all metrological conditions except the following:*
  - a. *During periods of rain or hail.*
  - b. *Average wind speed at microphone height exceeds 5 m/s;*
  - c. *Wind speeds greater than 3 m/s measured at 10m above ground level; or*
  - d. *Temperature inversion conditions greater than 3°C/100m.*

### **Determination of metrological conditions**

2. *Except for wind speed at microphone height, the data to be used for determining metrological conditions shall be that recorded by the meteorological station located on the site.*

### **Compliance monitoring**

3. *Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.*
4. *Unless otherwise agreed with the director-general, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:*
  - a. *Monitoring locations for the collection of representative noise data;*
  - b. *Metrological conditions during which collection of noise data is not appropriate;*
  - c. *Equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and*
  - d. *Modification to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.*

## **Appendix 5**

### **Statement of Commitments**

#### **3. Noise**

##### **3.1 Construction Activities**

*The following noise control measures will be implemented prior to commencement of construction of the Abel Underground Mine or the upgrade of the Bloomfield CHPP.*

1. *Maintain all machinery and equipment in working order;*
  - a. *No construction activities at the Abel pit top will take place on Sundays or Public Holidays;*
  - b. *Where possible locate noisy site equipment behind structures that act as barriers or at the greatest distance from noise sensitive areas; and*
  - c. *Orientate equipment so that noise emissions are directed away from noise sensitive areas.*

##### **3.2 Noise Control Measures**

- a. *The following noise control measures will be implemented prior to the mining of coal from the Abel underground Mine:*
  - i. *Orientation of the ventilation fans away from residential receivers and angle the output parallel to the ground.*
  - ii. *The sound power level of the front end loader to be used near the portal should not exceed 113 dBA and will be fitted with a noise sensitive reversing alarm.*
- b. *The following noise control measures will be implemented prior to the Bloomfield CHPP receiving any ROM coal from Able Underground Mine;*

- 
- i. *Noise mitigation works including partial enclosure and noise screening of drives and conveyors of the Bloomfield CHPP to screen residences to the north of the site.*

### **3.2 Monitoring**

*The Company will implement a Noise Monitoring Program for the Abel Underground Mine and the Bloomfield CHPP, to the satisfaction of the Director-General. The Noise Monitoring Program shall include a combination of real-time and supplementary attended monitoring measures, and a noise monitoring protocol for evaluating compliance with the noise environmental assessment. This plan will be integrated with the monitoring plans for the Tasman, Donaldson and Bloomfield Mines to provide a single integrated Noise Monitoring Program for all 4 mines.*

### **3.4 Continuous Improvement**

*The Company shall:*

- a. *Report on these investigations and implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director General.*

*The operator of the Bloomfield CHPP shall:*

- b. *Investigate ways to reduce the noise generated by the Bloomfield CHPP, including maximum noise levels which may result in sleep disturbance;*
- c. *Implement all reasonable and feasible best practice noise mitigation measures on the site;  
and*
- d. *Report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR, to the satisfaction of the Director-General.*

## 3 Noise Monitoring Methodology

### 3.1 General Requirements

The operational noise monitoring program was conducted with reference to Development Consent N97/00147 (Donaldson Coal Mine), Project Approval 05\_0136 (Abel Coal Mine), and in accordance with SLR's Report 630.01053.01300-R1 dated 12 August 2014 (*Noise Management Plan Abel Underground Mine*) and AS 1055-1997 *Acoustics - Description and Measurement of Environmental Noise*.

All acoustic instrumentation employed throughout the monitoring program has been designed to comply with the requirements of AS IEC 61672.1 – 2004 *Electroacoustics—Sound level meters – Specifications*, AS IEC 61672.2-2004, AS IEC 61672.3-2004 and carried current NATA or manufacturer calibration certificates. Certificates for acoustic instrumentation used during the March 2019 quarter is provided in **Appendix B**.

Instrument calibration was conducted before and after each measurement, with the variation in calibrated levels not exceeding  $\pm 0.5$  dBA.

### 3.2 Monitoring Locations

Baseline and preceding operational quarterly surveys have been conducted at 11 locations surrounding the Donaldson Mine and Abel Coal Mine sites. With the experience of these previous surveys, it was decided to concentrate noise monitoring at six focus locations that represent the potentially most noise affected areas from Donaldson Mine and Abel Coal Mine. The details of the monitoring locations are contained within **Table 1**.

It is relevant to note that Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Therefore, compliance noise monitoring for the Donaldson Open Cut Mine is no longer required.

Furthermore, Abel mine was placed in Care & Maintenance on 28<sup>th</sup> April 2016 and there was no operations onsite during the December 2018 noise monitoring period.

**Table 1 Monitoring Locations**

Noise Monitoring Location	Description
D	Black Hill School, Black Hill
F	Lot 684 Black Hill Road, Black Hill
G	156 Buchannan Road, Buchannan
I	Magnetic Drive, Ashtonfield
J	Parish Drive, Thornton
L	Kilshanny Ave, Ashtonfield

A map giving the approximate location of the noise monitoring sites is contained within **Appendix C**.

### 3.3 Unattended Continuous Noise Monitoring

An environmental noise logger was deployed for a minimum of seven days between Wednesday 13 March 2019 and Thursday 21 March 2019 at each of the nominated locations given in **Table 1**.

All unattended monitoring equipment was programmed to continuously record statistical noise level indices in 15 minute intervals including the  $L_{Amax}$ ,  $L_{A1}$ ,  $L_{A10}$ ,  $L_{A90}$ ,  $L_{A99}$ ,  $L_{Amin}$  and  $L_{Aeq}$ . The statistical noise exceedance levels ( $L_{AN}$ ) are the levels exceeded for N% of the 15 minute interval. The  $L_{A90}$  represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level. The  $L_{A10}$  is the level exceeded for 10% of the time and is usually referred to as the average maximum noise level. The  $L_{Aeq}$  is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The  $L_{Amax}$  is the maximum noise level recorded over the interval.

### 3.4 Operator Attended Noise Monitoring

Operator attended surveys were conducted at each of the six monitoring locations during the daytime, evening and night-time periods, to verify the unattended logging results and to determine the character and contribution of ambient noise sources.

## 4 Operator Attended Noise Monitoring

### 4.1 Results of Operator Attended Noise Monitoring

Operator attended noise measurements were conducted during the evening and night-time period on Tuesday 26 March 2019 and Wednesday 27 March 2019. Operator attended noise measurements were conducted during the daytime period on Wednesday 13 March 2019 and Thursday 21 March 2019. All operator attended noise surveys were conducted using a Brüel & Kjær 2250L integrating sound level meter (s/n: 3003389).

Results of the operator attended noise measurements are given in **Table 2** to **Table 7**.

Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and mine operations as well as any other industrial operations.

The tables provide the following information:

- Monitoring location.
- Date and start time.
- Wind velocity (m/s) and Temperature (°C) at the measurement location.
- Typical maximum ( $L_{Amax}$ ) and contributed noise levels.

Mine contributions listed in the tables are from the Abel Coal Mine and are stated only when a contribution could be quantified.

**Table 2 Location D, Black Hill School, Black Hill**

Period	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	13/03/2019 13:00 26°C 2 m/s SE	78	68	56	44	56	Road traffic 50-78 Birdsong 45-60 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 18:14 23°C 1.5 m/s SE	72	63	57	40	53	Road traffic 41-72 Birdsong 51-62 School air-conditioner 39 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	26/03/2019 22:00 18°C 1 m/s S	79	58	43	39	57	Insects 38 Traffic 40-79 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					

**Table 3 Location F, Lot 684 Black Hill Road, Black Hill**

Period	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	13/03/2019 13:30 26°C 1 m/s SSE	83	66	56	45	55	Road Traffic 49-83 Birdsong 45-66 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 18:39 22°C 1 m/s SE	74	67	58	38	55	Road Traffic 51-74 Insects 47 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	26/03/2019 22:22 18°C 1 m/s S	68	64	55	33	52	Road traffic 42-68 Insects 39-41 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					



**Table 4 Location G, 156 Buchanan Road, Buchanan**

Period	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	13/03/2019 16:10 27°C 2 m/s SE	67	58	54	46	51	Wind related noise 60-67 Road traffic 45-60 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 19:54 20°C 1 m/s SE	71	66	62	37	57	Road traffic 38-71 Insects 38 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	27/03/2019 00:26 17°C 1 m/s SE	89	77	49	36	63	Road traffic 50-89 Insects 34 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					

**Table 5 Location I, Magnetic Drive, Ashtonfield**

Period	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	21/03/2019 11:15 25°C Calm	75	69	62	47	68	Road traffic 53-75 Birdsong 62-69 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 20:51 19°C 1 m/s SE	68	53	45	41	45	Road traffic 42-68 Insects 39 Domestic noise 46-51 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	27/03/2019 01:18 18°C 1 m/s S	70	58	50	36	47	Road traffic 40-48 Insects 36-38 Dog barking 68-70 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					

**Table 6 Location J, Parish Drive, Thornton**

Period	Date/ Start time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	21/03/2019 11:54 27°C 1 m/s SW	56	44	37	32	39	Electric fence 31-33 Birdsong 37-56 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 20:51 19°C 1 m/s SE	59	44	40	37	39	Road traffic 37-41 Insects 35 Animal 59 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	27/03/2019 01:45 18°C 1 m/s S	50	44	41	34	38	Road traffic 43-46 Insects 38-42 Animal 50 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					

**Table 7 Location L, Kilshanny Ave, Ashtonfield**

Period	Date/ Start time/ Period/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission, Typical Maximum Noise Levels (L <sub>Amax</sub> – dBA)
		L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>A10</sub>	L <sub>A90</sub>	L <sub>Aeq</sub>	
Day	13/03/2019 16:5624°C 2 m/s SE	74	61	56	42	52	Road traffic 40-74 Birdsong 53-61 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Evening	26/03/2019 20:26 19°C 1 m/s SE	80	65	47	41	59	Road traffic 41-80 Insects 42 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					
Night	27/03/2019 00:54 17°C 1 m/s SE	58	48	46	46	44	Road traffic 32-40 Insects 40-44 Dog barking 58 <b>Abel Mine Inaudible</b>
		Estimated Abel Mine Noise Contribution Inaudible					

## 4.2 Operator Attended Noise Monitoring Summary

### 4.2.1 Donaldson Mine

Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Therefore, compliance noise monitoring for the Donaldson Open Cut Mine is no longer required.

### 4.2.2 Abel Coal Mine

Abel mine was placed in Care & Maintenance on 28<sup>th</sup> April 2016 and there was no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

The Bloomfield CHPP stockpile area was not audible during all operator attended noise surveys. Noise generated by local and distant traffic was a significant contributor to ambient noise levels at all monitored locations as well as ‘natural’ noises such as birds, insects.

## 4.3 Compliance Assessment and Discussion of Results

### 4.3.1 Operations

Results of the operational compliance assessment are given in **Table 8**.

**Table 8 Compliance Noise Assessment – Operations**

Location	Estimated Abel LAeq(15minute) Contribution dBA			Consent Conditions			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
D – Black Hill School, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
F – Black Hill Road, Black Hill	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
I – Magnetic Drive, Ashtonfield	Inaudible	Inaudible	Inaudible	36	36	36	Yes	Yes	Yes
J – Parish Drive, Thornton	Inaudible	Inaudible	Inaudible	35	35	35	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	Inaudible	Inaudible	40	40	40	Yes	Yes	Yes

Results presented in **Table 8** indicate that compliance with the relevant consent conditions was achieved at all noise monitoring locations during all periods.

#### 4.3.2 Sleep Disturbance

Results of the sleep disturbance compliance assessment are given in **Table 9**.

**Table 9 Compliance Noise Assessment – Sleep Disturbance**

Location	Estimated Bloomfield LA1(1minute) Contribution dBA	Consent Conditions LA1(1minute) dBA	Compliance
D – Black Hill School, Black Hill	Inaudible	45	Yes
F – Black Hill Road, Black Hill	Inaudible	45	Yes
G – Buchanan Road, Buchanan	Inaudible	45	Yes
I – Lord Howe Drive, Ashtonfield	Inaudible	45	Yes
J – Parish Drive, Thornton	Inaudible	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	47	Yes

Results presented in **Table 9** indicate that compliance with the sleep disturbance consent conditions was achieved at all noise monitoring locations during the night-time noise surveys.

## 5 Unattended Continuous Noise Monitoring

### 5.1 Results of Unattended Continuous Noise Monitoring

Unattended continuous noise monitoring was conducted between 13 March 2019 and Monday 21 March 2019 at each of the six monitoring locations given in **Table 10**.

**Table 10 Noise Logger and Noise Monitoring Locations**

Location	Noise Logger Serial Number	Date of Logging
D – Black Hill School, Black Hill	ARL EL-316 16-207-050	13 March 2019 - 21 March 2019
F – Black Hill Road, Black Hill	ARL EL-316 16-203-505	13 March 2019 - 21 March 2019
G – Buchanan Road, Buchanan	ARL EL-316 16-203-508	13 March 2019 - 21 March 2019
I – Magnetic Drive, Ashtonfield	ARL EL-316 16-203-525	13 March 2019 - 21 March 2019
L – Kilshanny Ave, Kilshanny	ARL EL-316 16-103-494	13 March 2019 - 21 March 2019
J – Parish Drive, Thornton	SVAN 957 27522	13 March 2019 - 21 March 2019

The unattended ambient noise logger data from each monitoring location are presented graphically on a daily basis and are attached as **Appendix C**. A summary of the results of the unattended continuous noise monitoring is given in **Table 11**.

The ambient noise level data quantifies the overall noise level at a given location independent of its source or character.

The measured ambient noise levels were divided into three periods representing day, evening and night as designated in the NSW Noise Policy for Industry (NPfi).

Precautions were taken to minimise influences from extraneous noise sources (eg optimum placement of the loggers away from creeks, trees, houses, etc), however, not all these sources or their effects can be eliminated. This is particularly the case during the warmer times of year when noise from insects, frogs, birds and other animals can become quite prevalent.

Weather data for the subject area during the noise monitoring period was provided by Bloomfield Colliery. Noise data during periods of any rainfall and/or wind speeds in excess of 5 m/s were discarded in accordance with NPfi weather affected data exclusion methodology.

**Table 11 Unattended Continuous Noise Monitoring Ambient Noise Levels (dBA)**

Location	Period	Primary Noise Descriptor (dBA re 20 µPA)			
		LA1	LA10	LA90	LAeq
D Black Hill School, Black Hill	Day	68	58	41	58
	Evening	62	52	41	54
	Night	55	50	40	52
F Lot 684 Black Hill Road, Black Hill	Day	71	57	43	59
	Evening	63	53	35	54
	Night	59	52	33	52
G 156 Buchanan Road, Buchanan	Day	51	48	38	49
	Evening	48	45	36	45
	Night	45	41	32	44
I 49 Magnetic Drive, Ashtonfield	Day	71	63	44	67
	Evening	61	47	39	57
	Night	52	48	38	50
L 17 Kilshanny Ave, Ashtonfield	Day	33	53	33	52
	Evening	3	50	33	53
	Night	43	61	43	59
J 220 Parish Drive, Thornton <sup>1</sup>	Day	-	-	-	-
	Evening	-	-	-	-
	Night	-	-	-	-

1. Due to a technical error, no unattended monitoring data was available for Location J.

## 5.2 Long term Unattended Continuous Monitoring Summary for Donaldson Mine and Abel Coal Mine

### 5.2.1 Ambient LA90 Noise Levels

The long term ambient LA90 noise levels collected from each monitoring location are presented graphically in **Figure 1**, **Figure 2** and **Figure 3** for the daytime, evening and night-time periods respectively.

Figure 1 Long term Daytime LA90 Noise Levels

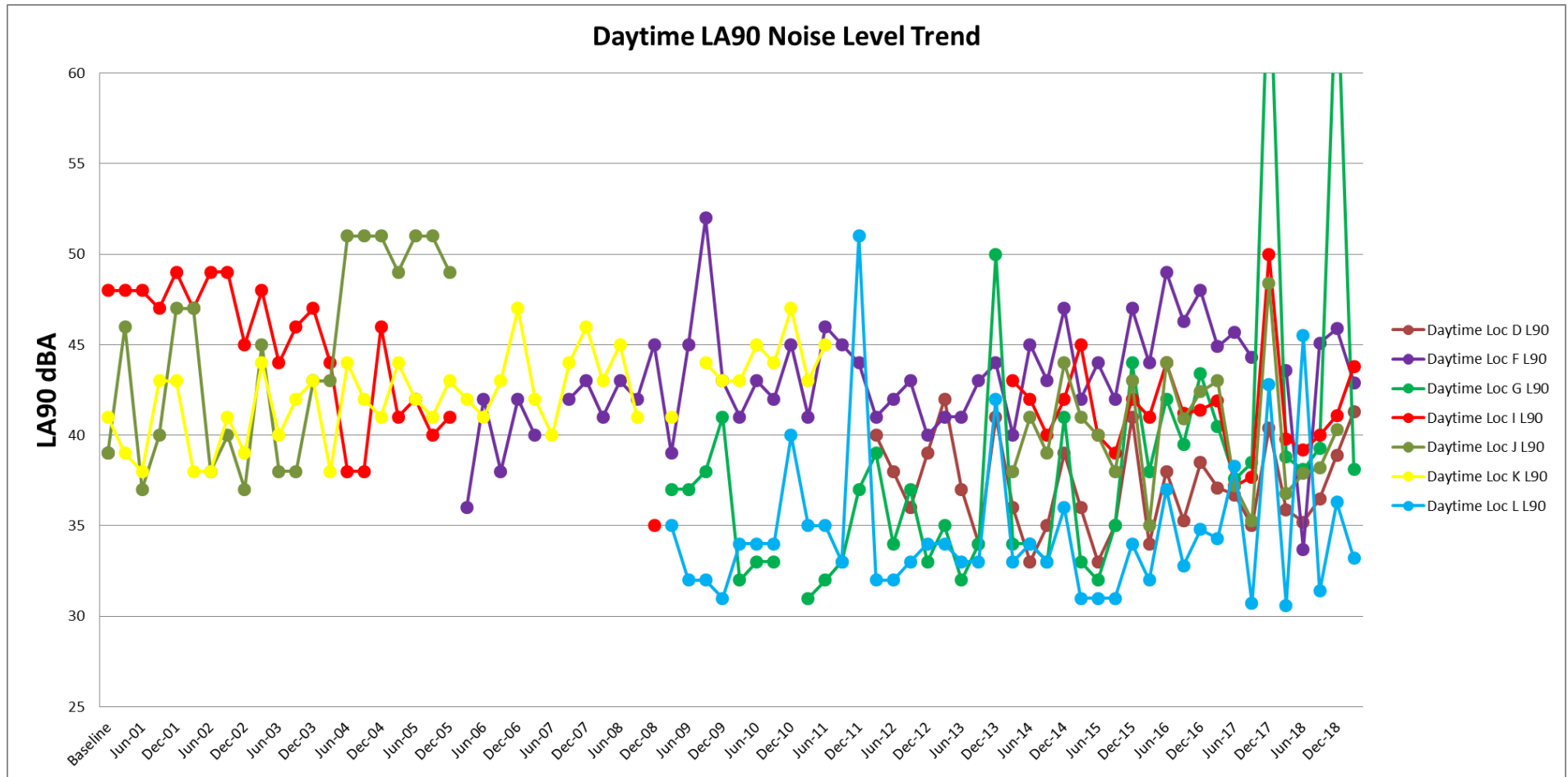




Figure 2 Long term Evening LA90 Noise Levels

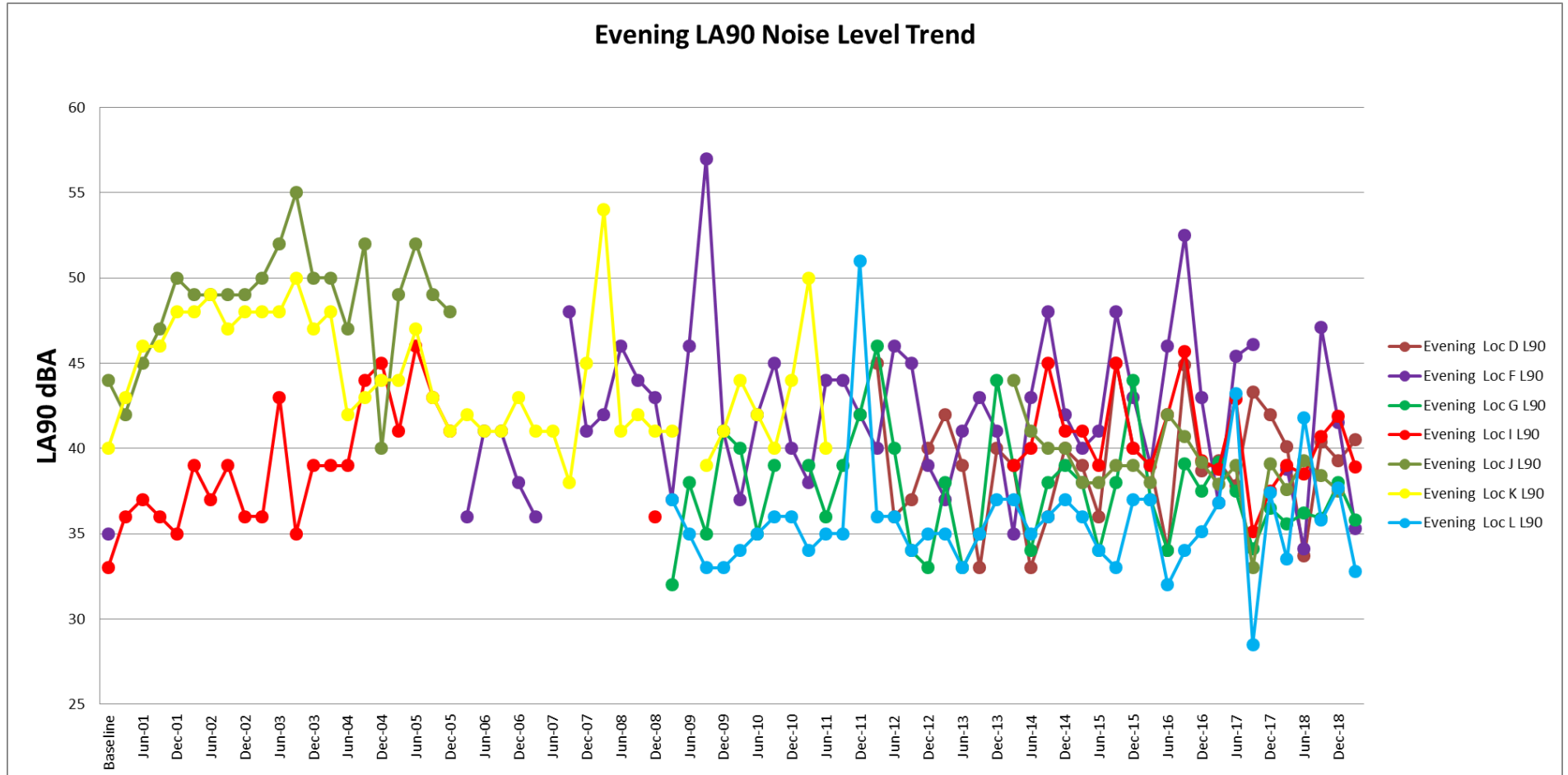
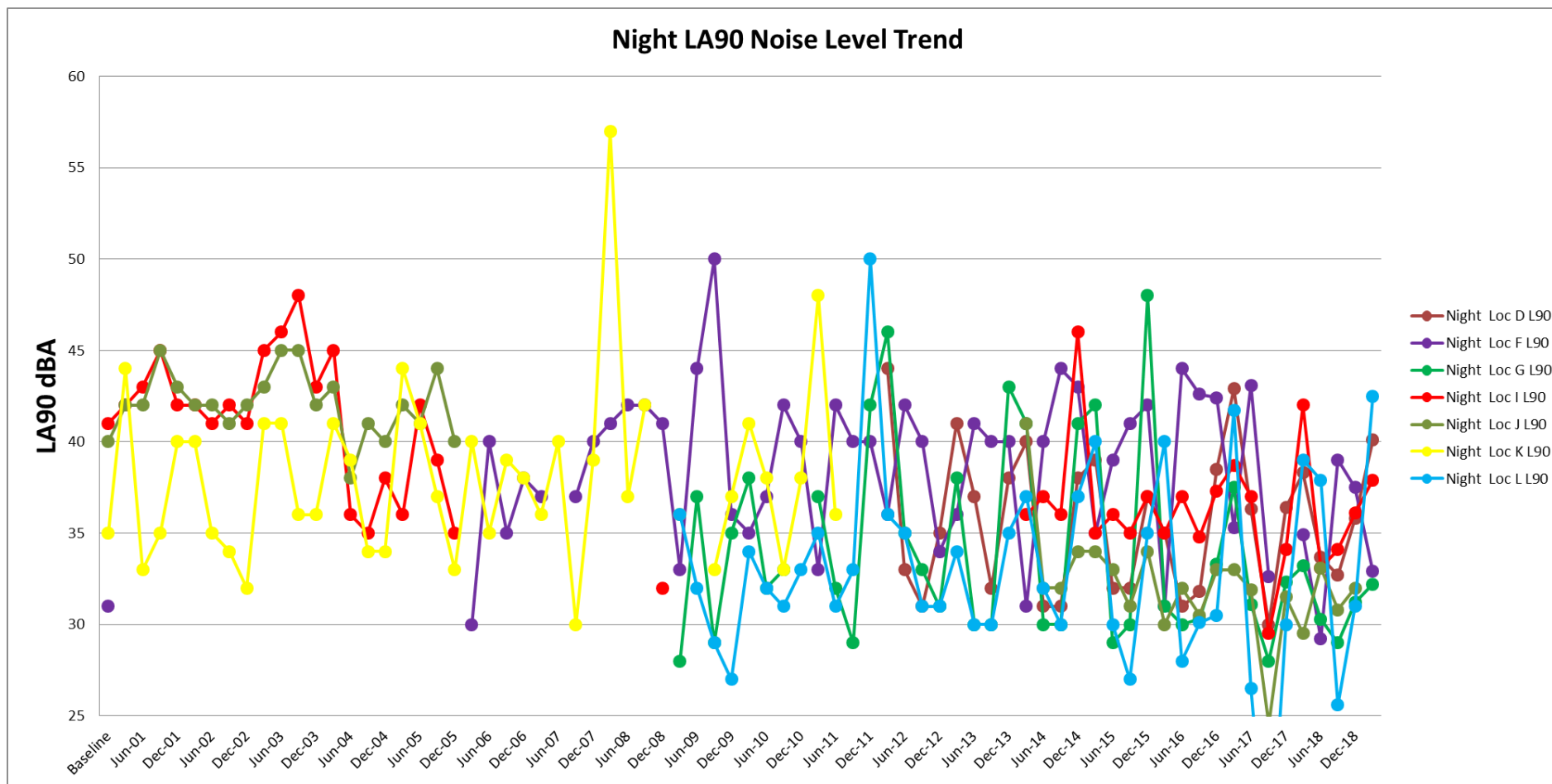


Figure 3 Long term Night-time LA90 Noise Levels



### 5.2.1.1 Baseline

The summary of results in **Table 12** shows the ambient LA90 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring process (ie. prior to commencement of mining operation at Donaldson).

**Table 12 LA90 Results Comparison – Baseline**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA90 Noise Levels		Difference dB <sup>3</sup>
		Baseline	March 2019	
D Black Hill School, Black Hill	Day	N/A <sup>2</sup>	41	N/A
	Evening	N/A <sup>2</sup>	41	N/A
	Night	N/A <sup>2</sup>	40	N/A
F Lot 684 Black Hill Road, Black Hill	Day	39	43	4
	Evening	35	35	0
	Night	31	33	2
G 156 Buchanan Road, Buchanan	Day	N/A <sup>2</sup>	38	N/A
	Evening	N/A <sup>2</sup>	36	N/A
	Night	N/A <sup>2</sup>	32	N/A
I 49 Magnetic Drive, Ashtonfield	Day	48	44	-4
	Evening	33	39	6
	Night	41	38	-3
L 17 Kilshanny Ave, Ashtonfield	Day	N/A <sup>2</sup>	33	N/A
	Evening	N/A <sup>2</sup>	33	N/A
	Night	N/A <sup>2</sup>	43	N/A
J 220 Parish Drive, Thornton	Day	39	-	-
	Evening	44	-	-
	Night	40	-	-

Note 1: Periods are as detailed the NPfl and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm to 10.00 pm; Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: No data was available during baseline measurements, no comparisons can be made.

Note 3: Rounded to the nearest whole dB.

### 5.2.1.2 Previous Quarter

**Table 13** presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured in the previous monitoring period.

**Table 13 LA90 Results Comparison – Previous Quarter**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA90 Noise Levels		Difference dB <sup>2</sup>
		December 2018	March 2019	
D Black Hill School, Black Hill	Day	39	41	2
	Evening	39	41	2
	Night	36	40	4
F Lot 684 Black Hill Road, Black Hill	Day	46	43	-3
	Evening	42	35	-7
	Night	38	33	-5
G 156 Buchanan Road, Buchanan	Day	66	38	-28
	Evening	38	36	-2
	Night	31	32	1
I 49 Magnetic Drive, Ashtonfield	Day	41	44	3
	Evening	42	39	-3
	Night	36	38	2
L 17 Kilshanny Ave, Ashtonfield	Day	36	33	-3
	Evening	38	33	-5
	Night	31	43	12
J 220 Parish Drive, Thornton	Day	40	-	-
	Evening	38	-	-
	Night	32	-	-

Note 1: 1. Periods are as detailed in the Industrial Noise Policy (INP) and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: Rounded to the nearest whole dB.

### 5.2.1.3 Coinciding Period Last Year

**Table 14** presents the ambient LA90 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

**Table 14 LA90 Results Comparison – Coinciding Period Last Year**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA90 Noise Levels		Difference dB <sup>2</sup>
		March 2018	March 2019	
D Black Hill School, Black Hill	Day	36	41	5
	Evening	40	41	1
	Night	38	40	2
F Lot 684 Black Hill Road, Black Hill	Day	44	43	-1
	Evening	39	35	-4
	Night	35	33	-2
G 156 Buchanan Road, Buchanan	Day	39	38	-1
	Evening	36	36	0
	Night	33	32	-1
I 49 Magnetic Drive, Ashtonfield	Day	40	44	4
	Evening	39	39	0
	Night	42	38	-4
L 17 Kilshanny Ave, Ashtonfield	Day	31	33	2
	Evening	34	33	-1
	Night	39	43	4
J <sup>3</sup> 220 Parish Drive, Thornton	Day	37	-	-
	Evening	38	-	-
	Night	30	-	-

Note 1: Periods are as detailed in the Industrial Noise Policy (INP) and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm 10.00 pm; Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: Rounded to the nearest whole dB.

Note 3: Due to a logger error no results are available at location J for the March 2019 quarter, as such a comparison cannot be made.

### 5.2.2 Ambient LA10 Noise Comparison

The long term ambient LA10 noise levels collected from each monitoring location are presented graphically in **Figure 4**, **Figure 5** and **Figure 6** for the daytime, evening and night-time respectively.

Figure 4 Long term Daytime LA10 Noise Levels

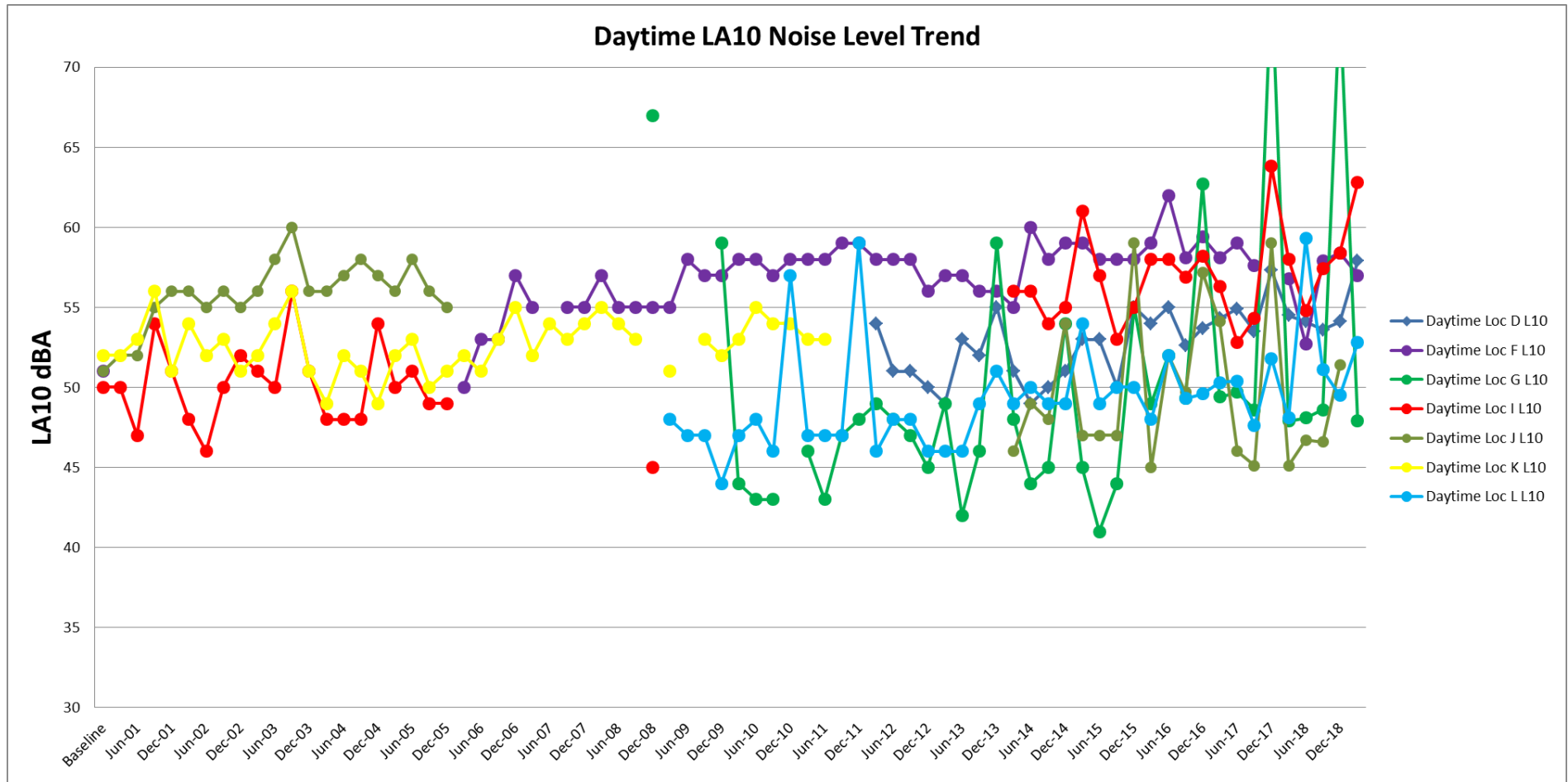


Figure 5 Long term Evening LA10 Noise Levels

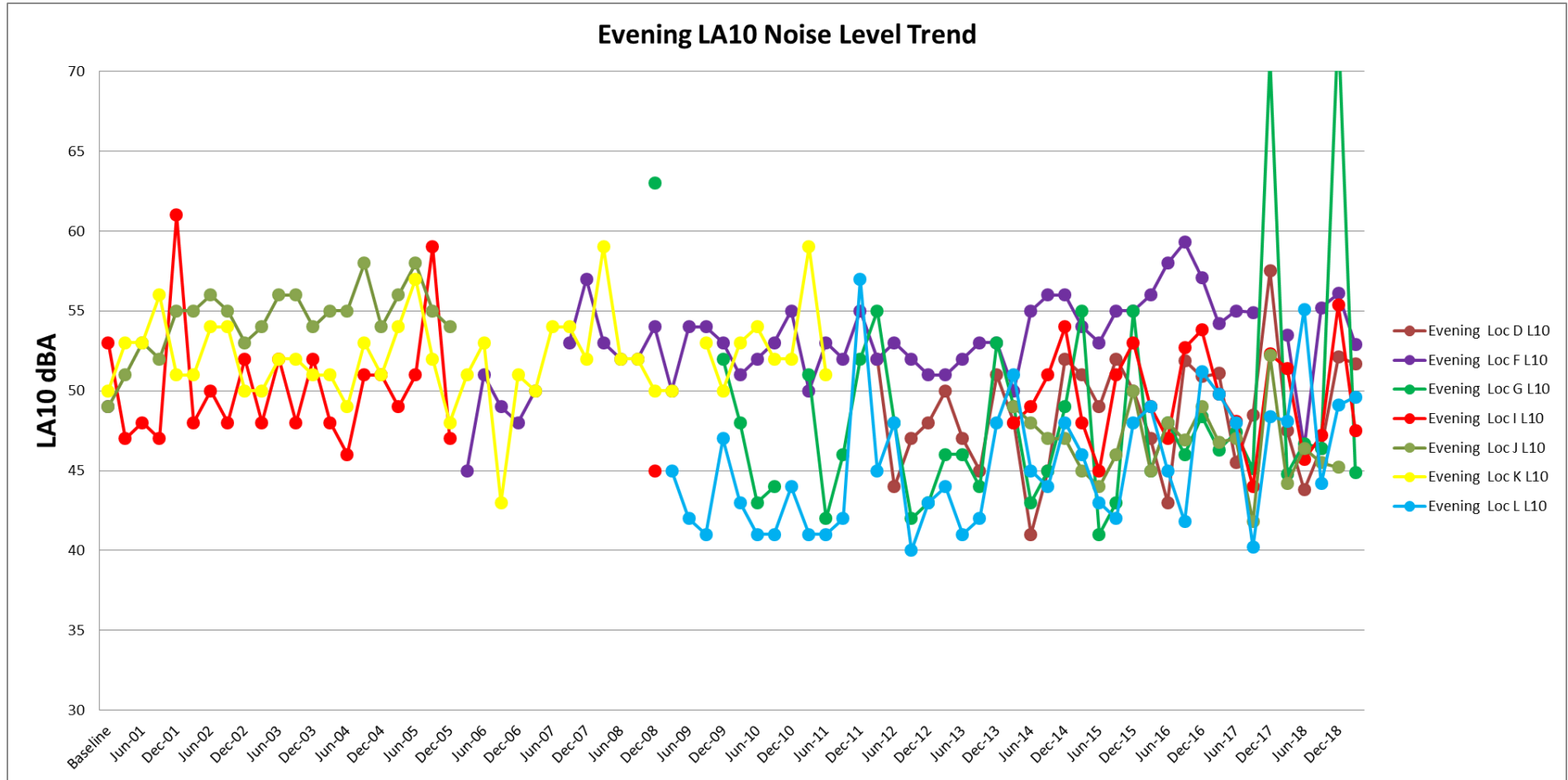
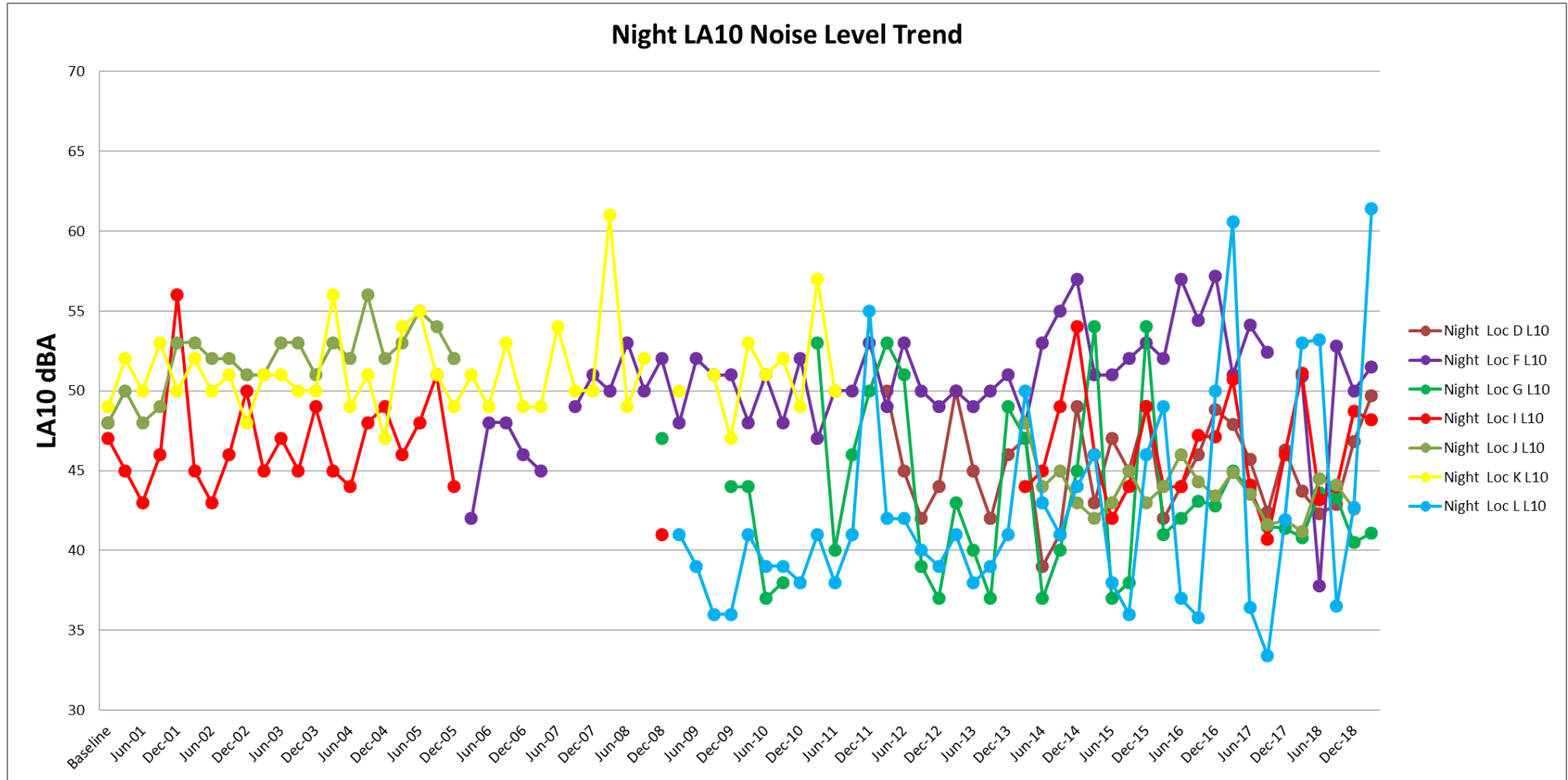


Figure 6 Long term Night-time LA10 Noise Levels





### 5.2.2.1 Baseline

**Table 15** presents the ambient LA10 noise levels recorded for the current monitoring period compared to the levels recorded during the baseline monitoring period.

**Table 15 LA10 Results Comparison – Baseline**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA10 Noise Levels		Difference dB <sup>3</sup>
		Baseline	March 2019	
D Black Hill School, Black Hill	Day	N/A <sup>2</sup>	58	N/A
	Evening	N/A <sup>2</sup>	52	N/A
	Night	N/A <sup>2</sup>	50	N/A
F Lot 684 Black Hill Road, Black Hill	Day	51	57	6
	Evening	49	53	4
	Night	48	52	4
G 156 Buchanan Road, Buchanan	Day	N/A <sup>2</sup>	48	N/A
	Evening	N/A <sup>2</sup>	45	N/A
	Night	N/A <sup>2</sup>	41	N/A
I 49 Magnetic Drive, Ashtonfield	Day	50	63	13
	Evening	53	48	-5
	Night	47	48	1
L 17 Kilshanny Ave, Ashtonfield	Day	N/A <sup>2</sup>	53	N/A
	Evening	N/A <sup>2</sup>	50	N/A
	Night	N/A <sup>2</sup>	61	N/A
J 220 Parish Drive, Thornton	Day	51	-	-
	Evening	49	-	-
	Night	48	-	-

Note 1: Periods are as detailed in the Industrial Noise Policy (INP) and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm to 10.00 pm; Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: No data was available during baseline measurements, no comparisons can be made.

Note 3: Rounded to the nearest whole dB.

### 5.2.2.2 Previous Quarter

**Table 16** presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the previous monitoring period.

**Table 16 LA10 Results Comparison – Previous Quarter**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA10 Noise Levels		Difference dB <sup>2</sup>
		December 2018	March 2019	
D Black Hill School, Black Hill	Day	54	58	4
	Evening	52	52	0
	Night	47	50	3
F Lot 684 Black Hill Road, Black Hill	Day	58	57	-1
	Evening	56	53	-3
	Night	50	52	2
G 156 Buchanan Road, Buchanan	Day	74	48	-26
	Evening	73	45	-28
	Night	41	41	0
I 49 Magnetic Drive, Ashtonfield	Day	58	63	5
	Evening	55	48	-7
	Night	49	48	-1
L 17 Kilshanny Ave, Ashtonfield	Day	50	53	3
	Evening	49	50	1
	Night	43	61	18
J 220 Parish Drive, Thornton	Day	51	-	-
	Evening	45	-	-
	Night	43	-	-

Note 1: Periods are as detailed in the Industrial Noise Policy (INP) and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm to 10.00 pm; Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: Rounded to the nearest whole dB.

### 5.2.2.3 Coinciding Period Last Year

**Table 17** presents the ambient LA10 noise levels recorded for the current monitoring period compared to those measured during the coinciding monitoring period last year.

**Table 17 LA10 Result Comparison – Coinciding Period Last Year**

Monitoring Location	Period <sup>1</sup>	Long term Night-time LA10 Noise Levels		Difference dB <sup>2</sup>
		March 2018	March 2019	
D Black Hill School, Black Hill	Day	55	58	3
	Evening	48	52	4
	Night	44	50	6
F Lot 684 Black Hill Road, Black Hill	Day	57	57	0
	Evening	54	53	-1
	Night	51	52	1
G 156 Buchanan Road, Buchanan	Day	48	48	0
	Evening	45	45	0
	Night	41	41	0
I 49 Magnetic Drive, Ashtonfield	Day	58	63	5
	Evening	51	48	-3
	Night	51	48	-3
L 17 Kilshanny Ave, Ashtonfield	Day	48	53	5
	Evening	48	50	2
	Night	53	61	8
J <sup>3</sup> 220 Parish Drive, Thornton	Day	45	-	-
	Evening	44	-	-
	Night	41	-	-

Note 1: Periods are as detailed in the Industrial Noise Policy (INP) and are Daytime - 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening - 6.00 pm to 10.00 pm; Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Note 2: Rounded to the nearest whole dB.

Note 3: Due to a logger error no results are available at location J for the March 2019 quarter, as such a comparison can not be made.

## 5.3 Rail Noise Monitoring

Due to a logger error at Location J no unattended monitoring data was available for the March 2019 monitoring period. The train loading times during the noise monitoring period are presented in **Table 18**.

**Table 18 Coal Train Loading Operations Log**

Date	Coal Train Loading Time	Period
13/03/19	12:45-16:15	Day
14/03/19	11:45-14:55	Day

Given the results of previous quarterly monitoring periods and that only one train movement occurred during each daytime period, it is considered likely that rail traffic noise was compliant during the March 2019 monitoring period.

## 6 Conclusion

SLR was engaged by Donaldson Coal Pty Ltd to conduct quarterly noise monitoring surveys for Donaldson Coal Mine and Abel Coal Mine in accordance with the Abel Coal Mine Noise Monitoring Program, dated 12 August 2014.

Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Therefore, compliance noise monitoring for the Donaldson Open Cut Mine is no longer required.

Abel mine was placed in Care & Maintenance on 28<sup>th</sup> April 2016 and there was no operations onsite, excluding that from the Bloomfield CHPP which operates under the Abel Coal Mine project consent conditions.

Operator-attended and unattended noise measurements were conducted for the March 2019 quarter at six focus locations surrounding the mine.

Abel portal operations were not observed to be audible at any locations during the monitoring period. Contributed noise levels from Abel Mine did not exceed noise emission goals (including night-time sleep arousal criteria) and compliance with the Abel Mine *Project Approval* was indicated at all locations.

A comparison of ambient LA10 and LA90 noise levels recorded during the current monitoring period (March 2019), the baseline monitoring period, the last monitoring period (December 2018), and the coinciding monitoring period from last year (March 2018) has been conducted.

Given the results of previous quarterly monitoring periods, rail noise levels from the Bloomfield Rail Spur were considered to be in compliance with the Abel Mine Project Approval during the noise monitoring period.

# APPENDIX A

## Acoustic Terminology

### 1. Sound Level or Noise Level

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

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

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

### 2. ‘A’ Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an ‘A-weighting’ filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

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

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

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

### 3. Sound Power Level

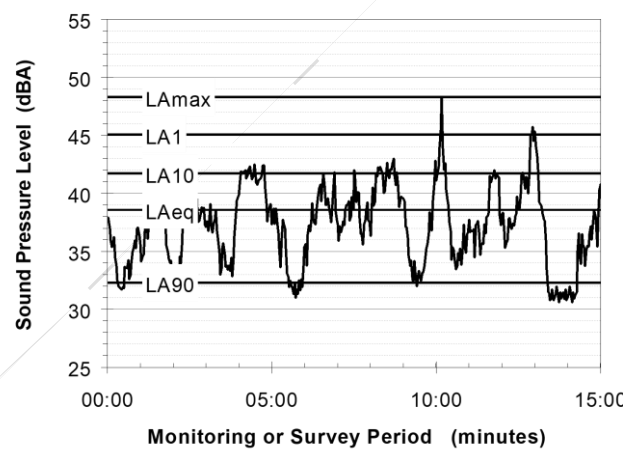
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit  $10^{-12}$  W.

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

### 4. Statistical Noise Levels

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

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



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

### 5. Frequency Analysis

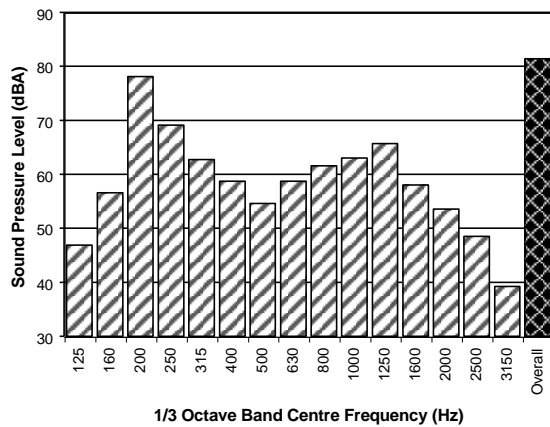
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

Frequency analysis can be in:

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

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



### 6. Annoying Noise (Special Audible Characteristics)

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

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

### 7. Vibration

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

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

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

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level  $V$ , expressed in mm/s can be converted to decibels by the formula  $20 \log (V/V_0)$ , where  $V_0$  is the reference level (10<sup>-9</sup> m/s). Care is required in this regard, as other reference levels may be used.

### 8. Human Perception of Vibration

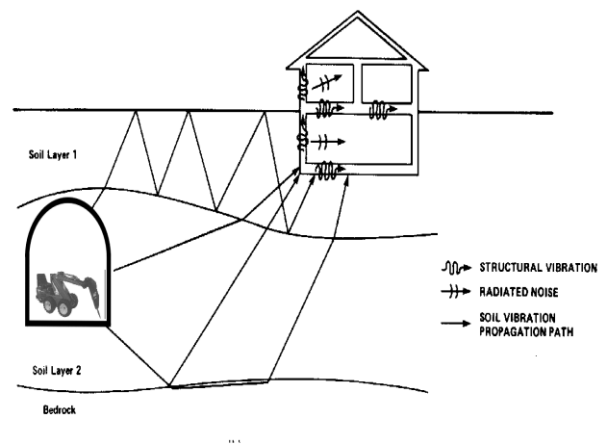
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

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

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

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

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



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

# APPENDIX B

## Calibration Certificates



# CERTIFICATE OF CALIBRATION

CERTIFICATE No.: SLM 23293 & FILT 4792

**Equipment Description:** Sound & Vibration Analyser

**Manufacturer:** B&K

**Model No:** 2250                      **Serial No:** 3003389

**Microphone Type:** 4950                      **Serial No:** 2913816

**Preamplifier Type:** ZC0032                      **Serial No:** 20519

**Filter Type:** 1/3 Octave                      **Serial No:** 3003389

**Comments:** All tests passed for class 1.  
(See over for details)

**Owner:** SLR Consulting Australia Pty Ltd  
Level 2, 2 Lincoln Street  
Lane Cove, NSW 2066

**Ambient Pressure:** 990 hPa  $\pm 1.5$  hPa

**Temperature:** 25 °C  $\pm 2^\circ$  C                      **Relative Humidity:** 29%  $\pm 5\%$

**Date of Calibration:** 06/08/2018                      **Issue Date:** 07/08/2018

**Acu-Vib Test Procedure:** AVP10 (SLM) & AVP06 (Filters)

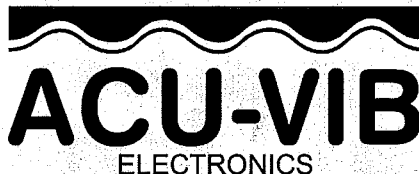
**CHECKED BY:** *[Signature]*

**AUTHORISED SIGNATURE:** *[Signature]*  
*Jack Klett*

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**CERTIFICATE No.: SLM 23293 & FILT 4792**

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	NA
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

**Statement of Compliance:** The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013. A full technical report is available if required.

**This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:**

1. Relative attenuation clause 5.3

**Date of Calibration:** 06/08/2018      **Issue Date:** 07/08/2018

**Checked by:** *[Signature]*

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## Sound Level Meter AS 1259.1:1990 - AS 1259.2:1990 Calibration Certificate

Calibration Number C17235

**Client Details** SLR Consulting Australia Pty Ltd  
2 Lincoln Street  
Lane Cove NSW 2066

**Equipment Tested/ Model Number :** ARL EL-316  
**Instrument Serial Number :** 16-207-050  
**Microphone Serial Number :** 318219  
**Pre-amplifier Serial Number :** 27911

### Atmospheric Conditions

**Ambient Temperature :** 22.4°C  
**Relative Humidity :** 36.6%  
**Barometric Pressure :** 100.02kPa

**Calibration Technician :** Vicky Jaiswal  
**Calibration Date :** 30/05/2017

**Secondary Check:** Riley Cooper  
**Report Issue Date :** 31/05/2017

**Approved Signatory :**

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

### Least Uncertainties of Measurement -

<b>Acoustic Tests</b> 31.5 Hz to 8kHz      ±0.12dB 12.5kHz                ±0.18dB 16kHz                    ±0.31dB <b>Electrical Tests</b> 31.5 Hz to 20 kHz    ±0.12dB	<b>Environmental Conditions</b> Temperature            ±0.05°C Relative Humidity       ±0.46% Barometric Pressure    ±0.017Pa
--	--

*All uncertainties are derived at the 95% confidence level with a coverage factor of 2.*

*The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.*



This calibration certificate is to be read in conjunction with the calibration test report.

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## Sound Level Meter AS 1259.1:1990 - AS 1259.2:1990 Calibration Certificate

Calibration Number **C17217**

**Client Details** SLR Consulting Australia Pty Ltd  
2 Lincoln Street  
Lane Cove NSW 2066

**Equipment Tested/ Model Number :** ARL EL-316  
**Instrument Serial Number :** 16-203-525  
**Microphone Serial Number :** 322080  
**Pre-amplifier Serial Number :** 27089

### Atmospheric Conditions

**Ambient Temperature :** 24.9°C  
**Relative Humidity :** 46.4%  
**Barometric Pressure :** 100.27kPa

**Calibration Technician :** Vicky Jaiswal      **Secondary Check:** Riley Cooper  
**Calibration Date :** 09/06/2017      **Report Issue Date :** 13/06/2017

**Approved Signatory :**

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

### Least Uncertainties of Measurement -

<p>Acoustic Tests</p> <p>31.5 Hz to 8kHz      ±0.16dB</p> <p>12.5kHz              ±0.2dB</p> <p>16kHz                 ±0.29dB</p> <p>Electrical Tests</p> <p>31.5 Hz to 20 kHz    ±0.12dB</p>	<p style="text-align: center;">Environmental Conditions</p> <p>Temperature            ±0.05°C</p> <p>Relative Humidity      ±0.46%</p> <p>Barometric Pressure    ±0.017Pa</p>
---	---

*All uncertainties are derived at the 95% confidence level with a coverage factor of 2.*

*The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.*

This calibration certificate is to be read in conjunction with the calibration test report.



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**Sound Level Meter**  
AS 1259.1:1990 - AS 1259.2:1990  
**Calibration Certificate**

Calibration Number C18314

**Client Details** SLR Consulting  
Suite 2, 2 Domville Avenue  
Hawthorn VIC 3122

**Equipment Tested/ Model Number :** ARL EL-316  
**Instrument Serial Number :** 16-203-508  
**Microphone Serial Number :** 319092  
**Pre-amplifier Serial Number :** 27474

**Atmospheric Conditions**

**Ambient Temperature :** 21.7°C  
**Relative Humidity :** 43.3%  
**Barometric Pressure :** 99.36kPa

**Calibration Technician :** Lucky Jaiswal  
**Calibration Date :** 14 Jun 2018

**Secondary Check:** Lewis Boorman  
**Report Issue Date :** 14 Jun 2018

**Approved Signatory :**

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

**Least Uncertainties of Measurement -**

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.15dB	Temperature	±0.3°C
12.5kHz	±0.21dB	Relative Humidity	±2.5%
16kHz	±0.29dB	Barometric Pressure	±0.017Pa
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025 - calibration.

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## Sound Level Meter AS 1259.1:1990 - AS 1259.2:1990 Calibration Certificate

Calibration Number **C17277**

**Client Details** SLR Consulting  
Suite 2, 2 Domville Avenue  
Hawthorn VIC 3122

**Equipment Tested/ Model Number :** ARL EL-316  
**Instrument Serial Number :** 16-203-505  
**Microphone Serial Number :** 318370  
**Pre-amplifier Serial Number :** 26962

### Atmospheric Conditions

**Ambient Temperature :** 24.9°C  
**Relative Humidity :** 44.3%  
**Barometric Pressure :** 100.78kPa

**Calibration Technician :** Vicky Jaiswal      **Secondary Check:** Riley Cooper  
**Calibration Date :** 14/06/2017      **Report Issue Date :** 15/06/2017

**Approved Signatory :** Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

### Least Uncertainties of Measurement -

<b>Acoustic Tests</b> 31.5 Hz to 8kHz      ±0.16dB 12.5kHz              ±0.2dB 16kHz                  ±0.29dB  <b>Electrical Tests</b> 31.5 Hz to 20 kHz      ±0.12dB	<b>Environmental Conditions</b> Temperature              ±0.05°C Relative Humidity        ±0.46% Barometric Pressure      ±0.017Pa
---	---

*All uncertainties are derived at the 95% confidence level with a coverage factor of 2.*

*The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.*



This calibration certificate is to be read in conjunction with the calibration test report.

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## Sound Level Meter AS 1259.1:1990 - AS 1259.2:1990 Calibration Certificate

Calibration Number C18311

**Client Details** SLR Consulting  
Suite 2, 2 Domville Avenue  
Hawthorn VIC 3122

**Equipment Tested/ Model Number :** ARL EL-316  
**Instrument Serial Number :** 16-103-494  
**Microphone Serial Number :** 317150  
**Pre-amplifier Serial Number :** 28022

### Atmospheric Conditions

**Ambient Temperature :** 22.5°C  
**Relative Humidity :** 42.4%  
**Barometric Pressure :** 99.31kPa

**Calibration Technician :** Lucky Jaiswal  
**Calibration Date :** 14 Jun 2018

**Secondary Check:** Lewis Boorman  
**Report Issue Date :** 14 Jun 2018

**Approved Signatory :**

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.3°C
31.5 Hz to 8kHz	±0.15dB	Relative Humidity	±2.5%
12.5kHz	±0.21dB	Barometric Pressure	±0.017Pa
16kHz	±0.29dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.12dB		

*All uncertainties are derived at the 95% confidence level with a coverage factor of 2.*

*The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.*



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.  
Accredited for compliance with ISO/IEC 17025 - calibration.

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# CERTIFICATE OF CALIBRATION

CERTIFICATE No.: SLM 23294 & FILT 4793

**Equipment Description:** Sound & Vibration Analyser

**Manufacturer:** Svantek

**Model No:** Svan-957      **Serial No:** 27522

**Microphone Type:** 7052E      **Serial No:** 62914

**Preamplifier Type:** SV12L      **Serial No:** 49862

**Filter Type:** 1/1 Octave      **Serial No:** 27522

**Comments:** All tests passed for class 1.  
(See over for details)

**Owner:** SLR Consulting Australia Pty Ltd  
Level 2, 2 Lincoln Street  
Lane Cove, NSW 2066

**Ambient Pressure:** 996 hPa  $\pm 1.5$  hPa

**Temperature:** 23 °C  $\pm 2^\circ$  C      **Relative Humidity:** 27%  $\pm 5\%$

**Date of Calibration:** 07/08/2018      **Issue Date:** 07/08/2018

**Acu-Vib Test Procedure:** AVP10 (SLM) & AVP06 (Filters)

**CHECKED BY:** IKJ

**AUTHORISED SIGNATURE:** 

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**CERTIFICATE No.: SLM 23294 & FILT 4793**

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	Pass
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

**Statement of Compliance:** The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013. A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

**Date of Calibration:** 07/08/2018      **Issue Date:** 07/08/2018

**Checked by:** *[Signature]*

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# APPENDIX C

## Noise Monitoring Locations



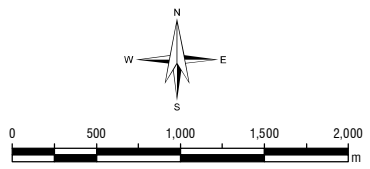
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www.slrconsulting.com

Project No.:	630.01053.01200
Date:	11/01/2018
Drawn by:	NT
Scale:	1:45,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

**LEGEND**  
 Noise Monitoring Locations



Donaldson Coal  
**Noise Monitoring**

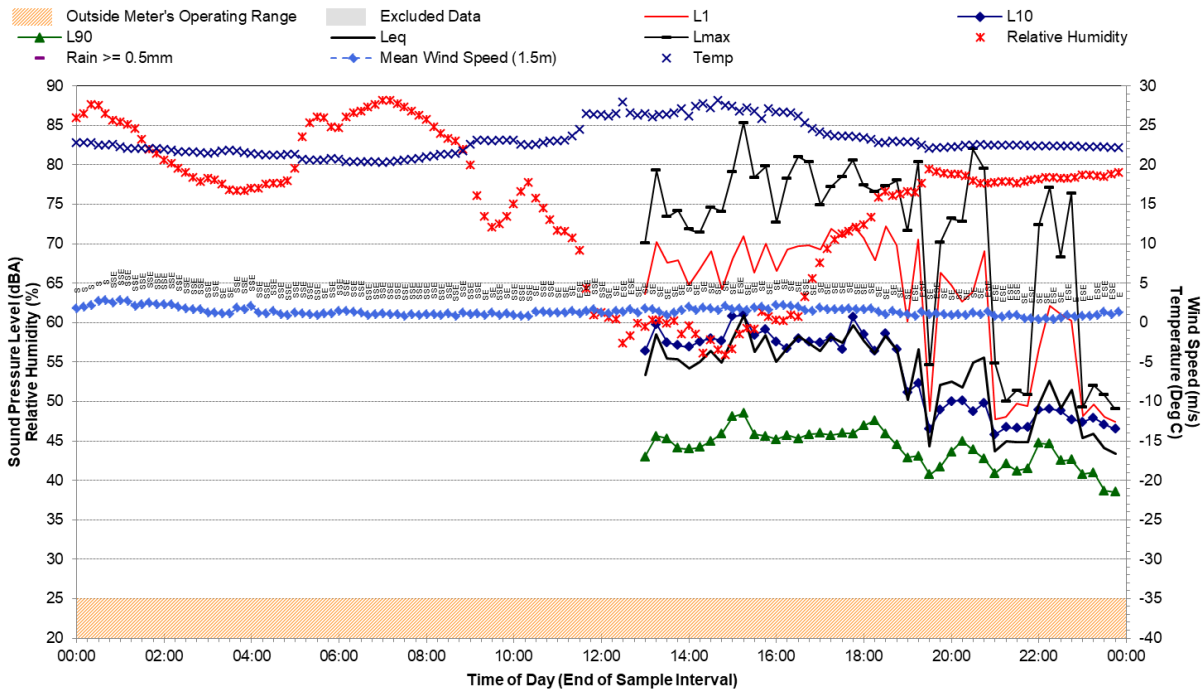
**Noise Monitoring Locations**

The content contained within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of such information.

## Statistical Ambient Noise Levels

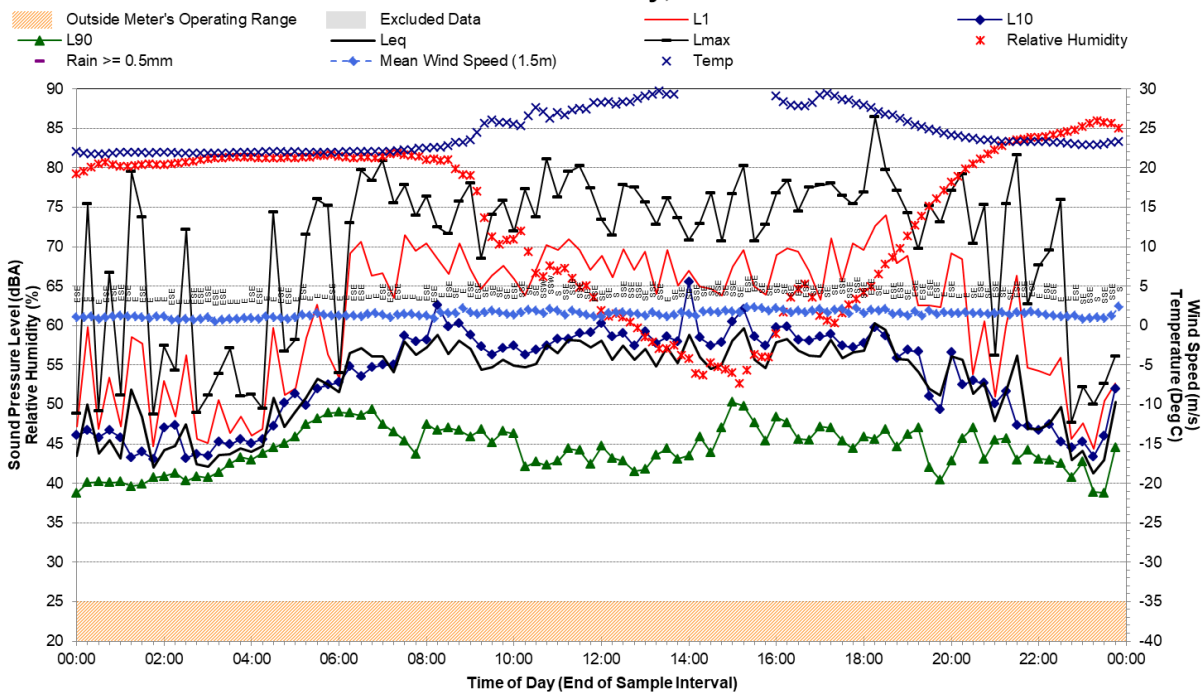
### Statistical Ambient Noise Levels

Location D - Wednesday, 13 March 2019

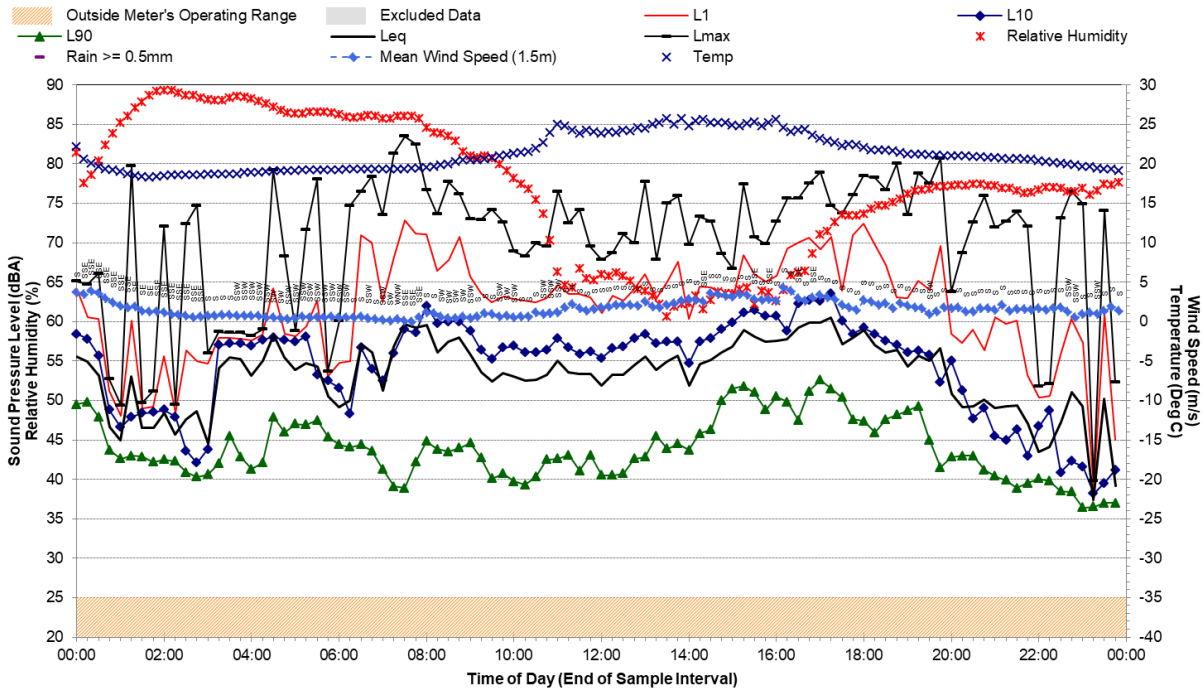


### Statistical Ambient Noise Levels

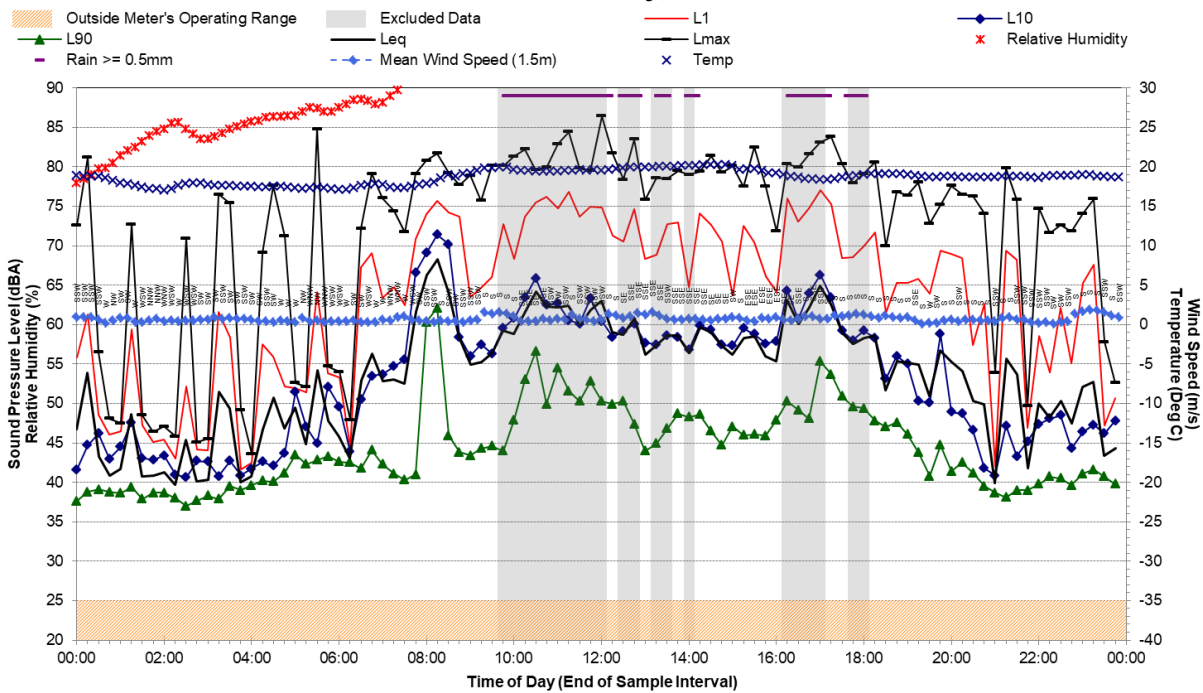
Location D - Thursday, 14 March 2019



## Statistical Ambient Noise Levels Location D - Friday, 15 March 2019

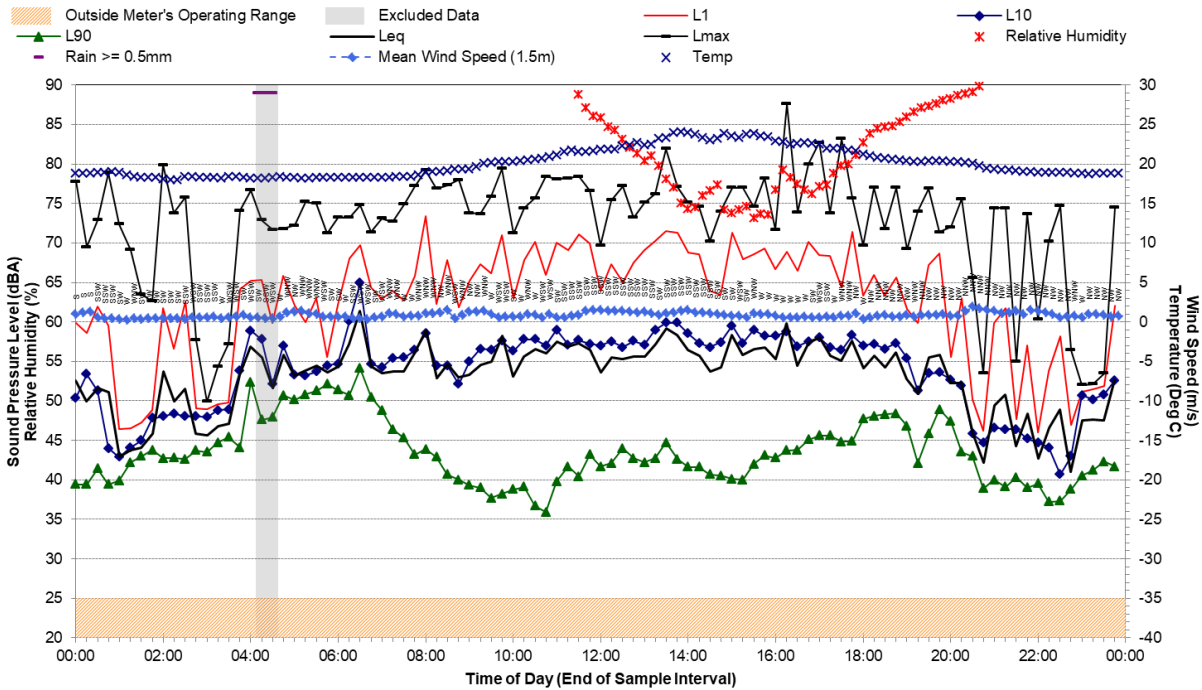


## Statistical Ambient Noise Levels Location D - Saturday, 16 March 2019



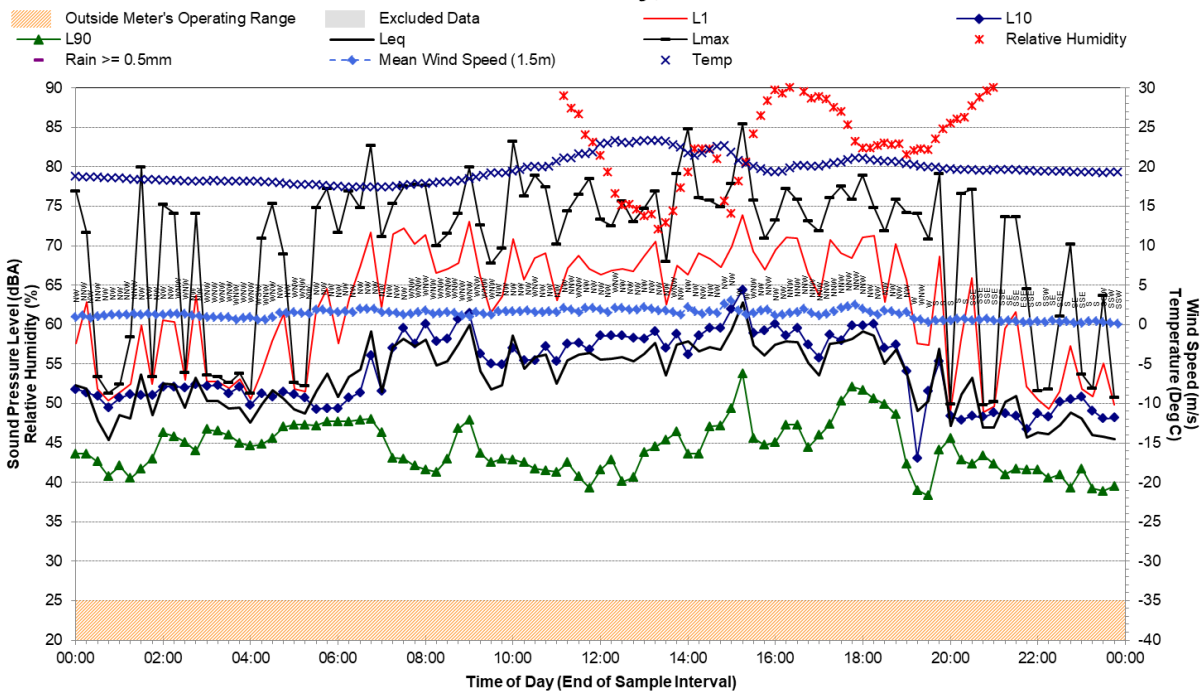
## Statistical Ambient Noise Levels

**Location D - Sunday, 17 March 2019**

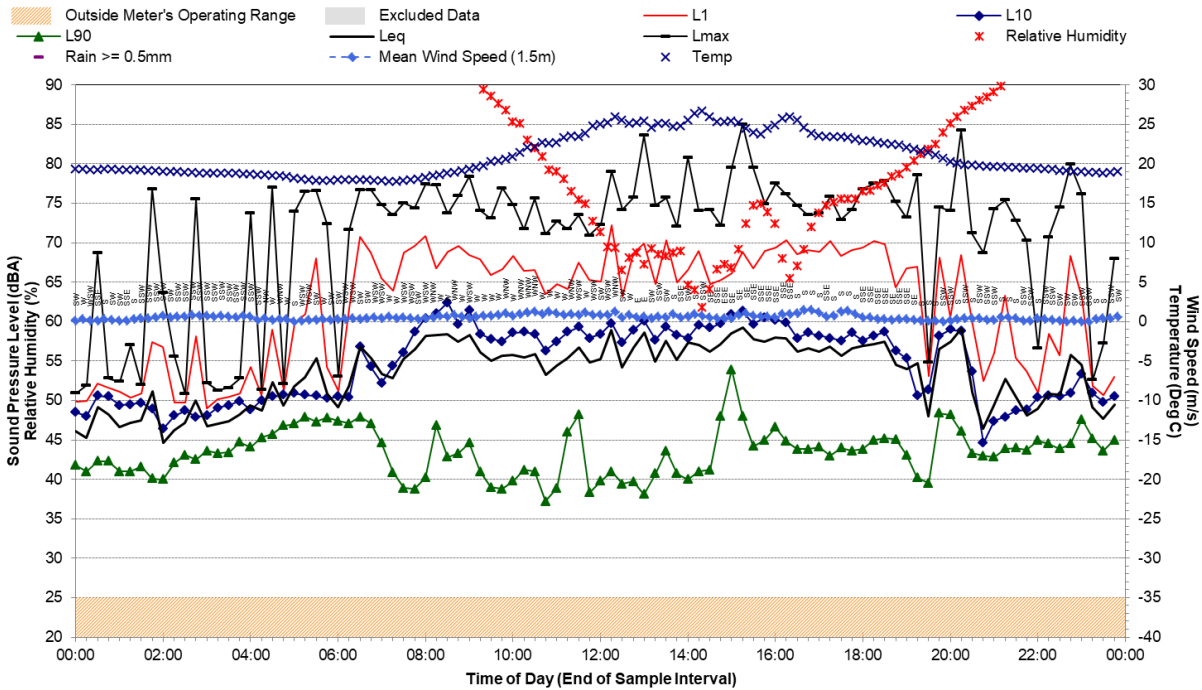


## Statistical Ambient Noise Levels

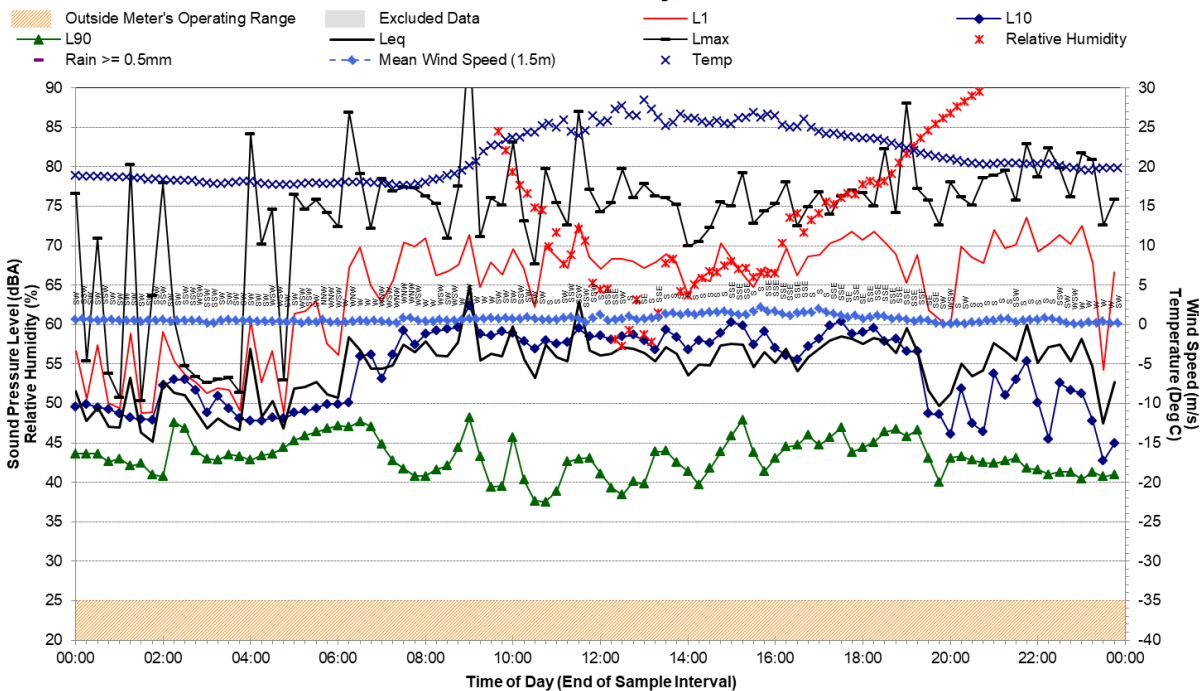
**Location D - Monday, 18 March 2019**



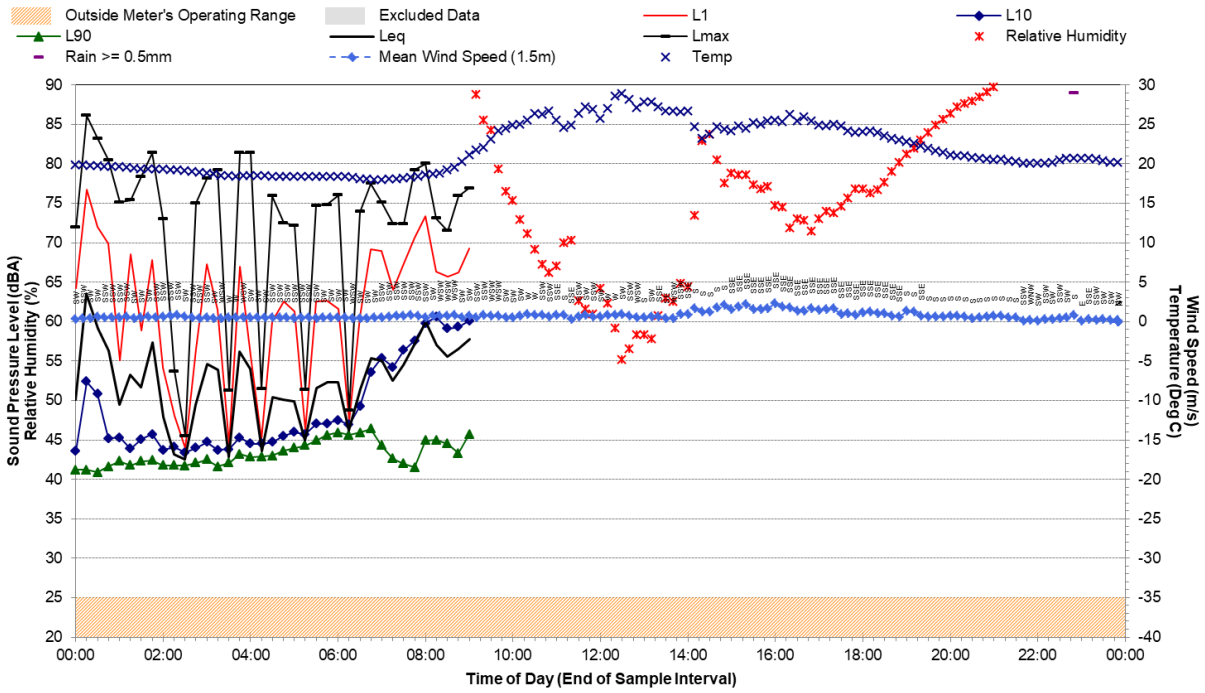
## Statistical Ambient Noise Levels Location D - Tuesday, 19 March 2019



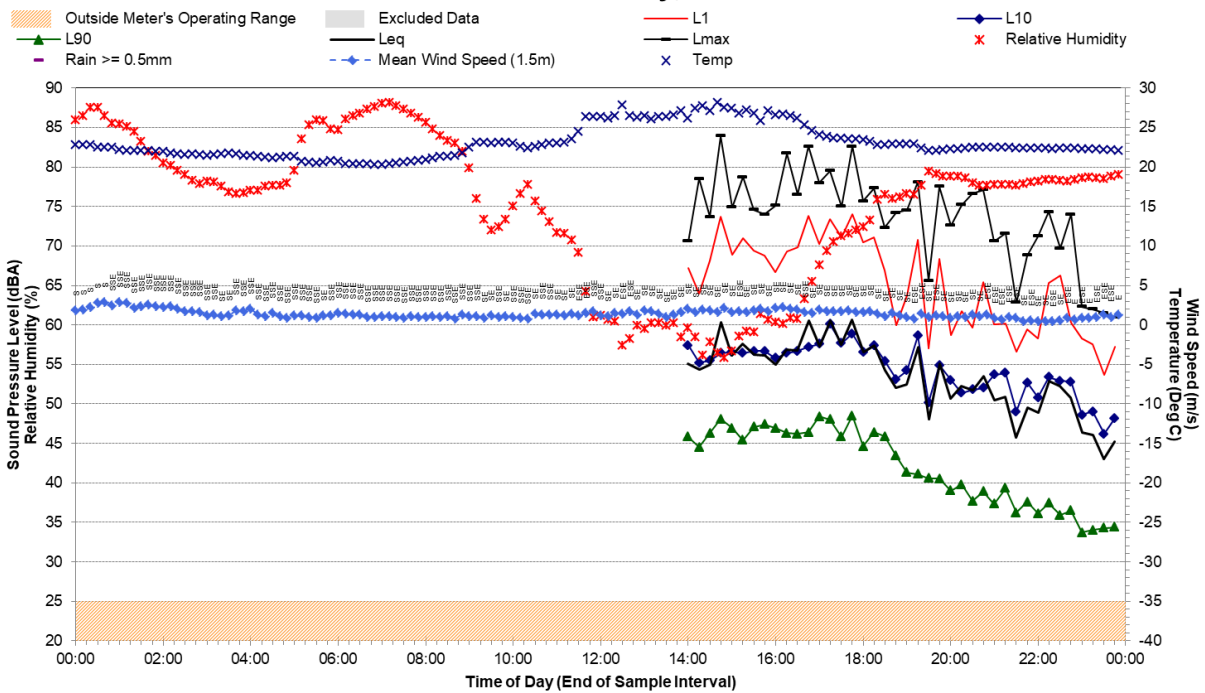
## Statistical Ambient Noise Levels Location D - Wednesday, 20 March 2019



## Statistical Ambient Noise Levels Location D - Thursday, 21 March 2019

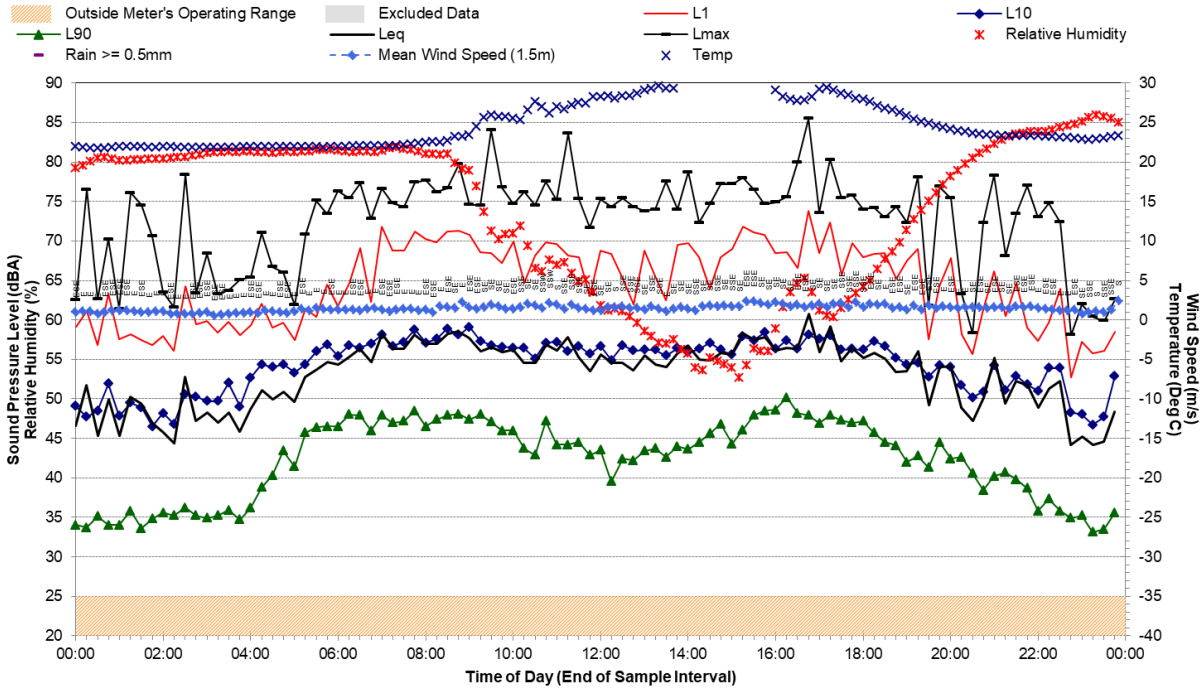


## Statistical Ambient Noise Levels Location F - Wednesday, 13 March 2019

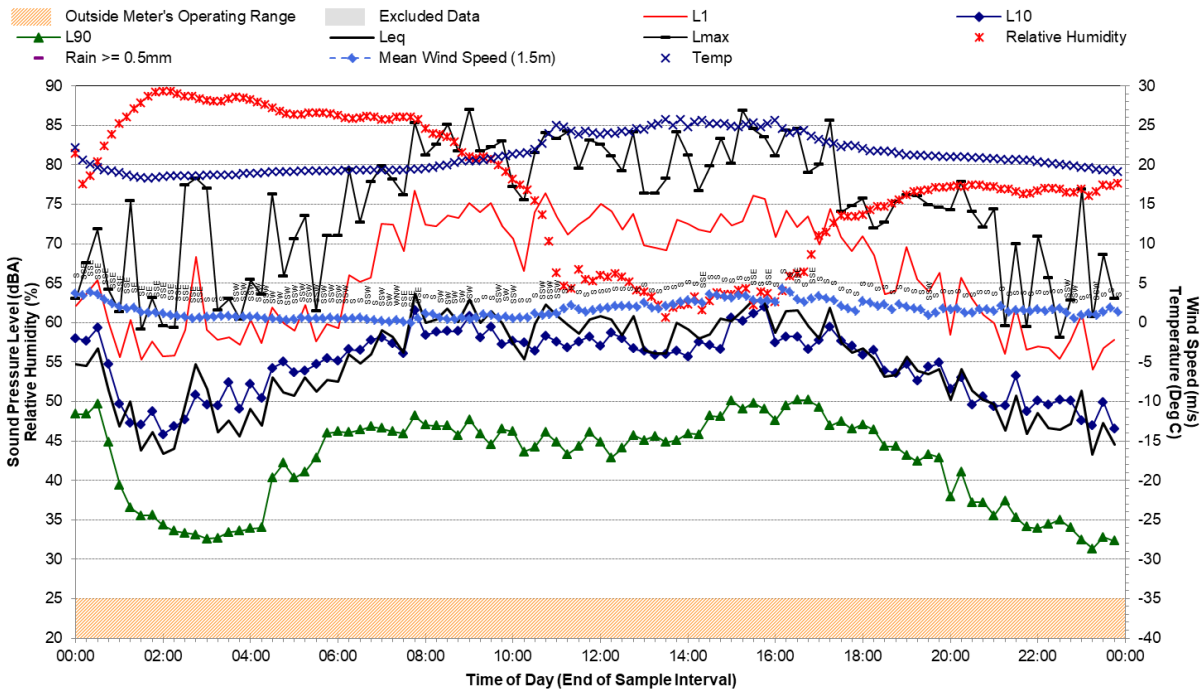




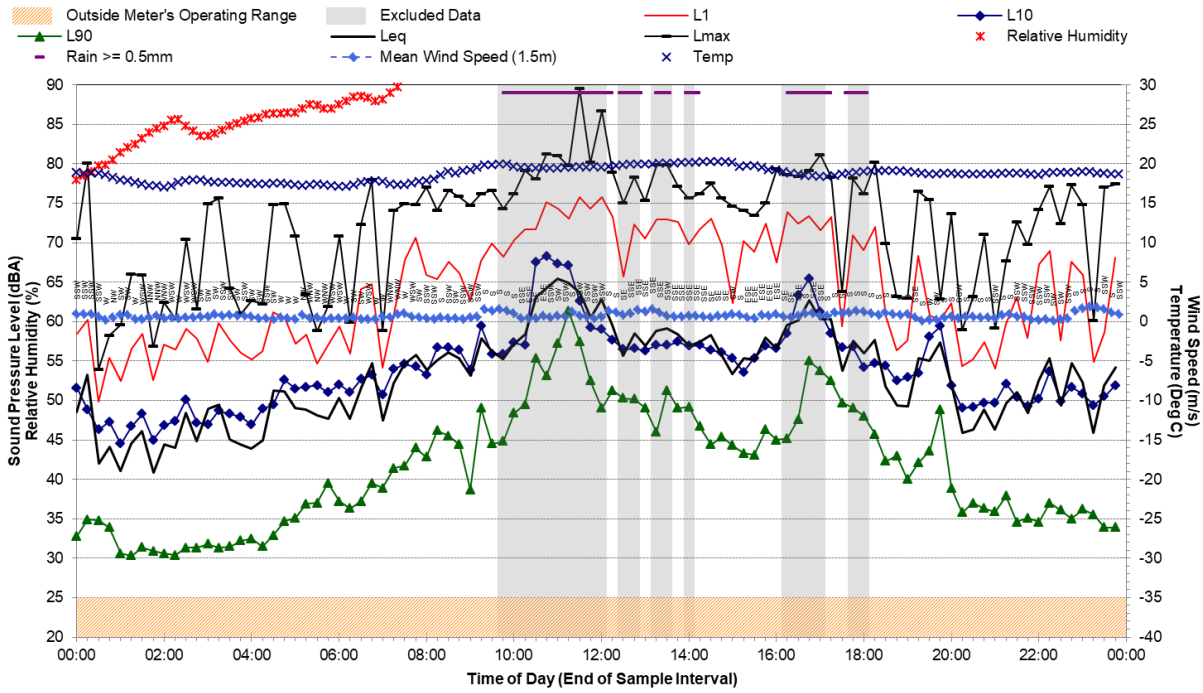
## Statistical Ambient Noise Levels Location F - Thursday, 14 March 2019



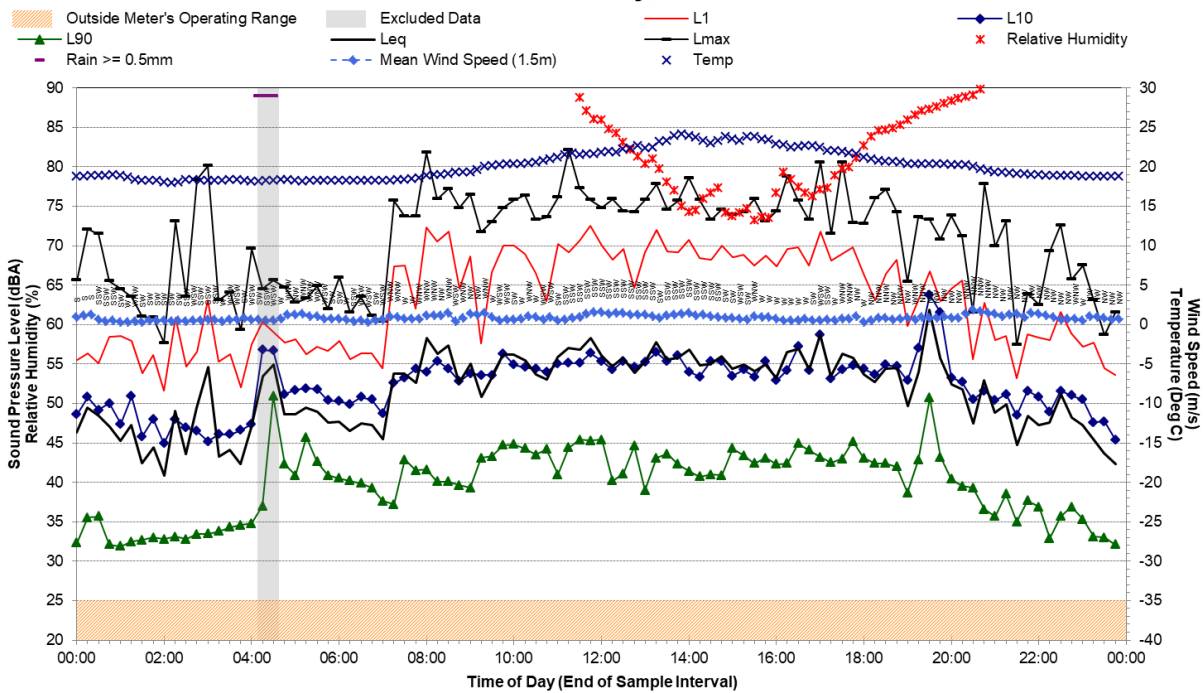
## Statistical Ambient Noise Levels Location F - Friday, 15 March 2019



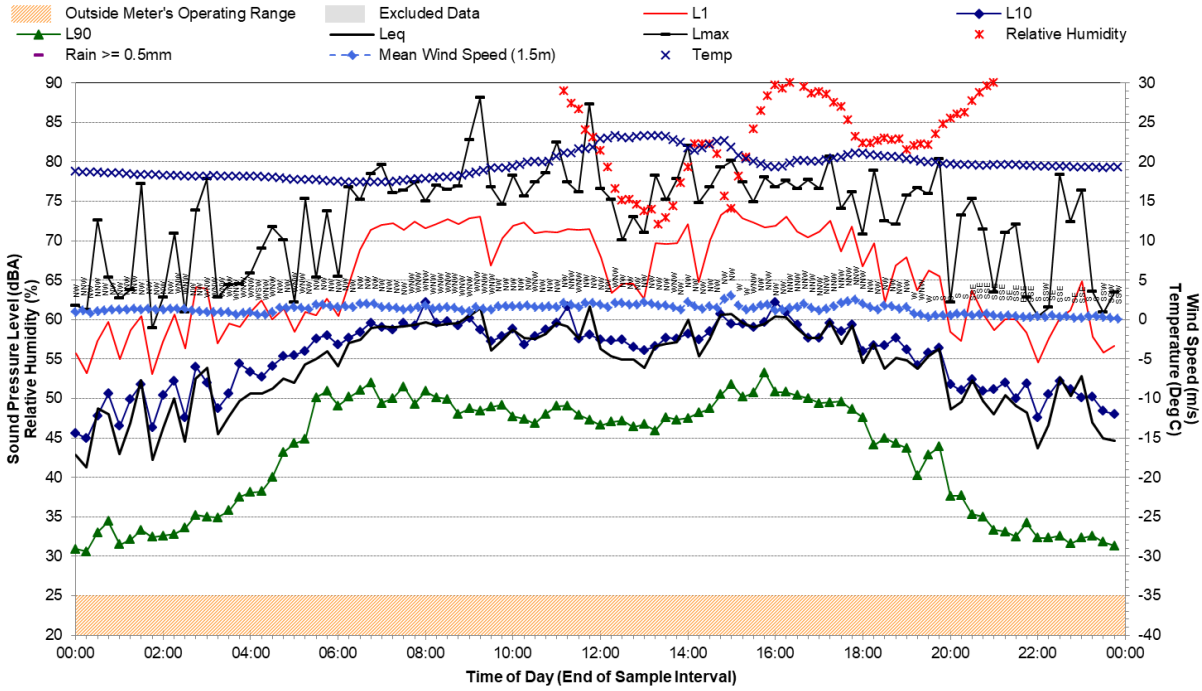
## Statistical Ambient Noise Levels Location F - Saturday, 16 March 2019



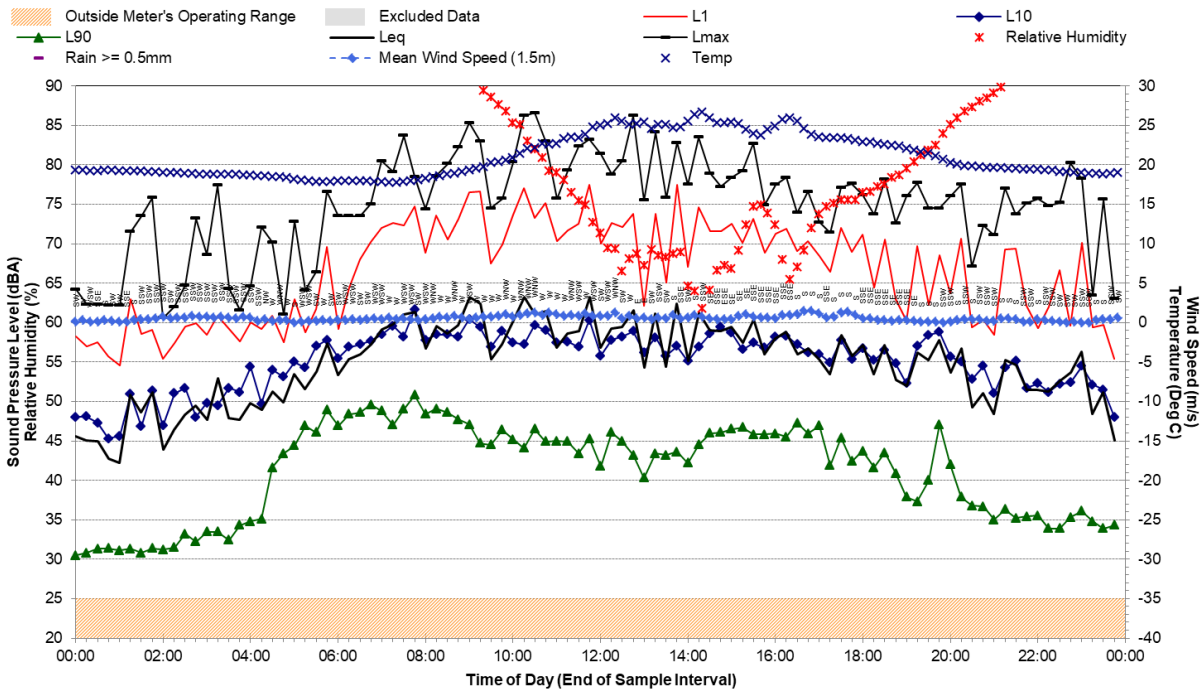
## Statistical Ambient Noise Levels Location F - Sunday, 17 March 2019



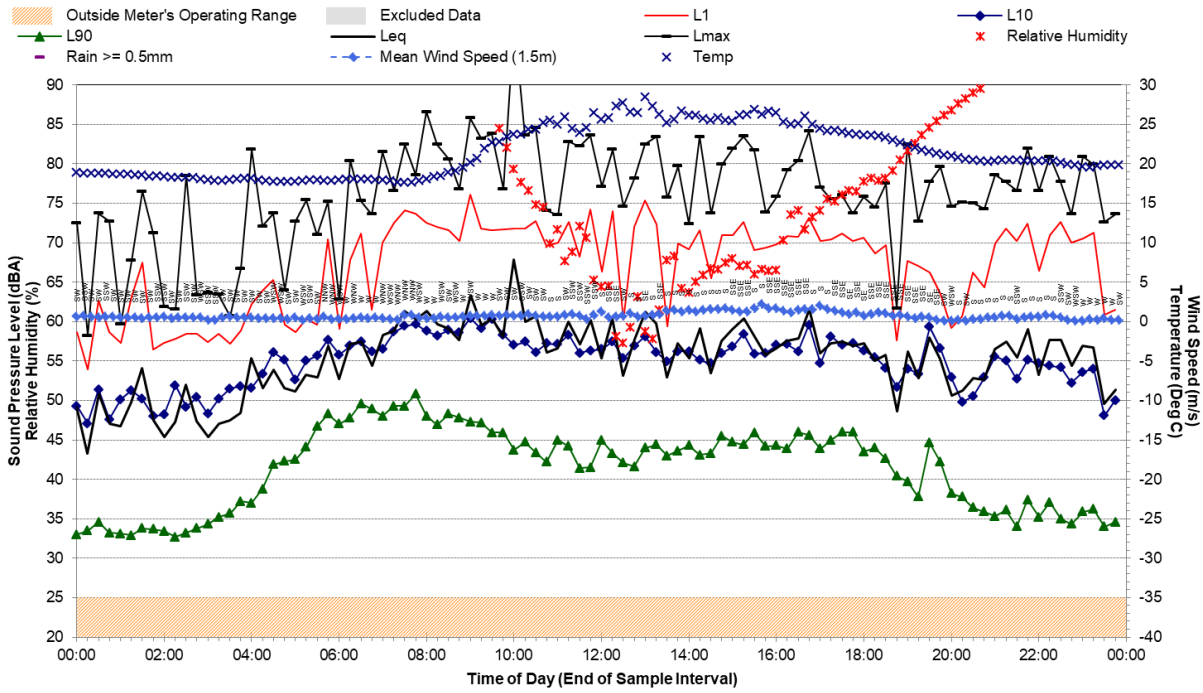
## Statistical Ambient Noise Levels Location F - Monday, 18 March 2019



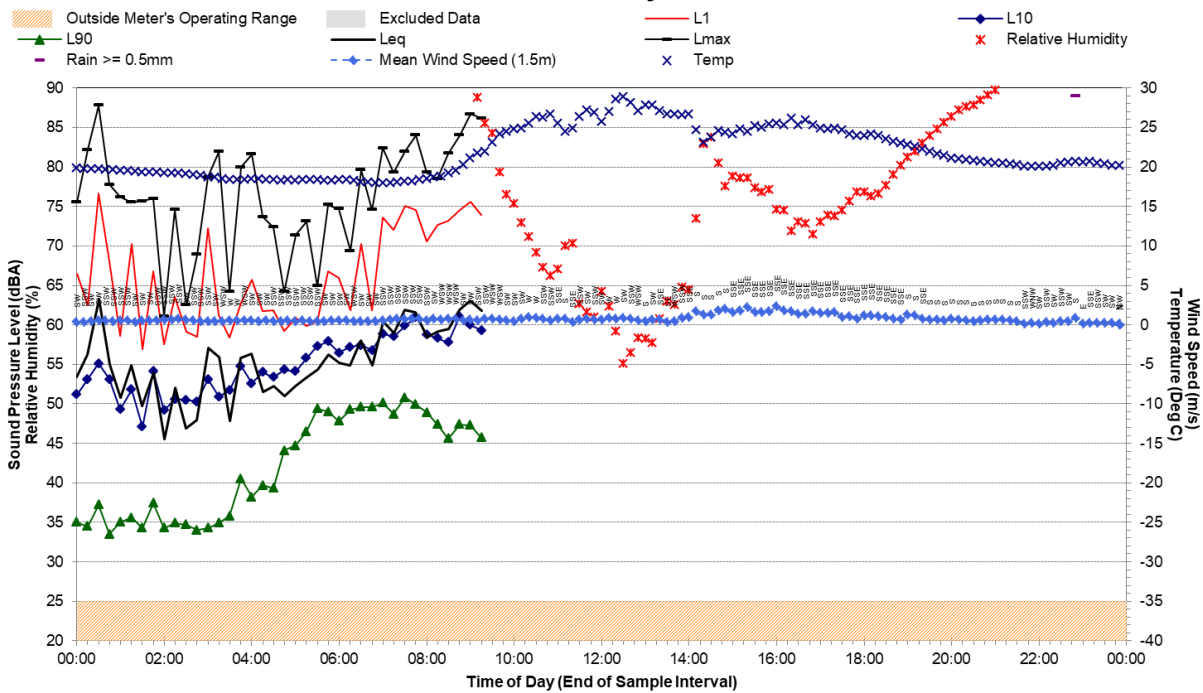
## Statistical Ambient Noise Levels Location F - Tuesday, 19 March 2019



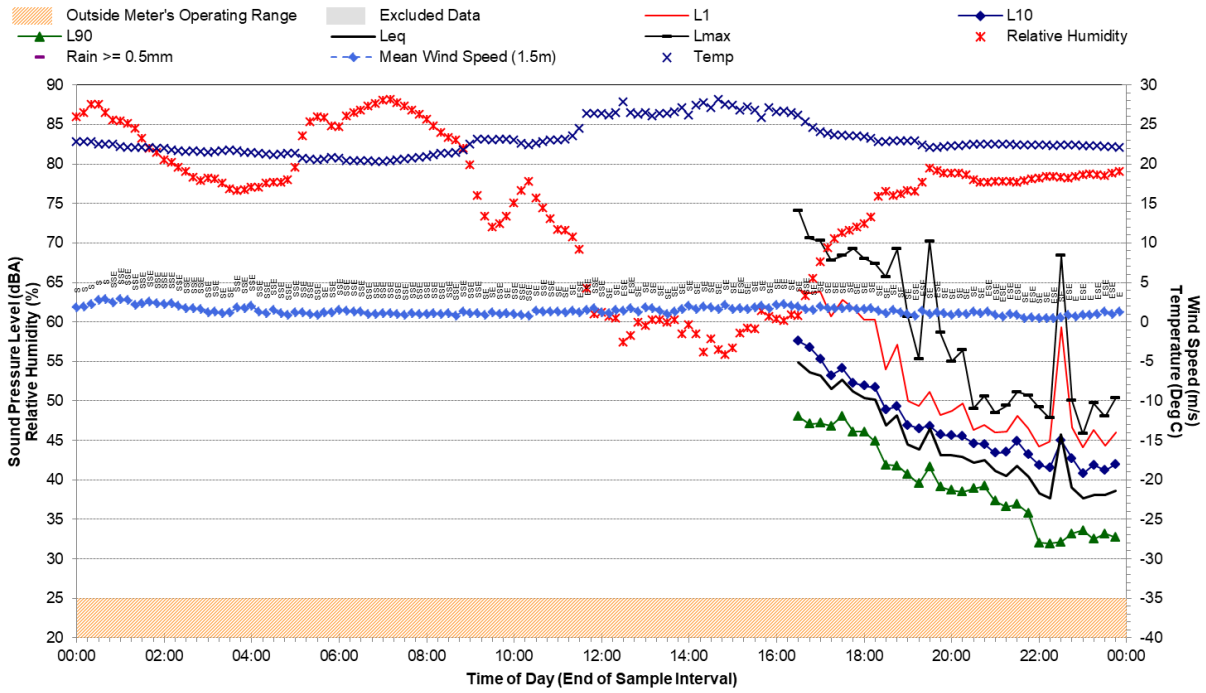
## Statistical Ambient Noise Levels Location F - Wednesday, 20 March 2019



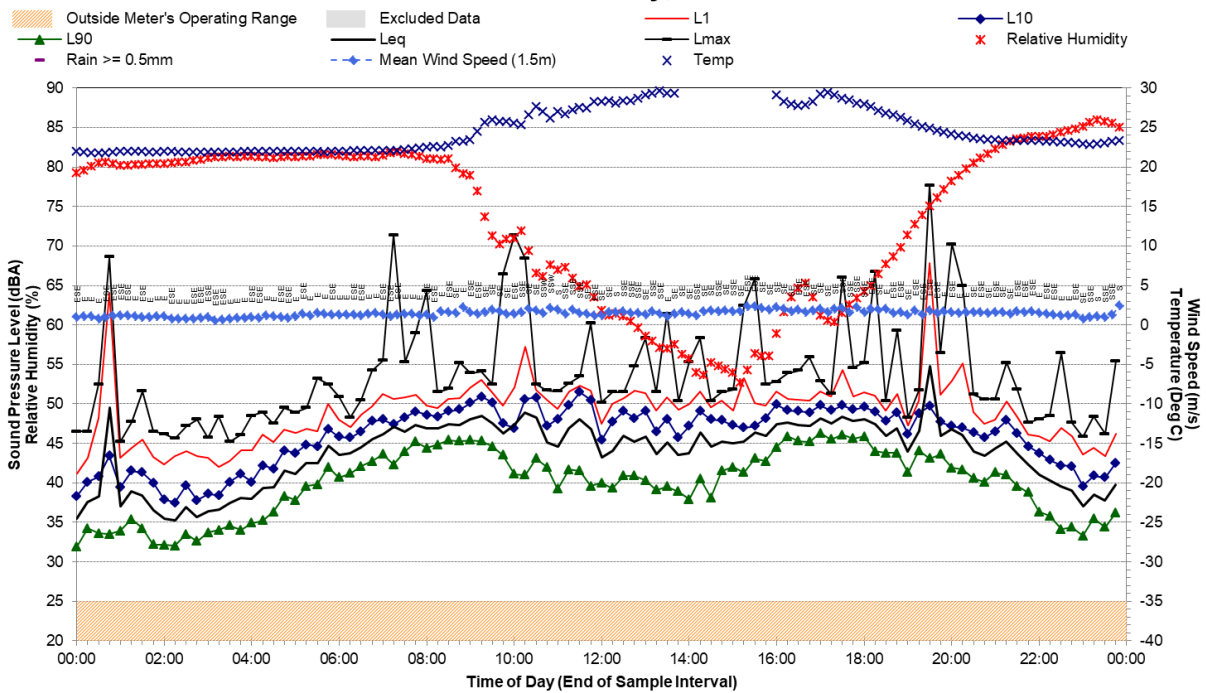
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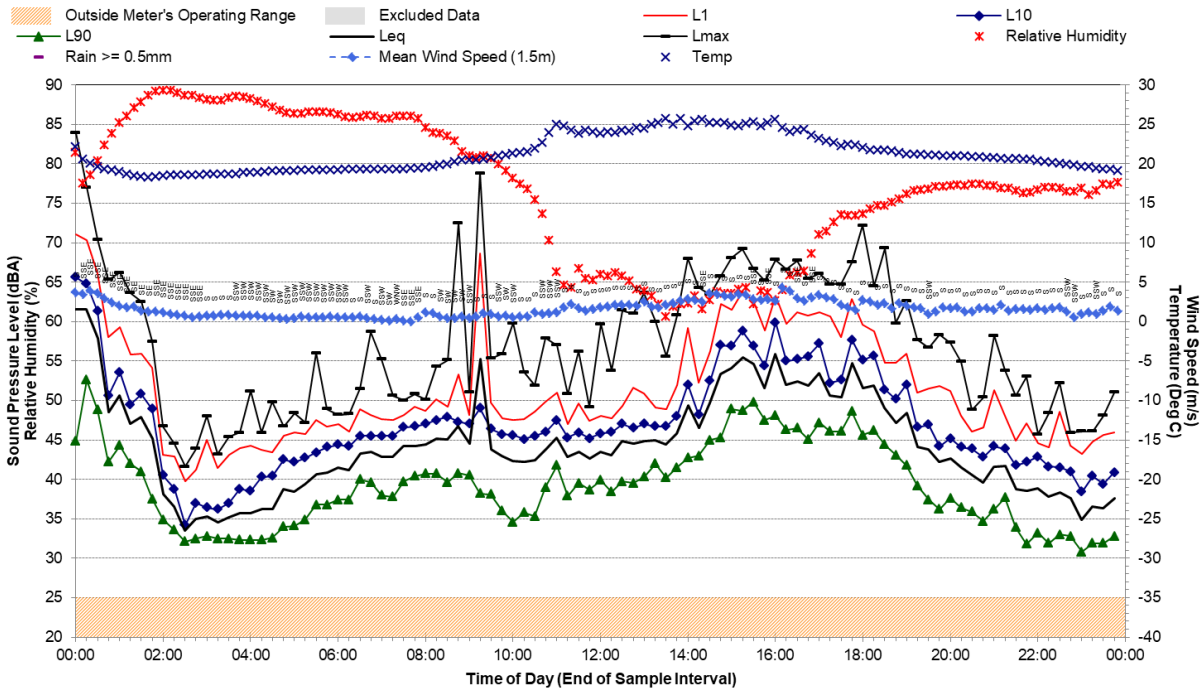
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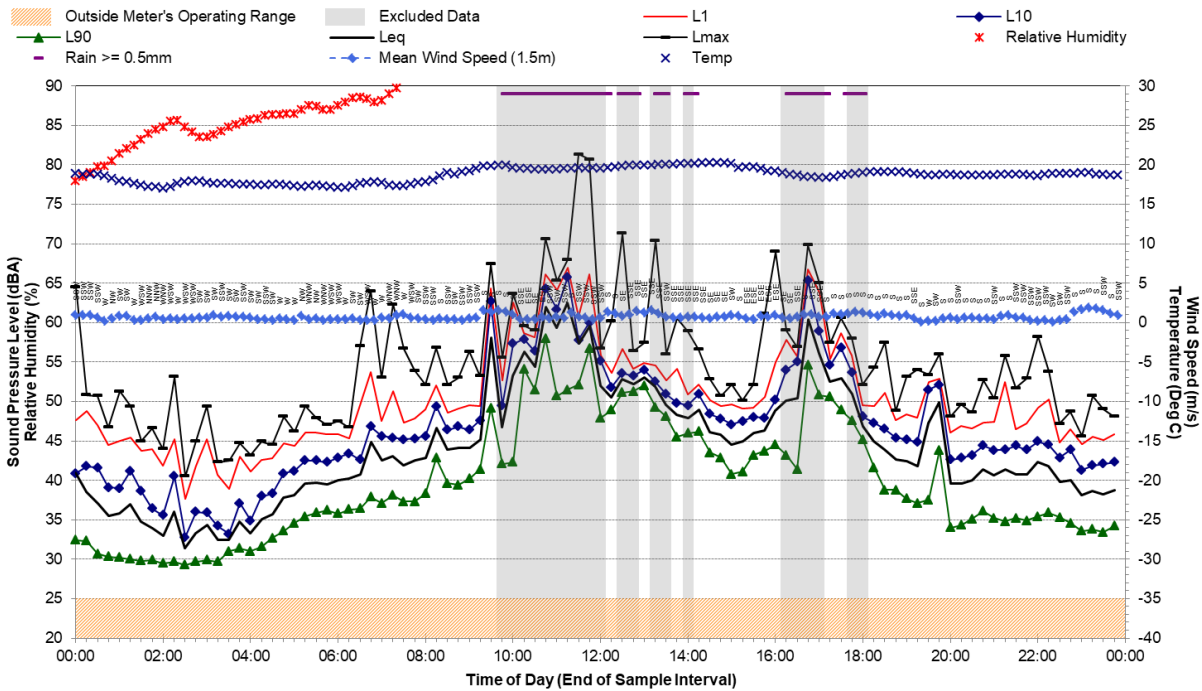
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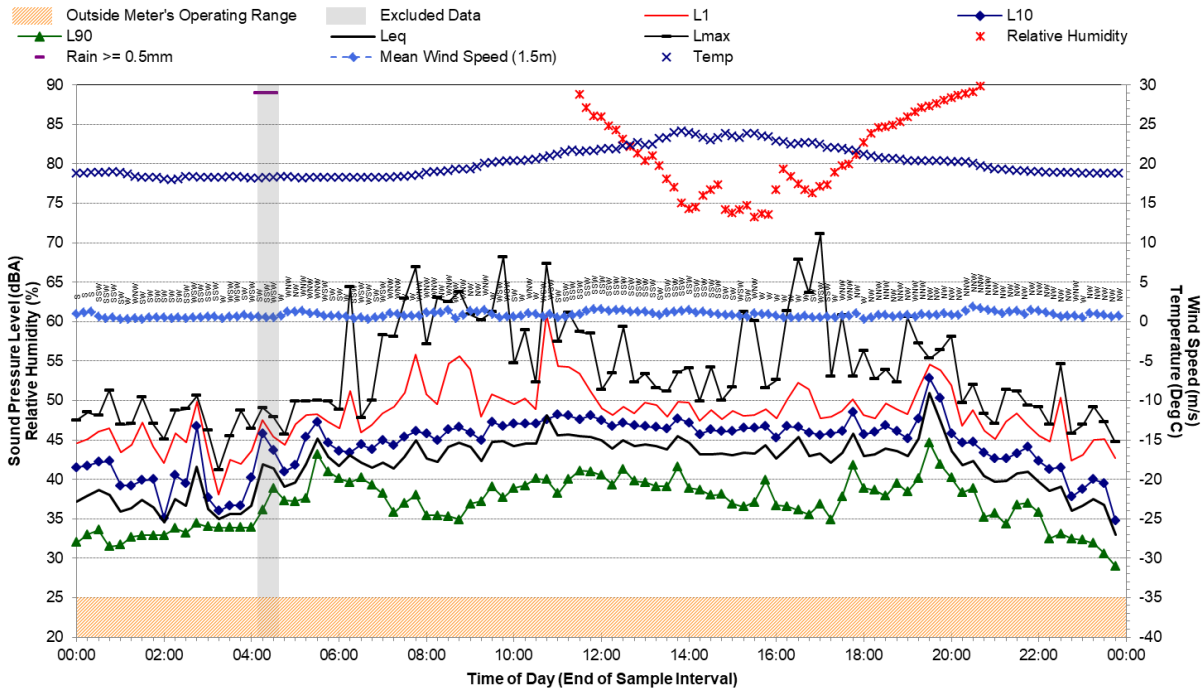
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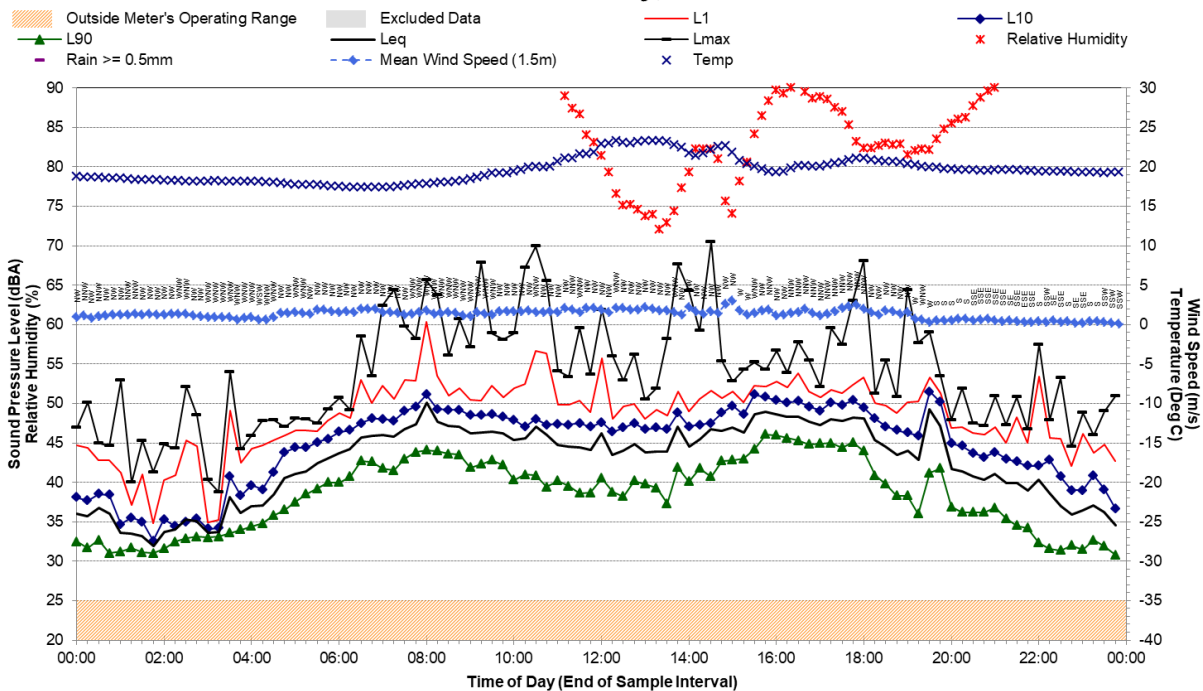
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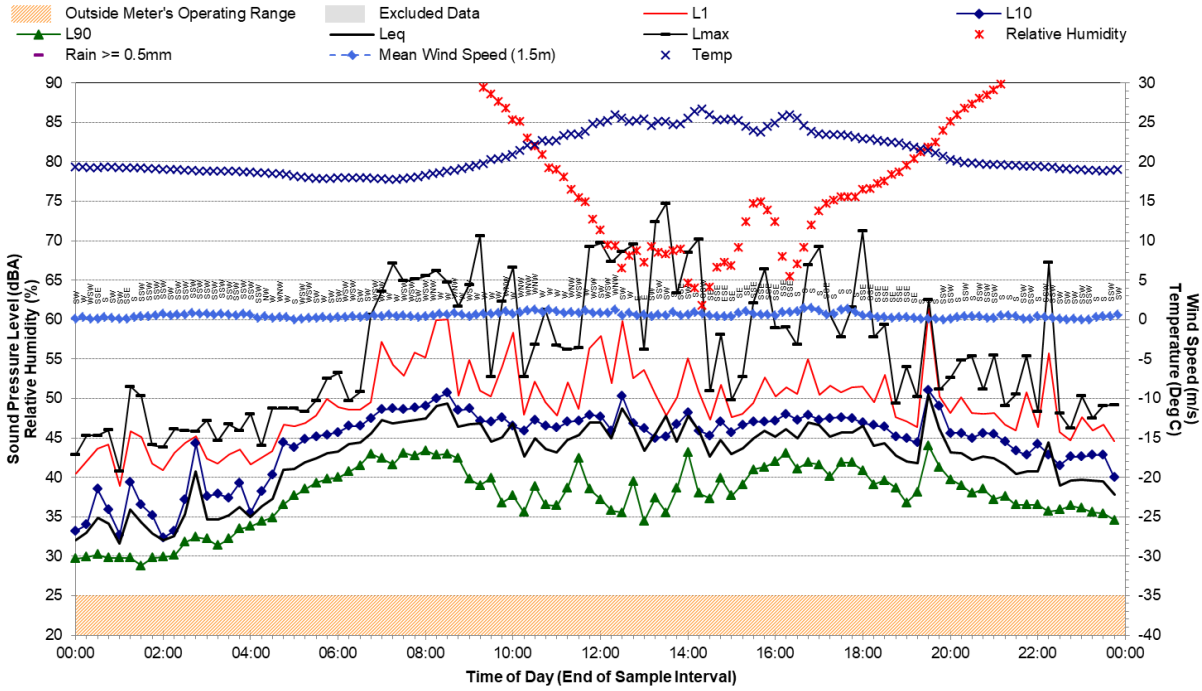
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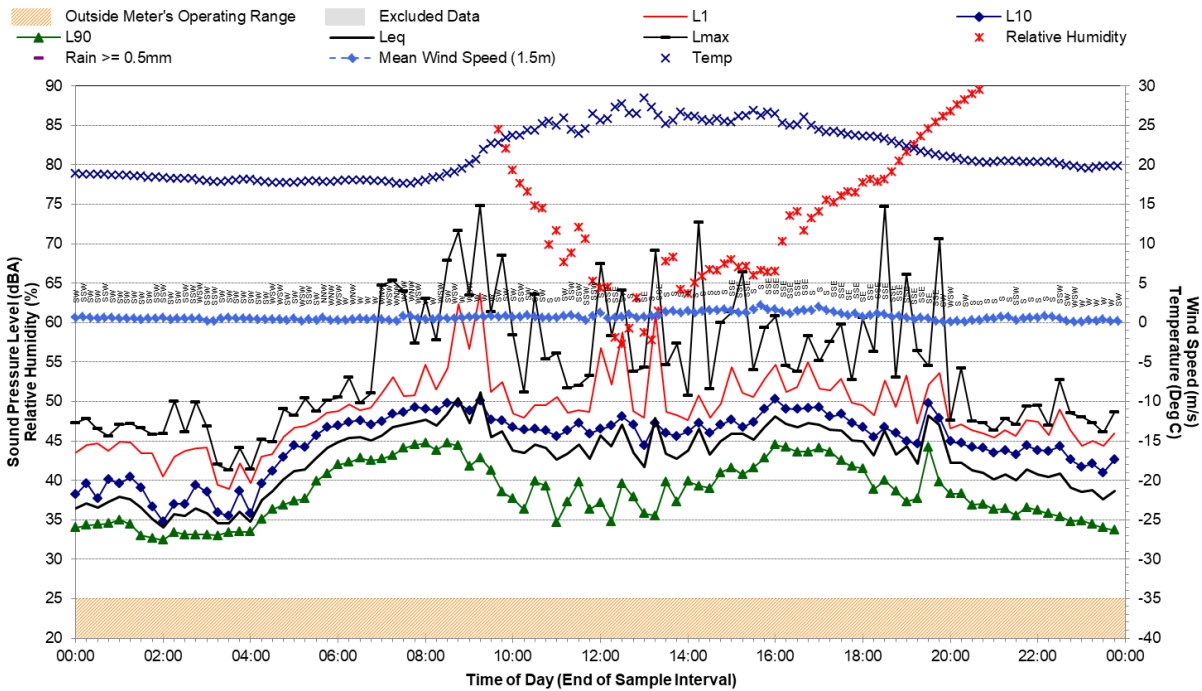
## Statistical Ambient Noise Levels Location G - Monday, 18 March 2019



## Statistical Ambient Noise Levels Location G - Tuesday, 19 March 2019

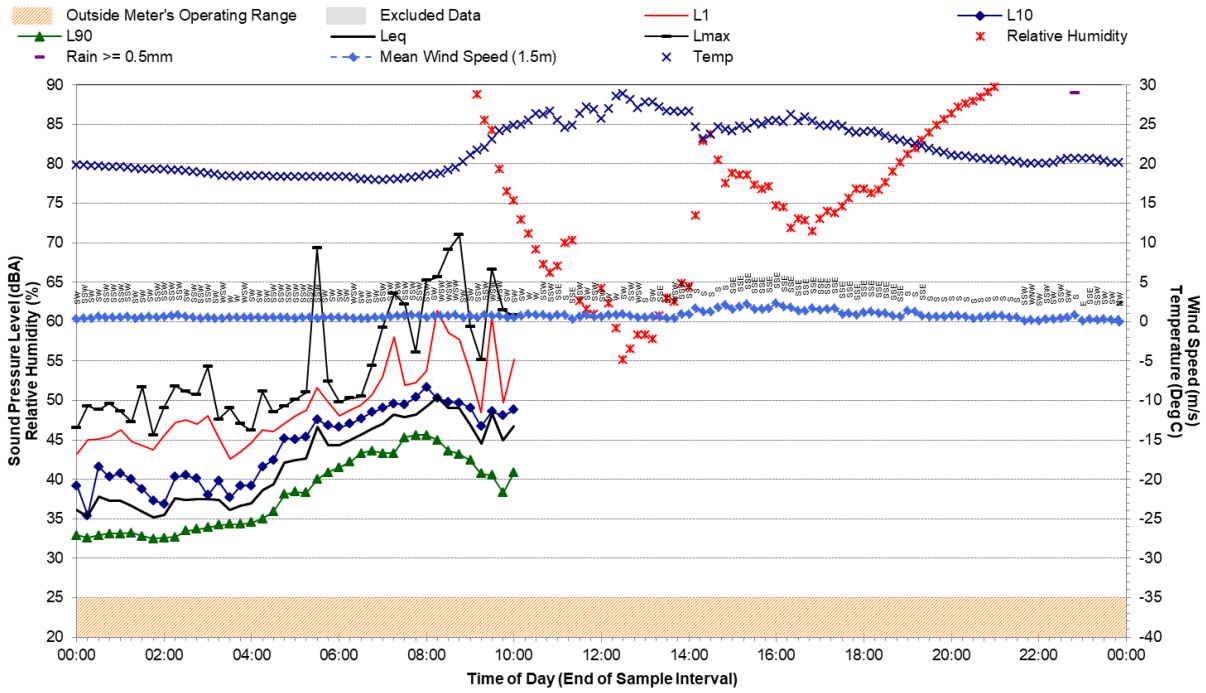


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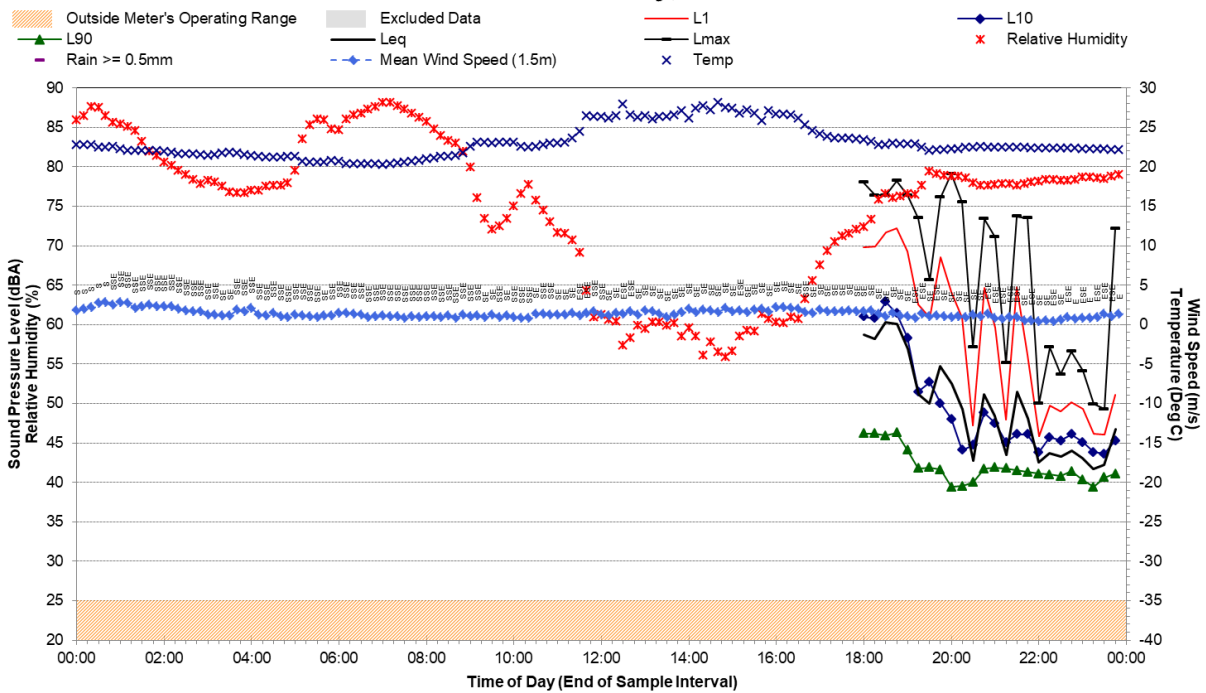




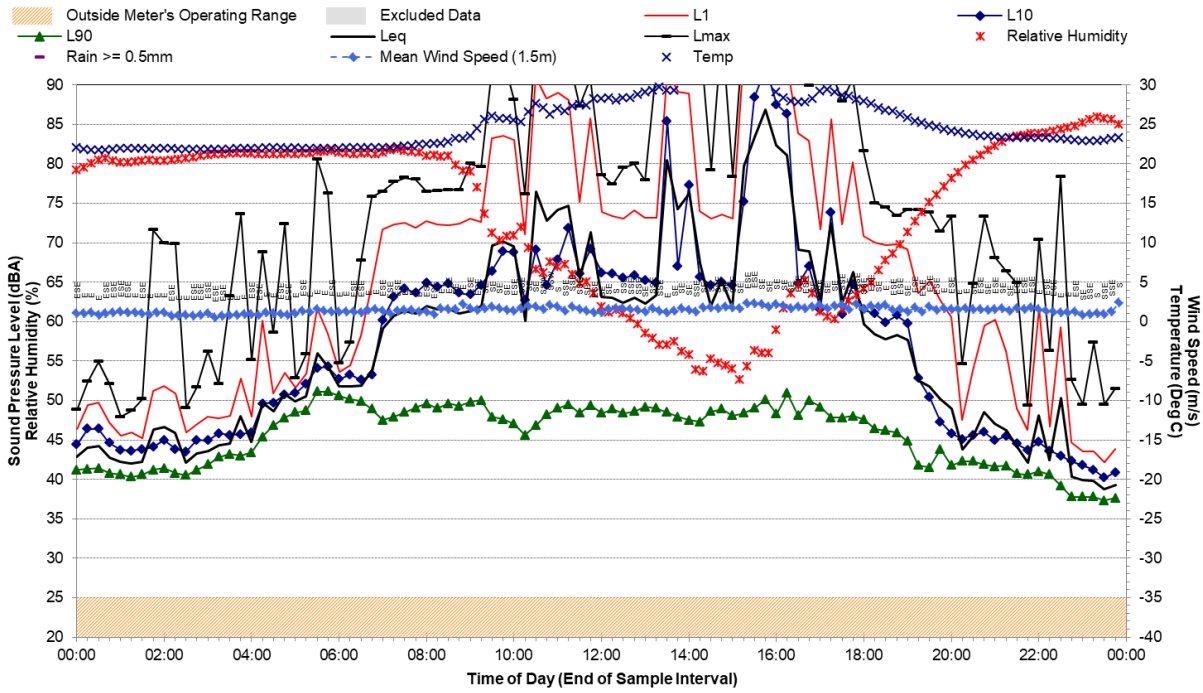
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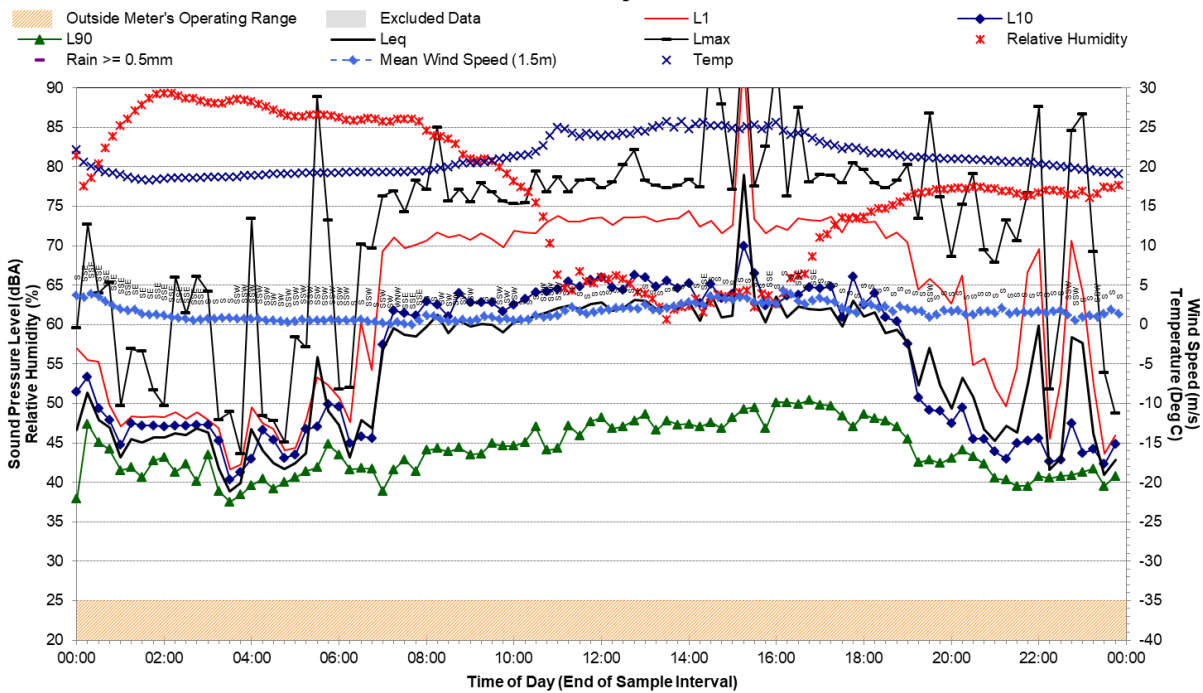
## Statistical Ambient Noise Levels Location I - Wednesday, 13 March 2019



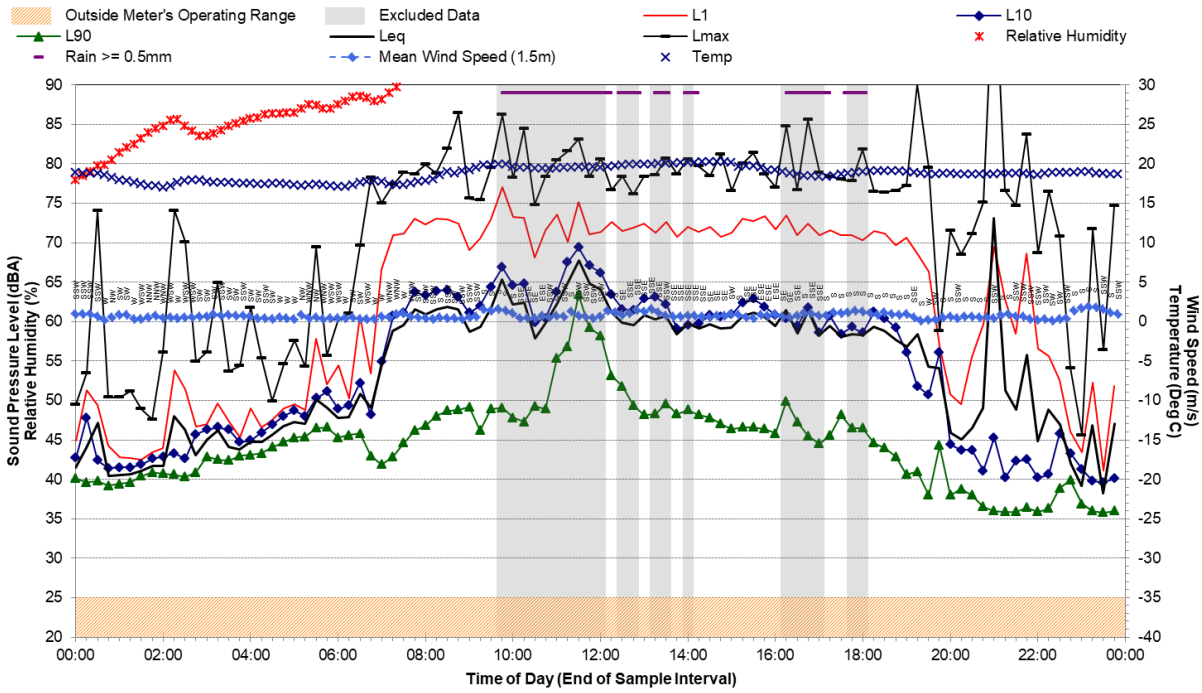
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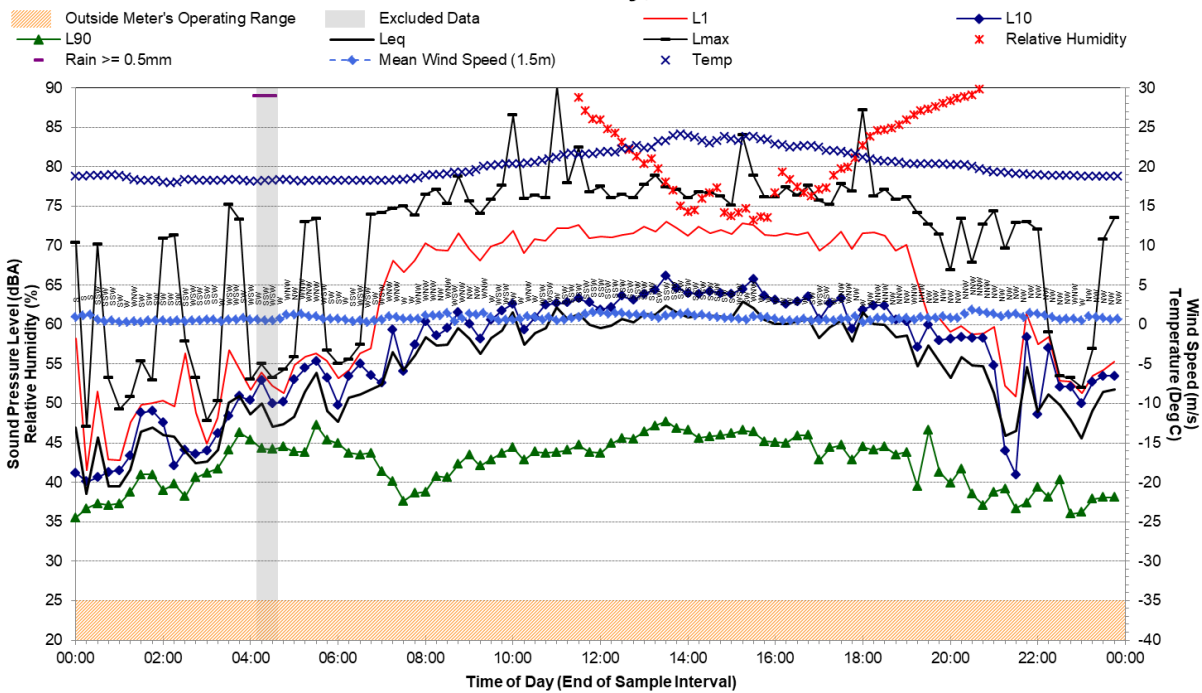
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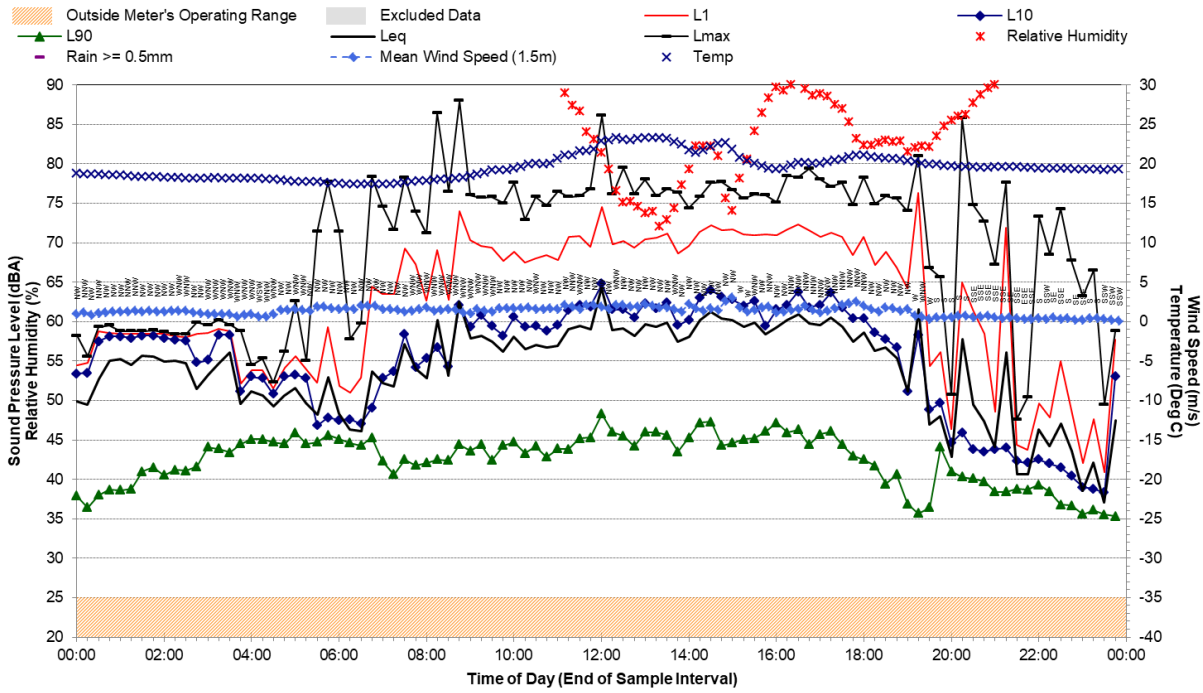
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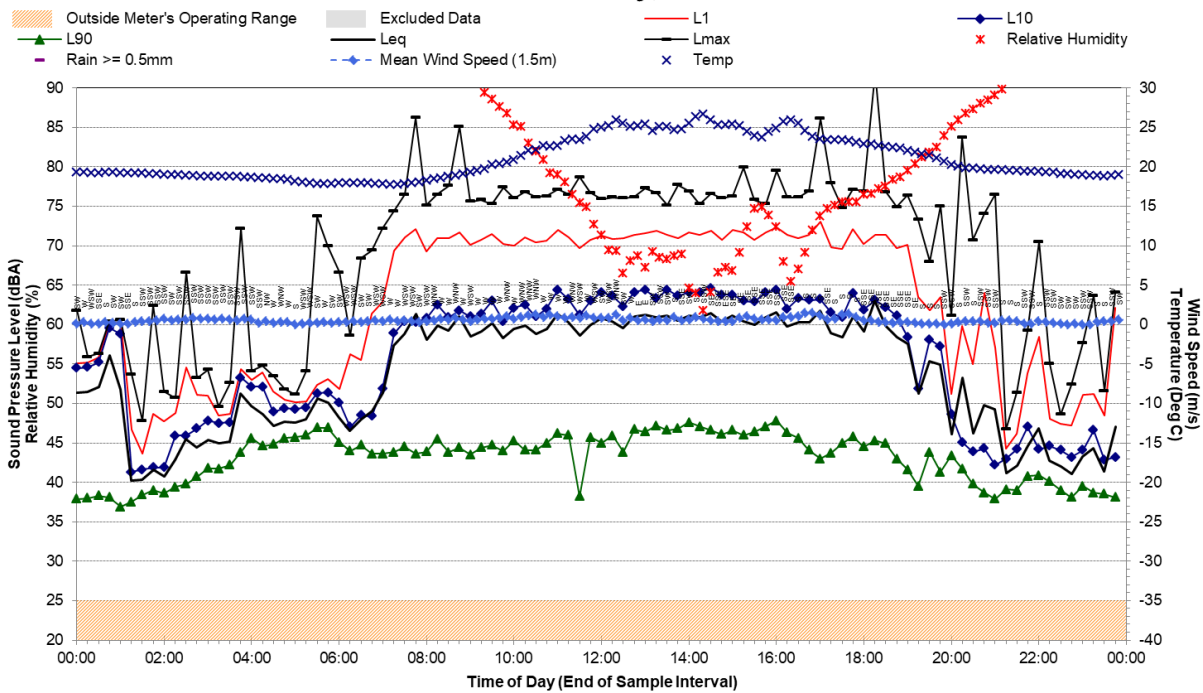
## Statistical Ambient Noise Levels Location I - Sunday, 17 March 2019



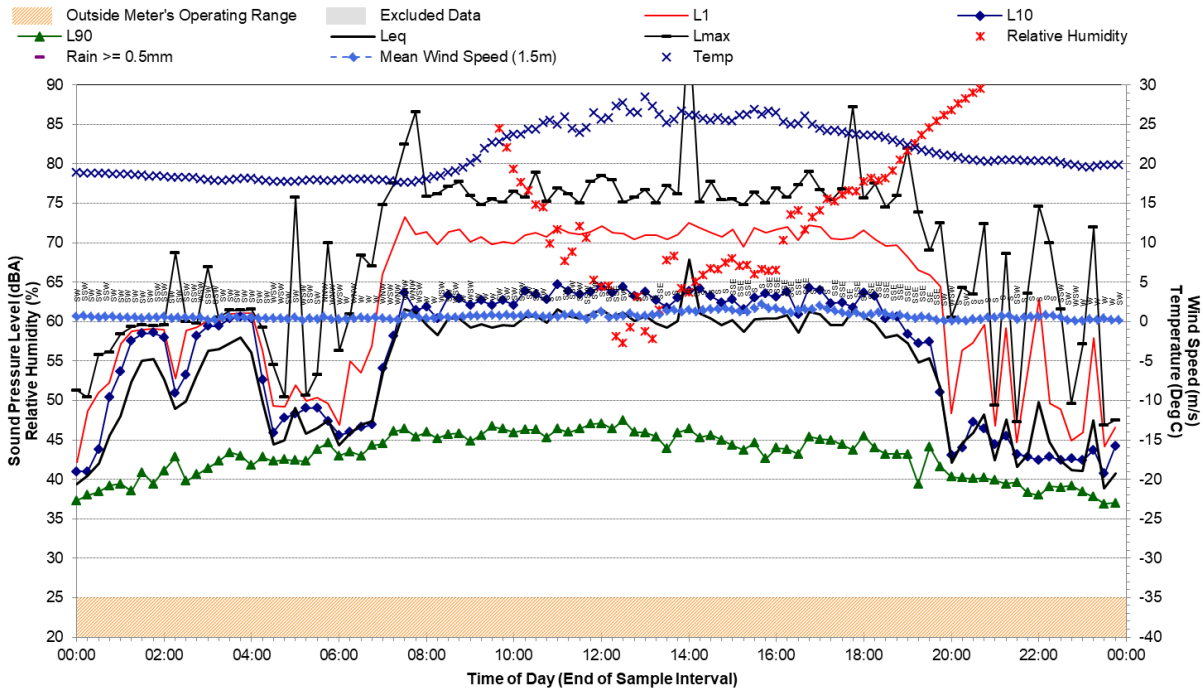
## Statistical Ambient Noise Levels Location I - Monday, 18 March 2019



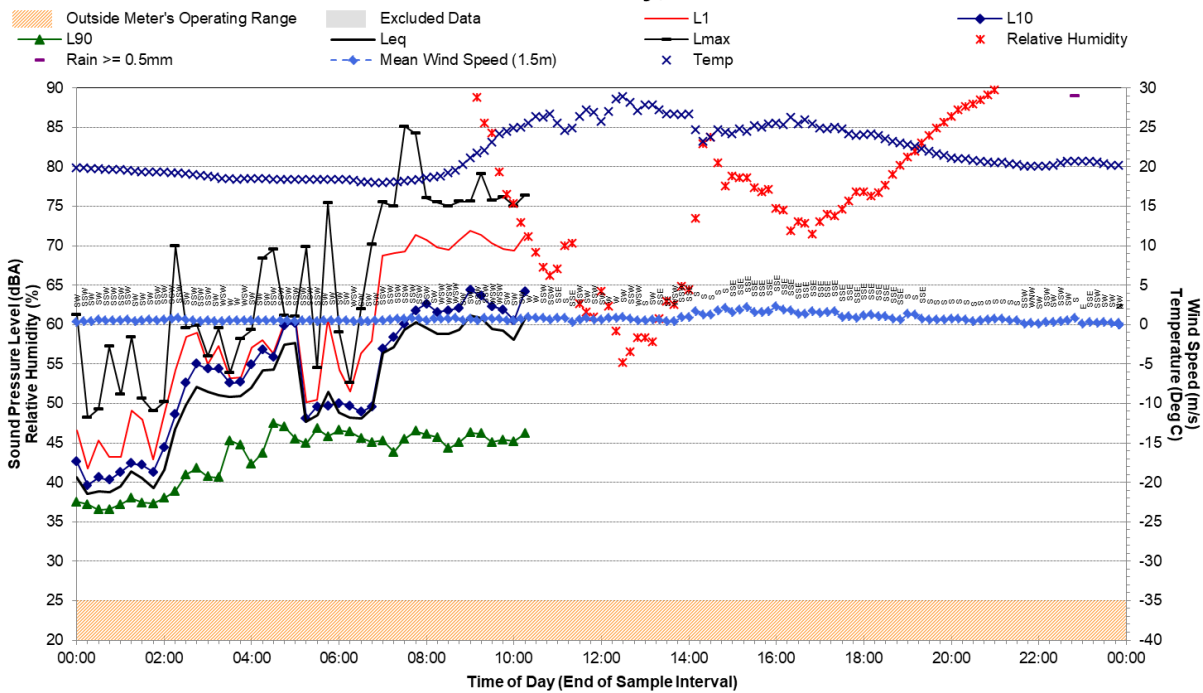
## Statistical Ambient Noise Levels Location I - Tuesday, 19 March 2019



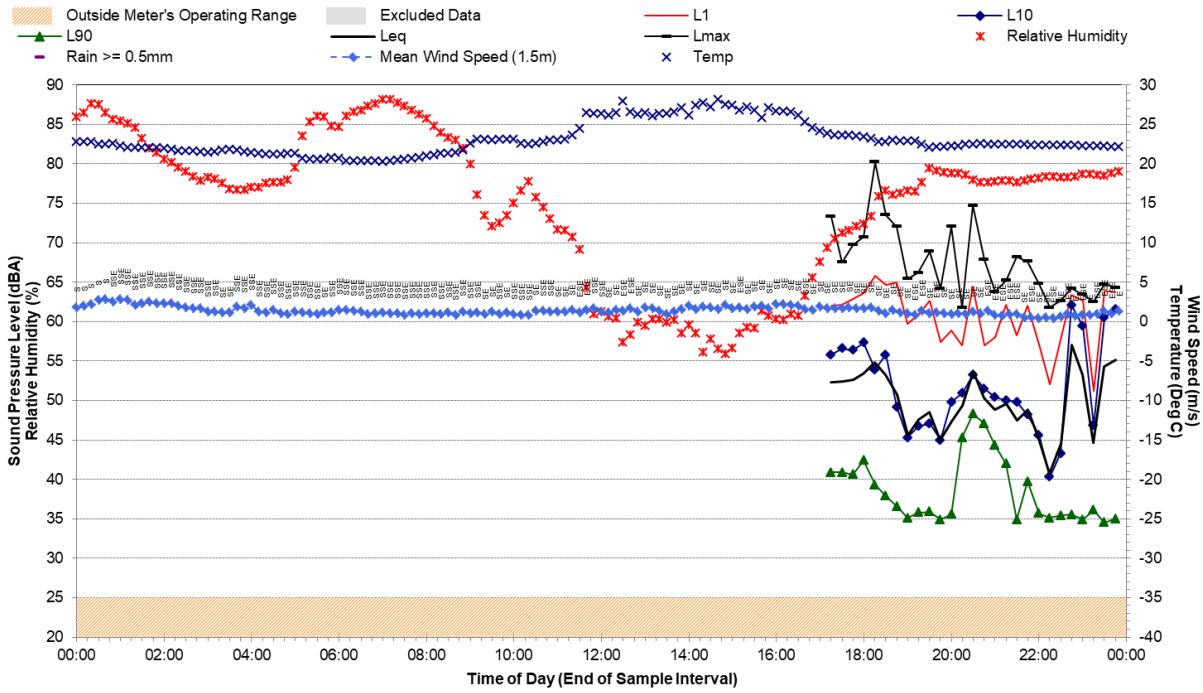
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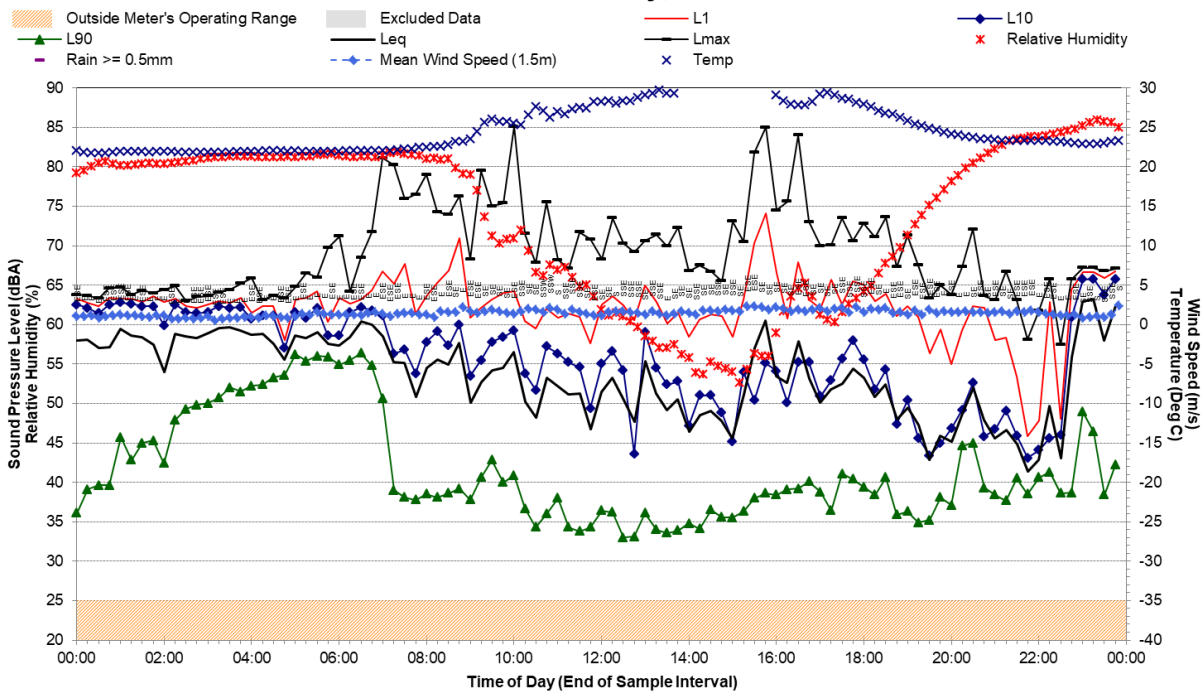
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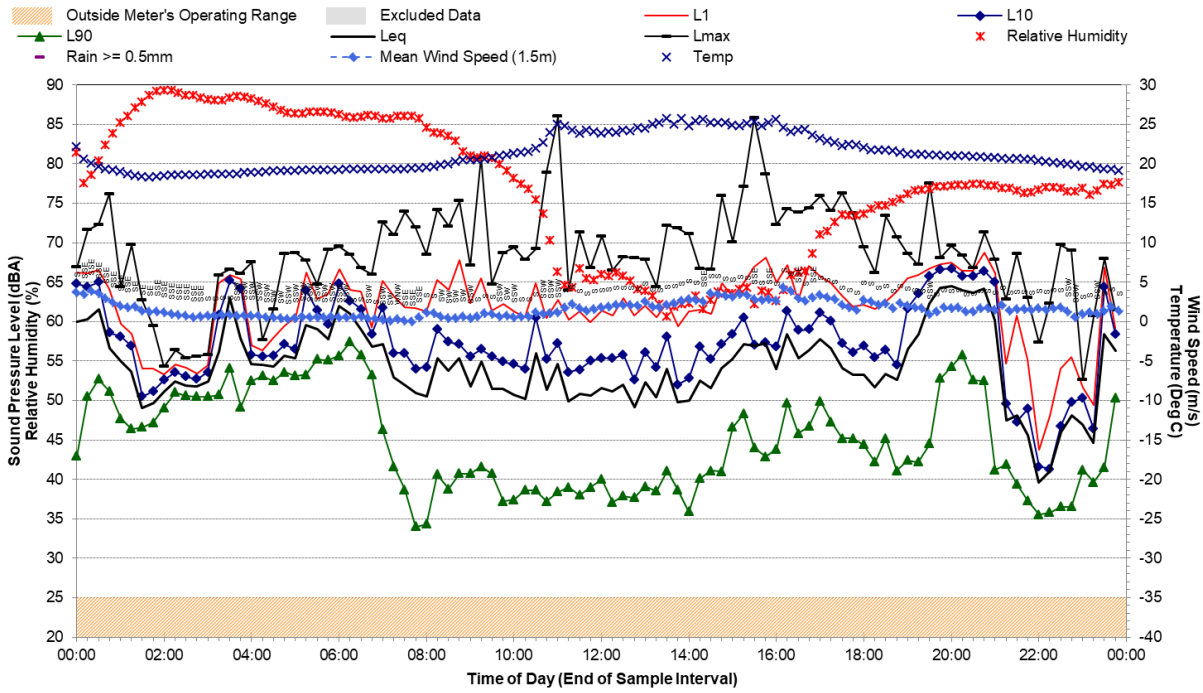
## Statistical Ambient Noise Levels Location L - Wednesday, 13 March 2019



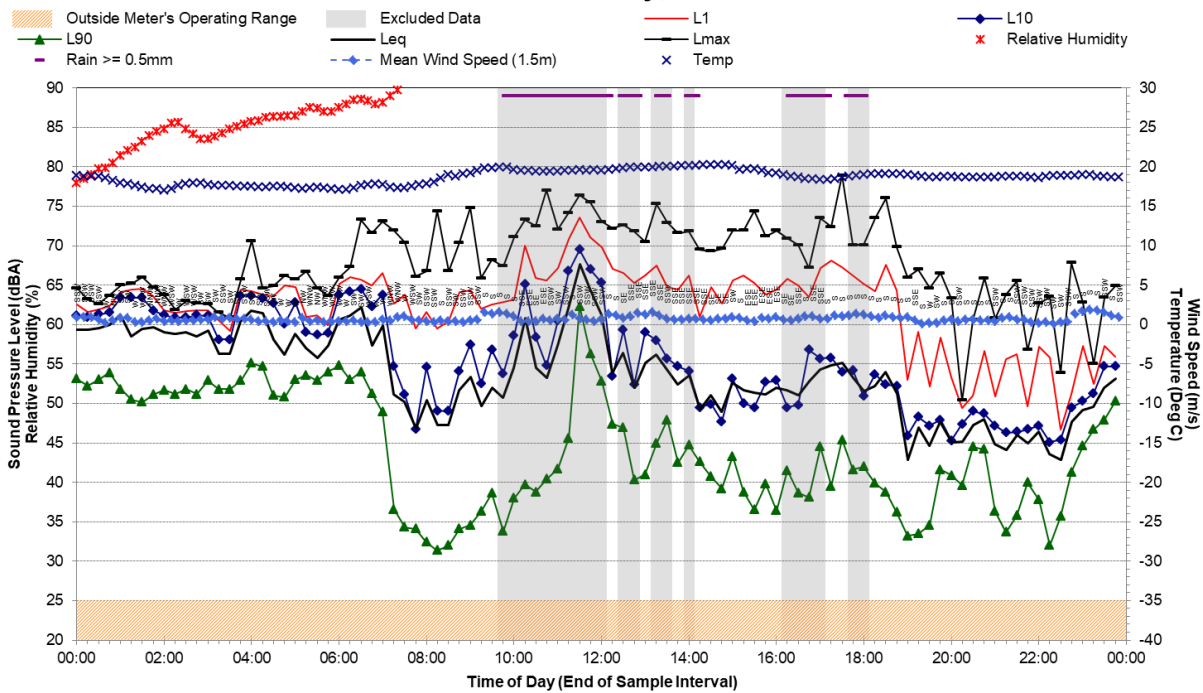
## Statistical Ambient Noise Levels Location L - Thursday, 14 March 2019



## Statistical Ambient Noise Levels Location L - Friday, 15 March 2019

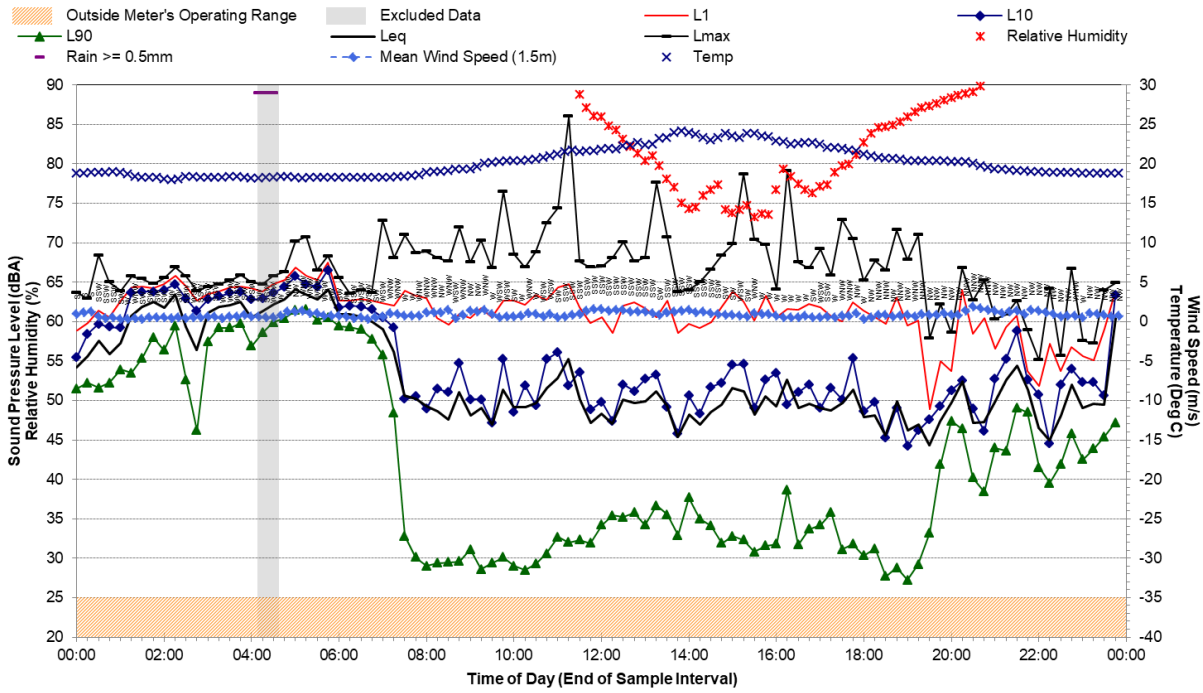


## Statistical Ambient Noise Levels Location L - Saturday, 16 March 2019



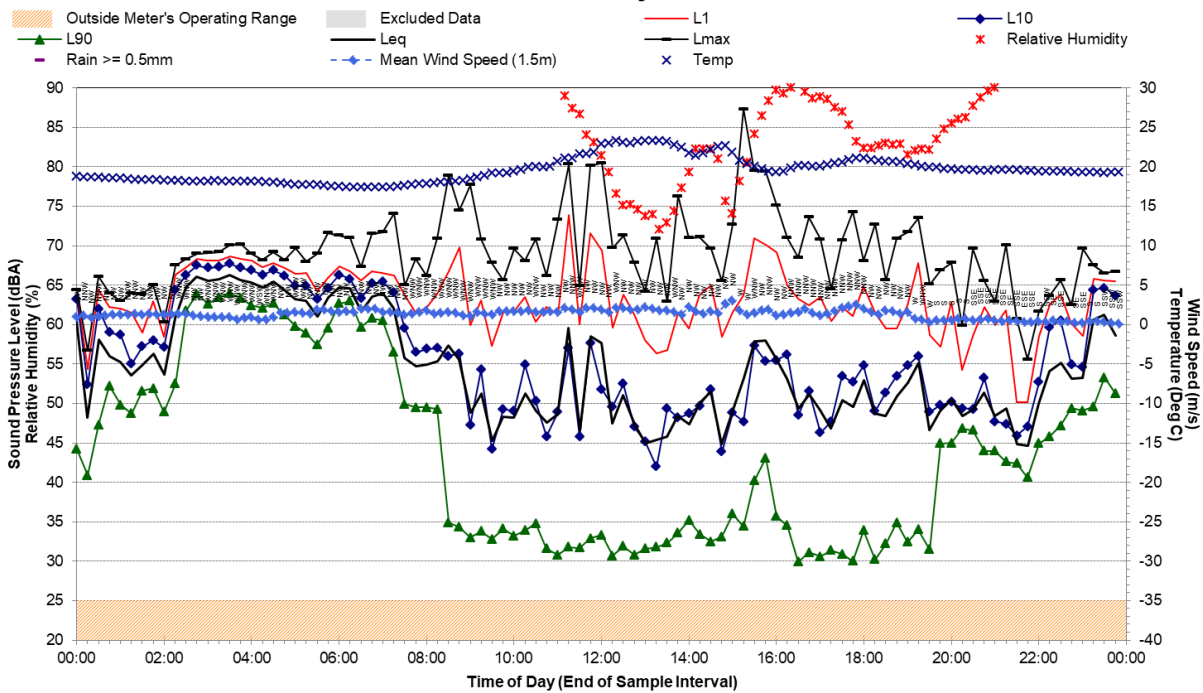
# Statistical Ambient Noise Levels

Location L - Sunday, 17 March 2019



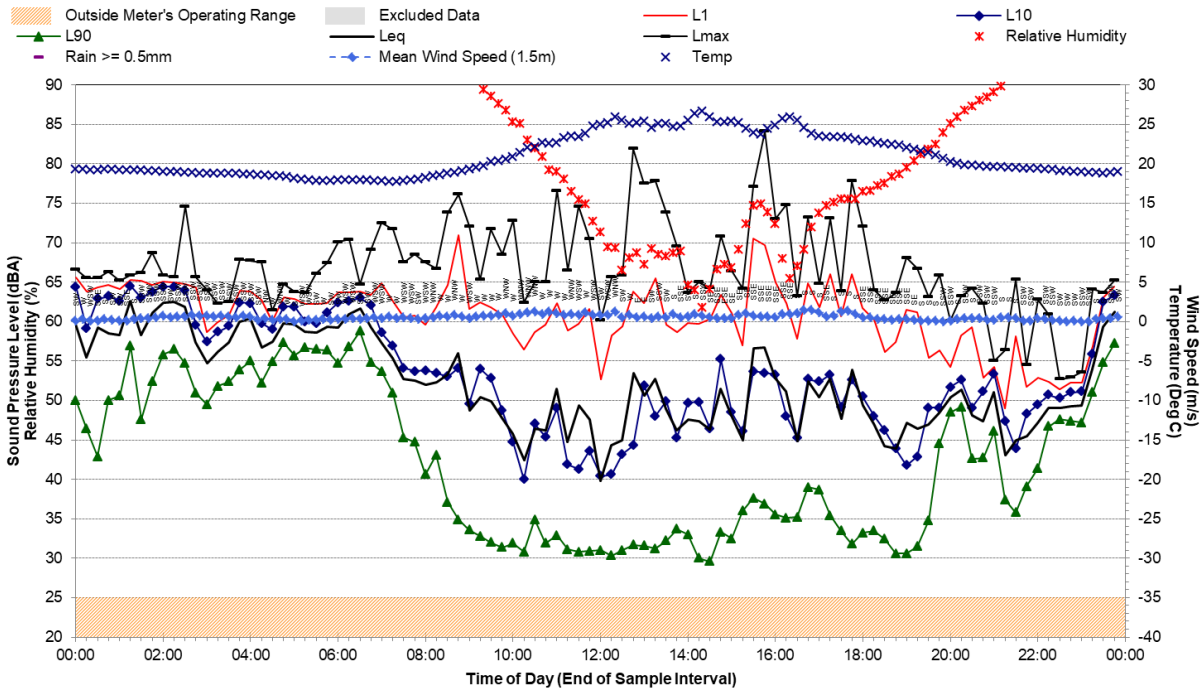
# Statistical Ambient Noise Levels

Location L - Monday, 18 March 2019

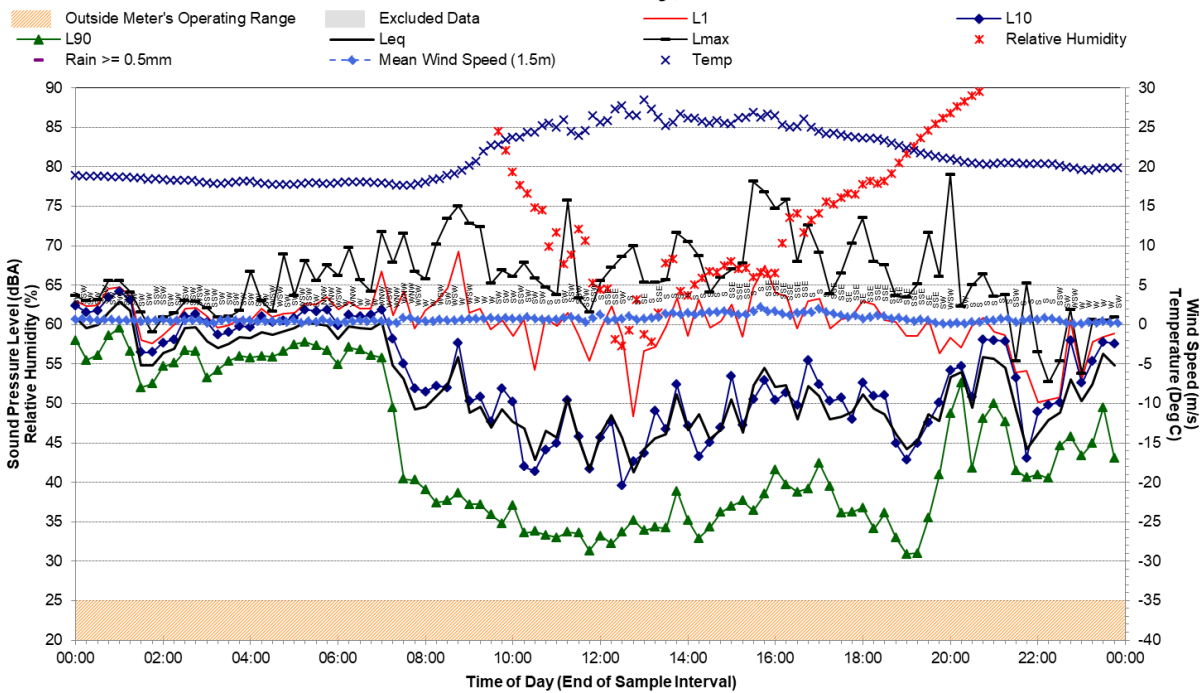




## Statistical Ambient Noise Levels Location L - Tuesday, 19 March 2019

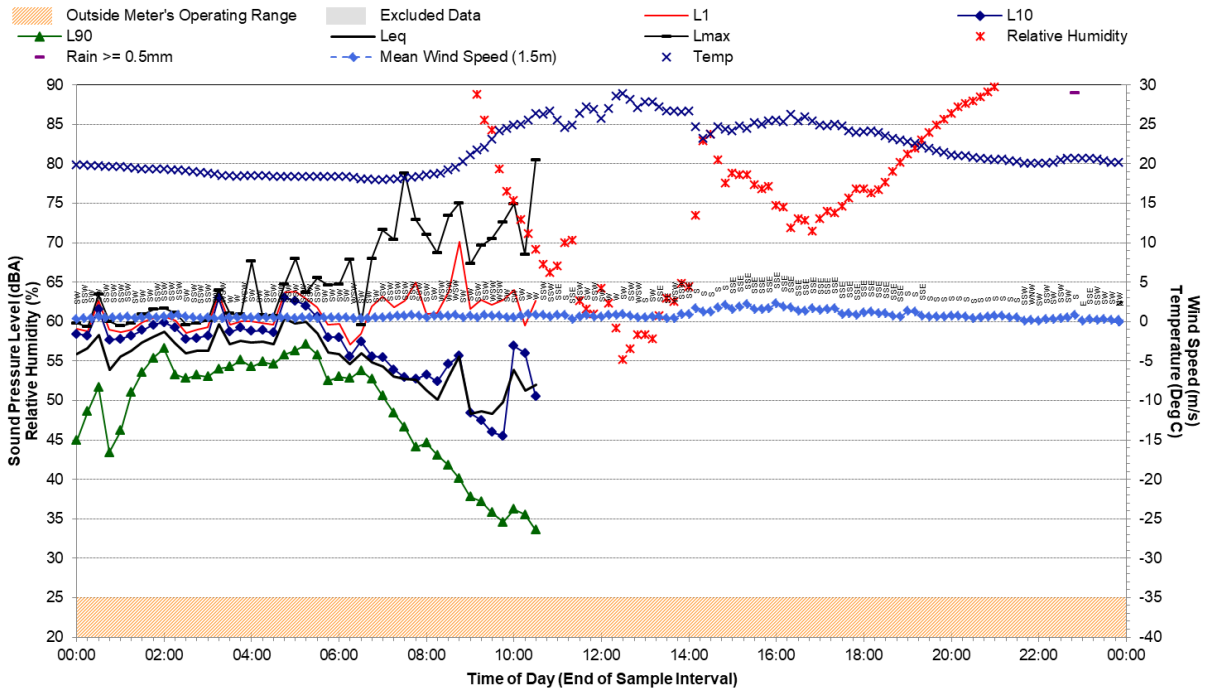


## Statistical Ambient Noise Levels Location L - Wednesday, 20 March 2019



# Statistical Ambient Noise Levels

## Location L - Thursday, 21 March 2019



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