

# Noise Monitoring Assessment

Austen Quarry, Hartley, NSW.

Prepared for : R.W.Corkery & Co. Pty Limited  
November 2017



# Document Information

## Noise Monitoring Assessment

### Austen Quarry, Hartley, NSW

October 2017

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# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by RW Corkery & Co Pty Limited (RWC) on behalf of Hy-Tec Pty Ltd (HT) to complete a Noise Monitoring Assessment (NMA) for Austen Quarry Operations, Hartley, NSW.

The monitoring has been conducted in accordance with the Austen Quarry Noise Management Plan and in general accordance with Conditions L4.1 to L4.3 of EPL #12323 (EPL); at three representative monitoring locations. This assessment was undertaken during October 2017 and forms part of the noise monitoring program to address conditions of the EPL, SSD6084 and the Noise Management Plan.

The assessment was conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Industrial Noise Policy (INP), 2000;
- Environment Protection Licence EPL #12323;
- RW Corkery & Co Pty Limited, Austen Quarry Noise Management Plan (NMP); and
- Standards Australia AS 1055.1:1997 - Acoustics - Description and measurement of environmental noise - General Procedures.

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

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## 2 Noise Criteria

### 2.1 Attended Noise Compliance

Schedule 3, Condition 3 of the Austen Quarry Development Consent (SSD-6084), approved on 15 July 2015, outlines the applicable noise criteria for all privately owned residential receivers surrounding the quarry site. The operating criteria specified in SSD6084 also aligns with criteria in EPL12323 for the quarry at all receivers ie 35dBA LAeq(15min). **Table 1** presents the criteria for privately owned residential receivers surrounding the quarry, as outlined in SSD6084 and EPL12323.

Table 1 Noise Criteria			
Receiver	Day dB(A) LAeq(15min)	Evening dB(A) LAeq(15min)	Morning Shoulder dB(A) LAeq(15min)
All privately owned residences	35	35	35

### 2.2 Unattended Noise Validation

As per Section 8.4.4 of the Noise Management Plan, unattended noise monitoring is to be completed annually at Location B for a period of five days. The unattended noise monitor will be calibrated against the results of the attended noise monitoring.

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### 3 Methodology

#### 3.1 Locality

The quarry is located on Jenolan Caves Road, Hartley, NSW approximately 10km south of Lithgow, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential. The Great Western Highway is situated to the north east of the site and Jenolan Caves Road to the west of the site.

#### 3.2 Noise Monitoring Locations

Three monitoring locations have been selected as part of the NMA and in accordance with the Noise Management Plan (NMP) and are summarised below:

- Location A (residence identifier R24A as per NMP), is located at 200 Jenolan Caves Road approximately 2.5km north of the project;
- Location B (residence identifier R31 as per NMP), is located at 781 Jenolan Caves Road and approximately 1km south west of the project site; and
- Location C (residential identifier R48 as per NMP) located at 64 Carrol Drive, Hartley which is approximately 2.5Km north east of the quarry.

The monitoring locations with respect to quarry location are presented in the locality plan shown in **Figure 1**.

#### 3.3 Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The measurements were carried out using Svantek Type 1, 971 noise analyser on Wednesday 4 October 2017 to Thursday 5 October 2017. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA.

Noise measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source. One measurement was conducted at each of the monitoring locations during the day, evening and morning shoulder monitoring periods to quantify the noise sources in the ambient noise environment.

During the day and morning shoulder period, the quarry was operating at full capacity with reduced operations during the evening period where the pit vehicles (trucks, excavator and drill) were not required to meet production demands.



**FIGURE 1**  
**LOCALITY PLAN**  
REF: MAC170523



KEY	
	MONITORING LOCATION
	SITE LOCATION



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## 4 Results

### 4.1 Assessment Results - Location A, 200 Jenolan Caves Road

Operational attended noise monitoring was completed in each assessment period at Location A on Wednesday 4 October 2017 and Thursday 5 October 2017. **Table 2** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 2 Operator-Attended Noise Survey Results – Location A							
Date	Time (hrs)	Period	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
			L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>		
5/10/17	7:59	Day	86	62	37	Dir: E Wind Speed: 0.2m/s Rain: Nil	Birds 37-46
							Flowing water 34-36
							Cars 54-70 Road Trucks 65-86
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							Not audible
4/10/17	18:22	Evening	84	61	37	Dir: SW Wind Speed: 1.0m/s Rain: Nil	Road Traffic 57-84
							Frogs 36-38
							Flowing water 35-38 Birds 42-44
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							Not audible
5/10/17	6:15	Shoulder	85	64	39	Dir: E Wind Speed:0.2m/s Rain: Nil	Road Trucks 54-75
							Birds 39-44
							Cars 59-68
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							Not audible

## 4.2 Assessment Results - Location B, 781 Jenolan Caves Road

Operational attended noise monitoring was completed in each assessment period at Location B on Wednesday 4 October 2017 and Thursday 5 October 2017. **Table 3** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 3 Operator-Attended Noise Survey Results – Location B							
Date	Time (hrs)	Period	Descriptor (dBA re 20 $\mu$ Pa)			Meteorology	Description and SPL, dBA
			L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>		
4/10/17	16:47	Day	47	40	38	Dir: NE Wind Speed: 1.4 m/s Rain: Nil	Dog Noise 42-65
							Birds 48-50
							Insects 35-36
							Aircraft Noise 35-37
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							34
4/10/17	18:47	Evening	59	37	28	Dir: NE Wind Speed: 1.3 m/s Rain: Nil	Wind in trees 33-35
							Aircraft 31-48
							Resident Noise 36
							Birds 33-59
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							28
5/10/17	6:42	Shoulder	61	40	33	Dir: NE Wind Speed: 1.3 m/s Rain: Nil	Birds 31-43
							Traffic Hum 35-36
							Trucks onsite 32-36
							Dogs Barking 34-61
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							33

### 4.3 Assessment Results - Location C, 64 Carrol Drive

Operational attended noise monitoring was completed in each assessment period at Location C on Wednesday 4 October 2017 and Thursday 5 October 2017. **Table 4** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 4 Operator-Attended Noise Survey Results – Location C							
Date	Time (hrs)	Period	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
			L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>		
5/10/17	7:28	Day	56	41	36	Dir: NE Wind Speed: 0.2m/s Rain: Nil	Birds 38-56 Traffic 38-44 Bangs onsite 37-38
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							32
4/10/17	18:00	Evening	69	43	37	Dir: E Wind Speed: 1.6m/s Rain: Nil	Birds 37-57 Leaves Rustling 36-38 Dog Bark 39 Traffic Noise 40-50
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							Not audible
5/10/17	5:55	Shoulder	58	49	43	Dir: SE Wind Speed: 0.1m/s Rain: Nil	Birds 44-58 Traffic Noise 40-49
Austen Quarry L <sub>Aeq</sub> (15min) Contribution							Not audible

### 4.4 Unattended Noise Monitoring Results

Unattended noise monitoring was conducted at Location B from Tuesday 19 September 2017 to Thursday 5 October 2017 while the quarry was operational. A comparison of attended and unattended noise monitoring data has been completed. **Table 5** presents the result of this comparison, focusing on the 15-minute statistics for both methods.

Table 5 Comparison of Operator-Attended Noise Survey versus Unattended Logging – Location B							
Date	Time (hrs)	Attended descriptors (dBA re 20 µPa)			Unattended descriptors (dBA re 20 µPa)		
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>
4/10/17	16:47	47	40	38	70	46	34
4/10/17	18:47	59	37	28	54	36	28
5/10/17	6:42	61	40	33	60	41	34

Results of the comparison identify that measured levels are generally consistent, some variation in the metrics are expected due to the proximity of noise sources to the microphones and the moderate separation between the unattended and attended monitoring positions.

Attended noise monitoring identified that the LA90 metric for Location B represented the worst-case quarry noise emissions. Therefore, the LA90 metric has been adopted as an indicative guide for compliance at Location B. A summary of daily metrics for the assessment period from Tuesday 19 September 2017 to Wednesday 4 October 2017 is presented in **Table 6. Appendix B** presents the logger charts of the results of the unattended monitoring survey. It is noted that data obtained on Saturdays and Sundays were influenced by local sources and as such have been excluded from the data set.

**Table 6 Unattended Noise Logging Summary– Location B**

Date	Unattended descriptors (dBA re 20 µPa)					
	LAeq			LA90 (Rating Background Level)		
	Day	Evening	Night	Day	Evening	Night
Tuesday-19-Sep-17	41	46	41	27	21	21
Wednesday-20-Sep-17	44	47	46	29	21	25
Thursday-21-Sep-17	49	36	42	30	22	23
Friday-22-Sep-17	43	35	39	29	23	22
Monday-25-Sep-17	58	44	48	<b>39<sup>1</sup></b>	28	21
Tuesday-26-Sep-17	55	57	50	30	<b>44<sup>1</sup></b>	31
Wednesday-27-Sep-17	53	43	44	29	23	24
Thursday-28-Sep-17	52	43	47	35	32	31
Friday-29-Sep-17	49	36	47	32	26	27
Monday-2-Oct-17	58	51	52	29	30	22
Tuesday-3-Oct-17	46	36	45	28	24	22
Wednesday-4-Oct-17	52	35	37	32	24	21

Note 1: Influenced by elevated wind speed, see Appendix B.

Results of the unattended noise monitoring during calm meteorological conditions identify that the LA90 metric remains below the relevant criteria of 35dBA for the majority of assessed periods.



## 5 Noise Compliance Assessment

The compliance assessment for the nominated monitoring locations are presented in **Table 7** to **Table 9** for day, evening and morning shoulder assessment periods.

**Table 7 Daytime Noise Compliance Assessment**

Receiver No.	Quarry Noise Contribution	Quarrying Noise Criteria	Compliant
	LAeq(15min)	LAeq(15min)	
A	Not audible	35	✓
B	34	35	✓
C	32	35	✓

**Table 8 Evening Noise Compliance Assessment**

Receiver No.	Quarry Noise Contribution	Quarrying Noise Criteria	Compliant
	LAeq(15min)	LAeq(15min)	
A	Not audible	35	✓
B	28	35	✓
C	Not audible	35	✓

**Table 9 Morning Shoulder Noise Compliance Assessment**

Receiver No.	Quarry Noise Contribution	Quarrying Noise Criteria	Compliant
	LAeq(15min)	LAeq(15min)	
A	Not audible	35	✓
B	33	35	✓
C	Not audible	35	✓

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## 6 Discussion

### 6.1 Discussion of Results - Location A

Monitoring conducted at Location A, 200 Jenolan Caves Road, Hartley, NSW, was dominated by passing traffic. This included trucks from both Austen Quarry, surrounding Oberon quarries and local traffic. Quarry noise emissions were inaudible during all three monitoring periods for October 2017. Other extraneous noise sources audible during the three attended surveys included birds, wind in trees, insects, and water flowing from nearby Coxs River.

### 6.2 Discussion of Results - Location B

Monitoring results at Location B, 781 Jenolan Caves Road, Good Forest, NSW, identified that the quarry is audible at this monitoring location, although remained within criteria and consistent with the predictions made in the EIS for Stage 2 of the Project (RWC, 2014). Mobile plant noise was audible during each of the three survey periods at this location. Notwithstanding, extraneous noise sources dominated the noise environment which included birds, distant traffic hum, dog barking, insects and aircraft noise.

### 6.3 Discussion of Results - Location C

Quarry noise was inaudible on two of the three survey periods at Location C, 64 Carroll Drive, Hartley, NSW. Transient noise events from the quarry were audible during the daytime period although, the LAeq(15min) contribution from these events remained below criteria. During the evening and morning shoulder periods the quarry was inaudible, with highway traffic and insects the dominant noise sources.

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## 7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment for RW Corkery & Co Pty Limited on behalf of Hy-Tec Pty Ltd and Austen Quarry, Hartley, NSW. The assessment was completed to assess the quarry's compliance with the relevant criteria outlined in their EPL#12323 and the SSD6084 for three nominated residential receivers surrounding the quarry.

Operator attended noise monitoring was undertaken on Wednesday 4 October 2017 and Thursday 5 October 2017 at the nominated monitoring locations with quarry noise contributions compared against the relevant criteria.

The assessment has identified that noise emissions generated by Austen Quarry comply with relevant noise criteria specified in EPL12323 and SSD6084 at all assessed locations for the three relevant assessment periods.

Unattended noise monitoring over a two-week period identifies that background noise levels (LA90) remain generally below 35dBA and hence, indicates that the quarry noise contribution at Location B is not significant when validated against attended noise monitoring data.

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# Appendix A – Glossary of Terms

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

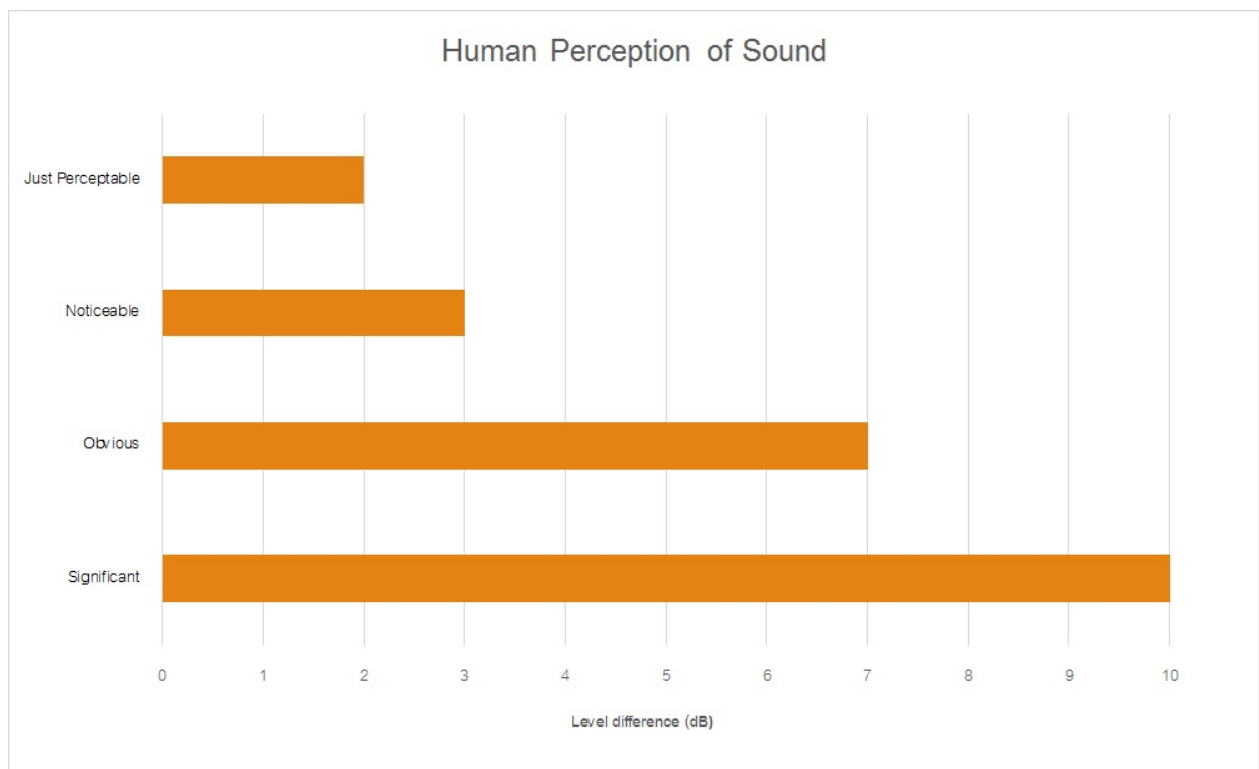
Table 1A Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm <sub>ax</sub>	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where : W is the sound power in watts and W <sub>0</sub> is the sound reference power at 10-12 watts.



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

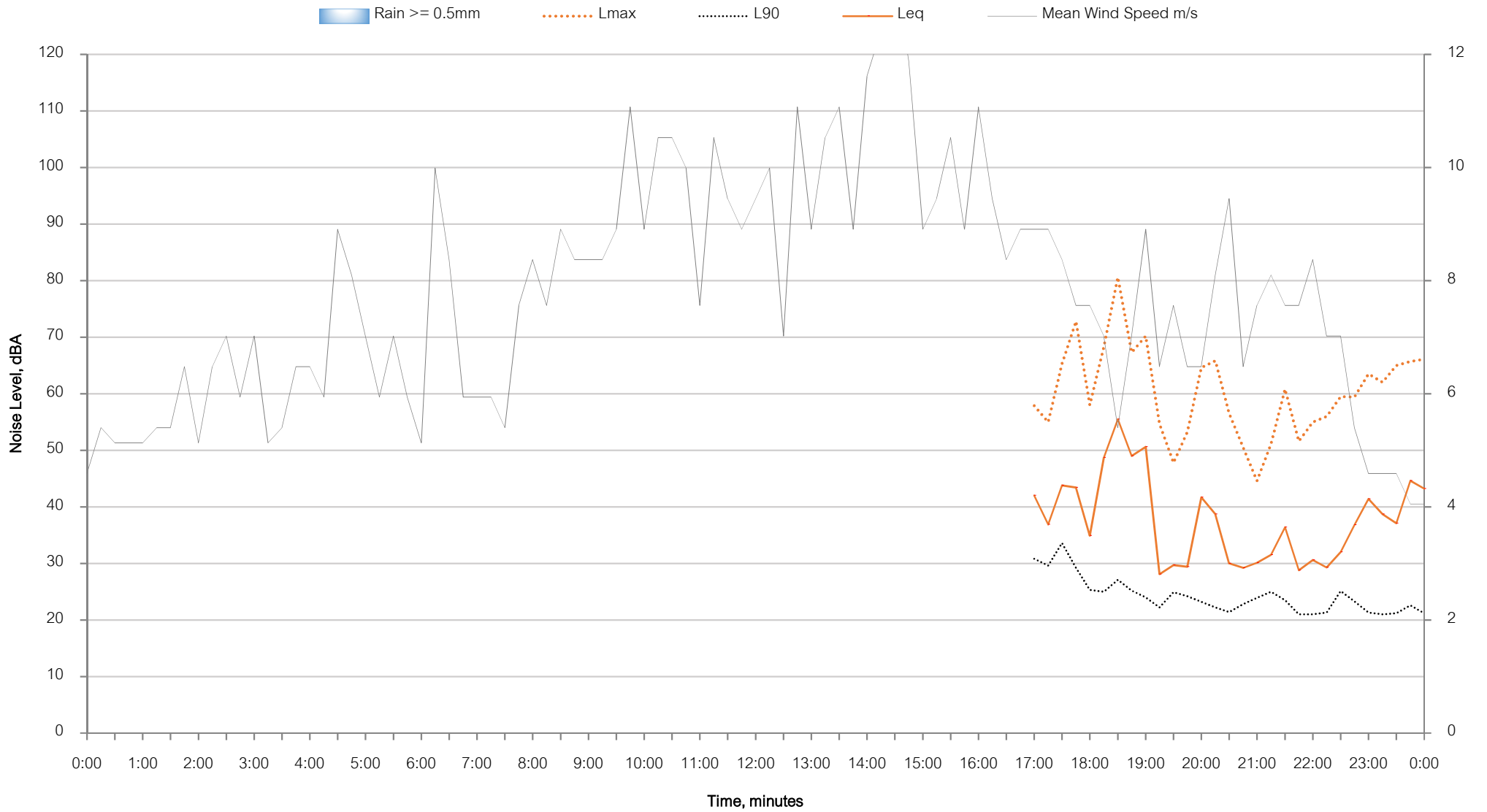
Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation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

Figure A1 – Human Perception of Sound

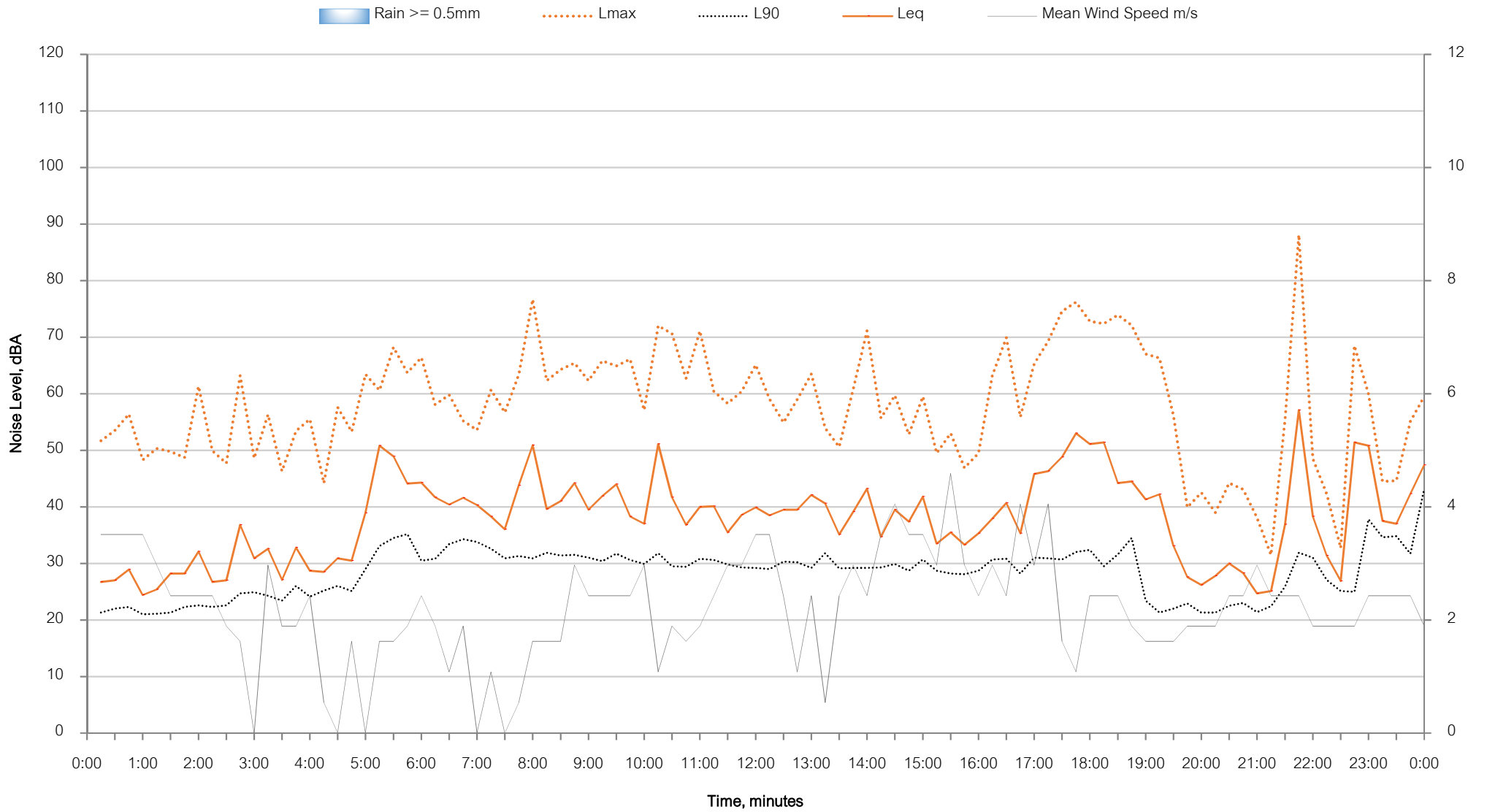


# Appendix B – Noise Logger Charts

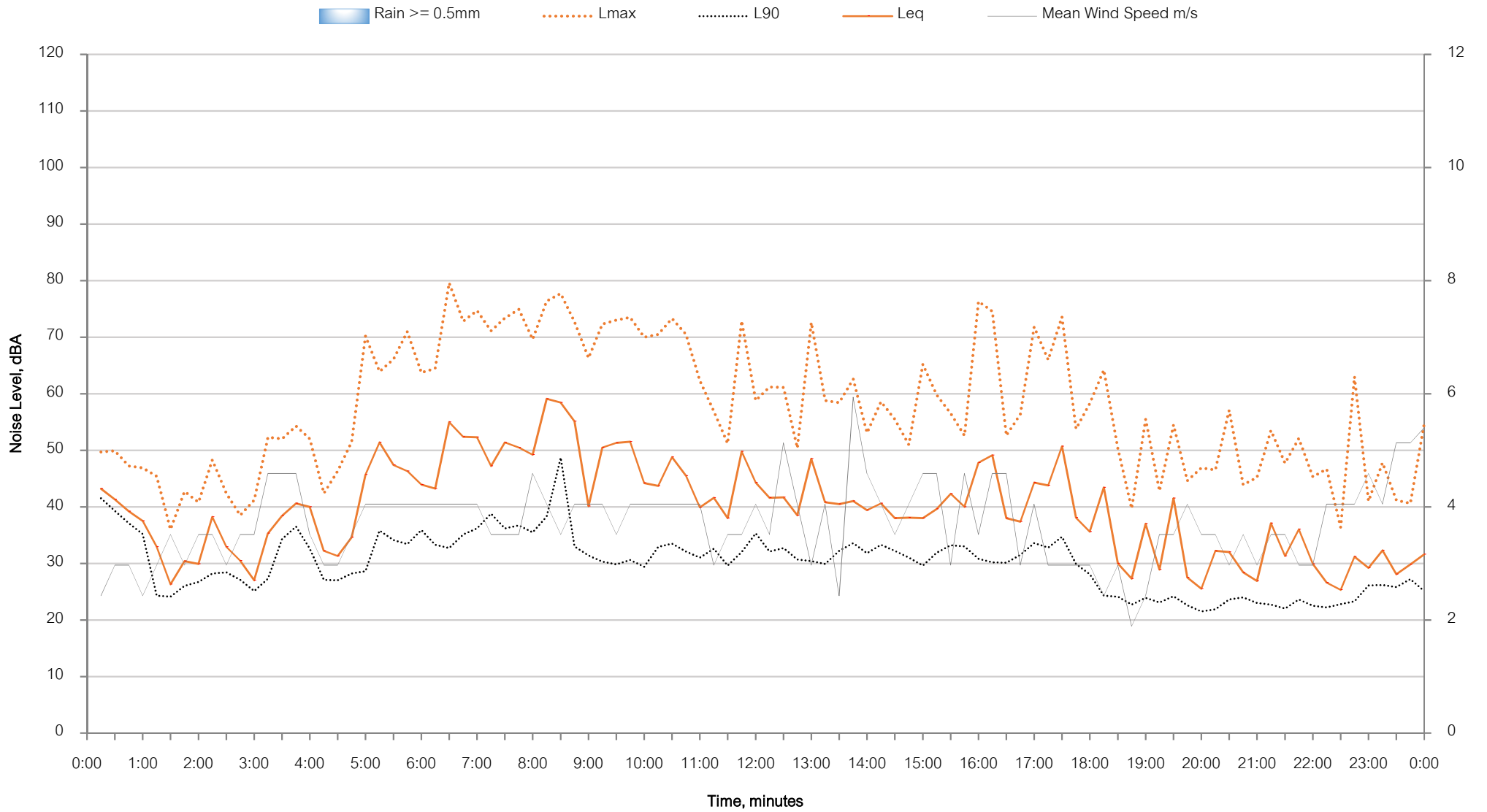
Background Noise Levels  
Location B - Tuesday 19 September 2017



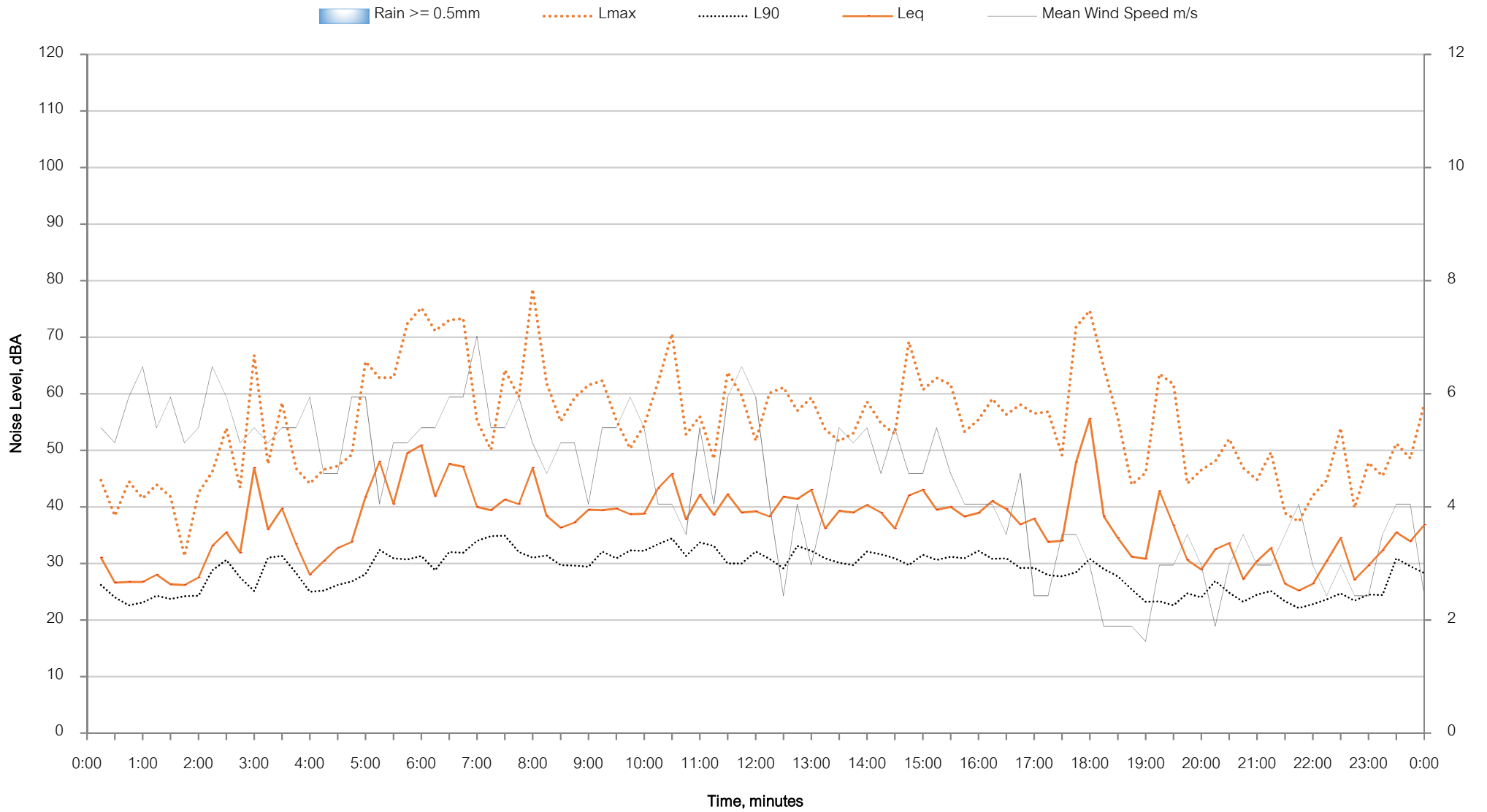
Background Noise Levels  
Location B - Wednesday 20 September 2017



Background Noise Levels  
Location B - Thursday 21 September 2017

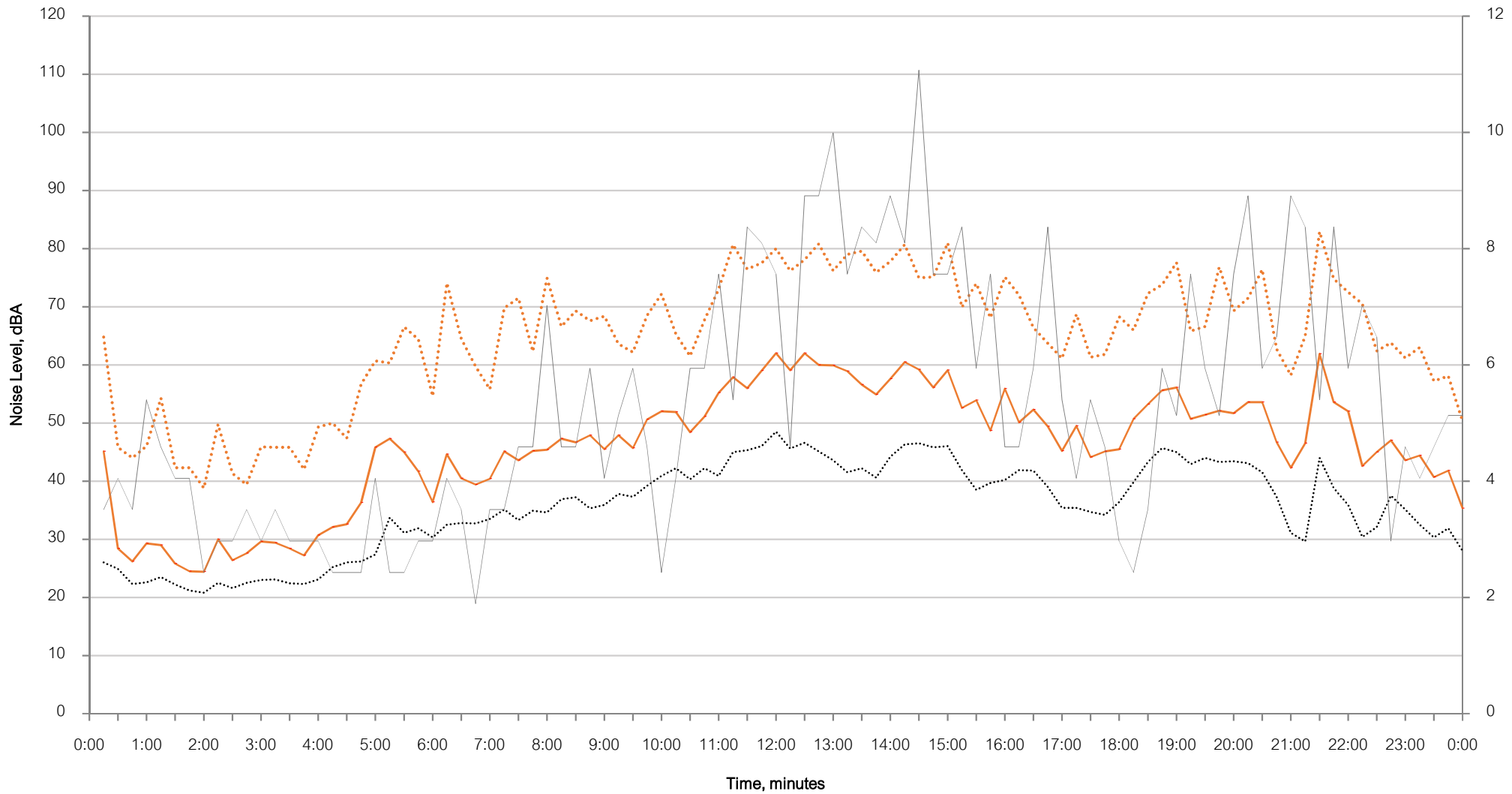


Background Noise Levels  
Location B - Friday 22 September 2017

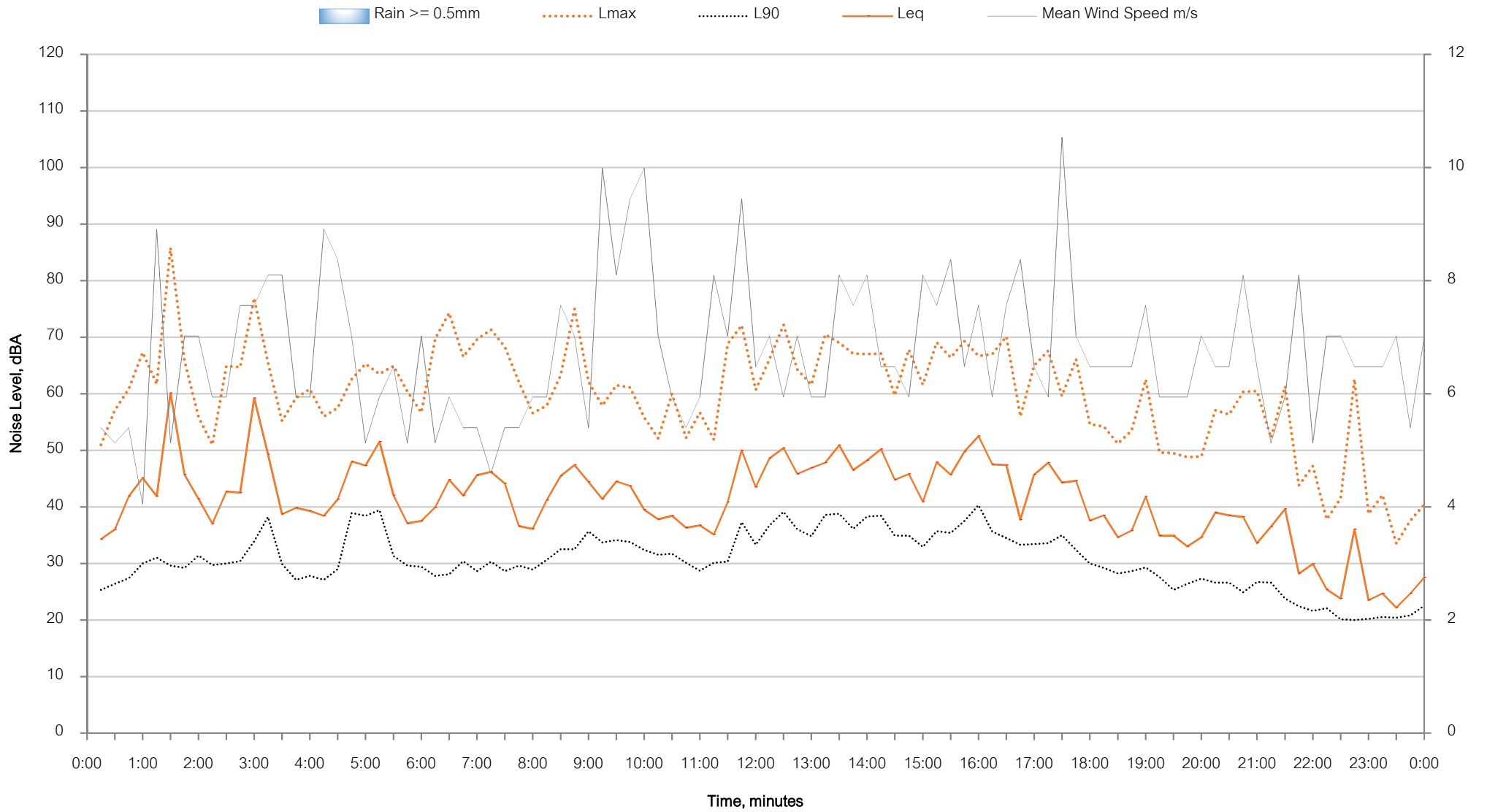


Background Noise Levels  
Location B - Saturday 23 September 2017

Rain >= 0.5mm    Lmax    L90    Leq    Mean Wind Speed m/s

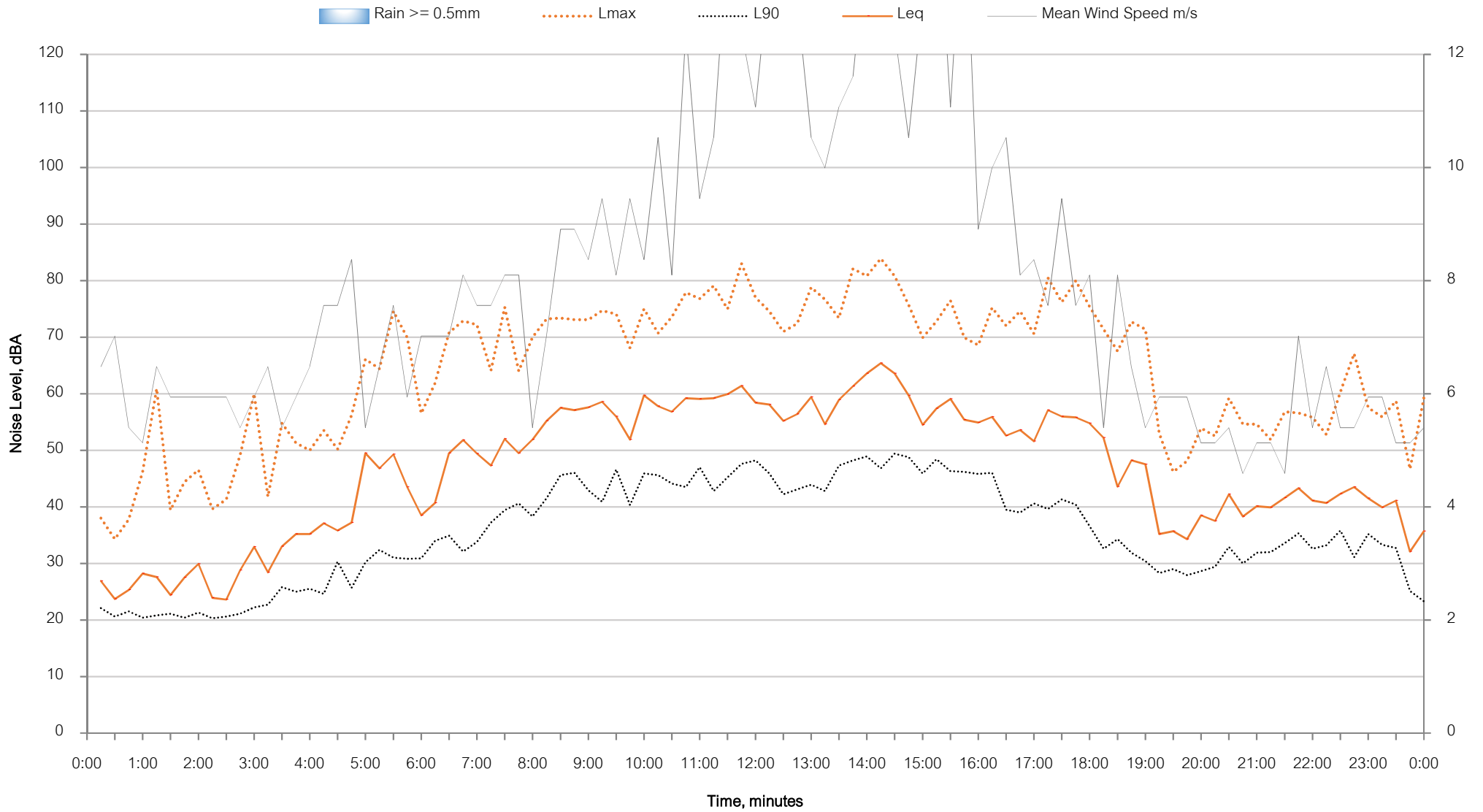


Background Noise Levels  
Location B - Sunday 24 September 2017

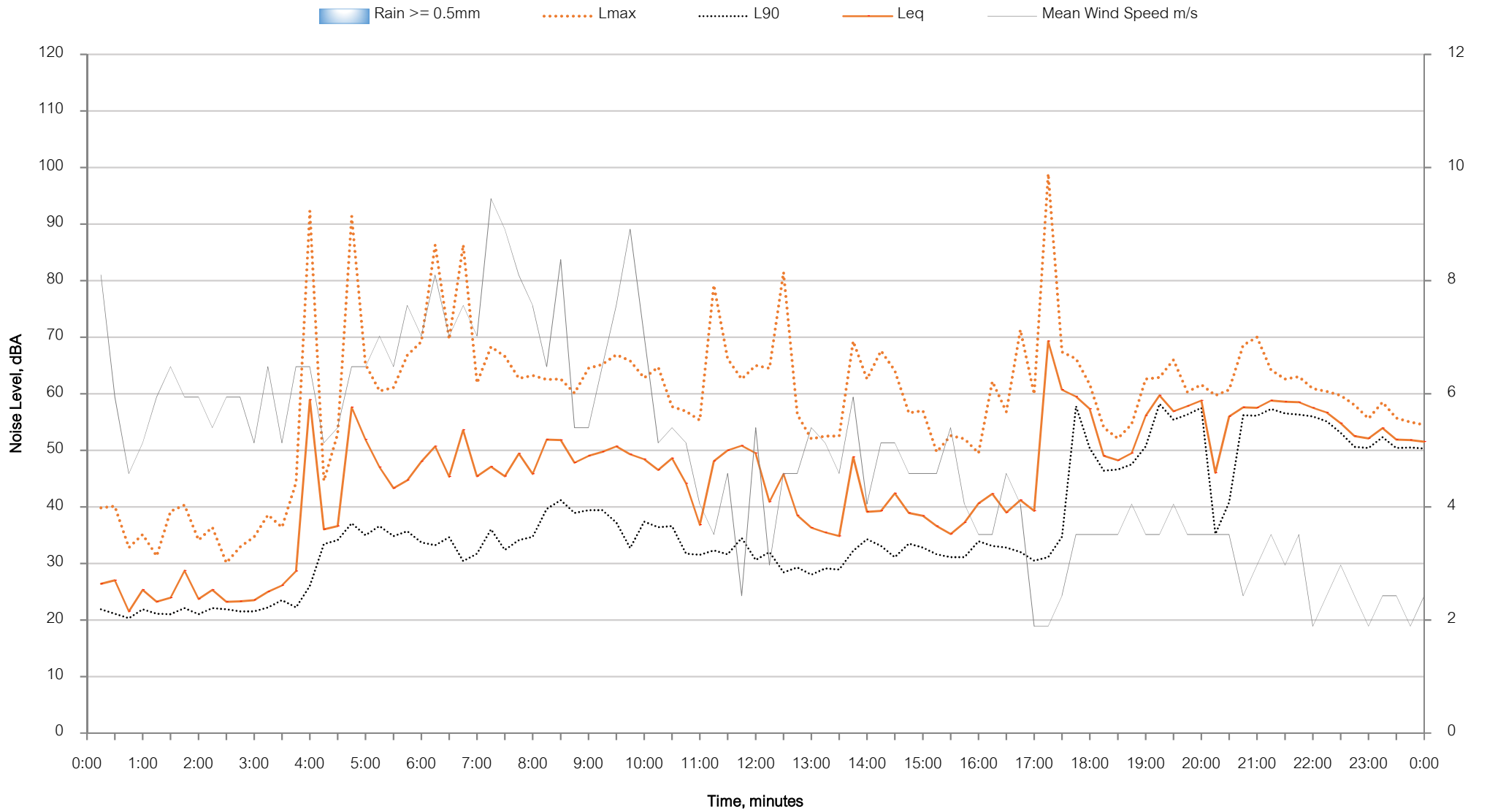




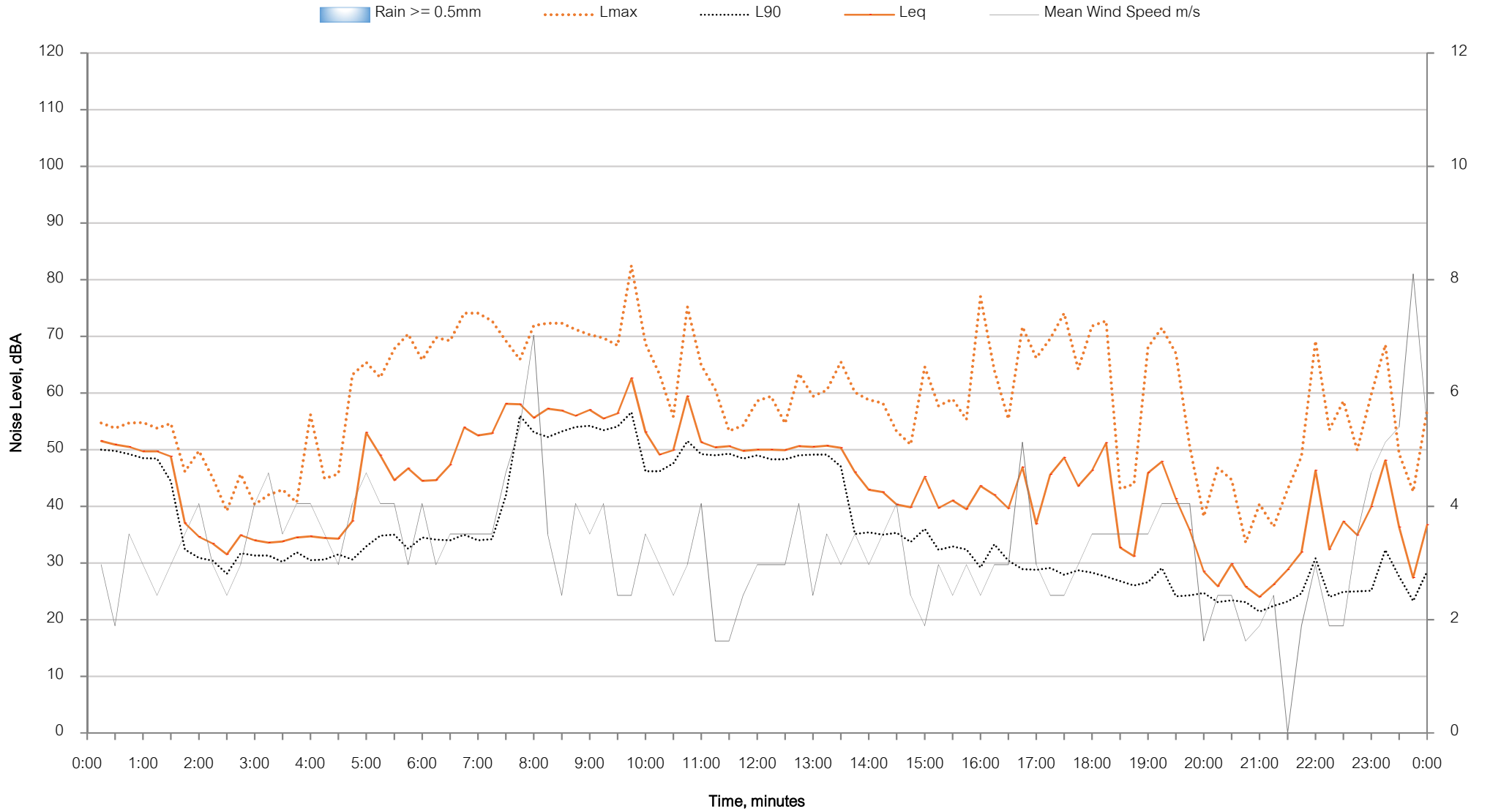
Background Noise Levels  
Location B - Monday 25 September 2017



Background Noise Levels  
Location B - Tuesday 26 September 2017



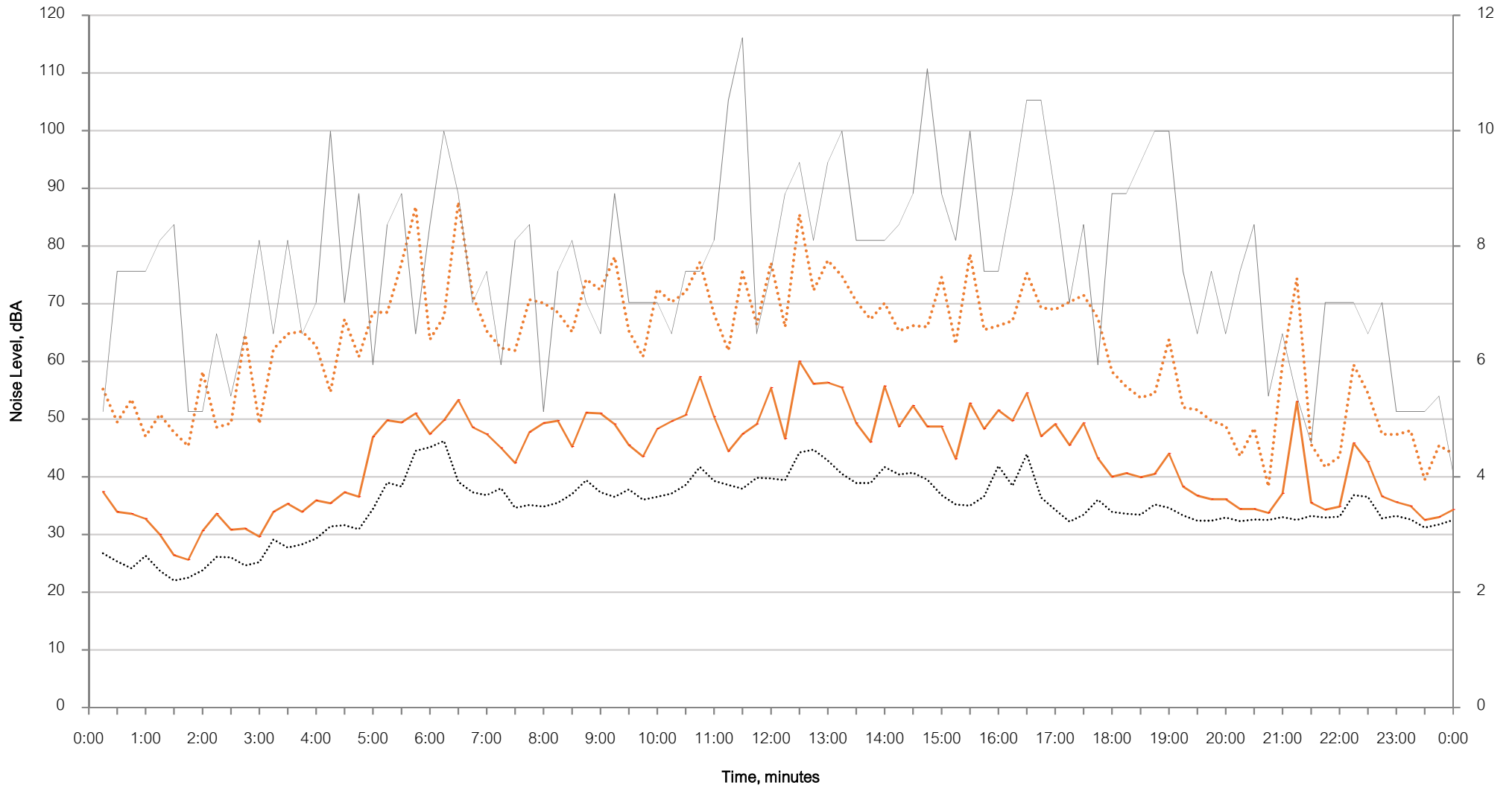
Background Noise Levels  
Location B - Wednesday 27 September 2017



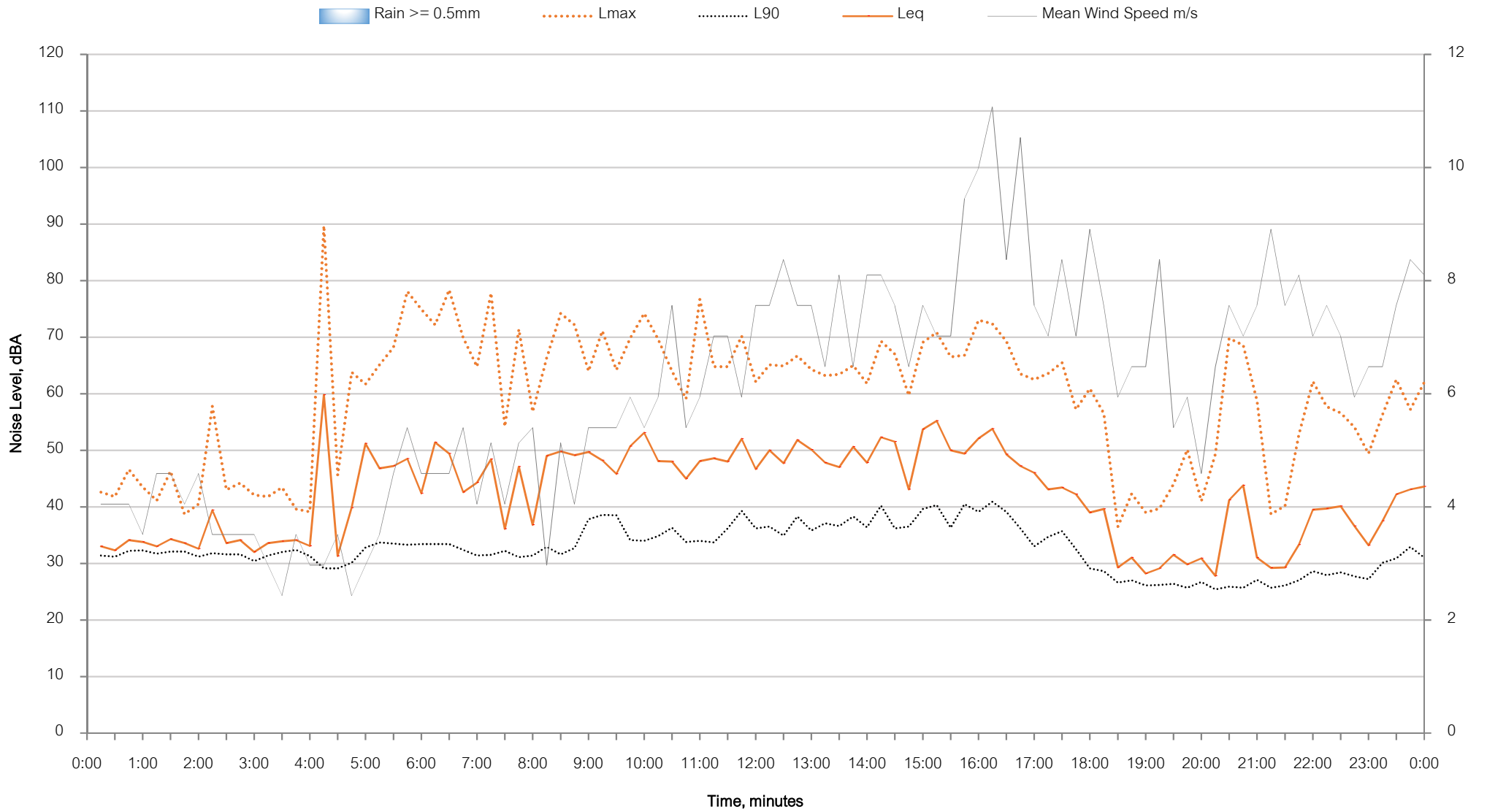
# Background Noise Levels

## Location B - Thursday 28 September 2017

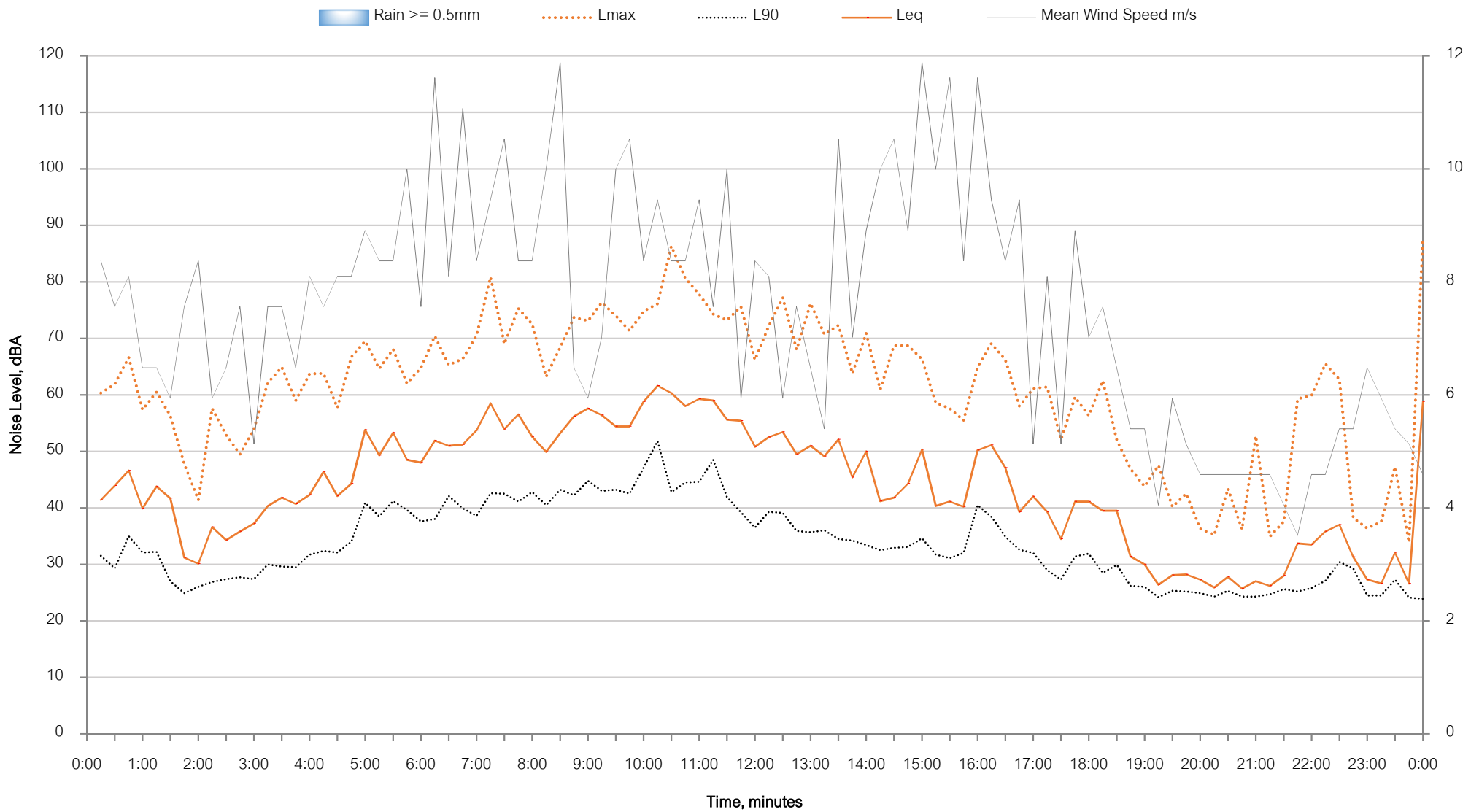
Rain >= 0.5mm    Lmax    L90    Leq    Mean Wind Speed m/s



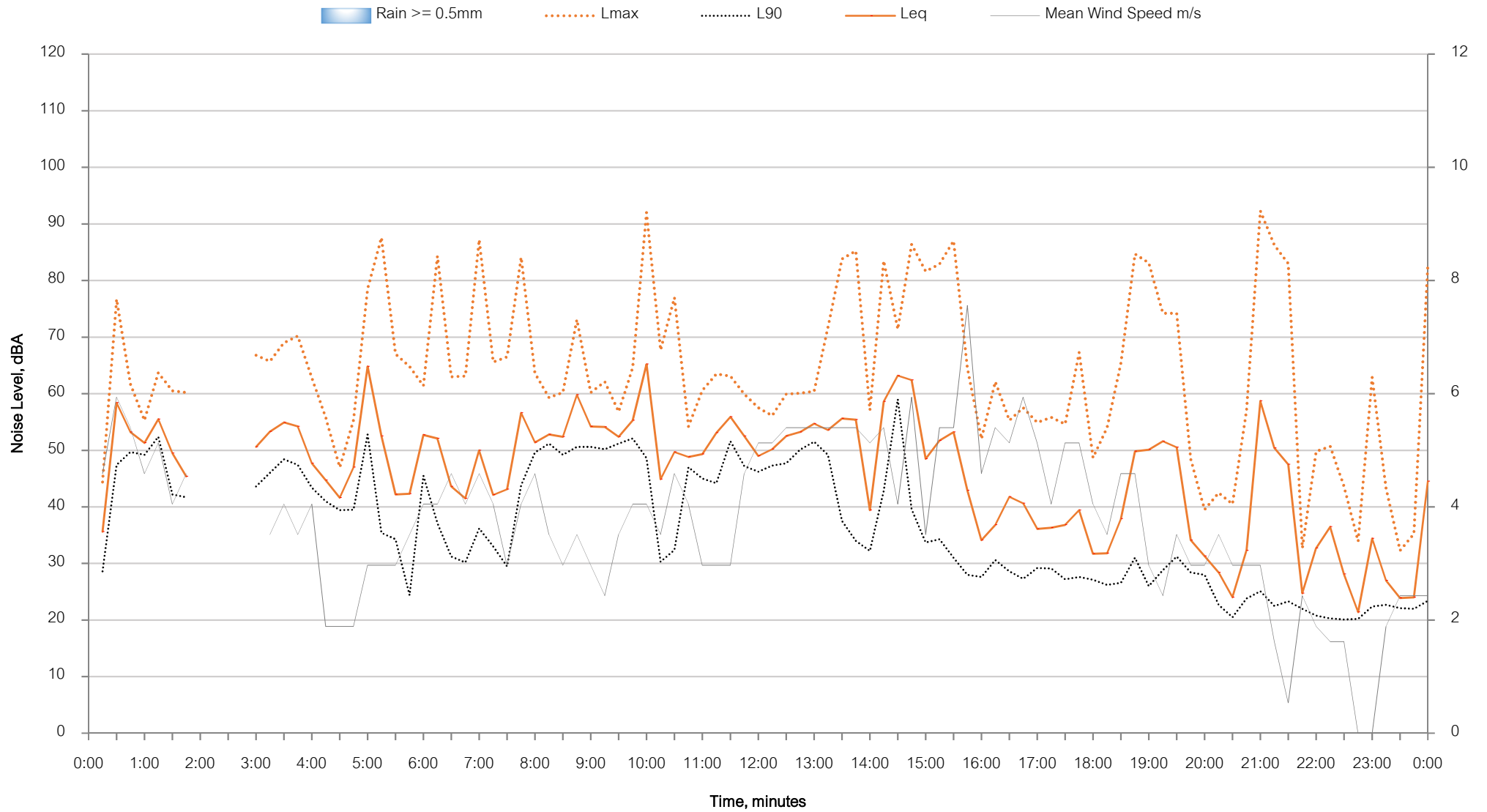
Background Noise Levels  
Location B - Friday 29 September 2017



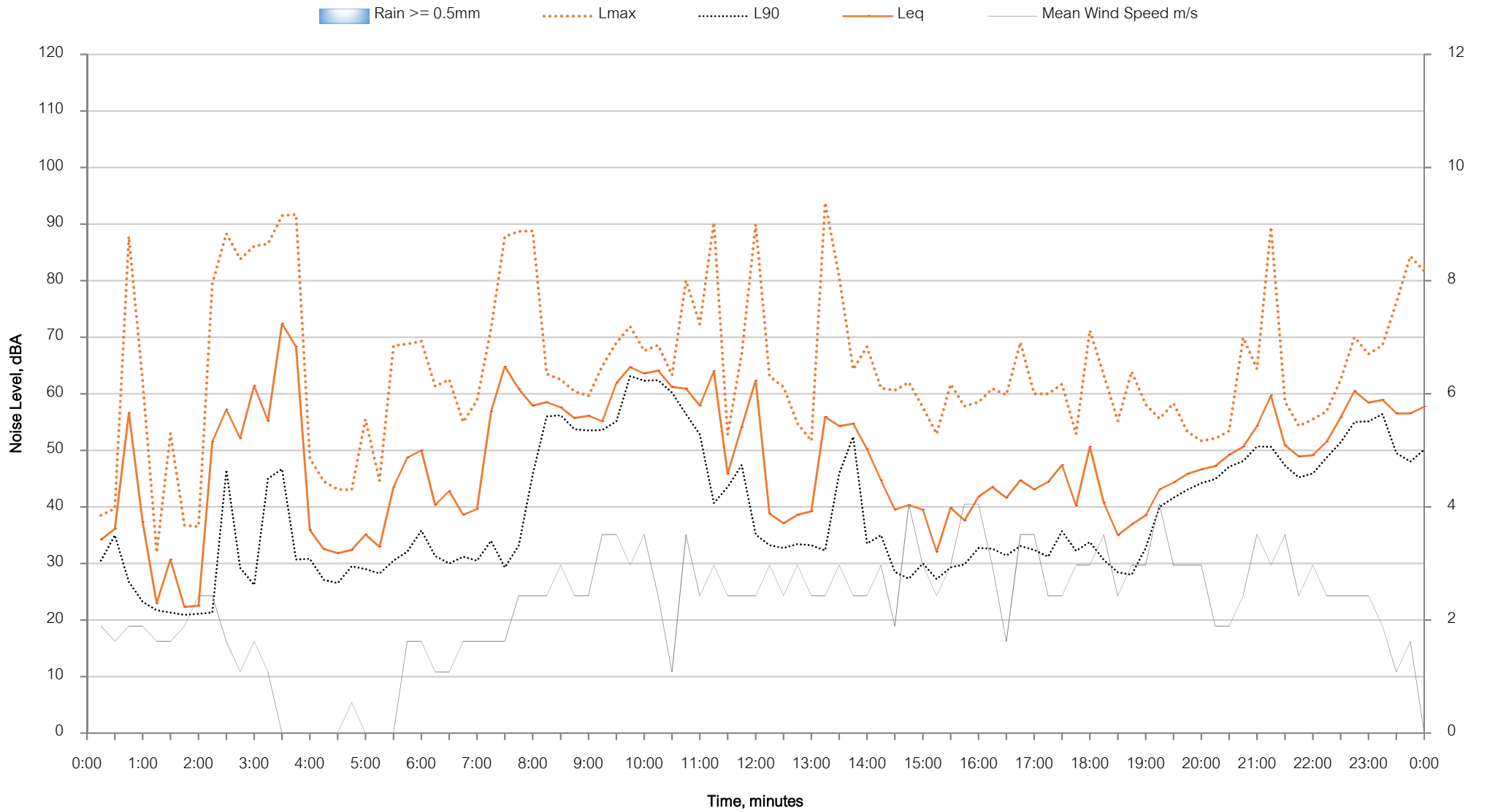
Background Noise Levels  
Location B - Saturday 30 September 2017



Background Noise Levels  
Location B - Sunday 1 October 2017

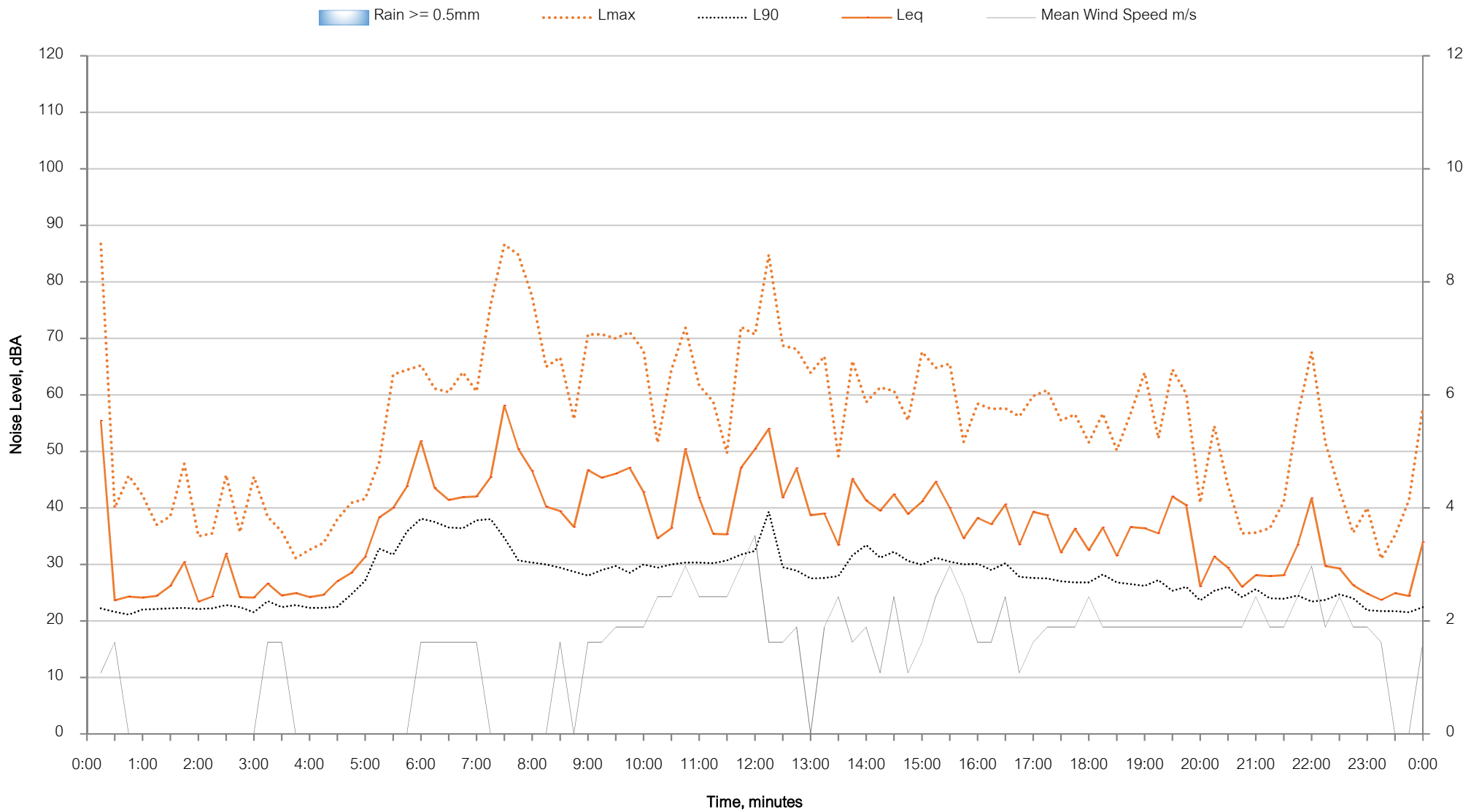


Background Noise Levels  
Location B - Monday 2 October 2017

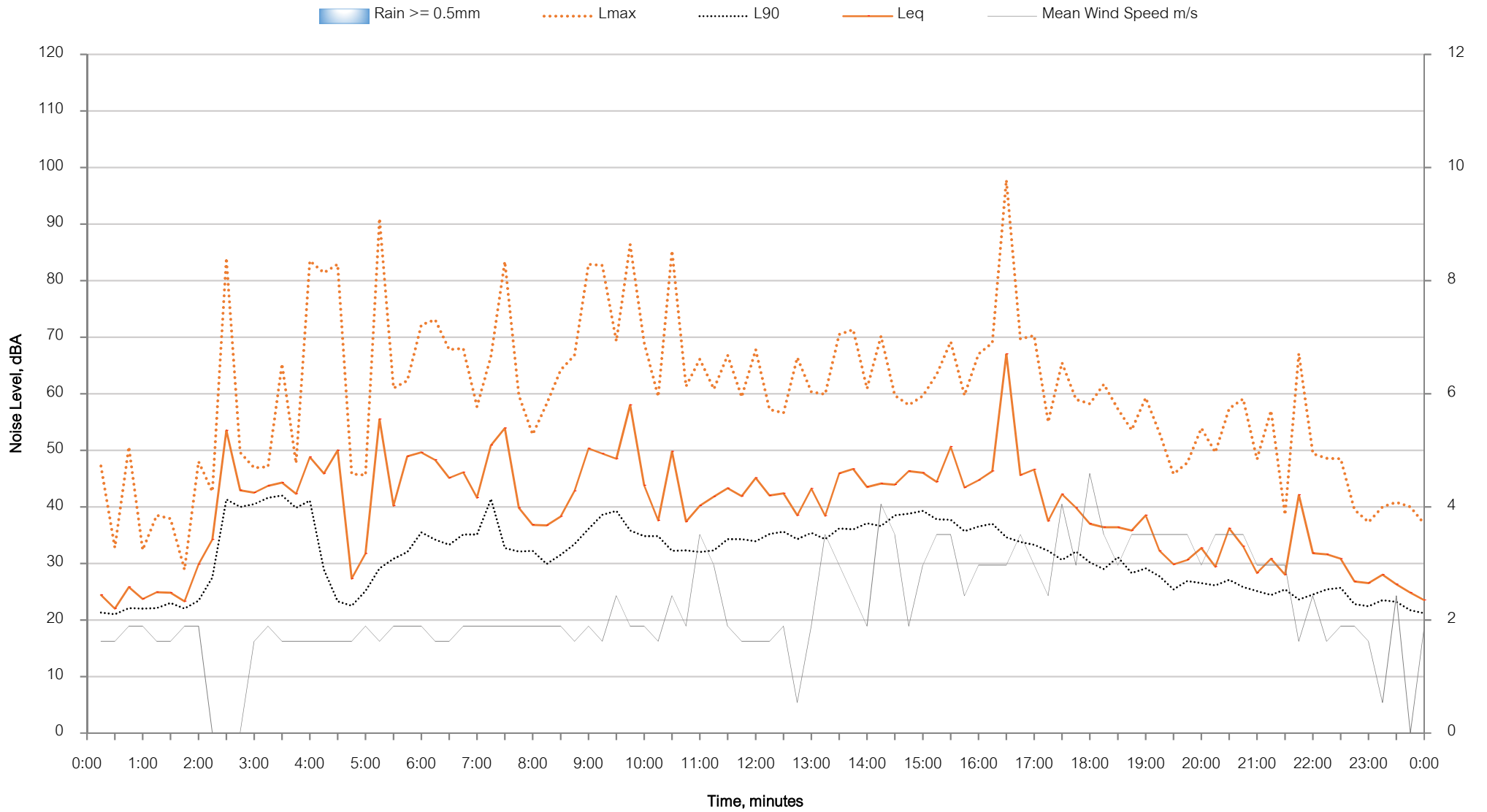




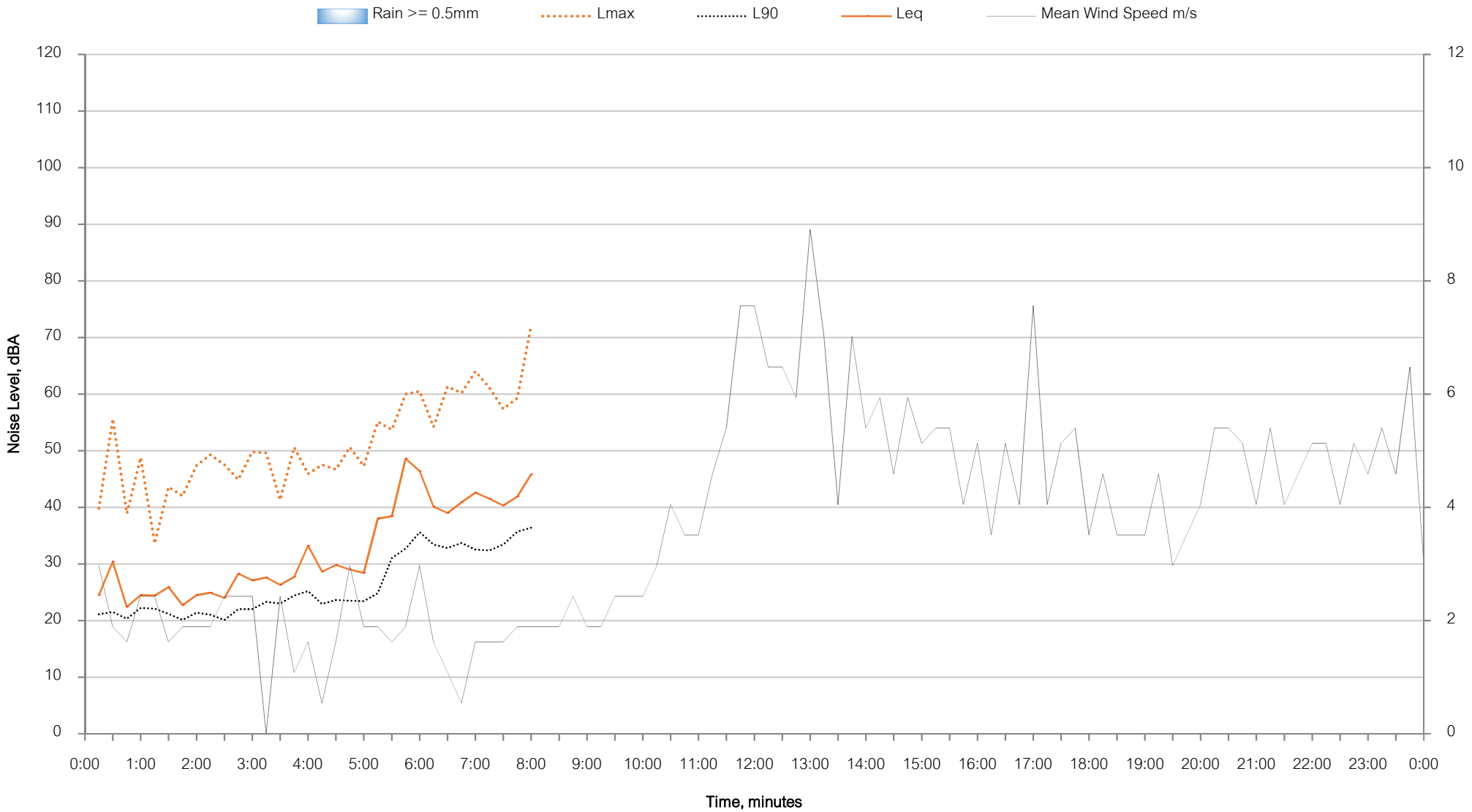
Background Noise Levels  
Location B - Tuesday 3 October 2017



Background Noise Levels  
Location B - Wednesday 4 October 2017



Background Noise Levels  
Location B - Thursday 5 October 2017



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