

WOLLONGONG COAL WONGAWILLI

QUARTERLY AIR QUALITY AND NOISE MONITORING REPORT

JANUARY TO MARCH 2016

1 INTRODUCTION

Pacific Environment provides air quality and noise monitoring at the Wollongong Coal (WCL) Wongawilli Colliery, Wongawilli, NSW using the Envirosuite system.

The following report provides a summary of the data collected during the first quarter, January to March 2016. The monitoring network comprises one continuous ambient air quality particulate monitor, one continuous ambient noise monitor and one continuous automatic weather station.

This report provides a summary of the quarterly monitoring. Monitoring Locations

The monitoring network is summarised in **Table 1-1** and presented in **Figure 1-1**.

Table 1-1: Monitoring Network

Description	Site	Address / Location	MGA 56 Easting (m)	MGA 56 Northing (m)
Continuous PM ₁₀ Monitor	BAM	Jersey Farm Road	294129	6182474
Meteorological Station	AWS	Near water tanks on ridge line	293358	6181778
Continuous Noise Monitor	NMT 1	Jersey Farm Road	294137	6182448

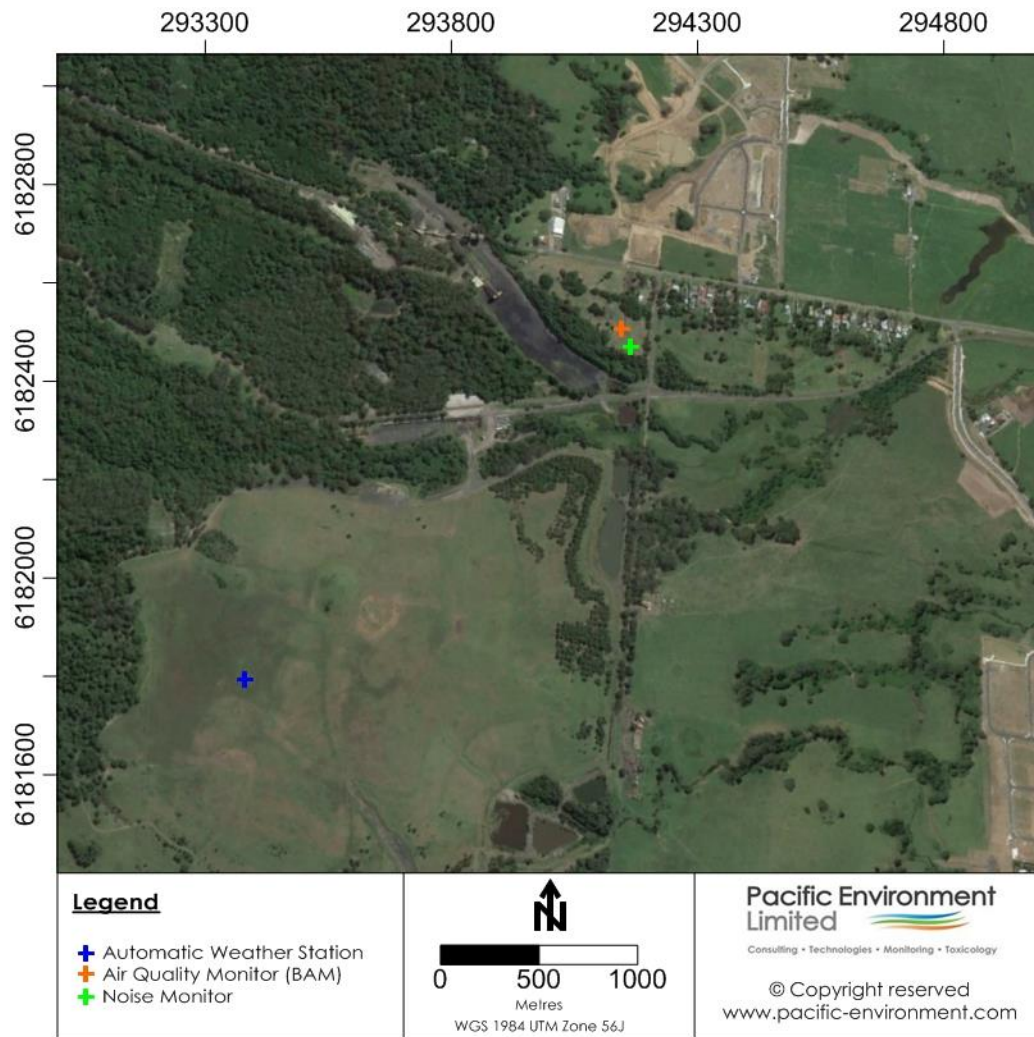


Figure 1-1: Monitoring Locations

2 PROJECT ENVIRONMENTAL CONDITIONS

2.1 Monitoring Requirements

In accordance with Project Approval (09_0161), the following air quality, meteorology and noise parameters are monitored as summarised in **Table 2-1**.

Table 2-1: Monitoring Summary

Item	Quantity Measured	Unit	Monitoring Frequency
Air Quality	Particulate Matter < 10 µm (PM ₁₀)	µg/m ³	24 h
	Temperature at 10m	°C	Real Time
	Temperature at 2m	°C	
	Wind Speed at 10m	m/s	
	Wind Direction	°	
	Standard Deviation of Wind Speed (sigma theta)	-	
	Barometric Pressure	hPa	
	Rainfall	mm	
Noise	15 minute ambient continuous equivalent energy average noise level	L _{Aeq,15min} dB(A)	15 min
	1 minute L _{A1} noise level	L _{A1,1min} dB(A)	1 min
	Period ambient continuous equivalent energy average noise level	L _{Aeq,period} dB(A)	Day, evening, night

2.2 Air Quality

The project is subject to environmental conditions as part of the Approval. For air quality these are summarised in **Table 2-2**.

Table 2-2: Project Air Quality Criteria

Pollutant	Averaging Period	Criterion ^a
Particulate Matter < 10 µm (PM ₁₀)	Annual	30 µg/m ³
Particulate Matter < 10 µm (PM ₁₀)	24 hour	50µg/m ³

Note: Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources)

- a) Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with OEH.

2.3 Noise

The Project Approval states both an amenity and intrusive noise criteria. The intrusive criteria are assessed over a 15 minute period and the amenity criteria are assessed over the relevant period (day, evening and night).

The intrusive criteria are both lower and assessed over a shorter time period, they represent the most onerous criteria and are therefore the limiting criteria.

These criteria are reproduced in **Table 2-3** and **Table 2-4**.

Table 2-3: Noise Criteria dB(A) – Medium term intrusive noise limits as defined in Table 4.3 of the Noise Management Plan

Location		Day	Evening	Night	
Area	Receiver Number	L _{Aeq} (15mins)	L _{Aeq} (15mins)	L _{Aeq} (15mins)	L _{A1} (15mins)
Lot 2410 Smiths Lane	RA1	43	43	43	59
120/130 Smiths Lane					
18 Wongawilli Road	RA2	44	43	43	60
1 Wongawilli Road					
Jersey Farm road	RA3	40	40	38	48
Horsley (closest receiver)					
All other privately owned land		40	40	38	48

Note: Day is defined as 7.00am to 6.00pm, evening as 6.00pm to 10.00pm and night as 10.00pm to 7.00am

Table 2-4: Noise Criteria dB(A) – Amenity Noise Limits as Defined in Table 4 of the Project Approval

Receiver Area	Day	Evening	Night
	L _{Aeq} (11hr)	L _{Aeq} (4hr)	L _{Aeq} (9hr)
All privately-owned land	60	50	45

3 MONITORING RESULTS

Summaries of the collected data are presented in the sections below. Quarterly compliance noise monitoring was not conducted by Pacific Environment during this period.

3.1 Meteorological Monitoring Results

A summary of the data collected during the quarter is provided in the following sections. The valid data recovery rate was 100% for all parameters except solar radiation, as the sensor is currently not operational (refer **Table 3-1**).

Table 3-1: Valid data recovery rates - AWS

Parameter	Valid Data Recovery Rate %
Wind Speed	85%
Wind Direction	85%
Temperature – 2 m	85%
Temperature – 10 m	85%
Pressure	85%

Note: a. Data not available in this AWS.

A summary of statistics for the data collected during January to March 2016 are shown in **Table 3-2**.

Table 3-2: Meteorology Summary

Statistics		Q1 2015		
		January	February	March
Temperature at 2m (°C)	Maximum	39.5	35.7	30.7
	Minimum	11.6	13.1	12.4
	Average	20.0	21.7	20.0
Temperature at 10m (°C)	Maximum	37.7	34.1	29.9
	Minimum	12.4	14.5	14.7
	Average	20.7	22.4	20.8
Wind Speed (m/s)	Maximum	14.3	10.4	10.9
	Minimum	0	0	0
	Average	2.4	2.3	2.3
	% Calms	7.9	8.6	10.7
Barometric Pressure (hPa)	Maximum	1012.4	1019.1	1018.2
	Minimum	988.3	997.3	994.1
	Average	1002.5	1009.4	1006.0
Rainfall (mm)	Total	131.2	59.8	77.6

3.1.1 Wind data

A windrose for the quarter is presented in **Figure 3-1**. The windrose indicates that for the period of monitoring winds from the South and south-south west were dominant. These wind patterns are typical of the prevailing wind conditions in the area.

The average wind speed for the period was 2.4 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was approximately 8.8 %.

3.1.2 Temperature

A plot of the hourly average temperature, recorded at 2 m and 10 m, is shown in **Figure 3-2**. The daily average temperature was 20°C. The lowest temperature was 12°C degrees recorded in January and a maximum of 39°C was recorded in January.

3.1.3 Rainfall

A plot of the daily rainfall over the three months period is shown in **Figure 3-3**. The station recorded 311 mm of rain in the quarter. The nearest Bureau of Meteorology site at Wollongong - Albion Park recorded 207 mm during the quarter. The highest rainfall recorded on site was on 21st January where 55.8 mm of rain was reported.

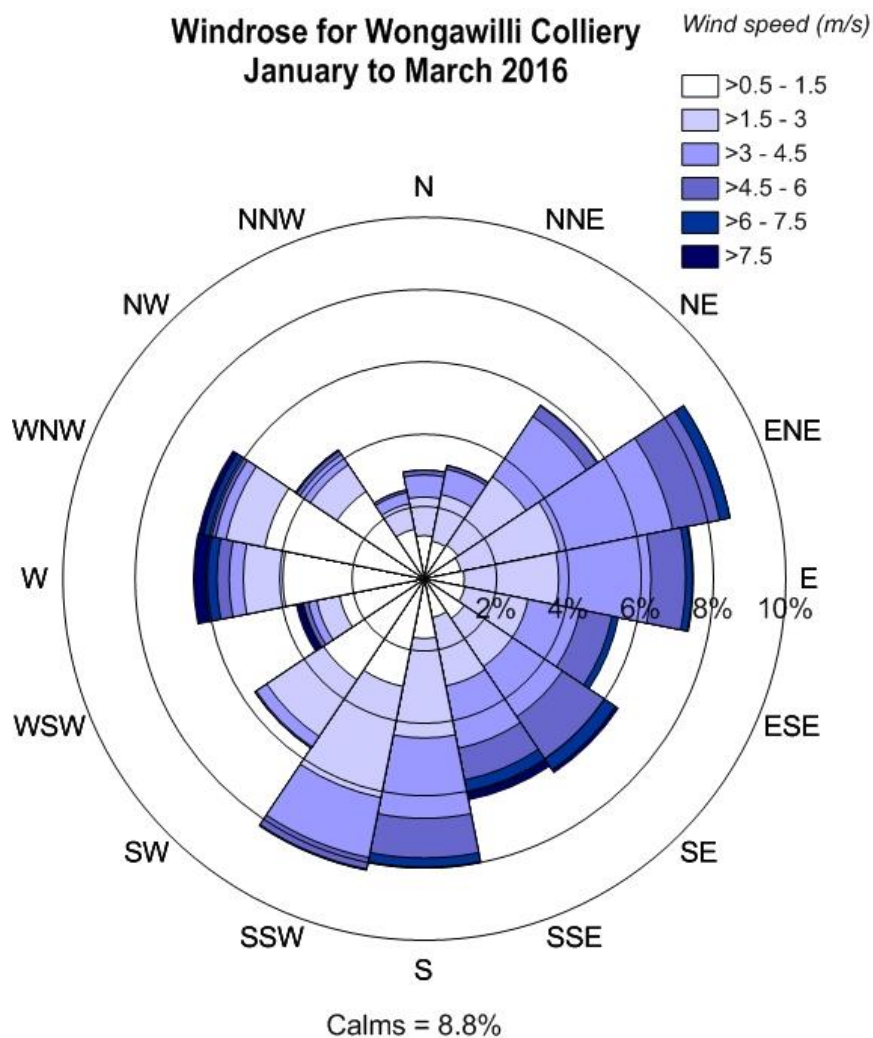


Figure 3-1: Windrose Q1 2016

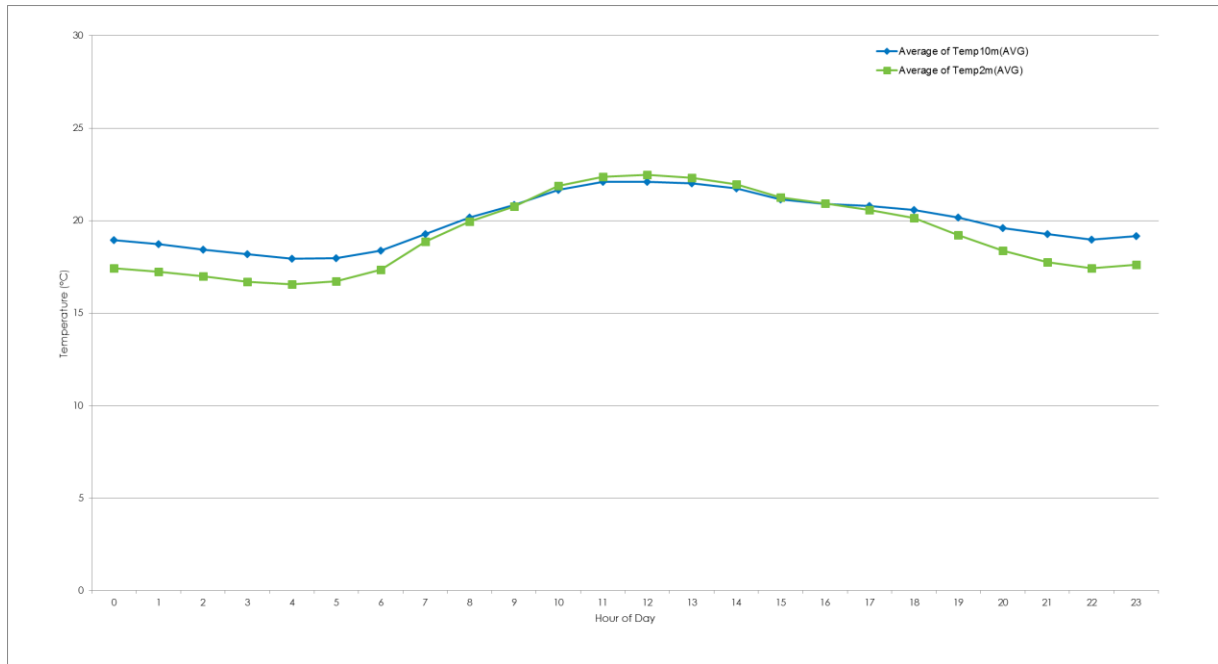
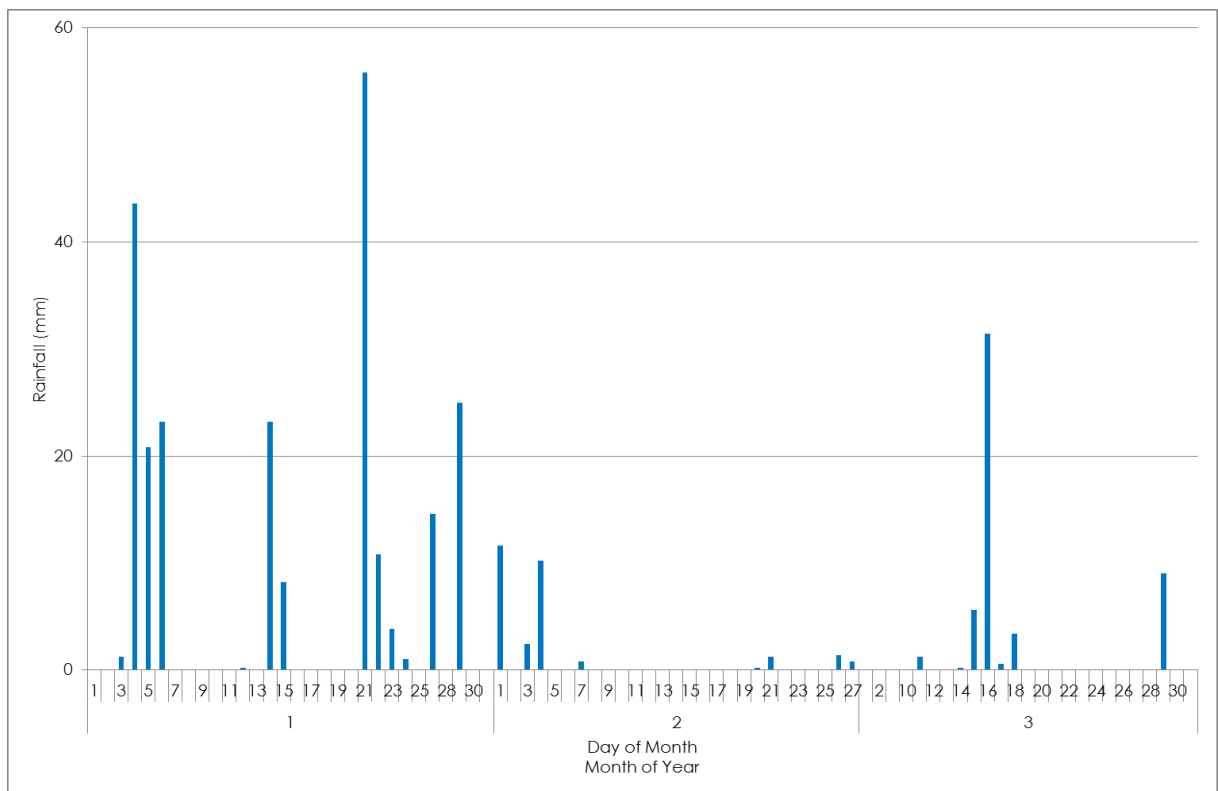


Figure 3-2: Hourly Average Temperature (January to March)



3.2 PM₁₀ Monitoring Results

Continuous air quality particulate monitoring is carried out at BAM monitoring station located on or near the site boundary (**Figure 1-1**). The monitor continuously measure airborne particulate matter from all sources.

The particle size ranges relevant to this report are described as PM₁₀ which refers to all particles with equivalent aerodynamic diameters of less than 10 µm, that is, all particles that behave aerodynamically in the same way as spherical particles.

A statistical summary of the 24- hour average monitoring data collected during the quarter is provided in **Table 3-3**. The data recovery rate was 30%. There were no days over the criteria in January to March 2016.

Table 3-3: January to March 2016 Summary Statistics for 24 hour average PM₁₀ (µg/m³)

Statistical measure	January 2016	February 2016	March 2016	Quarter 1 2016
Mean	20.4	18.2	9.8	14.0
Standard Deviation	2.7	3.7	2.8	5.5
Median	19.4	18.2	10.0	13.5
Minimum	17.7	13.9	4.1	4.1
Maximum	24.9	25.2	15.5	25.2
Days over the criteria	0	0	0	0

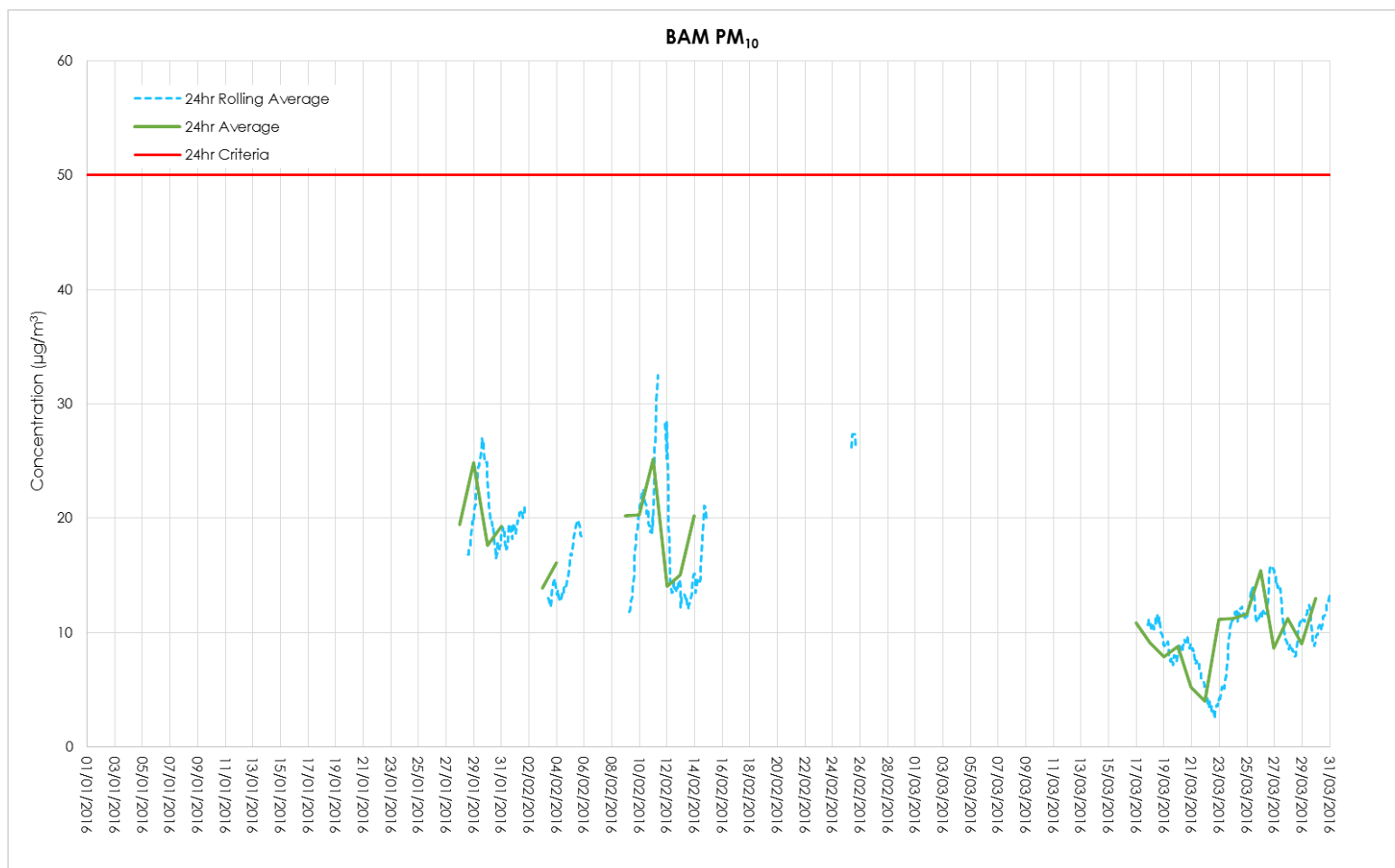


Figure 3-4: PM10 January - March 2016 Monitoring Data

4 NOISE MONITORING RESULTS

Noise is monitored using continuous unattended ambient noise monitoring and attended compliance noise monitoring.

Noise monitoring for compliance was not carried out by Pacific Environment during this quarter.

4.1 Unattended Noise Measurements

One permanent ambient noise monitors continuously monitor noise levels from all sources at the location (**Figure 1-1**) near the site boundary.

Table 4-1 presents NMT1 LA_{1,15 min} recovery data percentages for during this quarterly period.

Table 4-1: NMT1 LA_{1,15 min} Recovery Data Percentages January - March 16

NMT1	Recovery Data (%)
January	2 ¹
February	3 ¹
March	6 ¹

Notes: 1. Equipment failures occur during this period

A summary of the unattended noise monitoring is presented in **Table 4-2**. Noise monitoring is expressed in three descriptors as follows:

- b) Leq AP - The all-pass equivalent continuous energy average noise level. This descriptor represents the same energy as the actual fluctuating noise level over the measurement period.
- c) Leq LP - The low-pass equivalent continuous energy average noise level. This is the same as the Leq AP except that a frequency filter has been applied and excludes noise above the 800Hz third octave frequency band.
- d) RBL - The rating background level (RBL) as defined within the Industrial Noise Policy. The RBL is defined as the median of each assessment background level (ABL). The ABL is the lowest tenth percentile L₉₀ measurement for each period (day, evening and night) for the duration of the monitoring. The L₉₀ is the noise level exceeded for 90% of the measurement period.

The results in are presented in the following time periods:

- Day - 7.00am to 6.00pm;
- Evening - 6.00pm to 10.00pm; and
- Night - 10.00pm to 7.00am.

Table 4-2: January – March 2016 Noise Monitoring Average Summary, dB(A)

NMT1	Day			Evening			Night		
	Leq LP ¹	Leq AP ²	RBL ³	Leq LP	Leq AP	RBL	Leq LP	Leq AP	RBL
January	-	57	-	-	54	-	-	52	-
February	38	51	-	33	52	-	31	54	-
March	42	48	37	34	48	40	36	42	38

Note: 1. Leq LP is the Leq with a low pass filter applied at the 800Hz third octave band.
2. Leq AP is Leq All Pass with no frequency filter applied.
3. RBL is the rating background level according to the Industrial Noise Policy.

The daily noise monitoring results for NMT 1 are presented in **Table 4-5**, **Table 4-6** and **Table 4-7**. The daily noise monitoring results are expressed as a logarithmic average of each measured Leq,15min during each period and the ABL.

The unattended noise monitors also record $L_{A1,15min}$ levels continuously at both locations. The $L_{A1,15min}$ represents short noise events and is the noise level exceeded for 1% of 15 minutes. A summary of the $L_{A1,15min}$ levels is presented in **Table 4-3**.

Table 4-3: January – March 2016 $L_{A1,15min}$ Noise Monitoring Summary, dB(A)

NMT1	$L_{A1,15min}$ Maximum dB(A)	$L_{A1,15min}$ Average dB(A)	$L_{A1,15min} > 52$ dB(A) night time (%)
January	75.4	54.7	67
February	86.5	60.8	95
March	92.9	54.1	63

The noise limits at the site apply for wind speeds less than 3 m/s. **Table 4-4** presents monthly percentages that wind speeds more than 3 m/s occurred from WTX monitoring data during this quarterly period.

Table 4-4: Wind Speed Exceedances Percentages January - March 16

WTX	Exceedances (%)
January- F	31.4
February	30.0
March	33.3

Table 4-5: NMT1 January Daily Noise Monitoring Results

Date	Day			Evening			Night		
	Leq,11hr LP ¹	Leq,11hr AP	ABL ²	Leq,4hr LP	Leq,4hr AP	ABL	Leq,9hr LP	Leq,9hr AP	ABL
1/1/2016	-	-	-	-	-	-	-	-	-
1/2/2016	-	-	-	-	-	-	-	-	-
1/3/2016	-	-	-	-	-	-	-	-	-
1/4/2016	-	-	-	-	-	-	-	-	-
1/5/2016	-	-	-	-	-	-	-	-	-
1/6/2016	-	-	-	-	-	-	-	-	-
1/7/2016	-	-	-	-	-	-	-	-	-
1/8/2016	-	-	-	-	-	-	-	-	-
1/9/2016	-	-	-	-	-	-	-	-	-
1/10/2016	-	-	-	-	-	-	-	-	-
1/11/2016	-	-	-	-	-	-	-	-	-
1/12/2016	-	-	-	-	-	-	-	-	-
1/13/2016	-	-	-	-	-	-	-	-	-
1/14/2016	-	55	-	-	52	-	-	50	-
1/15/2016	-	45	-	-	47	-	-	43	-
1/16/2016	-	50	-	-	52	-	-	45	-
1/17/2016	-	57	-	-	49	-	-	48	-
1/18/2016	-	56	-	-	51	-	-	52	-
1/19/2016	-	57	-	-	52	-	-	48	-
1/20/2016	-	57	-	-	53	-	-	51	-
1/21/2016	-	63	-	-	61	-	-	57	-
1/22/2016	-	58	-	-	54	-	-	55	-
1/23/2016	-	47	-	-	-	-	-	-	-
1/24/2016	-	-	-	-	-	-	-	-	-
1/25/2016	-	-	-	-	-	-	-	-	-
1/26/2016	-	-	-	-	-	-	-	-	-
1/27/2016	-	-	-	-	-	-	-	-	-
1/28/2016	-	-	-	-	-	-	-	-	-
1/29/2016	-	-	-	-	-	-	-	-	-
1/30/2016	-	-	-	-	-	-	-	-	-
1/31/2016	-	-	-	-	-	-	-	-	-
Log Avg	-	57	-	-	54	-	-	52	-
Median	-	57	-	-	52	-	-	50	-
Max	-	63	-	-	61	-	-	57	-
Min	-	45	-	-	47	-	-	43	-

Note: 1. LP=Low Pass, AP= All Pass

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

Table 4-6: NMT1 February Daily Noise Monitoring Results

Date	Day			Evening			Night		
	L _{eq,11hr} LP ¹	L _{eq,11hr} AP	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr} AP	ABL
2/1/2016	-	-	-	-	-	-	-	54	-
2/2/2016	-	37	-	-	54	-	-	54	-
2/3/2016	-	54	-	-	57	-	-	52	-
2/4/2016	-	53	-	-	53	-	-	53	-
2/5/2016	-	53	-	-	52	-	-	52	-
2/6/2016	-	53	-	-	50	-	-	54	-
2/7/2016	-	52	-	-	52	-	-	55	-
2/8/2016	-	54	-	-	54	-	-	53	-
2/9/2016	-	52	-	-	52	-	-	56	-
2/10/2016	-	52	-	-	58	-	-	58	-
2/11/2016	-	52	-	-	-	-	-	-	-
2/12/2016	-	-	-	-	-	-	-	-	-
2/13/2016	-	-	-	-	-	-	-	-	-
2/14/2016	-	-	-	-	-	-	-	-	-
2/15/2016	-	-	-	-	-	-	-	-	-
2/16/2016	-	-	-	-	-	-	-	-	-
2/17/2016	-	-	-	-	-	-	-	-	-
2/18/2016	-	-	-	-	-	-	-	-	-
2/19/2016	-	-	-	-	-	-	-	-	-
2/20/2016	-	-	-	-	-	-	-	-	-
2/21/2016	-	-	-	-	-	-	-	-	-
2/22/2016	-	-	-	-	-	-	-	-	-
2/23/2016	-	-	-	-	-	-	-	-	-
2/24/2016	-	-	-	-	-	-	-	-	-
2/25/2016	-	-	-	-	-	-	-	-	-
2/26/2016	40	45	-	33	45	-	30	55	-
2/27/2016	37	49	-	32	49	-	31	57	-
2/28/2016	37	51	-	33	48	-	31	55	-
2/29/2016	38	50	-	33	45	-	31	49	-
Log Avg	38	51	-	33	52	-	31	54	-
Median	37	52	-	33	52	-	31	54	-
Max	40	54	-	33	58	-	31	58	-
Min	37	37	-	32	45	-	30	49	-

Note: 1. LP=Low Pass, AP= All Pass

2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

3. Monitor offline due to power supply issues.

Table 4-7: NMT1 March Daily Noise Monitoring Results

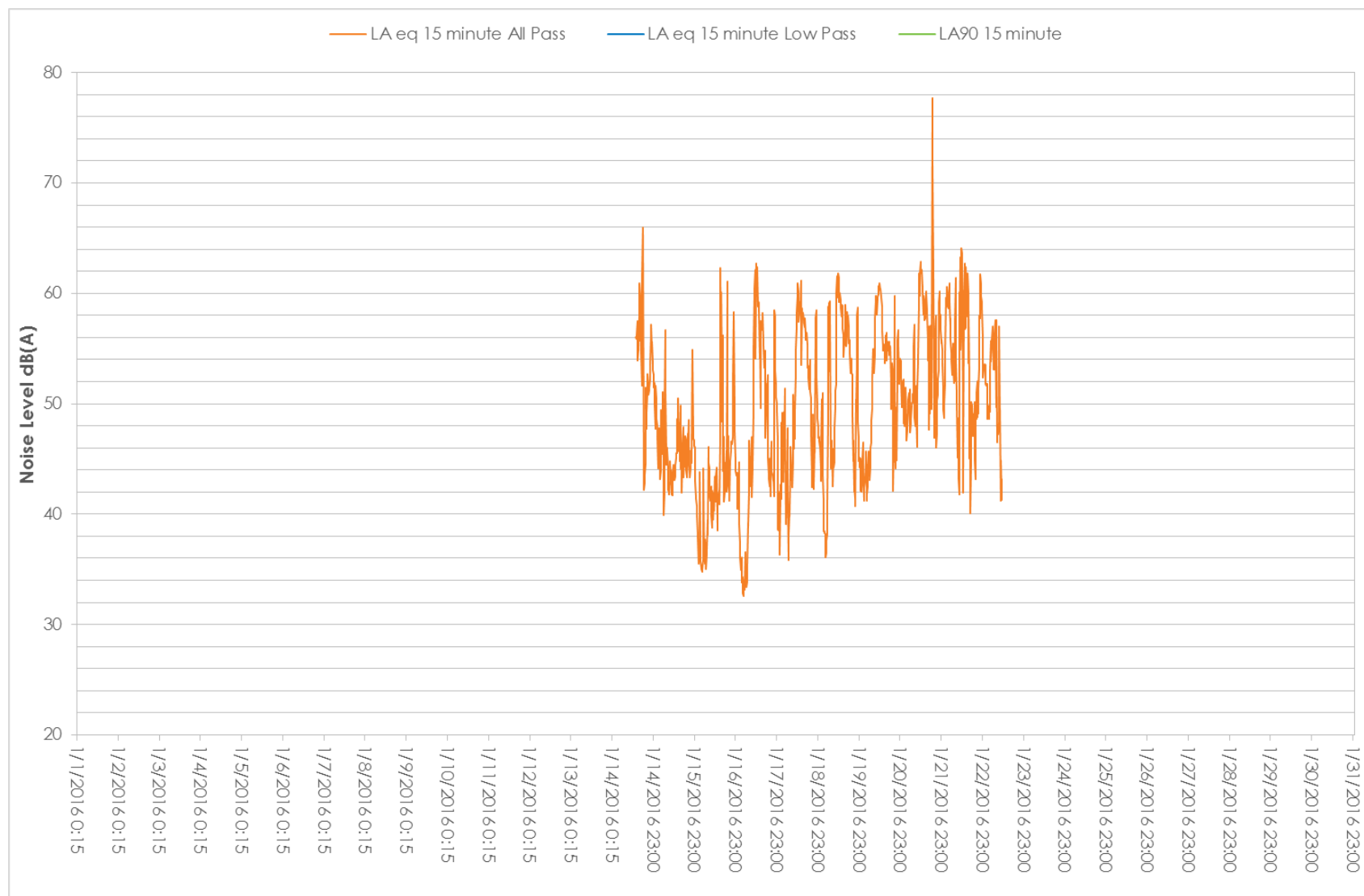
Date	Day			Evening			Night		
	L _{eq,11hr} LP ¹	L _{eq,11hr} AP	ABL ²	L _{eq,4hr} LP	L _{eq,4hr} AP	ABL	L _{eq,9hr} LP	L _{eq,9hr} AP	ABL
3/1/2016	44	51	37	35	47	42	33	53	39
3/2/2016	43	52	39	33	45	36	31	49	38
3/3/2016	43	50	37	33	46	37	34	54	39
3/4/2016	44	51	41	35	44	39	32	52	41
3/5/2016	41	48	37	34	49	39	32	48	42
3/6/2016	38	50	38	38	48	41	30	49	39
3/7/2016	43	50	36	33	45	38	30	49	40
3/8/2016	46	52	40	34	45	41	33	48	38
3/9/2016	42	50	35	34	44	37	31	49	41
3/10/2016	43	49	37	34	43	38	34	49	40
3/11/2016	43	51	38	-	45	-	-	49	-
3/12/2016	-	50	-	-	46	-	-	51	-
3/13/2016	-	49	-	-	47	-	-	49	-
3/14/2016	-	51	-	-	45	-	-	48	-
3/15/2016	-	51	-	-	45	-	-	47	-
3/16/2016	-	50	-	-	50	-	-	45	-
3/17/2016	-	-	-	-	-	-	-	-	-
3/18/2016	40	45	39	34	46	40	49	54	37
3/19/2016	45	48	33	35	46	39	32	42	32
3/20/2016	35	46	33	34	50	36	32	41	32
3/21/2016	42	46	37	33	49	40	31	42	31
3/22/2016	42	47	37	33	50	38	30	36	30
3/23/2016	43	47	34	34	53	42	32	42	36
3/24/2016	41	45	36	36	51	43	31	52	41
3/25/2016	37	43	33	35	49	42	28	40	32
3/26/2016	36	42	33	32	45	39	27	45	38
3/27/2016	32	42	33	34	47	38	32	47	37
3/28/2016	34	43	32	32	49	39	31	54	36
3/29/2016	36	45	32	37	48	41	31	44	35
3/30/2016	37	42	33	35	49	39	29	42	31
3/31/2016	41	45	33	34	46	38	31	39	-
Log Avg	42	48	37	34	48	40	36	42	38
Median	42	48	36	34	47	39	31	48	38
Max	46	52	41	38	53	43	49	54	42
Min	32	42	32	32	43	36	27	36	30

Note: 1. LP=Low Pass, AP= All Pass

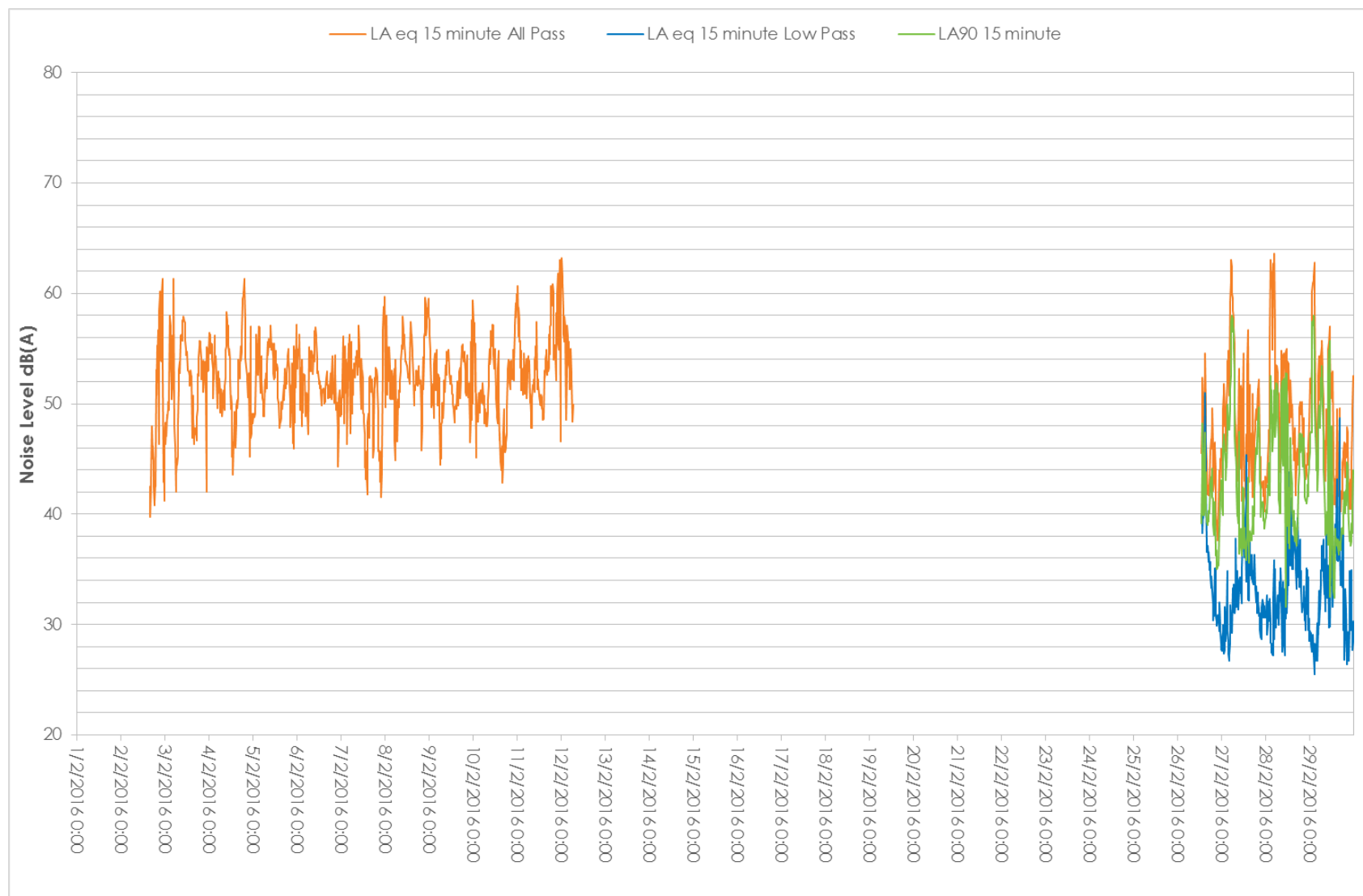
2. ABL is the Assessment Background Level and represents the lowest tenth percentile L₉₀ measured during the period.

3. Monitor offline due to power supply issues.

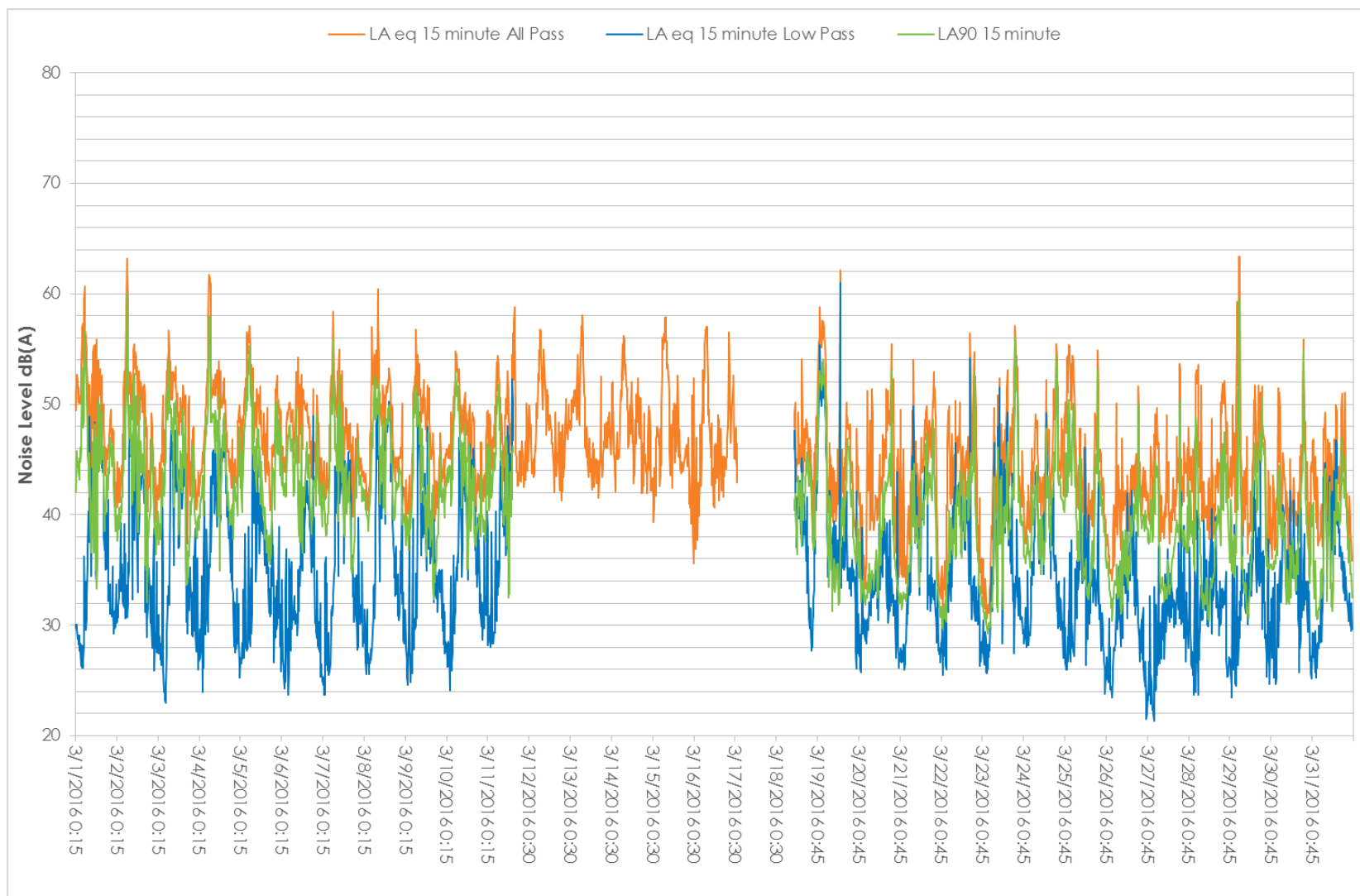
4.2 Unattended Noise Monitoring Graphs – January 2016



4.3 Unattended Noise Monitoring Graphs – February 2016



4.4 Unattended Noise Monitoring Graphs – March 2016



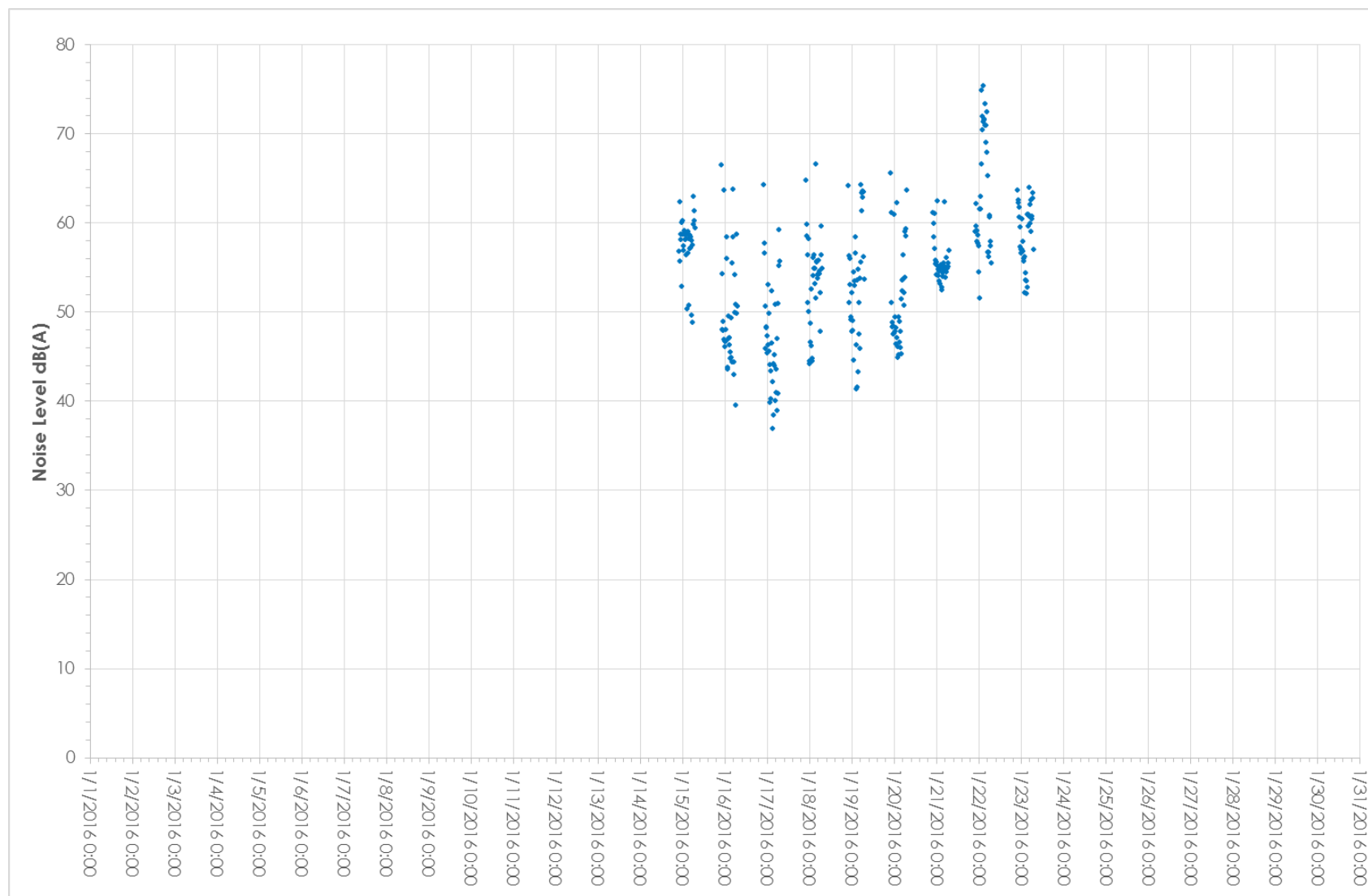


Figure 4-1: L_{1,15minute} (night time only) NMT1 Noise Monitoring Results – January 2016

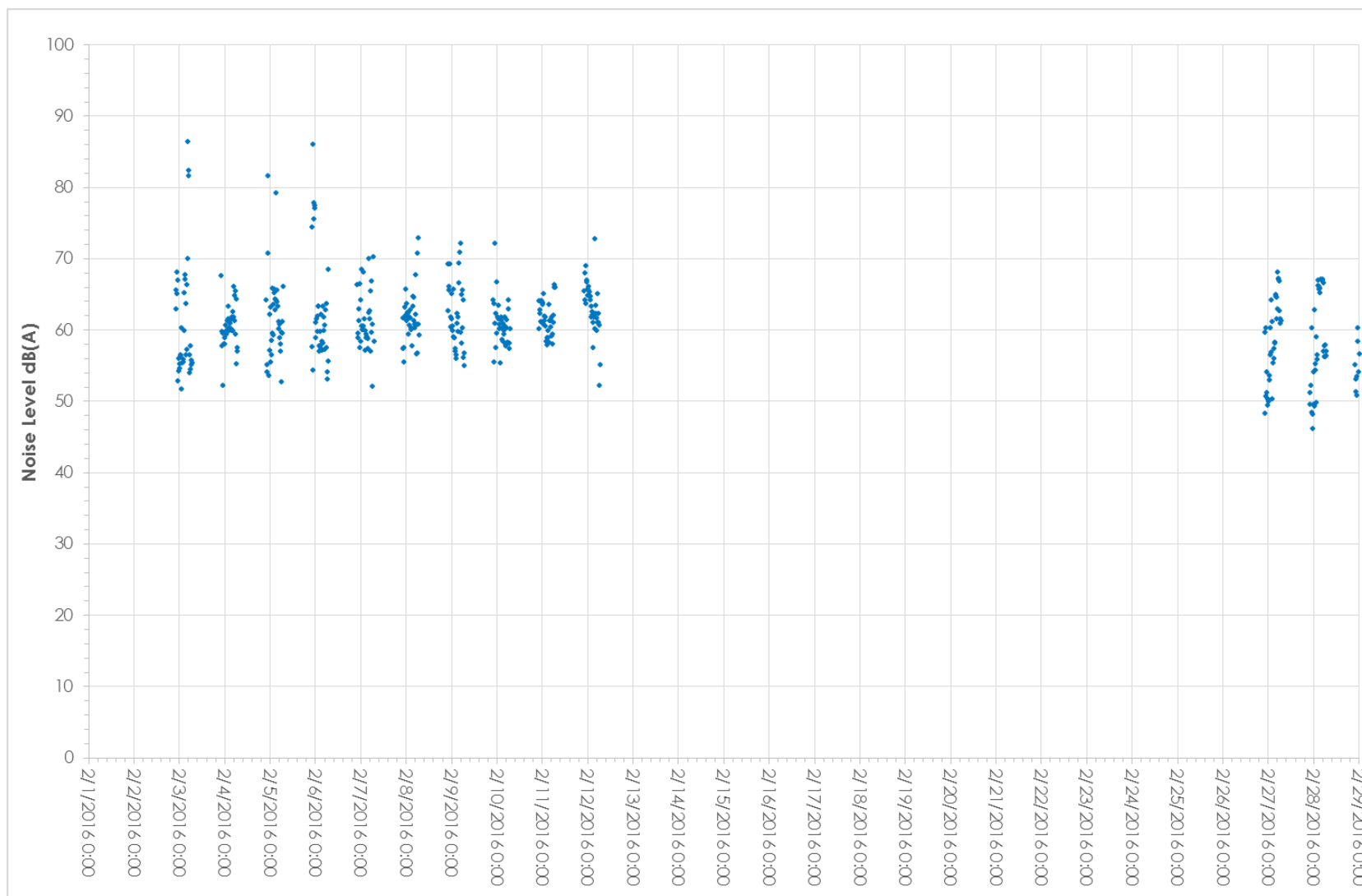


Figure 4-2: L_{1,15minute} (night time only) NMT1 Noise Monitoring Results – February 2016

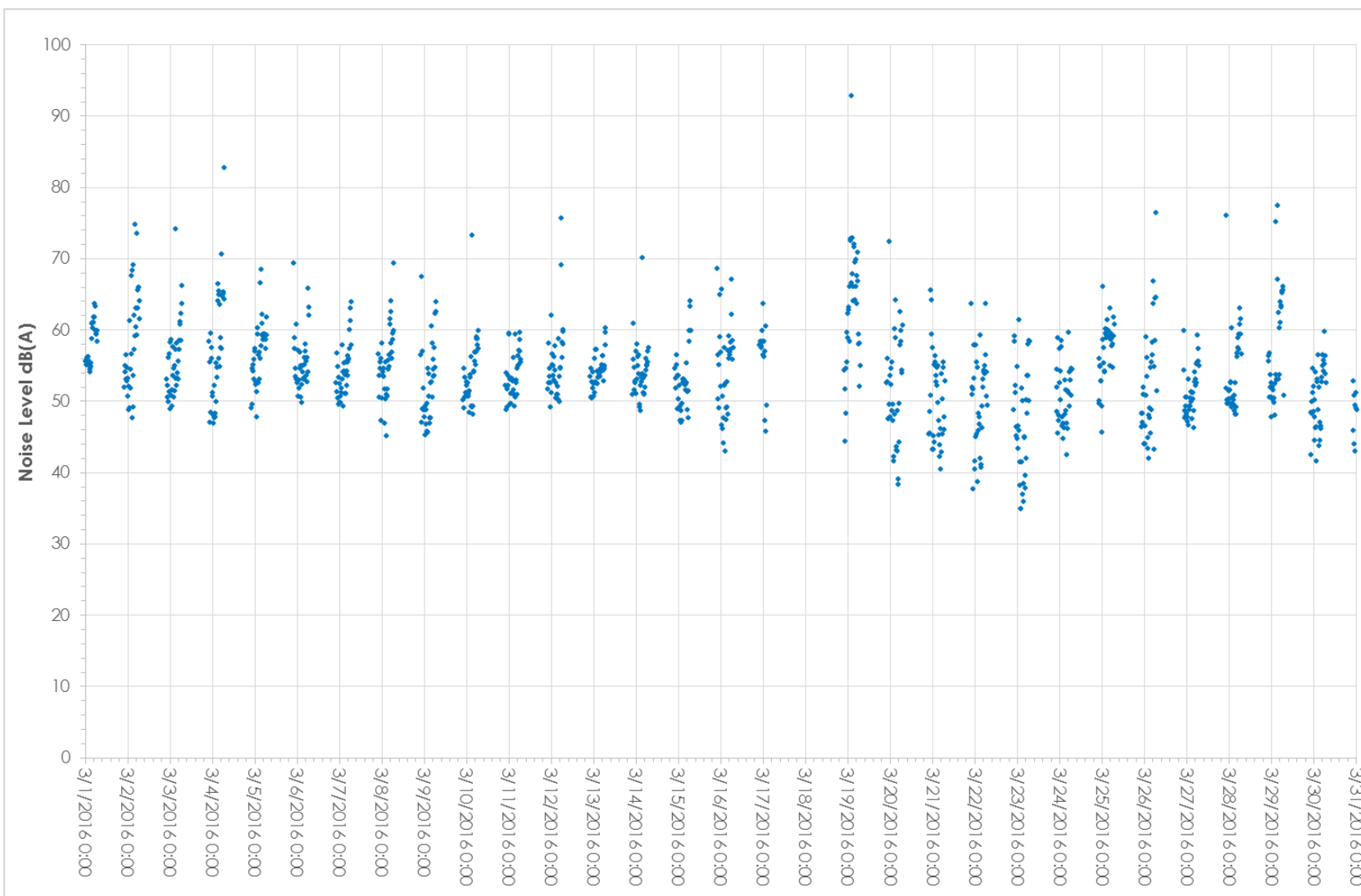


Figure 4-3: L_{1,15minute} (night time only) NMT1 Noise Monitoring Results – March 2016

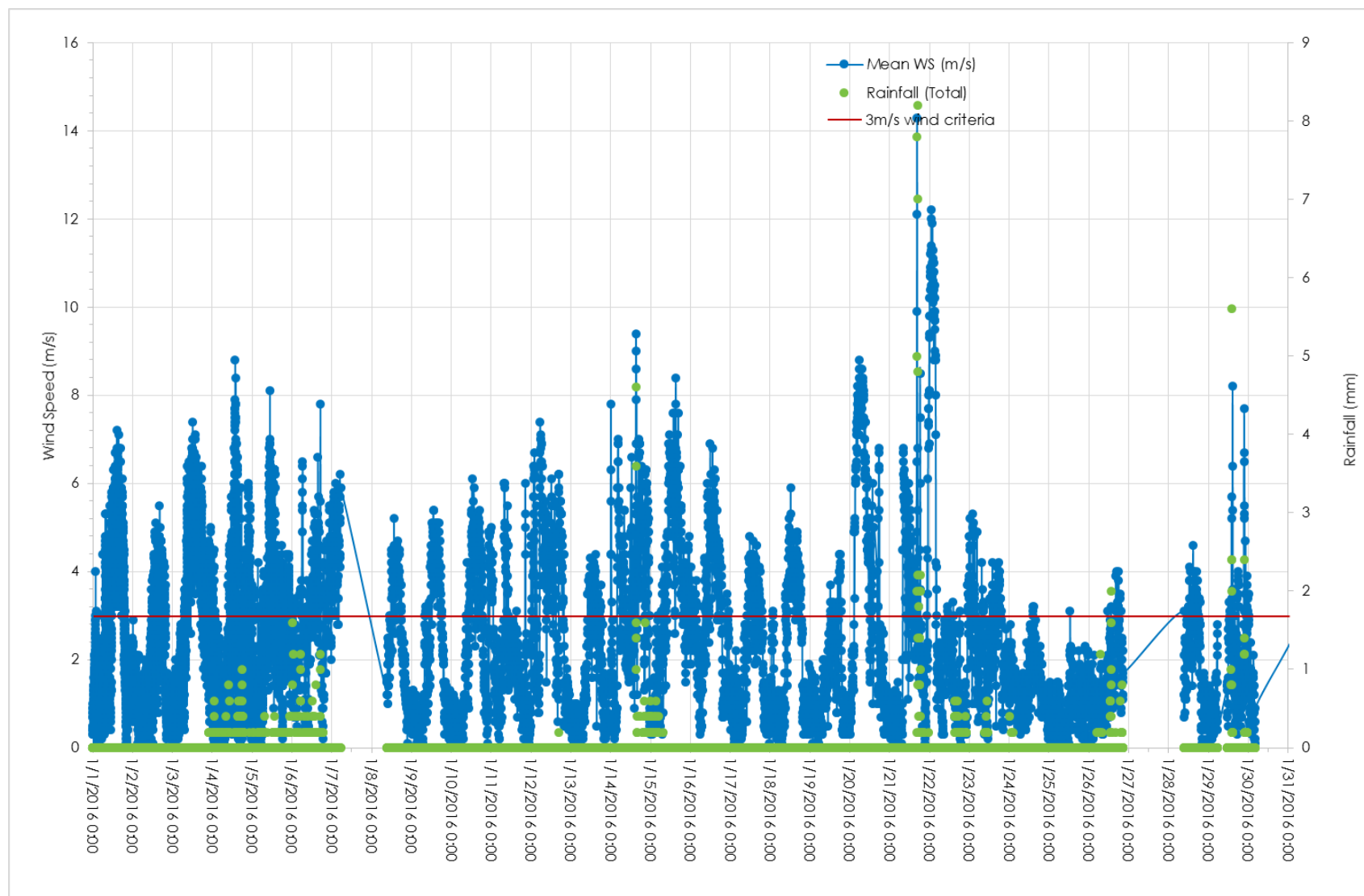


Figure 4-4: Wind Speed and Rainfall Monitoring Data – January 2016

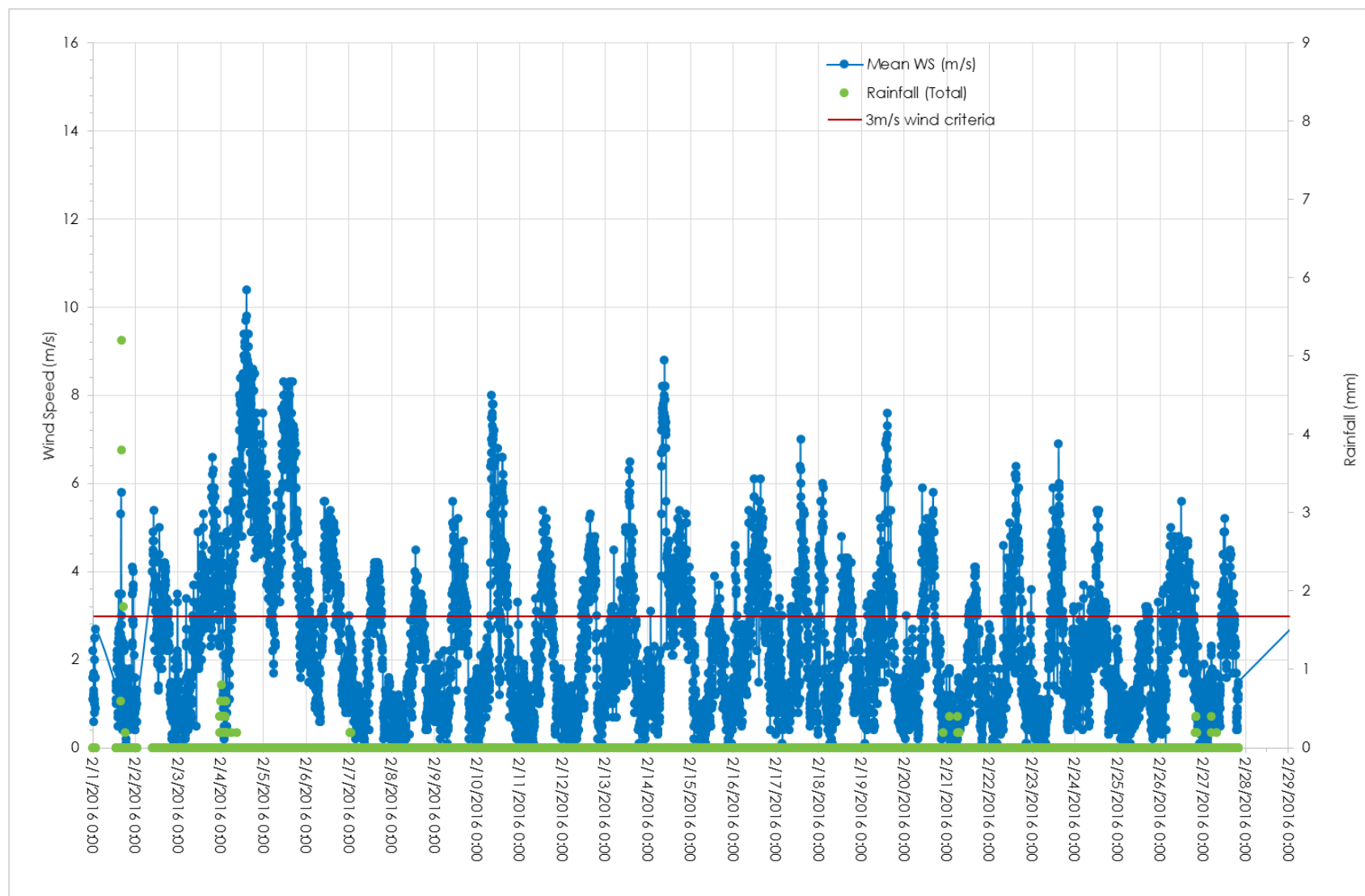


Figure 4-5: Wind Speed and Rainfall Monitoring Data – February 2016

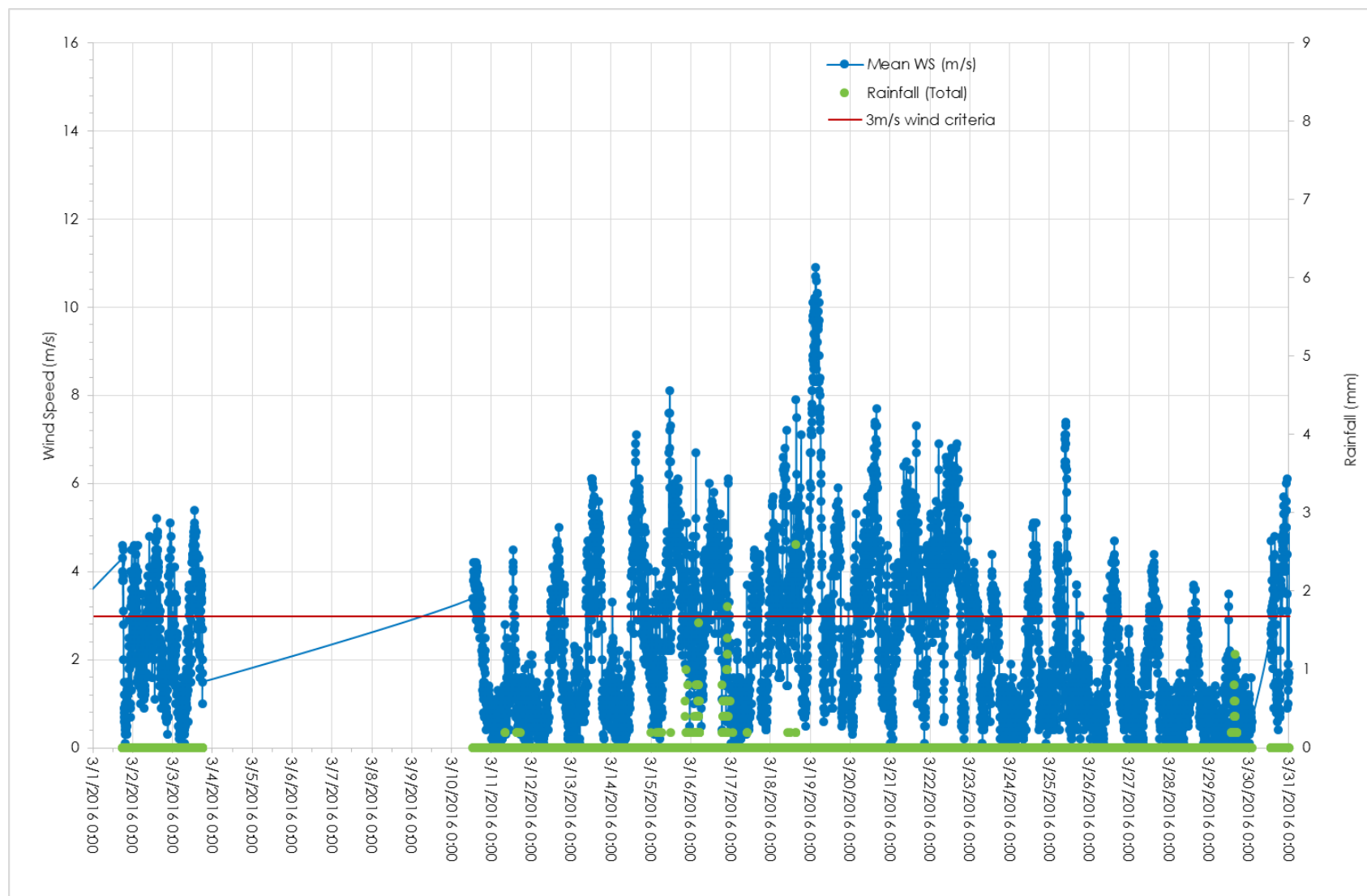


Figure 4-6: Wind Speed and Rainfall Monitoring Data – March 2016

4.5 Attended Noise Measurements

Whilst operational, attended noise measurements are carried out once every three months to establish compliance with the site's noise limits at up to ten different compliance locations surrounding the site during the day, evening and night.

As the Wongawilli is not currently operating, attended noise monitoring was not carried out in January - March 2016.