Coopers Gap Wind Farm

Noise Monitoring Report

S3982.1C14

August 2025

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1 INTRODUCTION

The Coopers Gap Wind Farm (the **Wind Farm**) is located approximately 50km north of Dalby, Queensland and consists of 123 wind turbine generators (**WTG**s).

The Wind Farm received development approval over two stages on 11 December 2018 and 12 December 2018, as contained in the documents with reference "1808-7081 SPD" and "1808-7080 SPD" respectively (collectively the **Approval**). It is understood that since beginning operation, the Wind Farm has operated under a curtailment regime, to reduce noise, which results in a lower power output for certain wind speeds and directions.

Condition 16 of the Approval requires a noise monitoring report be produced to summarise the operational noise monitoring required by Condition 15. This report has been prepared to fulfill Condition 16.

This report summarises the methodology and results of the compliance monitoring regime, conducted in accordance with the Approval conditions, the requirements of *State code 23: Wind farm development* (**State Code 23**) and *Planning guidance State Code 23: Wind farm development* (the **Planning Guidelines**), and the methodology outlined in the Noise Compliance Test Plan (the **NCTP**) summarised in the Sonus report with reference "S3982.1C7", dated April 2018.

2 OPERATIONAL NOISE CRITERIA

Condition 15 of the Approval for the Wind Farm requires a noise monitoring plan to be prepared prior to the commencement of construction. The NCTP was prepared in accordance with this condition and included the requirement that the operational noise criteria are to be determined in accordance with Condition 17 of the Approval and previous background noise monitoring conducted by AECOM between 26 July 2016 and 17 November 2016. The criteria in Condition 17 of the Approval are noted to be in accordance with the requirements of State Code 23. While the criteria must be determined in accordance with the AECOM background noise measurements, additional background noise measurements were conducted immediately prior to construction. These background measurements were summarised in the report with reference "S3982.1C8", dated July 2018 and were conducted to provide the closest comparison of pre and post construction noise levels.

In accordance with the Approval and State Code 23, the operational noise criteria are to be determined as follows:

<u>For Host lots:</u>

- The outdoor (free-field) night-time (10:00pm to 6:00am) A-weighted acoustic level does not exceed:
    - 45 dB(A), or
    - the background noise level (L_{A90}) by more than 5 dB(A)

  whichever is the greater, for wind speeds from cut-in to rated power of the wind turbine and each integer wind speed in between referenced to hub height.

<u>For Non-host lots:</u>

- The outdoor (free-field) night-time (10:00pm to 6:00am) A-weighted acoustic level does not exceed:
    - 35 dB(A), or
    - the background noise level (L_{A90}) by more than 5 dB(A)

  whichever is the greater, for wind speeds from cut-in to rated power of the wind turbine and each integer wind speed in between referenced to hub height.
- The outdoor (free-field) day-time (6:00am to 10:00pm) A-weighted acoustic level does not exceed:
    - 37 dB(A), or
    - the background noise level (L_{A90}) by more than 5 dB(A)

  whichever is the greater, for wind speeds from cut-in to rated power of the wind turbine and each integer wind speed in between referenced to hub height.

The Approval specifically references version 1.10 of State Code 23, and the version of the Planning Guidelines dated July 2016, and it is these versions that have been used for this assessment. It is noted that later versions of State Code 23 have changed the definition of the day and night periods to 6:00am to 8:00pm and 8:00pm to 6:00am, respectively. Despite this, the old definitions for the day and night periods have been used for this assessment, in accordance with the requirements of the Approval.

Given the above, the operational noise criteria determined based on the noise monitoring conducted by AECOM are given for the relevant compliance locations in Table 1 and Table 2 for the day and night periods, respectively.

Table 1: Day Period Operational Noise Criteria, dB(A)

Location	Hub Height Wind Speed, m/s											
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
AU/AV	37	37	37	37	38	39	40	41	42	44	45	46
BF	37	37	37	38	39	40	41	41	42	43	43	43
CF	37	37	37	37	38	39	39	40	40	41	41	41
G	45	45	45	45	45	45	45	45	46	48	50	52
L	37	37	37	37	37	37	38	39	40	41	41	41
Y	45	45	45	45	45	45	45	45	45	45	45	45

Table 2: Night Period Operational Noise Criteria, dB(A)

Location	Hub Height Wind Speed, m/s											
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
AU/AV	35	35	35	35	35	35	35	36	37	39	40	42
BF	35	35	35	35	35	35	36	36	37	36	35	35
CF	37	38	39	39	40	39	39	39	38	37	37	36
G	45	45	45	45	45	45	45	45	45	45	46	48
L	35	35	35	35	35	35	35	35	35	35	35	35
Y	45	45	45	45	45	45	45	45	45	45	45	45

3 NEAR FIELD NOISE MONITORING

Additional noise monitoring was previously conducted near to two turbines, T07 and T11, between 8 September 2023 and 9 November 2023, as required by the NCTP. The noise monitoring was conducted in accordance with the International Standard *IEC 61400-11: 2012 Wind turbines – Part 11: Acoustic noise measurements techniques* (**IEC 61400-11:2012**).

The near field noise monitoring was conducted to determine the noise profile of the WTGs as well as to investigate the presence of tonality in the noise output. The resultant apparent sound power levels from the previous testing have been reproduced in Table 3 and Table 4 for T07 and T11, respectively.

The results of the tonality analysis at T07 indicate that there was a tonal component to the noise from the turbine at 1.6kHz for wind speeds from 8 m/s to 14 m/s, inclusive. The analysis at T11 did not show any tonal components to the noise. Where tonality is found in the near field, further analysis shall be conducted at the residential locations for any frequency band and wind speed where tonality is detected in the near field.

Table 3: T07 Derived Apparent Sound Power Levels

V_{HH} (m/s)	V_{10} (m/s)	L_{WA} [dB(A)]	Sound Power Level [dB(A)] at each 1/3 Octave Band (Hz)																										
			20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
3	2.1	95.0*	52.1	[57.9]	65.3	67.6	[70.3]	74.1	78.0	81.1	79.2	[79.7]	[79.1]	[78.6]	[80.1]	[79.4]	[78.8]	[81.3]	83.2	87.6	90.5	84.2	81.4	78.4	75.0	72.7	66.2	[62.8]	[60.8]	[58.7]
4	2.7	94.5*	#	57.1	65.0	67.2	70.3	73.2	77.7	81.4	78.1	79.7	[78.8]	[78.3]	[79.8]	[79.3]	[78.9]	[81.2]	83.6	87.7	90.0	84.0	81.4	#	[74.4]	72.4	[66.6]	[64.2]	[62.5]	[60.5]
5	3.4	96.6*	[51.0]	[56.9]	65.7	68.2	71.4	74.4	78.9	82.2	78.9	81.0	[79.4]	[78.9]	[80.2]	[80.2]	[79.5]	82.8	84.6	88.6	91.5	88.0	83.9	80.8	76.5	73.6	[67.0]	[63.7]	[61.7]	[59.4]
6	4.1	100.1	[53.6]	59.6	69.0	70.9	73.3	77.6	79.3	85.4	82.2	81.2	[81.8]	[81.5]	[82.3]	84.4	[82.0]	85.1	86.2	90.5	95.9	92.7	86.8	84.0	80.9	77.2	70.7	[66.4]	#	#
7	4.8	103.0	57.7	63.5	69.2	71.8	75.6	79.0	81.8	85.4	86.5	84.9	84.9	86.1	85.7	89.0	87.1	88.9	89.4	91.3	95.7	98.5	91.2	88.0	84.5	80.8	75.9	69.6	#	#
8	5.5	105.4	59.8	65.4	69.9	72.9	77.3	80.5	83.4	86.0	88.4	87.6	87.6	88.8	88.4	90.1	90.1	91.0	91.7	93.1	96.2	101.9	94.4	90.4	86.6	82.7	77.0	[69.9]	#	#
9	6.2	107.2	61.5	66.9	71.3	74.1	78.5	81.6	84.4	86.6	88.8	88.8	88.9	90.2	90.1	90.5	91.5	92.0	93.0	94.3	97.1	104.1	97.0	91.9	88.3	84.4	78.8	[71.4]	#	#
10	6.8	107.6	61.4	66.8	71.3	73.9	78.4	81.4	84.3	86.6	88.7	89.1	89.1	90.7	90.8	90.9	92.3	92.5	93.5	94.9	97.8	104.3	97.9	92.7	89.3	85.5	80.2	73.3	[67.2]	[63.6]
11	7.5	107.8	63.8	69.0	73.4	76.1	80.1	82.8	85.3	87.3	89.2	89.5	89.4	91.2	91.5	91.5	92.5	92.9	93.9	95.3	98.1	104.2	98.1	93.2	89.7	86.0	80.9	74.9	[69.1]	[65.8]
12	8.2	108.1	64.9	70.0	74.4	77.1	81.0	83.6	86.0	87.9	89.7	90.0	89.7	91.9	92.4	92.3	93.2	93.7	94.5	95.7	98.3	104.3	98.5	93.6	90.2	86.4	81.2	[74.5]	[70.5]	#
13	8.9	108.6	65.7	70.8	75.3	77.8	81.5	84.2	86.5	88.4	90.2	90.6	90.7	93.0	93.7	93.7	94.4	95.0	95.4	96.5	98.7	104.4	98.7	94.1	90.7	87.1	82.5	76.9	[72.3]	[69.4]
14	9.6	109.2	66.4	71.6	76.1	78.7	82.4	84.9	87.3	89.2	90.9	91.4	91.8	94.3	95.2	95.2	95.7	96.4	96.5	97.5	99.3	104.5	99.1	94.9	91.7	88.4	84.4	79.9	76.2	73.0
15	10.3	109.6	66.6	71.8	76.4	79.0	82.6	85.4	87.9	89.9	91.7	92.4	93.2	95.5	96.5	96.5	96.8	97.5	97.3	98.2	99.7	103.9	98.9	95.3	92.1	88.8	84.8	79.6	74.7	[71.3]
16	11.0	110.0	67.0	72.3	76.7	79.4	83.0	85.8	88.5	90.6	92.4	93.2	94.1	96.4	97.3	97.3	97.5	98.2	98.0	98.8	100.1	103.9	99.3	95.8	92.7	89.5	85.8	81.6	78.0	74.9

- The background noise is higher than the total noise.

[ ] - The background noise is within 3 dB of the total noise.

^ - The difference between the sum of the 1/3-octave bands of the total noise and the sum of the 1/3-octave bands of the background noise is less than 3 dB. The results are therefore not reported.

* - The difference between the sum of the 1/3-octave bands of the total noise and the sum of the 1/3-octave bands of the background noise is between 3 and 6 dB.

V_{HH} - is the hub height (115m) wind speed.

V_{10} - is the standardised wind speed, referenced at 10m above ground level.

Table 4: T11 Derived Apparent Sound Power Levels

V_{HH} (m/s)	V_{10} (m/s)	L_{WA} [dB(A)]	Sound Power Level [dB(A)] at each 1/3 Octave Band (Hz)																											
			20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
3	2.1	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
4	2.7	93.6*	[50.3]	[55.1]	[60.0]	65.3	[65.9]	[68.1]	76.0	77.4	75.7	79.1	78.1	77.9	[77.9]	[78.4]	[78.5]	81.2	81.4	83.7	86.2	84.7	85.4	[80.2]	[76.6]	[74.7]	[71.6]	[69.4]	[66.0]	[61.7]
5	3.4	96.7	52.7	57.4	62.1	67.0	68.9	71.7	77.9	80.8	79.6	81.4	81.2	81.2	80.9	80.9	81.6	84.7	84.9	86.8	88.6	88.8	86.9	83.5	79.7	79.2	75.7	72.2	68.0	[62.3]
6	4.1	99.0	54.4	60.5	63.1	68.1	70.8	74.0	78.0	83.5	82.8	83.0	84.0	84.3	83.8	83.6	83.4	87.5	87.6	89.3	90.8	91.2	89.0	85.6	81.5	81.5	76.9	[71.8]	#	#
7	4.8	102.1	56.7	63.4	65.8	69.9	73.5	76.7	79.9	84.0	86.3	85.7	86.4	87.7	87.2	86.8	86.6	90.7	90.8	92.4	93.8	94.2	92.4	88.8	84.9	84.3	81.0	[74.4]	#	#
8	5.5	104.5	58.9	65.5	68.2	71.6	75.7	78.8	81.9	84.7	88.2	88.0	88.4	90.0	89.8	89.3	89.0	93.0	93.3	94.8	96.0	96.5	95.4	92.3	87.8	87.1	83.6	[77.2]	#	#
9	6.2	105.5	60.7	66.5	69.7	72.9	77.0	79.9	82.8	85.1	88.4	88.7	89.0	90.8	90.7	90.3	90.1	94.0	94.3	95.7	96.7	97.4	96.6	93.7	89.2	88.6	84.7	79.1	[73.4]	[68.1]
10	6.8	106.2	61.7	67.0	70.7	73.6	77.9	80.6	83.3	85.7	88.5	89.0	89.4	91.5	91.5	91.3	91.0	94.7	95.0	96.4	97.3	97.9	97.3	94.5	90.3	89.5	85.5	80.7	[74.9]	[69.7]
11	7.5	106.6	62.6	67.6	71.3	74.2	78.4	80.9	83.5	85.8	88.5	89.1	89.5	91.8	92.0	91.9	91.8	95.3	95.5	96.9	97.7	98.4	97.6	94.9	91.0	90.0	85.9	81.7	[76.1]	[70.9]
12	8.2	107.1	63.1	68.0	71.9	74.8	78.8	81.1	83.6	85.8	88.5	89.1	89.7	92.2	92.7	92.7	92.8	96.0	96.2	97.5	98.2	98.9	97.9	95.3	91.8	90.5	86.4	83.3	78.6	[73.7]
13	8.9	108.0	63.6	68.2	72.4	75.2	79.0	81.3	83.7	85.7	88.6	89.4	90.2	93.0	93.8	93.9	94.3	97.2	97.3	98.4	99.0	99.6	98.2	95.8	92.8	91.3	87.5	84.9	81.1	76.2
14	9.6	109.2	64.3	68.8	73.1	76.1	79.8	82.2	84.5	86.7	89.4	90.4	91.4	94.3	95.3	95.4	95.9	98.6	98.5	99.6	100.1	100.6	99.5	97.1	94.4	92.8	89.9	88.0	84.7	79.8
15	10.3	110.0	64.7	69.2	73.6	76.7	80.3	82.7	85.3	87.7	90.3	91.5	92.6	95.4	96.4	96.4	96.8	99.4	99.2	100.2	100.6	101.1	99.9	97.7	95.4	93.9	91.4	89.3	86.2	81.4
16	11.0	110.2	64.8	69.6	73.9	77.0	80.6	83.0	85.6	87.9	90.6	91.8	93.0	95.8	96.8	96.8	97.2	99.7	99.5	100.5	100.9	101.3	100.1	97.9	95.7	94.0	91.6	89.5	86.4	81.4

\# - The background noise is higher than the total noise.

[ ] - The background noise is within 3 dB of the total noise.

^ - The difference between the sum of the 1/3-octave bands of the total noise and the sum of the 1/3-octave bands of the background noise is less than 3 dB. The results are therefore not reported.

* - The difference between the sum of the 1/3-octave bands of the total noise and the sum of the 1/3-octave bands of the background noise is between 3 and 6 dB.

V_{HH} - is the hub height (115m) wind speed.

V_{10} - is the standardised wind speed, referenced at 10m above ground level.

4 OPERATIONAL NOISE MONITORING METHODOLOGY

Compliance noise monitoring was conducted at six locations between 20 March 2025 and 15 May 2025. A noise logger was positioned on each property at a location equivalent to where the background noise monitoring was conducted by Sonus prior to construction. Noise monitoring locations are provided in Table 5 and highlighted in Figure 1. Photographs of the noise monitoring equipment at each location are provided in Appendix A.

It is noted that a number of turbines were offline at the beginning of the noise monitoring program. In order to ensure that sufficient data were collected at all locations, the monitoring was extended past the required 6-week period. The majority of these turbines were returned to service on 24 March 2025. The impacts of the offline turbines on the noise monitoring are discussed in more detail in Section 4.5.1.

Table 5: Residential Monitoring Locations

Measurement Location	Residence Status	Coordinates (UTM WGS84 56 J)	
		Easting	Northing
AU/AV	Non-host	342645	7048139
BF	Non-host	335141	7050730
CF	Non-host	349691	7038188
G	Host	346243	7042887
L	Non-host	338333	7044568
Y	Host	345860	7038515

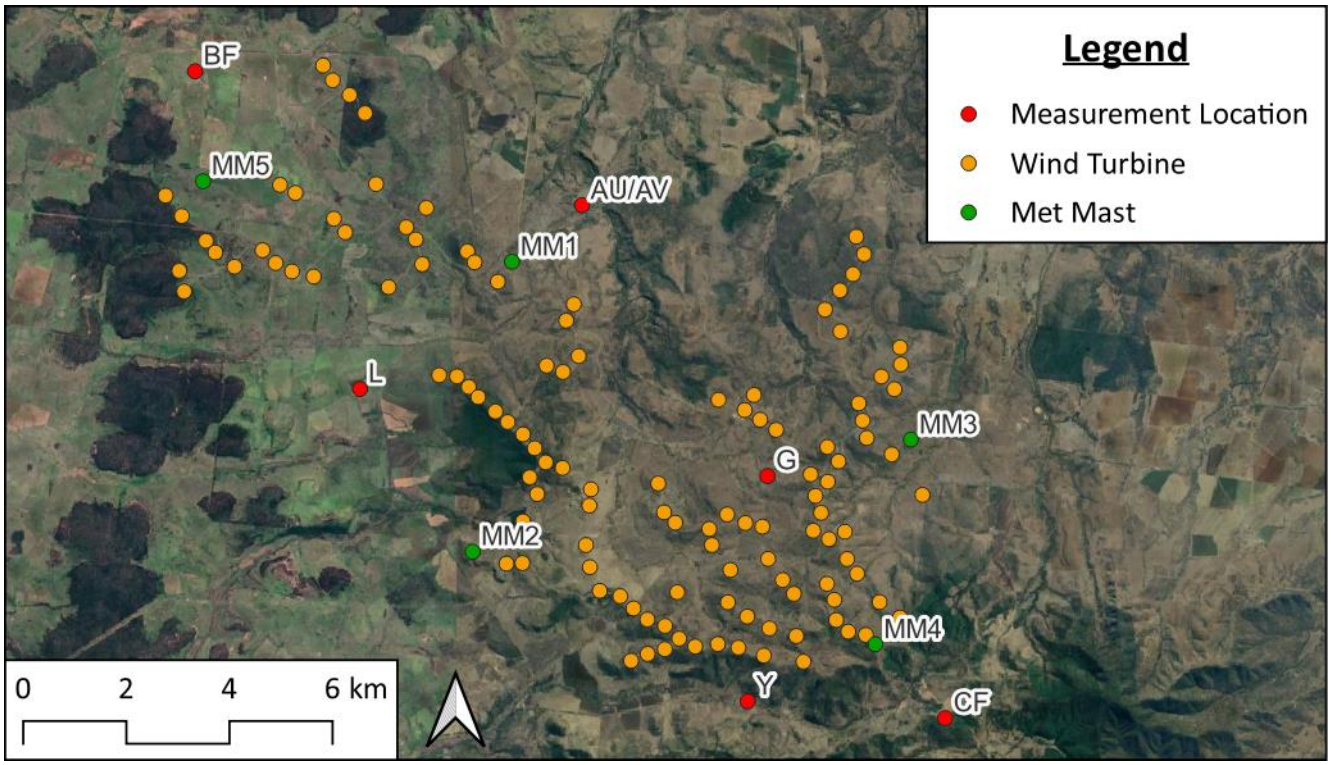

Figure 1: Residential Monitoring Locations

4.1 Equipment

The operational noise was measured in 10-minute intervals using a combination of *Rion* Class 1 and Class 2 sound level meters with a noise floor of less than 20 dB(A), calibrated at the beginning and the end of the period with a *Rion* NC-74 calibrator, with no significant drift observed. The microphones were positioned approximately 1.5m above ground level and fitted with *Rion* WS-15 double layer all weather windshields. An example of a typical on-site setup is shown in Figure 2.

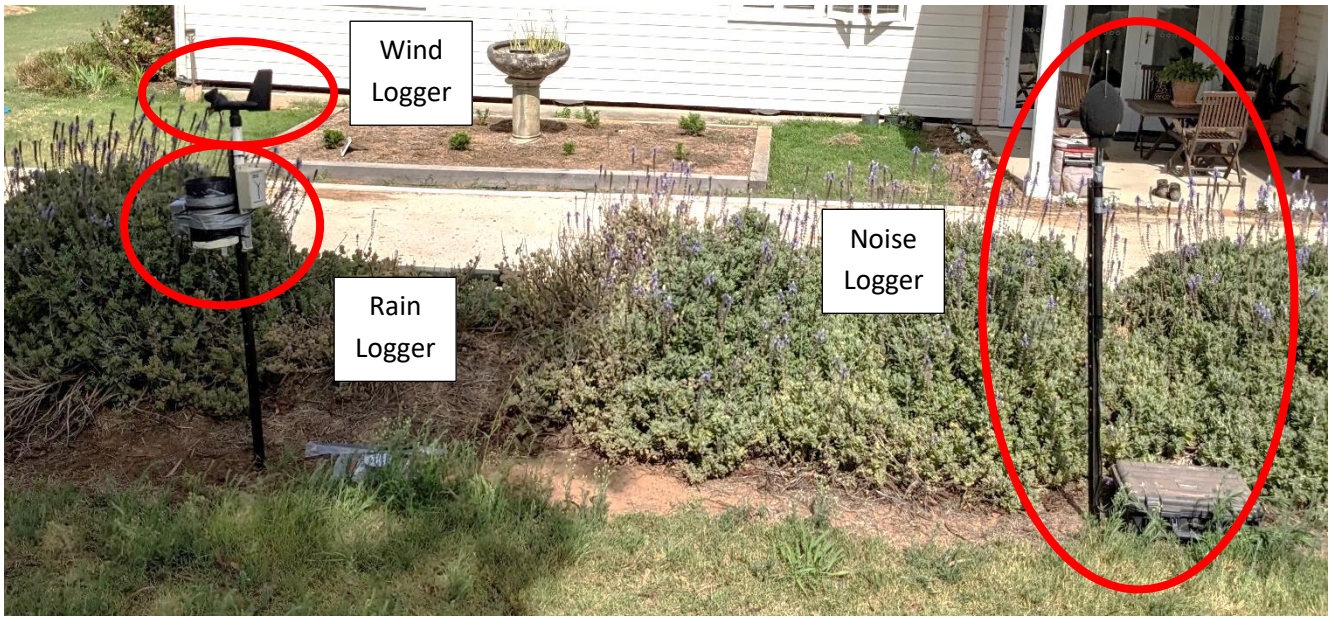

Figure 2: Typical Monitoring Location Setup

4.2 Hub Height Wind Speed

During the operational noise monitoring regime, the wind speed was measured in 10-minute intervals at five locations around the Wind Farm site. Table 6 provides the locations of the meteorological masts and the noise monitoring location the data is relevant to. The meteorological mast assigned to each noise monitoring location is noted to be the same as was used during the background noise measurements. The wind data was measured at a hub height of 115m, and wake effects were removed before being provided to Sonus.

Table 6: Meteorological Mast Locations

Met Mast	Coordinates (UTM WGS84 56 J)		Noise Monitoring Locations
	Easting	Northing	
MM1	341287	7047042	AU/AV
MM2	340525	7041414	L
MM3	349020	7043590	G
MM4	348333	7039621	CF, Y
MM5	335298	7048598	BF

4.3 Intermediate Monitoring Locations

In addition to the noise monitoring at the residential locations, noise monitoring was also conducted at four intermediate locations between the residences and the wind turbines. These locations were chosen such that they have a greater turbine to background noise ratio for the purpose of determining whether the noise measured at residences is from the Wind Farm or not. The intermediate locations are shown in Table 7 and in Figure 3.

Table 7: Intermediate Monitoring Locations

Measurement Location	Coordinates (UTM WGS84 56 J)	
	Easting	Northing
AU/AV Intermediate	342135	7048064
BF Intermediate	335748	7050221
CF Intermediate	349400	7038629
L Intermediate	338664	7044510

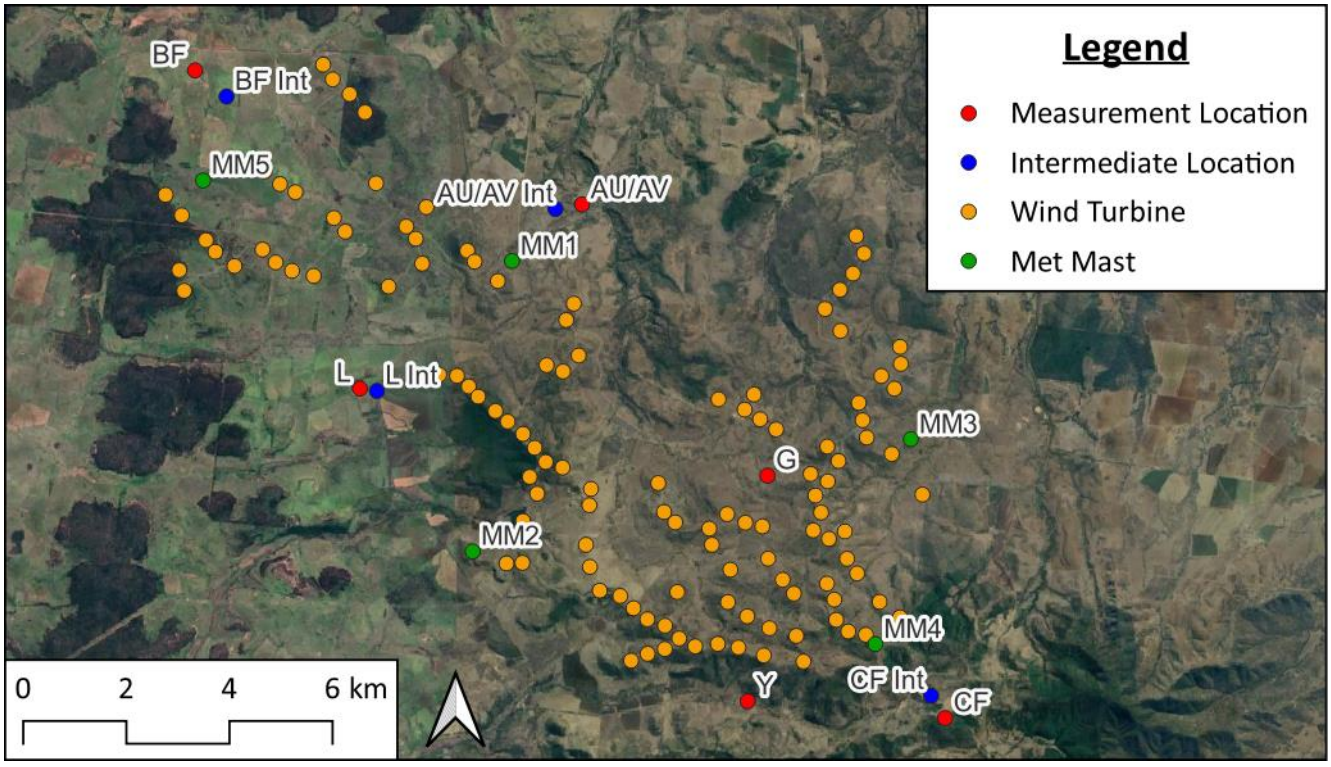

Figure 3: Intermediate Monitoring Locations

The measured noise levels at the intermediate locations can be used to filter out specific periods by showing that the noise is from a source other than the Wind Farm. A 10-minute period is considered to be from a source other than the Wind Farm where the measured noise level at the intermediate location, which is closer to the wind turbines, is lower than the level measured at the residence.

4.4 Local Weather

During the operational noise monitoring period, local wind and rain at the microphone location (approximately 1.5m above ground level) were measured using *Rainwise* wind loggers and *Hobo* rain loggers positioned at various locations around the Wind Farm site, as summarised Table 8.

Table 8: Local Weather Monitoring Locations

Measurement Location	Equipment Type	Coordinates (UTM WGS84 56 J)	
		Easting	Northing
AU/AV	Wind & Rain	342653	7048137
Y	Wind	345860	7038504

The rainfall and wind speed data were used to determine the periods where local weather may have affected the operational noise measurements. Data are considered to be affected by local weather where rainfall was measured in a period or the periods either side of the period in question, and/or where the measured wind speed at the microphone height exceeded 5 m/s for more than 90% of the measurement period. For locations where local weather was not measured, the conditions at the nearest weather monitoring location have been taken as representative.

4.5 Data Analysis

Data points have been filtered out for the following reasons:

- Any data for wind speeds below the cut-in wind speed, that is any data for a wind speed less than 3 m/s.
- As the background noise levels measured by AECOM and used to determine the criteria were only provided to 14 m/s, data for wind speeds above this have been removed.
- Data where the Wind Farm was not operating in a normal state and the non-operational turbines are predicted to effect the noise level at a residential location, as outlined in Section 4.5.1.
- Any data affected by local weather conditions, as per the procedure outlined in Section 4.4.
- Data where equipment was being set up or collected.

- Data where measurements at an intermediate location confirm that the noise is from a source other than the Wind Farm, as per the procedure in Section 4.3.
- Data where a review of audio recordings indicated that the noise was from a source other than the Wind Farm.
- Data affected by sources of extraneous noise, as per the procedure outlined in Section 4.5.2.

Intermittent noise sources, such as the noise from dogs barking or passing cars, are inherently excluded as the $L_{A90,10min}$ measured considers only the level of noise that is exceeded for 90% of the 10-minute time period.

Following the data removal procedure, the following number of data points remained for each of the monitoring locations, as shown in Table 9.

Table 9: Valid Data Points

Measurement Location	Valid Data Points (Day Period)	Valid Data Points (Night Period)
AU/AV	651	647
BF	687	1138
CF	2389	1329
G	3255	1694
L	638	397
Y	3772	1717

4.5.1 Wind Farm Operational State

Prior to conducting the operational noise monitoring, it was noted that two turbines, T11 and T62 would be down for long term maintenance. Noise predictions were conducted to determine the implication of these turbines remaining non-operational during the monitoring period. The results show that a decrease in noise level of 0.2 dB was predicted at residence AU/AV and a decrease of 0.1 dB at residence L. A decrease of less than 0.1 dB was predicted at all other residences. The predictions therefore indicate that these turbines do not have a significant impact on the predicted noise levels at any of the monitoring locations and monitoring can continue. It is noted that it is considered normal for a small number of turbines to be offline at any one time for maintenance, whether scheduled or unscheduled. In addition, it has been confirmed that adding the predicted noise level difference to the measured noise levels does not impact compliance.

At the beginning of the monitoring period a number of additional turbines were also offline, including T10, T12, T13, T14, and T15. Additional noise predictions were conducted, indicating that the offline turbines will have an effect on the predicted noise levels at one residence, residence BF. As such, any data collected before these turbines returned to service has been excluded from the analysis.

4.5.2 Extraneous Noise

A review of audio recordings indicated that a number of periods were dominated by noise from extraneous sources, such as birds and insects. Such sources of noise are typically found at higher frequencies where there is little influence from the Wind Farm. The frequency content of the measured noise levels has been analysed to determine periods that are affected by extraneous noise. Periods are considered to be affected by extraneous noise, and have been excluded from further analysis, where the highest A-weighted one-third octave band noise level:

- Occurs at a frequency of 2 kHz or greater,
- Is greater than a level of 20 dB L_{A90}, and
- Is within 5 dB of the broadband A-weighted noise level for the period in question.

4.6 Derived Wind Farm Noise Level

The Planning Guidelines require that the pre-construction noise level is subtracted from the post-construction noise level to determine the derived wind farm noise level. This procedure is, however, only valid where the same data filtering has been conducted for the pre and post construction monitoring. As additional filtering has been conducted for the post-construction monitoring to remove sources of extraneous noise, the pre-construction measured noise levels cannot be subtracted from the post-construction measured noise levels. Where background noise levels cannot be subtracted, the Planning Guidelines note that the operational noise monitoring measurement is to be taken as the derived wind farm noise level.

5 TONALITY ASSESSMENT

Where tonality is detected during the near field tests, further analysis is to be completed at residences. As per the NCTP, this additional analysis is to be completed for the frequencies and wind speeds where tonality was detected at the near field locations. All 10-minute data points, prior to any data exclusion, are split into wind speed bins centred on the integer wind speeds with a width of ±0.5 m/s. A 10-minute period within a wind speed bin is considered to be tonal if the level in that band exceeds the two adjacent bands by 5 dB(A), is audible to the human ear, and where there is no evidence that the noise is from a source other than the Wind Farm.

The number of 10-minute periods exhibiting tonality for each frequency and wind speed bin is determined. Where more than 10% of the data points within a wind speed bin exhibit tonality, the Wind Farm is considered to be tonal.

While it is noted that the NCTP only requires tonality to be assessed at the closest residence, residence G in this case, all residential monitoring locations have been considered. The measured noise levels at each of the residential monitoring locations has been analysed for tonality at the frequency and wind speeds of interest, the results of which can be seen in Table 10. It is noted that the presence of tonality at residences is not necessarily from the Wind Farm and while some filtering of tonality from other sources has been conducted, tonality from other sources may still remain.

Table 10: Residence Tonality Analysis

Residence	Tonality Percentage for 1.6kHz per Hub Height Wind Speed						
	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s
AU/AV	0%	0%	1%	4%	3%	5%	0%
BF	1%	0%	1%	1%	1%	0%	0%
CF	0%	0%	0%	0%	0%	0%	0%
G	0%	0%	0%	0%	0%	0%	0%
L	0%	0%	0%	0%	0%	0%	0%
Y	0%	0%	0%	0%	0%	0%	0%

As can be seen from the above table, tonality was identified rarely at the residential monitoring locations, for no more than 5% of periods in any wind speed bin of interest. The Wind Farm will therefore not attract the application of a penalty for excessive tonality.

6 NOISE MONITORING RESULTS

The operational noise data collected at each monitoring location, following data filtering, were correlated with the wind speed at the relevant meteorological masts for a hub height of 115m for each 10-minute period. Correlations have been completed separately for both the day (6:00am to 10:00pm) and night (10:00pm to 6:00am) periods.

A least squares regression analysis of the filtered data was undertaken to find the line of best fit for the correlations to determine the post-construction noise level, and therefore the derived wind farm noise level. The results of the analysis have been summarised in Table 11 to Table 22. The data and the regression curves used for the analysis are shown on the figures in Appendix B.

Table 11: AU/AV Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	25	27	29	30	32	33	35	37	38	39	40	41
Noise Level Criteria, L_{Aeq} [dB(A)]	37	37	37	37	38	39	40	41	42	44	45	46
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 12: AU/AV Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	19	22	25	27	29	31	33	35	36	37	39	39
Noise Level Criteria, L_{Aeq} [dB(A)]	35	35	35	35	35	35	35	36	37	39	40	42
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 13: BF Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	26	27	29	31	33	35	37	38	38	37	34	29
Noise Level Criteria, L_{Aeq} [dB(A)]	37	37	37	38	39	40	41	41	42	43	43	43
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 14: BF Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	23	25	27	29	31	33	35	36	36	36	35	34
Noise Level Criteria, L_{Aeq} [dB(A)]	35	35	35	35	35	35	36	36	37	36	35	35
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 15: CF Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	23	24	25	26	27	28	30	32	33	35	37	40
Noise Level Criteria, L_{Aeq} [dB(A)]	37	37	37	37	38	39	39	40	40	41	41	41
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 16: CF Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	24	22	22	22	23	25	27	29	31	33	35	36
Noise Level Criteria, L_{Aeq} [dB(A)]	37	38	39	39	40	39	39	39	38	37	37	36
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 17: G Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	32	34	36	38	40	41	43	44	45	45	45	44
Noise Level Criteria, L_{Aeq} [dB(A)]	45	45	45	45	45	45	45	45	46	48	50	52
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 18: G Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	35	36	37	39	40	42	43	44	45	45	45	45
Noise Level Criteria, L_{Aeq} [dB(A)]	45	45	45	45	45	45	45	45	45	45	46	48
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 19: L Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	25	27	28	29	31	32	34	35	36	37	38	39
Noise Level Criteria, L_{Aeq} [dB(A)]	37	37	37	37	37	37	38	39	40	41	41	41
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 20: L Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	23	23	24	25	26	27	29	30	30	30	29	28
Noise Level Criteria, L_{Aeq} [dB(A)]	35	35	35	35	35	35	35	35	35	35	35	35
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 21: Y Compliance Analysis – Day Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	31	31	33	34	35	36	37	38	39	40	41	41
Noise Level Criteria, L_{Aeq} [dB(A)]	45	45	45	45	45	45	45	45	45	45	45	45
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 22: Y Compliance Analysis – Night Period

Acoustic Descriptor	Hub Height Wind Speed, m/s											
	3	4	5	6	7	8	9	10	11	12	13	14
Derived Wind Farm Noise Level, L_{A90} [dB(A)]	25	26	28	29	31	33	35	37	38	39	40	40
Noise Level Criteria, L_{Aeq} [dB(A)]	45	45	45	45	45	45	45	45	45	45	45	45
Compliance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The results in the above tables indicate that compliance will be achieved at each of the residential monitoring locations for all wind speeds and times of day. As the appropriate noise criteria are achieved at the residential monitoring locations, it is considered that the noise modelling is accurate and the Wind Farm will therefore be compliant at all other locations, as per the procedure laid out in the NCTP.

7 CONCLUSION

Noise monitoring has been completed for the Coopers Gap Wind Farm for the purpose of determining compliance. The noise monitoring was conducted in accordance with the procedures described in the *Noise Compliance Test Plan* and *Planning guidance State Code 23: Wind farm development*. The results of the noise monitoring were assessed against criteria determined in accordance with *State Code 23: Wind farm development* and previous background noise measurements conducted by AECOM.

This assessment also considered the potential impacts of tonality and concluded that tonality from the turbines will not be sufficiently dominant at residences to warrant a penalty. The results of the compliance monitoring indicate that the Wind Farm complied with the relevant noise criteria at all assessment locations, while operating under a curtailment regime. As per the procedure in the Noise Compliance Test Plan, demonstrating compliance at each of the six assessment locations demonstrates compliance at all other locations. It can therefore be determined that the Wind Farm as a whole complied with all relevant noise criteria.

APPENDIX A: NOISE MONITORING PHOTOS

Figure 4: Monitoring Equipment at Residence AU/AV

Figure 5: Monitoring Equipment at AU/AV Intermediate

Figure 6: Monitoring Equipment at Residence BF

Figure 7: Monitoring Equipment at BF Intermediate

Figure 8: Monitoring Equipment at Residence CF

Figure 9: Monitoring Equipment at CF Intermediate

Figure 10: Monitoring Equipment at Residence G

Figure 11: Monitoring Equipment at Residence L

Figure 12: Monitoring Equipment at L Intermediate

Figure 13: Monitoring Equipment at Residence Y

APPENDIX B: REGRESSION CURVES

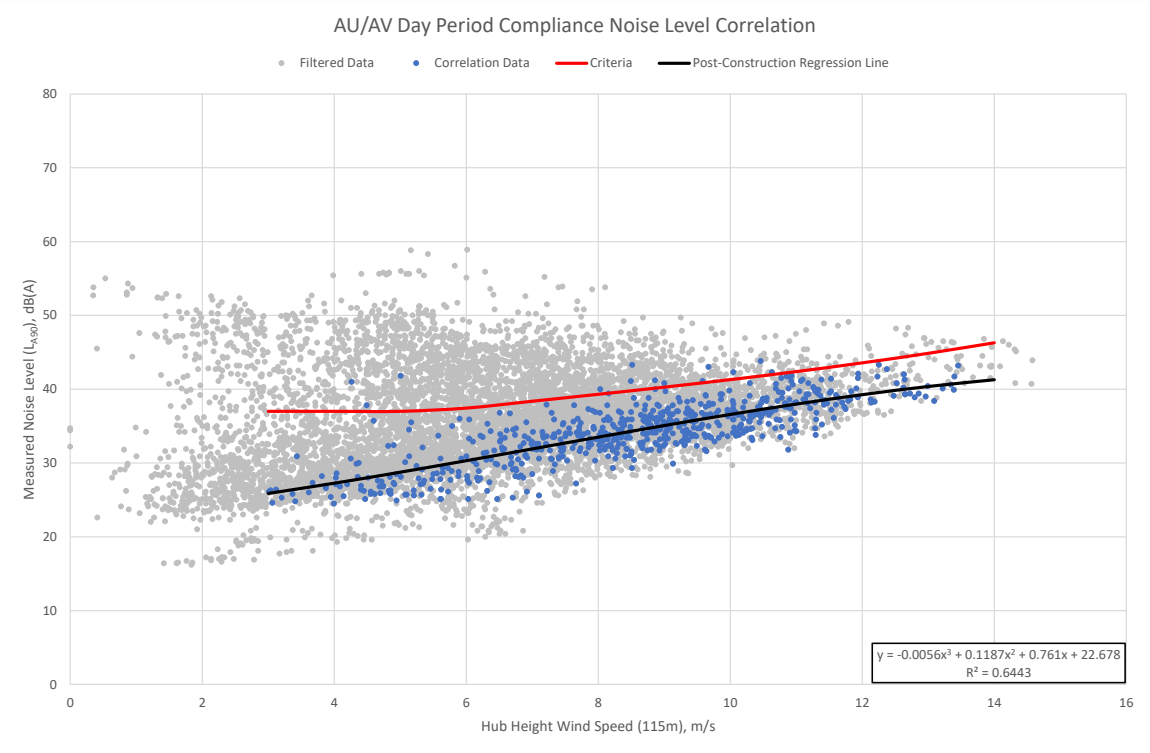

Figure 14: Residence AU/AV Day Period Noise Level Correlations

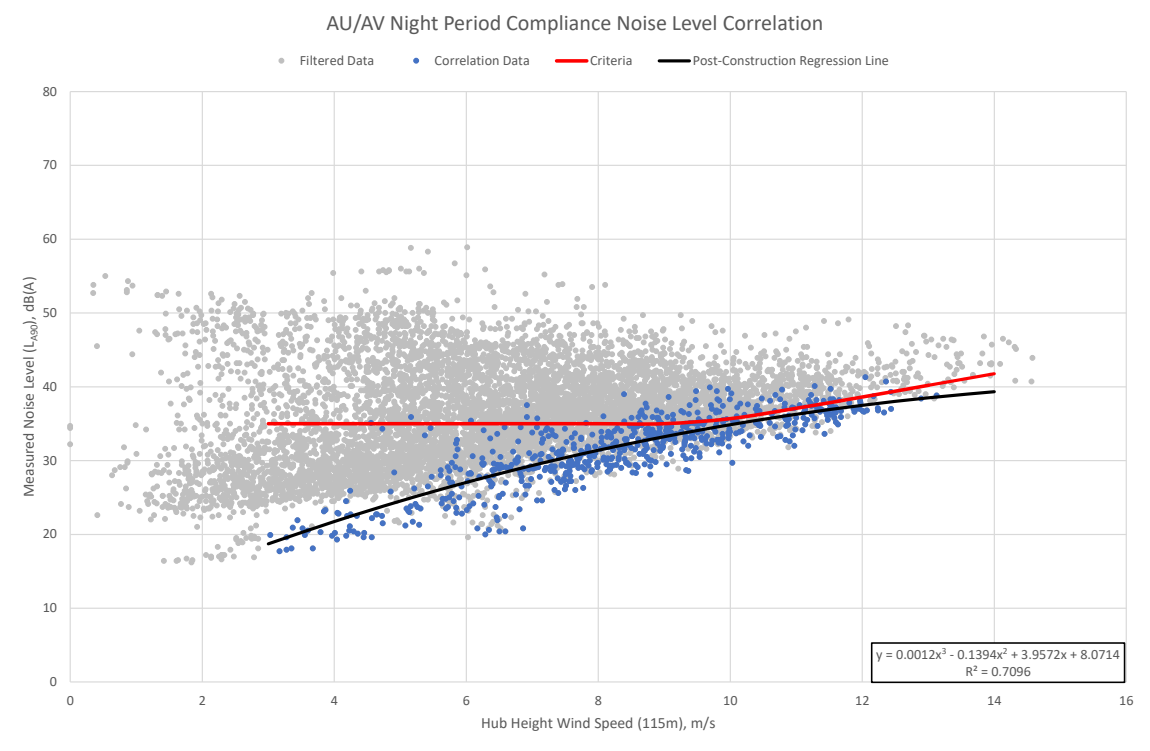

Figure 15: Residence AU/AV Night Period Noise Level Correlations

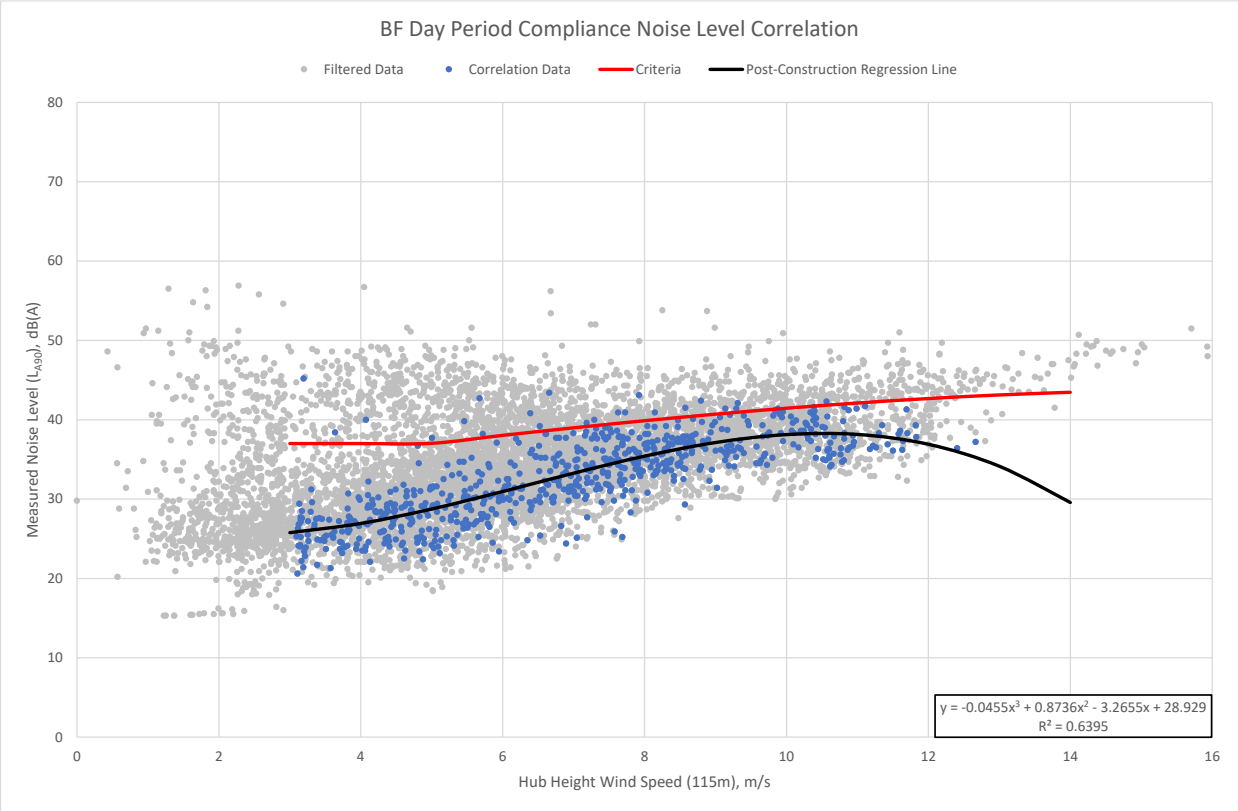

Figure 16: Residence BF Day Period Noise Level Correlations

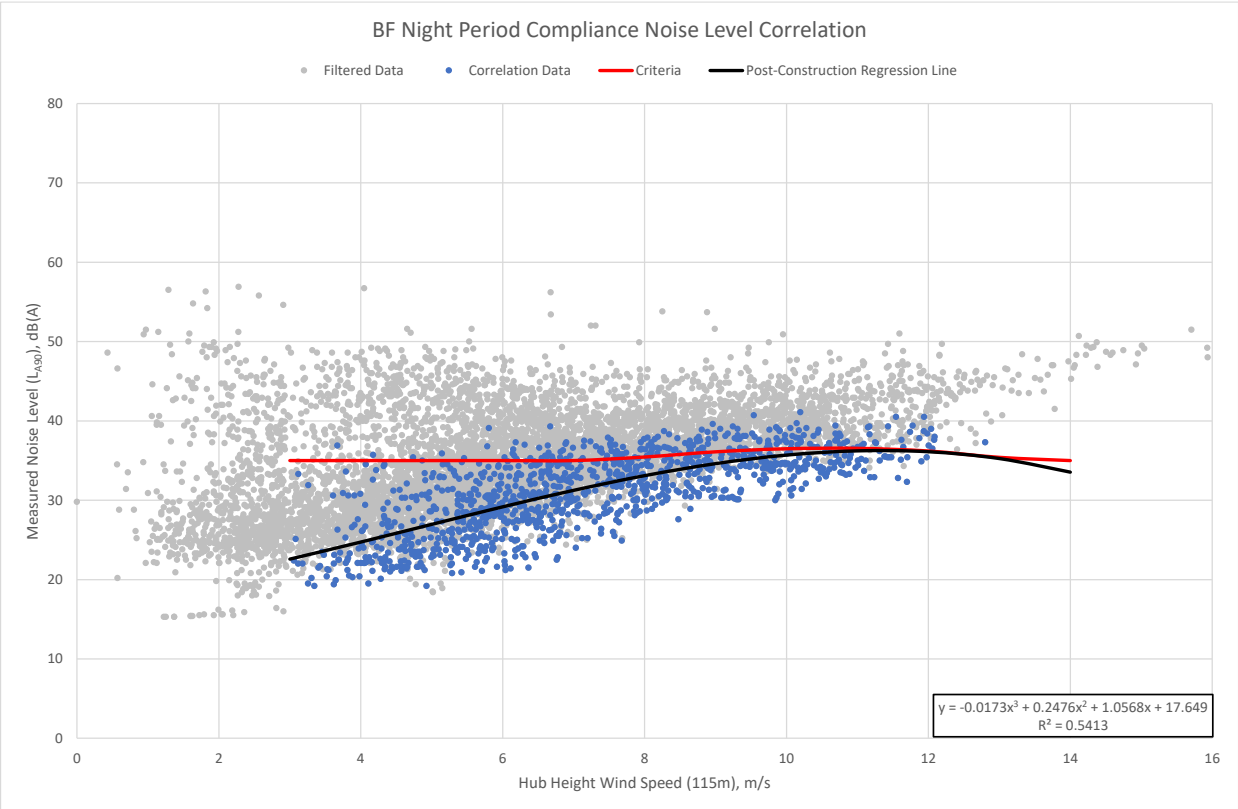

Figure 17: Residence BF Night Period Noise Level Correlations

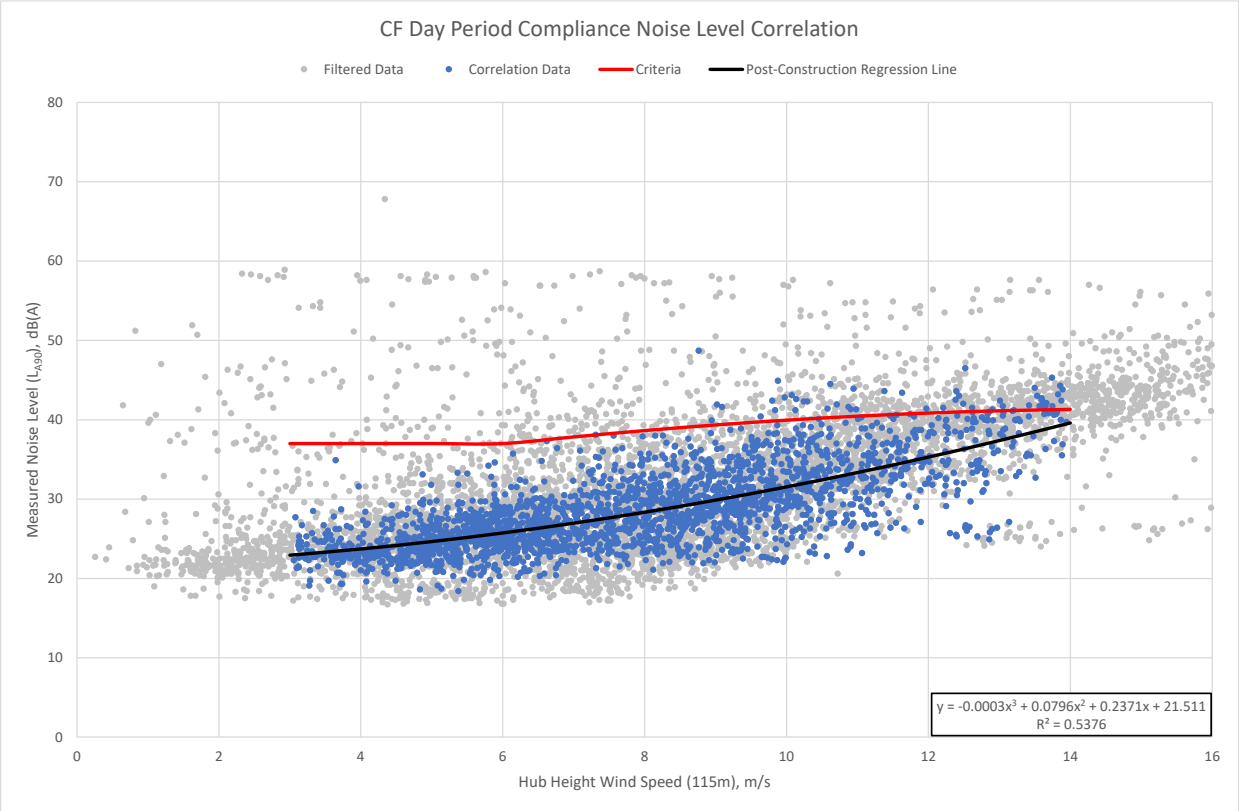

Figure 18: Residence CF Day Period Noise Level Correlations

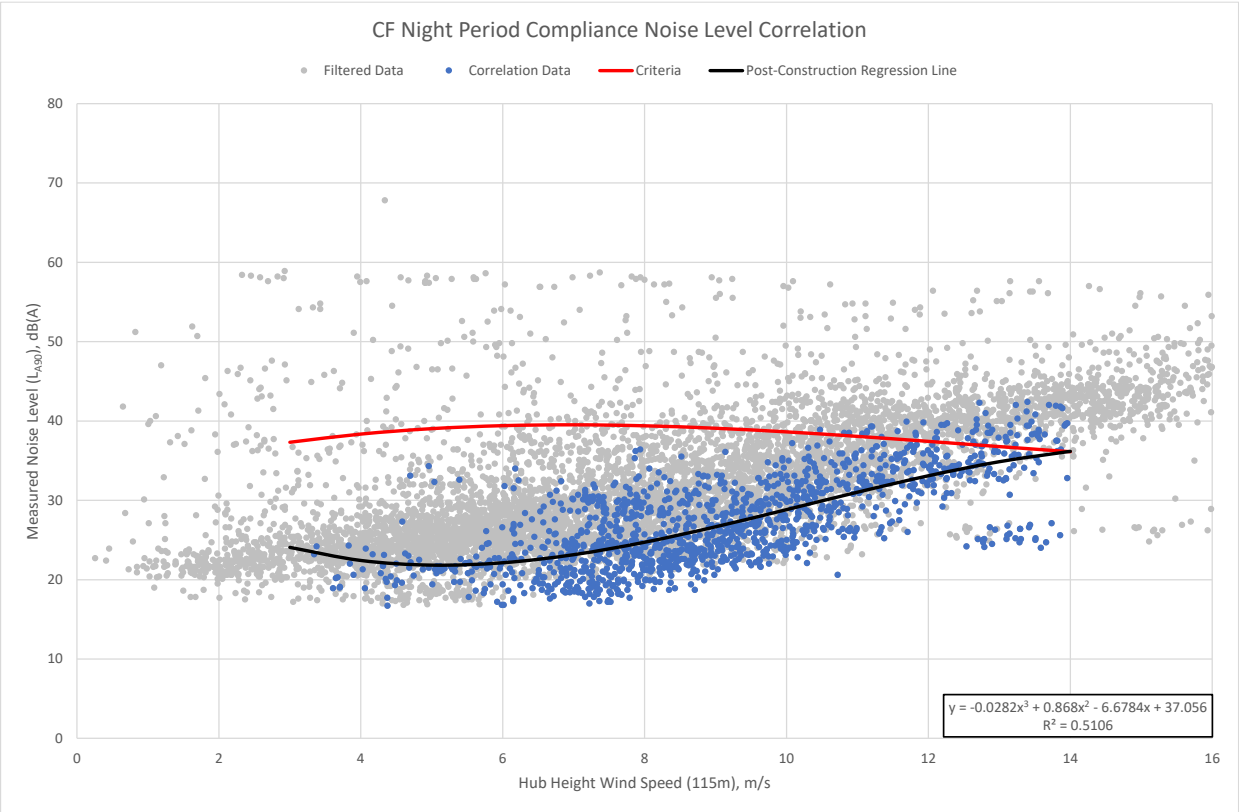

Figure 19: Residence CF Night Period Noise Level Correlations

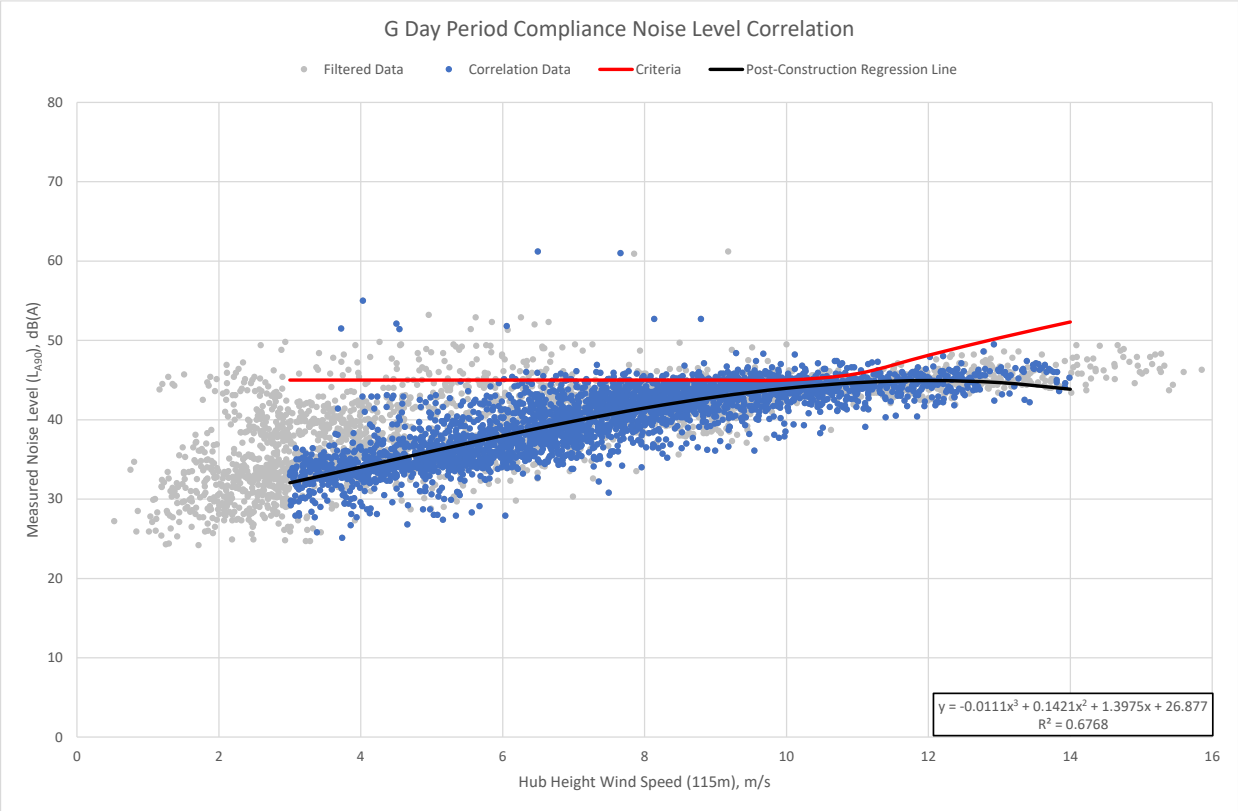

Figure 20: Residence G Day Period Noise Level Correlations

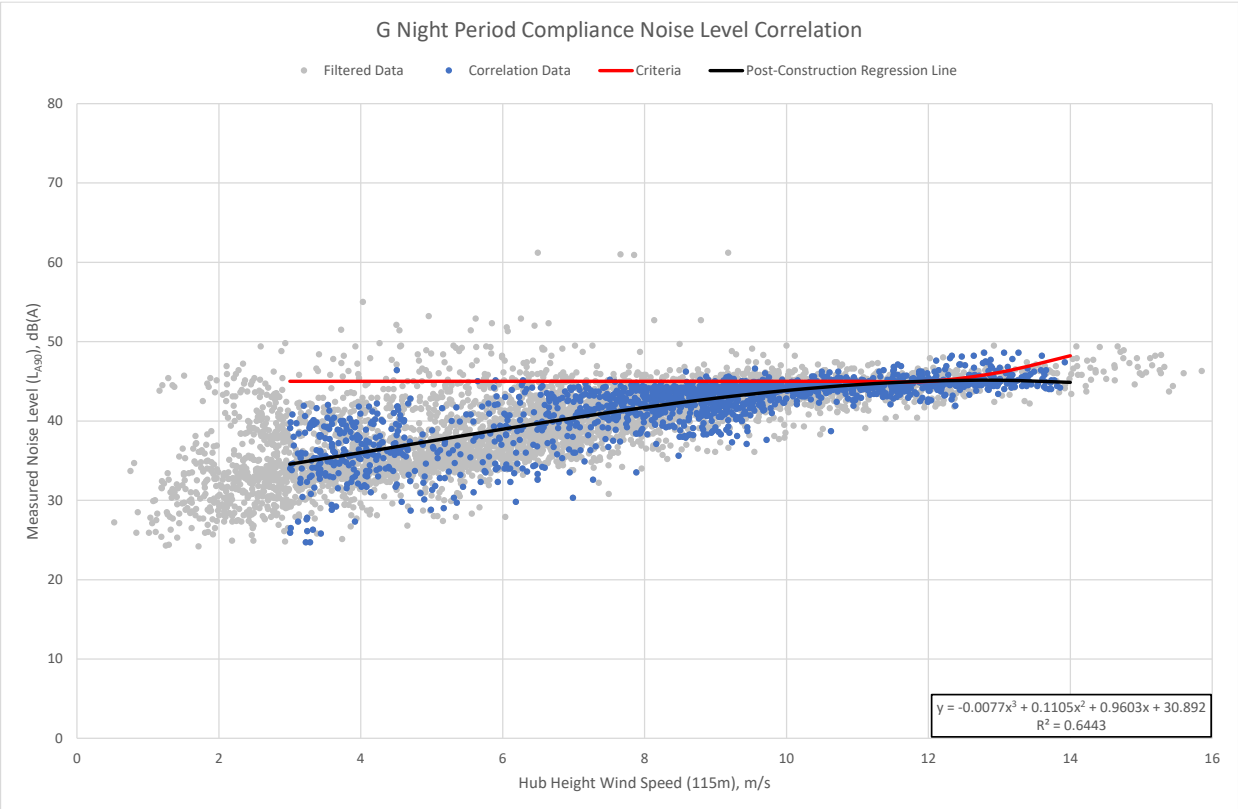

Figure 21: Residence G Night Period Noise Level Correlations

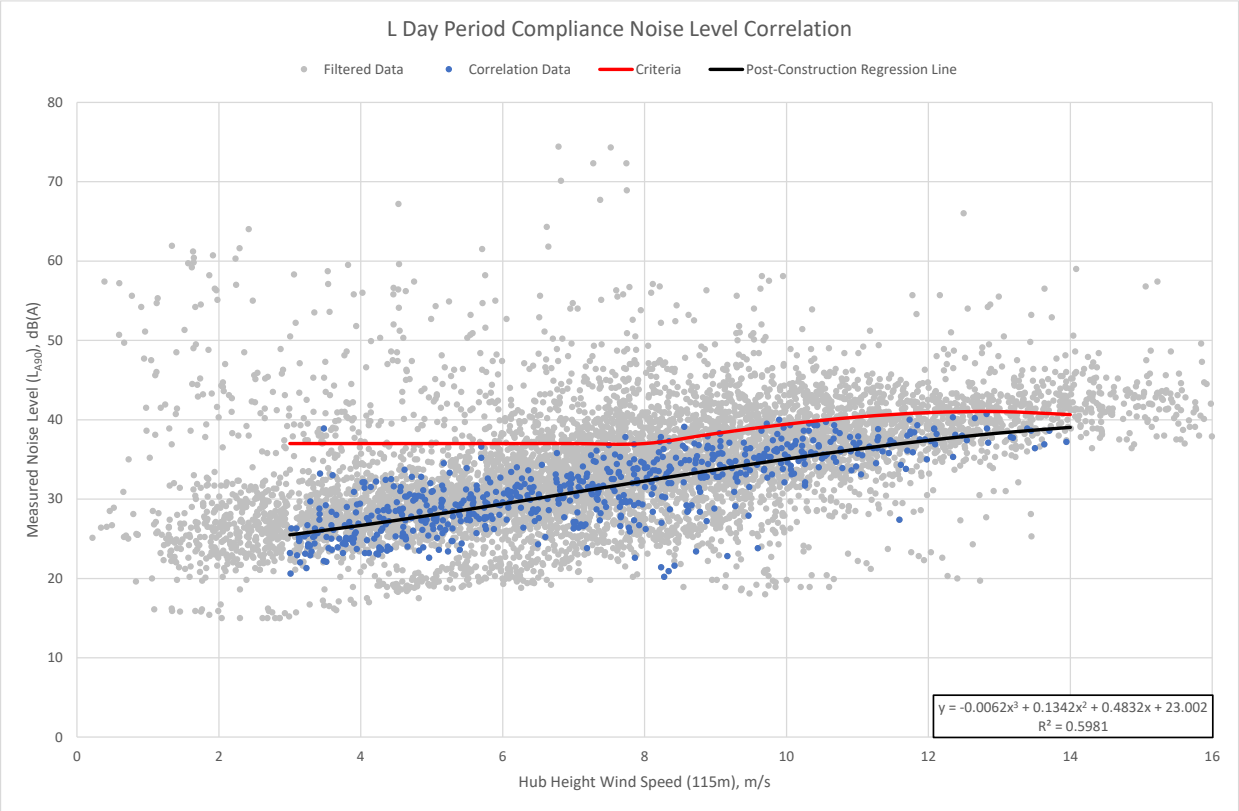

Figure 22: Residence L Day Period Noise Level Correlations

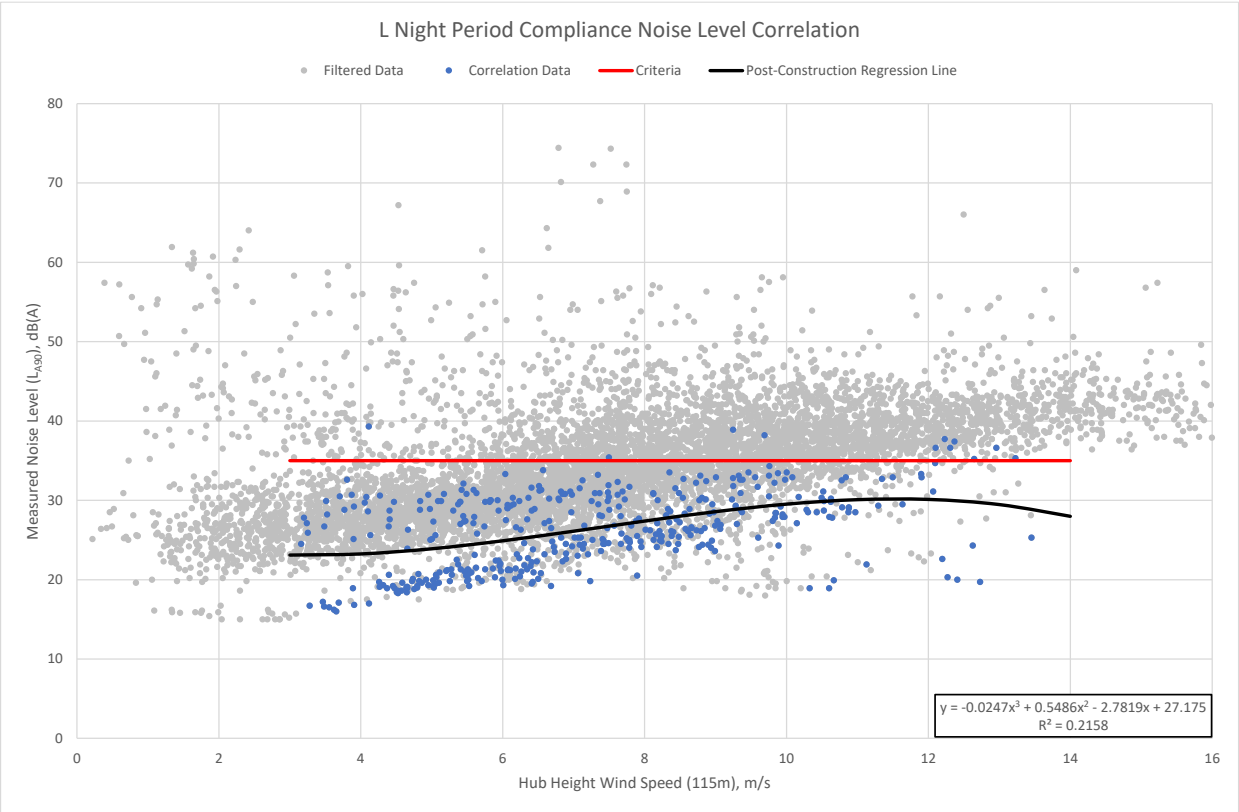

Figure 23: Residence L Night Period Noise Level Correlations

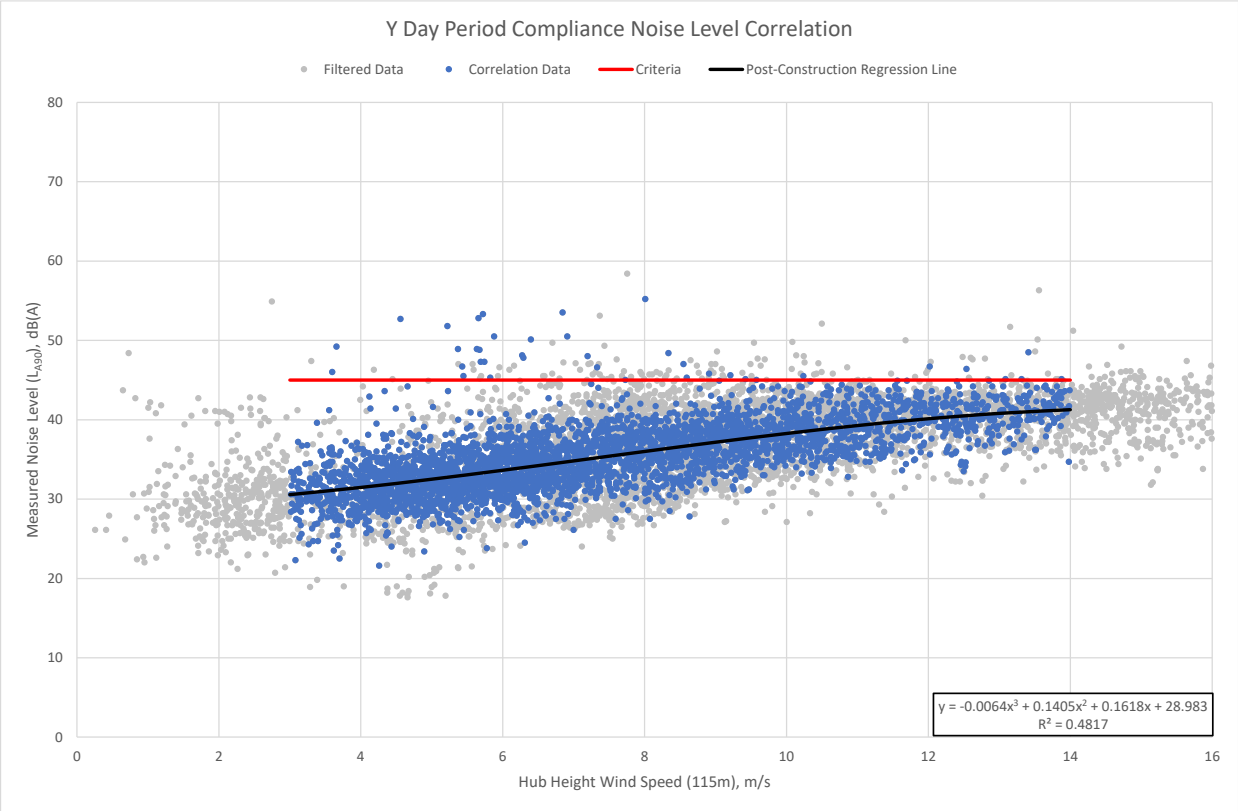

Figure 24: Residence Y Day Period Noise Level Correlations

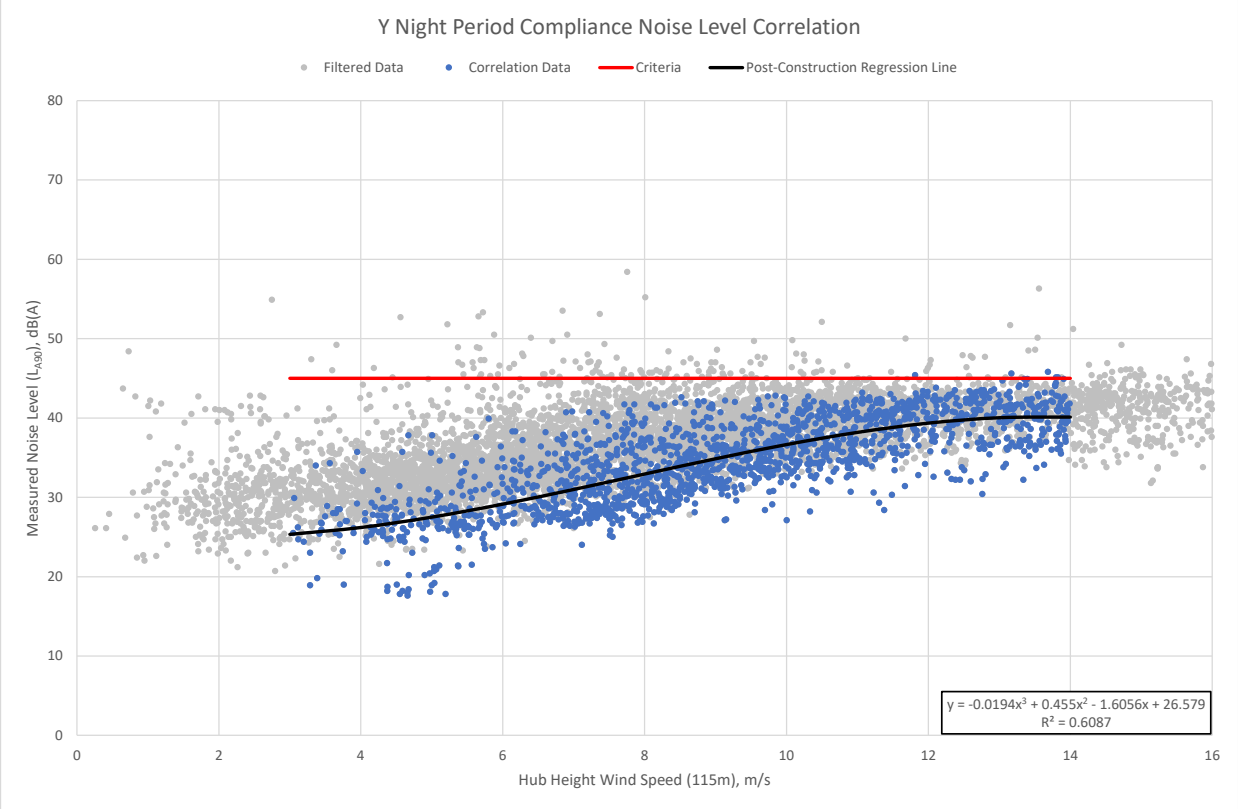

Figure 25: Residence Y Night Period Noise Level Correlations