

Appendix 10.3 - Baseline Data Charts

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Appendix 10.3 Baseline data charts

Chart 10.1 – Wind Rose

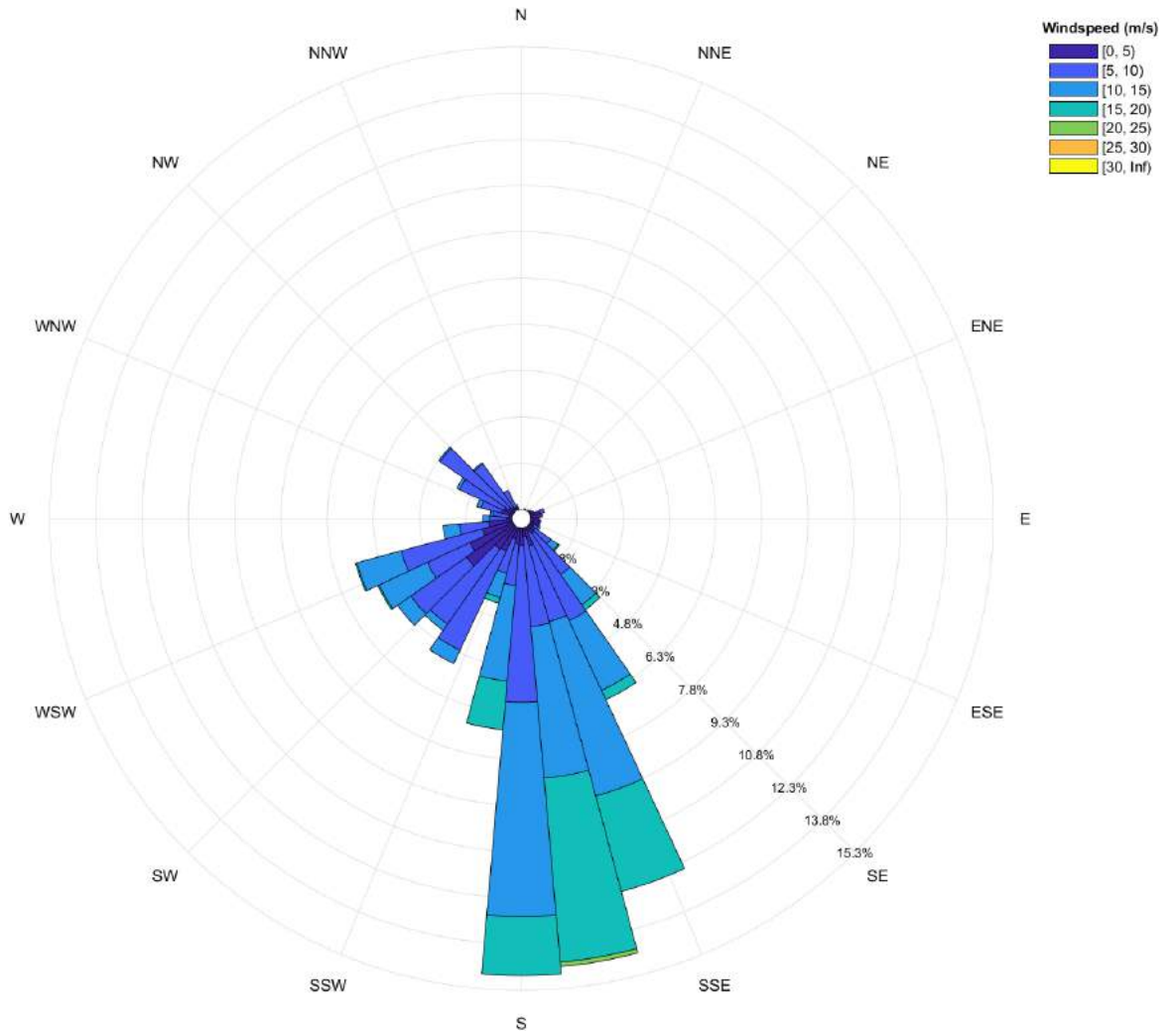




Chart 10.2 – NMP1 Time History

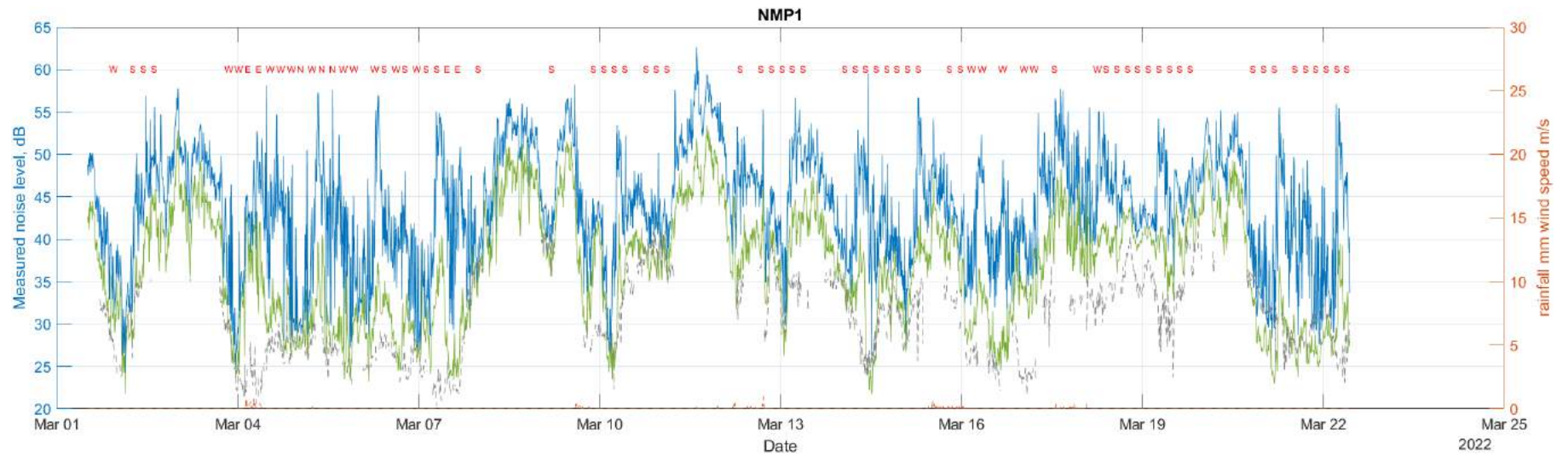


Chart 10.3 – NMP2 Time History

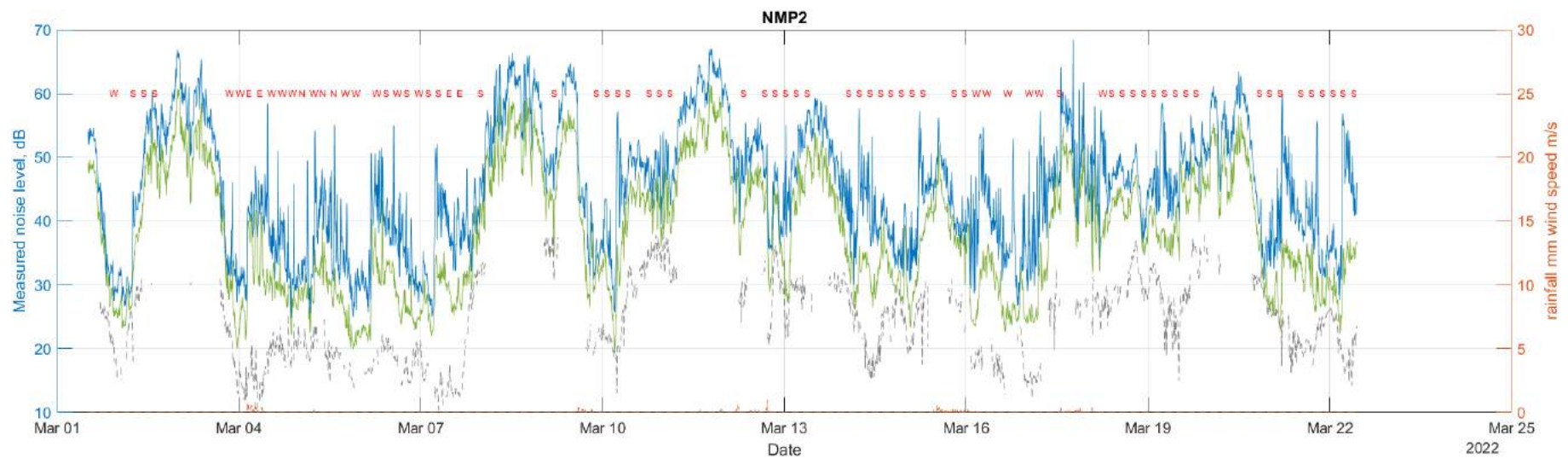


Chart 10.5 – NMP1 Daytime Regression Analysis

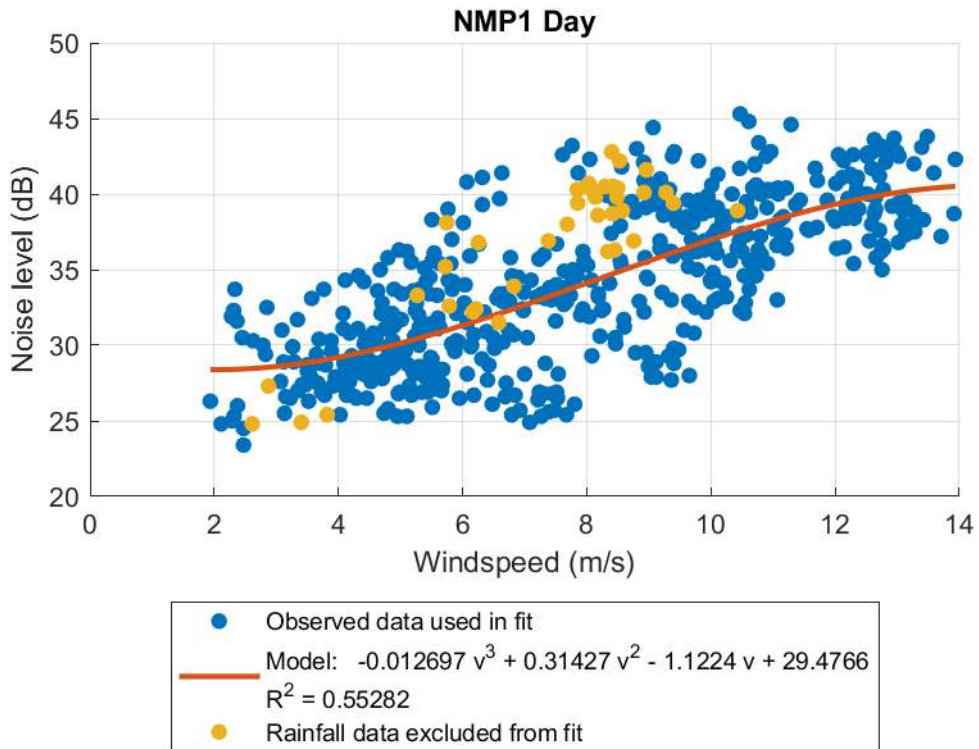
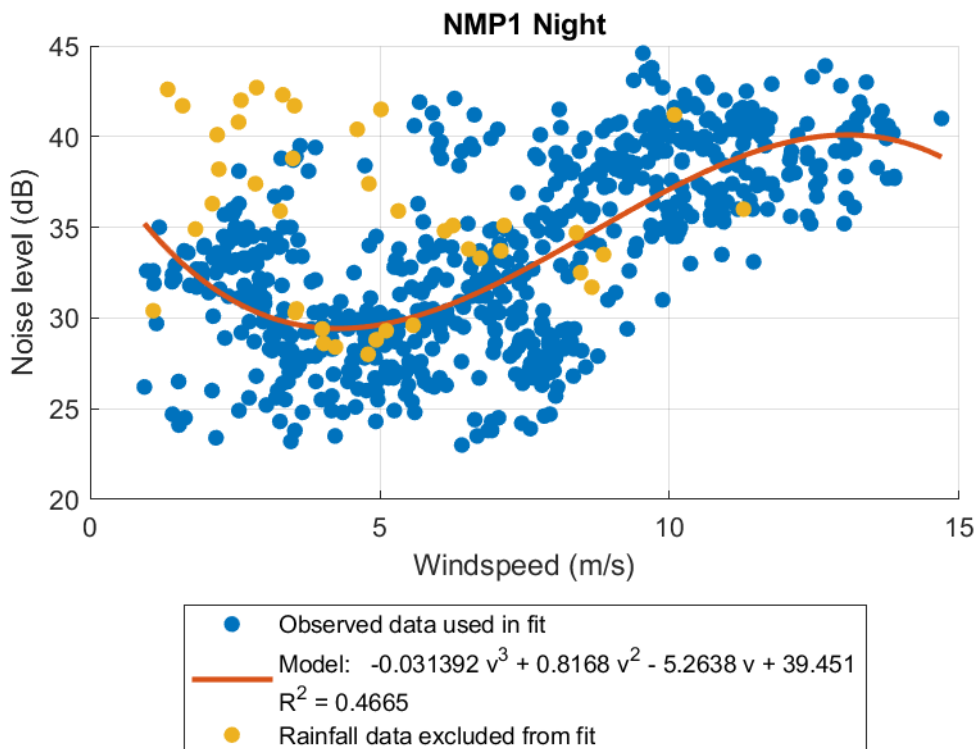


Chart 10.6 – NMP1 Night-time Regression Analysis



Derivation of representative background and ONLs – NMP1

Solution:

Subtract predicted level from Newhouse turbine from measured data (all wind directions) - noting that limited datapoints under upwind conditions make this approach not overly-robust.

More distant turbines at Mucklhouse/Hundland and Ludenhill will have a negligible contribution at this NMP due to distance and screening by the building.

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background including Newhouse turbine, dBLA90	29.2	30.1	31.3	32.7	34.1	35.6	37.0	38.3	39.3
Night-time background including Newhouse turbine, dBLA90	29.5	29.6	30.5	31.9	33.5	35.4	37.1	38.6	39.7

Predicted levels at NMP1 @ height of 1.5m including screening by buildings - Newhouse turbine only.

Receiver				Wind Speed								
Name	ID	X	Y	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s
				Day LA90 (dB)								
NMP1	NMP1	329425	1027824	14.7	16.8	18.9	21	23.1	25.2	27.3	29.4	31.5

Comparison of predicted level due to Newhouse turbine and measured background level

Wind Speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background level, dBLA90	29.2	30.1	31.3	32.7	34.1	35.6	37.0	38.3	39.3
Difference c/w turbine predicted level	14.5	13.3	12.4	11.7	11.0	10.4	9.7	8.9	7.8
Night-time background level, dBLA90	29.5	29.6	30.5	31.9	33.5	35.4	37.1	38.6	39.7
Difference c/w turbine predicted level	14.8	12.8	11.6	10.9	10.4	10.2	9.8	9.2	8.2

Predictions are within 10 dB of measured data at higher wind speeds, therefore need to be subtracted from measured baseline Background level determined by subtraction of predicted level from Newhouse turbine from measured background levels (all wind directions).

Overall Noise Limits derived from corrected background levels

Wind speed m/s	4	5	6	7	8	9	10	11	12
Derived daytime background level, dBL _{A90}	29.0	29.9	31.1	32.4	33.8	35.2	36.5	37.7	38.5
Derived night-time background level, dBL _{A90}	29.3	29.4	30.2	31.5	33.1	34.9	36.6	38.0	38.9
Daytime non-FI limit, dBL _{A90,10min}	35.0	35.0	36.1	37.4	38.8	40.2	41.5	42.7	43.5
Daytime FI limit, dBL _{A90,10min}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Night-time non-FI limit, dBL _{A90,10min}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9
Night-time FI limit, dBL _{A90,10min}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Chart 10.7 – NMP2 Daytime Regression Analysis

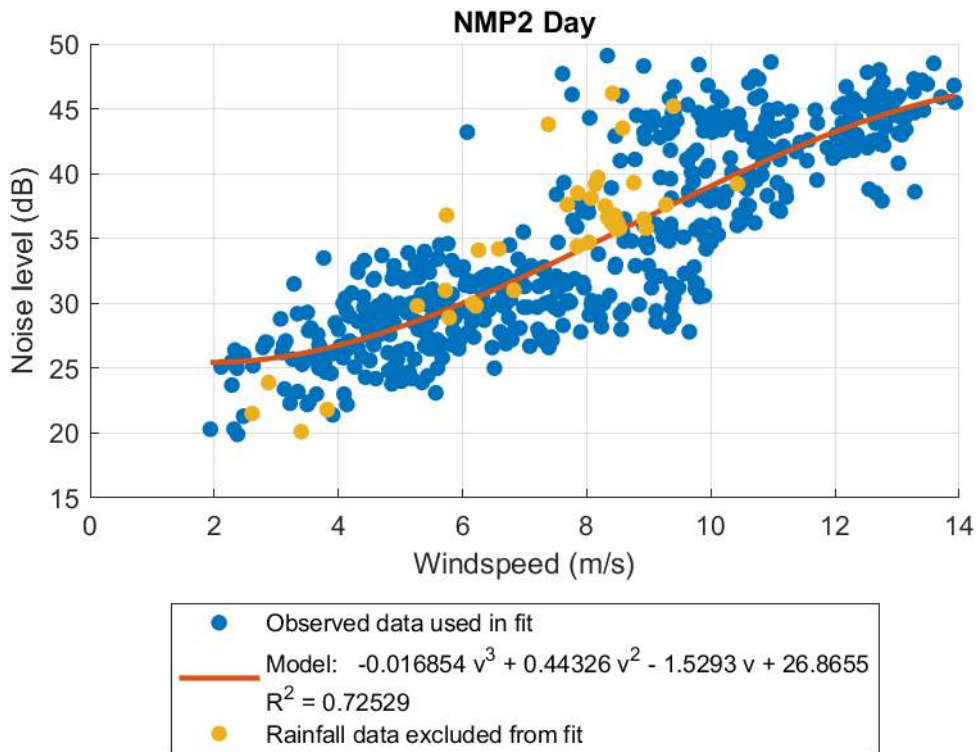
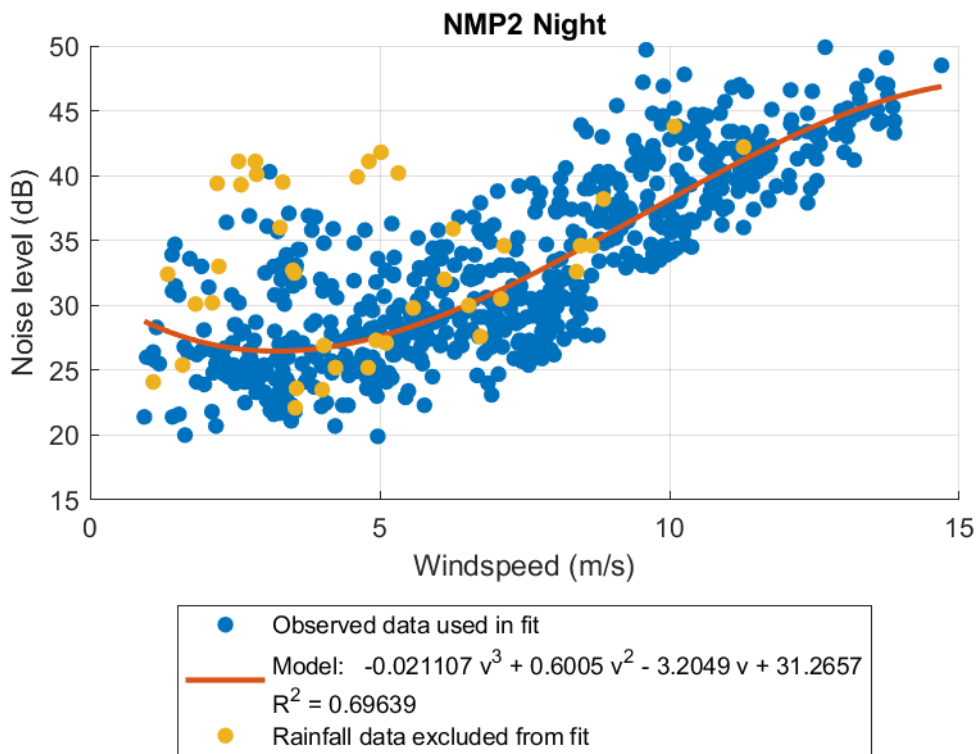


Chart 10.8 – NMP2 Night-time Regression Analysis



Derivation of representative background and ONLs – NMP2

Predicted levels at NMP2 height of 1.5m including screening by buildings - Evance 9000 turbines only.

Receiver				Wind Speed								
Name	ID	X	Y	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s
				Day LA90 (dB)								
NMP2	NMP2	330092	1026550	13.7	15.8	17.9	20	22.1	24.2	26.3	28.4	30.5

Comparison of predicted noise level from Ludenhill turbine and measured background level

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background level, dBLA90	26.8	28.2	30.0	32.1	34.4	36.7	39.0	41.2	43.2
Difference c/w turbine predicted level	13.1	12.4	12.1	12.1	12.3	12.5	12.7	12.8	12.7
Night-time background level, dBLA90	26.7	27.6	29.1	31.0	33.3	35.7	38.2	40.6	42.8
Difference c/w turbine predicted level	13.0	11.8	11.2	11.0	11.2	11.5	11.9	12.2	12.3

Predicted level due to Evance 9000 turbines >10 dB below measured background levels. No correction required.

Predicted levels at NMP2 height of 1.5m including screening by buildings - Ludenhill turbine

Receiver				Wind Speed								
Name	ID	X	Y	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s
				Day LA90 (dB)								
NMP2	NMP2	330092	1026550	21.0	21.0	21.1	20.7	21.4	22.1	22.7	22.7	22.7

Comparison of predicted level due to Newhouse turbine and measured background level

Wind Speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background level, dBLA90	26.8	28.2	30.0	32.1	34.4	36.7	39.0	41.2	43.2
Difference c/w turbine predicted level	5.8	7.2	8.9	11.4	13.0	14.6	16.3	18.5	20.5
Night-time background level, dBLA90	26.7	27.6	29.1	31.0	33.3	35.7	38.2	40.6	42.8
Difference c/w turbine predicted level	5.7	6.6	8.0	10.3	11.9	13.6	15.5	17.9	20.1

Predictions exceed measured data at lower wind speeds, likely due to conservative prediction method (no SWL data for 4m/s therefore 5m/s SWL used).

Measured background levels at NMP2 higher when upwind of turbine than when downwind, likely due to influence of noise from waves on the loch and screening of the wind at the monitoring location when down-wind of the turbine.

Background level determined by subtraction of predicted level from Ludenhill turbine from measured background levels (all wind directions).

Overall Noise Limits derived from corrected background levels

Wind speed m/s	4	5	6	7	8	9	10	11	12
Derived daytime background level, dBL _c	25.4	27.3	29.4	31.8	34.1	36.6	38.9	41.2	43.2
Derived night-time background level, dBL _n	25.3	26.5	28.3	30.6	33.0	35.5	38.0	40.5	42.8
Daytime non-FI limit, dBL _{A90,10min}	35.0	35.0	35.0	36.8	39.1	41.6	43.9	46.2	48.2
Daytime FI limit, dBL _{A90,10min}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.2	48.2
Night-time non-FI limit, dBL _{A90,10min}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.5	47.8
Night-time FI limit, dBL _{A90,10min}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.5	47.8

Chart 10.9 – NMP3 Daytime Regression Analysis

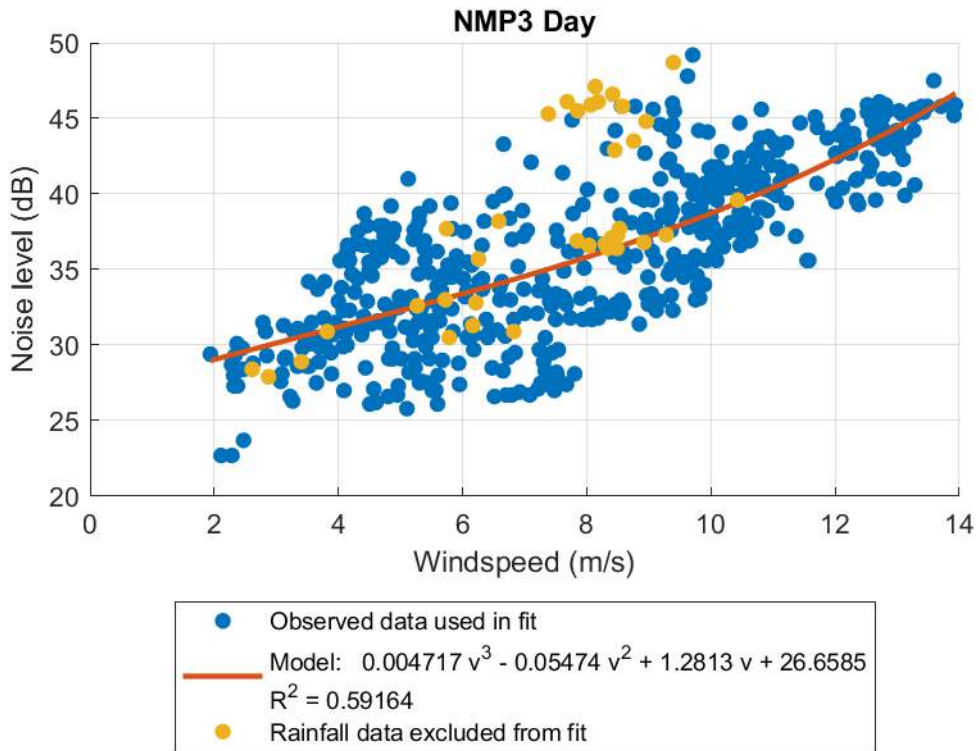
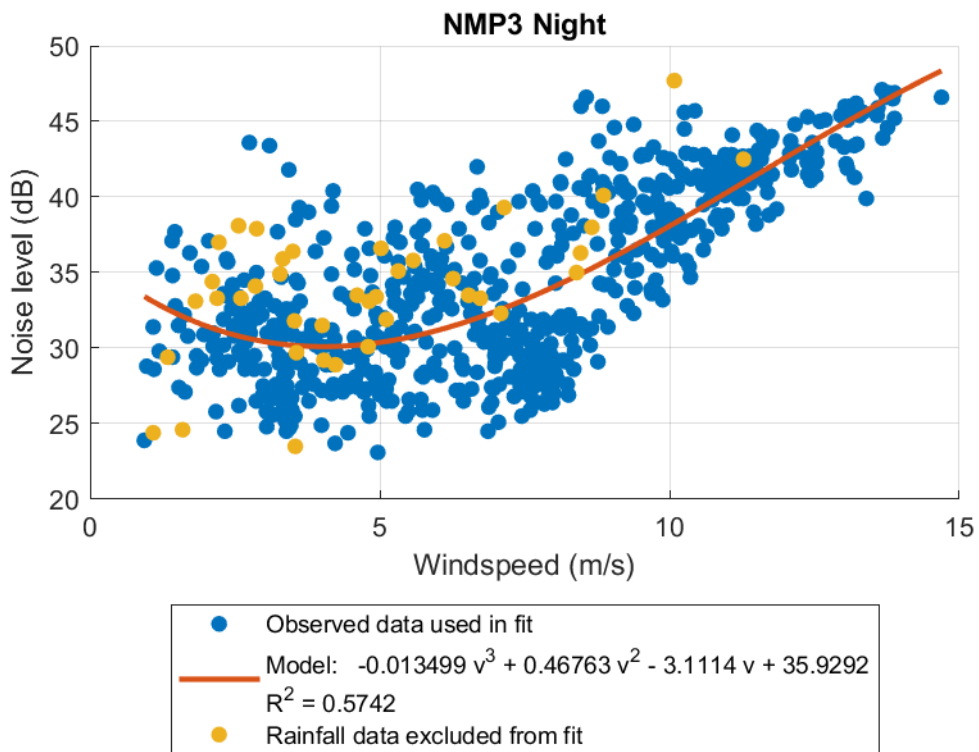


Chart 10.10 – NMP3 Night-time Regression Analysis



Derivation of representative background and ONLs – NMP3

Example background defined by data collected when NMP2 was upwind of Ludenhill turbine (and proposed development) minus predicted levels from Bugar Hill Wind farm, if significant (within 10 dB of measured levels)

Highly conservative predicted noise levels from Bugar Hill at NMP3 at 4m above ground

Receiver Name	ID	X	Y	Wind Speed								
				4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s
Southend	NMP3	331928	1027270	20.5	24.0	27.0	28.5	28.5	28.5	28.5	27.8	28.5

Comparison of predicted noise level from Bugar Hill turbines and measured background level

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background level, dBLA90	31.5	32.3	33.3	34.5	35.8	37.2	38.8	40.5	42.4
Difference c/w turbine predicted level	11.0	8.3	6.3	6.0	7.3	8.7	10.3	12.7	13.9
Night-time background level, dBLA90	30.5	30.6	31.2	32.1	33.5	35.2	37.2	39.6	42.2
Difference c/w turbine predicted level	10.0	6.6	4.2	3.6	5.0	6.7	8.7	11.8	13.7

Predictions less than 10 dB below measured levels at 5 - 10m/s wind speeds, therefore potential contribution from Bugar Hill to measured levels

Example derivation of noise limits from background defined by measured levels when NMP3 upwind of Ludenhill turbine, minus highly conservative prediction for Bugar Hill WF:

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Derived daytime background level	31.1	31.6	32.2	33.2	34.9	36.6	38.4	40.3	42.2
Derived night-time background level	30.1	29.6	29.1	29.6	31.8	34.1	36.6	39.3	42.1
Daytime non-FI limit	36.1	36.6	37.2	38.2	39.9	41.6	43.4	45.3	47.2
Daytime FI limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.3	47.2
Night-time non-FI limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.3	47.1
Night-time FI limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.1

Chart 10.11 – NMP3 Daytime Regression Analysis – Down-wind of Ludenhill turbine

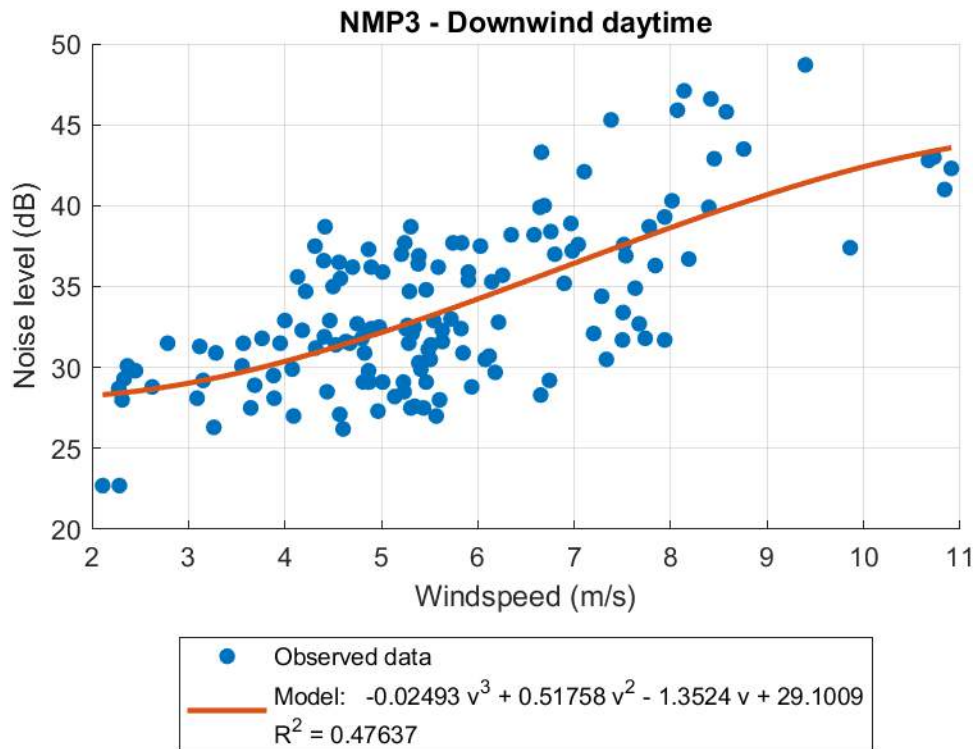
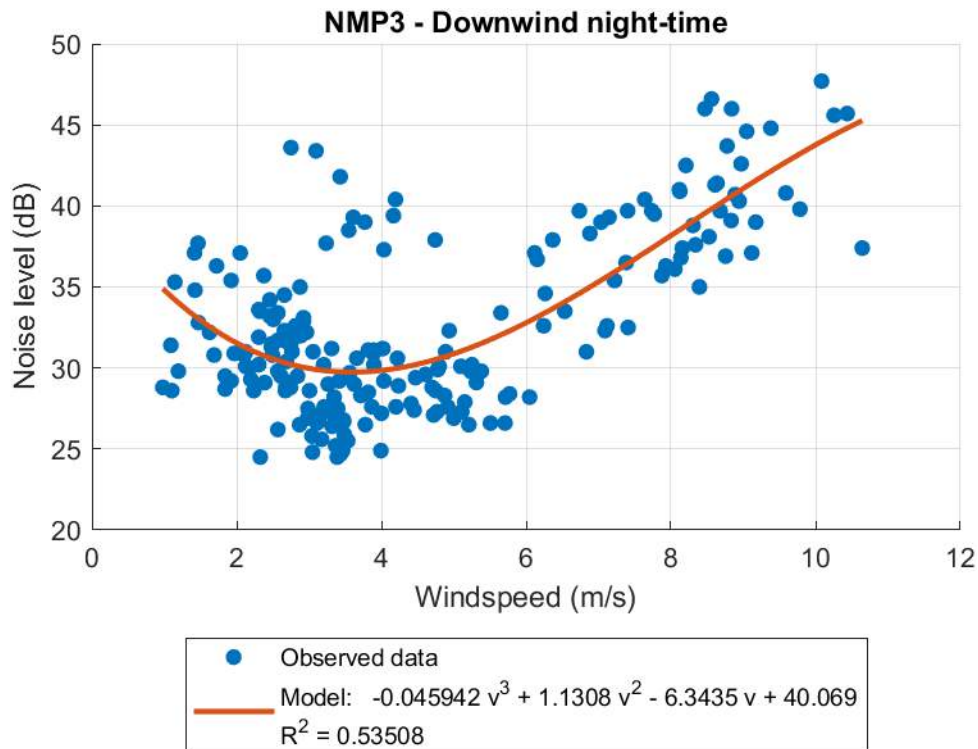


Chart 10.12 – NMP3 Night-time Regression Analysis – Down-wind of Ludenhill turbine



Predicted noise levels from Ludenhill turbine at NMP3 at 4m above ground

Receiver				Wind Speed								
				4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s
Name	ID	X	Y	Day LA90 (dB)								
Southend	NMP3	331928	1027270	23.6	23.6	23.7	23	23.7	24.4	25	25	25

Comparison of predicted noise level from Ludenhill turbine and measured background level

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Daytime background level, dBLA90	30.4	32.2	34.2	36.4	38.6	40.7	42.4	43.7	44.3
Difference c/w turbine predicted level	6.8	8.6	10.5	13.4	14.9	16.3	17.4	18.7	19.3
Night-time background level, dBLA90	29.8	30.9	32.8	35.3	38.2	41.1	43.8	46.0	47.4
Difference c/w turbine predicted level	6.2	7.3	9.1	12.3	14.5	16.7	18.8	21.0	22.4

Predicted levels from Ludenhill turbine at lower wind speeds are within 10 dB of measured background, therefore potential contribution from Bugar Hill to measured levels

Derivation of noise limits from background defined by measured levels when NMP3 down-wind of Ludenhill turbine, minus predicted level for Ludenhill turbine

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Derived daytime background level	29.4	31.5	33.8	36.2	38.5	40.6	42.3	43.6	44.3
Derived night-time background level	28.7	30.0	32.2	35.1	38.0	41.0	43.7	45.9	47.4
Daytime non-FI limit	35.0	36.5	38.8	41.2	43.5	45.6	47.3	48.6	49.3
Daytime FI limit	45.0	45.0	45.0	45.0	45.0	45.6	47.3	48.6	49.3
Night-time non-FI limit	43.0	43.0	43.0	43.0	43.0	46.0	48.7	50.9	52.4
Night-time FI limit	45.0	45.0	45.0	45.0	45.0	46.0	48.7	50.9	52.4

Comparison of derived limits using corrected background data when up-wind / down-wind of Ludenhill turbine

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Non-FI daytime from background data when up-wind of Ludenhill:	36.1	36.6	37.2	38.2	39.9	41.6	43.4	45.3	47.2
Non-FI daytime from background data when down-wind of Ludenhill:	35.0	36.5	38.8	41.2	43.5	45.6	47.3	48.6	49.3
difference (down-wind minus up-wind)	-1.1	-0.1	1.7	3.0	3.6	4.0	3.9	3.3	2.1
Non-FI night-time from background data when up-wind of Ludenhill:	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.3	47.1
Non-FI night-time from background data when down-wind of Ludenhill:	43.0	43.0	43.0	43.0	43.0	46.0	48.7	50.9	52.4
difference (down-wind minus up-wind)	0.0	0.0	0.0	0.0	0.0	3.0	5.7	6.6	5.3

Difference expected to be because predictions from Bugar Hill are over-conservative and because of noise from the loch (dominant noise source at NMP3).

Noise limits adopted from measured background when down-wind of Ludenhill, minus predicted level from Ludenhill turbine

Rationale:

Loch of Swannay is the dominant noise source at the monitoring location, and these locations will be down-wind of the loch when they are down-wind of the proposed Nisthill development.

Some uncertainty over contribution of Bugar Hill turbines - sound power data not held on file

Adopted overall noise limits derived from NMP3 data:

Wind speed, m/s	4	5	6	7	8	9	10	11	12
Daytime non-FI limit	35.0	36.5	38.8	41.2	43.5	45.6	47.3	48.6	49.3
Daytime FI limit	45.0	45.0	45.0	45.0	45.0	45.6	47.3	48.6	49.3
Night-time non-FI limit	43.0	43.0	43.0	43.0	43.0	46.0	48.7	50.9	52.4
Night-time FI limit	45.0	45.0	45.0	45.0	45.0	46.0	48.7	50.9	52.4