



Spiorad na Mara Offshore Wind Farm

Offshore Project

Environmental Impact Assessment Report

Appendix 19.7: Baseline Noise Conditions - Directional Split, Volume 2c

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1 INTRODUCTION

1.1 OVERVIEW

1.1.1.1 This appendix of the Environmental Impact Assessment Report (EIAR) presents the results of directional analysis of the site baseline noise survey relevant to the assessment of offshore airborne noise of the proposed Spiorad na Mara Offshore Wind Farm (hereafter referred to as 'the Offshore Project'). This appendix accompanies **Chapter 19: Offshore Airborne Noise, Volume 2a** of the EIAR.

1.1.1.2 This appendix should be read in conjunction with the project description provided in **Chapter 3: Project Description, Volume 1a** and the relevant parts of the following chapters and appendices:

- **Chapter 19, Volume 2a;**
- **Appendix 19.1: Policy, Guidance and Legislative Context, Volume 2c;**
- **Appendix 19.2: Noise Modelling and Prediction, Volume 2c;**
- **Appendix 19.3: Baseline Noise Survey, Volume 2c;**
- **Appendix 19.4: Wind Shear Correction, Volume 2c;**
- **Appendix 19.5: Baseline Noise Conditions - All Wind Directions, Volume 2c;**
- **Appendix 19.6: Baseline Noise Analysis Comparison - Option 1 vs Option 2, Volume 2c;**
- **Appendix 19.8: Existing Wind Turbine Contribution Check, Volume 2c;**
- **Appendix 19.9: Modelled Receptor Noise Levels, Volume 2c;**
- **Appendix 19.10: Noise Limits, Volume 2c;**
- **Appendix 19.11: Cumulative Wind Turbine Noise Assessment, Volume 2c.**

1.1.2 PROJECT BACKGROUND

1.1.2.1 Spiorad na Mara Limited (hereafter referred to as 'the Applicant') is proposing to develop the Project. The Project is an offshore wind farm (OWF) that will consist of up to 60 fixed-bottom wind turbine generators (WTGs).

1.1.2.2 The Project will include both offshore and onshore infrastructure. This EIAR supports the application for the offshore components of the Project as outlined in **Chapter 1: Introduction, Volume 1a**. The offshore components of the Project (the Offshore Project) includes all infrastructure and activities located seaward of Mean High Water Springs (MHWS) within the Array Area and Offshore Cable Area of Search (OCAS) (**Figure 1.2: Offshore Project Location, Volume 1b**). Further detailed information is provided in **Chapter 3, Volume 1a**.

1.1.2.3 The Offshore Project is situated off the northwest coast of Isle of Lewis/*Eilean Leòdhais* and the Array Area is located approximately 5-13 km offshore and is approximately 161 km² in size. It will comprise WTGs, foundations, Offshore Cables, Offshore Substation Platform (OSP) (if required),

and Landfall. The Array Area combined with the OCAS is defined as the Offshore Project Boundary. The water depths across the Turbine Area range from 37 m-67 m with the southwest corner of the Array Area reaching 72 m. The proposed WTGs and fixed foundations will be located within a Turbine Area of approximately 140 km², within the Array Area.

1.2 PURPOSE OF THIS APPENDIX

- 1.2.1.1 Analysis of the noise survey and wind speed data has established that background noise levels are dependent on wind direction. Background noise levels tend to be higher under downwind conditions and lower under upwind conditions.
- 1.2.1.2 Downwind conditions refer to wind directions ranging from 238°-58°, originating from the sea. Upwind conditions refer to wind directions ranging from 58°-238°, originating from the land (i.e. directions wrapping through north).
- 1.2.1.3 Directional filtering has been applied to the baseline noise monitoring data to produce separate datasets for downwind and upwind conditions. With directional filtering applied, the background noise data points are more tightly grouped, indicating greater correlation. As a result, it is considered appropriate to apply directional filtering to background noise level data based on wind direction.
- 1.2.1.4 The relationship between the measured background noise levels and standardised 10 m wind speed, based on the Turbine Layout Option 2 (Option 2) hub height of 198.4 m have been established. Option 2 hub height background noise curves have been adopted as there is a minimal difference between Option 1 and Option 2 curves, see **Appendix 19.6, Volume 2c**.
- 1.2.1.5 This appendix describes the following:
- Analysis of the noise survey and wind speed data has established that background noise levels based on downwind and upwind conditions;
 - Separate analysis graphs are presented for downwind and upwind conditions, for each measurement location, and for quiet daytime and night-time periods;
 - Background noise curves (polynomial lines of best fit) are calculated for each measurement location, and for quiet daytime and night-time periods;
 - The background noise curves are used to determine operational WTG site-specific noise limits based on wind direction.

2 DOWNWIND DATA ANALYSIS

2.1 MEASUREMENT LOCATION LT1

Plate 2-1 LT1 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

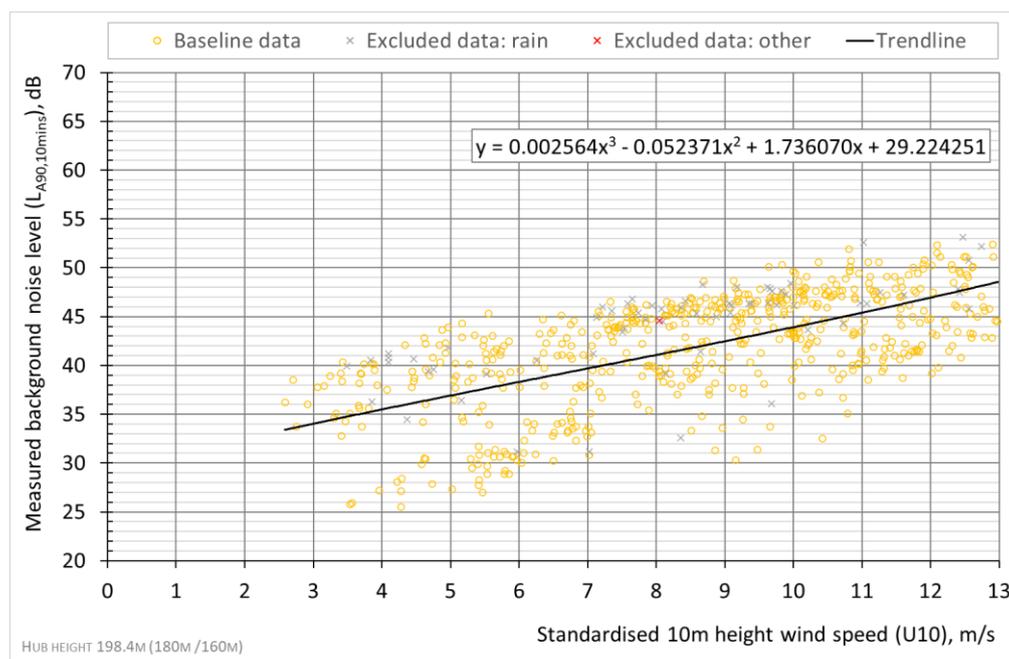
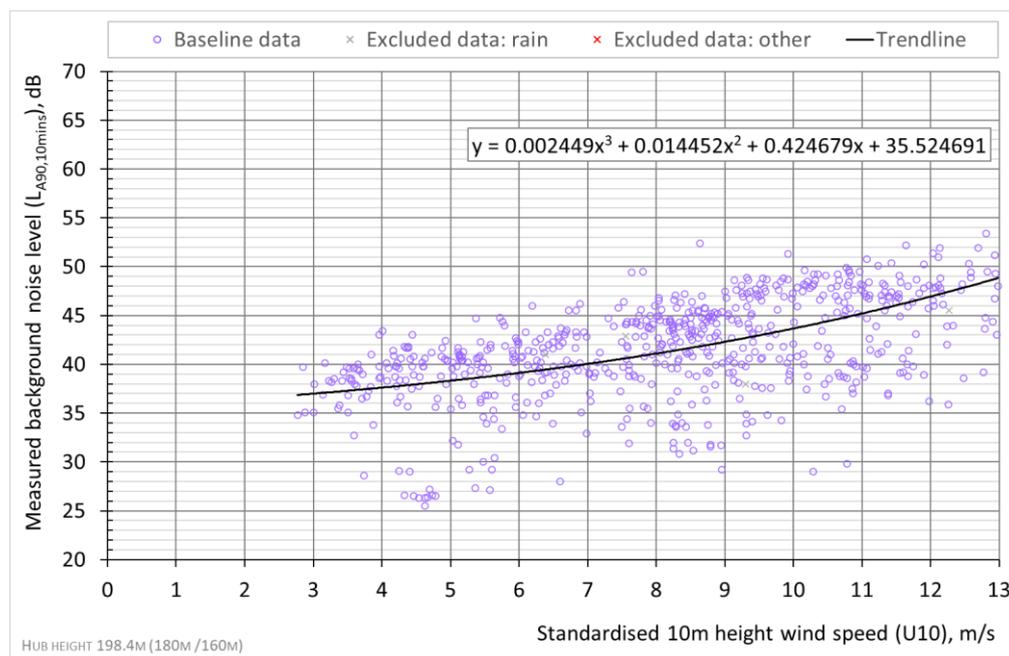


Plate 2-2 Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



2.2 MEASUREMENT LOCATION LT2

Plate 2-3 LT2 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

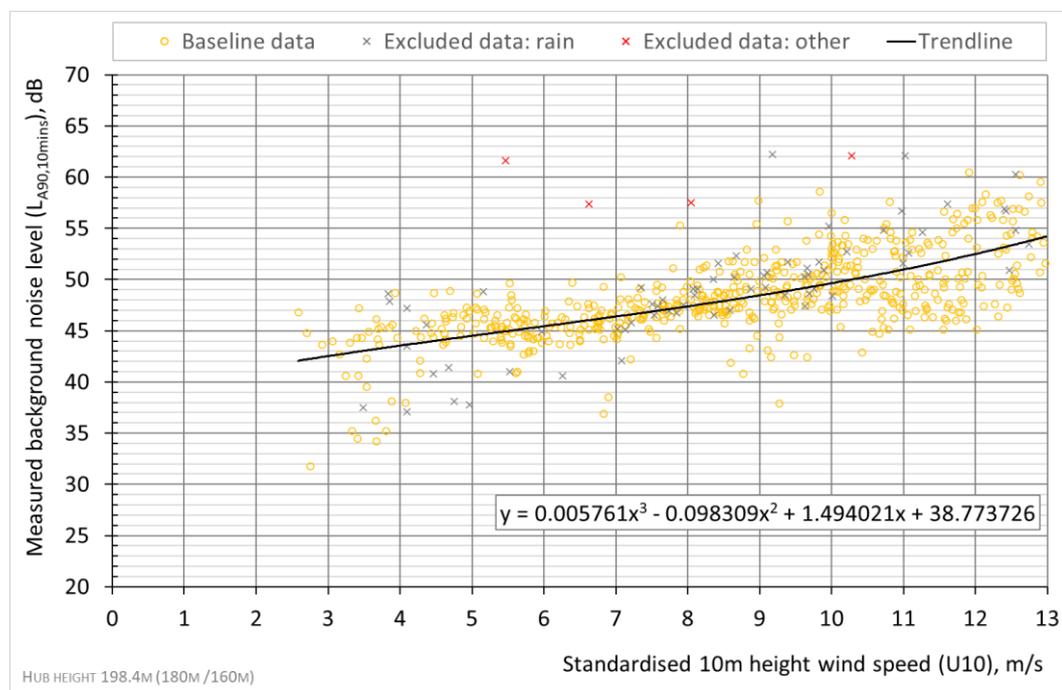
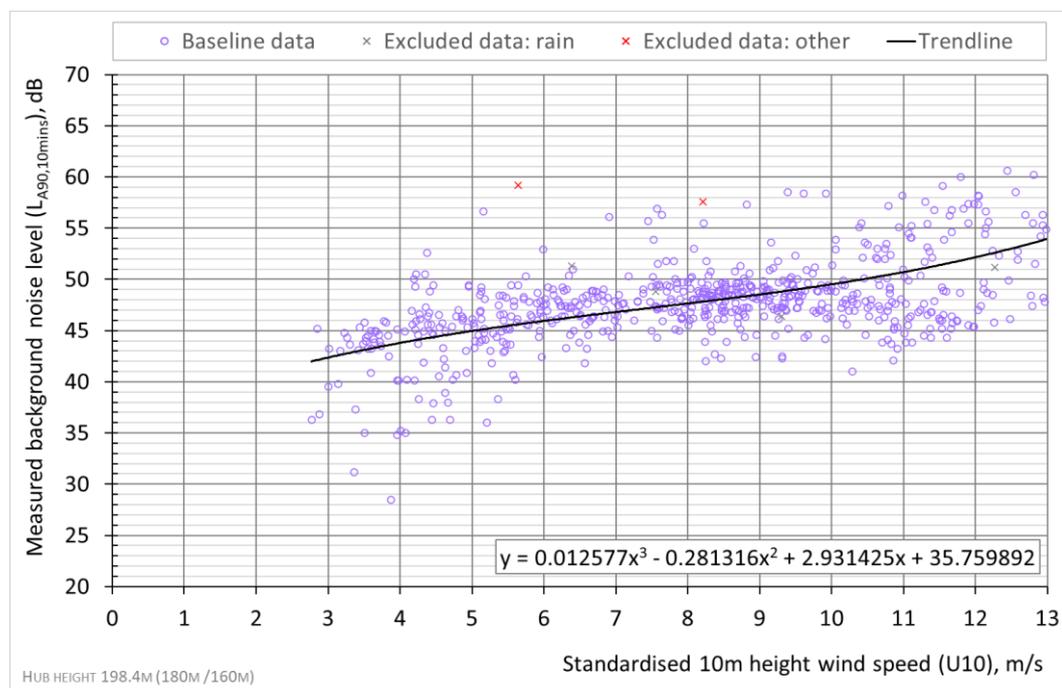


Plate 2-4 LT2 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



2.3 MEASUREMENT LOCATION LT3

Plate 2-5 LT3 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

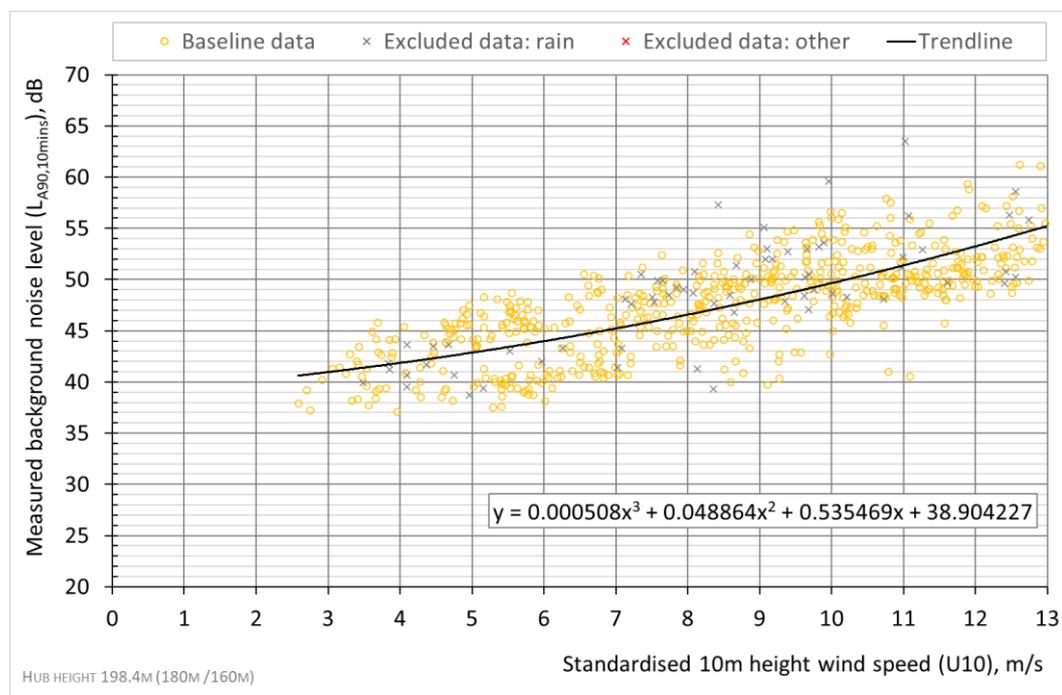
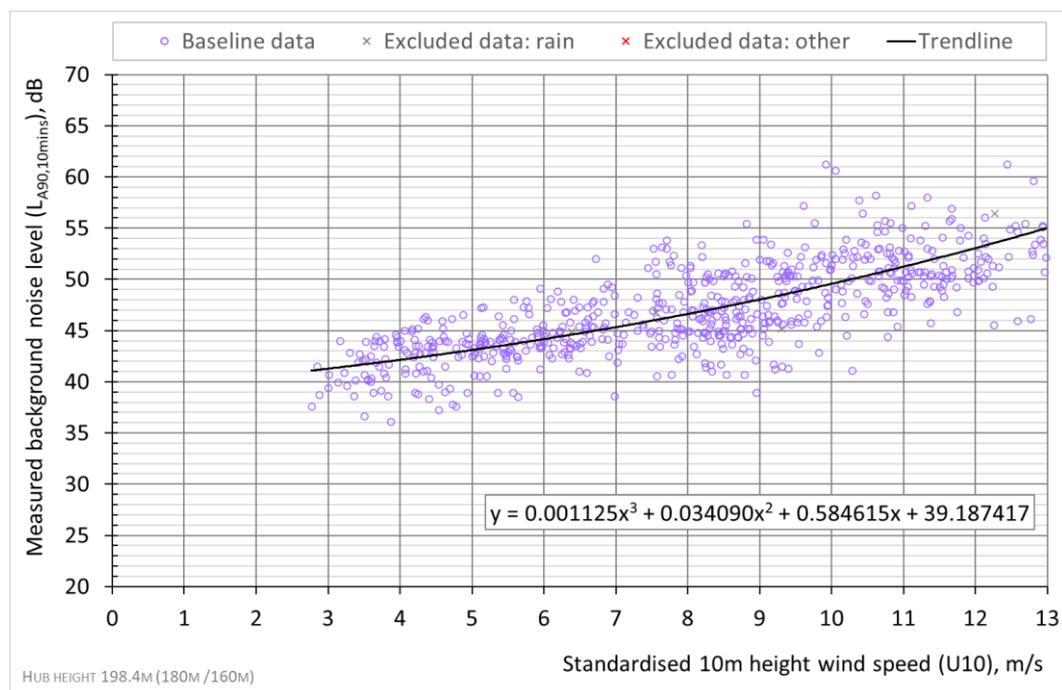


Plate 2-6 LT3 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



2.4 MEASUREMENT LOCATION LT4

Plate 2-7 LT4 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

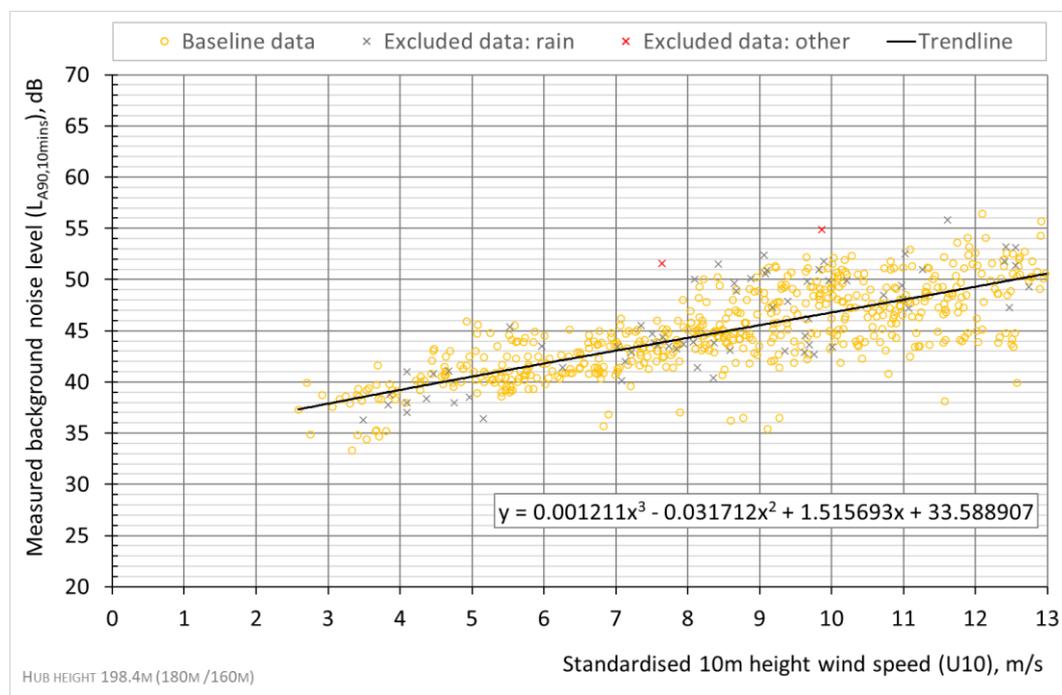
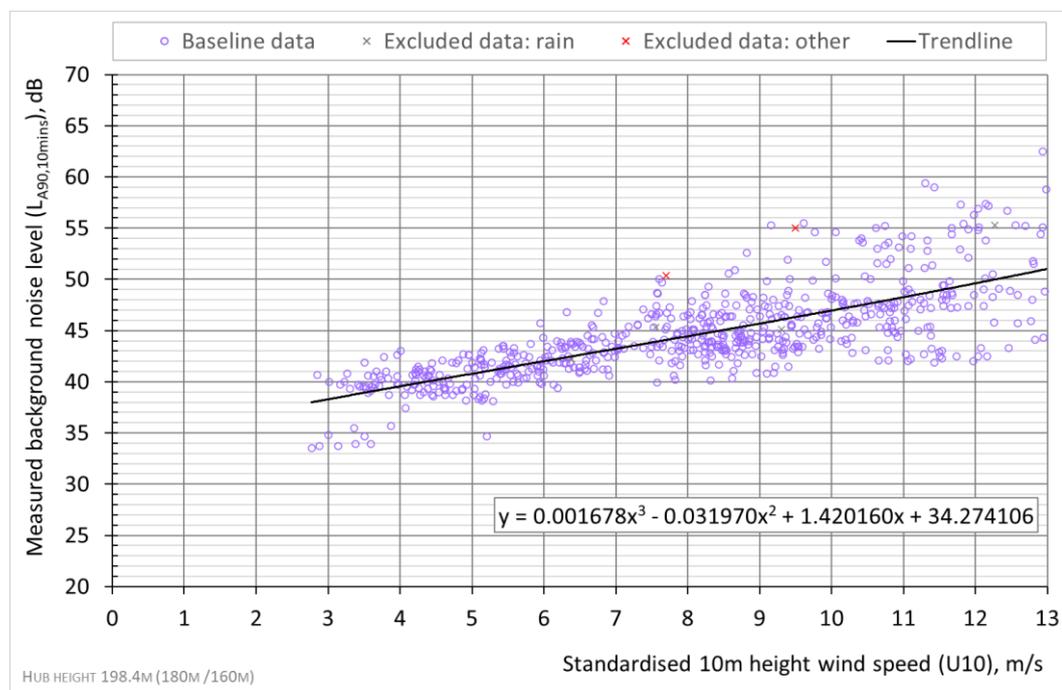


Plate 2-8 LT4 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

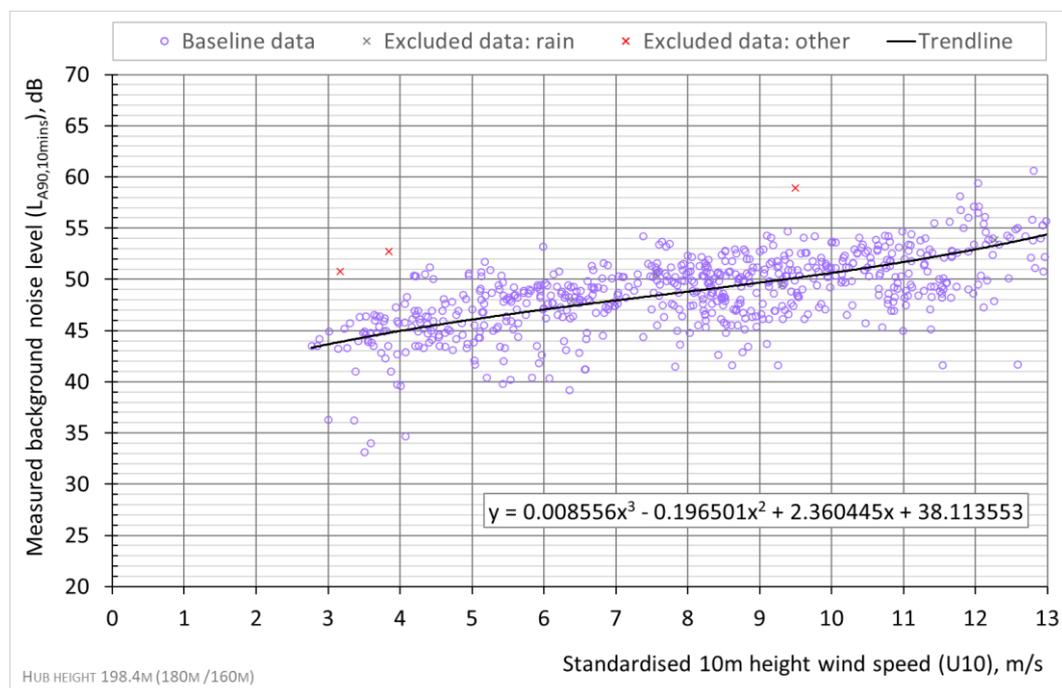


2.5 MEASUREMENT LOCATION LT5

Plate 2-9 LT5 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



Plate 2-10 LT5 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



2.6 MEASUREMENT LOCATION LT6

Plate 2-11 LT6 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

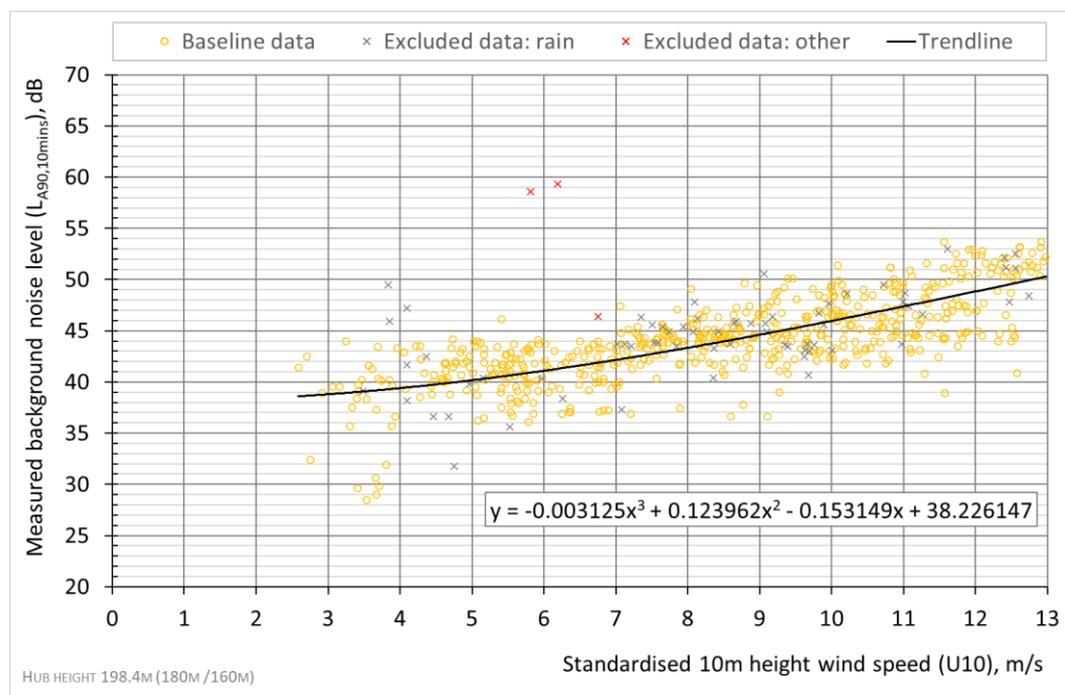
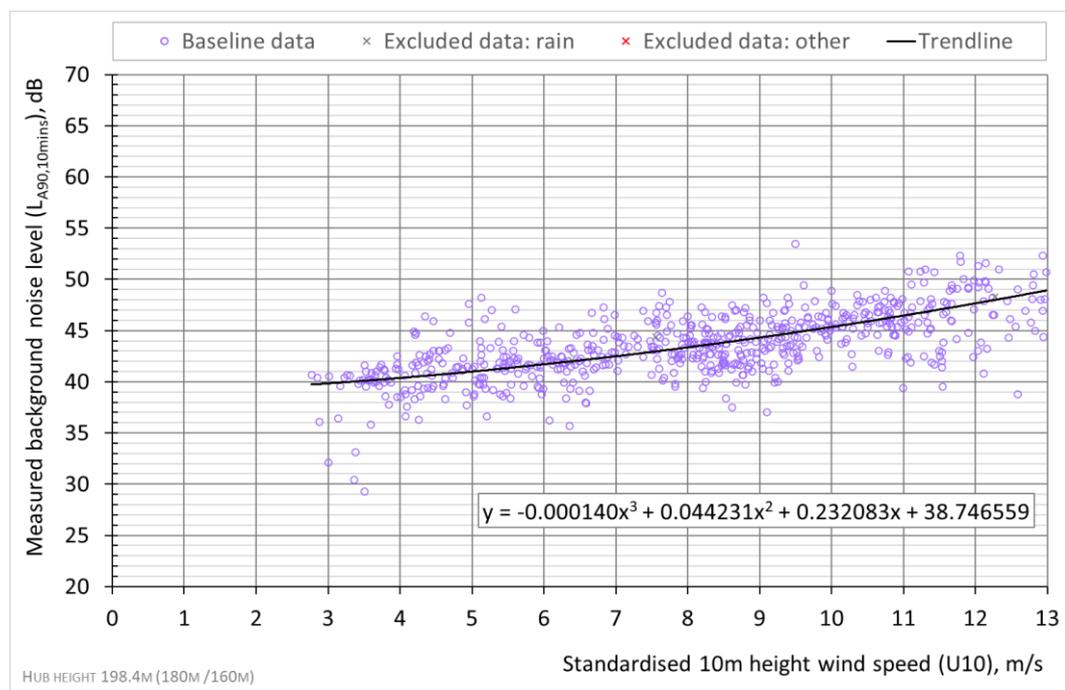


Plate 2-12 LT6 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Downwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3 UPWIND DATA ANALYSIS

3.1 MEASUREMENT LOCATION LT1

Plate 3-1 LT1 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

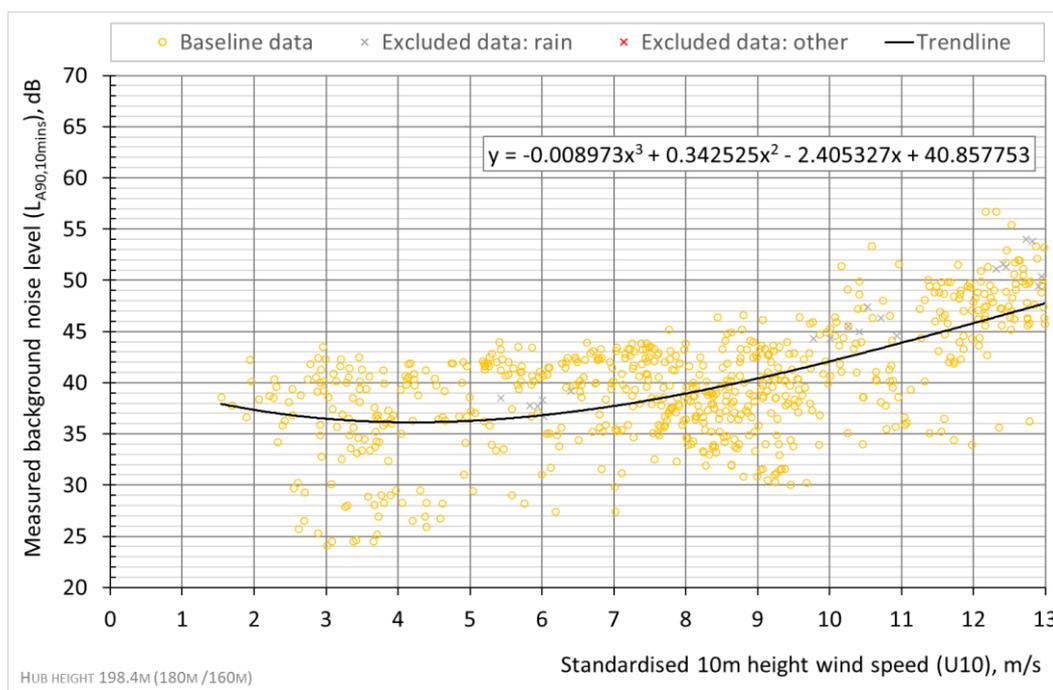
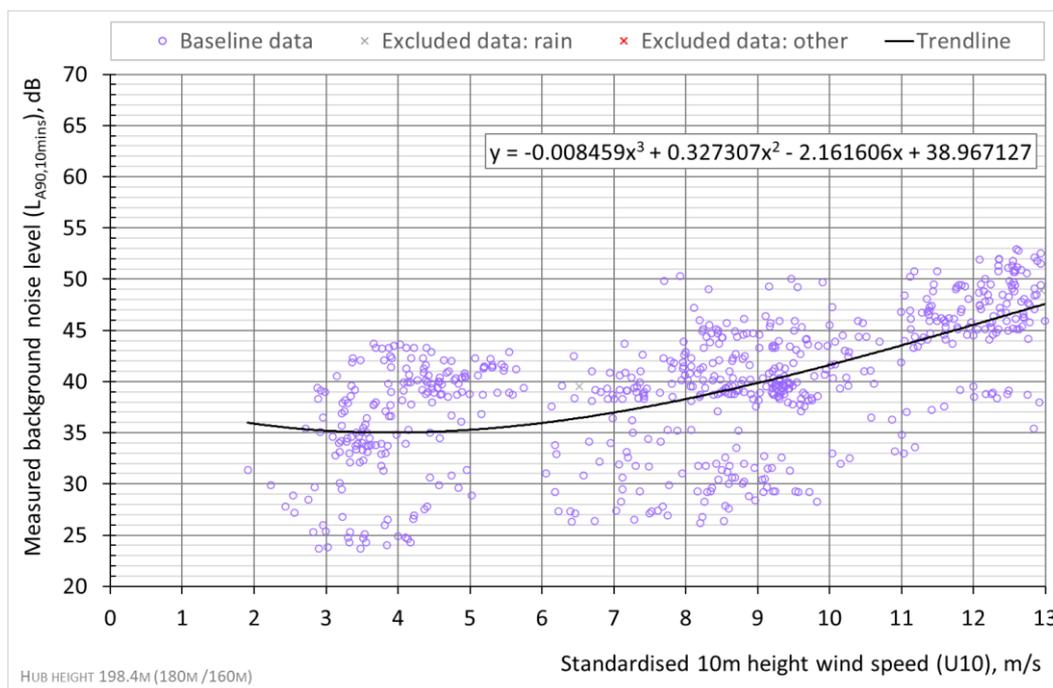


Plate 3-2 LT1 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3.2 MEASUREMENT LOCATION LT2

Plate 3-3 LT2 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

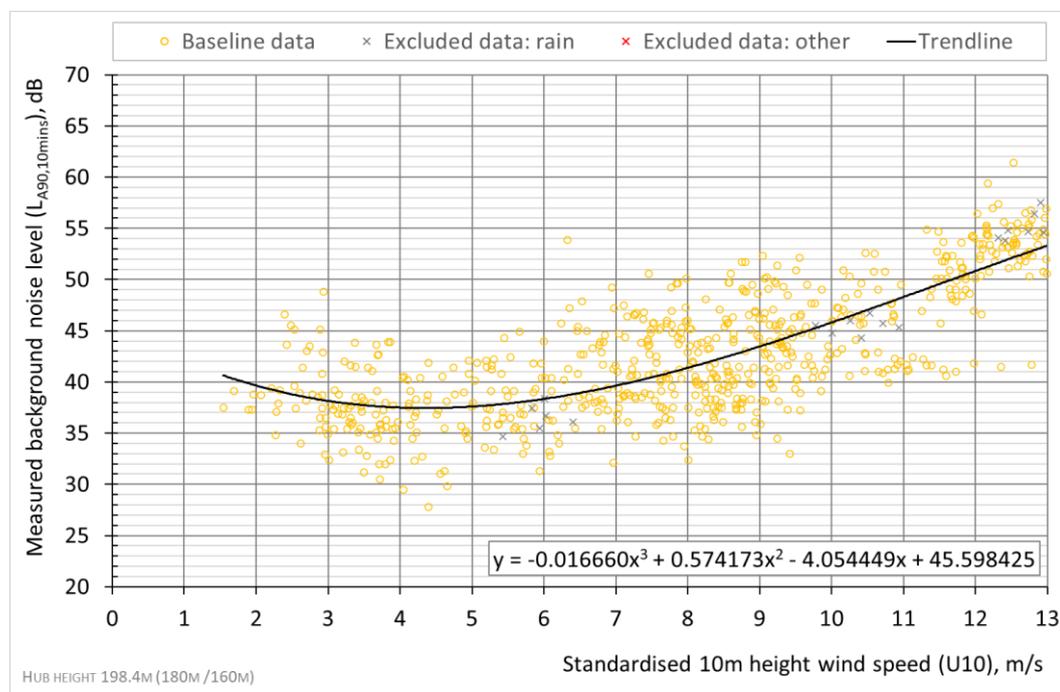
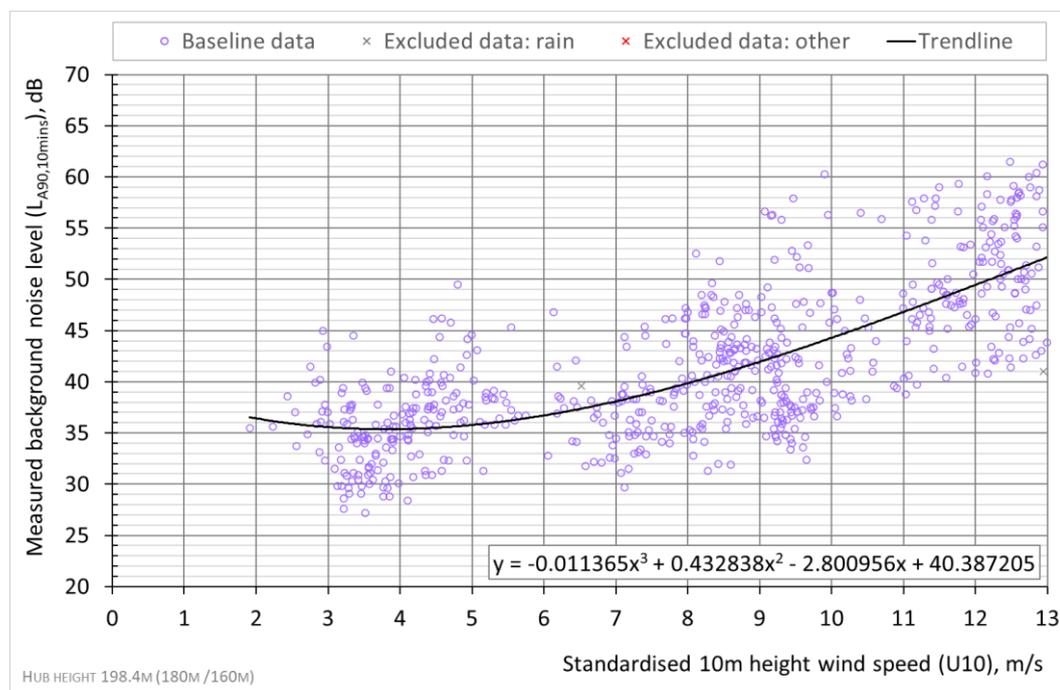


Plate 3-4 LT2 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3.3 MEASUREMENT LOCATION LT3

Plate 3-5 LT3 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

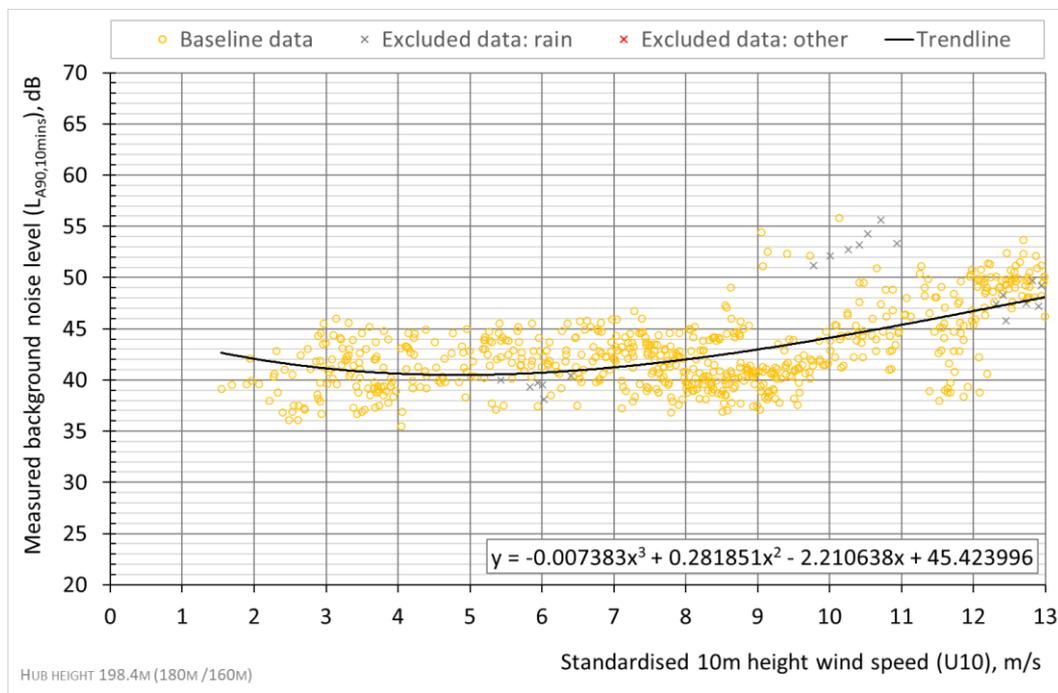
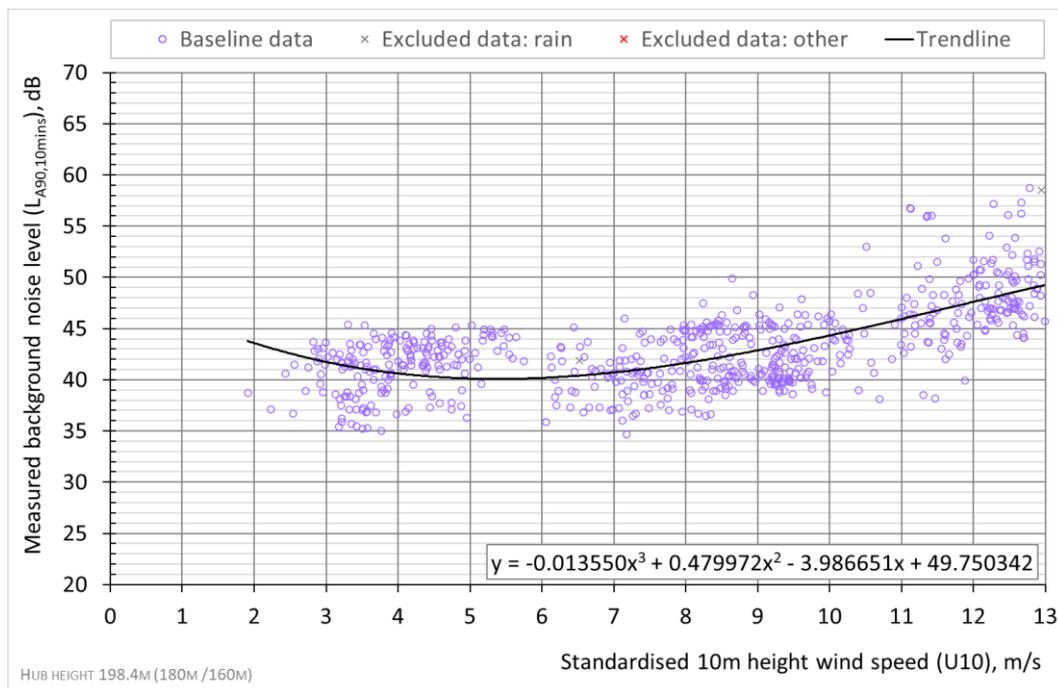


Plate 3-6 LT3 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3.4 MEASUREMENT LOCATION LT4

Plate 3-7 LT4 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

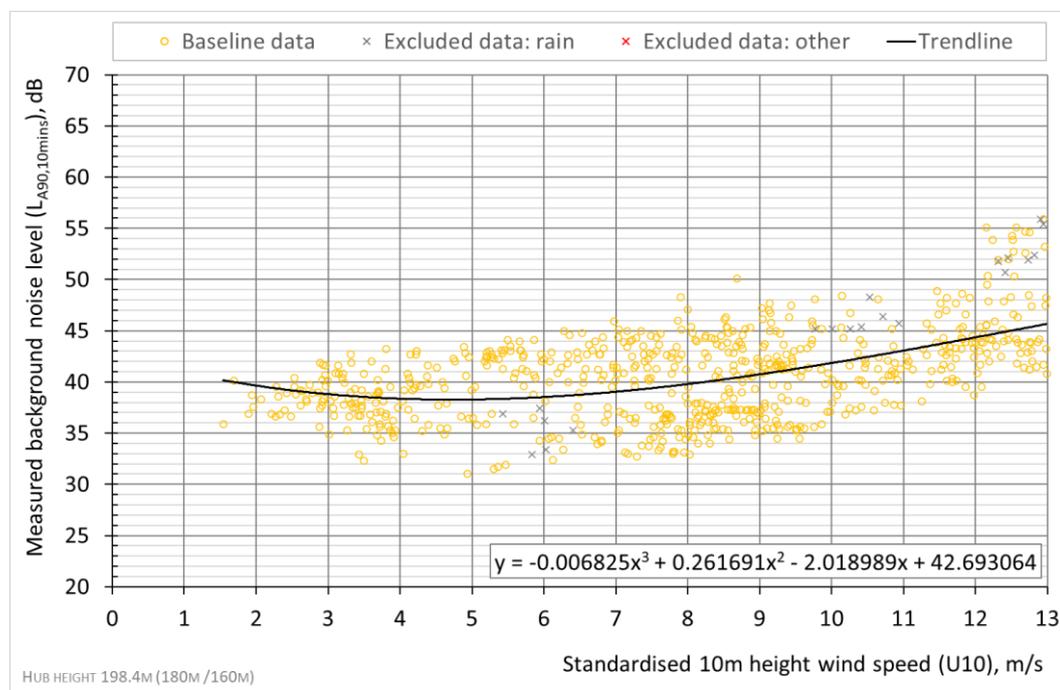
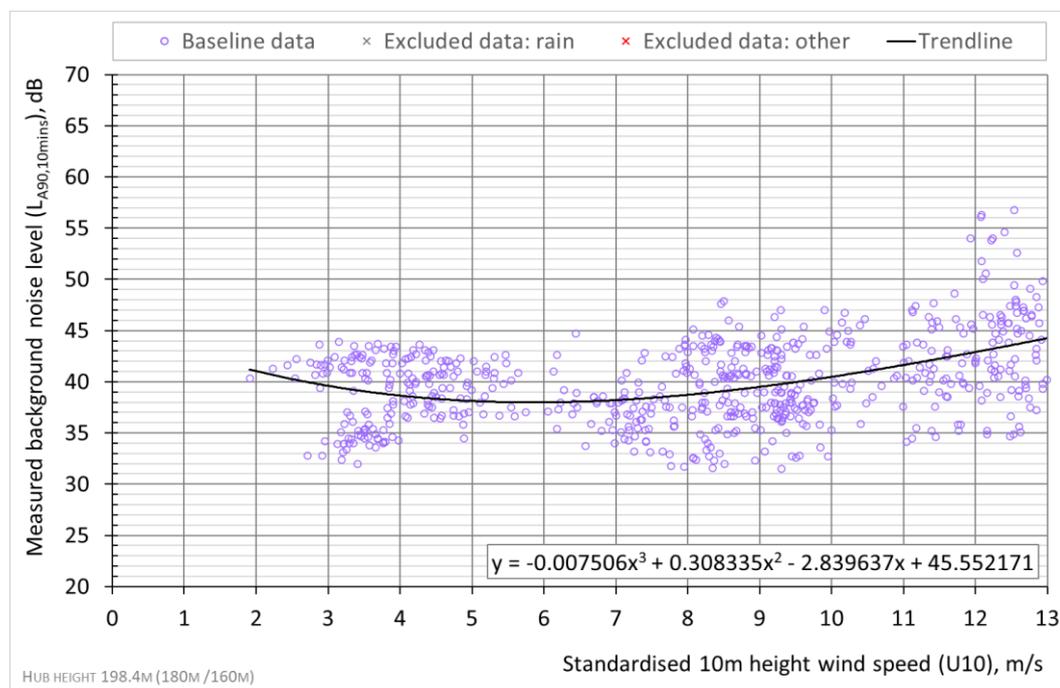


Plate 3-8 LT4 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3.5 MEASUREMENT LOCATION LT5

Plate 3-9 LT5 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

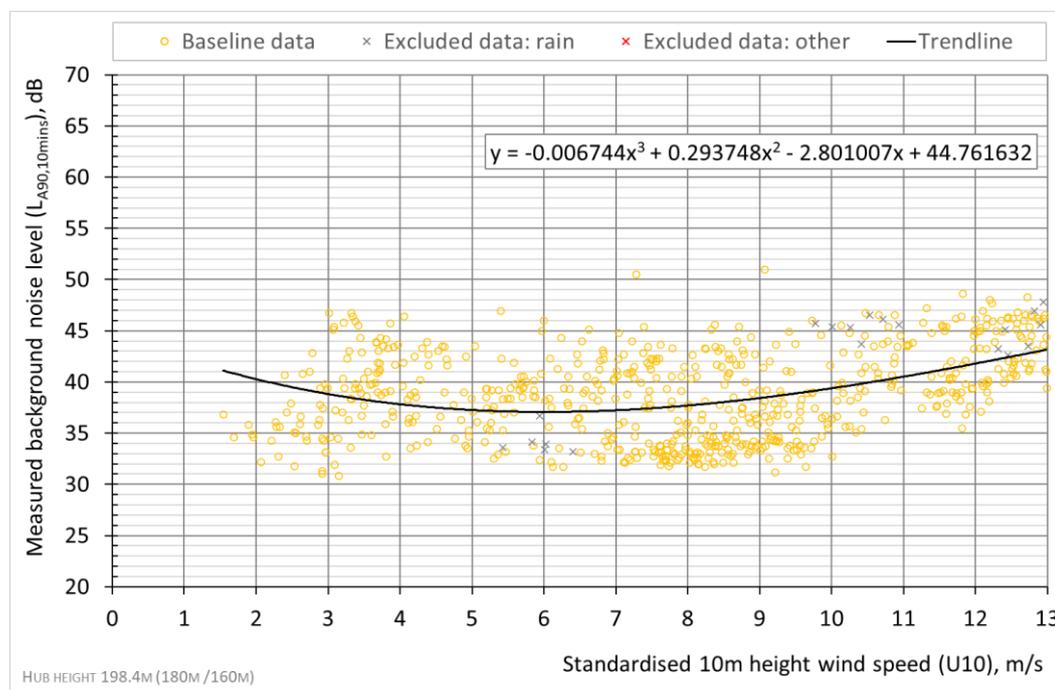
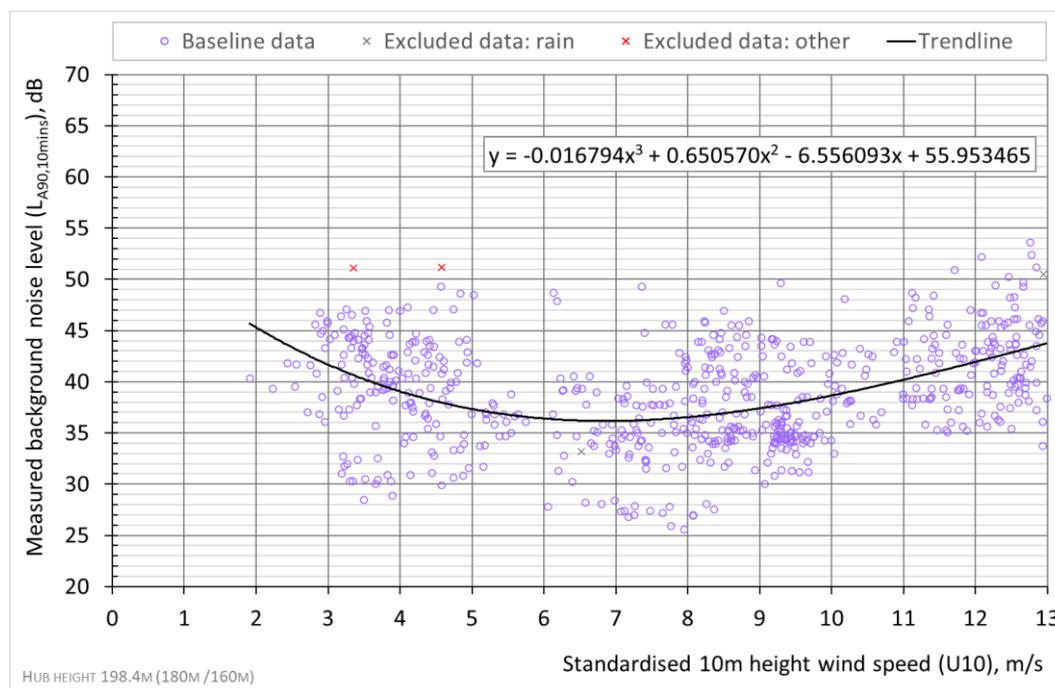


Plate 3-10 LT5 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



3.6 MEASUREMENT LOCATION LT6

Plate 3-11 LT6 – Quiet Daytime Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions

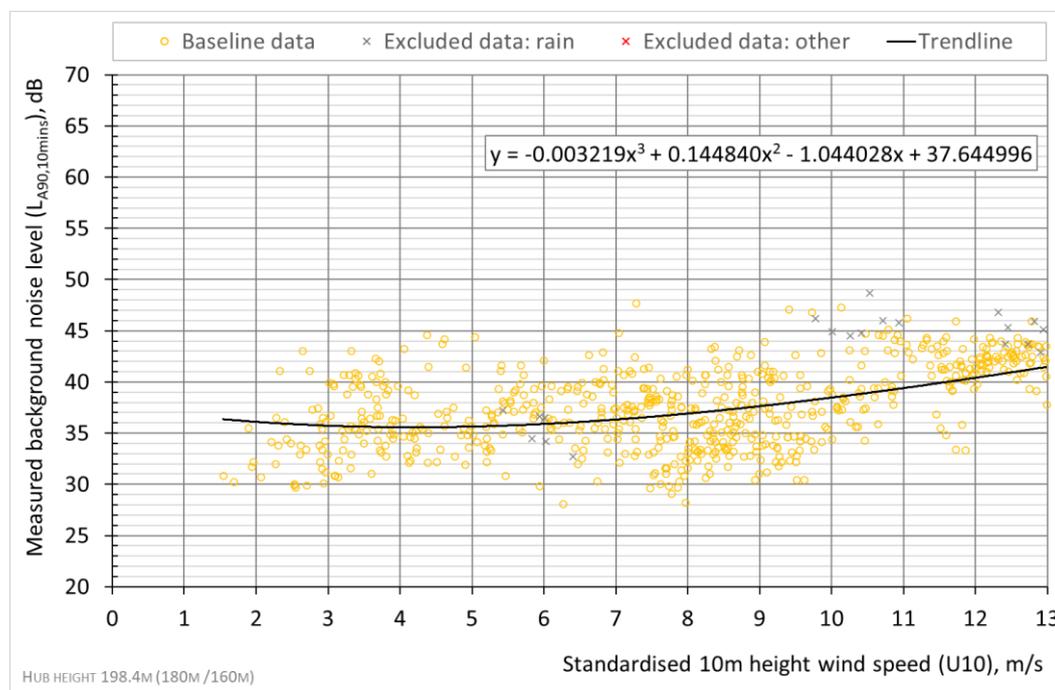
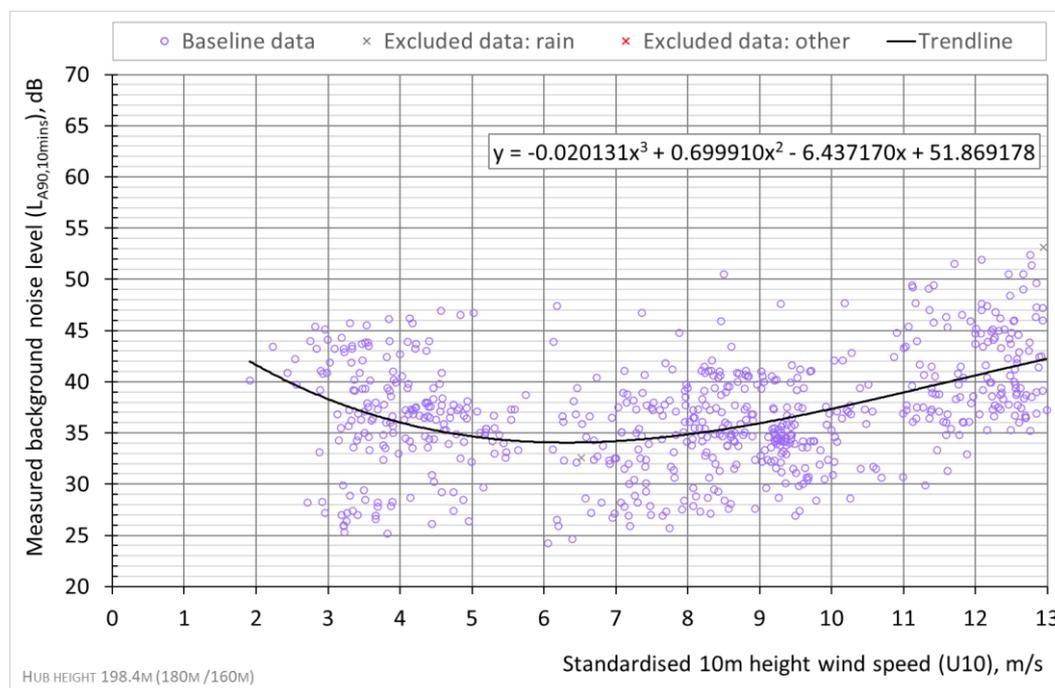


Plate 3-12 LT6 – Night-time Background Noise (dB(A)) versus Wind Speed (m/s) – Upwind Data - Standardised from 198.4 m hub height for Baseline Noise Conditions



4 GLOSSARY OF TERMS AND ABBREVIATIONS

4.1.1.1 A list of key terms and acronyms used in this appendix are provided in **Table 4-1** and **Table 4-2**.

Table 4-1 Acronyms and abbreviations

Term	Definition
dB	Decibel
dB(A)	A-weighted decibel
EIAR	Environmental Impact Assessment Report
km	Kilometre
m	metres
m/s	metres per second
MHWS	Mean High Water Springs
OCAS	Offshore Cable Area of Search
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
WTG	Wind Turbine Generator

Table 4-2 Glossary

Term	Meaning
A-weighting	Frequency weighted sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
$L_{A90,T}$	A statistical noise index defined as the level that is exceeded for 90% of the time over the measurement time period T. The 'A' denotes that the level is determined with 'A-weighting' applied.
U_{10}	Wind speed at standardised 10 m height