



APPENDIX 12-2

OPERATIONAL NOISE REPORT



A specialist energy consultancy

Appendix 12-2

Operational Noise Report

Crumhach Wind Farm, Co. Sligo

SSE Renewables (Ireland) Ltd

IE00220-010-R0
27 May 2026

COMMERCIAL IN CONFIDENCE



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Executive Summary

TNEI Ireland Ltd was commissioned by MKO on behalf of SSE Renewables (Ireland) Ltd ('the Applicant') to undertake predictions of the wind turbine noise that would be emitted by the operation of the proposed Crumhach Wind Farm (hereinafter referred to as 'the Proposed Project' or 'the Proposed Wind Farm').

The Proposed Project will remove the currently operational Dunneill Wind Farm 13 no. turbines, and Kingsmountain Wind Farm 10 no. turbines wind farm sites and replace them with 17 no. wind turbines across both existing wind farm sites and additional greenfield areas within the Site. A substation will also be installed and in operation during the lifetime of the development.

The noise predictions were used to assess the potential impact of operational noise from the Proposed Project on the nearest noise sensitive receptors.

The Irish Government Department of Environment Heritage and Local Government document '*Wind Energy Development Guidelines, 2006*' (WEDG 2006, also referred to as DoEHLG 2006) are the current guidelines for setting noise limits for wind energy developments. The information relating to noise in the WEDG 2006, is very limited and it is widely agreed that the limits proposed in the WEDG 2006 were drafted to broadly align with the former UK guidance ETSU-R-97 '*The Assessment and Rating of Noise from Wind Farms*'. In 2013, the former UK guidance was supplemented by a document produced by the Institute of Acoustics '*A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise*' (IOA GPG). An update which supersedes ETSU-R-97 was released in June 2026 named '*Assessment and Rating of Wind Turbine Noise*' (ARWTN); the assessment principles are generally the same as ETSU-R-97, but does introduce new terminology and clarifications to previous. It is specified in this update that the IOA GPG is endorsed and should continue to be used.

Given the WEDG 2006 were drafted to broadly align with ETSU-R-97 and given the assessment principles in ARWTN are broadly aligned with ETSU-R-97, the WEDG 2006 are also considered to align with ARWTN. Reference has been made to guidance contained in ARWTN and the IOA GPG to supplement the WEDG 2006.

The operational noise assessment has been undertaken in three stages:

- Stage 1 – establish the Total WEDG Noise Limits for nearby receptors based on measured background noise levels;
- Stage 2 – undertake a cumulative assessment based on likely predictions for all relevant turbines in the area (existing and proposed (in planning)) and compare the cumulative noise predictions against the Total WEDG Noise Limits; and,
- Stage 3 – establish Site Specific Noise Limits for the Proposed Project (at levels below the Total WEDG Noise Limits, where limit apportionment is required) and compare the noise predictions from the Proposed Wind Farm on its own against the proposed Site Specific Noise Limits.

Background noise monitoring was undertaken at eight Noise Sensitive Receptors (NSRs). The Noise Monitoring Locations (NMLs) were considered to be representative of the NSRs located closest to the Proposed Wind Farm.

There are 100 buildings within 2.5 km proximity of the Proposed Wind Farm (1 of which is Lough Easky Water treatment Works, and 9 of which are residential buildings classed as derelict), 90 of the buildings are residential and classed as NSRs. In addition, a further 5 NSRs located at further distances (of up to 6 km) to the east, south and west which are the closest dwellings in these directions, have

been added for completeness. Of the 95 identified NSRs, a total of 13 NSRs were chosen as Noise Assessment Locations (NALs). The NALs were chosen to represent the NSRs located closest to the Proposed Wind Farm. Additional receptors were also included to consider cumulative noise impacts. The modelling results for the NALs have been presented within the main body of this report whilst an assessment for all NSRs have been included within an Annex to the reportⁱ. For the NALs where no background noise measurements were undertaken, noise data collected at proxy locations deemed representative of the expected background noise environment was used to assess the wind turbine noise impact at those receptors.

Wind speed and direction data were measured using a LiDAR device located within the Proposed Wind Farm. The wind data measured at 105 m and 120 m height was used to calculate hub height wind speeds (at 110 m). These hub height wind speeds were then standardised to a height of 10 m in accordance with current good practice. Analysis of the measured data has been undertaken in accordance with the WEDG 2006, ARWTN and current good practice to determine the pre-existing background noise environment and to establish the daytime and night-time noise limits at each of the NALs.

Two sets of noise limits have been derived; the Total WEDG Noise Limits apply to the cumulative noise level of all turbines operating in the area including the Proposed Wind Farm, whilst the Site Specific Noise Limits apply to operational noise from the Proposed Wind Farm only.

Based on the guidance in the WEDG 2006, the daytime Total WEDG Noise Limit was set at 40 dB(A) where background noise levels were <30 dB and 45 dB(A) or background plus 5 dB whichever is the greater where background noise levels were >30 dB. The night-time Total WEDG Noise Limit has been set at 43 dB(A) or background plus 5 dB whichever is the greater. Whilst it is understood that An Coimisiún Pleanála (ACP) currently condition night-time noise limits based on a fixed limit of 43 dB(A), the Association of Acoustic Consultants of Ireland produced a document, *'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments'*, detailing advice for local authority officers *'involved in enforcement, assessment of noise reports, & drafting of noise conditions for planning permissions & permits'*. The advice therein is to set night-time limits based on 43 dB(A) or background noise plus 5 dB, which is the approach that TNEI have taken for this assessment.

Predictions of wind turbine noise for the Proposed Wind Farm were made, based upon the sound power level data for a candidate wind turbine, the Nordex N149 5.X MW with serrated trailing edge blades and a hub height of 105 m. The Nordex N149 5.X MW has been chosen as the main candidate for the assessment as it is the loudest of the candidates being considered and therefore provides the most precautionary scenario. To consider the full design envelope for the Proposed Wind Farm, additional modelling has been undertaken using two other candidates:

- the Vestas V150 6.0 MW with serrated trailing edge blades and 105 m hub; and,
- the Nordex N133 4.8 MW with standard blades and 110 m hub.

Predictions for all three candidates have been included when assessing the Proposed Wind Farm against its Site Specific Noise Limits, and the results have been included within an Annex to this report. All candidates modelled are considered representative of the type of turbine that could be installed at the site. Whatever the final turbine choice is, the Proposed Wind Farm will need to meet the noise limits determined and contained within any condition applied as part of consent.

Modelling was undertaken using the ISO 9613: 2024 *'Acoustics – Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors'*

ⁱ Whilst coordinates are provided for Lough Easky Water Treatment Plant and the derelict buildings, they have not been assessed in the Annex.

noise prediction model which accords with current good practice and is considered to provide a realistic impact assessment.

A cumulative assessment was undertaken at the NALs where predictions from the Proposed Wind Farm were found to be within 10 dB of the noise predictions from all other schemes. The assessment of likely cumulative noise levels undertaken at the NALs shows that the Proposed Wind Farm can operate concurrently with the other wind farm developments in the area, whilst meeting the Total WEDG Noise Limit, at all NALs. At NAL12 (NSR102) an exceedance of the night-time noise limit is predicted but is a result of the other developments; the Proposed Project is not predicted to have any influence on predicted cumulative noise levels at this location. The predictions for the other schemes have been undertaken using sound power level data for the installed turbines or a suitable candidate. The model of turbine was either identified through an online search, or through the Council's Planning Application Portal.

Site Specific Noise Limits have also been derived that take account (where required) of the other wind farm developments. Where wind turbine immissions from the other wind turbines at a given receptor were found to be at least 10 dB below the Total WEDG Noise Limit, it is considered that they will be using a negligible proportion of the limit, as such it was considered appropriate to allocate the entire noise limit to the Proposed Wind Farm. This was the case for all NSR's with the exception of NSR102 (or NAL12, as above); the Proposed Wind Farm does not require any of the Total WEDG Noise Limit at this location as there is not predicted to be any noise influence from the Proposed Wind Farm here.

Predicted noise levels indicate that at all NALs the wind turbine noise immissions were below the Site Specific Noise Limits when considering any of the candidate turbines under consideration.

The use of Site Specific Noise Limits would ensure that the Proposed Wind Farm could operate concurrently with other proposed (in planning), permitted or operational turbines in the area and would also ensure that the Proposed Wind Farm's individual contribution could be measured and enforced if required.

Should planning permission be granted for the Proposed Project it would be appropriate to include a set of noise related planning conditions, which detail the noise limits applicable to the Proposed Project.

There are a number of wind turbine makes and models that may be suitable for the Proposed Wind Farm. Should the Proposed Project receive planning permission, the final choice of turbine would be subject to a competitive tendering process. As such, predictions of wind turbine noise are for informational and assessment purposes only. The final choice of turbine would, however, need to meet the noise limits determined and contained within any condition imposed.

In terms of the operational substation, the closest noise sensitive receptor is located ~360 m from the centre of the proposed substation location. A document prepared by Eirgrid, '*EirGrid Evidence Based Environmental Studies Study 8: Noise Literature review and evidence based field study on the noise effects of high voltage transmission development*', presents measured noise levels for a 110 kV substation (as per that being installed as part of the Proposed Project) which vary between 37 dB LAeq(t) and 39 LAeq(t) at distances of ~5-10 m from the substation. It has been calculated from these measurements that noise from the substation at the nearest NSR will be sufficiently attenuated due to distance and therefore have negligible noise impacts at the closest NSR, and those at further distances.

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Annex 7 – Summary of Wind Turbine Noise Source Data

1 Introduction

1.1 Brief

1.1.1 TNEI Ireland Ltd was commissioned by MKO on behalf of SSE Renewables (Ireland) Ltd ('the Applicant') to undertake an operational noise assessment for the proposed Crumhach Wind Farm (hereinafter referred to as 'the Proposed Wind Farm'). The following steps summarise the noise assessment process:

- Measure and analyse existing background noise levels and present the measured noise data with reference to existing Government Guidance and the recommendations of the Department of Environment Heritage and Local Government (DoEHLG) which are contained in the '*Wind Energy Development Guidelines, 2006*' (1) (WEDG 2006, also referred as DoEHLG 2006), in conjunction with the guidance produced by the United Kingdom's Department of Energy Security and Net Zero which are contained within '*Assessment and Rating of Wind Turbine Noise*' (ARWTN) (2) and the Institute of Acoustics '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' (4) (IOA GPG) which represents current good practice in the UK, and is frequently used to supplement the WEDGs and further inform wind farm noise assessments in Irelandⁱⁱ (see Section 2.6.5);
- Determine the Total WEDG 2006 Noise Limits applicable to all wind farms in the area;
- Assess and undertake a cumulative noise assessment, where required, to take account of other proposed, permitted or operational schemes near to the Proposed Wind Farm;
- Derive Site Specific Noise Limits for the Proposed Wind Farm. These derived noise limits will be suitable for inclusion in a noise related planning condition should An Coimisiún Pleanála grant planning permission for the Proposed Wind Farm;
- Undertake predictions of the operational wind turbine noise immission from the Proposed Wind Farm that will be incident at neighbouring noise sensitive receptors, considering noise data for candidate wind turbine models;
- Consider noise from the proposed on-site operational substation, where required;
- Compare the predictions of the operational wind turbine noise immission from the Proposed Wind Farm against the Site Specific Noise Limits; and,
- Assess the impact of noise from the Proposed Wind Farm with reference to existing Government Guidance and the recommendations of the DoEHLG which are contained in the WEDG 2006.

1.2 Background

1.2.1 The Proposed Wind Farm is located in County Sligo, on the northwest slopes of the Ox Mountains, located approx. 4.5km south of the village of Dromore West, and approx. 3km

ⁱⁱ Note ARWTN superseded the guidance produced by the United Kingdom's Department of Trade and Industry Noise Working Group, named ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms' (3) in June 2026; whilst this is a new piece of guidance, the assessment principles are generally the same as detailed in ETSU-R-97 and reference is made to the IOA GPG. ARWTN and the IOA GPG are therefore considered appropriate to use to continue to inform the WEDG 2006 guidelines. Further information is detailed in Section 2.9.

southwest of the village of Templeboy in Co. Sligo. The approximate Irish Transverse Mercator (ITM) reference for the centre of the Proposed Wind Farm is 546041, 828377 and the proposed layout is comprised of 17 wind turbines as shown on Figure A1.1a in Annex 1.

- 1.2.2 In the absence of a confirmed turbine model, this noise assessment models a candidate turbine, the Nordex N149 5.X MW with serrated trailing edge blades and a hub height of 105 m. The Nordex N149 5.X MW has been chosen as the main candidate for the assessment as a comparison of predictions of all candidates at NSRs indicates it has higher levels at wind speeds greater than 6 m/s at 10 m standardised height. Additional modelling has been undertaken using two other candidates to consider the full design envelope for the site, the Vestas V150 (105 m hub) and Nordex N133 (110 m hub). Further detail can be found in Section 6.2.
- 1.2.3 Predictions for all three candidates have been included when assessing the Proposed Wind Farm against its Site Specific Noise Limits (the results are included within Annex 1). All candidates modelled are representative of the type of turbine that could be installed at the site.
- 1.2.4 The noise assessment has considered schemes that are operational, permitted and proposed (planning application submitted) but not those in the pre-planning stage. The schemes considered in the assessment are summarised in Table 1.1.

Table 1.1 Cumulative Wind Farm/ Turbine Developments

Wind Farm/ Wind Turbine	Number of Turbines	Status	Make and Model of Turbine Considered in Modelling
Black Lough	4	Operational	Enercon E92 2.3 MW
Carrowleagh	13	Operational	Enercon E70 2.3 MW
Cloonkeelaun	3	Operational	Enercon E70 2.3 MW
Cloonkeelaun 2	2	Operational	Enercon E92 2.3 MW
Cloonkeelaun Single Turbine	1	Operational	Enercon E92 2.3 MW
Strokane Single Turbine	1	Consented	Enercon E92 2.3 MW
Firlough Wind Farm	13	Consented	Nordex 149 5.X MW

- 1.2.5 Figure A1.2 in Annex 1 shows the location of the above developments relative to the Proposed Wind Farm. The turbine type modelled for each of the schemes detailed in Table 1.1 was chosen using information contained within the Environmental Impact Assessment Reports (EIARs) for the schemes or using information detailed on the specific project websites.
- 1.2.6 For the purposes of assessing the above schemes in conjunction with the Proposed Wind Farm the following terms have been referred to throughout the assessment:
- ‘Total WEDG Noise Limits’; defined as being the limit that should not be exceeded from the cumulative operation of all wind farm developments, including the Proposed Project; and,

- 'Site Specific Noise Limits'; defined as being the limit that is specific to the Proposed Project only, and derived through the apportionment (where required), of the 'Total WEDG Noise Limits' in accordance with current good practice (IOA GPG).

1.2.7 Note that the term 'noise emission' relates to the sound power level emitted from each wind turbine, whereas the term 'noise immission' relates to the sound pressure level received at any receptor location, due to the operation of the wind turbines. All references to dB are dB(A), unless otherwise stated. Wind speeds are standardised to 10 m height and grid coordinates are in ITM unless otherwise stated. A full glossary of terms is provided in Section 8.

2 Noise Planning Policy and Guidance

2.1 Overview of Noise Planning Policy and Guidance

2.1.1 In assessing the potential noise impacts of the Proposed Wind Farm, the following guidance and policy documents have been considered:

- National Planning Policy;
- Regional Planning Policy;
- Local Policy;
- Department of Environment Heritage and Local Government (DoEHLG) ‘Wind Energy Development Guidelines’ (WEDG 2006 also referred as DoEHLG 2006);
- Department for Energy Security and Net Zero ‘Assessment and Rating of Wind Turbine Noise’ (ARWTN); and,
- Institute of Acoustics ‘A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise’ (IOA GPG) May 2013.

2.2 National Planning Policy

2.2.1 National Planning Framework (NPF) is the primary material consideration for all planning decisions in Ireland. It is a long term, 20-year strategy for strategic planning and sustainable development of urban and rural areas to 2040, with the core objectives of securing balanced regional development and a sustainable growth.

2.2.2 The NPF was first introduced in 2018, the NPF serves as an overarching spatial planning and development strategy for the country. Subsequently, the revised NPF was approved by the Oireachtas in April 2025.

2.2.3 Within the NPF, there is an emphasis on the provision of renewable energy in helping to work towards a low carbon economy and climate resilience. Section 1.3 of the NPF outlines Ireland’s shared goals.

2.2.4 One of these goals relates to the transition to a low-carbon society, promoting the need for renewable energy and associated infrastructure, emphasised below:

“This objective will shape investment choices over the coming decades in line with the National Mitigation Plan and the National Adaptation Framework. New energy systems and transmission grids will be necessary for a more distributed, renewables-focussed energy generation system, harnessing both the considerable on-shore and off-shore potential from energy sources such as wind...”

2.2.5 Moreover, development policies have also been introduced in the NPF which are to be applied country wide. Such as Policy Objective 55, which states that:

“Promote renewable energy use at appropriate locations within the built and natural environment to meet national objectives towards achieving a low-carbon economy by 2050.”

2.3 Local Policy

- 2.3.1 The Sligo County Development Plan 2024-2030 (Sligo CDP 2024-2030) was formally adopted in November 2024. Chapter 2 'Climate Action' of Volume 1 states that climate action is a significant priority for the Irish Government, in which targets have been set to halve Ireland's greenhouse gas emissions by 2030 to reach Net Zero by 2050.
- 2.3.2 At a more local level, Sligo County Council adopted their Climate Change Action Plan in 2024. This Strategy sets out the County's Regional Renewable Energy Strategy, which states the importance of decarbonisation within Sligo's economy. The following is stated within the Strategy:
- 2.3.3 The development of new renewable energy facilities and infrastructure will be a very important element in the decarbonisation of our economy and society, through the provision of green electricity. This will require very serious consideration, and therefore there is a commitment in the County Development Plan to "developing a renewable energy strategy for Sligo and ensuring that policy frameworks are in place to assist the attraction of investment in this area".

2.4 Sligo Noise Action Plan 2024-2028

- 2.4.1 The Sligo County Council Noise Action Plan 2024-2028 has been prepared by Sligo County Council for the primary purpose of managing noise issues and their effects. The Plan has been prepared in accordance with the requirements of the EU Directive 2002/49/EC. The aim of the Directive is to provide an approach to avoid, prevent or reduce noise based effects, specifically with reference to transport and industrial noise.
- 2.4.2 The overall aim of the Action Plan is to manage the existing noise environment and prevent any potential future adverse impacts, the following is stated in Section 1 of the Action Plan:

"The purpose of the Action Plan is to endeavour to manage the existing noise environment and protect future noise environment within the action planning area. Management of the existing noise environment may be achieved by prioritising areas for which further assessment and possible noise mitigation may be required".
- 2.4.3 In relation to the production of noise assessments and noise limits, the Action Plan has stated that there is no legislation that limits noise levels to a particular value, due to the difficulties arising when attempting to choose a reasonable value for noise limits. To address this lack of legislative measures, the Environmental Protection Agency (EPA) have issued guidelines for the assessment of noise and prioritising areas for noise mitigation. These values have been determined after a review of guidance values from different countries such as the UK.

2.5 Regional Spatial and Economic Strategies (RSES) 2026-2031

- 2.5.1 The Northern & Western RSES (applicable to Co. Sligo) provides a high-level development framework for the Northern and Western Regional Assembly of Ireland, supporting the implementation of the National Planning Framework. In relation to renewable energy, it states (page 163):

'It is important that our region sets out its ambitions concerning renewable energy in this context and shows its ability to help contribute achieving national targets.'

- 2.5.2 The RSES does not include any information specific to noise but states the following:

'The forthcoming Renewable Electricity Policy and Development Framework will aim to identify strategic areas for the sustainable development of renewable electricity projects of scale, in a sustainable manner, compatible with environmental and cultural heritage, landscape and amenity considerations. The development of the Wind Energy Guidelines and the Renewable Electricity Development Plan will also facilitate informed decision making, in relation to renewable energy infrastructure.'

- 2.5.3 The Irish Government's Department of Environment, Climate and Communications (DECC) is currently preparing the Renewable Electricity and Policy Development Framework (REPDF). This document has not been published at the time of writing and therefore has not been considered in this report.

2.6 Wind Energy Development Guidelines, 2006 (WEDG 2006)

- 2.6.1 The current guidelines for setting noise limits are detailed in the DoEHLG, WEDG 2006.

- 2.6.2 The information relating to noise in the WEDG 2006 is very limited (for example there is no guidance on where or how to measure background noise levels and how to correlate these with wind speed on the Proposed Wind Farm, there is also no mention of how to consider cumulative effects). The WEDG 2006 guidelines do, however, include guidance on how to derive limits for daytime and night-time periods.

- 2.6.3 The daytime limits take account of existing background noise levels and include a fixed limit of 45 dB or background + 5 dB, whichever is the greater, except in low background noise environments where a fixed minimum limit in the range 35-40 dB should be considered. TNEI's interpretation of these limits is that turbine noise should not exceed:

- 45 dB $L_{A90, 10 \text{ min}}$ or background noise + 5 dB, whichever is the greater, for daytime hours (applicable where background noise levels are greater than 30 dB L_{A90}); or,
- 35 to 40 dB $L_{A90, 10 \text{ min}}$ where background noise is less than 30 dB L_{A90} .

- 2.6.4 For the daytime period in Ireland, developments are generally consented with reference to the upper fixed minimum limit of 40 dB; the same has therefore been adopted within this assessment.

- 2.6.5 The WEDG states that a *'fixed limit of 43dB(A) will protect sleep inside properties during the night'*, however, whilst it is not explicit within the WEDG guidance, the addition of a night-time 'background noise +5 dB' parameter is commonly applied in wind turbine noise assessments. This is as recommended in the Association of Acoustic Consultants of Ireland document *'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments'* (5). This details advice for local planning authorities on how to draft noise related conditions for a variety of sectors, including renewable energy developments. With relation to guidance on night-time noise limits for wind farms, the document recommends a limit of 5 dB above background, subject to a lower fixed limit of 43 dB, and notes that the WEDG 2006 wording is particularly vague.

- 2.6.6 On that basis, the night-time noise limits used in this assessment have been based on 43 dB or background noise + 5 dB, whichever is the greater.
- 2.6.7 It is widely agreed that the limits proposed in the WEDGs were drafted to broadly align with the former UK guidance ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms'*. In 2013 this former UK guidance was supplemented by a document produced by the Institute of Acoustics' (IOA) 'A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise' (IOA GPG). An update which supersedes ETSU-R-97 was released in June 2026 named 'Assessment and Rating of Wind Turbine Noise' (ARWTN); the assessment principles are generally the same as ETSU-R-97 but does introduce new terminology and clarifications to previous. It is specified in this update that the IOA GPG is endorsed and should continue to be used.
- 2.6.8 Given the WEDG 2006 were drafted to broadly align with ETSU-R-97 and given the assessment principles in ARWTN are generally the same as ETSU-R-97, the WEDG 2006 are also considered to align with ARWTN. Reference has been made to guidance contained in ARWTN and the IOA GPG to supplement the less detailed WEDG 2006 guidelines.

2.7 Draft 2019 WEDG

- 2.7.1 It is noted that the WEDG 2006 are currently under review and a set of 'Draft WEDG 2019' updated guidelines were issued for consultation in December 2019. Significant concerns were raised during the public consultation process on the Draft WEDG 2019 Guidelines, including concerns raised by acousticians (6) with significant experience in wind farm noise, and how the authors had misinterpreted existing guidance and had incorporated a number of errors within the technical approaches proposed. In light of these concerns, and the fact that significant changes would need to be made before they could be adopted, an assessment using the Draft WEDG 2019 Guidelines is not, in the professional opinion of TNEI, technically feasible or appropriate and has not therefore been undertaken.
- 2.7.2 Timelines for the conclusion of the Draft WEDG 2019 review are still unclear however the Government of Ireland's Climate Action Plan 2024 (7) includes a 2024 Action (EL/24/5) to 'Publish the Revised Wind Energy Development Guidelines for onshore wind.' No timescales for completion are provided.
- 2.7.3 Therefore, at time of writing this Operational Noise Report, the DoEHLG 2006 Guidelines remain the relevant statutory guidelines and, as a result, they have been used for this assessment, appropriately supplemented by the guidance in ARWTN and the IOA GPG, which are considered by TNEI to represent current best practice. This report has been prepared by suitably qualified Acousticians, affiliated with the IOA. Based on the experience of TNEI of undertaking wind farms noise assessment projects with a combined rated capacity of >5 GW, it is considered that the use of these documents represents best available evidence and is the most robust approach.

2.8 Assessment and Rating of Wind Turbines (ARWTN)

- 2.8.1 On June 19th, 2026, the UK Government Department of Energy Security and Net Zero released refreshed guidance which supersedes ETSU-R-97 titled *'Assessment and Rating of Wind Turbines'* (ARWTN).
- 2.8.2 The basic aim of ARWTN is to provide:

"guidelines for the control of wind turbine noise, such that wind farm neighbours receive a reasonable degree of protection without placing unreasonable restrictions on wind farm development."

- 2.8.3 ARWTN follows ETSU-R-97's prior aim of trying to balance any environmental impact with the need for renewable energy stating:

'ETSU-R-97 recognised the specific nature and operation of wind turbines and the noise they produce, and how this differs to many other sources of noise. The ETSU-R-97 guidance also identified the need to balance the environmental impacts from a wind farm with the benefits that arise through the development of renewable energy sources. These same principles remain relevant for these guidelines. The guidance recognises that achieving this balance may result in operational wind turbine noise being audible at nearby properties where such levels are considered acceptable.'

- 2.8.4 The guidance states that noise assessment criteria (previously known as noise limits in ETSU-R-97) should reflect the variation in both turbine source noise and background noise with wind speed. Lower Limiting Values (LLVs), which are different for the daytime and night-time periods, are applied where low levels of background sound are measured. The wind speed range that should be considered ranges between the cut-in wind speed for the turbines (usually about 2 to 3 ms⁻¹) and up to 10 ms⁻¹, where all wind speeds are referenced to a 10-metre measurement height.
- 2.8.5 Separate LLVs apply for daytime and for night-time. Daytime LLVs are chosen to protect a property's external amenity, and night-time LLVs are chosen to protect a properties indoor environment (with windows either open or closed).
- 2.8.6 The daytime noise assessment criteria is derived from background sound data measured during so-called 'quiet day' periods (considered to be the periods of the day when background sound levels are lower than at other times of the day); these comprise weekday evenings (18:00 to 23:00), Saturday afternoons and evenings (13:00 to 23:00) and all day and evening on Sundays (07:00 to 23:00). Multiple samples of 10-minute background noise levels using the $L_{A90,10min}$ measurement index are logged continuously over a range of wind speed conditions. These measured noise levels are then plotted against concurrent wind speed data and a 'best fit' curve is fitted to the data to establish the background noise level as a function of wind speed. The daytime noise assessment criteria is then set at a level 5 dB(A) above the best fit curve over the desired wind speed range; subject to an appropriate daytime LLV.
- 2.8.7 The night-time noise assessment criteria limit is derived from background sound data measured during the night-time periods (23:00 to 07:00), with no differentiation being made between weekdays and weekends. The 10-minute L_{A90} noise levels measured over the night-time periods are plotted against concurrent wind speed data and a 'best fit' correlation is established. The night-time noise limit is also based on a level 5 dB(A) above the best fit curve over the 0 - 12 ms⁻¹ wind speed range, with a LLV of 43 dB L_{A90} .
- 2.8.8 The exception to the setting of both the daytime and night-time LLVs occurs where a property occupier has a financial involvement in the wind farm development. Paragraph 2.29 of ARWTN states:

‘The LLV used to define the noise assessment criteria can be increased to 45 dB for both day and night periods where the occupier (whether owner-occupiers or tenants) of the property has a financial involvement in the wind farm. Detailed guidance on appropriate arrangements for financial involvement is beyond the scope of this technical guide, however case law suggests this should be where the occupier receives a profitable (not merely compensatory) financial benefit associated with the wind farm over the life of that scheme.’

- 2.8.9 Additional reference is also made in ARWTN to aspects that can be scoped out of the requirement to be assessed. These include Infrasound, Ground-borne Vibration, and Low Frequency Sound – these are further detailed in Section 3.2 below.
- 2.8.10 Whilst there are differences with relation to terminology and clarifications, overall the document represents an evolution of ETSU-R-97 rather than a fundamental change to the underlying assessment approach. However, like ETSU-R-97, ARWTN provides a robust basis for determining the noise limits for wind turbine(s) and is the accepted standard for such developments across the UK. It also continues to consider previous good practice documentation released with relation to ETSU-R-97, as detailed below.

2.9 Current Good Practice

A Good Practice Guide on the Application of ETSU-R-97

- 2.9.1 In May 2013, the Institute of Acoustics issued ‘A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise’ (IOA GPG). The document provides guidance on background noise data collection, data analysis and limit derivation, noise predictions, cumulative issues, reporting requirements and other matters such as noise related planning conditions.

- 2.9.2 The Authors of the IOA GPG sets out the scope of the document in Section 1.2:

‘This guide presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine developments above 50 kW, reflecting the original principles within ETSU-R-97, and the results of research carried out and experience gained since ETSU-R-97 was published. The noise limits in ETSU-R-97 have not been examined as these are a matter for Government.’

- 2.9.3 With relation to the release of the ARWTN guidance, the IOA published a statement (8) indicating that the IOA GPG and Supplementary Guidance Notes should continue to be used;

‘A replacement for ETSU-R-97 for the assessment and rating of wind turbine noise, has been published by the Government. The Assessment and Rating of Wind Turbine Noise (ARWTN), endorses good practice guidance produced by the Institute of Acoustics. In this refreshed guidance, noise limits have not changed, and assessment principles are generally the same as before. The ARWTN does introduce new terminology and clarifications.

For the assessment of wind turbine noise IOA have set out a statement advising on good practice, and practitioners should continue to use the IOA Good Practice Guide published in 2013, alongside the six 2014 Supplementary Guidance Notes.’

- 2.9.4 Therefore, where any direct reference is made to ETSU-R-97 in quoted text from the IOA GPG, this is intended to relate to ARWTN.

- 2.9.5 The guidance document was endorsed by all Governments within the UK. For this assessment the recommendations included in the IOA GPG have been used to supplement the guidance provided within the WEDG 2006.
- 2.9.6 The IOA GPG refers to six Supplementary Guidance Notes and where applicable these have also been considered in this report.
- 2.9.7 To summarise, the assessment of operational noise from the Proposed Wind Farm has been undertaken in accordance with WEDG 2006, supplemented by the guidance presented in ARWTN and the IOA GPG where appropriate.

3 Potential Impacts

3.1 Operational Noise Sources

- 3.1.1 Wind turbines emit two types of noise. Firstly, aerodynamic noise is a more natural sounding 'broad band' noise, albeit with a characteristic modulation, or 'swish', which is produced by the movement of the rotating blades through the air. Secondly, mechanical noise may emanate from components within the nacelle of a wind turbine. Potential sources of mechanical noise include gearboxes or generators.
- 3.1.2 Aerodynamic noise is usually perceived when the wind speeds are (generally) low to moderate, although at very low wind speeds the blades either do not rotate, or rotate very slowly, and so negligible aerodynamic noise is generated. In higher winds, aerodynamic noise may be masked by the normal sound of wind blowing through the trees and around buildings. The level of this natural 'masking' noise relative to the level of wind turbine noise is one of the several factors that determine the subjective audibility of the wind turbines (10).
- 3.1.3 The potential impact assessed in this report considers the overall noise levels of wind farms inclusive of expected Normal Amplitude Modulation (NAM), as originally described in ETSU-R-97. Other topics relating to operational wind farm noise characteristics, such as Low Frequency Noise (LFN) and Other Amplitude Modulation (OAM) are discussed below.

3.2 Infrasound, Low Frequency Noise and Vibration

- 3.2.1 The term infrasound can be defined as the frequency range below 20 Hz, while low frequency noise (LFN) is typically in the frequency range 20 – 200 Hz (11). An average young healthy adult has an audible range from 20 Hz to 20,000 Hz, although the sensitivity of the ear varies with frequency and is most sensitive to sounds with frequencies between 500 Hz and 4,000 Hz. Wind turbines do produce low frequency sounds (12), but our threshold of hearing at such low frequencies is relatively high and they often therefore go unnoticed. Infrasound from wind turbines is often at levels below that of the noise generated by wind around buildings and other obstacles.
- 3.2.2 In 2004, the former Department of Trade and Industry (DTI) commissioned The Hayes McKenzie Partnership to report on claims that infrasound or LFN emitted by wind turbine generators (WTGs) were causing health effects. Of the 126 wind farms operating in the UK, five had reported LFN problems, therefore, such complaints are an exception, rather than a general problem that exists for all wind farms. Hayes McKenzie investigated the effects of infrasound and LFN at three wind farms for which complaints had been received and the results were reported in May 2006 (13). The report concluded that:
- *'infrasound associated with modern wind turbines is not a source which will result in noise levels which may be injurious to the health of a wind farm neighbour;*
 - *low frequency noise was measurable on a few occasions but below the existing permitted Night Time Noise Criterion. Wind turbine noise may result in internal noise levels within a dwelling that is just above the threshold of audibility, however at all sites it was always lower than that of local road traffic noise;*

- *the common cause of complaint was not associated with LFN, but the occasional audible modulation of aerodynamic noise especially at night. Data collected showed that the internal noise levels were insufficient to wake up residents at these three sites. However once awoken, this noise can result in difficulties in returning to sleep.'*

3.2.3 The Applied and Environmental Geophysics Research Group at Keele University was commissioned by the Ministry of Defence (MOD), the DTI and the British Wind Energy Association (BWEA) to undertake microseismic and infrasound monitoring of LFN and ground-borne vibrations from wind farms for the purposes of siting wind farms in the vicinity of Eskdalemuir in Scotland. Whilst the testing showed that ground-borne vibration can be detected several kilometres away from wind turbines, the levels of vibration from wind turbines were so small that only the most sophisticated instrumentation can reveal their presence and they are almost impossible to detect. Nevertheless, the Renewable Energy Foundation alleged potential adverse health effects and when that story was picked up in the popular press, notably the Scotsman, the report's authors expressed concern over the way in which their work had been misinterpreted and issued a rebuttal statement (14) in August 2005:

'Vibrations at this level and in this frequency range will be available from all kinds of sources such as traffic and background noise – they are not confined to wind turbines. To put the level of vibration into context, they are ground vibrations with amplitudes of about one millionth of a millimetre. There is no possibility of humans sensing the vibration and absolutely no risk to human health.'

3.2.4 In response to concerns that wind turbines emit infrasound and cause associated health problems, Dr Geoff Leventhall, Consultant in Noise Vibration and Acoustics and author of the Defra Report on Low Frequency Noise and its Effects, said in the article in the Scotsman ('Wind farm noise rules 'dated' - James Reynolds, 5 August 2005'):

'I can state quite categorically that there is no significant infrasound from current designs of wind turbines.'

3.2.5 An article (15) published in the IOA Bulletin (March/April 2009) concluded that there is no robust evidence that either low frequency noise (including 'infrasound') or ground-borne vibration from wind farms, has an adverse effect on wind farm neighbours.

3.2.6 Work (16) by Dr Leventhall looked at infrasound levels within the ear compared to external sources and concluded:

'The conclusion is that the continuous inner ear infrasound levels due to internal sources, which are in the same frequency range as wind turbine rotational frequencies, are higher than the levels produced in the inner ear by wind turbines, making it unlikely that the wind turbine noise will affect the vestibular systems, contrary to suggestions made following the measurements at Shirley. The masking effect is similar to that in the abdomen (Leventhall 2009). The body, and vestibular systems, appear to be built to avoid disturbance from the high levels of infrasound which are produced internally from the heartbeat and other processes. In fact, the hearing mechanisms and the balance mechanisms, although in close proximity, have developed to minimise interaction (Carey and Amin 2006).'

3.2.7 During a planning Appeal (PPA-310-2028, Clydeport Hunterston Terminal Facility, approximately 2.5 km south-west of Fairlie, 9 Jan 2018), the health impacts related to LFN

associated with wind turbines were considered at length by the appointed Reporter (Mr M Croft). The Reporter considered evidence from Health Protection Scotland and the National Health Service. In addition, he also considered LFN surveys undertaken by the Appellant and the Local Authority, both of which demonstrated compliance with planning conditions and did not identify any problems attributable to the turbine operations; some periods with highest levels of low frequency noise were in fact recorded when the turbines were not operating.

3.2.8 The Reporter concluded that:

- The literature reviews by bodies with very significant responsibilities for the health of local people found insufficient evidence to confirm a causal relationship between wind turbine noise and the type of health complaints cited by some local residents;
- The NHS's assessment is that concerns about health impact are not supported by good quality research; and
- Although given the opportunity, the Community Council failed to provide evidence that can properly be set against the general tenor of the scientific evidence.

3.2.9 The WSP BEIS report notes on page 113 that:

'Several studies have investigated the claimed links between adverse health symptoms and infrasound emissions from wind turbines. Although some experimental studies have linked infrasonic signals with activation of physiological sensory processing, these have tended to be based on signals that are not representative of wind turbine infrasound. There remains no compelling evidence of adverse health effects associated with wind turbine infrasound exposure at sound frequencies and levels expected to be present at noise-sensitive receptor locations in the vicinity of wind farms.'

3.2.10 The WSP BEIS report goes on to note on page 114 that:

'Overall, the findings from the existing evidence base indicate that infrasound from wind turbines at typical exposure levels has no direct adverse effects on physical or mental health, and reported symptoms of ill-health are more likely to be psychogenic in origin.'

3.2.11 It is noted that research into infrasound is ongoing but the WSP BEIS report concluded that:

'It is expected that further evidence from ongoing studies into wind turbine infrasound effects will emerge soon, in particular from the NHMRC studies in Australia. However, based on the existing scientific evidence, it does appear probable that the above findings will not be contradicted by newer evidence.'

3.2.12 Since the publication of the WSP BEIS report, the study that was granted funding by NHMRC (the National Health and Medical Research Council of Australia) was published in the Environmental Health Perspectives (EHP) journal which is published by the United States National Institute of Environmental Health. The study (17) aimed to test the effect of exposure to 72 hours of infrasound (designed to simulate a wind turbine infrasound signature) exposure on human physiology, particularly sleep. The study concluded that:

‘Our findings did not support the idea that infrasound causes WTSⁱⁱⁱ. High level, but inaudible, infrasound did not appear to perturb any physiological or psychological measure tested in these study participants.’

- 3.2.13 The UK based ARWTN guidelines specifically state with relation to existing evidence to infrasound and ground-borne vibration that;

‘Infrasound from wind turbines at typical exposure levels has no direct adverse effects on physical or mental health.’, and;

‘Levels of ground-borne vibration from modern upwind turbines are very low and, although ground-borne vibration from wind turbines can be measured at large distances using sensitive equipment, these levels are significantly below the human perception threshold and therefore do not result in adverse effects on human receptors.’

- 3.2.14 With relation to LFN, ARWTN states that should the proposed noise criteria be followed then noise sensitive receptors will be considered suitably protected from LFN, as the criteria are based on A-weighted noise levels.

- 3.2.15 It is therefore not considered necessary to carry out specific assessments of infrasound, ground-borne vibration, or LFN, and it has not been considered further in the noise assessment.

3.3 Amplitude Modulation of Aerodynamic Noise (AM)

- 3.3.1 In the context of wind turbine noise, amplitude modulation describes a variation in noise level over time; for example, observers may describe a ‘whoosh whoosh’ sound, which can be heard close to a wind turbine as the blades sweep past. Amplitude Modulation of aerodynamic noise is an inherent characteristic of wind turbine noise and was originally noted in ETSU-R-97, on page 68:

‘The modulation or rhythmic swish emitted by wind turbines has been considered by some to have a characteristic that is irregular enough to attract attention. The level and depth of modulation of the blade noise is, to a degree, turbine-dependent and is dependent upon the position of the observer. Some wind turbines emit a greater level of modulation of the blade noise than others. Therefore, although some wind turbines might be considered to have a character that may attract one’s attention, others have noise characteristics which are considerably less intrusive and unlikely to attract one’s attention and be subject to any penalty.’

This modulation of blade noise may result in a variation of the overall A-weighted noise level by as much as 3dBA (peak to trough) when measured close to a wind turbine. As distance from the wind turbine [or] wind farm increases, this depth of modulation would be expected to decrease as atmospheric absorption attenuates the high frequency energy radiated by the blade.’

- 3.3.2 The Acoustics community has sought to make a distinction between the AM discussed within ETSU-R-97, which is expected at most wind farms and as such may be considered as ‘Normal Amplitude Modulation’ (NAM), compared to the unusual AM that has sometimes been

ⁱⁱⁱ WTS stands for Wind Turbine Syndrome which is a term for adverse human health effected related to the proximity of wind turbines.

heard at some wind farms, hereinafter referred to as 'Other Amplitude Modulation' (OAM). The term OAM is used to describe an unusual feature of aerodynamic noise from wind turbines, where a greater than normal degree of regular fluctuation in sound level occurs at blade passing frequency, typically once per second. In some appeal decisions it may also be referred to as 'Excess Amplitude Modulation' (EAM). It should be noted that the noise assessment and rating procedure detailed in ARWTN fully takes into account the presence of the intrinsic level of NAM when setting acceptable noise limits for wind farms.

3.3.3 On 16 December 2013, RenewableUK (RUK) released six technical papers (18) on OAM, which reflected the outcomes of research commissioned over the previous three years, together with a template planning condition. Whilst this research undoubtedly improved understanding of OAM and its effects, it should be noted that at the time of writing it has not been endorsed by any relevant body such as the Institute of Acoustics (IOA).

3.3.4 On 22 January 2014, the IOA released a statement regarding the RUK research and the proposed planning condition to deal with the issue of amplitude modulation from a wind turbine and stated:

'This research is a significant step forward in understanding what causes amplitude modulation from a wind turbine, and how people react to it. The proposed planning condition, though, needs a period of testing and validation before it can be considered to be good practice. The IOA understands that RenewableUK will shortly be making the analysis tool publicly available on their website so that all interested parties can test the proposed condition, and the IOA will review the results later in the year. Until that time, the IOA cautions the use of the proposed planning condition.'

3.3.5 In April 2015, an Amplitude Modulation Working Group (AMWG) formed by the IOA issued a discussion document entitled 'Methods for Rating Amplitude Modulation in Wind Turbine Noise'. The document presented three methods that can be used to quantify the level of AM at a given measurement location. After extensive consultation a preferred method of measuring OAM was recommended by the IOA in a report called 'Final Report - A Method for Rating Amplitude Modulation in Wind Turbine Noise' dated 9th August 2016, which details a preferred method for practitioners to measure and rate AM near operational wind farms. The method calculates an amplitude modulation depth value in decibel (dB) for any given 10 minute period, and the executive summary states:

'The AMWG has not addressed the question of what level of AM in wind turbine noise (when measured by a specific metric) is likely to result in adverse community response or how that response should be evaluated. The psycho-acoustic aspects of AM are not within the scope of this study, but the proposed metric is intended to assist with such further research.'

3.3.6 On 3 August 2015, the UK Department for Energy and Climate Change (DECC), subsequently the Department for Business, Energy and Industrial Strategy (BEIS), commissioned independent consultants WSP Parsons Brinkerhoff to carry out a literature review on OAM (which they refer to simply as AM). The stated aims were as follows:

- 'To review the available evidence on Amplitude Modulation (AM) in relation to wind turbines, including but not limited to the research commissioned and published by RenewableUK in December 2013;

- *To work closely with the Institute of Acoustics' AM working group, who are expected to recommend a preferred metric and methodology for quantifying and assessing the level of AM in a sample of wind turbine noise data;*
- *To review the robustness of relevant dose response relationships, including the one developed by the University of Salford as part of the RenewableUK study, on which the correction (or penalty) for amplitude modulation proposed as part of its template planning condition is based;*
- *To consider how, in a policy context, the level(s) of AM in a sample of noise data should be interpreted, in particular determining at what point it causes a significant adverse impact;*
- *To recommend how excessive AM might be controlled through the use of an appropriate planning condition; and*
- *To consider the engineering/cost trade-offs of possible mitigation measures.'*

3.3.7 Their report (19), 'Wind Turbine AM Review – Phase 2 Report' was published in August 2016 at the same time as the release of the IOA AMWG Final Report and concluded that there is sufficient robust evidence that excessive AM leads to increased annoyance from wind turbine noise and recommended that excessive AM is controlled through a suitably worded planning condition, which will control it during periods of complaint. Those periods should be identified by measurement using the metric proposed by the IOA, and enforcement action would rely upon professional judgement by Local Authority Environmental Health Officers, based on the duration and frequency of occurrence. It is not clear within the body of the report what evidence the authors relied upon to arrive at their conclusions, although the Executive Summary states (page 4):

'It is noted that none of the Category 1 or 2 papers have been designed to answer the main aim of the current review in its entirety. The Category 1 studies have limited representativeness due to sample constraints and the artificiality of laboratory environments, whereas the Category 2 studies generally do not directly address the issue of AM WTN exposure-response. A meta - analysis of the identified studies was not possible due to the incompatibility of the various methodologies employed. Notwithstanding the limitations in the evidence, it was agreed with DECC that the factors to be included in a planning condition should be recommended based on the available evidence and supplemented with professional experience'.

3.3.8 The report (19) states that any planning condition must accord with existing planning guidance and should be subject to legal advice on a case by case basis. Existing guidance would include compliance with the six tests of a planning condition, which in Ireland are embodied in Development Management Guidelines 2007 Chapter 7. The report's authors did not dictate a particular condition to be used but did suggest that any condition should include the following elements (p5):

- *'The AM condition should cover periods of complaints (due to unacceptable AM);*
- *The IoA-recommended metric should be used to quantify AM (being the most robust available objective metric);*
- *Analysis should be made using individual 10-minute periods, applying the appropriate decibel 'penalty' to each period, with subsequent analysis;*

- *The AM decibel penalty should be additional to any decibel penalty for tonality; [tonality means mechanical sound already covered by ETSU noise limits]; and*
- *An additional decibel penalty is proposed during the night time period to account for the current difference between the night and day limits on many sites to ensure the control method works during the most sensitive period of the day.'*

3.3.9 In 2017 a potential noise related planning condition which included consideration of OAM was published in the Acoustics Bulletin magazine (by the IOA) written by a number of acousticians working in the field of wind farm noise in the UK. The approach outlined in the document was not subject to any wider consultation nor has it been endorsed by the IOA, the UK Government or Scottish Government. The lack of robust information regarding the second element is highlighted in the article itself which notes:

'Whilst local authorities and developers have waited for a planning condition that could be applied to newly consented wind farms, or to those already consented but with a suspensive condition, the report Wind Turbine AM Review (WTAMR) by WSP/Parsons Brinckerhoff for DECC arguably did not provide that. In addition there have been a number of comments on WTAMR that we consider should be addressed. The introductory sections and the conditions text represent the broad consensus view of those whose names appear below, following a period of discussion, compromise and agreement. This approach is proposed based on the current state of understanding, but may be subject to modification in light of new research and further robust information.'

'As various people before us have discovered, the derivation of a penalty is not easy. There is not sufficient reliable research to be confident that a penalty system would always provide a fair indication of the impact of AM.'

3.3.10 The article goes on to note that:

'However, to do nothing would be unfair on those wind farm neighbours adversely affected by AM and, in any case, there seems to be general agreement amongst many stakeholders on all sides of the debate that a robust condition including AM is required.'

3.3.11 The topic of AM from wind turbine noise was considered again in the UK in 2022, with a review of evidence commissioned by the UK Government published in the WSP BEIS report 'A review of Noise Guidance for Onshore Wind Turbines,' (October 2022). The report notes that the IOA preferred metric provides a suitable approach to measure and quantify AM near operational wind farms (whilst noting that work is ongoing to refine the approach) but also highlights that further work is required to develop a robust mechanism for controlling AM that can be incorporated into a planning condition. In relation to the potential for a penalty scheme to control AM, the WSP BEIS report notes on page 208 that:

'In practice, the details of applying such a penalty scheme are complicated by the complexities of wind turbine sound measurements. These often involve a considerable amount of data filtering and data aggregation to address the practical difficulties of measuring a highly variable source, which is often also at a level that is relatively low compared with other, fluctuating residual sounds present in the acoustic environment. Such details will need to be carefully considered in further study, and the example planning condition proposed by a group of IOA members in 2017 should be considered as a starting point.'

3.3.12 To note, In March 2024, the International Electrotechnical Commission (IEC) published International Standard 'IEC TS 61400-11-2 Wind energy generation systems – Part 11-2: Acoustic Noise measurement techniques – Measurement of wind turbine sound characteristics in receptor position' was published, which also details an AM measurement method. The method closely resembles that of the IOA AM working groups, though differs in respect to output requirements, and use of worst-case results per wind speed bin.

3.3.13 Whilst AM is discussed in the consultation draft issued by the UK Government in July 2025, until additional guidance is published, the approach set out in the IOA GPG remains valid, the document states (paragraph 7.2.10):

'7.2.1 The evidence in relation to "Excess" or "Other" Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM.'

3.3.14 Persistent OAM can be a source of nuisance to wind farm neighbours. A recent decision of the Irish High Court on the 8th of March 2024 found that frequent and sustained periods of OAM arising from the operational Ballyduff Wind Farm, Co. Wexford, was an unreasonable interference with a neighbour's use and enjoyment of their property, which was located approximately 359 m from the nearest turbine. The residents were awarded monetary damages, in addition to an order being made for one of the turbines to be shut down during certain periods of the day. As of writing, the wind farm operator is appealing this decision, alleging the High Court erred legally and factually in a range of its findings. However it is considered that for instances in which OAM arises, mitigation is possible and is the appropriate response.

3.3.15 The ARWTN guidelines released in June 2026 state with relation to AM that;

'All wind turbines generate AM (or blade swish, to a limited extent), but the occurrence of elevated levels of AM is a complex phenomenon that is likely to be related to a combination of turbine and site characteristics; the current consensus is that AM cannot be predicted.'

3.3.16 And goes on to note that it is 'best controlled through enforcement of planning conditions which include the application of character corrections'.

3.3.17 As a summary, a significant amount of research has been undertaken in relation to OAM and key outcomes of the research are that:

- It is clear that OAM, if it occurs frequently and for sustained periods, it has the potential to result in adverse impacts for wind farm neighbours;
- It is not currently possible to predict if and when OAM will occur at a proposed wind farm site. On sites where OAM has been identified it occurs intermittently and varies in terms of severity;
- There are methodologies available that can be used to measure and quantify OAM, in particular the method produced by the Amplitude Modulation Working Group (AMWG), which was formed by the Institute of Acoustics. The methodology was presented in a report 'Methods for Rating Amplitude Modulation in Wind Turbine Noise' which was published in April 2015;
- Whilst it is possible to measure and quantify OAM using the AMWG methodology (which provides an AM rating for each 10 minute period), further study is still

required to help quantify what level of OAM, if any, is acceptable. This is complicated by the fact that it is unclear whether a small amount of OAM that occurs regularly is likely to be more (or less) annoying than a large amount of OAM that occurs very infrequently; and

- Notwithstanding a lack of a defined threshold detailing what level of OAM is acceptable, there are measures available which have been shown to mitigate OAM should it occur. Measures can include:
 - Changes to the operation of the relevant wind turbine(s) by changing parameters such as blade pitch;
 - Addition of blade furniture (such as vortex generators) to alter the flow of air over the wind turbine blades; and, in extreme cases,
 - Targeted wind turbine shutdowns in specific conditions where OAM is found to occur.

3.3.18 Where mitigation is required, it needs to be designed on a site-specific basis.

4 Methodology

4.1 Assessing Operational Noise Impact

4.1.1 To undertake an assessment of the operational noise impact in accordance with the requirements of the WEDG 2006, the following steps are required:

- Specify the location of the wind turbines for the Proposed Wind Farm;
- Measure the background noise levels as a function of on-site wind speed at a selection of representative Noise Monitoring Locations (NML);
- Establish for each NML the Total WEDG Noise Limits on analysis of the measured background noise levels;
- Identify the locations of all nearby noise sensitive receptors and select a sample of relevant Noise Assessment Locations (NAL). For each NAL, identify the most representative measured background noise data;
- Specify the likely noise emission characteristics of the wind turbines for the Proposed Wind Farm and all nearby cumulative wind turbines;
- Calculate the likely noise immission levels due to the cumulative operation of all relevant wind turbines and compare it to the Total WEDG Noise Limits;
- Determine the Site Specific Noise Limits, which take account of the noise limit already allocated to, or could theoretically be used by other schemes in the area; and
- Calculate the likely noise immission levels due to the operation of the Proposed Wind Farm on its own and compare it to the Proposed Wind Farm's Site Specific Noise Limits.

4.1.2 In order to consider the steps outlined above the assessment has been split into three separate stages:

- Stage 1 – establish the Total WEDG 2006 Noise Limits for each NAL based on the measured background noise levels;
- Stage 2 – undertake a cumulative assessment for locations where noise predictions from the Proposed Wind Farm are within 10 dB of the total noise predictions from the other wind farms/turbines and compare cumulative predictions against the Total WEDG Noise Limits; and
- Stage 3 – establish the Proposed Wind Farm's Specific Noise Limits (at levels below the Total WEDG Noise Limits, where limit apportionment is required) and compare the noise predictions from the Proposed Wind Farm on its own against the proposed Site Specific Noise Limits.

4.1.3 There are a range of turbine makes and models that may be appropriate for the Proposed Wind Farm. In the absence of a confirmed turbine model, this noise assessment models a candidate turbine, the Nordex N149 5.x MW with serrated trailing edge blades and a hub height of 105 m. The Nordex N149 5.x MW has been chosen as the main candidate for the assessment as it is the loudest of the candidates being considered and therefore provides the most precautionary scenario. To consider the full design envelope for the site, additional modelling has been undertaken using two other candidates:

- the Vestas V150 6.0 MW with serrated trailing edge blades and 105 m hub; and,

- the Nordex N133 4.8 MW with normal blades and 110 m hub.

4.1.4 Predictions for all three candidates have been included when assessing the Proposed Wind Farm against its Site Specific Noise Limits (as shown on Figures A1.4). All candidates modelled are representative of the type of turbine that could be installed at the site.

4.1.5 Consultation

4.1.6 Comments regarding noise and vibration were included in the Scoping Responses from three consultees, namely the response from Transport Infrastructure Ireland (September 2024), HSE Environmental Health (October 2024), and Fáilte Ireland (September 2024).

4.1.7 The Transport Infrastructure Ireland (TII) response states:

‘The EIAR should have regard to TII’s Environmental Assessment and Construction Guidelines, including the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014),

The EIAR should consider the European Communities (Environmental Noise) Regulations, 2018, (S.I. no. 549 of 2018), and how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (National Roads Authority, 2014)),’

4.1.8 The *Environmental Assessment and Construction Guidelines* states that;

“The purpose of this document is to provide guidance on the treatment of noise and vibration during the planning and design of national road schemes.”

4.1.9 It is not, intended for use for wind farm development or similar. Nonetheless, the document has been considered, as requested by Transport Infrastructure Ireland, to consider whether road traffic noise mitigation needs to be incorporated within the Proposed Development.

4.1.10 Section 2.3.1 of the document provides guidance on when road traffic noise mitigation measures are deemed necessary, however, the Proposed Development does not meet the stated criteria that would warrant the requirement for noise barriers, or any other noise mitigation measures, to be implemented.

4.1.11 Section 2.3.2 of the document provides some guideline noise levels that are “typically deemed acceptable,” for construction noise occurring on the road network, however, it is noted that those levels are higher than the levels adopted within this EIAR in respect of the construction noise assessment. Therefore, no further cognisance has been given to these recommended levels (on the understanding that if it meets the noise thresholds adopted within the EIAR assessment it will also meet the National Roads Schemes guidance).

4.1.12 Given that the ‘*Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014)*’ relate to the good practice application of the ‘*Environmental Assessment and Construction Guidelines*’, they have also not been considered further.

4.1.13 The HSE Environmental Health response sets out a number of requirements for the consideration of noise, including the need to consider construction noise and the requirement for a baseline survey to be conducted. All of the HSE requirements are covered within this EIAR, except a request to consider the Draft WEDG 2019 guidance, due to the significant limitations identified in the WEDG2019, as already explained (section 2).

4.1.14 The Fáilte Ireland response referred to their 'Guidelines for the Treatment of Tourism in an EIA'. With relation to noise this states that (noise references in bold for emphasis);

*'A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of **noise and vibration** can be significant. Construction adjoining hotels for example should consider the sensitivity of the development and ensure mitigation is in place.*

Material Assets; Traffic and Transport

*The different transport patterns associated with tourism activities is a key impact of tourism and should be considered especially for tourism projects. These produce temporal and seasonal changes on the norm and specialist consideration and interpretation should be given. Tourism proposals should, where possible, be well served by public transport and should be accessible by modes other than the car. The impact of traffic on tourism assets can be substantial and can vary in severity according to season, the weather, etc. The impact of construction traffic can be a particular concern in tourism sensitive areas in terms of **noise pollution** and visual impact. The construction programme of developments should work to avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.'*

4.1.15 The Proposed Wind Farm is located in a remote location and will be unlikely to impact aspects such as planned tourism events / festivals with regards to noise, but this can be kept under review as the Proposed Wind Farms timeline progresses.

4.2 Stage 1 Assessment Methodology – Setting the Total DoEHLG 2006 Guidelines Noise Limits

Wind Shear

4.2.1 Wind shear is defined as the variation in wind speed with height above ground. Due to wind shear, wind speeds recorded on one meteorological mast at different heights are usually different, generally the higher the anemometer the higher the wind speed recorded. For example, if a wind speed of 4 ms⁻¹ is recorded at 80 m height, 3.5 ms⁻¹ may be recorded at 40 m and 2.5 ms⁻¹ may be recorded at 10 m.

4.2.2 Hub height wind speed is the key wind speed for a wind farm noise assessment, as it is the wind speed at hub height which will determine the noise emitted by the wind turbines and informs the turbine control system. Ideally, both wind turbine noise predictions and background noise level measurements should refer to hub height wind speed (or a representation thereof), ensuring that there is no discrepancy between the wind speed at which the noise is emitted and the wind speed at which the corresponding background noise is measured.

- 4.2.3 The IOA GPG states that one of three methods of wind speed measurement may be adopted. For this assessment wind speeds were recorded by a LiDAR for a range of heights between 40 m and 120 m. In line with 'Method A' of Section 2.6.3 of the IOA GPG, the wind speed data recorded at the nearest heights to the proposed turbine hub height (105 m and 120 m) were used to extrapolate to hub height wind speeds (110 m) which were then standardised to 10 m height. When considering the turbine envelope (180 m to turbine tip), 110 m is the highest potential hub height that can be reached when considering each of the candidate turbines; to be conservative wind speeds have been standardised using this maximum hub height of 110 m.

Noise Impact Criteria in the WEDG

- 4.2.4 Analysis of the measured data has been undertaken in accordance with ARWTN and current good practice to determine the pre-existing background noise environment and to establish the daytime and night-time Total WEDG Noise Limits for each NAL.
- 4.2.5 The Total WEDG Noise Limits for the daytime have been set at:
- 40 dB(A) where background noise levels are below 30 dB(A); and,
 - 45 dB(A) or background noise plus 5 dB, whichever is the greater, where background noise levels are greater than 30 dB(A).
- 4.2.6 Total WEDG Noise Limits at night-time has been set at 43 dB(A) or background plus 5 dB, whichever is the greater.
- 4.2.7 This 'Total' limit relates to noise from all wind farm developments in the area. The limit was chosen with due regard to the guidance in the WEDG 2006.
- 4.2.8 The acceptable limits for wind turbine operational noise are clearly defined for all time periods by the application of the WEDG 2006 methodology. Consequently, the test applied to operational noise is whether or not the predicted wind turbine noise immission levels at nearby noise sensitive properties lie below the WEDG Noise Limits. Depending on the levels of background noise, the satisfaction of the WEDG derived limits can lead to a situation whereby, at some locations under some wind conditions and for a certain proportion of the time, the wind turbine noise would be audible.

4.3 Assessment of likely effects and the requirement for a cumulative assessment (Stage 2)

- 4.3.1 The 2006 WEDGs do not include any information on the assessment of cumulative noise impacts, therefore the guidance provided within the IOA GPG (2013) has been adopted. The IOA GPG contains a detailed section on cumulative noise and provides guidance on where a cumulative assessment is required. Section 5.1.4 and 5.1.5 of the GPG state:

'During scoping of a new wind farm development consideration should be given to cumulative noise impacts from any other wind farms in the locality. If the proposed wind farm produces noise levels within 10 dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary.'

Equally, in such cases where noise from the proposed wind farm is predicted to be 10 dB greater than that from the existing wind farm (but compliant with ETSU-R-97 in its own right), then a cumulative noise impact assessment would not be necessary.'

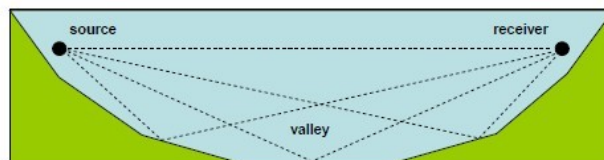
- 4.3.2 An assessment was undertaken at each of the noise sensitive receptors proximate to the Proposed Wind Farm and other nearby operational wind farm developments to determine whether the wind turbine noise immission from the Proposed Wind Farm were within 10 dB of the wind turbine noise immission from the other schemes. Where predictions were found to be within 10 dB of each other, then a cumulative noise assessment was undertaken to determine the likely impacts of the Proposed Wind Farm, however, if wind turbine immission were more than 10 dB apart then a cumulative noise assessment was not required.

Noise Prediction / Propagation Model

- 4.3.3 Modelling was undertaken using the methodology presented in ISO 9613-2: 2024 'Acoustics – Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors' (20).
- 4.3.4 The ISO 9613-2 model can take account of the following factors that influence sound propagation outdoors:
- Geometric divergence;
 - Atmospheric absorption;
 - Reflecting obstacles;
 - Screening;
 - Vegetation; and,
 - Ground attenuation.
- 4.3.5 The model uses as its acoustic input data the octave band sound power output of the turbine and calculates, on an octave band basis, attenuation due to the factors above, as appropriate.
- 4.3.6 There is currently no standard approach to specifying error bands for wind turbine noise predictions, however, Table 4 of ISO 9613-2 suggests an estimated of accuracy for downwind conditions of ± 3 dB(A) for calculations of up to 1000 m for broadband noise levels.
- 4.3.7 The ISO 9613-2 noise model is intended for the modelling of many noise source types and was not written specifically for the modelling of wind turbine noise, however, a number of studies have been undertaken to determine the standard's accuracy for wind turbine noise predictions and some amendments to the propagation model have been widely adopted for the modelling of wind turbine noise in the UK, primarily through the incorporation of recommendations in the IOA GPG.
- 4.3.8 In 1998, a European Commission (EC) research project into wind farm noise propagation over large distances, published 'Development of a Wind Farm Noise Prediction Model,' JOULE project JOR3-CT95-0051, which identified a simplified version of ISO 9613-2 as the most suitable prediction method at that time.

- 4.3.9 Additional wind farm specific studies have also been undertaken to validate the use of the Standard and these are referenced in Section 4 of the IOA GPG, which goes on to conclude that: *'The outcome of this research has demonstrated that the ISO 9613-2 standard in particular, which is widely used in the UK, can be applied to obtain realistic predictions of noise from on-shore wind turbines during worst case propagation conditions (i.e. sound speed gradients due to downwind conditions or temperature inversions), but only provided that the appropriate choice of input parameters and correction factors are made.'*
- 4.3.10 It should be noted that the IOA GPG references the 1996 version of the 9613 standard, which was updated in 2024, however, use of either version when adopting the IOA GPG amendments to the noise model, results in negligible differences in predicted noise levels.
- 4.3.11 TNEI's experience of undertaking compliance monitoring for operational wind farms also indicates that noise predictions undertaken using ISO 9613-2, whilst following the guidance in the IOA GPG, show a good correlation with measured noise levels, with predicted levels usually slightly higher than measured levels.
- 4.3.12 The IOA GPG quotes a comparative study undertaken in Australia that indicated ISO 9613-2 can, in some conditions, under-predict ground attenuation effects and the potential for additional reflection paths 'across a valley', whilst slightly over-predicting wind turbine noise on flat terrain. With due regard to this study, the IOA GPG states that a 'further correction of +3 dB should be added to the calculated overall A-weighted level for propagation 'across a valley', i.e. a concave ground profile or where the ground falls away significantly between a turbine and the receiver location.' The potential reflection paths are illustrated in Schematic 4.1 below.

Schematic 4.1: Multiple reflection paths for sound propagation across concave ground



Source: IOA GPG, page 21, Figure 5

- 4.3.13 A formula from the JOULE Project JOR3-CT95-0051 dated 1998 is suggested for determining whether a correction is required.

$$h_m \geq 1.5 \times (\text{abs}(h_s - h_r) / 2)$$

where h_m is the mean height above the ground of the direct line of sight from the receiver to the source (as defined in ISO 9613-2, Figure 3), and h_s and h_r are the heights above local ground level of the source and receiver respectively).

- 4.3.14 The calculation of h_m requires consideration of the digital terrain model and needs to be performed for each path between every turbine and every receiver. Interpretation of the results of the calculation above and the subsequent inclusion of a concave ground profile correction requires careful consideration with any topographical variation considered in the context of a site.
- 4.3.15 The IOA GPG also discusses the potential for topographical screening effects of the terrain surrounding a wind farm and the nearby noise sensitive receptors. Although barrier

screening effects in ISO 9613-2 can make corrections of up to 15 dB, the IOA GPG states that where there is no line of sight between the highest point on the rotor and the receiver location a reduction of no more than 2 dB may be applied.

4.4 Noise Propagation Parameters

- 4.4.1 The noise immission levels have been calculated using the full ISO 9613-2 model with a receiver height of 4.0 m above local ground level, mixed ground ($G=0.5$) and air absorption based on a temperature of 10 °C and 70 % relative humidity. The modelling parameters reflect current good practice as detailed within the IOA GPG.
- 4.4.2 The wind turbine noise immission levels are based on the $L_{A90,10 \text{ minute}}$ noise indicator in accordance with the recommendations in the 2006 WEDGs, which were obtained by subtracting 2 dB(A) from the turbine sound power level data (L_{Aeq} indicator).
- 4.4.3 A topographical assessment has been undertaken between each NSR and wind turbine location to determine whether any concave ground profiles exist between the source and receiver (noise sensitive receptor). Analysis undertaken using a combination of CadnaA (21) and an Excel model found that if the formula in the IOA GPG is applied directly, then topographical corrections are required.
- 4.4.4 In addition, an assessment has been undertaken to determine whether any topographical screening effects of the terrain occur where there is no direct line of sight between the highest point on the turbine rotor and the receiver location. Upon analysis of each NSR it was found that further barrier corrections are required.
- 4.4.5 The need to include a concave ground/screening correction may change depending on the final location of the turbines (following micro-siting) and the final turbine hub height. Nevertheless, turbine noise levels will have to meet the noise limits detailed in planning conditions regardless of any difference in noise propagation caused by topography. Should planning permission be granted for the Proposed Wind Farm, the need to apply a concave slope correction will need to be considered by the Applicant prior to the final selection of a turbine model for the Proposed Wind Farm.
- 4.4.6 The cumulative assessment has taken into account directivity effects in line with good practice. The directivity of wind turbines has been recognised for some time. Building on earlier work by NASA, in 1988 Wyle Laboratories studied sound propagation using an omnidirectional loudspeaker source elevated 80 ft above ground, in upwind, downwind and cross wind situations, and in both flat and hilly terrain, then compared those measurements to measured data from actual wind turbines. Their study quantified directivity factors for a limited frequency range but was unable to conclusively demonstrate the anticipated directivity effects on real wind turbines. It also highlighted, but was unable to explain, measured differences observed between flat and hilly terrain.
- 4.4.7 Hubbard (1990) (IOA GPG Section 4.4.3) described a number of factors believed to influence propagation and directivity, notably refraction caused by vertical wind and temperature gradients. In the downwind direction the wind gradient causes the sound rays to bend toward the ground, whereas in the upwind direction the rays curve upward away from the ground. Upwind of the turbine this results in a region of increased attenuation termed the 'shadow zone'. The excess attenuation is frequency dependent, with lowest frequencies least attenuated. Relating this to the earlier NASA studies, Hubbard noted that the distance

from the source to the edge of the shadow zone is related to the wind speed gradient and the elevation of the source, which for a typical turbine source was calculated to be approximately 5 times the source height.

- 4.4.8 This observation was adopted in the IOA GPG, which states (Section 4.4.2) ‘Such reductions (due to “shadow zone” refraction effects) will in practice only progressively come into play at distances of between 5 and 10 turbine tip heights’, while Section 4.4.3 provides graphical examples of increasing broadband directivity with increasing tip height scaling in both flat and hilly terrain, without qualifying either of those designations.
- 4.4.9 The IOA GPG recommends (Section 4.4.1) that directivity attenuation factors adopted in any assessment should be clearly stated. The noise model has considered the effect of directivity and in line with current good practice the attenuation values used are in detailed in Table 4.1 These are based upon the examples given in the IOA GPG (Section 4.4.2), using interpolation where required.

Table 4.1 Wind Directivity Attenuation Factors used in Modelling

Direction (°)	0	15	30	45	60	75	90	105	120	135	150	165
Attenuation dB(A))	-10	-9.9	-9.3	-8.3	-6.7	-4.6	-2	0	0	0	0	0
Direction (°)	180	195	210	225	240	255	270	285	300	315	330	345
Attenuation (dB(A))	0	0	0	0	0	0	-2	-4.6	-6.7	-8.3	-9.3	-9.9

4.5 Setting the Site Specific Noise Limits (Stage 3)

- 4.5.1 Summary Box 21 of the IOA GPG states:

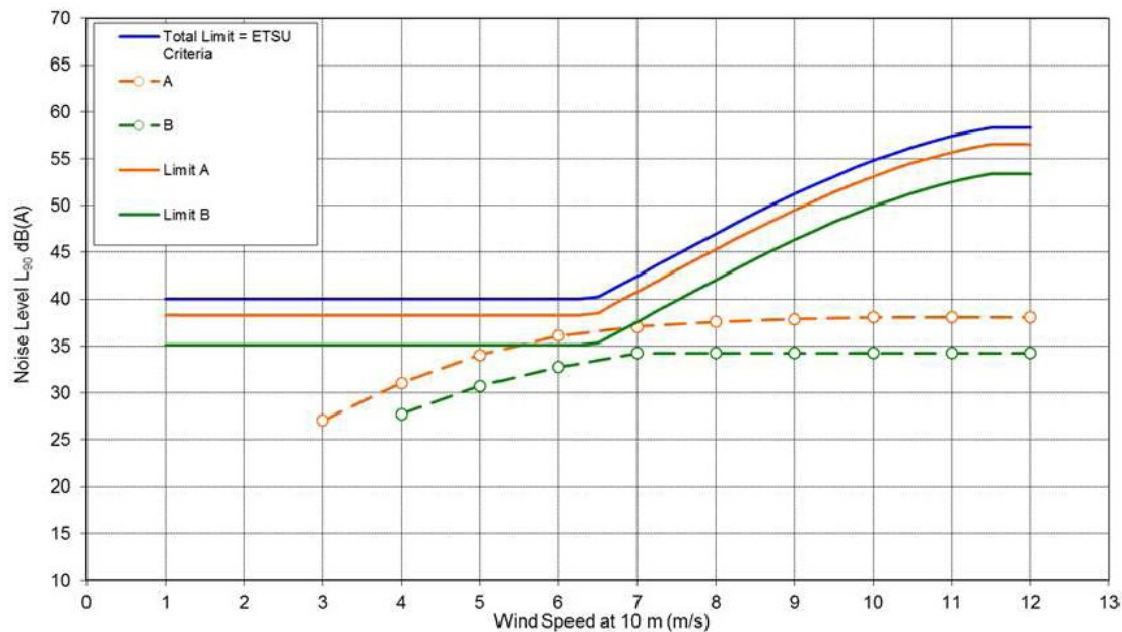
‘Whenever a cumulative situation is encountered, the noise limits for an individual wind farm should be determined in such a way that no cumulative excess of the total ETSU-R-97 noise limit would occur.’

- 4.5.2 In order to determine Site Specific Noise Limits at receptors in proximity to the Proposed Wind Farm (where required), the guidance detailed within Section 5.4 of the IOA GPG has been considered. The options detailed within Section 5.4 of the IOA GPG are summarised below.

Limit Apportionment

- 4.5.3 Limit apportionment considers the potential to share out the noise limit with other proposed wind farms in the area. This approach is demonstrated in Graph 4.1 below which is reproduced from the Section 5.4 of the IOA GPG. In this example the total limit (shown in blue) is shared between two proposed wind farms (A and B). The two noise limits for a given receptor (the solid orange and green lines) when added together equate to the total noise limit, and the predicted levels for each wind farm (the dashed lines) meet the specific limits established for each wind farm.

Graph 4.1: Limit Apportionment Example



Significant Headroom

- 4.5.4 The limit derivation can also be undertaken with consideration to the amount of headroom between another scheme's predictions and the Total Noise Limit. With regard to this Section 5.4.11 of the IOA GPG states:

'In cases where there is significant headroom (e.g. 5 to 10 dB) between the predicted noise levels from the existing wind farm and the Total Noise Limits, where there would be no realistic prospect of the existing wind farm producing noise levels up to the Total Noise Limits, agreement could be sought with the LPA as to a suitable predicted noise level (including an appropriate margin to cover factors such as potential increases in noise) from the existing wind farm to be used to inform the available headroom for the cumulative assessment without the need for negotiation or cumulative conditioning. This may be the case particularly at low wind speeds.'

- 4.5.5 With this in mind, where appropriate, an additional 2 dB buffer has been added to the other schemes' turbine noise predictions. This is considered to be a suitable buffer in accordance with Section 5.4.11 of the IOA GPG and would represent a 60% increase in emitted noise levels from the other schemes.

10 dB Rule

- 4.5.6 Where predicted wind turbine noise levels from the nearby wind farms/ turbine schemes are found to be >10 dB below the Total WEDG Noise Limits then it has been deemed appropriate to allocate the entire noise limit to the Proposed Wind Farm as the existing schemes will use a negligible proportion of the noise budget. Further information on the approach to apportionment is provided in Section 6.4.3 below.

5 Baseline

5.1 Identification of Potential Noise Receptors

- 5.1.1 The WEDG 2006 state that *‘a noise sensitive location includes any occupied dwelling house, hostel, health building or place of worship and may include areas of particular scenic quality or special recreational amenity importance.’* Following a review of NSRs surrounding the Proposed Wind Farm, the closest receptors were found all to be residential properties.
- 5.1.2 Of the identified receptors, a total of eight Noise Monitoring Locations (NMLs) were selected as being appropriate locations to determine a representative baseline for all of the identified NSRs. The location of the NMLs relative to the Proposed Wind Farm are shown on Figure A1.1a in Annex 1.
- 5.1.3 The NMLs were selected following a detailed review of the area using aerial photography and on site checks. Where possible, locations were selected that were subject to minimal influence from other noise sources, such as local watercourses and vegetation.

5.2 Background Noise Survey

- 5.2.1 Background noise monitoring was undertaken for the purposes of setting the Total WEDG Noise Limits. Data was recorded over the period:
- 14th June 2024 – 26th September 2024 at NMLs 1-3, 5 and 7;
 - 17th June 2024 – 26th September 2024 at NMLs 4, 8; and,
 - 17th July 2024 – 26th September 2024 at NML 6.
- 5.2.2 The data was collected over two periods of grid outage, where Dunneill and Kingsmountain Wind Farms (operating in the near vicinity) were both shut down. These periods were used in the analysis to obtain clean baseline noise datasets in the absence of wind farm noise to inform the Total WEDG Noise Limits. Further detail is provided in Section 5.5 below.
- 5.2.3 Details of the exact monitoring periods, the rationale behind the exact kit location and the dominant noise sources observed at each of the NMLs are detailed in the Field Data Sheets (FDS) and installation report included in Annex 2.
- 5.2.4 The NML is the position that the sound level meter was sited at each property, as shown on Figure A1.1a (Annex 1) and summarised in Table 5.1 below.

Table 5.1 Noise Monitoring Locations

NML	X (ITM)	Y (ITM)
NML1	543163	829657
NML2	545131	829617
NML3	545905	829597
NML4	546623	829719
NML5	547829	830365

NML	X (ITM)	Y (ITM)
NML6	544754	822419
NML7	544720	830081
NML8	544890	829807

- 5.2.5 NML5 suffered a fault following a maintenance visit, therefore valid data only exists for this location over the period 14th June 2024 – 25th August 2024.
- 5.2.6 At NML6 (an isolated dwelling to the south of the Proposed Wind Farm) the noise monitoring equipment was sited to minimise the possible influence of the stream leading to Easky Lough that encircles the property. The data collected was clearly affected by the watercourse and has therefore only been used to inform noise limits for this dwelling only.

5.3 Noise Monitoring Equipment

- 5.3.1 Section 2.4 of the IOA GPG includes information on the type and specification of noise monitoring equipment that should be used for background noise surveys and states:

‘Noise measurement equipment and calibrators used on site should comply with Class 1/Type 1 of the relevant standard(s). Enhanced microphone windscreens should be used. Standard windshields of a diameter of less than 100 mm cannot be relied upon to provide sufficient reduction of wind noise in most circumstances.’

- 5.3.2 The noise monitoring equipment used for the background noise survey meets with the requirements of the IOA GPG. Details of the noise monitoring equipment used, the calibration drift recorded and photographs at each NML are detailed in the FDS included in Annex 2. The IOA GPG states that for calibration drift greater than 1 dB the measurements should be discarded. The maximum calibration drift recorded during the noise survey was -0.2 dB as detailed in the FDS therefore no correction was applied to the noise data.
- 5.3.3 Copies of the calibration/conformance certificates for the sound level meters and sound level meter calibrator used for the noise survey are included in Annex 3. All sound level meters conform to Class 1/ Type 1, and were laboratory calibrated within 2 years of any measurements, as per the recommendations of the IOA GPG. The sound level meter calibrator was also laboratory calibrated within 1 year of any measurements, as per the recommendations of the IOA GPG.
- 5.3.4 The microphones were all mounted between 1.2 m and 1.5 m above local ground level, situated between 3.5 m and 20 m from the dwelling and were located *‘in an area frequently used for rest and relaxation’* (Section 2.5.1 of IOA GPG), and away from obvious local sources of noise such as boiler flues, fans and running water where practicable. The sound level meters were situated as far away from hard reflective surfaces such as fences and walls as practicable.
- 5.3.5 All measurement systems were set to log the L_{A90} and L_{Aeq} noise levels in ten-minute intervals continuously over the deployment period.

5.4 Meteorological Data

- 5.4.1 The 2006 WEDGs state on Page 29 that:

‘Noise limits should be applied to external locations and should reflect the variation in both turbine source noise and background noise with wind speed.’

- 5.4.2 ARWTN states on Page 13 that:

- 5.4.3 *‘Background sound levels for the day (derived from the “quiet day” periods) and night, are related to standardised wind speeds determined from hub height wind speeds on the Proposed Wind Farm being assessed’*

- 5.4.4 This allows comparison of actual operating noise levels from the turbines with the noise levels that would otherwise be experienced at a dwelling.

- 5.4.5 The preferred methodologies for measuring or calculating wind shear are detailed in Section 4.2.1.

- 5.4.6 For the Proposed Wind Farm, concurrent wind speed and direction were recorded using a LiDAR device which was located within the Proposed Wind Farm (ITM location 545983, 828334). The meteorological data was collected and provided by the Applicant. The wind data measured at 105 m and 120 m height was used to calculate hub height wind speeds (at 110 m). These hub height wind speeds were then standardised to a height of 10 m in accordance with current good practice. Wind speed and direction data were collected over the same time-scale and averaged over the same ten-minute periods as the noise data to provide the analysis of the measured background noise as a function of wind speed and direction.

- 5.4.7 The installation report and calibration information for the LiDAR device can be provided upon request.

- 5.4.8 Tipping bucket rain gauges were installed at NML1, NML6 and NML7 for the duration of the noise survey to record periods of rainfall, the time for the gauges was synchronised to the sound measurements. As per the recommendations in Section 3.1.9 of the IOA GPG, the rain data were analysed by TNEI and the 10-minute periods that contained a registered rainfall event and the preceding 10-minute periods have been excluded. All excluded rainfall periods are shown on Figures A1.2a-A1.2h (Annex 1) as blue squares.

- 5.4.9 Isolated instances of raised levels occurred at each of the NMLs, and these were manually excluded. The periods of manual exclusions are shown on Figures A1.2a-A1.2h (Annex 1) as red triangles.

5.5 Influence of Existing Turbines on Background Measurements

- 5.5.1 In Section 2.2.2 the IOA GPG states that background noise levels should be determined such that they are not influenced by existing turbine noise; given the Dunneill and Kingsmountain wind farms are in operation in the area and would potentially contaminate noise measurements due to their proximity; the noise data collected only during periods when the turbines were switched off was used for deriving background noise.

- 5.5.2 Two periods of grid related outages were scheduled during the summer of 2024 (such that grid related maintenance, upgrades, can be made), and noise measurements were planned

such they coincided with the outage periods. The shutdowns occurred over the following dates:

- 17/06/2024 07:50 to 21/06/2024 12:20; and,
- 13/08/2024 07:00 to 16/08/2024 08:40.

5.5.3 In addition to utilising the periods during the grid outages, data was also considered during periods where the wind farms were off due to low wind speed conditions (i.e. where the wind speeds were lower than the cut in wind speeds of the wind turbines). The periods were infrequent over the monitoring period but allowed further valid data to be included at the lower wind speeds within the assessment.

5.5.4 The Applicant provided turbine operation data (SCADA data) to allow validation of the periods of shut down within the analysis (from either grid outages or low wind speed conditions).

5.5.5 For NML6 it was considered that due to the large separation distances between Dunneill and Kingsmountain wind farms, and the monitoring location (some 8 km, and therefore no influence from wind turbine noise), no filtering for turbine operation would be required.

5.6 Directional Filtering of Background Noise

5.6.1 In Section 3.1.22 of the IOA GPG the need to directionally filter background noise data is discussed. Where a receiver is located upwind of a dominant local noise source whilst also being systematically downwind of the turbines then it may be necessary to filter background noise data particularly when this corresponds to the prevailing wind direction.

5.6.2 For this site there are no dominant local noise sources so no directional filtering was undertaken.

5.6.3 NML6 was filtered for downwind directions from the wind farms, but following review it was found that the data is heavily contaminated by noise from water courses in the area and directional filtering made no discernible difference to the dataset.

5.7 Analysis of Measured Data

5.7.1 Analysis of the measured data has been undertaken in accordance with the recommendations in the 2006 WEDGs, ARWTN and the IOA GPG.

5.7.2 Meteorological data was screened upon receipt by TNEI and where rainfall occurred, the noise and wind speed data has been excluded from the assessment as detailed in Section 5.4 above.

5.7.3 Time series graphs are provided in Annex 4, which show the variation in measured wind speed/direction and noise level over the monitoring period. These graphs also show where data was excluded, either due to rainfall, birdsong (dawn chorus) or manual exclusions due to atypical data.

5.8 Prevailing Background Noise Level

5.9 Table 5.2 and Table 5.3 summarise the derived prevailing background noise levels from the baseline survey.

Table 5.2 Summary of Prevailing Background Noise Levels during Quiet Daytime Periods ($L_{A90,10 \text{ min}}$ dB(A))

NML	Wind Speed (ms^{-1}) as standardised to 10 m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	23.6	24.3	26.0	28.4	31.3	34.4	37.4	40.1	42.3	43.6	43.9	43.9
NML2	24.7	26.0	27.3	28.7	30.1	31.7	33.4	35.3	37.5	39.8	42.5	42.5
NML3	22.1	22.3	23.5	25.4	28.0	30.9	34.1	37.2	40.1	42.5	44.4	44.4
NML4	21.2	21.9	23.1	24.9	27.0	29.6	32.4	35.4	38.5	41.7	44.8	44.8
NML5	29.2	29.7	30.6	32.0	33.7	35.9	38.3	41.1	44.1	47.3	50.8	50.8
NML6	36.6*	36.6	36.6	36.6	36.8	37.2	37.9	38.8	40.0	41.5	43.2	45.1
NML7	27.8	28.7	30.0	31.6	33.5	35.6	37.7	39.9	42.1	44.1	46.0	46.0
NML8	28.8	29.0	29.9	31.4	33.3	35.4	37.5	39.4	40.9	41.8	42.0	42.0

Table 5.3 Summary of Prevailing Background Noise Levels during night-time Periods ($L_{A90,10 \text{ min}}$ dB(A))

NML	Wind Speed (ms^{-1}) as standardised to 10 m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	21.2*	21.2	22.2	24.1	26.7	29.7	33.0	36.4	39.6	42.4	44.7	46.1
NML2	24.8	24.9	25.3	25.9	26.9	28.2	29.9	32.1	34.8	38.0	41.7	46.1
NML3	19.8*	19.8	20.3	21.9	24.3	27.3	30.7	34.2	37.8	41.1	44.0	46.3
NML4	19.9*	19.9	20.4	21.8	23.9	26.7	29.9	33.4	37.1	40.7	44.3	47.5
NML5	27.0	27.2	27.8	28.9	30.4	32.3	34.7	37.4	40.4	43.9	47.6	51.7
NML6	34.0	34.3	34.6	34.9	35.4	36.0	37.0	38.2	39.9	42.0	44.8	48.1
NML7	27.0*	27.0	27.4	28.5	30.2	32.4	34.9	37.6	40.3	43.1	45.6	47.9
NML8	27.3*	27.3	27.6	28.6	30.3	32.3	34.6	36.9	39.0	40.8	42.0	42.5

*restricted where derived minimum occurs at lower wind speeds and derived maximum occurs at higher wind speeds, see Section 5.8.4.

5.9.1 A series of graphs are presented for each of the NMLs to illustrate the data collected, these are included as Figures A1.2a - A1.2h (Annex 1). There is a set of graphs for each NML, which

show the range of wind speeds and directions recorded during the survey, the 10-minute average wind speed plotted against the recorded $L_{A90, 10min}$ noise level, and a calculated 'best fit' polynomial regression line for both Quiet daytime and night-time periods. Each Figure also includes a table with the number of measured data points per integer wind speed bin and the prevailing measured background noise level. An additional set of time series graphs showing the excluded data have been included within Annex 4.

- 5.9.2 The background noise levels have been calculated using a best fit polynomial regression line of no more than a fourth order through the measured $L_{A90, 10min}$ noise data, as required by ARWTN and the IOA GPG.
- 5.9.3 In line with the recommendations included in Section 3.1.21 of the IOA GPG, where relevant, the lowest derived noise level has been adopted for all windspeeds below where the derived minimum occurs. The wind speeds and values that this occurs for have been highlighted in Tables 5.2 and 5.3 as asterisked values. This is also presented on the figures, the final regression analysis curve is shown as a continuous black line.
- 5.9.4 Section 2.9.5 of the IOA GPG recommends that no fewer than 200 valid data points should be recorded in each of the Quiet daytime and night-time periods, with no fewer than 5 valid data points in any 1 ms^{-1} wind speed bin. Where the background noise data has been filtered by wind direction the IOA GPG (Section 2.9.6) recommends that 100 data points and 3 per wind speed bin may be appropriate.
- 5.9.5 For the quiet daytime periods, no datapoints were measured in the 8 ms^{-1} wind speed bin, and 4 datapoints in the 9 ms^{-1} bin. For the 10 & 11 ms^{-1} bins more than 5 datapoints were measured. Whilst less than the recommended datapoints were measured in the 8 & 9 ms^{-1} bins, the data that was measured at 9 ms^{-1} are tightly banded indicating the measurements are valid and representative of baseline noise levels at this wind speed, and also follow the general trend into the 10 & 11 ms^{-1} wind speed bins. Any wind speed bin between 0 - 12 ms^{-1} in which valid data exists has been included in the regression analysis.
- 5.9.6 The number of data points measured in each wind speed bin for each receptor, once exclusions were applied, are summarised in Figures A1.2a - A1.2h (Annex 1). The Figures also show the final prevailing background noise levels which have been determined following the analysis detailed above.

6 Noise Assessment Results

6.1 Noise Sensitive Receptors and Noise Assessment Locations

- 6.1.1 As part of the initial noise modelling work all NSRs in proximity to the Proposed Wind Farm were identified. A total of thirteen NSRs were chosen as representative Noise Assessment Locations (NALs). The NALs were chosen to represent the noise sensitive receptors located closest to the Proposed Wind Farm. The modelling results for the NALs have been presented within the main body of this report whilst an assessment for all other NSRs has been included within Annex 5 of this report for completeness. Each NAL and NSR are shown on Figures A1.1a. Figures A1.1b-d present the locations of NSRs around the Proposed Wind Farm at a larger scale for clarity (Annex 1).
- 6.1.2 Predictions of noise at the NALs ensures that the assessment reports the worst case (loudest) noise immission level expected at each group of NSRs. Table 6.1 details which NML has been used to set noise limits for each NAL and a similar table detailing which NML has been used to set limits at each NSR has also been included within Annex 5.

Table 6.1 Noise Assessment Locations

Noise Assessment Location (NAL)	Easting (m)	Northing (m)	Elevation (m AOD)	Distance to Nearest Turbine (m)	Background Noise Data Used
NAL1 (NSR084)	541330	828834	121.57	2347	NML1
NAL2 (NSR015)	543341	829184	141.21	994	NML1
NAL3 (NSR027)	543819	830001	117.97	1243	NML1
NAL4 (NSR020)	544723	830052	119.55	1090	NML7
NAL5 (NSR004)	545239	829418	155.73	815	NML2
NAL6 (NSR002)	545914	829099	189.74	728	NML3
NAL7 (NSR013)	546618	829694	178.6	890	NML4
NAL8 (NSR008)	547834	829917	186.44	772	NML4
NAL9 (NSR105)	550429	830453	143.37	3119	NML4
NAL10 (NSR104)	552926	827309	241.52	4377	NML4
NAL11 (NSR103)	544758	822431	194.2	3703	NML6
NAL12 (NSR102)	539410	826328	119.99	4138	NML1

Noise Assessment Location (NAL)	Easting (m)	Northing (m)	Elevation (m AOD)	Distance to Nearest Turbine (m)	Background Noise Data Used
NAL13 (NSR101)	539680	827953	101.45	3792	NML1

6.2 Noise Emission Characteristics of the Wind Turbines

6.2.1 This assessment models a candidate turbine, the Nordex N149 5.x MW with serrated trailing edge blades and a hub height of 105 m. The Nordex N149 5.x MW has been chosen as the main candidate for the assessment as it is the loudest of the candidates being considered and therefore provides the most precautionary scenario. In order to consider the full design envelope for the site, additional modelling has been undertaken using two other candidates:

- the Vestas V150 6.0 MW with serrated trailing edge blades and 105 m hub; and,
- the Nordex N133 4.8 MW with normal blades and 110 m hub.

6.2.2 For the cumulative assessment the turbines considered are summarised in Annex 6 and the noise immission levels from the cumulative schemes are included within Annex 5. Sound Power Level Data for the candidate turbines used in this assessment is shown in Annex 7; data for some turbines has not been included due to data confidentiality. The detailed noise data can be made available to the relevant decision makers (ACP / LPA) upon request, subject to the signing of the appropriate Non-Disclosure Agreement.

6.2.3 Due to the differences in the way in which levels are provided by the different manufacturers, TNEI has accounted for uncertainty using the guidance contained within Section 4.2 of the IOA GPG (2013). Details of the sound power level, octave data and measurement uncertainty used for the turbine types considered in this assessment which are not subject to data confidentiality are included in Annex 7.

6.2.4 The source data provided for each turbine does not indicate a tonal component and as such no tonal penalty (as envisaged in ARWTN) was applicable. This is consistent with the guidance provided in the IOA GPG which states, in Section 4.2.7:

'It is highly unlikely that any specific information on tonality at representative receptor separation distances in accordance with the ETSU-R-97 methodology will be available at the planning application stage. When such information is available, it should be appropriately applied. It is standard to control the potential presence of tones in practice through the use of suitable planning conditions.'

6.2.5 Manufacturer noise level data is usually supplied based on a turbine of a specific hub height although the noise levels are presented as standardised to 10 m height. Accordingly, the noise data used in this assessment corrects the published turbine noise data following the guidance detailed in Section 4.3 of IOA GPG Supplementary Guidance Note 4, where applicable. The hub heights considered for the cumulative wind farm/turbine developments are summarised in Annex 6, in addition to their grid references. The location of the wind turbines are also shown visually on Figure A1.2, Annex 1.

6.3 Total WEDG Noise Limits (Stage 1)

6.3.1 The Total WEDG Noise Limits have been established for each of the NALs as detailed in

6.3.2 Table 6.2 and Table 6.3 below, based on a fixed minimum level of 40 dB(A) (daytime) and 43 dB(A) (night-time).

Table 6.2 Total WEDG Noise Limits Daytime

Location	Wind Speed (ms ⁻¹) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL1 (NSR084)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
NAL2 (NSR015)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
NAL3 (NSR027)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
NAL4 (NSR020)	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
NAL5 (NSR004)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
NAL6 (NSR002)	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
NAL7 (NSR013)	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
NAL8 (NSR008)	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
NAL9 (NSR105)	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
NAL10 (NSR104)	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
NAL11 (NSR103)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.5	48.2	50.1
NAL12 (NSR102)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
NAL13 (NSR101)	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9

Table 6.3 Total WEDG Noise Limits Night-time

Location	Wind Speed (ms ⁻¹) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL1 (NSR084)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
NAL2 (NSR015)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
NAL3 (NSR027)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
NAL4 (NSR020)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
NAL5 (NSR004)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
NAL6 (NSR002)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
NAL7 (NSR013)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
NAL8 (NSR008)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
NAL9 (NSR105)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
NAL10 (NSR104)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
NAL11 (NSR103)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.2	44.9	47.0	49.8	53.1
NAL12 (NSR102)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
NAL13 (NSR101)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1

6.4 Predicting the requirement for a cumulative assessment and the likely effects (Stage 2)

6.4.1 A likely cumulative noise assessment was undertaken for all NALs and tabular results are summarised in Table 6.4 and Table 6.5. The results show that the predicted cumulative wind

turbine noise immission levels (assuming a Nordex N149 as the candidate turbine for the Proposed Wind Farm) meet the 'Total WEDG Noise limits' under all conditions, with the exception of NAL12 during the night-time period - at this location the Proposed Wind Farm does not contribute to the predicted exceedance and is a result of the cumulative wind farms. The predicted 'likely' cumulative levels are the actual levels expected at a NAL and include the addition of an appropriate level of uncertainty to the turbine data as per Section 4.2 of the IOA GPG. The uncertainty level added is generally +2 dB but this can vary depending on the turbine manufacturer data available for each turbine.

- 6.4.2 Figures A1.3a-m (Annex 1) show predictions at each NAL from the Proposed Wind Farm and 'cumulative (including Proposed Wind Farm)' against the 'Total WEDG Noise Limits'. The individual contribution of the cumulative schemes are also included. It should be noted that at most NALs the contribution of the Proposed Wind Farm is dominant meaning that the predicted cumulative levels including the Proposed Wind Farm are very similar to the predictions for the Proposed Wind Farm on its own. In these cases, the lines are plotted on top of each other so can be hard to distinguish.

Table 6.4 WEDG Compliance Table – Likely Cumulative Noise - Daytime

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	28.9	30.3	30.5	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-	-	-16.1	-14.7	-14.6	-16.6	-17.9	-18.2	-18.2
NAL2	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	36.1	37.5	37.5	37.5	37.5	37.5	37.5
	Exceedance Level	-	-	-	-	-	-8.9	-7.5	-7.6	-9.8	-11.1	-11.4	-11.4
NAL3	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	33.5	34.9	34.9	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-	-	-	-11.5	-10.1	-10.2	-12.3	-13.6	-13.9	-13.9
NAL4	Total Noise Limit: WEDG L _{A90}	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	34.6	36.0	36.0	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-	-	-	-10.4	-9.0	-9.0	-11.0	-13.0	-14.9	-14.9
NAL5	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	38.7	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-	-	-6.3	-4.9	-4.9	-4.9	-4.9	-7.4	-7.4
NAL6	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	40.0	41.4	41.4	41.5	41.5	41.5	41.5
	Exceedance Level	-	-	-	-	-	-5.0	-3.6	-3.6	-3.6	-6.0	-7.9	-7.9

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL7	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	37.8	39.2	39.2	39.2	39.2	39.2	39.2
	Exceedance Level	-	-	-	-	-	-2.2	-5.8	-5.8	-5.8	-7.5	-10.6	-10.6
NAL8	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	36.9	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-	-3.1	-6.7	-6.7	-6.7	-8.4	-11.5	-11.5
NAL9	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	23.8	25.2	25.3	25.3	25.3	25.3	25.3
	Exceedance Level	-	-	-	-	-	-16.2	-19.8	-19.7	-19.7	-21.4	-24.5	-24.5
NAL10	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	19.3	20.8	20.9	21.0	21.0	21.0	21.0
	Exceedance Level	-	-	-	-	-	-20.7	-24.2	-24.1	-24.0	-25.7	-28.8	-28.8
NAL11	Total Noise Limit: WEDG L _{A90}	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.5	48.2	50.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	23.9	25.5	25.9	26.3	26.3	26.3	26.3
	Exceedance Level	-	-	-	-	-	-21.1	-19.5	-19.1	-18.7	-20.2	-21.9	-23.8
NAL12	Total Noise Limit: WEDG L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	40.9	42.3	43.2	44.0	44.1	44.1	44.1
	Exceedance Level	-	-	-	-	-	-4.1	-2.7	-1.9	-3.3	-4.5	-4.8	-4.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL13	Total Noise Limit: WEDG L_{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	-	28.2	29.7	30.3	30.9	31.0	31.0	31.0
	Exceedance Level	-	-	-	-	-	-16.8	-15.3	-14.8	-16.4	-17.6	-17.9	-17.9

Table 6.5 WEDG Compliance Table – Likely Cumulative Noise – Night-time

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	28.9	30.3	30.5	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-	-	-14.1	-12.7	-12.5	-13.9	-16.7	-19.0	-20.4
NAL2	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	36.1	37.5	37.5	37.5	37.5	37.5	37.5
	Exceedance Level	-	-	-	-	-	-6.9	-5.5	-5.5	-7.1	-9.9	-12.2	-13.6
NAL3	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	33.5	34.9	34.9	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-	-	-	-9.5	-8.1	-8.1	-9.6	-12.4	-14.7	-16.1
NAL4	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	34.6	36.0	36.0	36.1	36.1	36.1	36.1
	Exceedance Level	-	-	-	-	-	-8.4	-7.0	-7.0	-9.2	-12.0	-14.5	-16.8
NAL5	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	38.7	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-	-	-4.3	-2.9	-2.9	-2.9	-2.9	-6.6	-11.0
NAL6	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	40.0	41.4	41.4	41.5	41.5	41.5	41.5
	Exceedance Level	-	-	-	-	-	-3.0	-1.6	-1.6	-1.5	-4.6	-7.5	-9.8

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL7	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	37.8	39.2	39.2	39.2	39.2	39.2	39.2
	Exceedance Level	-	-	-	-	-	-5.2	-3.8	-3.8	-3.8	-6.5	-10.1	-13.3
NAL8	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	36.9	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-	-6.1	-4.7	-4.7	-4.7	-7.4	-11.0	-14.2
NAL9	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	23.8	25.2	25.3	25.3	25.3	25.3	25.3
	Exceedance Level	-	-	-	-	-	-19.2	-17.8	-17.7	-17.7	-20.4	-24.0	-27.2
NAL10	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	19.3	20.8	20.9	21.0	21.0	21.0	21.0
	Exceedance Level	-	-	-	-	-	-23.7	-22.2	-22.1	-22.0	-24.7	-28.3	-31.5
NAL11	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.2	44.9	47.0	49.8	53.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	23.9	25.5	25.9	26.3	26.3	26.3	26.3
	Exceedance Level	-	-	-	-	-	-19.1	-17.5	-17.3	-18.6	-20.7	-23.5	-26.8
NAL12	Total Noise Limit: WEDG L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Cumulative Wind Turbine Noise L _{A90}	-	-	-	-	-	40.9	42.3	43.2	44.0	44.1	44.1	44.1
	Exceedance Level	-	-	-	-	-	-2.1	-0.7	0.2	-0.6	-3.3	-5.6	-7.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL13	Total Noise Limit: WEDG L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	-	28.2	29.7	30.3	30.9	31.0	31.0	31.0
	Exceedance Level	-	-	-	-	-	-14.8	-13.3	-12.7	-13.7	-16.4	-18.7	-20.1

- 6.4.3 As a result of noise data being unavailable at the lower wind speeds for some of the other developments, the cumulative noise predictions have only been calculated for windspeeds more than or equal to 6m/s. The only locations where other developments contribute to the overall predicted cumulative noise level is at NAL1, 10, 11 and 13. At these locations there is over 10 dB headroom between the cumulative noise predictions and the Total Noise Limits at 6 m/s; given the predicted cumulative noise level will continue to decrease at wind speeds less than 6 m/s, there will continue to be over 10 dB headroom for predicted cumulative noise at the lower wind speeds and therefore have a negligible impact.

6.5 Derivation of Site Specific Noise Limits (Stage 3)

- 6.5.1 In order to protect residential amenity, the IOA GPG (2013) recommendations are that cumulatively, all schemes operate within the Total Noise Limits. This can be found in summary box SB21 of the IOA GPG (2013) which states:

‘Whenever a cumulative situation is encountered, the noise limits for an individual wind farm should be determined in such a way that no cumulative excess of the total ETSU-R-97 noise limit would occur.’

- 6.5.2 The Site Specific Noise Limits have been derived to take account of the proportion of the noise limit that has been allocated to, or could theoretically be used by, other wind farm developments in proximity to the Proposed Wind Farm. Table 6.6 summarises the approach adopted at each NAL to derive the Site-Specific Noise Limits.

Table 6.6 Limit Derivation Strategy

NAL	Limit Derivation Strategy
1, 9-13	The likely noise predictions from the Proposed Wind Farm are significantly below the Total WEDG Noise Limits (at minimum >13 dB below), and therefore these NALs can be scoped out of the need to be assessed.
2-8	The likely noise predictions from the other schemes were found to be more than 10 dB below the Total WEDG Noise Limits during the daytime and night-time and as such the other schemes do not require a share of the noise budget and the entire noise limits have been allocated to the Proposed Wind Farm.

- 6.5.3 As summarised in Table 6.6 above, NALs 1 & 9-13 can be scoped out of the requirement to be assessed, as predicted noise from the Proposed Development is considered negligible. For the remaining NALs 2-8, it is proposed that the Site Specific Noise Limits for the Proposed Wind Farm are set equal to the full WEDG Noise Limits at all noise assessment locations, as the other schemes do not need a portion of the limit.
- 6.5.4 Table 6.7 and Table 6.8 show the Daytime and Night-time Site Specific Noise Limits, noise predictions for the Proposed Wind Farm (Nordex N149 candidate turbine) and the exceedance level. A negative exceedance demonstrates compliance with the Site Specific Noise Limits.
- 6.5.5 The Stage 3 assessment shows that the predicted wind turbine noise levels from the Proposed Wind Farm meet the Site Specific Noise Limits at all locations.
- 6.5.6 A series of graphs to show the predicted wind turbine noise from the Proposed Wind Farm compared to the Site Specific Noise Limits are included as Figures A1.4a-g (Annex 1). There

is a set of graphs for each of the NALs, which show the Total WEDG Noise Limit (solid red line), the Site Specific Noise Limit (dashed red line with triangles) and the predicted wind turbine noise from the Proposed Wind Farm (Nordex N149 as solid blue line, the Vestas V150 as dashed blue line with triangular markers, and the Nordex N133 as dashed blue line with circular markers).

Table 6.7 Site Specific Noise Limits Compliance Table – Daytime

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL2	Site Specific Noise Limit L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Wind Turbine Noise L _{A90}	-	-	25.8	27.0	31.6	36.0	37.4	37.4	37.4	37.4	37.4	37.4
	Exceedance Level	-	-	-14.2	-13.0	-13.4	-9.0	-7.6	-7.7	-9.9	-11.2	-11.5	-11.5
NAL3	Site Specific Noise Limit L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Predicted Wind Turbine Noise L _{A90}	-	-	23.2	24.4	29.0	33.4	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-16.8	-15.6	-16.0	-11.6	-10.2	-10.3	-12.5	-13.8	-14.1	-14.1
NAL4	Site Specific Noise Limit L _{A90}	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Predicted Wind Turbine Noise L _{A90}	-	-	24.4	25.6	30.2	34.6	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-20.6	-19.4	-14.8	-10.4	-9.0	-9.0	-11.1	-13.1	-15.0	-15.0
NAL5	Site Specific Noise Limit L _{A90}	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
	Predicted Wind Turbine Noise L _{A90}	-	-	28.5	29.7	34.3	38.7	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-11.5	-10.3	-10.7	-6.3	-4.9	-4.9	-4.9	-4.9	-7.4	-7.4
NAL6	Site Specific Noise Limit L _{A90}	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Predicted Wind Turbine Noise L _{A90}	-	-	29.8	31.0	35.6	40.0	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-10.2	-9.0	-4.4	-5.0	-3.6	-3.6	-3.7	-6.1	-8.0	-8.0
NAL7	Site Specific Noise Limit L _{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Wind Turbine Noise L _{A90}	-	-	27.5	28.7	33.3	37.7	39.1	39.1	39.1	39.1	39.1	39.1

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-12.5	-11.3	-6.7	-2.3	-5.9	-5.9	-5.9	-7.6	-10.7	-10.7
NAL8	Site Specific Noise Limit L_{A90}	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Predicted Wind Turbine Noise L_{A90}	-	-	26.7	27.9	32.5	36.9	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-13.3	-12.1	-7.5	-3.1	-6.7	-6.7	-6.7	-8.4	-11.5	-11.5

Table 6.8 Site Specific Noise Limits Compliance Table – Night-time

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL2	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Wind Turbine Noise L _{A90}	-	-	25.8	27.0	31.6	36.0	37.4	37.4	37.4	37.4	37.4	37.4
	Exceedance Level	-	-	-17.2	-16.0	-11.4	-7.0	-5.6	-5.6	-7.2	-10.0	-12.3	-13.7
NAL3	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Predicted Wind Turbine Noise L _{A90}	-	-	23.2	24.4	29.0	33.4	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-19.8	-18.6	-14.0	-9.6	-8.2	-8.2	-9.8	-12.6	-14.9	-16.3
NAL4	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Predicted Wind Turbine Noise L _{A90}	-	-	24.4	25.6	30.2	34.6	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-18.6	-17.4	-12.8	-8.4	-7.0	-7.0	-9.3	-12.1	-14.6	-16.9
NAL5	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
	Predicted Wind Turbine Noise L _{A90}	-	-	28.5	29.7	34.3	38.7	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-14.5	-13.3	-8.7	-4.3	-2.9	-2.9	-2.9	-2.9	-6.6	-11.0
NAL6	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Predicted Wind Turbine Noise L _{A90}	-	-	29.8	31.0	35.6	40.0	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-13.2	-12.0	-7.4	-3.0	-1.6	-1.6	-1.6	-4.7	-7.6	-9.9
NAL7	Site Specific Noise Limit L _{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Wind Turbine Noise L _{A90}	-	-	27.5	28.7	33.3	37.7	39.1	39.1	39.1	39.1	39.1	39.1

Location		Wind Speed (ms^{-1}) as standardised to 10 m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-15.5	-14.3	-9.7	-5.3	-3.9	-3.9	-3.9	-6.6	-10.2	-13.4
NAL8	Site Specific Noise Limit L_{A90}	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Predicted Wind Turbine Noise L_{A90}	-	-	26.7	27.9	32.5	36.9	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-16.3	-15.1	-10.5	-6.1	-4.7	-4.7	-4.7	-7.4	-11.0	-14.2

- 6.5.7 The assessment shows that the predicted wind turbine noise immission levels meet the Site Specific Noise Limits under all conditions and at all locations for both Daytime and Night-time periods at all receptors.
- 6.5.8 In the event that planning permission is granted for the Proposed Wind Farm it would be appropriate to set noise limits equal to the Site Specific Noise Limits contained Table 6.7 and Table 6.8.

6.6 On-site Substation

- 6.6.1 The 110 kV onsite substation will be installed in the western side of the Wind Farm site. The closest receptor to the centre of the substation is NSR15, which is at a distance of approximately 360 m.

‘EirGrid Evidence Based Environmental Studies Study 8: Noise’⁽²⁰⁾ presents measured noise levels for a similar 110 kV substation (Dunfirth Substation). Sound pressure level measurements are provided at four different locations around the substation at distances of 5 m and 10 m, which vary between 37 dB LAeq(t) and 39 dB LAeq(t). The document provides commentary on the measurements, stating, “The measured noise levels at the boundary of this substation are below the daytime WHO threshold limits for serious annoyance (55 dB LAeq) and moderate annoyance (50 dB LAeq) for outdoor living areas. They are also below the night-time free-field threshold limit of 42 dB (LAeq) for preventing negative effects on sleep.”

- 6.6.2 Given the Eirgrid report presents results 5/10 m from the boundary, the proposed substation has been represented as a point source located at the approximate centre of the substation compound.
- 6.6.3 The distance from the assumed source location to the nearest noise-sensitive receptor, NSR15, is approximately 360 m. Using the highest measured noise level reported in the EirGrid study (39 dB LAeq at 10 m) and applying geometric divergence from the assumed source location, the predicted level of distance attenuation will be approximately 31 dB. Accordingly, the noise level from the substation at the receptor will be negligible.

7 Summary and Conclusions

- 7.1.1 This report has assessed the potential impact of operational noise from the Proposed Wind Farm on nearby NSRs using the guidance contained within the WEDG 2006. Reference was also made to guidance contained in ARWTN and the IOA GPG to supplement the WEDG 2006.
- 7.1.2 Background noise monitoring was undertaken by TNEI at eight NSRs neighbouring the Proposed Wind Farm. A total of 105 NSRs were identified, of which 13 were chosen as Noise Assessment Locations (NALs). For the assessment locations where no background noise measurements were undertaken, noise data collected at proxy locations considered representative of the expected background noise environment was used to assess the noise impact at those receptors.
- 7.1.3 Concurrent wind speed data was collected using a LiDAR located within the Proposed Wind Farm. The data collected at 105 m and 120 m height, were used to calculate hub height wind speeds (110 m), which were then standardised to 10 m height in accordance with current good practice.
- 7.1.4 Analysis of the measured data was undertaken to determine the pre-existing background noise environment and to establish the daytime and night-time noise limits for each of the assessment locations. A Total WEDG Noise Limit of 40 dB(A), where background noise levels are below 30 dB, and 45 dB or background noise plus 5 dB, whichever is the greater, where background noise levels are above 30 dB was set for the daytime period. A limit of 43 dB(A) or background noise plus 5 dB, whichever is the greater, was used for the night-time period.
- 7.1.5 Predictions of wind turbine noise for the Proposed Wind Farm were made, based upon the sound power level data for:
- the Nordex N149 5.x MW with serrated trailing edge blades and 105 m hub;
 - the Vestas V150 6.0 MW with serrated trailing edge blades and 105 m hub;
 - the Nordex N133 4.8 MW with normal blades and 110 m hub; and,
- 7.1.6 The candidate turbine models are considered representative of the type of turbine that could be installed at the Proposed Wind Farm.
- 7.1.7 There are a number of permitted wind farms in proximity to the Proposed Wind Farm. A cumulative assessment was undertaken at all NALs. The results show that the predicted cumulative wind farm noise immission levels would meet the Total WEDG Noise Limits at all NALs (and all identified NSRs) during both the daytime and night-time periods.
- 7.1.8 Site Specific Noise Limits have also been derived for the Proposed Wind Farm at NALs 2-8. In deriving the Site-Specific Noise Limits, it was found that the likely noise predictions from the other schemes were more than 10 dB below the Total WEDG Noise Limits during the daytime and night-time periods and so do not require a share of the noise budget; the entire noise limits have therefore been allocated to the Proposed Wind Farm.
- 7.1.9 An assessment was undertaken to determine whether the Proposed Wind Farm could operate within the Site Specific Noise Limits and it was found that at all receptors, predicted turbine noise immissions were below the Site Specific Noise Limits when considering all candidate turbines. For NALs 1 & 9-13, it was found that the Proposed Wind Farm would not have an impact due to predicted level being in excess of 13 dB below the noise limits. These

NALs were therefore scoped out of the requirement to derive site specific noise limits for the Proposed Wind Farm.

- 7.1.10 The use of Site Specific Noise Limits for the operational phase will ensure that the Proposed Wind Farm could operate concurrently with other operational wind farm developments in the area and would also ensure that the Proposed Wind Farm's individual contribution could be measured and enforced if required.
- 7.1.11 For completeness, the cumulative noise predictions for all 105 NSRs have been included within Annex 5.
- 7.1.12 The wind turbine models assumed in this assessment were chosen in order to allow a representative assessment of the noise impacts. Should the Proposed Wind Farm receive planning permission, the final choice of wind turbine would be subject to a competitive tendering process and the final choice of wind turbine will, however, meet the noise limits in the noise assessment.
- 7.1.13 An assessment has also been undertaken with regards to operational noise from the proposed substation. The assessment referenced a document prepared by Eirgrid which presents measured noise levels for a 110 kV substation. Measured levels were reported to be between 37 dB LAeq(t) and 39 LAeq(t) at distances of ~5-10 m. A calculation was therefore undertaken for the nearest NSR, assuming a point source at the centre of the substation compound (located some 360 m away). It was found that the level of distance attenuation will be approximately 31 dB; accordingly the noise level from the substation at the receptor is considered negligible.

8 Glossary of Terms

AOD: Above Ordnance Datum is the height above sea level.

Amplitude Modulation: a variation in noise level over time; for example observers may describe a 'whoosh whoosh' sound, which can be heard close to a wind turbine as the blades sweep past.

Attenuation: the reduction in level of a sound between the source and a receiver due to any combination of effects including: distance, atmospheric absorption, acoustic screening, the presence of a building façade, etc.

Background Noise: the noise level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night time periods. The L_{A90} indices (see below) is often used to represent the background noise level.

Bin: subset or group into which data can be sorted; in the case of wind speeds, bins are often centred on integer wind speeds with a width of 1 m/s. For example the 4 m/s bin would include all data with wind speeds of 3.5 to 4.5 m/s.

Dawn Chorus: noise due to birds which can occur at sunrise.

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in noise level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.

dB(A): the ear has the ability to recognise a particular sound depending on its pitch or frequency. Microphones cannot differentiate noise in the same way as the ear, and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Some typical subjective changes in noise levels are:

- a change of 3 dB(A) is just perceptible;
- a change of 5 dB(A) is clearly perceptible;
- a change of 10 dB(A) is twice (or half) as loud.

Directivity: the property of a sound source that causes more sound to be radiated in one direction than another.

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Ground Effects: the modification of sound at a receiver location due to the interaction of the sound wave with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard), 0.5 (mixed) and 1 (soft).

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

L_w : is the sound power level. It is a measure of the total noise energy radiated by a source of noise, and is used to calculate noise levels at a distant location. The L_{WA} is the A-weighted sound power level.

L_{eq} : is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The $LA_{eq,T}$ is the A-weighted equivalent continuous sound level over a given time period (T).

L_{90} : index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background noise level. The $LA_{90,10min}$ is the A-weighted background noise level over a ten minute measurement sample.

Noise emission: the noise energy emitted by a source (e.g. a wind turbine).

Noise immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Night-Time Hours: ARWTN defines the Night-time hours as 23.00 to 07.00 every day.

Quiet Daytime Hours: ARWTN defines the amenity hours as 18.00 to 23.00 Monday to Friday, 13.00 to 23.00 on Saturdays and 07.00 to 23.00 on Sundays.

Sound Level Meter: an instrument for measuring sound pressure level.

Sound Power Level: the total sound power radiated by a source, in decibels.

Sound Pressure Level: a measure of the sound pressure at a point, in decibels.

Standardised Wind Speed: a wind speed measured at a height different than 10 m (generally measured at the turbine hub height) which is expressed to a reference height of 10 m using a roughness length of 0.05 for standardisation purpose (in accordance with the IEC 61400-11 standard).

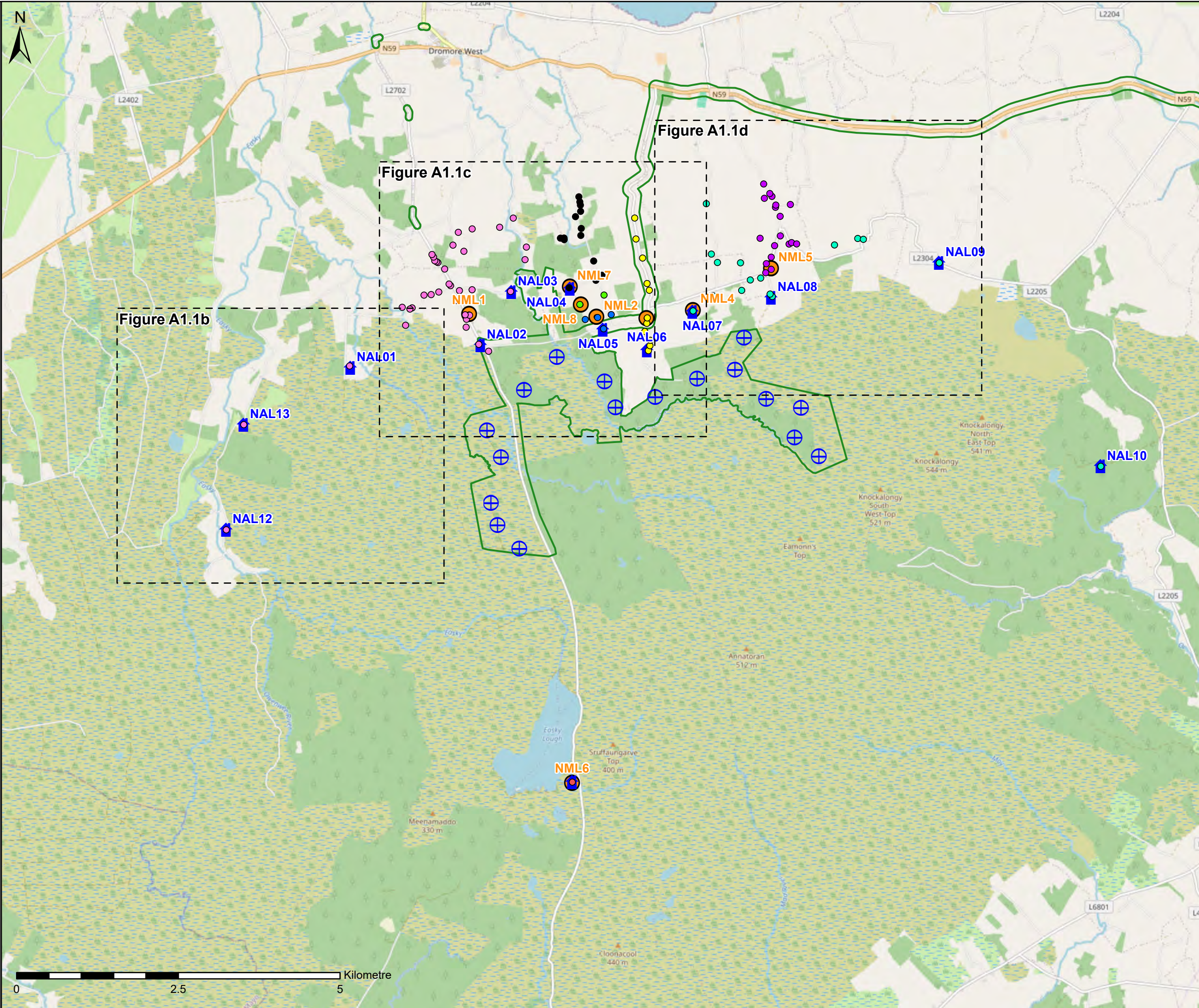
Tonal Noise: noise which covers a very restricted range of frequencies (e.g. a range of ≤ 20 Hz). This noise can be more annoying than broadband noise.

Wind Shear: the increase of wind speed with height above the ground.

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Annex 1 – Figures



LEGEND

EIAR Site Boundary

Noise Monitoring Locations (NMLs)

Noise Assessment Locations (NALs)

Crumhach Wind Farm

Noise Sensitive Receptors (NSRs) Represented By:

Id

NML1

NML2

NML3

NML4

NML5

NML6

NML7

NML8

2	26/05/2026	REVISION	MT	JB
1	18/03/2026	REVISION	MT	JB
0	10/03/2026	FIRST ISSUE	JCM	MT
Rev.	Date	Amendment Details	Drawn	Approved

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Client

Drawing Status:

FOR INFORMATION

Project Title:

CRUMHACH WIND FARM

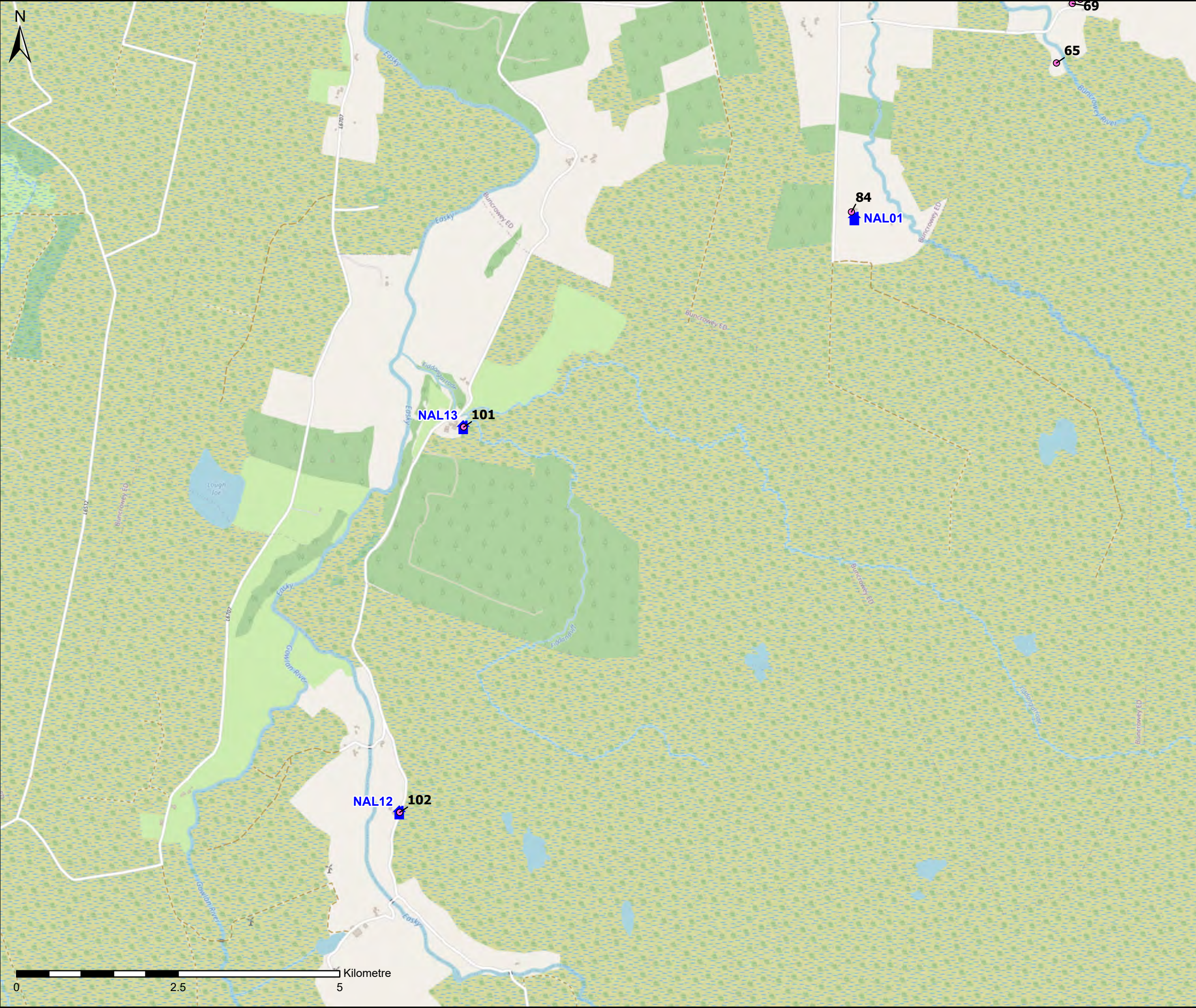
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FIGURE A1.1A: NOISE MONITORING AND ASSESSMENT LOCATIONS

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Drawing Number:

IE00220-016



LEGEND

EIAR Site Boundary

Crumhach Wind Farm

Noise Monitoring Locations (NMLs)

Noise Assessment Locations (NALs)

Noise Sensitive Receptors (NSRs) Represented By:

NML1

NML2

NML3

NML4

NML5

NML6

NML7

NML8

2	26/05/2026	REVISION	MT	JB
1	18/03/2026	REVISION	MT	JB
0	10/03/2026	FIRST ISSUE	JCM	MT
Rev.	Date	Amendment Details	Drawn	Approved

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Client

Drawing Status:

FOR INFORMATION

Project Title:

CRUMHACH WIND FARM

Drawing Title:

FIGURE A1.1B: NOISE MONITORING AND ASSESSMENT LOCATIONS

Scale:

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Original Size:

A3

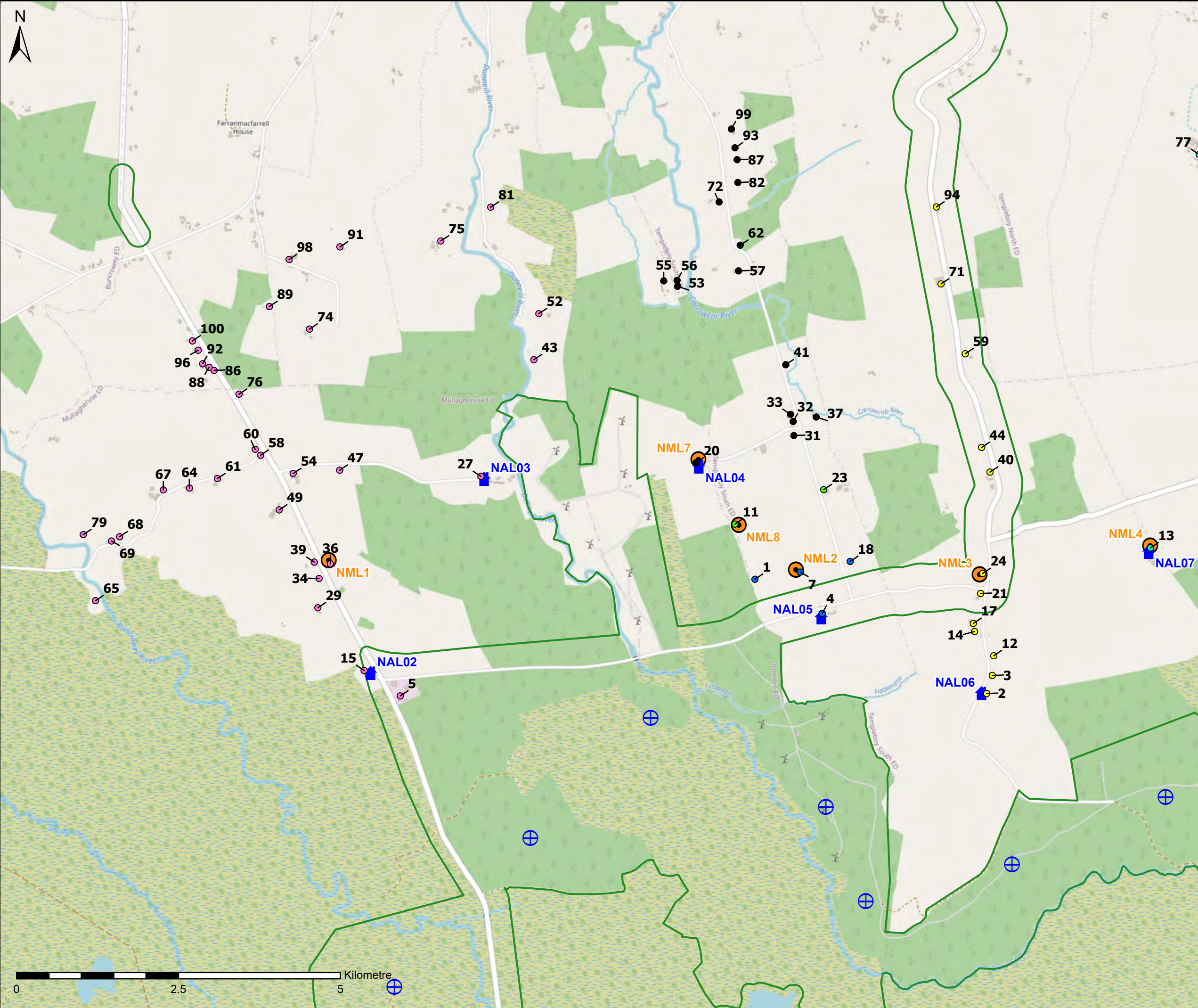
Spatial Reference:

IRENET95 Irish Transverse Mercator

Drawing Number:

IE00220-016

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LEGEND

- EIAR Site Boundary
- Crumhach Wind Farm
- Noise Monitoring Locations (NMLs)
- Noise Assessment Locations (NALs)

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- NML7
- NML8

Rev.	Date	Amendment Details	Drawn	Approved
2	26/05/2026	REVISION	MT	JB
1	18/03/2026	REVISION	MT	JB
0	10/03/2026	FIRST ISSUE	JCM	MT

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Client:

FOR INFORMATION

Project Title:

CRUMHACH WIND FARM

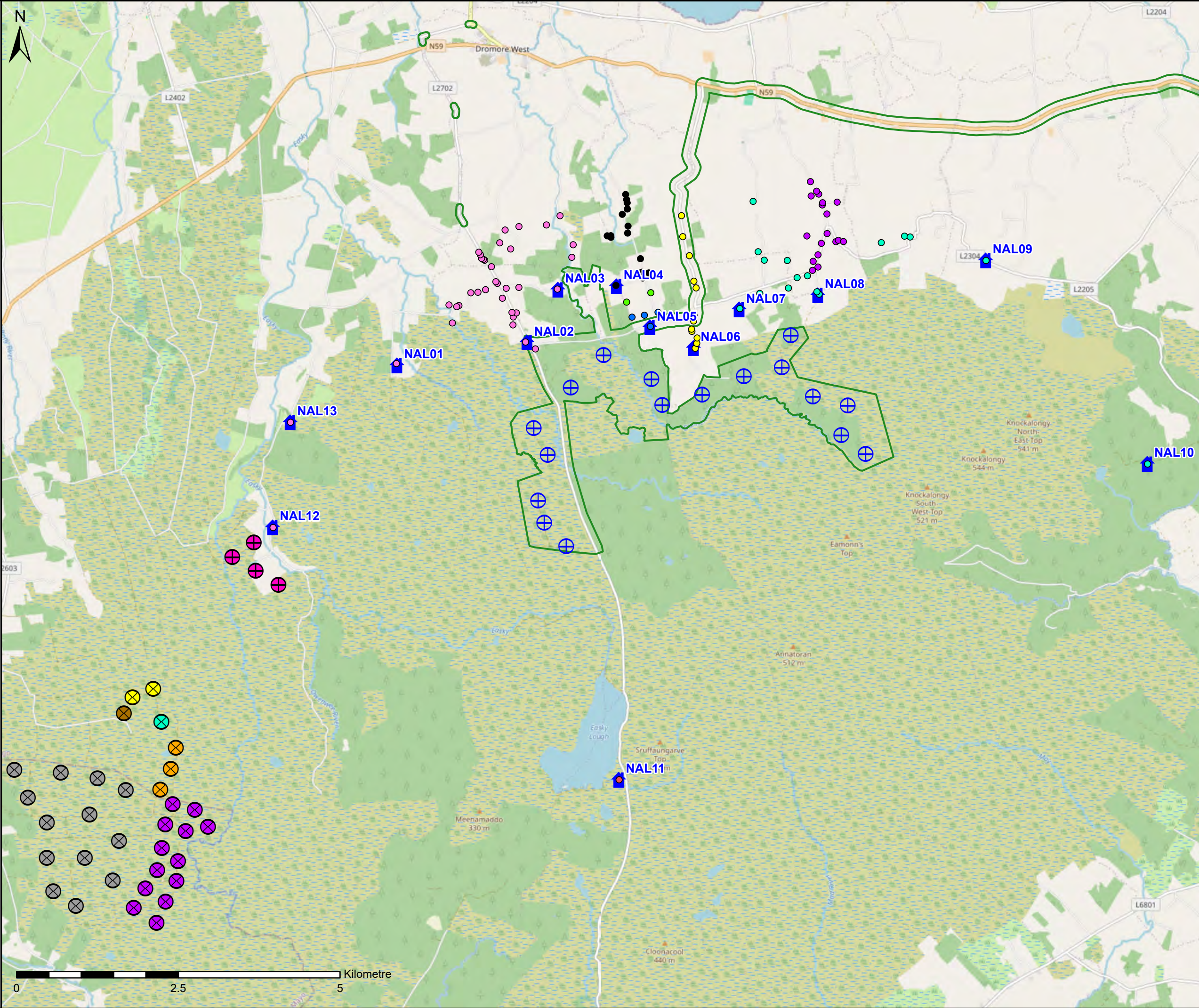
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FIGURE A1.1C: NOISE MONITORING AND ASSESSMENT LOCATIONS

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Drawing Number:

IE00220-016



LEGEND

EIAR Site Boundary

Crumhach Wind Farm

Noise Assessment Locations (NALs)

Cumulative Wind Farms

Black Lough Wind Farm

Carrowleagh 1 Wind Farm

Cloonkeelaun Wind Farm (Carrowleagh WF Extension)

Cloonkeelaun 2 Wind Turbine

Cloonkeelaun Single Wind Turbine

Firlough Wind Farm

Strokane Single Turbine (Cloonkeelaun)

Noise Sensitive Receptors (NSRs) Represented By:

NML1

NML2

NML3

NML4

NML5

NML6

NML7

NML8

2	26/05/2026	REVISION	MT	JB
1	18/03/2026	REVISION	MT	JB
0	10/03/2026	FIRST ISSUE	JCM	MT
Rev.	Date	Amendment Details	Drawn	Approved

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Client

Drawing Status:

FOR INFORMATION

Project Title:

CRUMHACH WIND FARM

Drawing Title:

FIGURE A1.2: CUMULATIVE WIND FARM LOCATIONS

Scale:

1:55,000

Original Size:

A3

Spatial Reference:

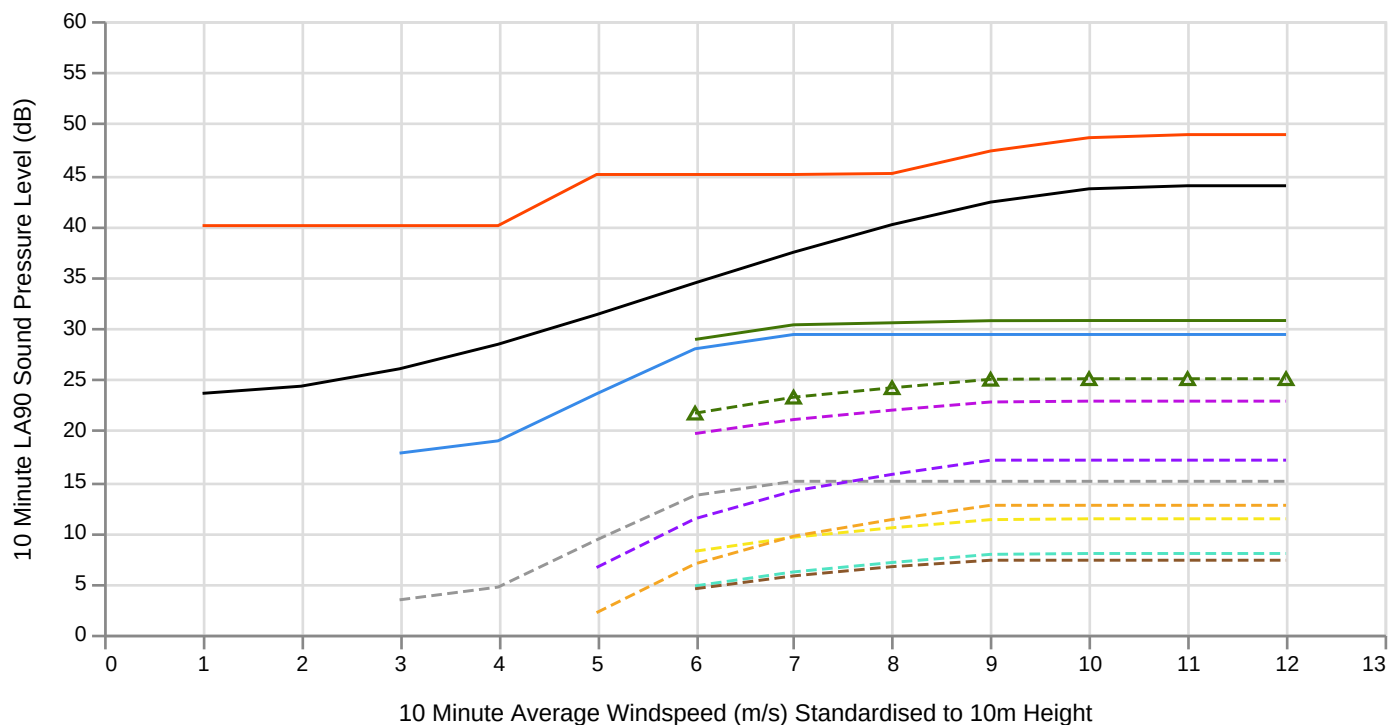
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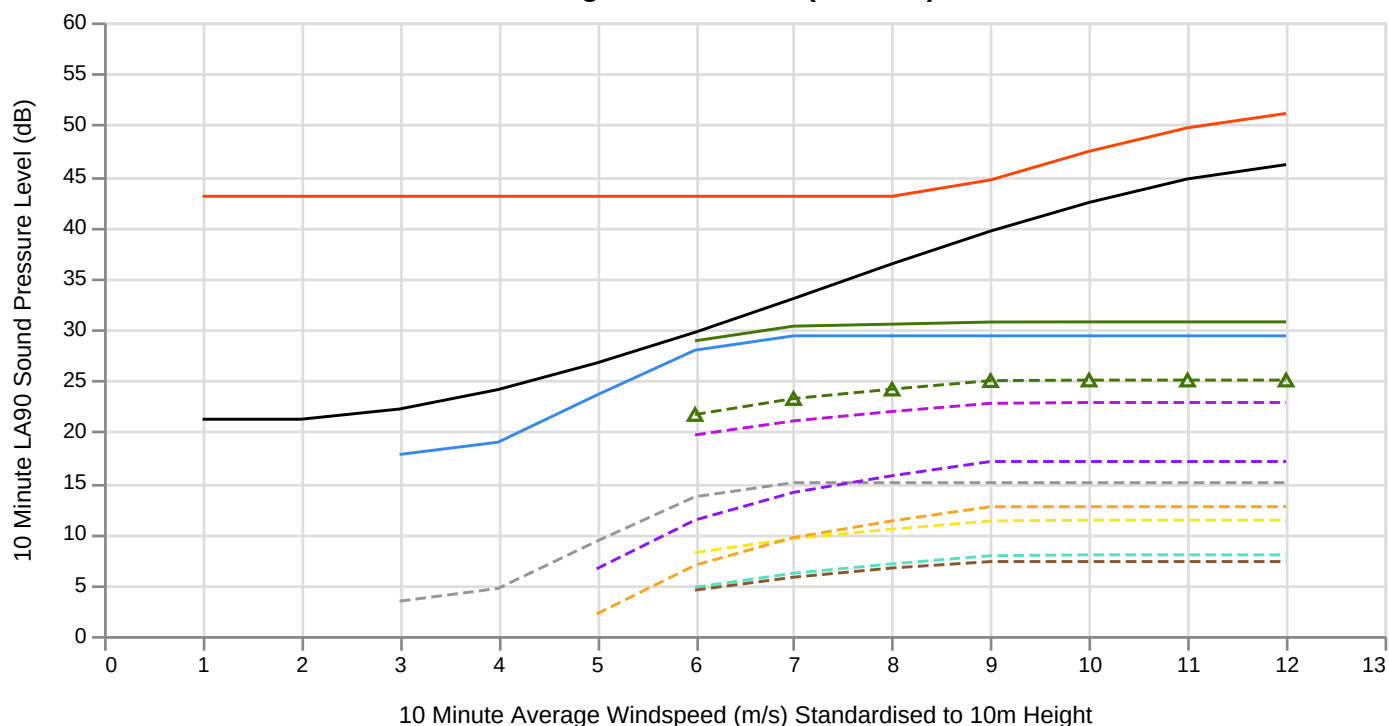
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Night time - NAL1 (NSR084)

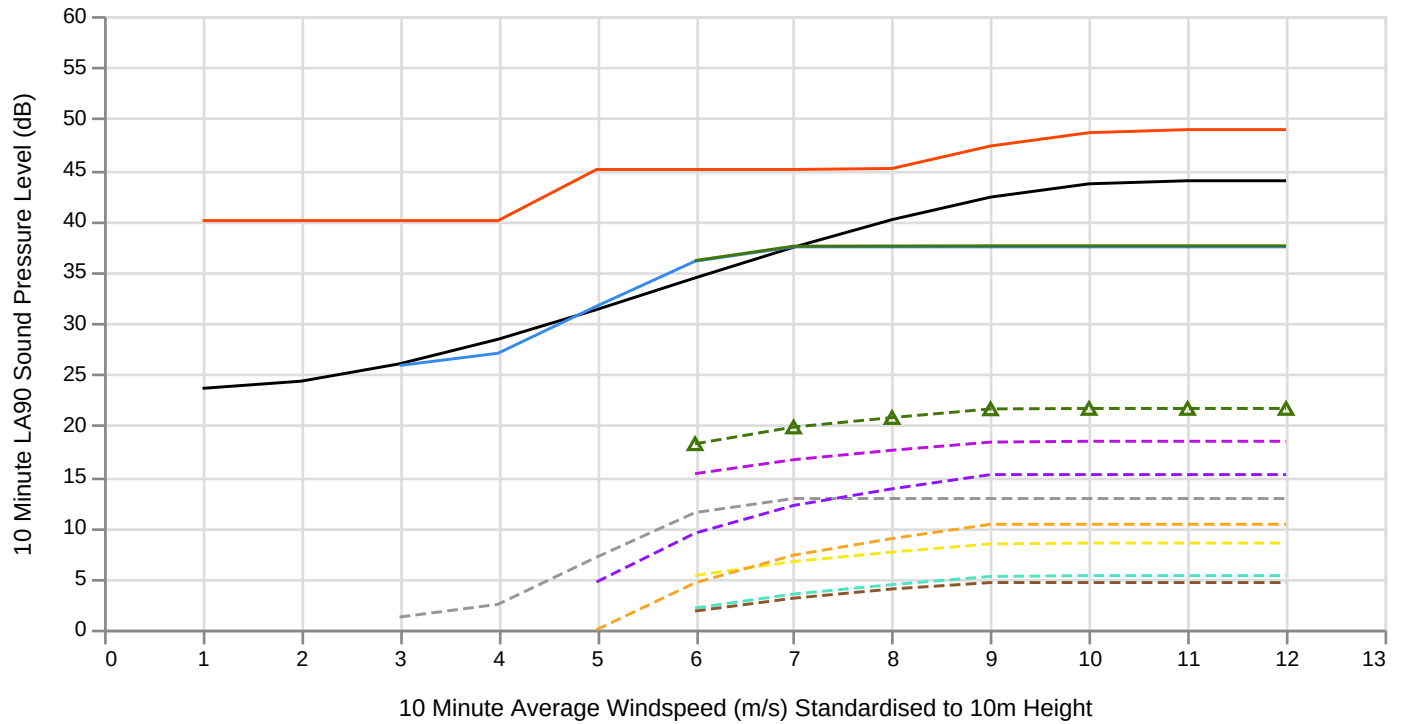


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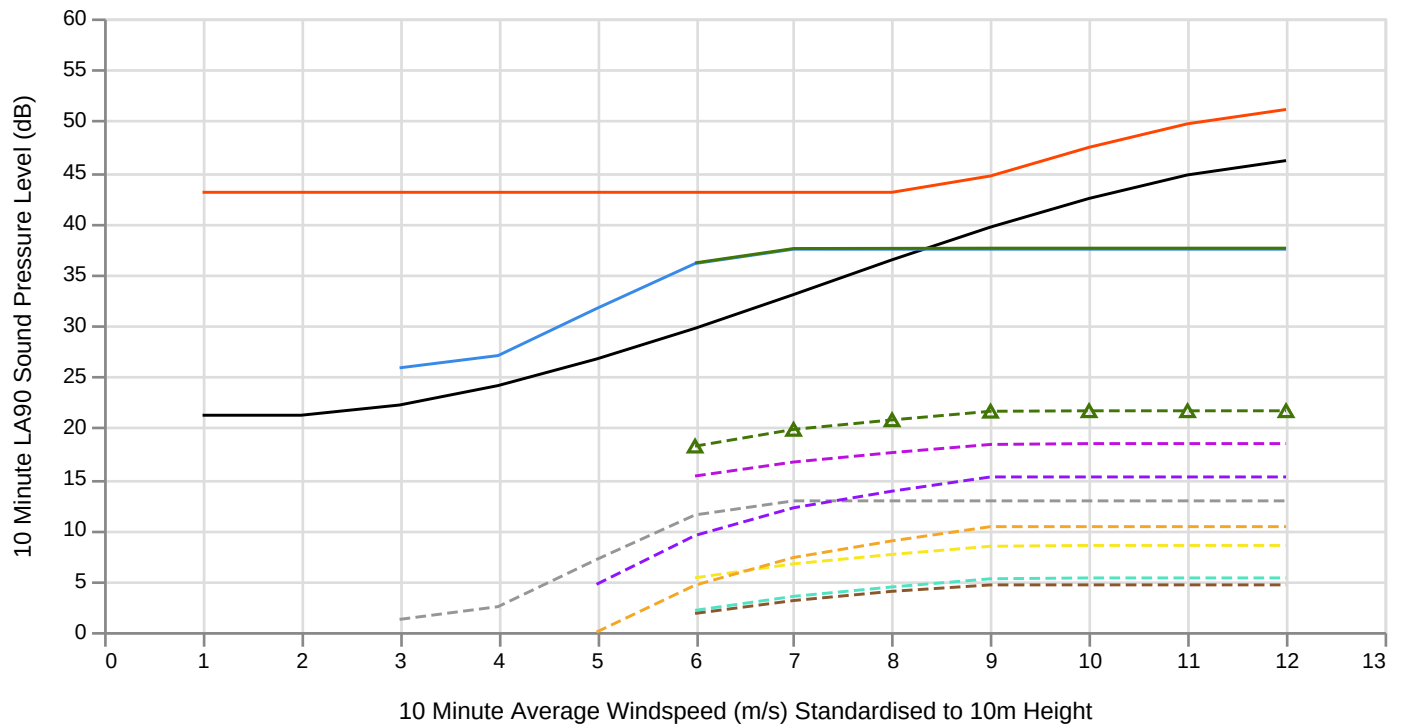
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- Crumhach Wind Farm (N149)
- 🗑️ Cumulative Excl Crumhach WF
- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL2 (NSR015)



Night time - NAL2 (NSR015)

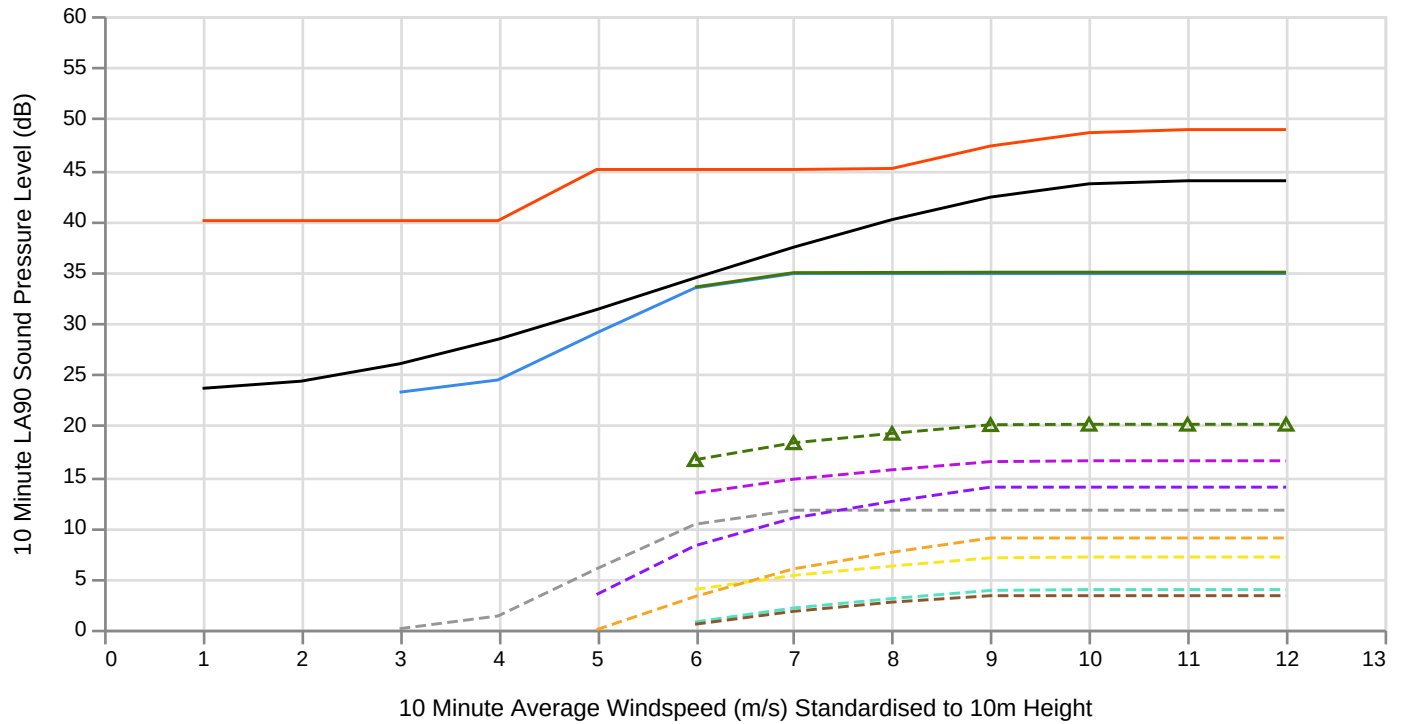


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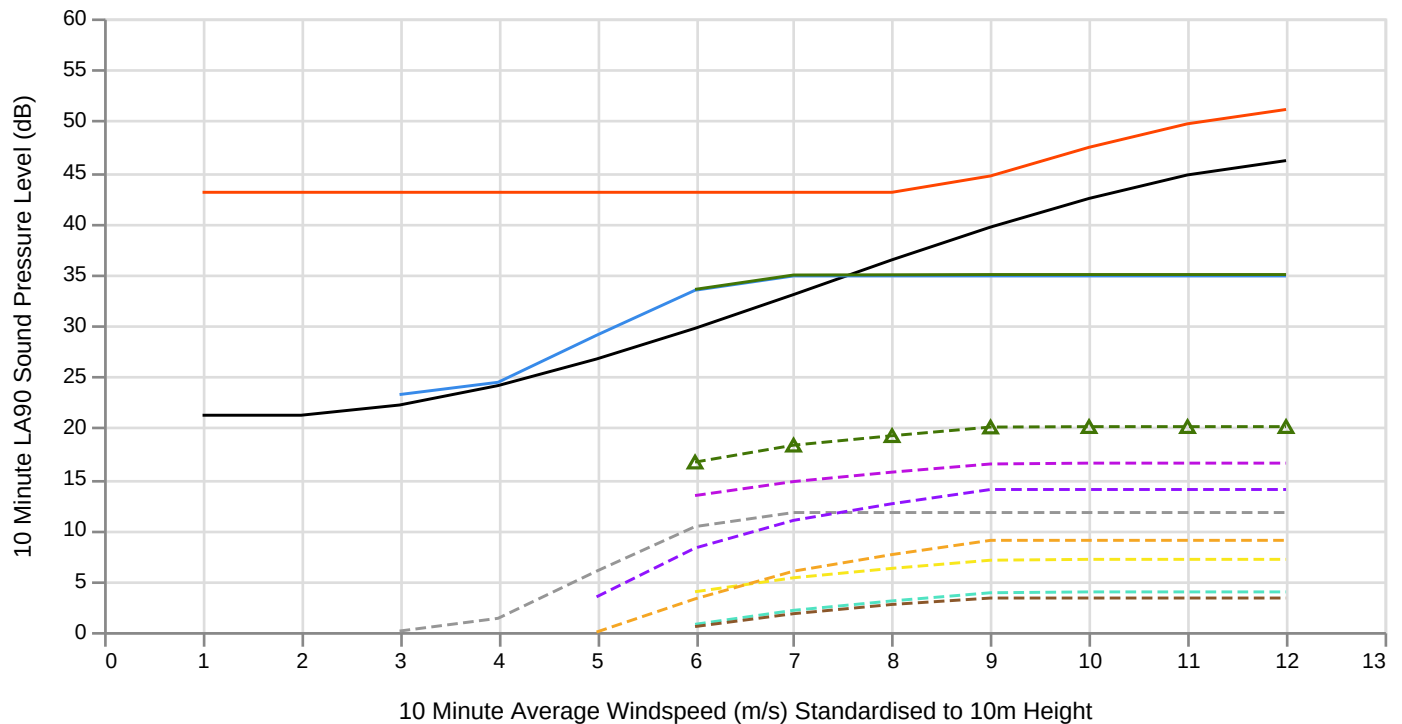
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— Cumulative Excl Crumhach WF	— Cloonkeelaun WF
— Cumulative (Crumhach - N149)	— Firlough WF
— Black Lough WF	— Carrowleagh WF

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL3 (NSR027)



Night time - NAL3 (NSR027)

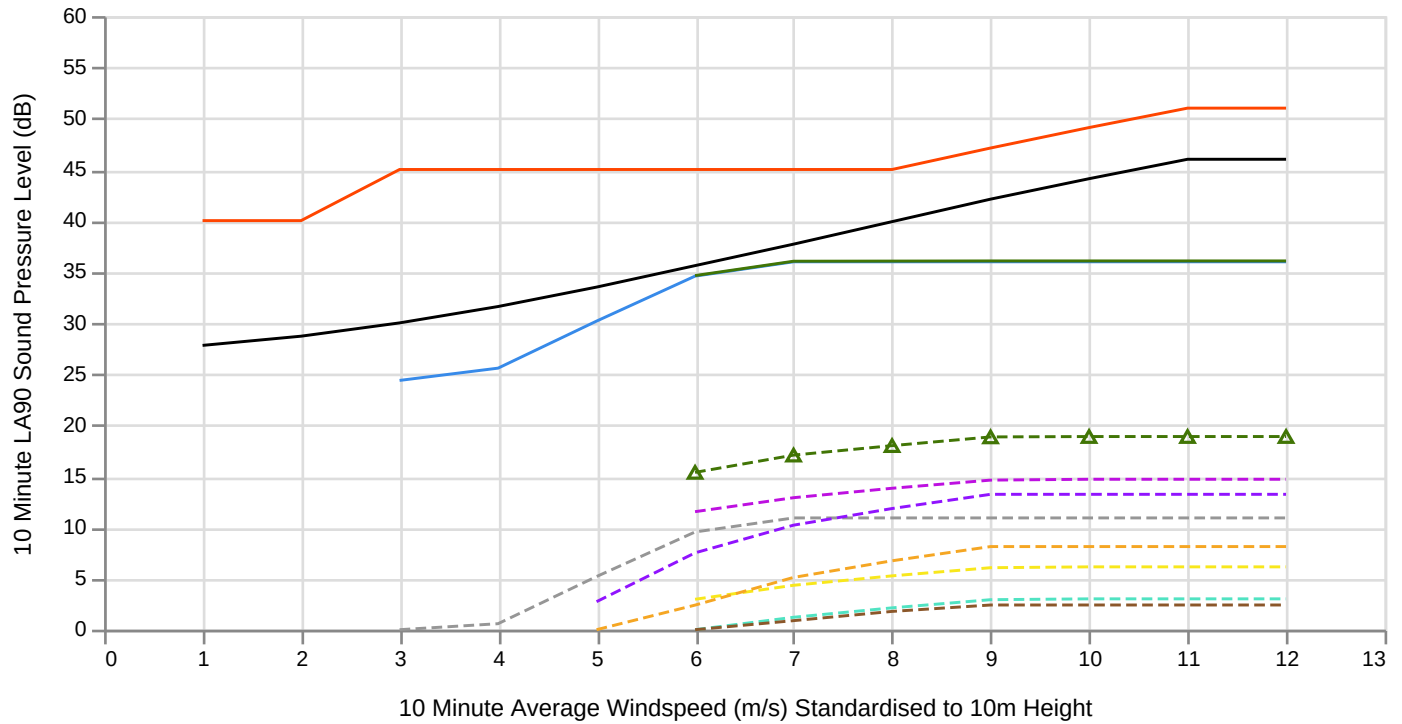


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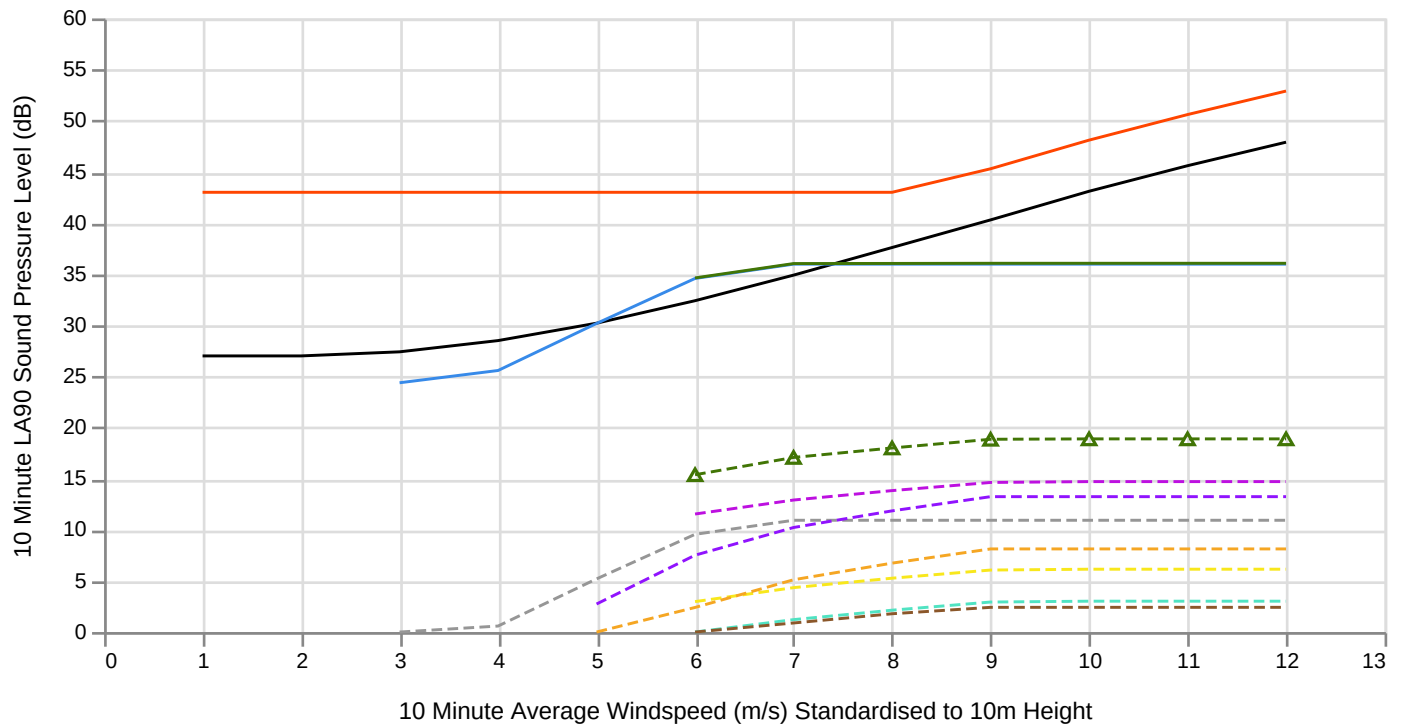
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- 🗑️ Cumulative Excl Crumhach WF
- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL4 (NSR020)



Night time - NAL4 (NSR020)

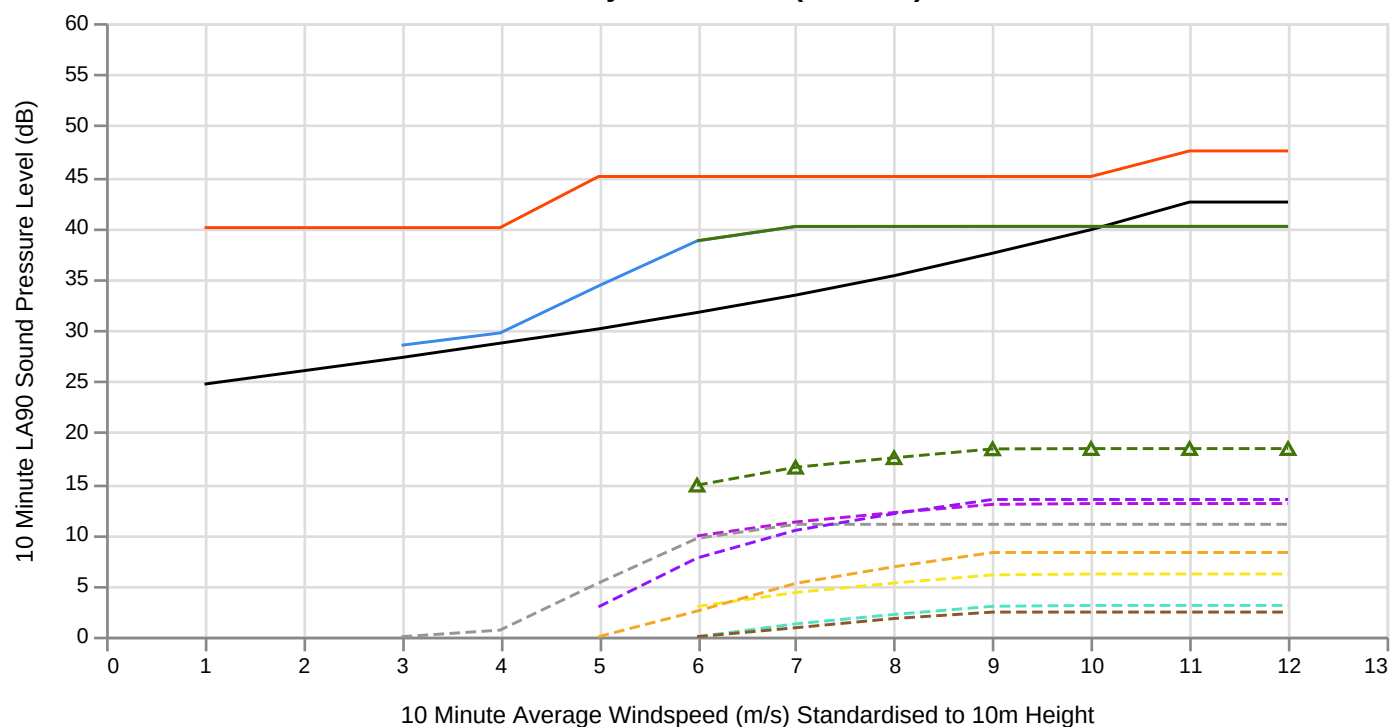


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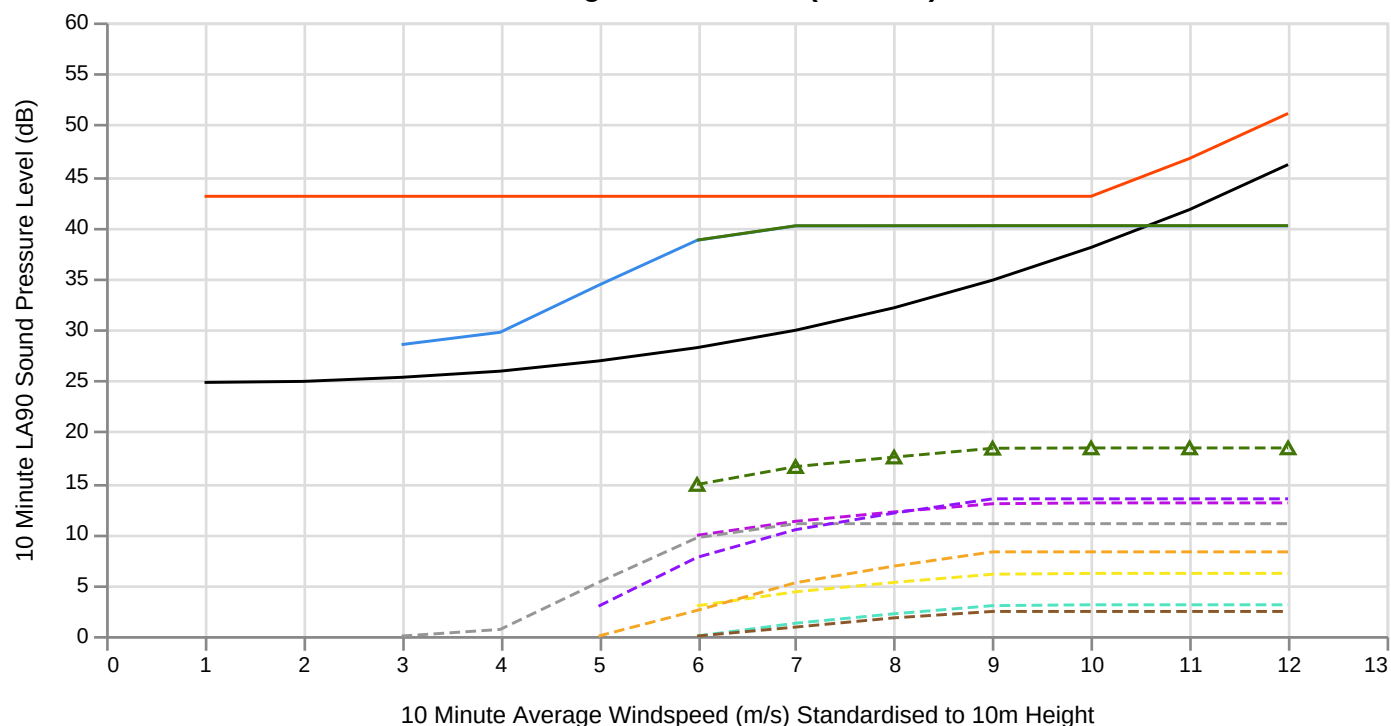
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🗑️ Cumulative Excl Crumhach WF	— Cloonkeelaun WF
— Cumulative (Crumhach - N149)	— Firlough WF
— Black Lough WF	— Carrowleagh WF

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL5 (NSR004)



Night time - NAL5 (NSR004)

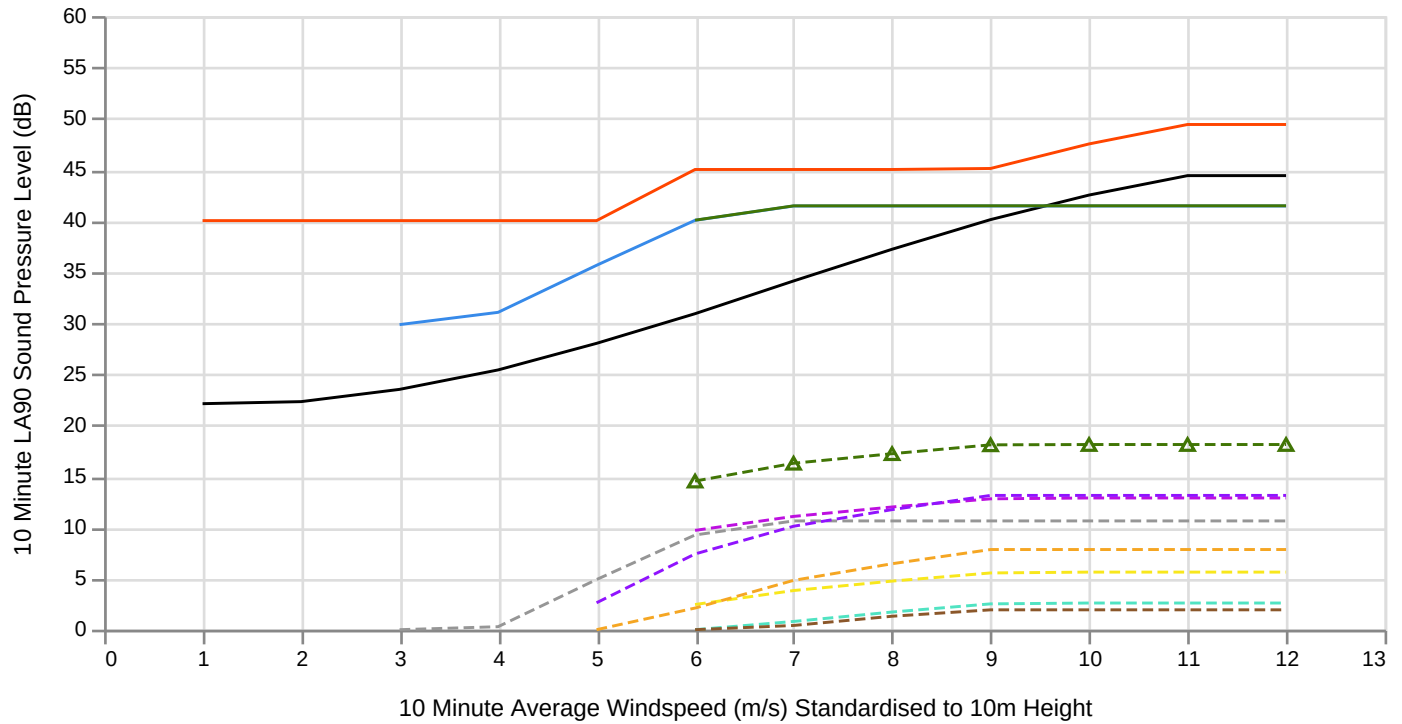


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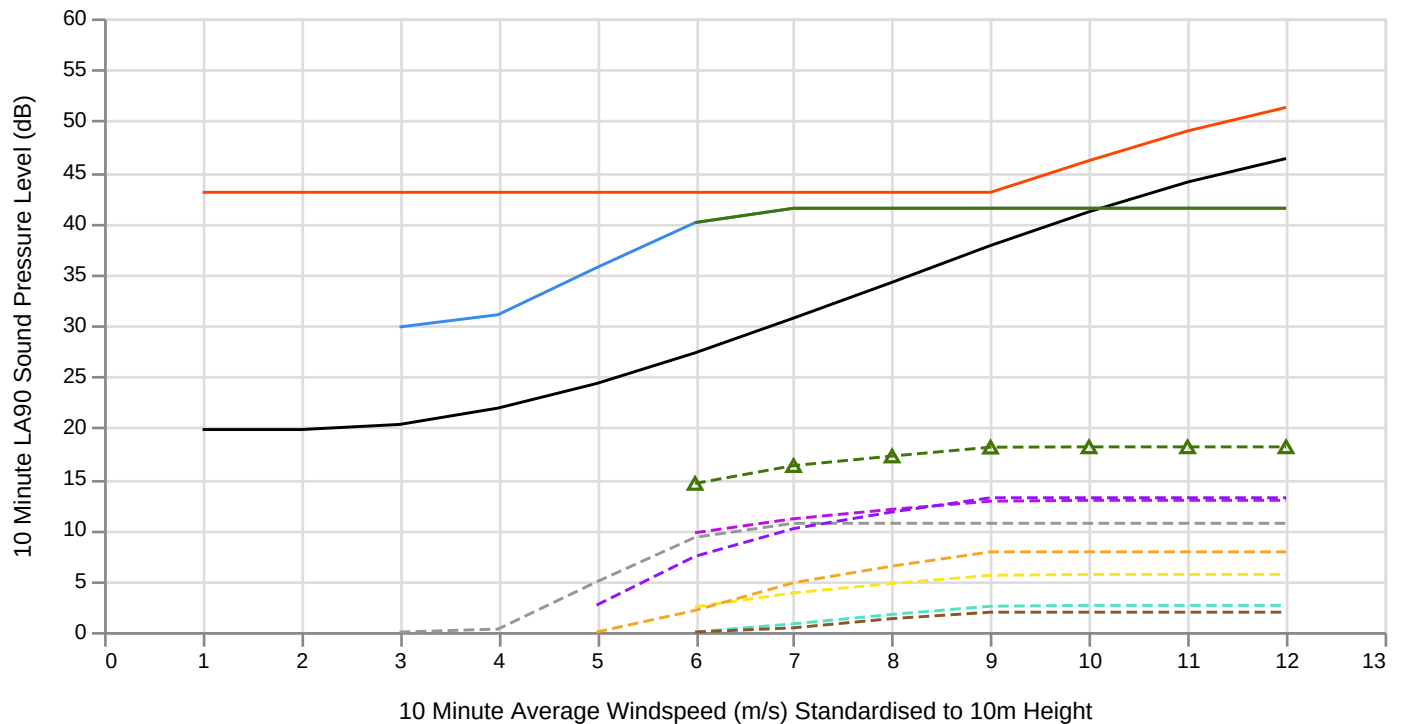
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- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL6 (NSR002)



Night time - NAL6 (NSR002)

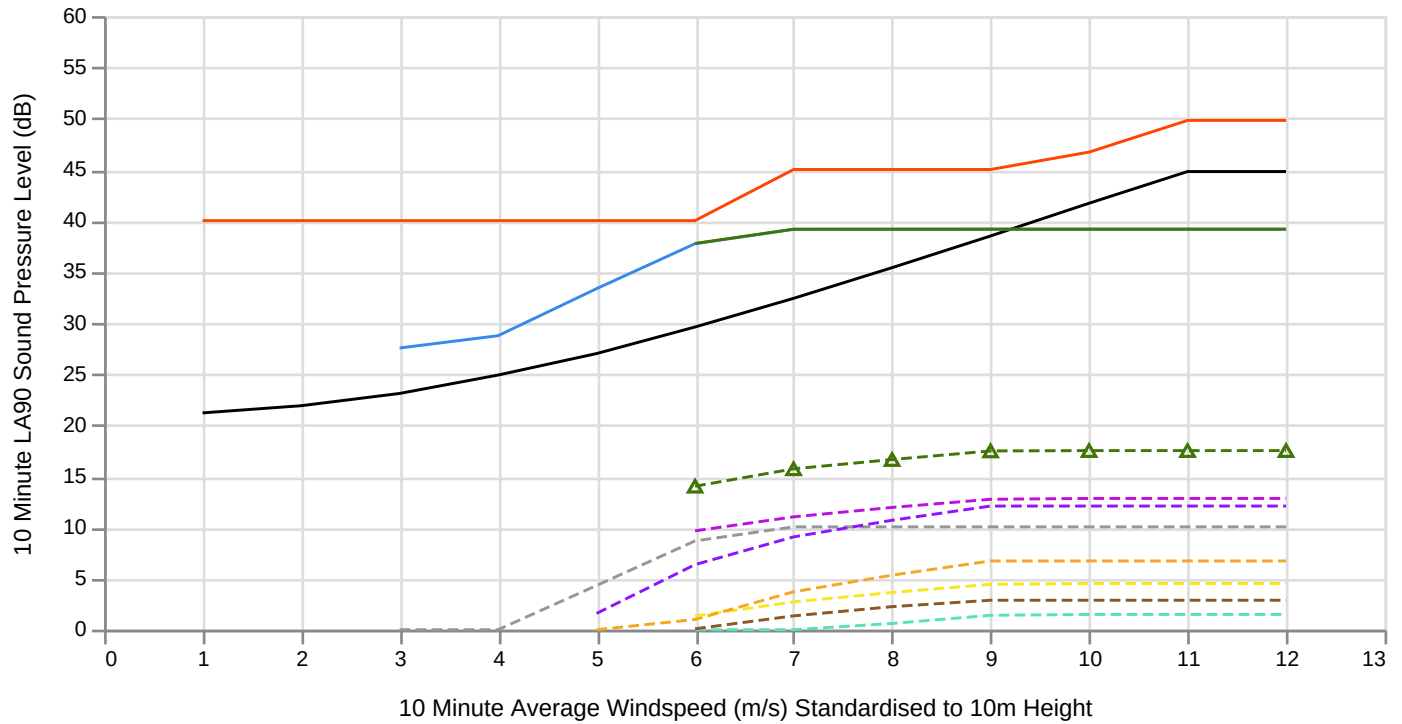


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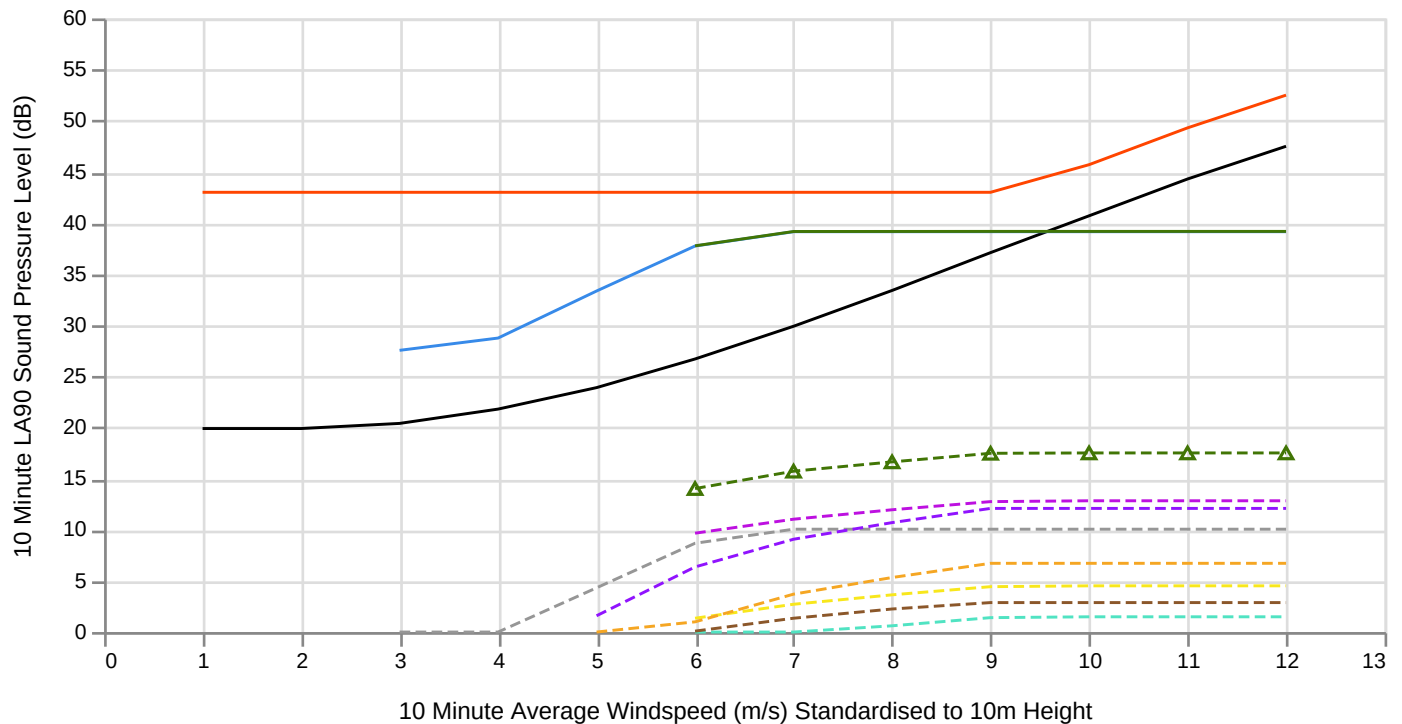
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- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL7 (NSR013)



Night time - NAL7 (NSR013)

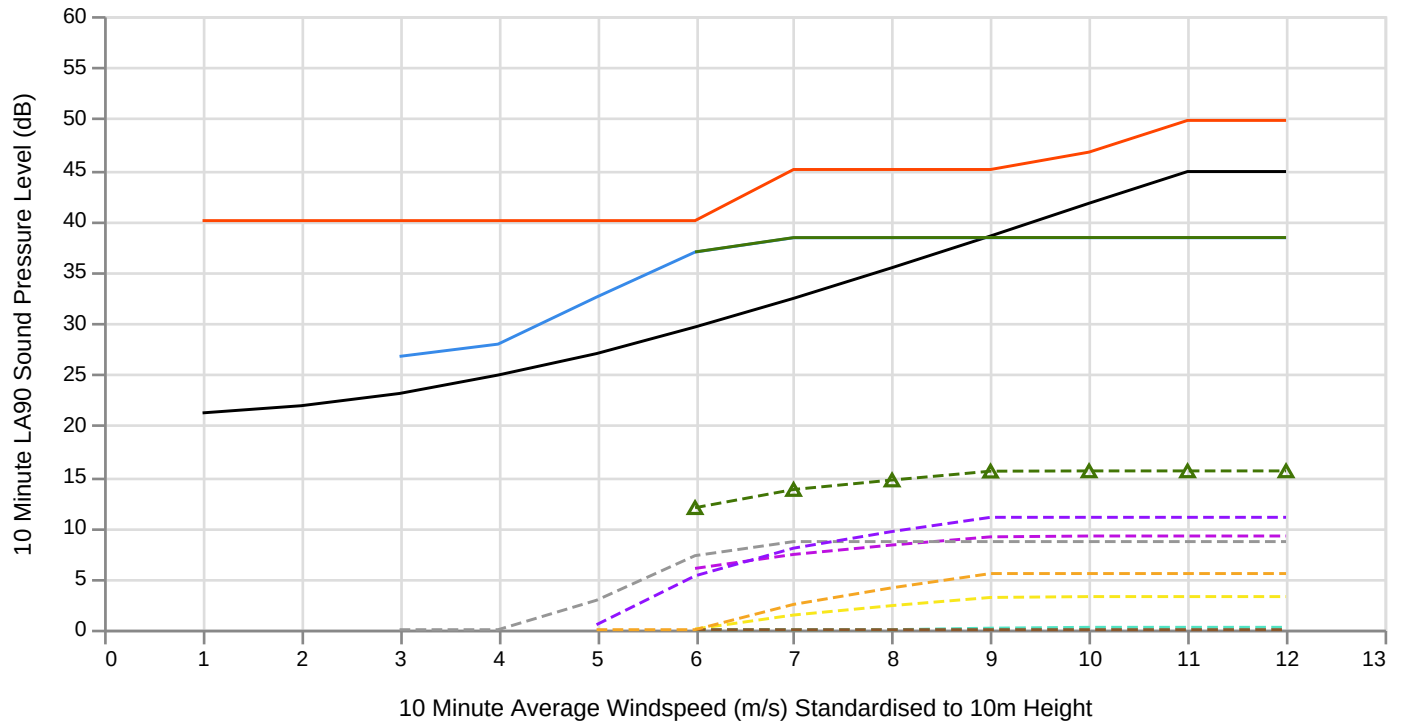


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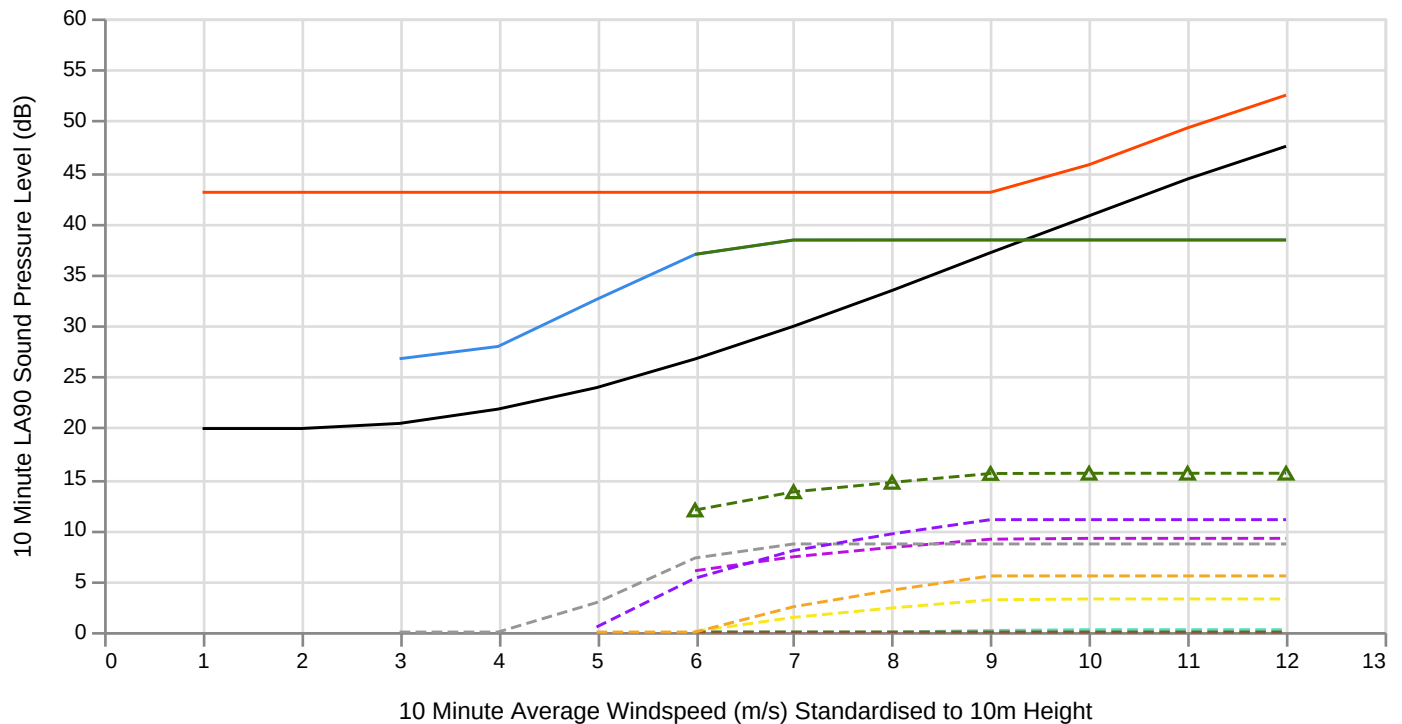
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— Total WEDG Noise Limit	— Cloonkeelaun 2 Single WT
— Crumhach Wind Farm (N149)	— Strokane Single Turbine (Cloonkeelaun)
🗑️ Cumulative Excl Crumhach WF	— Cloonkeelaun WF
— Cumulative (Crumhach - N149)	— Firlough WF
— Black Lough WF	— Carrowleagh WF

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL8 (NSR008)



Night time - NAL8 (NSR008)



Legend

- Background Noise Trendline
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- Crumhach Wind Farm (N149)
- Cumulative Excl Crumhach WF
- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
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Client: SSE Renewables

Project Name: Crumhach Wind Farm

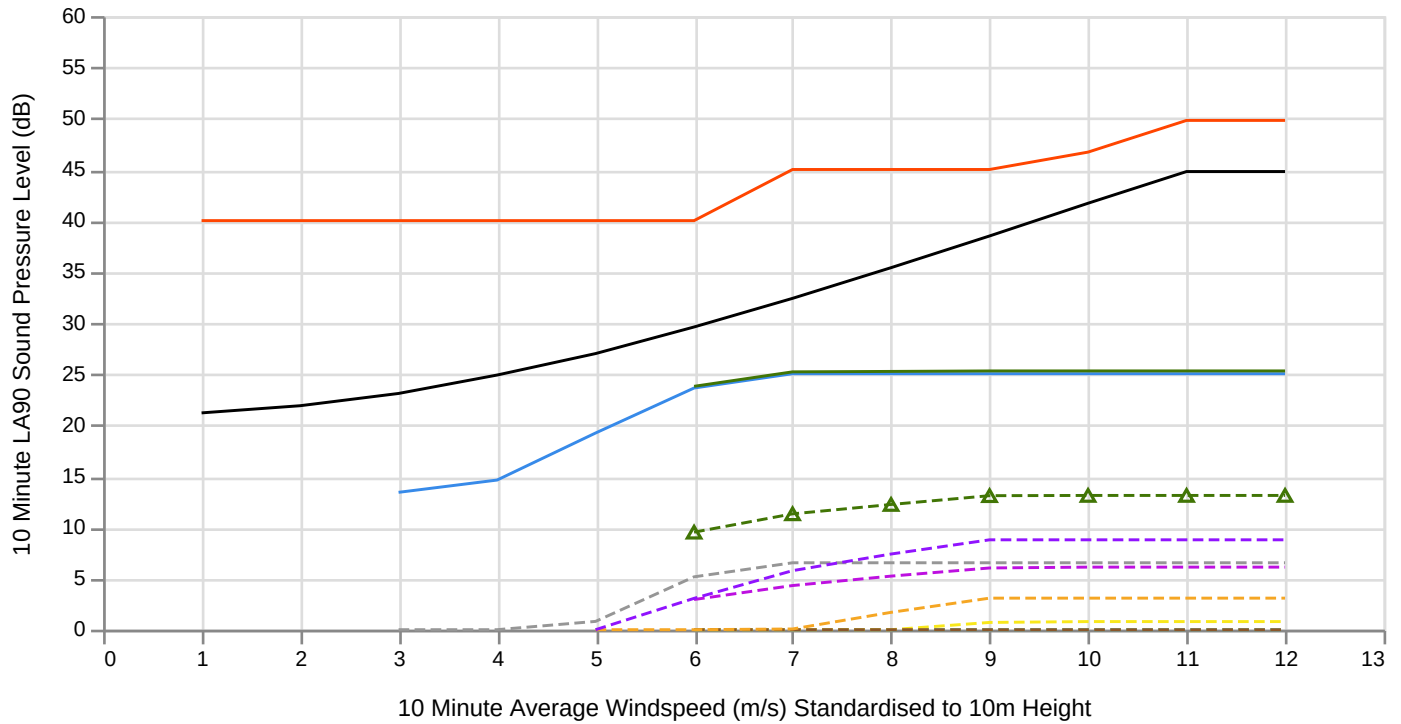
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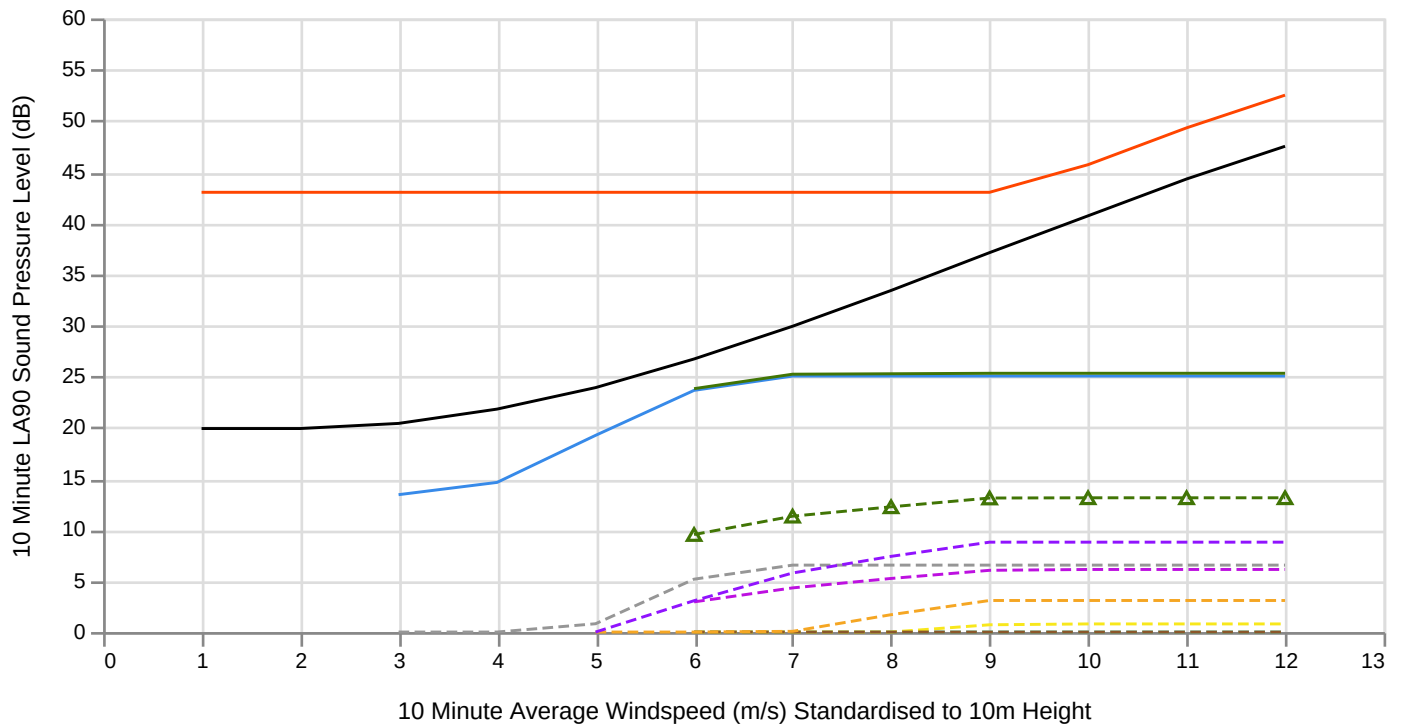
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Date: 2026-05-25

Daytime - NAL9 (NSR105)



Night time - NAL9 (NSR105)

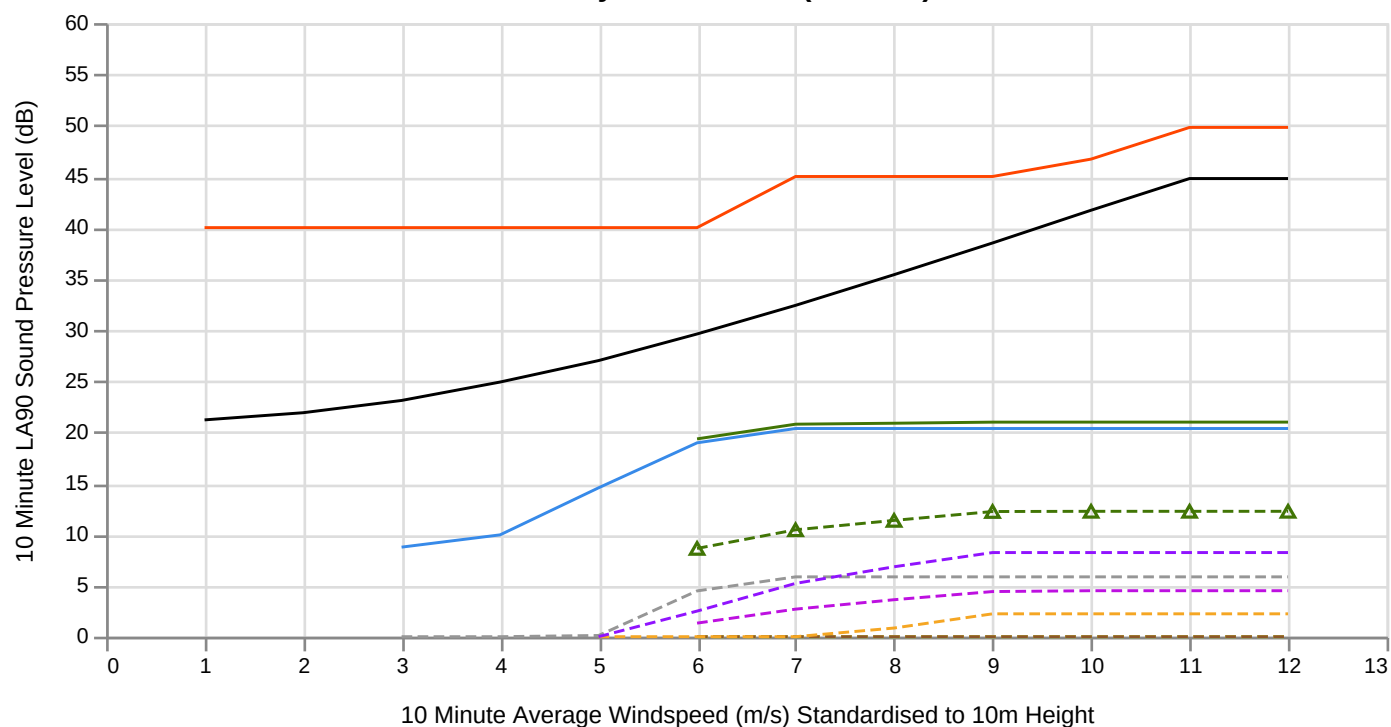


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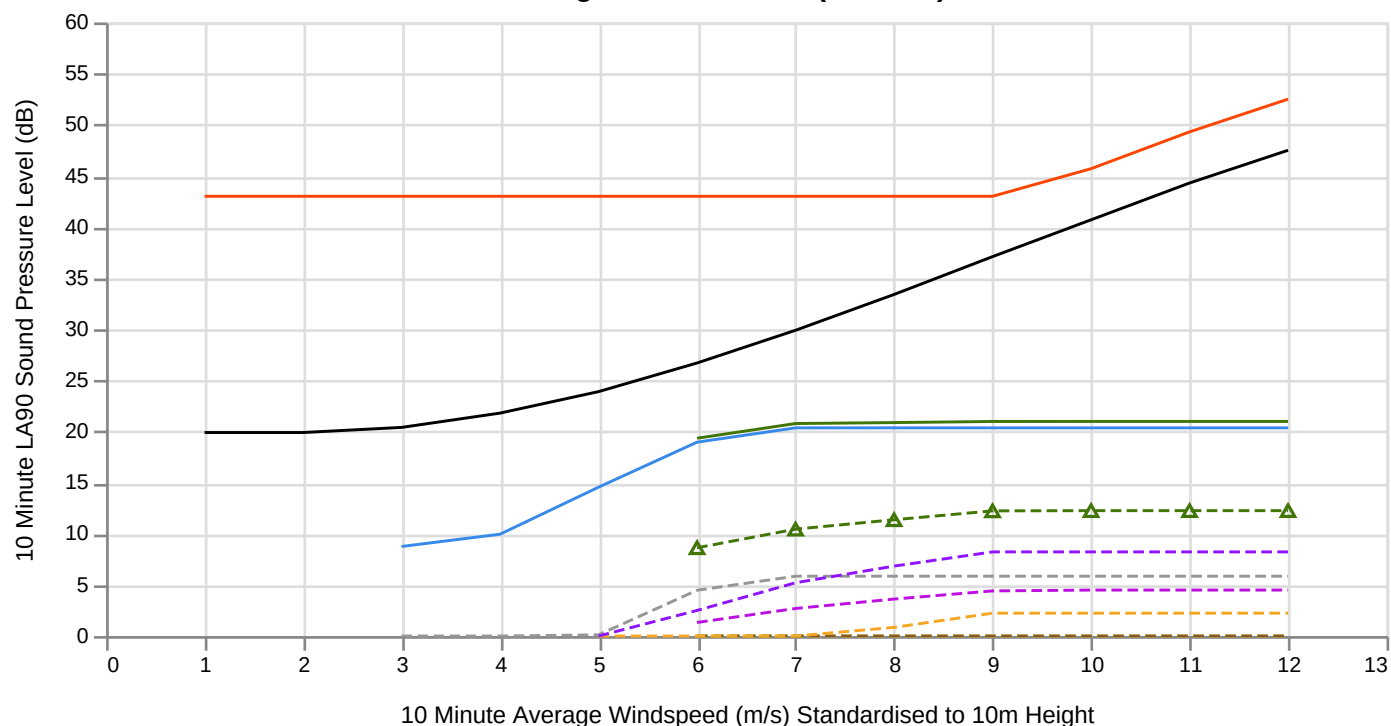
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- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL10 (NSR104)



Night time - NAL10 (NSR104)

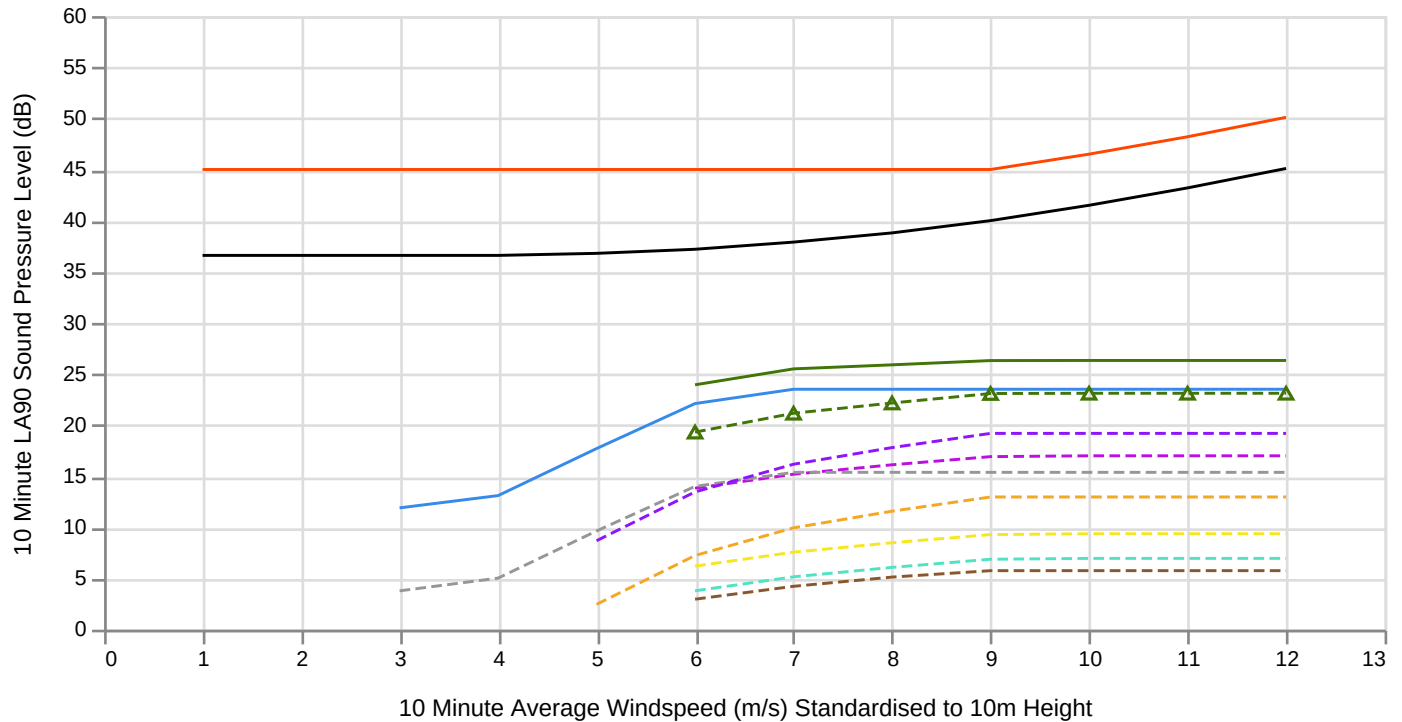


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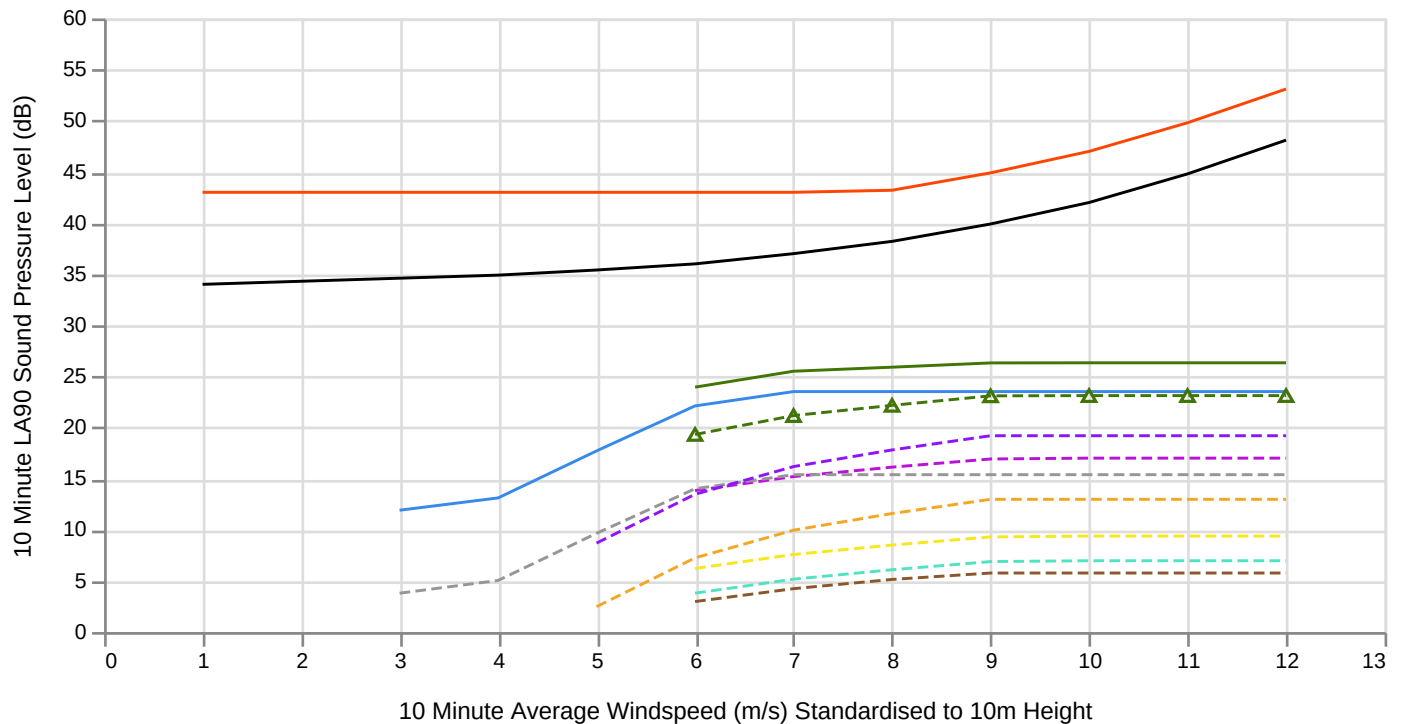
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- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client: SSE Renewables
 Project Name: Crumhach Wind Farm
 Project Number: 220
 Drawn By: JB
 Checked By: JM
 Date: 2026-05-25

Daytime - NAL11 (NSR103)



Night time - NAL11 (NSR103)

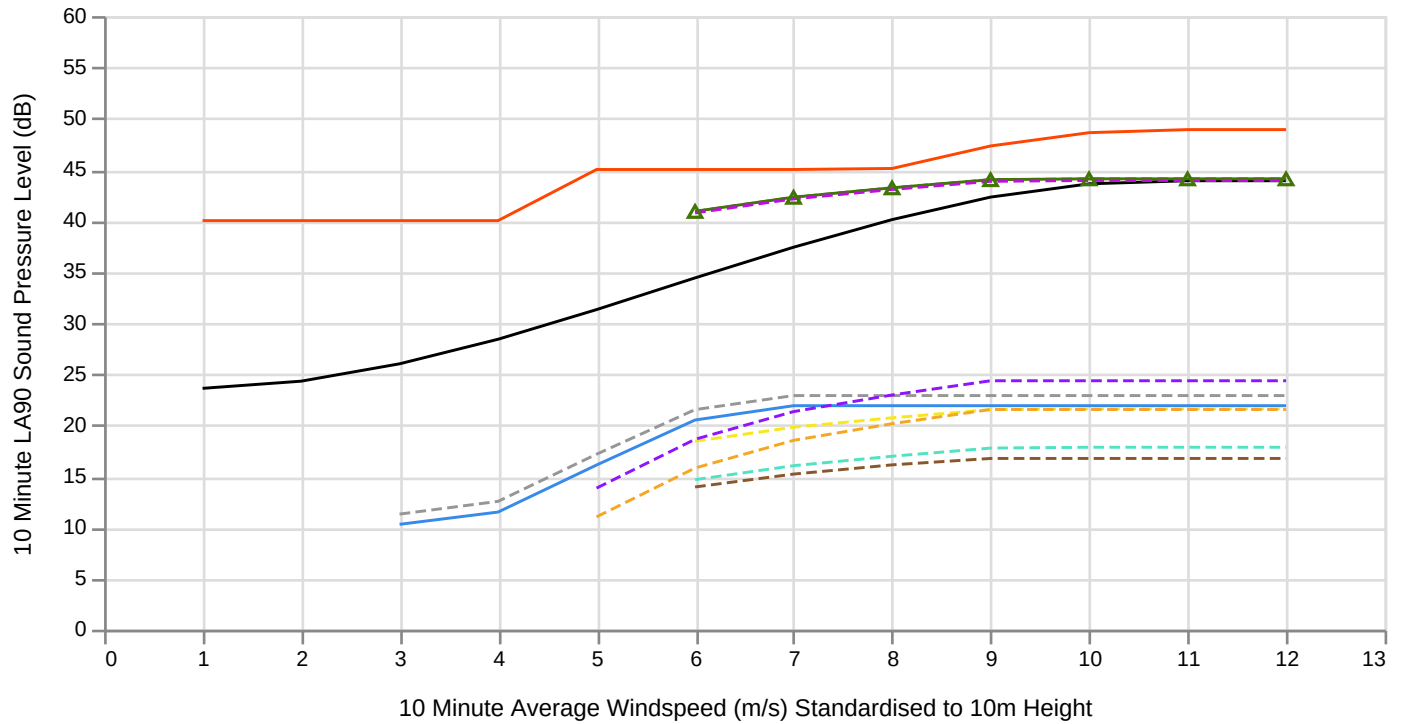


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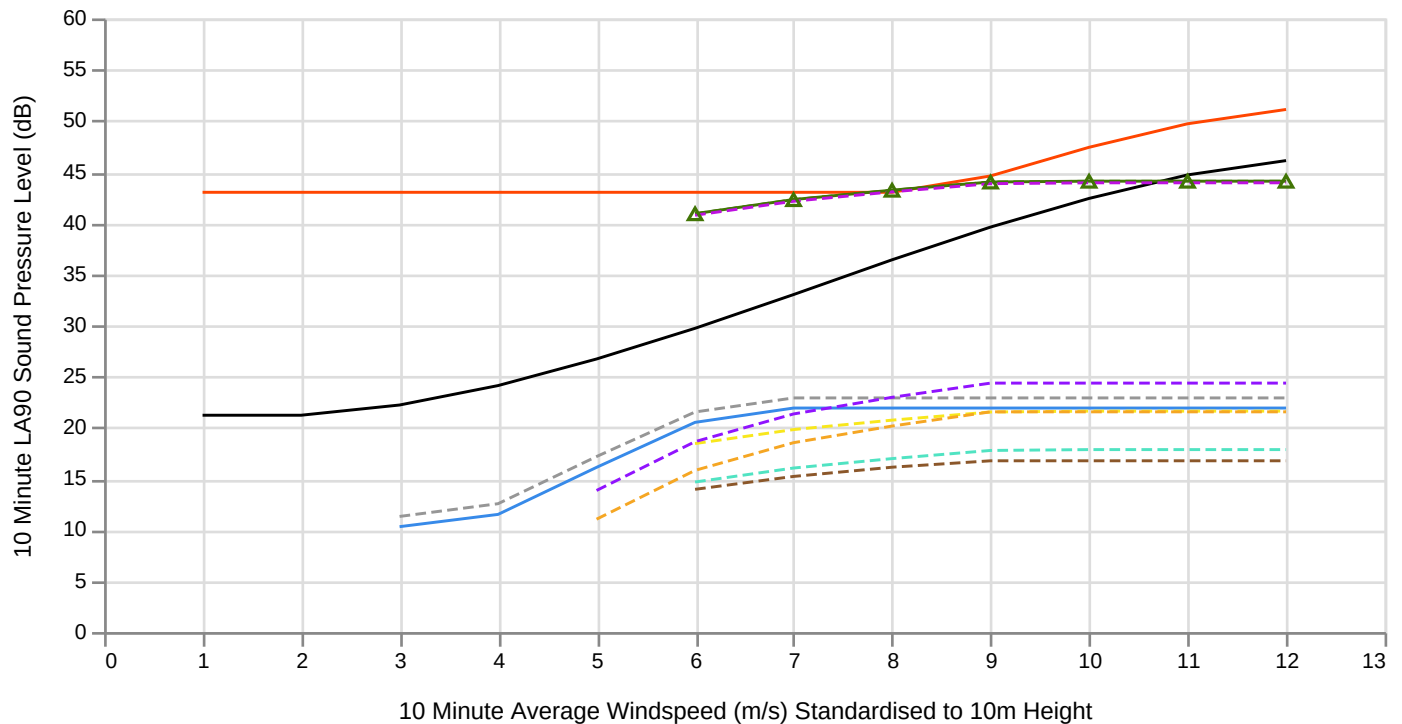
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- Total WEDG Noise Limit
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- 🔄 Cumulative Excl Crumhach WF
- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL12 (NSR102)



Night time - NAL12 (NSR102)



Legend

- Background Noise Trendline
- Total WEDG Noise Limit
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- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
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Client: SSE Renewables

Project Name: Crumhach Wind Farm

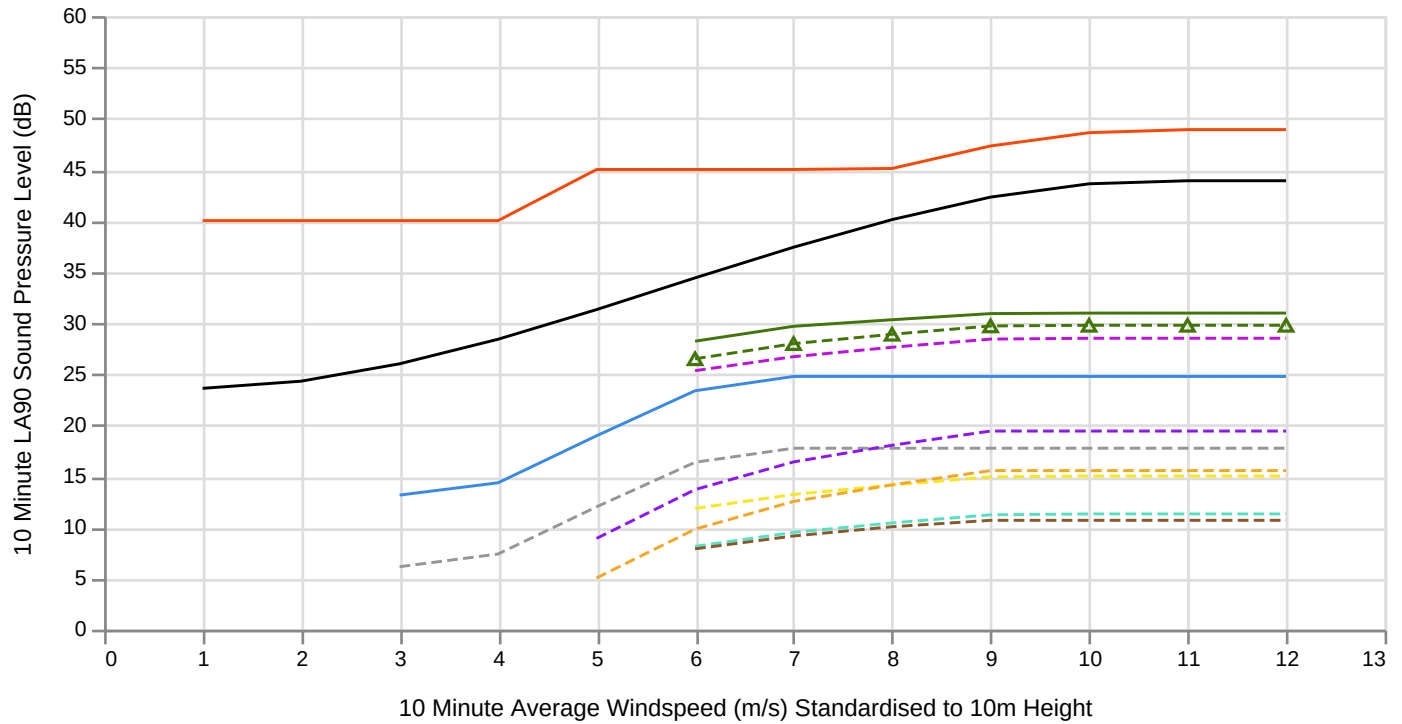
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Drawn By: JB

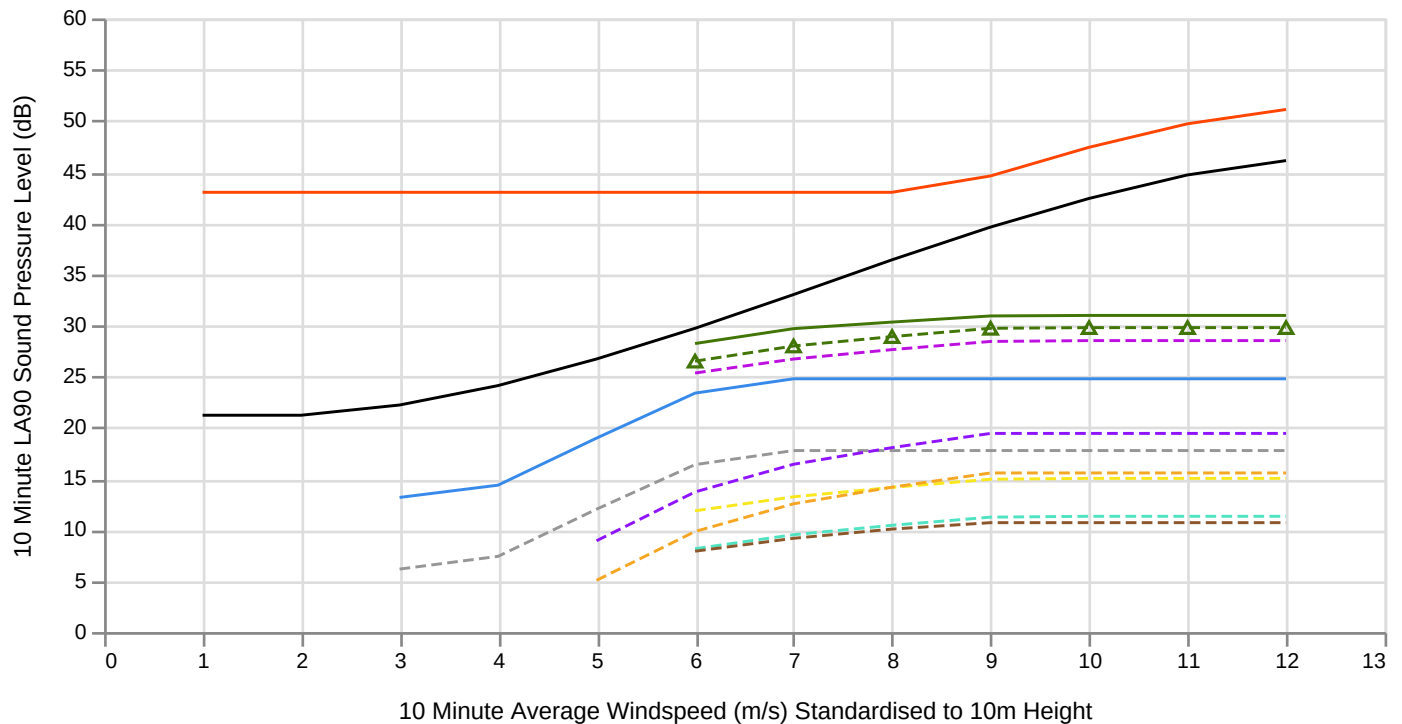
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Date: 2026-05-25

Daytime - NAL13 (NSR101)



Night time - NAL13 (NSR101)

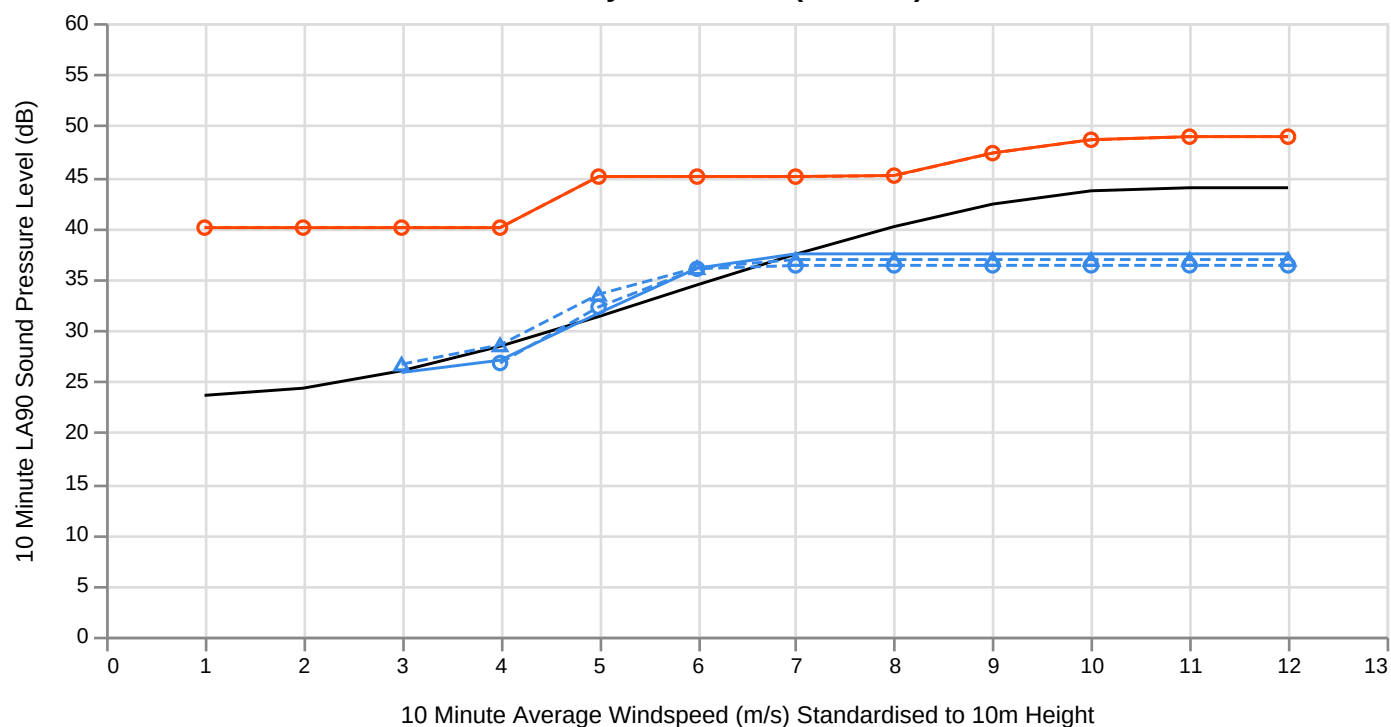


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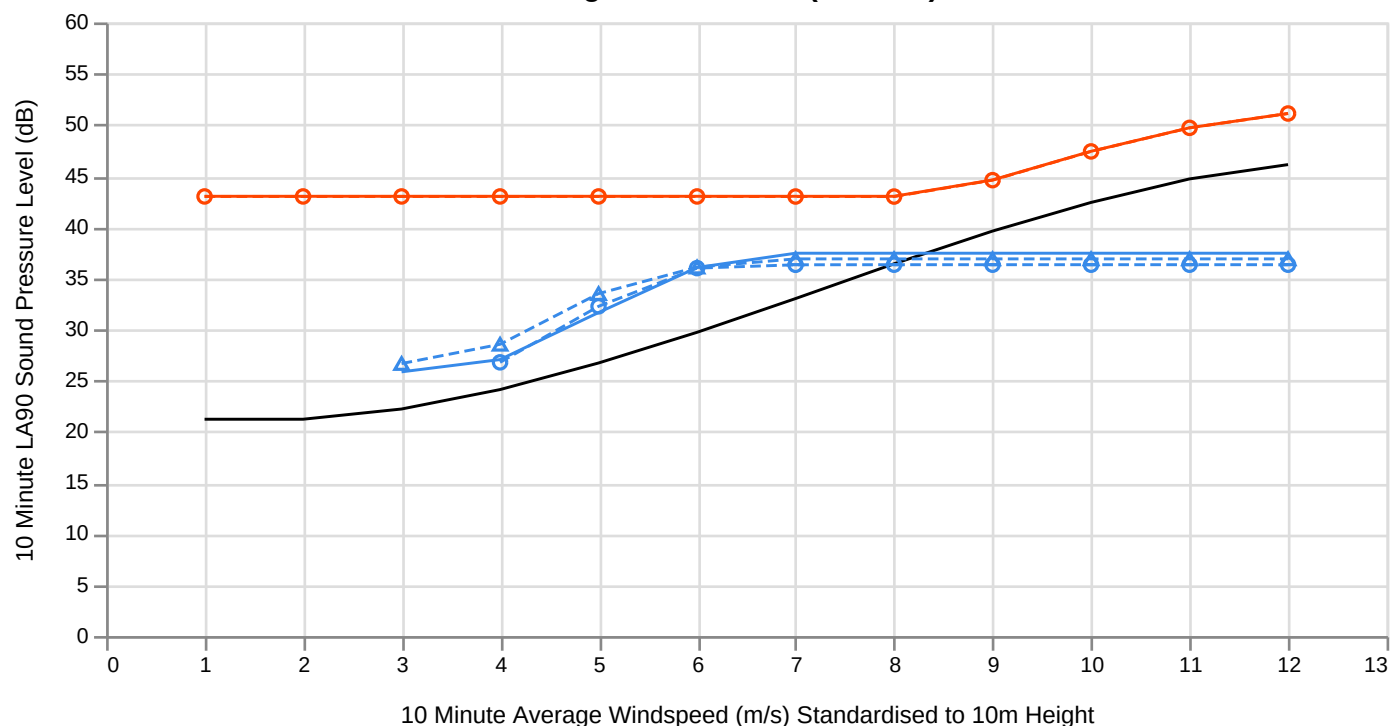
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm (N149)
- 🗑️ Cumulative Excl Crumhach WF
- Cumulative (Crumhach - N149)
- Black Lough WF
- Cloonkeelaun Single WT
- Cloonkeelaun 2 Single WT
- Strokane Single Turbine (Cloonkeelaun)
- Cloonkeelaun WF
- Firlough WF
- Carrowleagh WF

Client SSE Renewables
Project Name Crumhach Wind Farm
Project Number 220
Drawn By JB
Checked By JM
Date 2026-05-25

Daytime - NAL2 (NSR015)



Night time - NAL2 (NSR015)

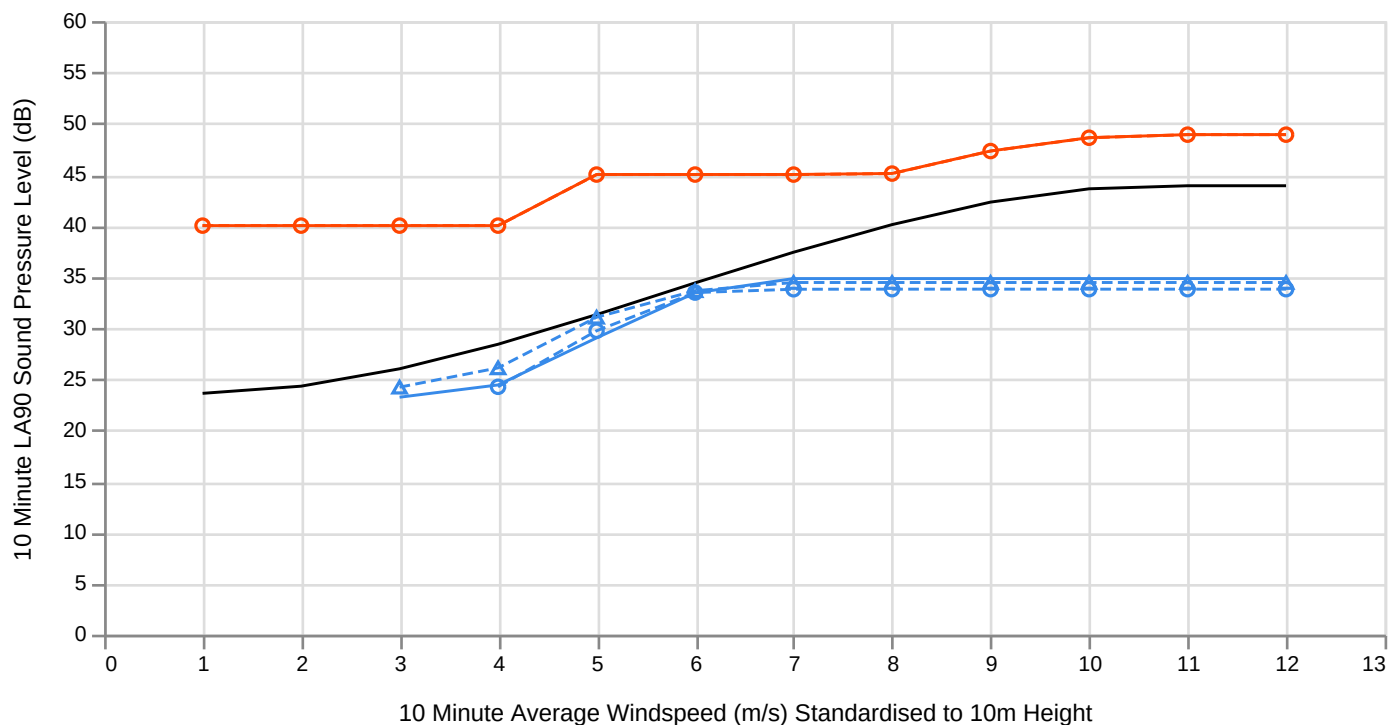


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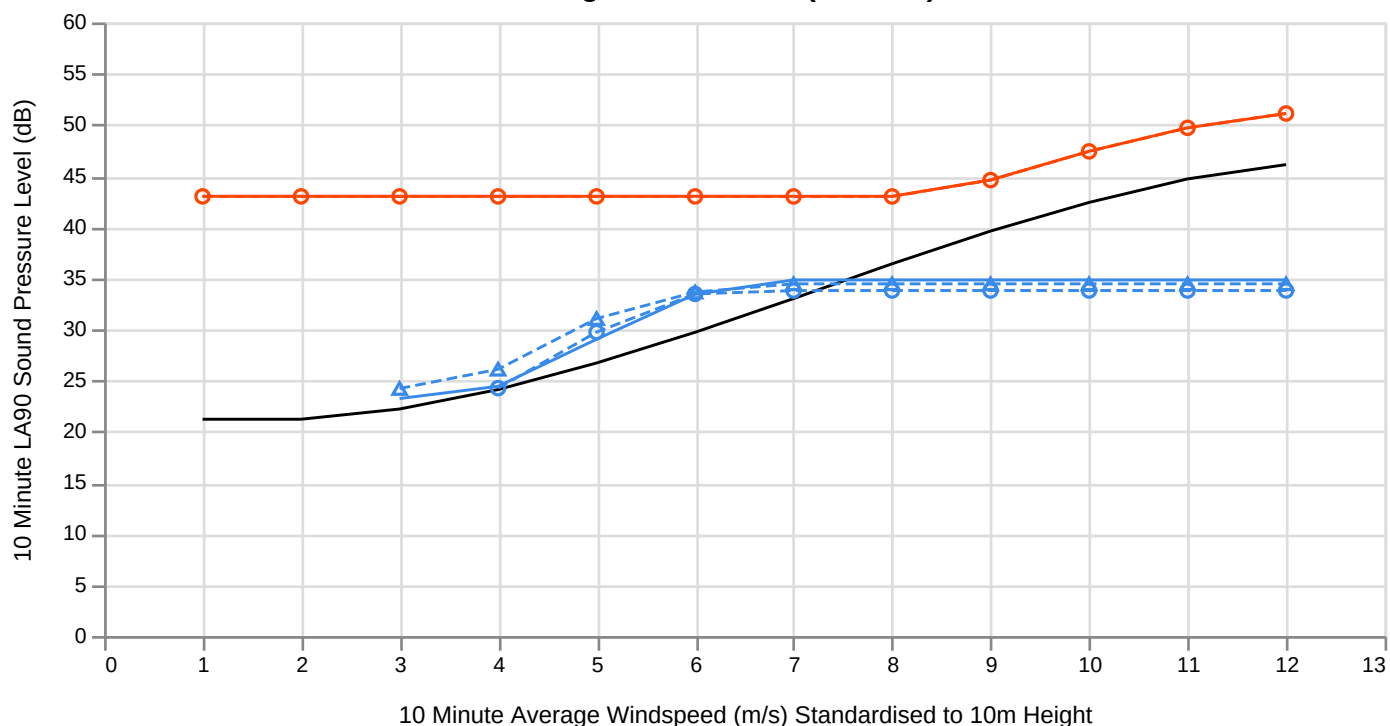
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - - Crumhach Wind Farm - Nordex N133
- ▲ Crumhach Only - Vestas V150
- Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL3 (NSR027)



Night time - NAL3 (NSR027)

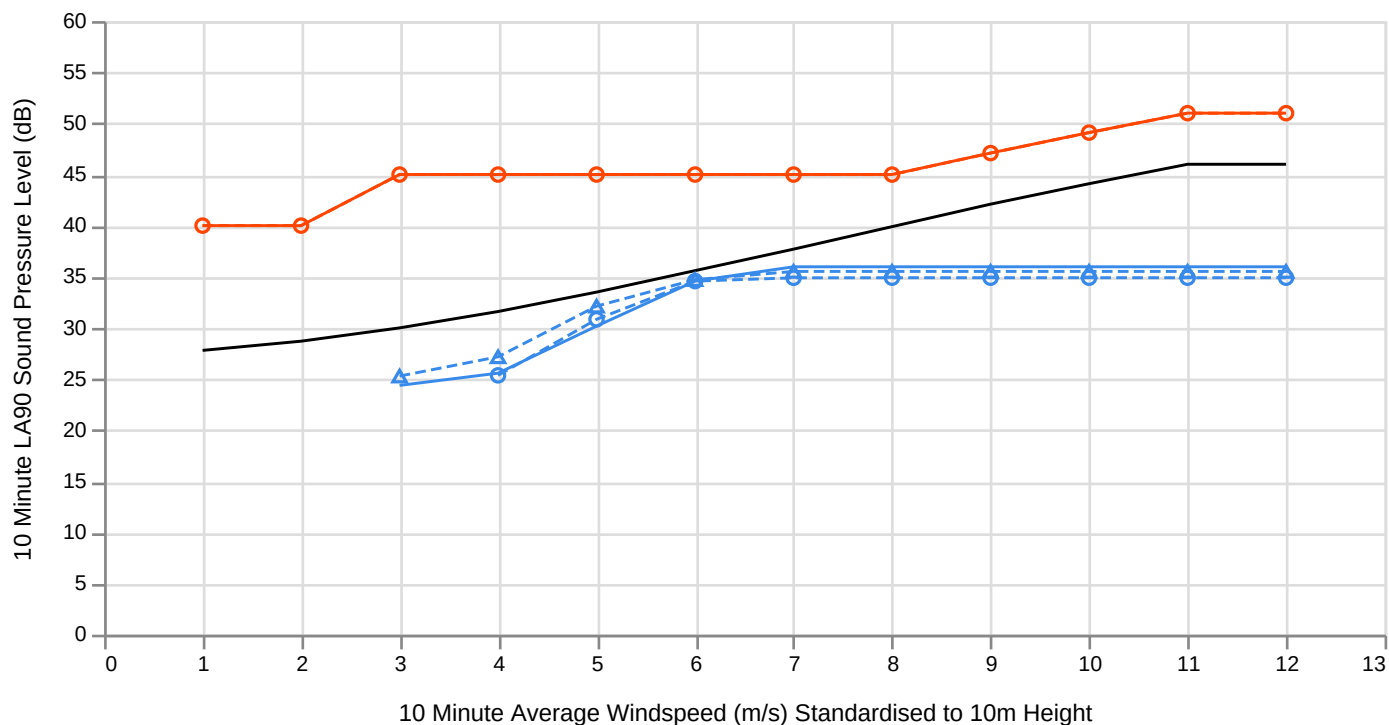


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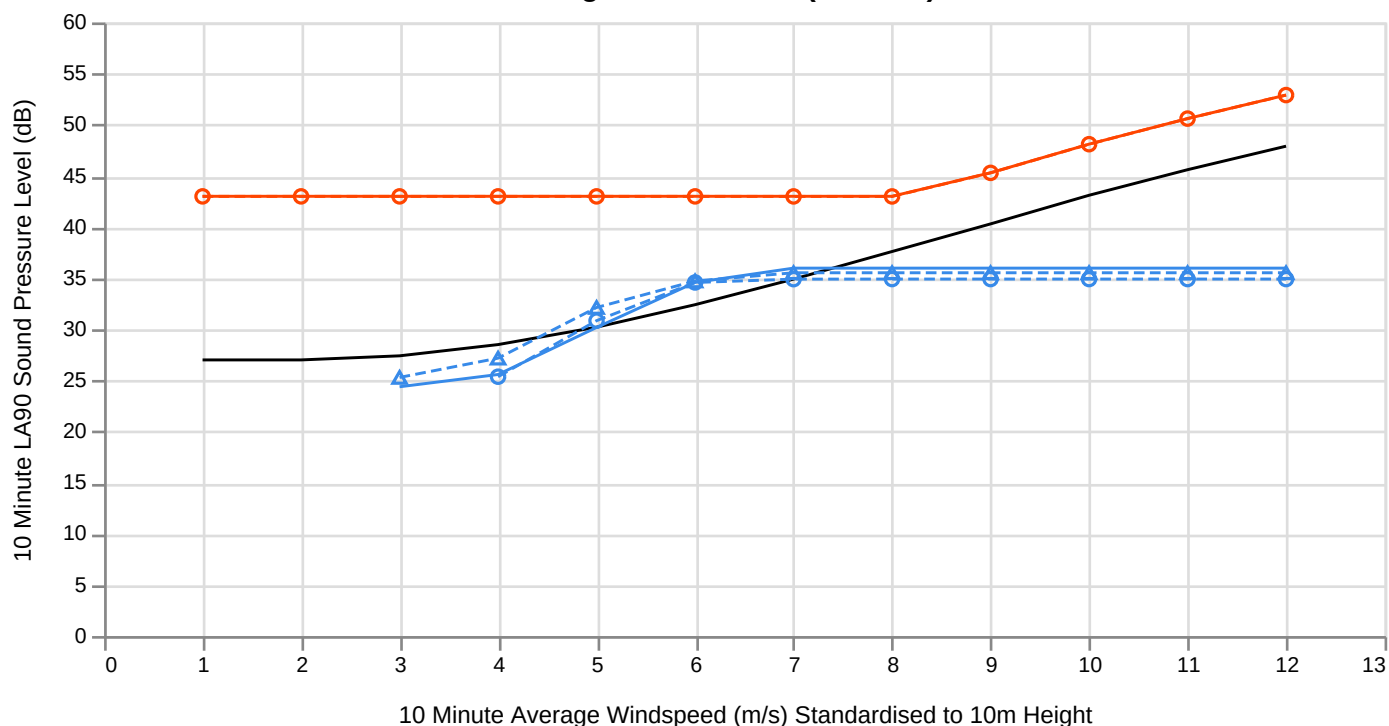
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - Crumhach Wind Farm - Nordex N133
- Site Specific Noise Limits
- △ Crumhach Only - Vestas V150

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL4 (NSR020)



Night time - NAL4 (NSR020)

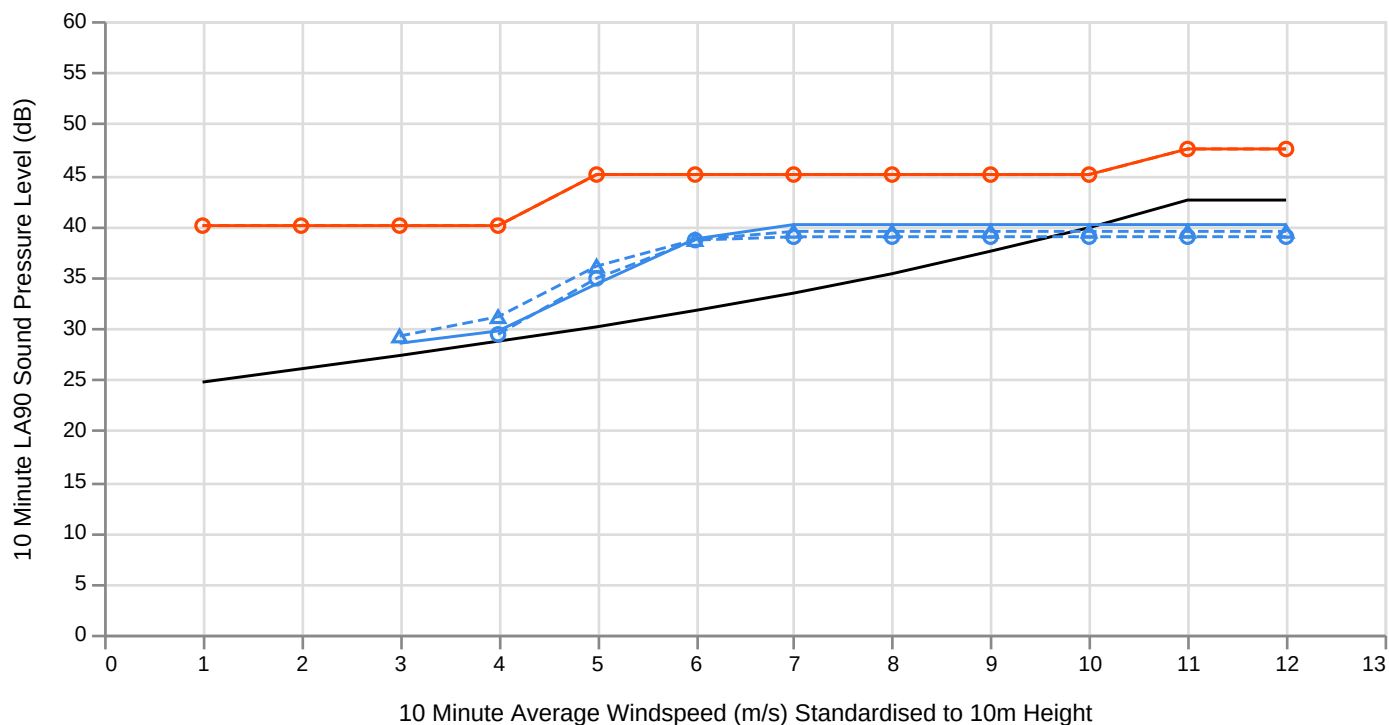


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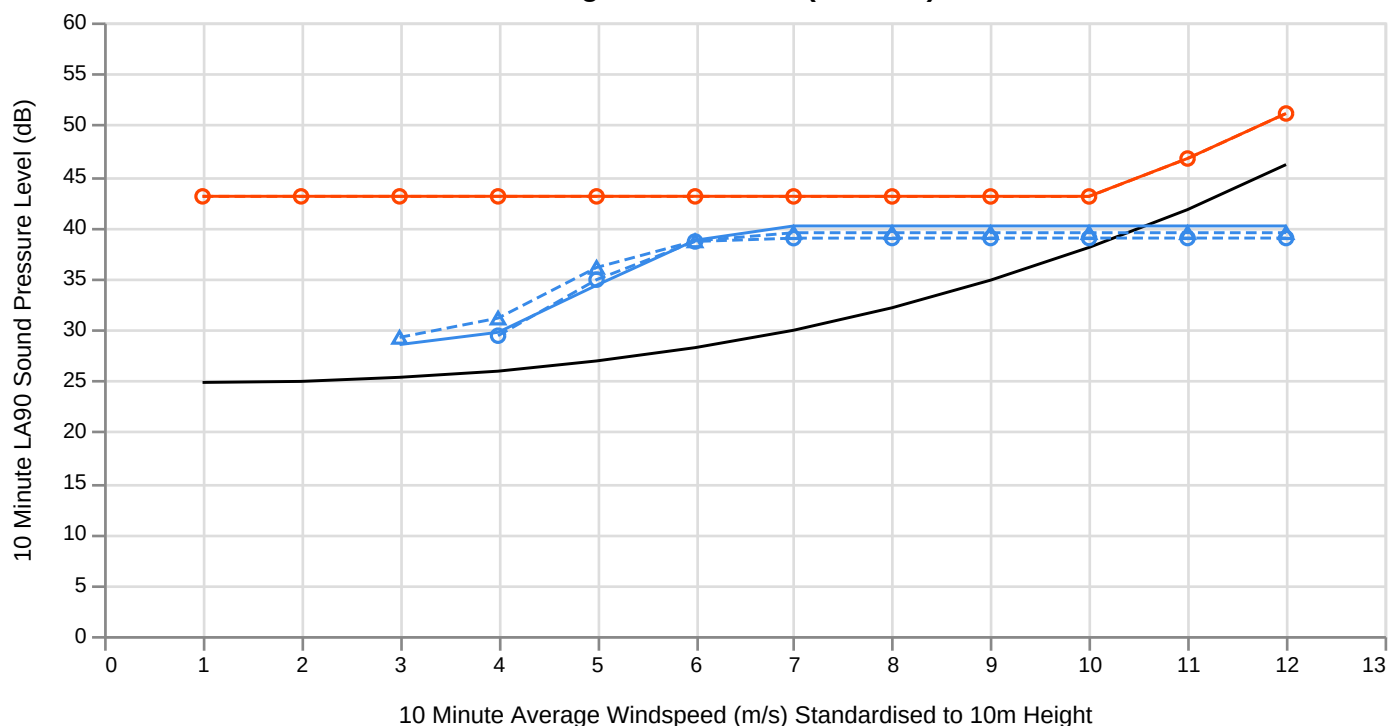
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - Crumhach Wind Farm - Nordex N133
- - Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL5 (NSR004)



Night time - NAL5 (NSR004)

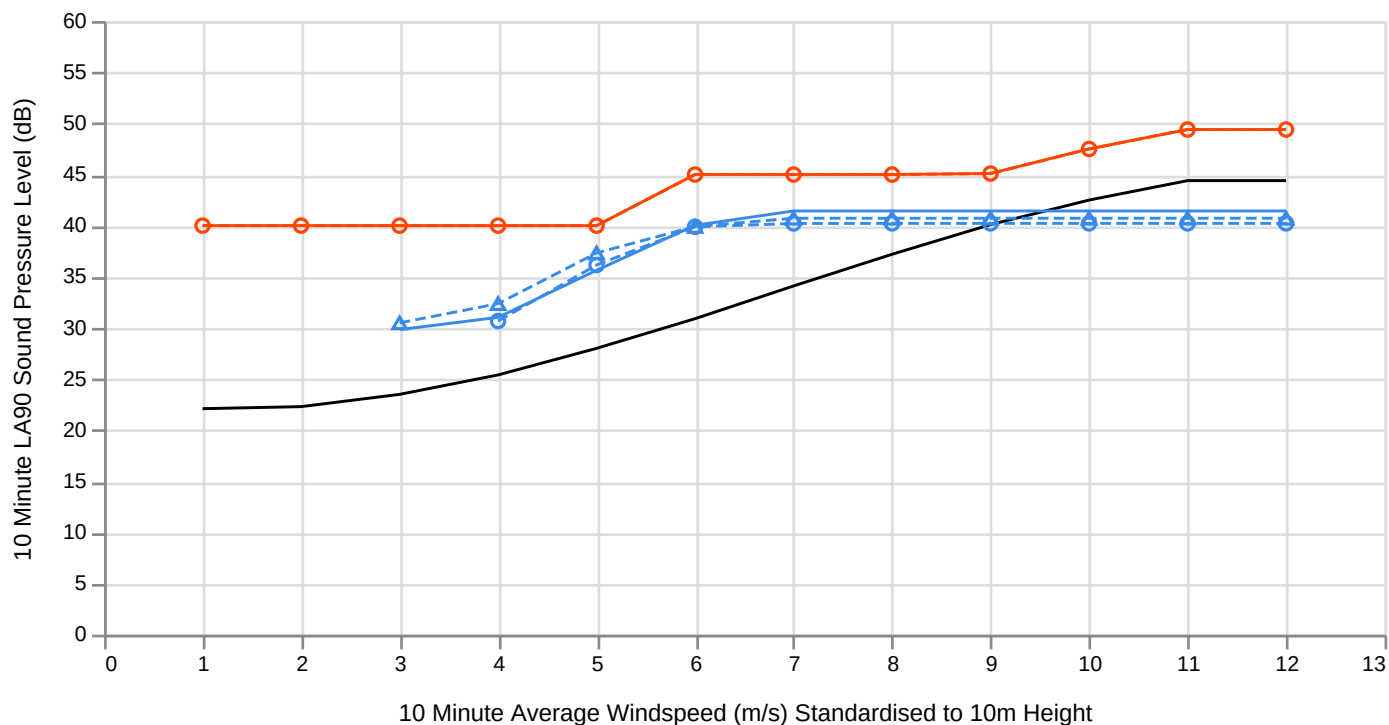


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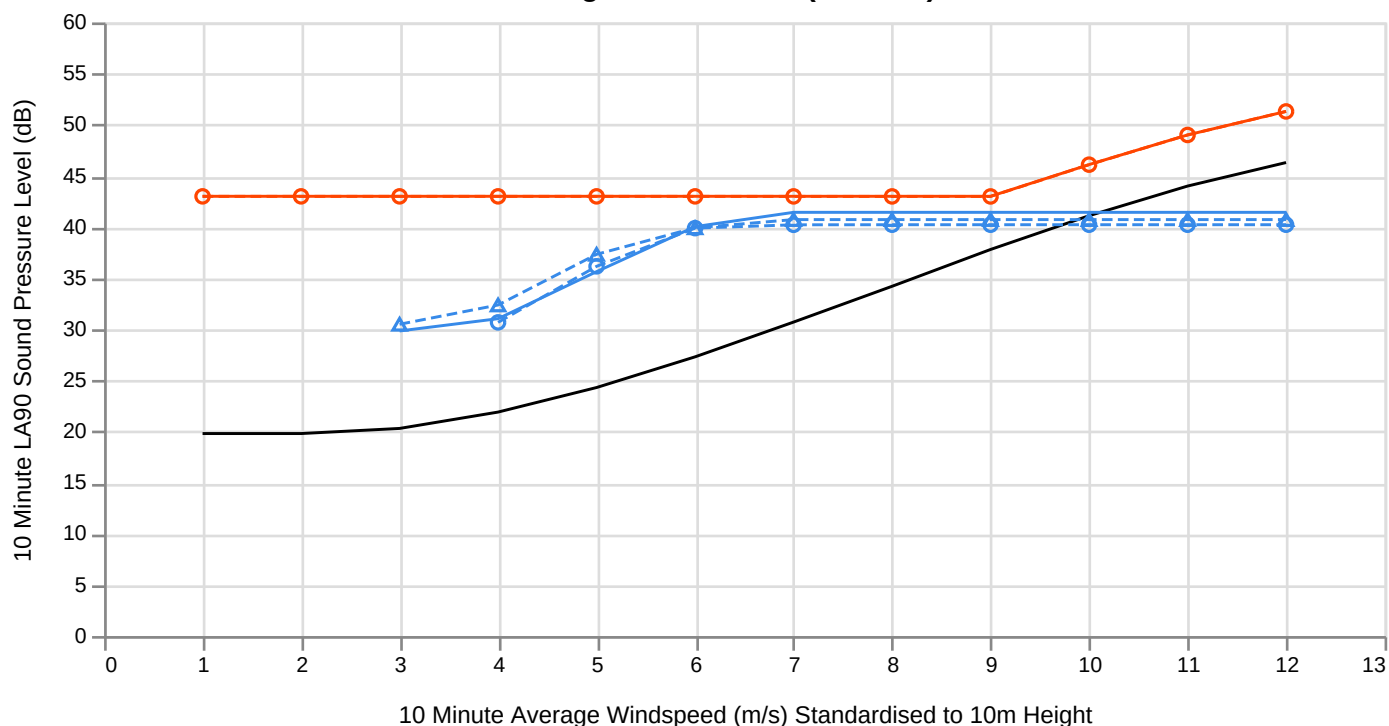
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - - Crumhach Wind Farm - Nordex N133
- - - Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL6 (NSR002)



Night time - NAL6 (NSR002)

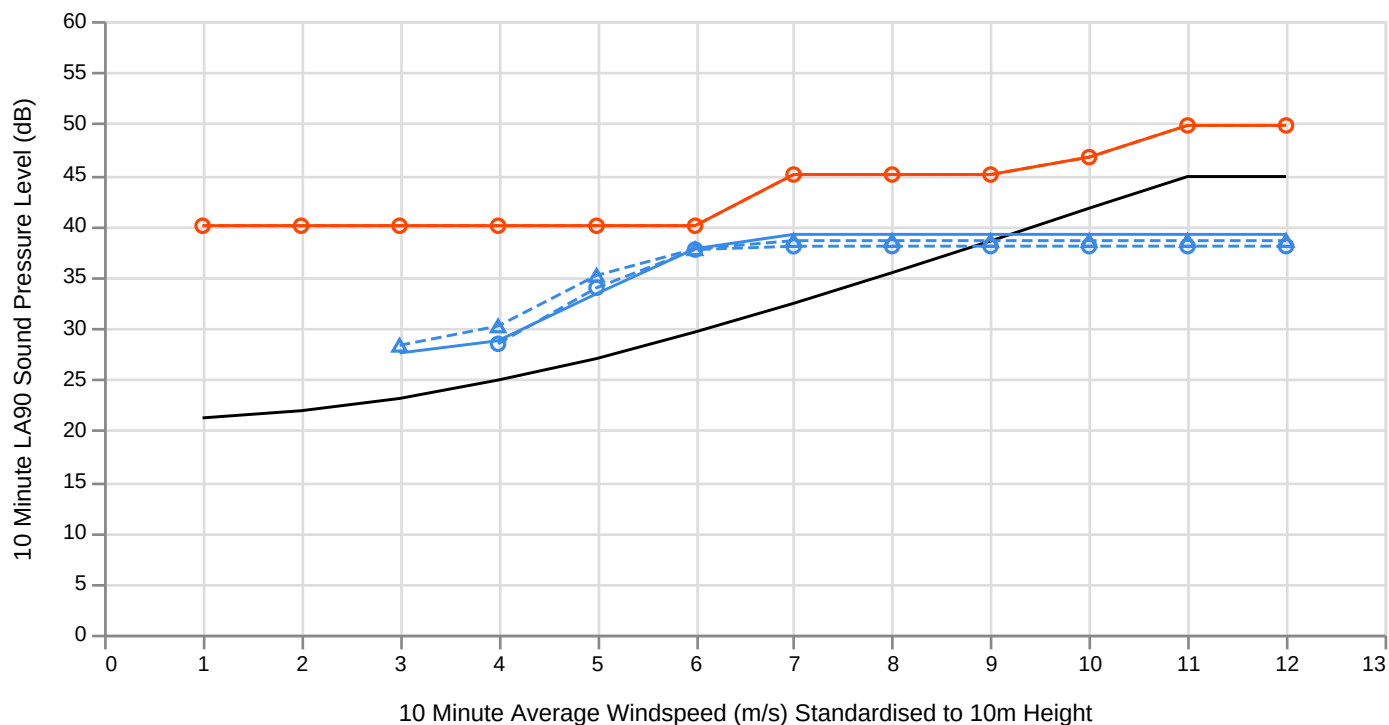


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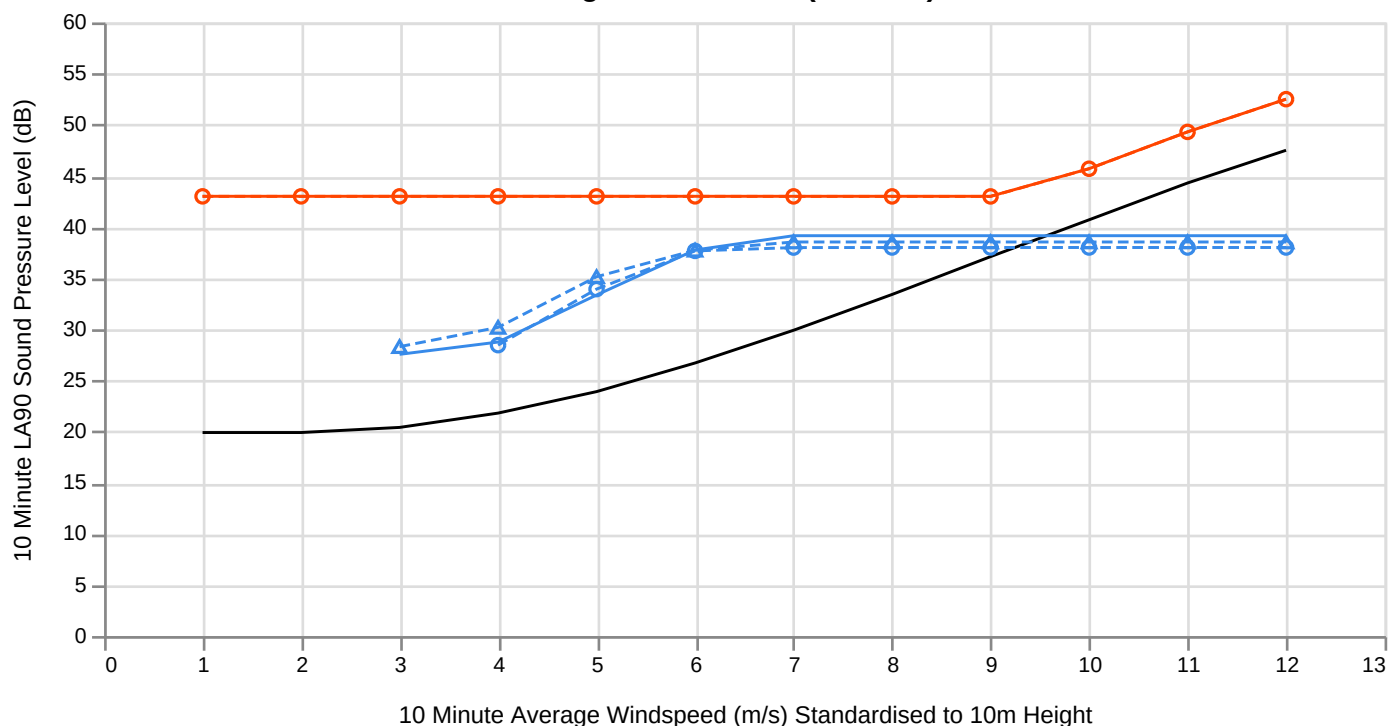
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - - Crumhach Wind Farm - Nordex N133
- △ Crumhach Only - Vestas V150
- Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL7 (NSR013)



Night time - NAL7 (NSR013)

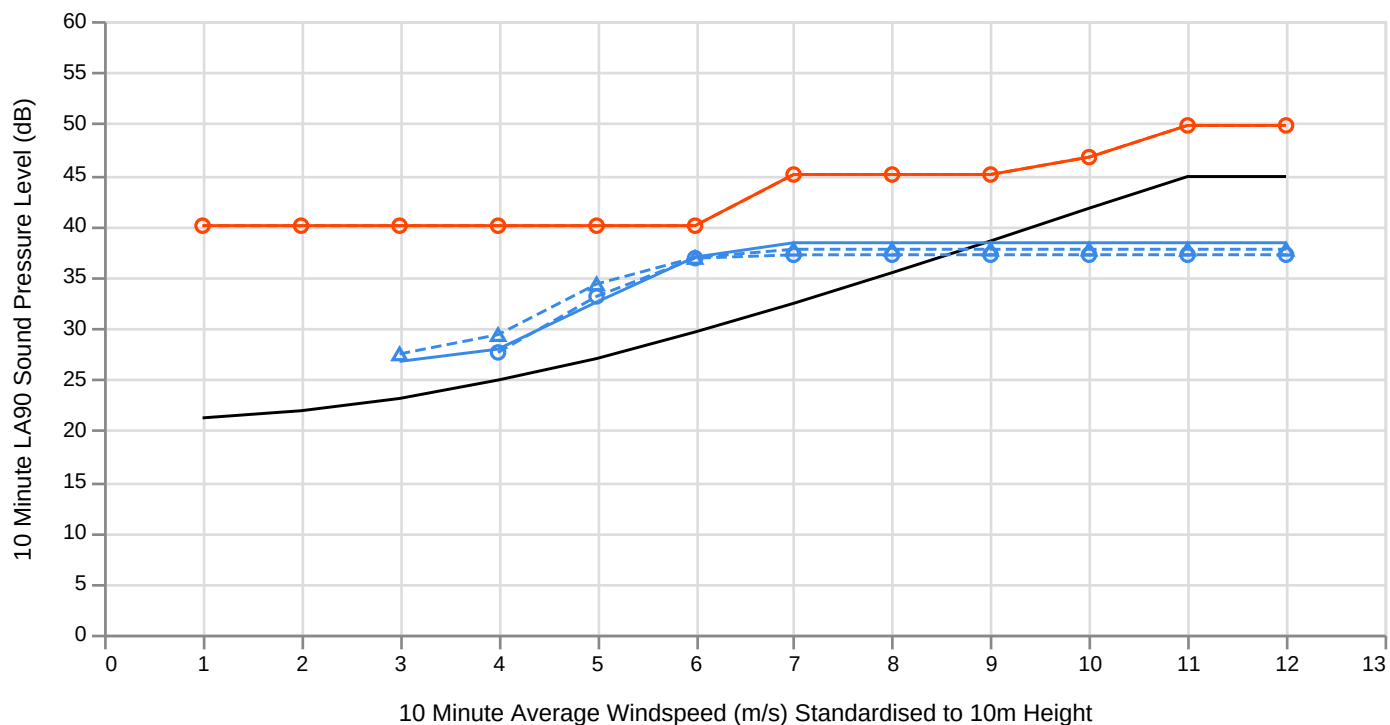


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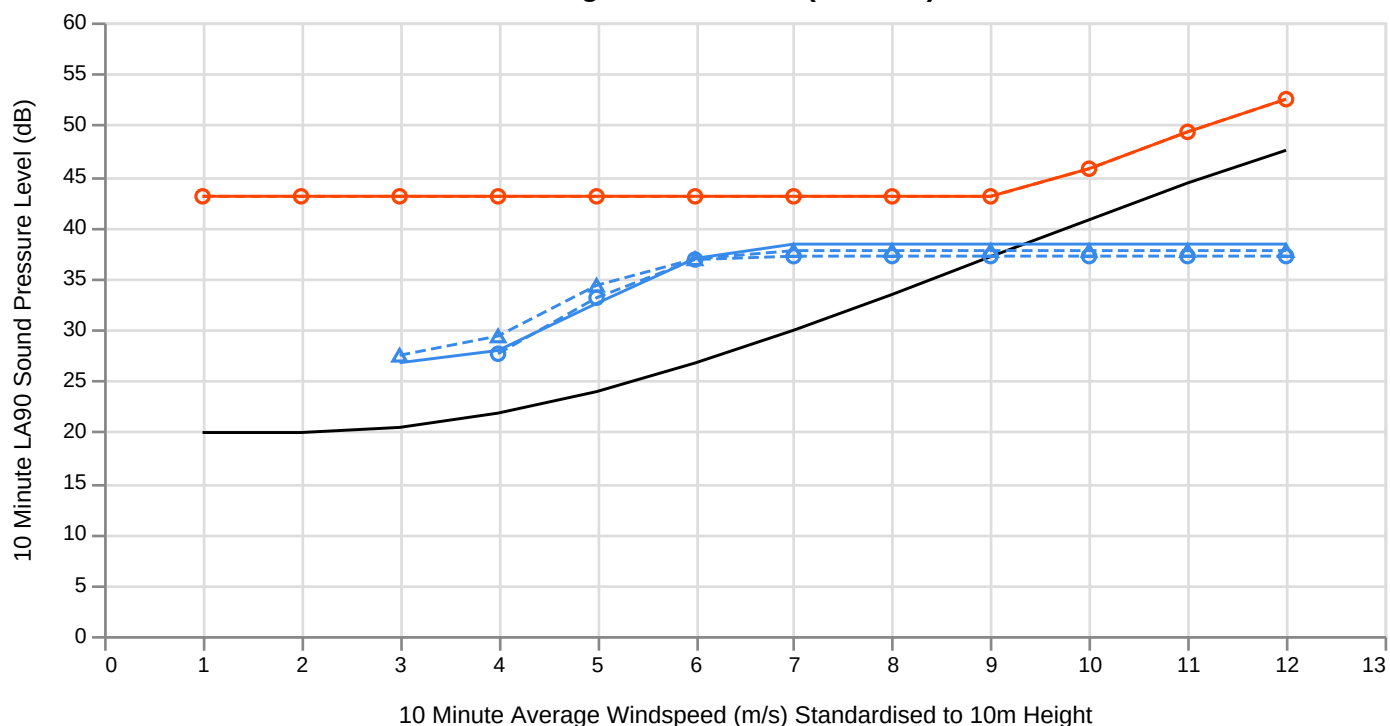
- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - Crumhach Wind Farm - Nordex N133
- - Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Daytime - NAL8 (NSR008)



Night time - NAL8 (NSR008)



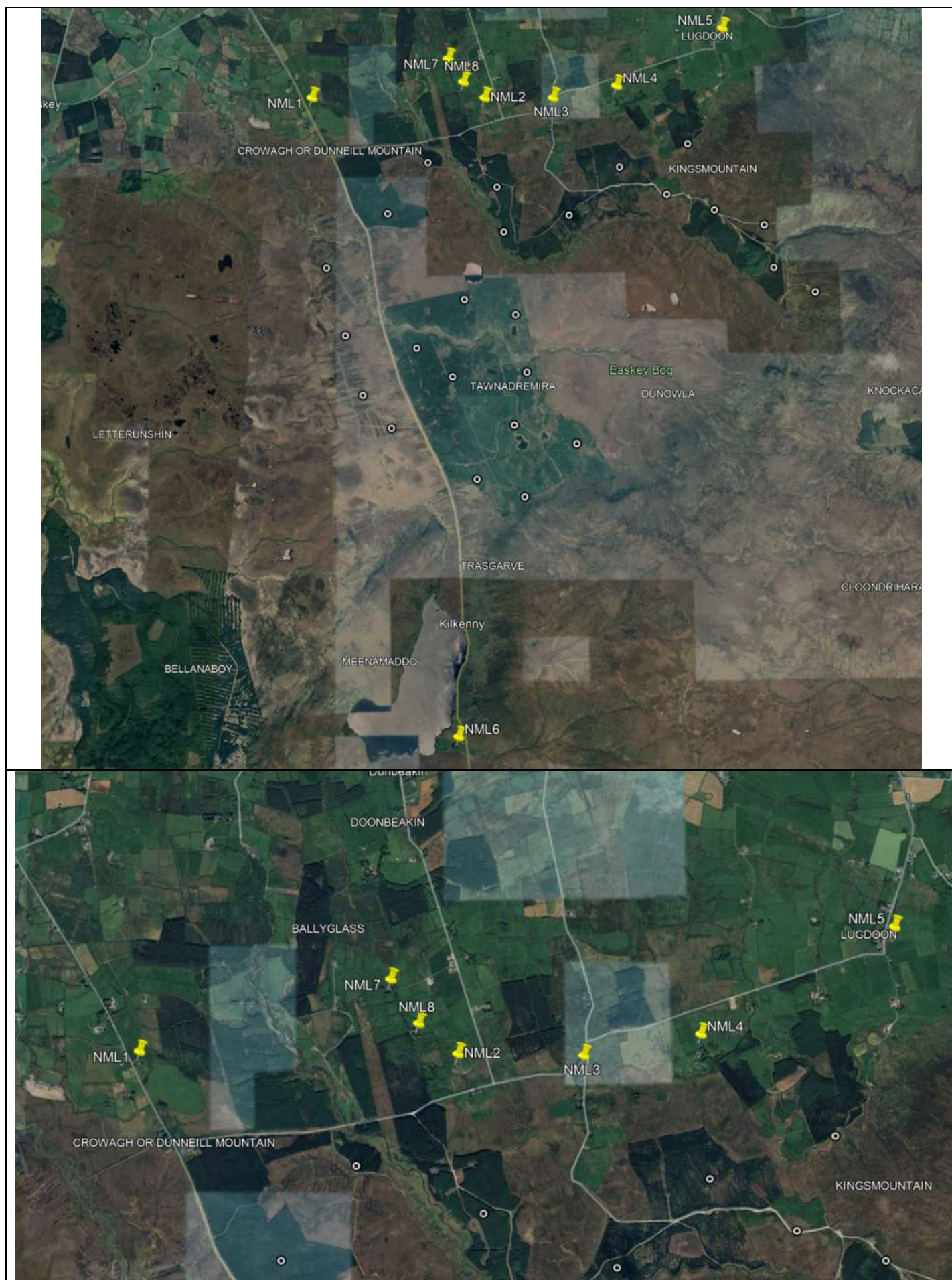
Legend

- Background Noise Trendline
- Total WEDG Noise Limit
- Crumhach Wind Farm - Nordex N149
- - - Crumhach Wind Farm - Nordex N133
- - - Crumhach Only - Vestas V150
- - - Site Specific Noise Limits

Client	SSE Renewables
Project Name	Crumhach Wind Farm
Project Number	220
Drawn By	JB
Checked By	JM
Date	2026-05-25

Annex 2 – Field Data Sheets / Installation Report

Crumach Wind Farm Noise Survey - Installed Noise Monitoring Locations



Present during the course of the installation:

- Jason Baldwin, TNEI Ireland

Unless specified, all noise meters were installed at least 3.5 m from any hard-reflecting surface except the ground and less than 20 m from the dwelling and away from obvious noise sources, such as boiler flues.

Detailed information and pictures for each of the installed locations are provided below. The original full-size pictures are available on request.

Noise Monitoring Locations Easting / Northings (IG)

NML/PNML	Easting	Northing
1	143208	329641
2	145176	329601
3	145950	329581
4	146668	329703
5	147874	330349
6	144799	322403
7	144765	330065
8	144935	329791

NML1



North



East



South



West



Description
The noise monitoring equipment was installed to the north of the property. The location was chosen due to its proximity to the north west of the western portion of the proposed development, and is seen to be representative of the other properties in the vicinity, both adjacent, further north and further south. The kit was positioned in what was considered to be the residents amenity area. The predominant sounds that were audible during the installation were from an aircraft overhead, birdsong, and wind induced noise from the nearby vegetation and trees. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground. A rain gauge was installed at this location.

NML2



North



East



South

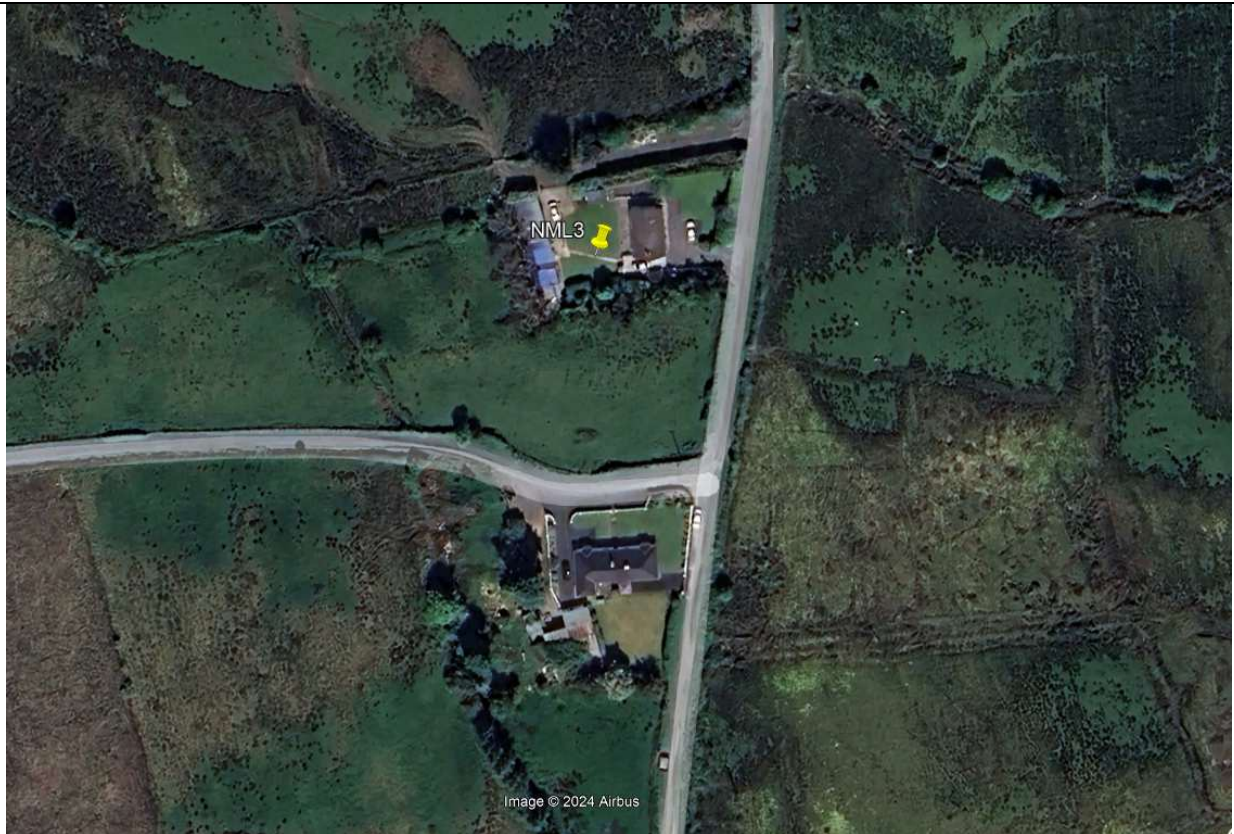


West



Description
The noise monitoring equipment was installed to the west of the property. The location was chosen due to its proximity to the north east of the western portion of the proposed development, and is seen to be representative of the other properties in the vicinity, and further north. The kit was positioned in what was considered to be the residents amenity area. The predominant sounds that were audible during the installation were from wind turbine noise from Dunneil wind farm, an aircraft overhead, birdsong, and wind induced noise from the nearby vegetation and trees in the distance. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML3



North



East



South



West



Description

The noise monitoring equipment was installed to the west of the property, in the back garden.

The location was chosen due to its proximity to the north of the centre of the proposed development, and is seen to be representative of the other properties in the vicinity (further north and the four properties further south). The kit was positioned in what was considered to be the residents amenity area.

The predominant sounds that were audible during the installation were from birdsong, and wind induced noise from the vegetation and trees in the garden.

The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML4



North



East



South



West



Description

The noise monitoring equipment was installed to the north of the property.

The location was chosen due to its proximity to the north of the eastern portion of the proposed development, and is seen to be representative of the other properties in the vicinity, and further north. The kit was positioned in what was considered to be the residents amenity area.

The predominant sounds that were audible during the installation were from birdsong, and wind induced noise from the nearby vegetation and trees in the garden.

The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML5



North

East



South

West



Description
The noise monitoring equipment was installed to the north of the property. The location was chosen due to its proximity to the north east of the eastern portion of the proposed development, and is seen to be representative of the other properties in the vicinity, both further north, north east, and south. The kit was positioned in what was considered to be the residents amenity area. The predominant sounds that were audible during the installation were from the odd car passing, birdsong, and a tractor in the distance. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML6



North



East



South



West



Description

The noise monitoring equipment was installed to the north of the property.

The location was chosen to ensure that the closest property to the south of the proposed development was considered. The property is a large distance from the proposed development (~3.5 km) and is the only property in the immediate area. Measurements at this property are likely to only represent this property, a stream wraps around the property to the north and is expected to influence measurements here. The kit was positioned in what was considered to be the residents amenity area.

The predominant sounds that were audible during the installation were from birdsong, and wind induced noise from the vegetation and trees in the garden. Slight stream noise was audible, though this was not especially noticeable at the measurement installation location. Wind chimes were audible on installation, but these were tied together to prevent them making noise during the monitoring campaign.

The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

NML7



North



East



South



West



Description

The noise monitoring equipment was installed to the north of the property.

The location was chosen due to concerns raised by the resident of noise from the proposed development. The kit was positioned in what was considered to be the residents amenity area.

The predominant sounds that were audible during the installation were predominantly from wind turbine noise from Dunneil wind farm, and wind induced noise from the nearby vegetation and trees in the distance.

The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

A rain gauge was installed at this location.

NML8



North



South



East



West



Description
The noise monitoring equipment was installed to the south of the property. The location was chosen due to concerns raised by the resident of noise from the proposed development. The kit was positioned in what was considered to be the residents amenity area, as directed by the resident. The predominant sounds that were audible during the installation were from wind induced noise from the nearby vegetation and trees, and birdsong. The noise meter was located in a free field position, greater than 3.5m from any hard reflecting surface except the ground.

Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML1
Description	The equipment was installed in the property's amenity area and away from hard surfaces, thus being representative of the typical soundscape.
Approximate ITM Reference	543163, 829657
Noise sources noted during installation, weekly inspection and removal	The soundscape at this location consisted of prominent vegetation rustle and slight birdsong. Aircraft overhead and infrequent cars going past the property were both noted.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM14	NL-32	01273102	06/07/2023
Sound Level Meter	SLM57	NL-52	00520921	22/04/2024 (swapped SLMs on 20/08/24)
Calibrator	CAL3	NC74	35173441	22/04/2024

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0101	11:40 14/06/2024	11:10 17/07/2024	94.0	93.9	0.1dB	Installation - Birdsong - Foliage rustling - Aircraft overhead Maintenance Visit - Wind in trees prominent, 47-48dB - (clock ~4 seconds slow) - SLM would not restart and was swapped with SLM57, NL52 - advanced
0103	11:30 20/08/24	11:17 26/09/24	94.0	93.9	0.1dB	Removal - Wind in vegetation - Faint noise of traffic - Occasional car driving by - Windy conditions

NML01 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML2
Description	The equipment was installed in the resident's stated main amenity area which is on the same side as the Dunneill Wind Farm.
Approximate ITM Reference	545131, 829617
Noise sources noted during installation, weekly inspection and removal	The soundscape at this location consisted of prominent mechanical and blade modulation noise from the Dunneill wind farm and faint birdsong and vegetation rustle. Aircraft overhead and slight traffic noise were also noted.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM64	NL-52	00408987	21/10/2022
Calibrator	CAL3	NC74	35173441	22/04/2024

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0201	12:30 14/06/2024	11:37 17/07/2024	94.0	94.0	0.0dB	Installation - Dunneill wind farm - Birdsong - Aircraft overhead Maintenance Visit - Wind through vegetation - Turbines to the west audible - Faint traffic noise
0203	11:50 20/08/24	11:41 26/09/24	94.0	94.0	0.0dB	Removal - Wind in vegetation - Turbines not very audible this time - Windy conditions

NML02 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML3
Description	The equipment was installed in the properties amenity area and away from hard surfaces, thus being representative of the typical soundscape.
Approximate ITM Reference	545905, 829597
Noise sources noted during installation, weekly inspection and removal	The soundscape at this location consisted of prominent vegetation rustle and slight birdsong. Aircraft overhead and infrequent cars going past the property were both noted.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM12	NL-31	01273087	17/04/2023
Calibrator	CAL3	NC74	35173441	22/04/2024

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0301	15:10 14/06/2024	13:01 17/07/2024	94.0	94.1	0.1dB	Installation - Wind through vegetation - Otherwise quiet Maintenance Visit - Boiler came on upon arrival, unknown location - Wind through trees - Blade modulation of turbines to the south
0303	13:00 20/08/24	13:06 26/09/24	94.0	94.0	0.0dB	Removal - Wind in vegetation - Noise from animals

NML03 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML4
Description	The equipment was installed in the front garden amenity area, away from boiler and trees at the rear of the property
Approximate ITM Reference	546623, 829719
Noise sources noted during installation, weekly inspection and removal	The soundscape at this location consisted of wind induced noise in the trees. Overhead aircraft was noted overhead. Turbine noise was not audible.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM25	NL-32	00703296	22/04/2024
Calibrator	CAL3	NC74	35173441	22/04/2024

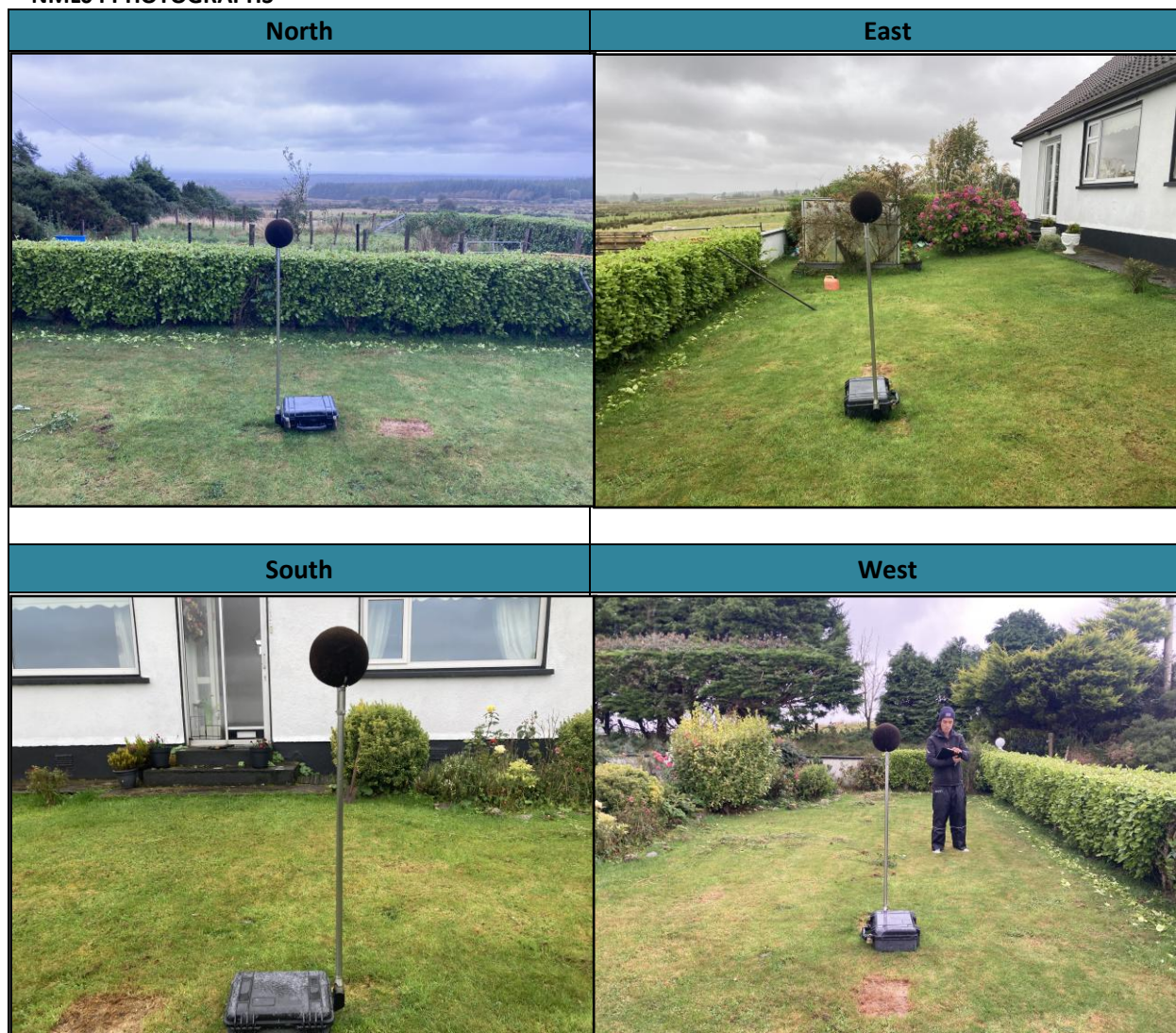
NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0401	12:00 17/06/2024	13:37 17/07/2024	94.0	94.0	0.0dB	Installation - Quiet due to wind farm outages in the area - Birdsong - Wind through vegetation Maintenance Visit - Wind through trees - Turbine not really audible
0403	13:10 20/08/24	12:32 26/09/24	94.0	94.0	0.0dB	Removal - Aircraft overhead - Wind through trees

NML04 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML5
Description	The equipment was installed in what was considered the resident's amenity area to the north of the property.
Approximate ITM Reference	547829, 830365
Noise sources noted during installation, weekly inspection and removal	The predominant sounds that were audible during the installation were from the occasional car passing, birdsong, and a tractor in the distance. Farm animal sounds and wind through the trees were also audible. At some points after installation the resident put a clothes line next to the kit.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM63	NL-52	01010714	21/10/2022
Calibrator	CAL3	NC74	35173441	22/04/2024

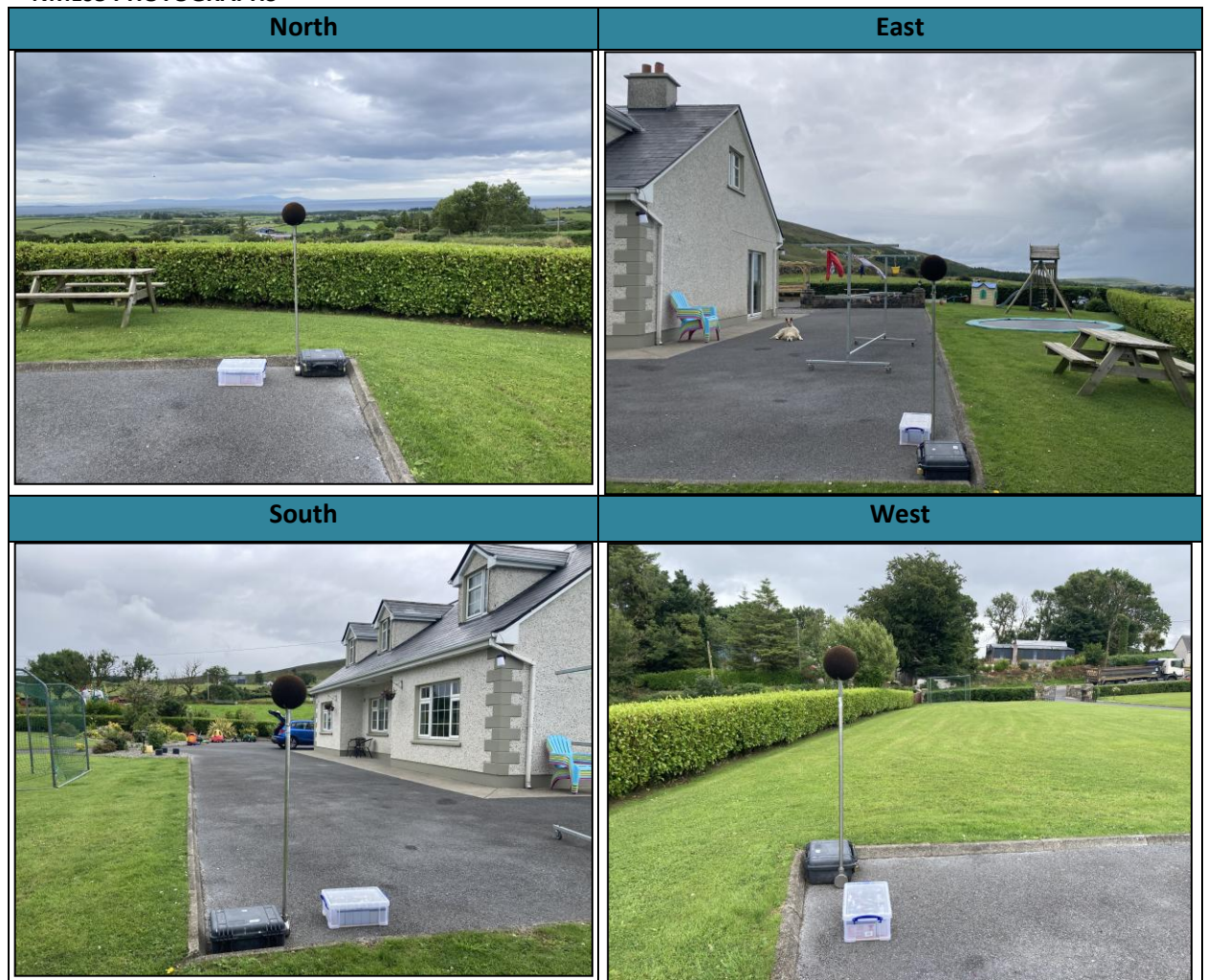
NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0501	13:30 14/06/2024	13:44 17/07/2024	94.0	93.8	0.2dB	Installation - Tractor in the distance - Occasional car passing by - Birdsong Maintenance Visit - Wind through vegetation - Sheep bleating - Clothes line was placed next to the kit
0503	13:30 20/08/24	13:41 26/09/24	94.0	93.9	0.1dB	Removal - Wind through trees, windy conditions

NML05 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML6 – Lough Easky
Description	The equipment was installed in what was considered the resident's amenity area away from the stream.
Approximate ITM Reference	544754, 822419
Noise sources noted during installation, weekly inspection and removal	The predominant sounds that were audible was noise from a stream on the property, wind through vegetation and a bell was ringing which was subsequently removed.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM29	NL-52	00932360	23/04/2024
Calibrator	CAL3	NC74	35173441	22/04/2024

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0601	14:30 17/07/2024	13:48 20/08/2024	94.0	94.0	0.0dB	Installation - Wind in vegetation and valley - Bell ringing (subsequently removed) - No turbine noise audible
0602	14:00 20/08/24	~14:00 26/09/24	94.0	94.0	0.0dB	Removal - Noise from the stream - Slight wind induced noise

NML06 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML7
Description	The equipment was installed in what was considered the resident's amenity area. It was noted that there were sheep in the adjacent fields
Approximate ITM Reference	544720, 830081
Noise sources noted during installation, weekly inspection and removal	The predominant sounds that were audible during the installation were wind turbine noise from Dunneill wind farm, and wind induced noise from the nearby vegetation and trees in the distance. Birdsong was also present.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM67	NL-52	00721061	21/10/2022
Calibrator	CAL3	NC74	35173441	22/04/2024

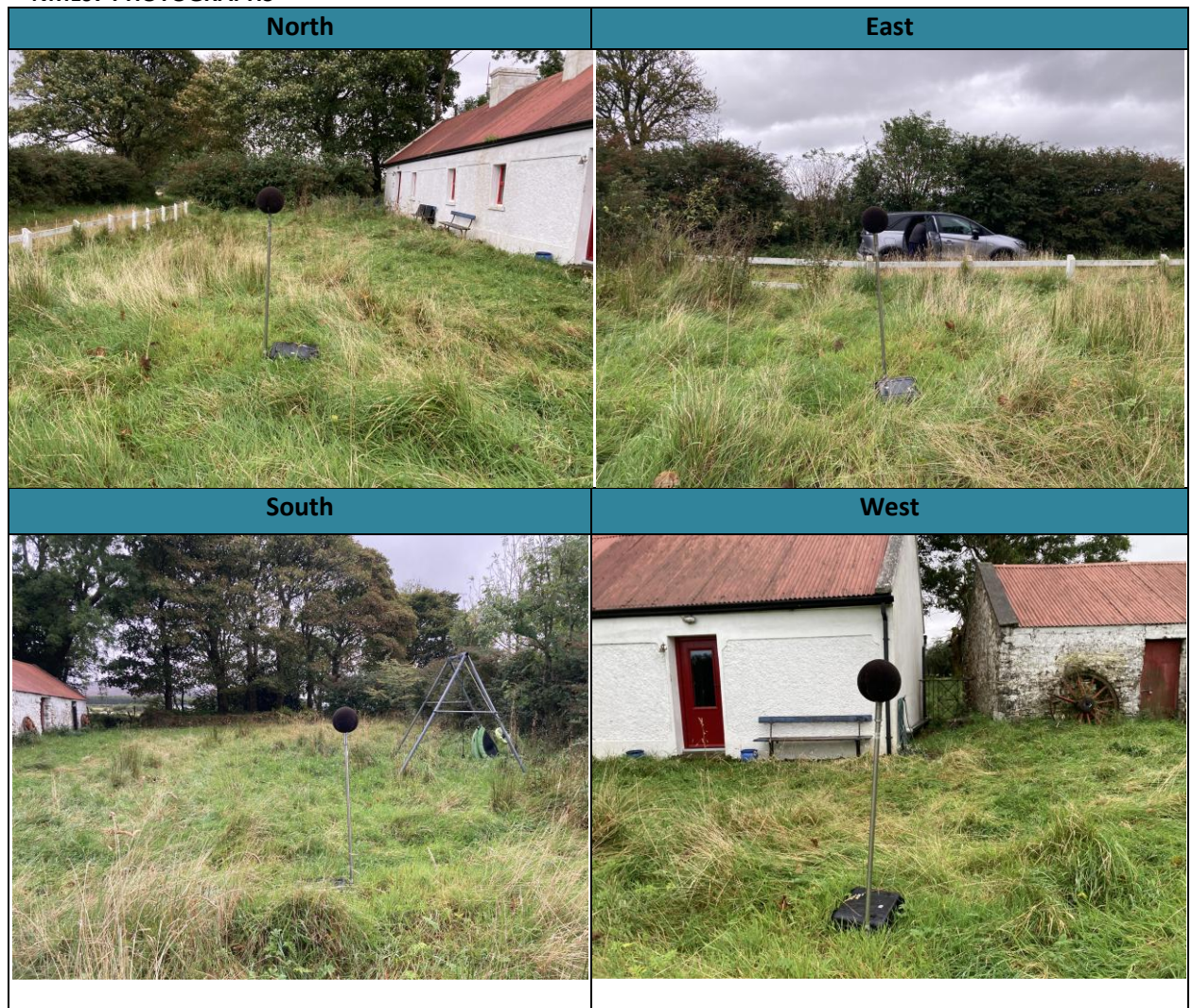
NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0701	14:00 14/06/2024	12:33 17/07/2024	94.0	93.9	0.1dB	Installation - Dunneill turbines dominant (47dB during installation) - Wind through trees - Birdsong Maintenance Visit - Turbine to the south dominant - Wind in trees
0703	12:30 20/08/24	12:15 26/09/24	94.0	93.9	0.1dB	Removal - Wind through trees - Turbine not audible due to wind direction

NML07 PHOTOGRAPHS



Noise Monitoring Field Data Sheet



Project Title	Crumhach Wind Farm	Project Number	IE220
Client	MKO Ireland	Surveyor	JB, FL

MONITORING LOCATION

Location Name	NML8
Description	The equipment was installed in the resident's stated amenity area which was also in line of sight of the Dunneill turbines.
Approximate ITM Reference	544890, 829807
Noise sources noted during installation, weekly inspection and removal	The predominant sounds that were audible during the installation were from wind induced noise from the nearby vegetation and trees, and birdsong. Turbine noise was strongly present on subsequent visits. Noise from overheard aircraft was also observed.

NOISE MONITORING EQUIPMENT DETAILS

	Kit Number	Model	Serial Number	Last Calibrated/ Conformance Checked
Sound Level Meter	SLM66	NL-52	00721064	21/10/2022
Calibrator	CAL3	NC74	35173441	22/04/2024

NOISE MONITORING EQUIPMENT SETTINGS

	Network (A,B,Z)	Index and Time	Time Weighting (Slow, Fast)	Range (dB)	Audio
Parameters Recorded	A	LA9010min, LAeq10min	Fast	20-110	No

DATA

File Name	Start Time	End Time	Cal. at Start	Cal. at End	Drift	Observations
0801	12:50 17/06/2024	12:13 17/07/2024	94.0	93.9	0.1dB	Installation - Wind in trees predominantly - Resident stated that stream can make noise in wetter periods - Turbines were off at the time Maintenance Visit - Turbines dominant (~38dB), heavy modulation observed at low wind speeds
0803	12:10 20/08/24	11:58 26/09/24	94.0	93.9	0.1dB	Removal - Wind through trees - Overhead aircraft - Faint turbine noise with given wind direction

NML08 PHOTOGRAPHS



Annex 3 – Calibration/ Conformance Certificates for Sound Level Meters and Calibrator



NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to
TNEI Ireland Limited
Unit S12 Synergy Centre
Technological University Dublin Campus
Tallaght
Dublin

Certificate Number	232431
Item Calibrated	Rion NL-31 Sound Level Meter, complete with Rion UC53A Microphone
Serial Numbers	01273102 (Sound Level Meter) and 313359 (Microphone)
ID Number	SLM014
Order Number	19
Date Received	06 Jun 2023
NML Procedure Number	AP-NM-09

Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), <i>Periodic tests, specification for the verification of sound level meters</i> . This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
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Calibration Standards	Norsonic 1504A Calibration System incorporating: SR DS360 Signal Generator, No. 0735 [Cal Due Date: 11 Aug 2023] Agilent 34401A Digital Multimeter, No. 0736 [Cal Due Date: 16 Aug 2023] B&K 4134 Measuring Microphone, No. 0744 [Cal Due Date: 10 Jul 2023] B&K 4228 Pistonphone, No. 0740 [Cal Due Date: 10 Jul 2023] B&K 4226 Acoustical Calibrator, No. 0150 [Cal Due Date: 10 Oct 2023]
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Calibrated by

David Fleming

Approved by

Paul Hetherington

Date of Calibration

06 Jul 2023

Date of Issue

06 Jul 2023



This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

Standard Terms & Conditions for Calibration, Testing and Consultancy Assignments

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4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
5. This contract is governed by the laws of Ireland whose courts shall have exclusive jurisdiction.

Decision Rule and Compliance Statement

The rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement is known as a decision rule. The rule used by NSAI NML follows the guidelines set out in the document ILAC-G8:09/2019 published by the International Laboratory Accreditation Co-operation. Further information on the decision rule is available on the NSAI website:

(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

Statement of compliance and associated symbol	Description
PASS	The absence of a symbol indicates that the measurement result is inside the specification limit by a margin greater than its associated expanded uncertainty; the instrument meets its accuracy specification.
Conditional PASS Symbol: £	The measurement result is inside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state compliance. There is a risk that the instrument fails to meet its specification.
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Unc. > Spec Symbol: #	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
Outside CIPM MRA Symbol: ¢	Indicates that the calibration result is traceable to SI units but is not currently included in the table of NSAI NML's calibration and measurement capabilities approved under the CIPM MRA.

Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

**Ambient laboratory conditions:**

Barometric Pressure:	100.5 kPa $\pm$ 0.5 kPa
Temperature:	22.0 °C $\pm$ 1 °C
Relative Humidity:	42 %RH $\pm$ 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	PASS
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was adjusted to read correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) ⁽¹⁾

Range: Single Range Instrument
Mode: Leq

SLM Configuration	Freq. Weighting Network	SLM Reading ⁽²⁾
Microphone installed	A	20.2 dB
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	17.9 (U/R) ⁽³⁾
	C	25.4
	Z (Linear)	32.2

Acoustical signal test of a frequency weighting (Test #11) ⁽¹⁾

Range: Single Range Instrument
Frequency Weighting setting: C
Time Weighting response: Slow

Input Level ⁽⁴⁾	Input Freq.	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ ($\pm$)	Uncertainty of Measurement ($\pm$)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.1	1.5	0.3
	4000 ⁽⁷⁾	+0.3	1.6	0.5

**Electrical signal tests of frequency weightings (Test #12)⁽¹⁾**

Range: Single Range Instrument

Freq. (nominal)	Input Level ⁽⁴⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.2	+0.2	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.1	+0.1	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	93.2	+0.2	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	93.1 dB	+0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	93.0	0.0	1.4	0.20
500	93	93.0	0.0	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.0	0.0	1.6	0.20
8000	93	93.0	0.0	2.1, -3.1	0.20
16000	93	92.5	-0.5	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)⁽¹⁾

Range: Single Range Instrument

Time Weighting Setting	Frequency Weighting Setting	Input Level ⁽⁴⁾	Deviation from Reference	Tolerance ⁽⁶⁾ (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		+0.2	0.4	0.20
	Z		+0.2	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

**Linearity level on the reference range (Test #14)⁽¹⁾**

Range: Single Range Instrument
 Input Frequency: 1 kHz
 SLM Measuring Mode: SPL

Range	Input Level ⁽⁴⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	103.9	-0.1	1.1	0.20
	109	108.9	-0.1	1.1	0.20
	114	113.9	-0.1	1.1	0.20
	119	118.9	-0.1	1.1	0.20
	124	123.9	-0.1	1.1	0.20
	129	128.9	-0.1	1.1	0.20
	131	130.9	-0.1	1.1	0.20
	132	131.9	-0.1	1.1	0.20
	133	132.9	-0.1	1.1	0.20
	134	133.9	-0.1	1.1	0.20
	135	134.9	-0.1	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	88.9	-0.1	1.1	0.20
	84	83.9	-0.1	1.1	0.21
	79	78.9	-0.1	1.1	0.21
	74	73.9	-0.1	1.1	0.21
	69	68.9	-0.1	1.1	0.21
	64	63.9	-0.1	1.1	0.21
	59	58.9	-0.1	1.1	0.21
	54	53.9	-0.1	1.1	0.21
	49	48.9	-0.1	1.1	0.21
	44	43.9	-0.1	1.1	0.21

Level Linearity including Range Control (Test #15)⁽¹⁾

Input Frequency: 1 kHz
 SLM Measuring Mode: SPL

Range	Input Level ⁽³⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
130 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	125.0	125.0	0.0	1.1	0.20
120 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	115.0	115.0	0.0	1.1	0.20
110 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	105.0	105.0	0.0	1.1	0.20
100 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	95.0	95.0	0.0	1.1	0.20
90 dB	85.0 dB	84.9 dB	-0.1 dB	1.1 dB	0.20 dB
80 dB	75.0 dB	74.9 dB	-0.1 dB	1.1 dB	0.20 dB

Toneburst response (Test #16)⁽¹⁾

Range: Single Range Instrument

Burst Type	SLM Mode	Input Level ⁽⁴⁾	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
200 ms	LAF	116.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	99.0	-0.1	1.3	0.3
0.25 msec	LAF	90.0	-0.2	1.3, -3.3	0.3
200 ms	LAS	109.6 dB	-0.1 dB	0.8 dB	0.3 dB
2.0 ms	LAS	90.0	-0.1	1.3, -1.8	0.3
200 ms	SEL	110.0 dB	-0.1 dB	0.8 dB	0.3 dB
2.0 ms	SEL	90.3	-0.1	1.3	0.3
0.25 ms	SEL	81.0	-0.1	1.3, -3.3	0.3

Peak C sound level (Test #17)⁽¹⁾

Range: Single Range Instrument

Pulse Type	Pulse Frequency	Input Level ⁽⁴⁾ (peak value)	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	136.4 dB	-0.7 dB	2.4 dB	0.35 dB
Pos. 1/2 cycle	500 Hz	138.4 dB	-0.4 dB	1.4 dB	0.35 dB
Neg. 1/2 cycle	500 Hz	138.4 dB	-0.3 dB	1.4 dB	0.35 dB

Overload indication (Test #18)⁽¹⁾

Range: Single Range Instrument
SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos - Neg)	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
Positive 1/2 cycle at 4 kHz	139.1 dB	-	-	-
Negative 1/2 cycle at 4 kHz	139.1 dB	-	-	-
Level difference of positive & negative pulses	-	0.0 dB	1.8 dB	0.30 dB

**Notes:**

- (1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).
- (2) SLM denotes Sound Level Meter
- (3) U/R denotes Under Range
- (4) All input levels are given in dB relative to a 20 μ Pa reference level.
- (5) The SLM Error of Indication is defined as follows:
$$\text{SLM Error of Indication} = \text{SLM Reading} - \text{Input Level}$$
- (6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.
- (7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response. This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA. For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.

Addendum to Certificate 232431

Rion
Type: UC53A

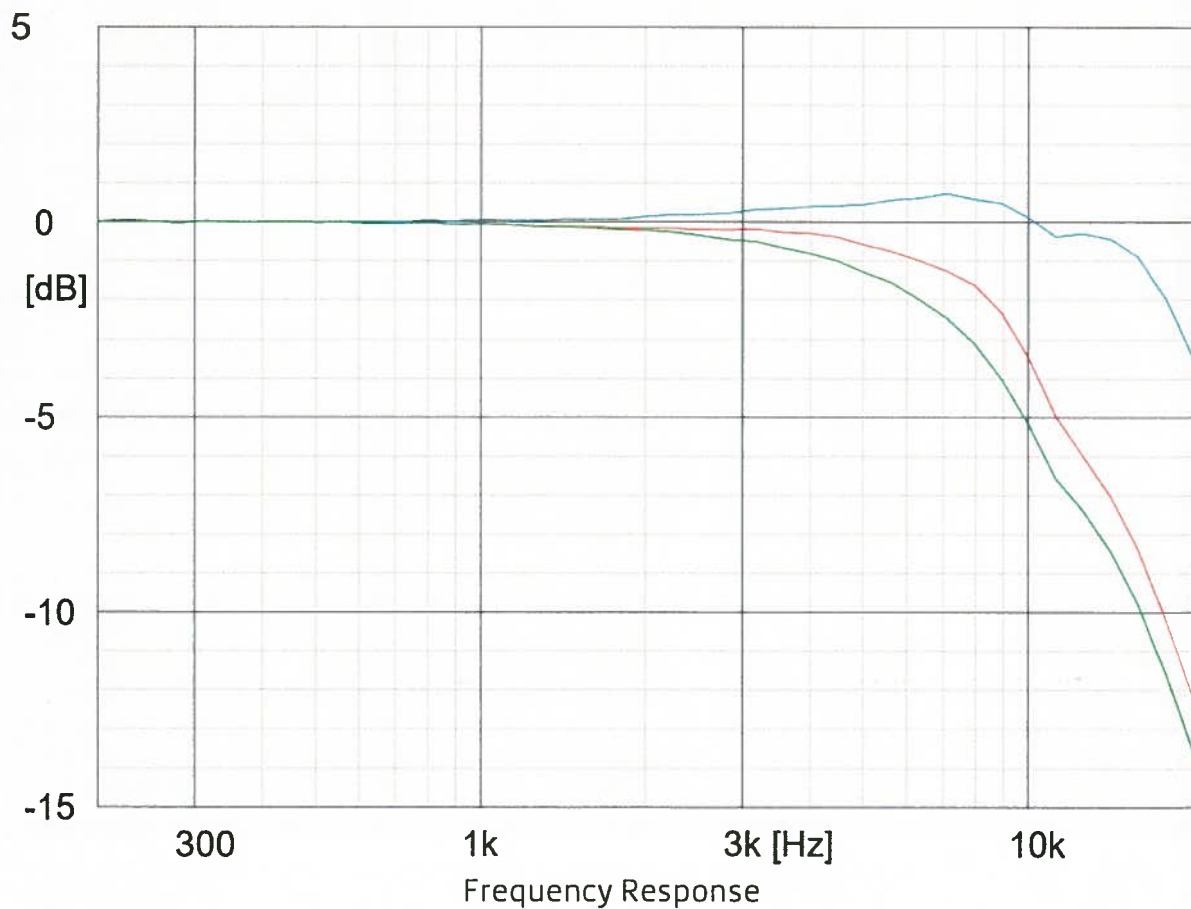
Serial no: 313359

Sensitivity: 42.8 mV/Pa
-27.4 $\pm$ 0.01 dB re. 1 V/Pa

Date: 06/07/2023

Measurement conditions:
Polarisation voltage: 0.0 V
Pressure: 100.52 $\pm$ 0.01 kPa
Temperature: 21.9 $\pm$ 1.1 °C
Relative humidity: 42.0 $\pm$ 2.2 %RH
Results are normalized to
the reference conditions.

Free field response
Diffuse field response
Pressure (Actuator) response





CERTIFICATE OF CALIBRATION

Date of Issue: 22 April 2024

Certificate Number: TCRT24/1316

Issued by:

ANV Measurement Systems

Beaufort Court

17 Roebuck Way

Milton Keynes MK5 8HL

Telephone 01908 642846 Fax 01908 642814

E-Mail: info@noise-and-vibration.co.uk

Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer TNEI Ireland
Unit S12
Synergy Centre
TU Dublin
Tallaght Campus
Tallaght
D24 A386

Order No. IE5001

Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	Manufacturer	Instrument	Type	Serial No. / Version
	Rion	Sound Level Meter	NL-52	00520921
	Rion	Firmware		2.1
	Rion	Pre Amplifier	NH-25	11768
	Rion	Microphone	UC-59	21318
	Rion	Calibrator	NC-74	35173441
		Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 10. SLM 61672-3:2013

Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013 Yes

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received 19 April 2024

ANV Job No. TRAC24/04167

Date Calibrated 22 April 2024

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT24/1316

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		
	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes
Total expanded uncertainties within the requirements of IEC 61672-1:2013			YES
Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	22 April 2024		
Calibrator cert. number	UCRT24/1608		
Calibrator cal cert issued by Lab	ANV Measurement Systems		
Calibrator SPL @ STP	93.97	dB	Calibration reference sound pressure level
Calibrator frequency	1001.74	Hz	Calibration check frequency
Reference level range	Single	dB	
Accessories used or corrected for during calibration - None			

Environmental conditions during tests	Start	End	
Temperature	23.25	23.60	± 0.30 °C
Humidity	42.0	39.3	± 3.00 %RH
Ambient Pressure	101.73	101.70	± 0.03 kPa

Indication at the Calibration Check Frequency			
Initial indicated level	93.9	dB	Adjusted indicated level 94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±			0.10 dB

Self Generated Noise										
Microphone installed -		Less Than		20.0		dB		A Weighting		
Microphone replaced with electrical input device -						UR = Under Range indicated				
Weighting		A			C			Z		
		11.1	dB	UR	15.1	dB	UR	20.3	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

Additional Comments

None

END

Calibrated by: K. Zablocki

R 1



CERTIFICATE OF CONFORMANCE

Date of Issue 21 October 2022
Customer TNEI Ireland Ltd
Certificate Number CONF102212

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	00408987
Preamplifier	Rion	NH-25	11641
Microphone	Rion	UC-59	19741

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

Signed.....
B. Bogdan

Position. Calibration Technician Date. 21 October 2022

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

☎ 01908 642846 📠 01908 642814

✉ info@noise-and-vibration.co.uk 🌐 www.noise-and-vibration.co.uk

ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.



NSAI

National Metrology Laboratory

Certificate of Calibration

Issued to

TNEI Group
Unit S12 Synergy Group
Technological University Campus Dublin
Tallaght
Dublin

Certificate Number	231155
Item Calibrated	Rion NL-31 Sound Level Meter, complete with Rion UC53A Microphone
Serial Numbers	01273087 (Sound Level Meter) and 313365 (Microphone)
ID Number	SLM012
Order Number	16
Date Received	14 Mar 2023
NML Procedure Number	AP-NM-09

Method	The above sound level meter was allowed to stabilise for a suitable period in laboratory conditions. It was then calibrated by carrying out the verification tests detailed in IEC 61672-3 (2006), <i>Periodic tests, specification for the verification of sound level meters</i> . This standard specifies a procedure for the periodic verification of conformance of a sound level meter or integrating-averaging meter to IEC 61672-1 (2003).
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Calibrated by

David Fleming

Approved by

Paul Hetherington

Date of Calibration

17 Apr 2023

Date of Issue

18 Apr 2023



This certificate is consistent with Calibration and Measurement Capabilities (CMC's) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures. Under the MRA, all participating institutes recognize the validity of each other's calibration certificates and measurement reports for quantities, ranges and measurement uncertainties specified in Appendix C (for details see www.bipm.org)

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2. No action or legal proceeding shall be taken (except in the case of wilful neglect or default) against NSAI or the Board or any member of the Board or any committee appointed by the Board or any officer or servant of NSAI, by reason of or arising out of the carrying out of any research, investigation, test or analysis or the publication of the results thereof in the name of NSAI.
3. NSAI will not release any information received from or provided to the client in relation to this report except as may be required by law, including the Freedom of Information Act 1997, or as specified by the client.
4. This certificate relates only to the item(s) described on the front page and shall not be reproduced, except in full.
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(https://www.nsai.ie/images/uploads/metrology/Decision_Rule.pdf).

The symbols used to indicate the state of compliance of the instrument calibration and their meanings are given in the following table.

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Conditional FAIL Symbol: &	The measurement result is on the specification limit or is outside the specification limit by a margin less than or equal to its associated expanded measurement uncertainty; it is therefore not possible to state non-compliance.
FAIL Symbol: \$	The measurement result is outside the specification limit by a margin greater than its associated measurement uncertainty; the instrument fails to meet its accuracy specification.
Unc. > Spec Symbol: #	The expanded measurement uncertainty is greater than the instrument's accuracy specification. It is not possible to determine compliance or otherwise with the specification. The user should expand the in-use accuracy specification to make allowance for the calibration uncertainty.
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Where no specification exists, and none is prescribed by the client, the Decision Rule policy of the NSAI NML does not apply and results are provided without a statement of compliance.

**Ambient laboratory conditions:**

Barometric Pressure:	102.2 kPa $\pm$ 0.5 kPa
Temperature:	20.9 °C $\pm$ 1 °C
Relative Humidity:	49 %RH $\pm$ 5%RH

Summary of Results:

The following table summarises the results of the verification tests. The detailed results are given in the subsequent tables.

IEC 61672 Test	Test Title	Status
10	Self-generated Noise (Electrical)	/
11	Acoustical Signal	PASS
12	Frequency Weighting	PASS
13	Frequency and Time Weighting @ 1 kHz	PASS
14	Level Linearity Test on Reference Level Range	PASS
15	Level Linearity including Range Control	PASS
16	Toneburst Response	PASS
17	Peak C	PASS
18	Overload Indication	PASS

Detailed Results.

Prior to carrying out the verification tests the sound level meter was confirmed to be reading correctly for pressure response through application of a reference acoustical calibrator.

Self-generated Noise Test (Electrical Input) (Test #10) ⁽¹⁾

Range:	20 - 80 dB
Mode:	Leq

SLM Configuration	Freq. Weighting Network	SLM Reading ⁽²⁾
Microphone installed	A	21.1 dB
Microphone replaced by electrical signal device and Fitted with a short-circuit	A	17.9 (U/R) ⁽³⁾
	C	22.9
	Z (Linear)	29.8

Acoustical signal test of a frequency weighting (Test #11) ⁽¹⁾

Range:	20 - 110 dB
Frequency Weighting setting:	C
Time Weighting response:	Slow

Input Level ⁽⁴⁾	Input Freq.	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ ($\pm$)	Uncertainty of Measurement ($\pm$)
94.0 dB	1000 Hz	0.0 dB (Ref)	1.1 dB	0.3 dB
	125	+0.2	1.5	0.3
	4000 ⁽⁷⁾	-0.1	1.6	0.5

**Electrical signal tests of frequency weightings (Test #12)⁽¹⁾**

Range: 20 - 110 dB

Freq. (nominal)	Input Level ⁽⁴⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
A-Weighting					
63 Hz	93 dB	92.9 dB	-0.1 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	93.3	+0.3	3.5, -17	0.20
C-Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	93.1	+0.1	2.1, -3.1	0.20
16000	93	93.3	+0.3	3.5, -17	0.20
LIN Weighting					
63 Hz	93 dB	92.8 dB	-0.2 dB	1.5 dB	0.20 dB
125	93	92.9	-0.1	1.5	0.20
250	93	92.9	-0.1	1.4	0.20
500	93	92.9	-0.1	1.4	0.20
1000	93	93.0	0.0	1.1	0.20
2000	93	93.0	0.0	1.6	0.20
4000	93	93.1	+0.1	1.6	0.20
8000	93	92.9	-0.1	2.1, -3.1	0.20
16000	93	92.4	-0.6	3.5, -17	0.20

Frequency and time weightings at 1 kHz (Test #13)⁽¹⁾

Range: 30 - 120 dB

Time Weighting Setting	Frequency Weighting Setting	Input Level ⁽⁴⁾	Deviation from Reference	Tolerance ⁽⁶⁾ (±)	Uncertainty. of Measurement (±)
Fast	A	94.0 dB	0.0 dB	0.4 dB	0.20 dB
	C		0.0	0.4	0.20
	Z		0.0	0.4	0.20
Slow	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
Leq.	A	94.0 dB	0.0 dB	0.3 dB	0.20 dB
SEL	A	114.0 dB	0.0 dB	0.3 dB	0.20 dB

**Linearity level on the reference range (Test #14)⁽¹⁾**

Range: 40 to 130 dB

Input Frequency: 1 kHz

SLM Measuring Mode: SPL

Range	Input Level ⁽⁴⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
130 dB	94 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	99	99.0	0.0	1.1	0.20
	104	103.9	-0.1	1.1	0.20
	109	108.9	-0.1	1.1	0.20
	114	113.9	-0.1	1.1	0.20
	119	118.9	-0.1	1.1	0.20
	124	123.9	-0.1	1.1	0.20
	129	128.9	-0.1	1.1	0.20
	94	94.0	0.0	1.1	0.20
	89	89.0	0.0	1.1	0.20
	84	83.9	-0.1	1.1	0.20
	79	78.9	-0.1	1.1	0.20
	74	73.9	-0.1	1.1	0.20
	69	68.9	-0.1	1.1	0.20
	64	63.9	-0.1	1.1	0.20
	59	58.9	-0.1	1.1	0.21
	54	53.9	-0.1	1.1	0.21
	49	49.0	0.0	1.1	0.21
	44	43.9	-0.1	1.1	0.21

Level Linearity including Range Control (Test #15)⁽¹⁾

Input Frequency: 1 kHz

SLM Measuring Mode: SPL

Range	Input Level ⁽³⁾	SLM Reading	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
130 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	125.0	125.0	0.0	1.1	0.20
120 dB	94.0 dB	93.9 dB	-0.1 dB	1.1 dB	0.20 dB
	115.0	115.0	0.0	1.1	0.20
110 dB	94.0 dB	93.9 dB	-0.1 dB	1.1 dB	0.20 dB
	105.0	104.9	-0.1	1.1	0.20
100 dB	94.0 dB	94.0 dB	0.0 dB	1.1 dB	0.20 dB
	95.0	95.0	0.0	1.1	0.20
90 dB	85.0 dB	85.0 dB	0.0 dB	1.1 dB	0.20 dB
80 dB	75.0 dB	75.0 dB	0.0 dB	1.1 dB	0.20 dB

**Toneburst response (Test #16)⁽¹⁾**

Range: 40 to 130 dB

Burst Type	SLM Mode	Input Level ⁽⁴⁾	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
200 ms	LAF	135.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	LAF	118.0	-0.1	1.3	0.3
0.25 msec	LAF	109.0	-0.2	1.3, -3.3	0.3
200 ms	LAS	128.6 dB	-0.1 dB	0.8 dB	0.3 dB
2.0 ms	LAS	109.0	-0.1	1.3, -1.8	0.3
200 ms	SEL	129.0 dB	0.0 dB	0.8 dB	0.3 dB
2.0 ms	SEL	109.3	-0.1	1.3	0.3
0.25 ms	SEL	100.0	-0.2	1.3, -3.3	0.3

Peak C sound level (Test #17)⁽¹⁾

Range: 40 to 130 dB

Pulse Type	Pulse Frequency	Input Level ⁽⁴⁾ (peak value)	SLM Error of Indication ⁽⁵⁾	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
1 cycle	8 kHz	130.4 dB	-0.1 dB	2.4 dB	0.35 dB
Pos. 1/2 cycle	500 Hz	132.4 dB	-0.4 dB	1.4 dB	0.35 dB
Neg. 1/2 cycle	500 Hz	132.4 dB	-0.4 dB	1.4 dB	0.35 dB

Overload indication (Test #18)⁽¹⁾

Range: 40 to 130 dB

SLM Measuring Mode: LAEq

Test description	Overload occurred at (±)	Meas. Diff. (Pos – Neg)	Tolerance ⁽⁶⁾ (±)	Uncertainty of Measurement (±)
Positive 1/2 cycle at 4 kHz	139.3 dB	-	-	-
Negative 1/2 cycle at 4 kHz	139.2 dB	-	-	-
Level difference of positive & negative pulses	-	0.1 dB	1.8 dB	0.30 dB

**Notes:**

- (1) The test number, given in parentheses after the section heading, refers to the relevant clause in IEC 61672-3 (2006).
- (2) SLM denotes Sound Level Meter
- (3) U/R denotes Under Range
- (4) All input levels are given in dB relative to a 20 μ Pa reference level.
- (5) The SLM Error of Indication is defined as follows:
$$\text{SLM Error of Indication} = \text{SLM Reading} - \text{Input Level}$$
- (6) The figures in the column labelled 'Tolerance' are the acceptance limits given in IEC 61672-1(2003). These tolerance limits include an allowance for the maximum expanded uncertainty of the test laboratory. The criteria for compliance with the tolerance is that the measurement result, extended by its associated uncertainty, lies within the specified limits.
- (7) Microphone response at 4 kHz was measured using an electrostatic actuator. A Free Field correction of +1.2 dB was applied to the measured actuator response. This measurement is not included in NML's tables of Calibration and Measurement Capabilities, approved under the CIPM MRA. For information, the measured sensitivity and frequency response of the microphone is given in an addendum to this certificate.

Comments:

Where used in the results table, further information on the meaning of symbols is given in the table on page 2 of this certificate.

The instrument was found to meet the requirements of IEC 61672-1 (2003) in accordance with the verification procedures set out in IEC 61672-3 (2006) at the time of calibration.

The reported measurement results are traceable, via national standards maintained by NSAI National Metrology Laboratory (NML) or by other national metrology institutes, to internationally accepted realisations of the SI units.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%. It has been determined in accordance with the "Guide to the Expression of Uncertainty in Measurement (GUM)". These uncertainties apply only to the measured values and do not carry any implication regarding the long-term stability of the instrument.



NSAI

National Metrology Laboratory

Addendum to Certificate 231155

Rion

Type: UC53A

Serial no: 313365

Sensitivity: 46.4 mV/Pa
-26.7 $\pm$ 0.01 dB re. 1 V/Pa

Date: 17/04/2023

Measurement conditions:

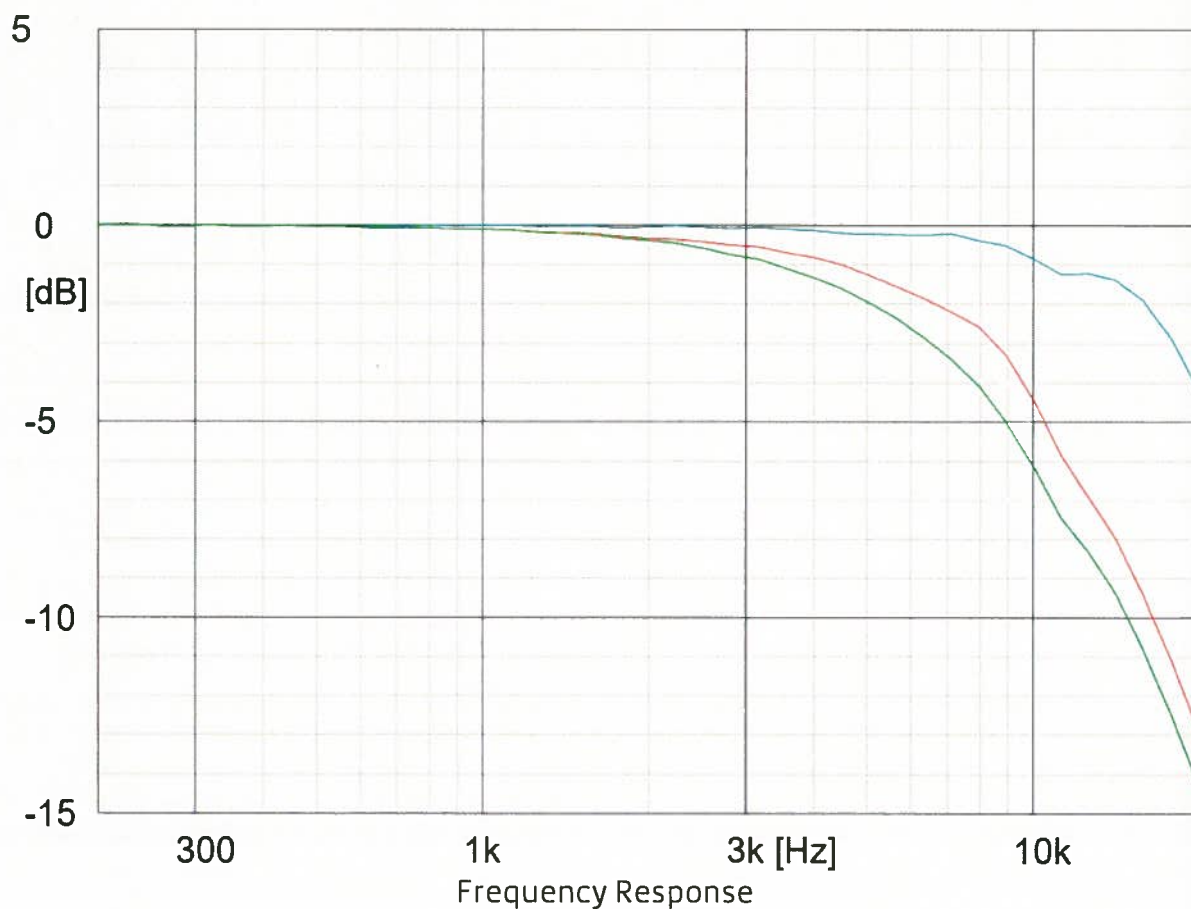
Polarisation voltage: 0.0 V
Pressure: 102.22 $\pm$ 0.00 kPa
Temperature: 21.3 $\pm$ 1.1 °C
Relative humidity: 47.8 $\pm$ 2.1 %RH

Results are normalized to
the reference conditions.

Free field response

Diffuse field response

Pressure (Actuator) response





CERTIFICATE OF CALIBRATION

Date of Issue: 22 April 2024

Certificate Number: TCRT24/1321

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk

Page 1 of 3 Pages
Approved Signatory

K. Mistry

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Customer	TNEI Ireland Unit S12 Synergy Centre TU Dublin Tallaght Campus Tallaght D24 A386			
Order No.	IE5001			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	Manufacturer	Instrument	Type	Serial No. / Version
	Rion	Sound Level Meter	NL-32	00703296
	Rion	Firmware		1.400
	Rion	Pre Amplifier	NH-21	33387
	Rion	Microphone	UC-53A	317048
	Rion	Calibrator	NC-74	35173441
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 2.SLM 61672-3 TPS-49 <i>Procedures from IEC 61672-3:2006 were used to perform the periodic test.</i>			
Type Approved to IEC 61672-1:2002	No	Approval Number		
	<i>If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003</i>			
Date Received	19 April 2024	ANV Job No.	TRAC24/04167	
Date Calibrated	22 April 2024			

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT24/1321

Page 2 of 3 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-22 NL-32 Instruction Manual		
SLM instruction manual ref / issue	33625 09-06		
SLM instruction manual source	Manufacturer		
Internet download date if applicable	N/A		
Case corrections available	Yes		
Uncertainties of case corrections	No	See comment on page 3	
Source of case data	Manufacturer		
Wind screen corrections available	Yes		
Uncertainties of wind screen corrections	No	See comment on page 3	
Source of wind screen data	Manufacturer		
Mic pressure to free field corrections	Yes		
Uncertainties of Mic to F.F. corrections	No	See comment on page 3	
Source of Mic to F.F. corrections	Manufacturer		
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes	
Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	22 April 2024		
Calibrator cert. number	UCRT24/1608		
Calibrator cal cert issued by Lab.	ANV Measurement Systems		
Calibrator SPL @ STP	93.97	dB	Calibration reference sound pressure level
Calibrator frequency	1001.74	Hz	Calibration check frequency
Reference level range	30 - 120	dB	

Accessories used or corrected for during calibration - None

Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	23.41	23.21	± 0.30 °C
Humidity	41.1	43.8	± 3.00 %RH
Ambient Pressure	101.65	101.63	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.2	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device -		UR = Under Range indicated			
Weighting	A	C		Z	
	10.6	dB	UR	14.7	dB
				21.1	dB
Uncertainty of the electrical self generated noise ±				0.12	dB

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by the International Organisation for Standards (ISO).

Comments

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT24/1321

Page 3 of 3 Pages

If any of the "Uncertainties of" are set to NO above, then the following applies.

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator, or the manufacturer of the electrostatic actuator was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of the measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the sound level meter may not conform to the requirements of IEC 61672-1:2002.

Calibrated by: K. Zablocki

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..... END

Additional Comments

None



CERTIFICATE OF CONFORMANCE

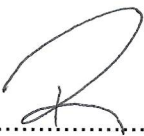
Date of Issue 21 October 2022
Customer TNEI Ireland Ltd
Certificate Number CONF102215

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	01010714
Preamplifier	Rion	NH-25	11361
Microphone	Rion	UC-59	21251

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

Signed.......... Position. Calibration Technician Date. 21 October 2022
B. Bogdan

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

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✉ info@noise-and-vibration.co.uk 🌐 www.noise-and-vibration.co.uk

ACOUSTICS NOISE AND VIBRATION LIMITED. REGISTERED IN ENGLAND NO. 3549028. REGISTERED OFFICE AS ABOVE.



CERTIFICATE OF CALIBRATION

Date of Issue: 23 April 2024

Certificate Number: TCRT24/1326

Issued by:

ANV Measurement Systems

Beaufort Court

17 Roebuck Way

Milton Keynes MK5 8HL

Telephone 01908 642846 Fax 01908 642814

E-Mail: info@noise-and-vibration.co.uk

Web: www.noise-and-vibration.co.uk

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	TNEI Ireland Unit S12 Synergy Centre TU Dublin Tallaght Campus Tallaght D24 A386			
Order No.	IE5001			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	Manufacturer	Instrument	Type	Serial No. / Version
	Rion	Sound Level Meter	NL-52	00932360
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	32388
	Rion	Microphone	UC-59	25052
	Rion	Calibrator	NC-74	35173441
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 2.SLM 61672-3 TPS-49 <i>Procedures from IEC 61672-3:2006 were used to perform the periodic tests.</i>			
Type Approved to IEC 61672-1:2002	YES	Approval Number	21.21 / 13.02 <i>If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003</i>	
Date Received	19 April 2024	ANV Job No.	TRAC24/04167	
Date Calibrated	23 April 2024			

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT24/1326

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52
SLM instruction manual ref / issue		11-03
SLM instruction manual source	Manufacturer	
Internet download date if applicable	N/A	
Case corrections available	Yes	
Uncertainties of case corrections	Yes	
Source of case data	Manufacturer	
Wind screen corrections available	Yes	
Uncertainties of wind screen corrections	Yes	
Source of wind screen data	Manufacturer	
Mic pressure to free field corrections	Yes	
Uncertainties of Mic to F.F. corrections	Yes	
Source of Mic to F.F. corrections	Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002	Yes	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Customers Calibrator	
Calibrator adaptor type if applicable	NC-74-002	
Calibrator cal. date	22 April 2024	
Calibrator cert. number	UCRT24/1608	
Calibrator cal cert issued by	ANV Measurement Systems	
Calibrator SPL @ STP	93.97	dB Calibration reference sound pressure level
Calibrator frequency	1001.74	Hz Calibration check frequency
Reference level range	25 - 130	dB

Accessories used or corrected for during calibration - None

Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.34	22.34	± 0.30 °C
Humidity	44.3	40.7	± 3.00 %RH
Ambient Pressure	101.25	101.25	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.0	dB	Adjusted indicated level	94.0	dB
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10	dB

Self Generated Noise This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A	dB	A Weighting
Uncertainty of the microphone installed self generated noise ±	N/A	dB	

Microphone replaced with electrical input device -					UR = Under Range indicated				
Weighting	A			C			Z		
	11.5	dB	UR	15.5	dB	UR	20.9	dB	UR
Uncertainty of the electrical self generated noise ±						0.12		dB	

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with the Guide to the Expression of Uncertainty in Measurement published by ISO.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

..... END

Calibrated by: K. Zablocki

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Additional Comments

Prior to calibration the instrument's microphone was replaced and the meter was realigned.



CERTIFICATE OF CONFORMANCE

Date of Issue 21 October 2022
Customer TNEI Ireland Ltd
Certificate Number CONF102213

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	00721061
Preamplifier	Rion	NH-25	22167
Microphone	Rion	UC-59	22049

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

A handwritten signature in black ink, appearing to be 'B. Bogdan', is written over a dotted line.

Signed.....

B. Bogdan

Position. Calibration Technician Date. 21 October 2022

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

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CERTIFICATE OF CONFORMANCE

Date of Issue 21 October 2022
Customer TNEI Ireland Ltd
Certificate Number CONF102211

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	00721064
Preamplifier	Rion	NH-25	22170
Microphone	Rion	UC-59	22052

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

Signed.....
B. Bogdan

Position. Calibration Technician Date. 21 October 2022

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL

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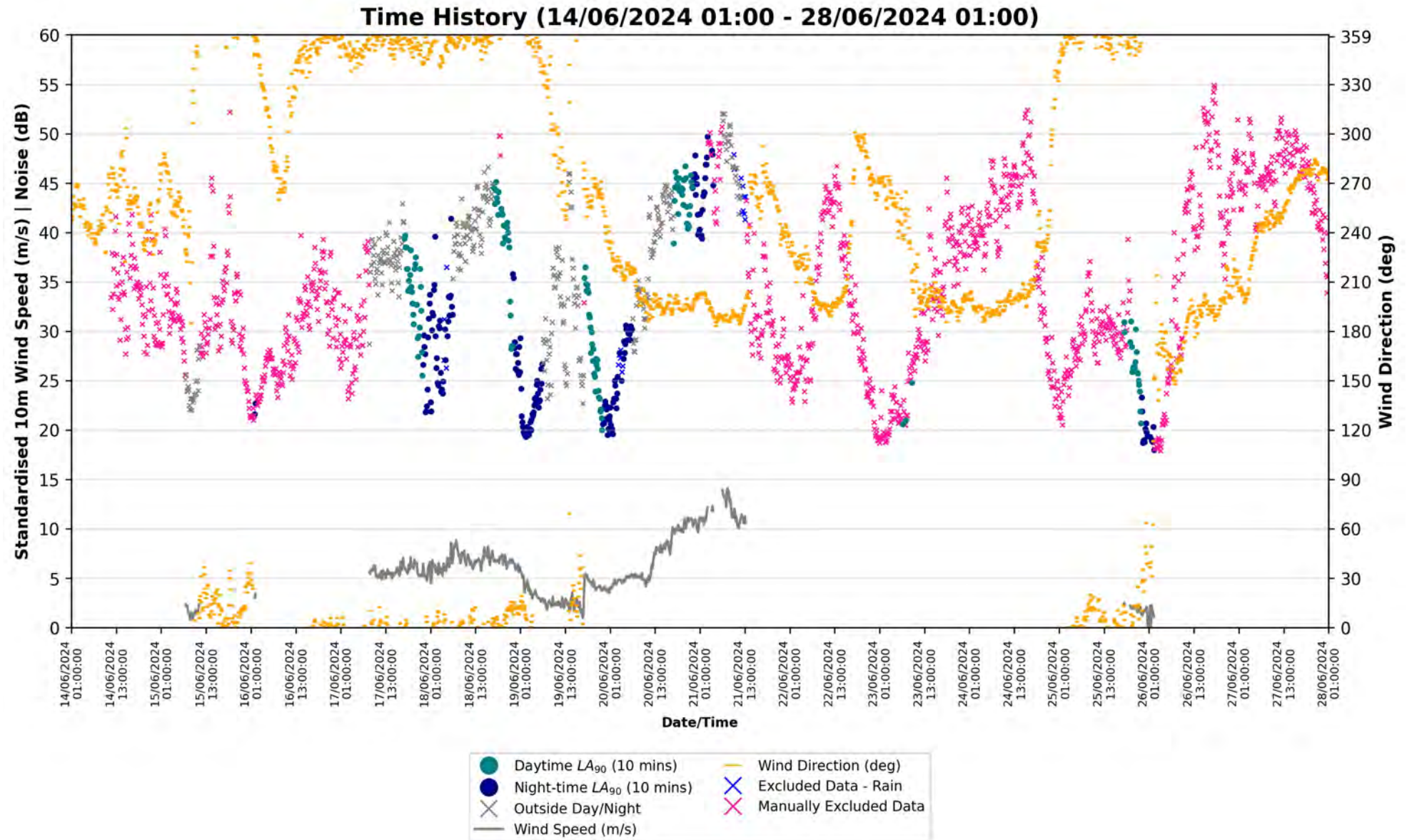
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Annex 4 – Time Series Graphs

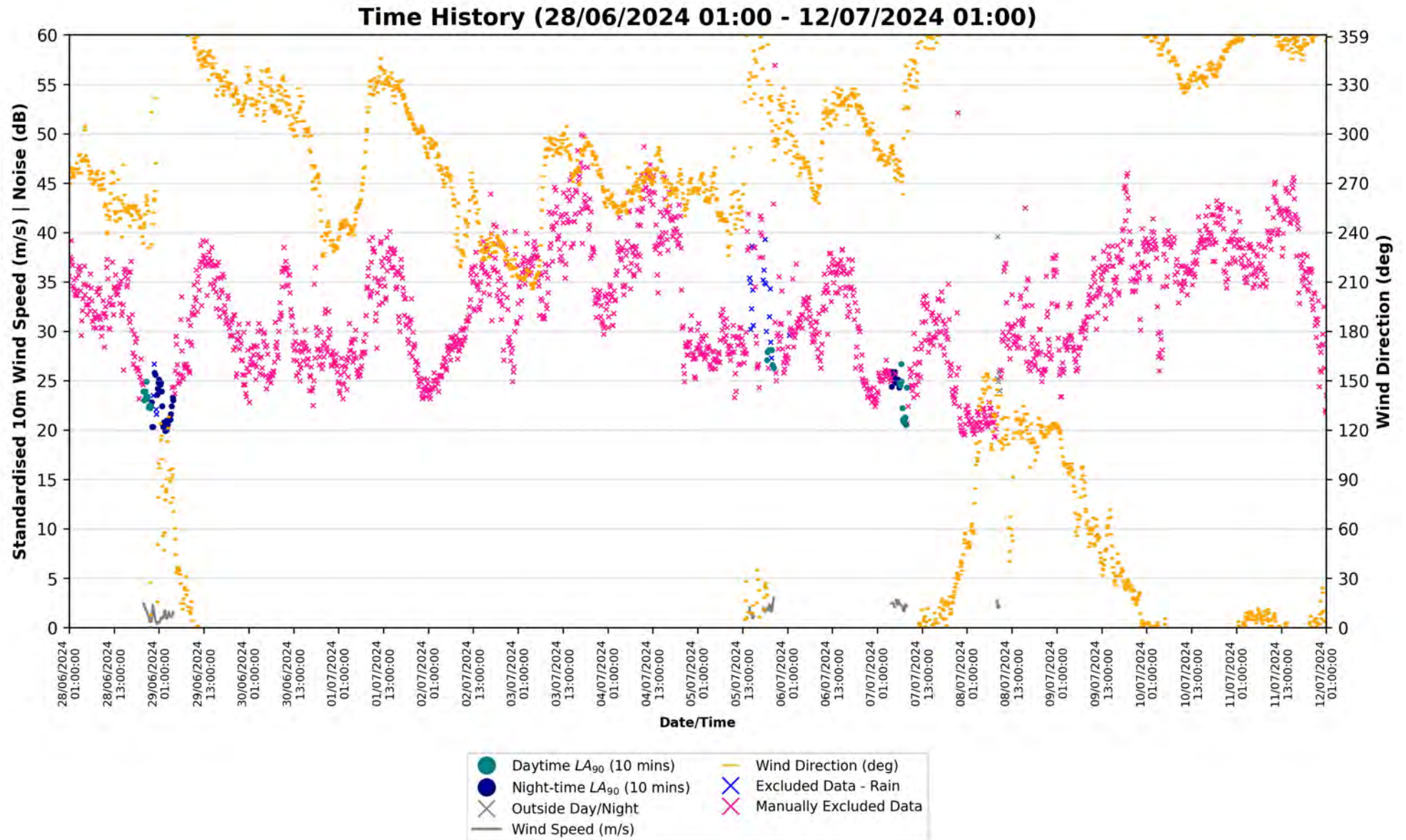
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Receptor Name: NML01



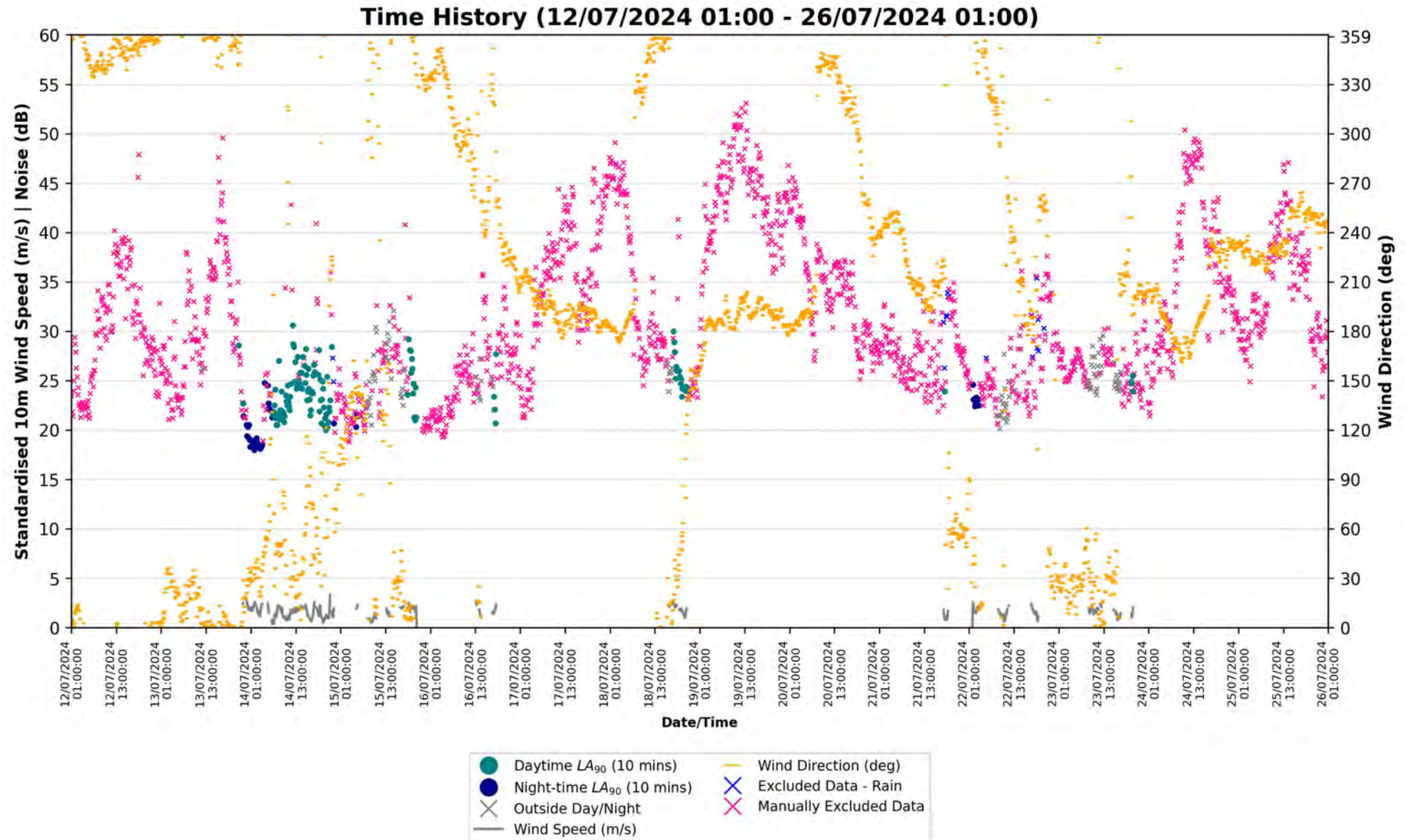
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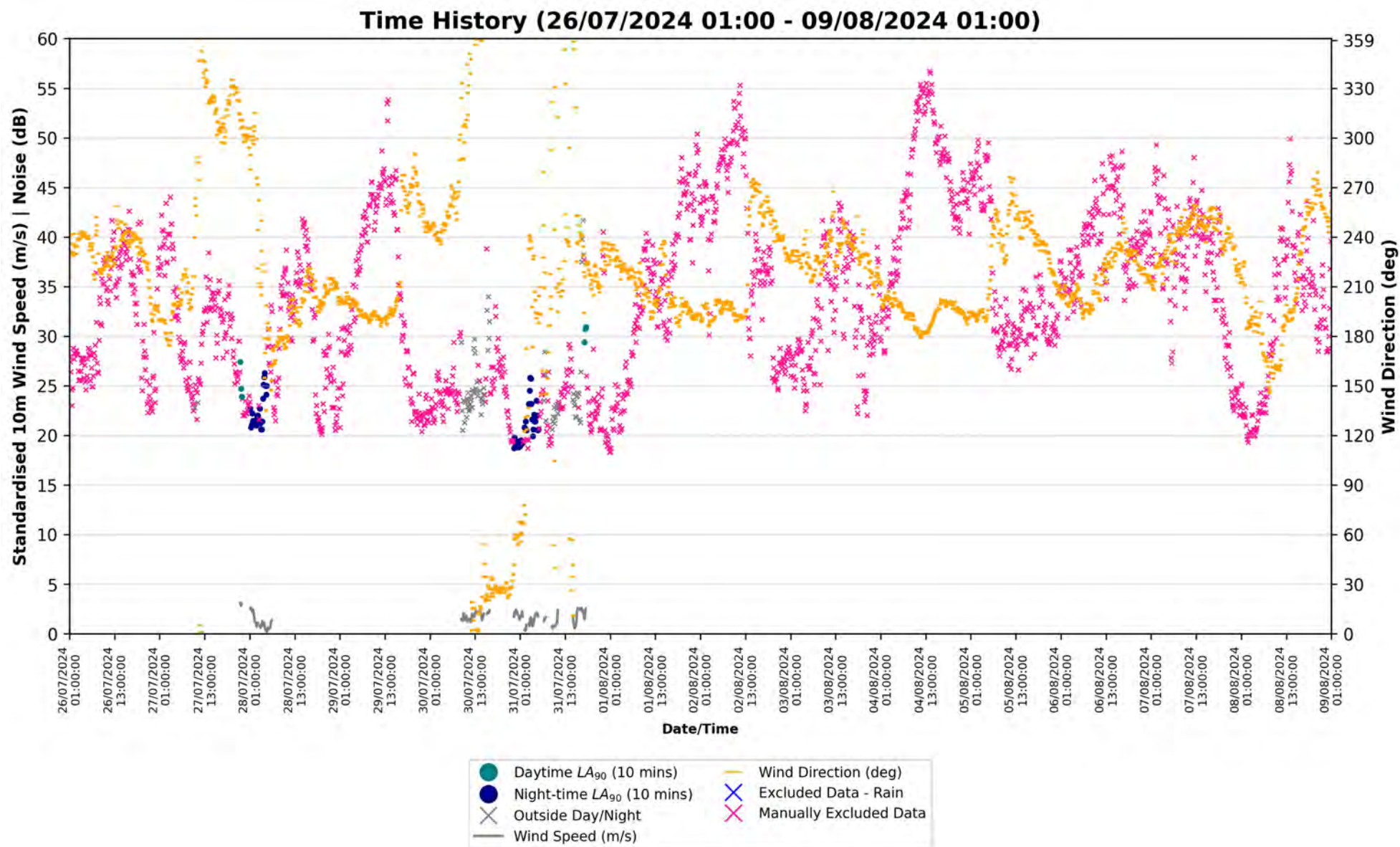
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Receptor Name: NML01



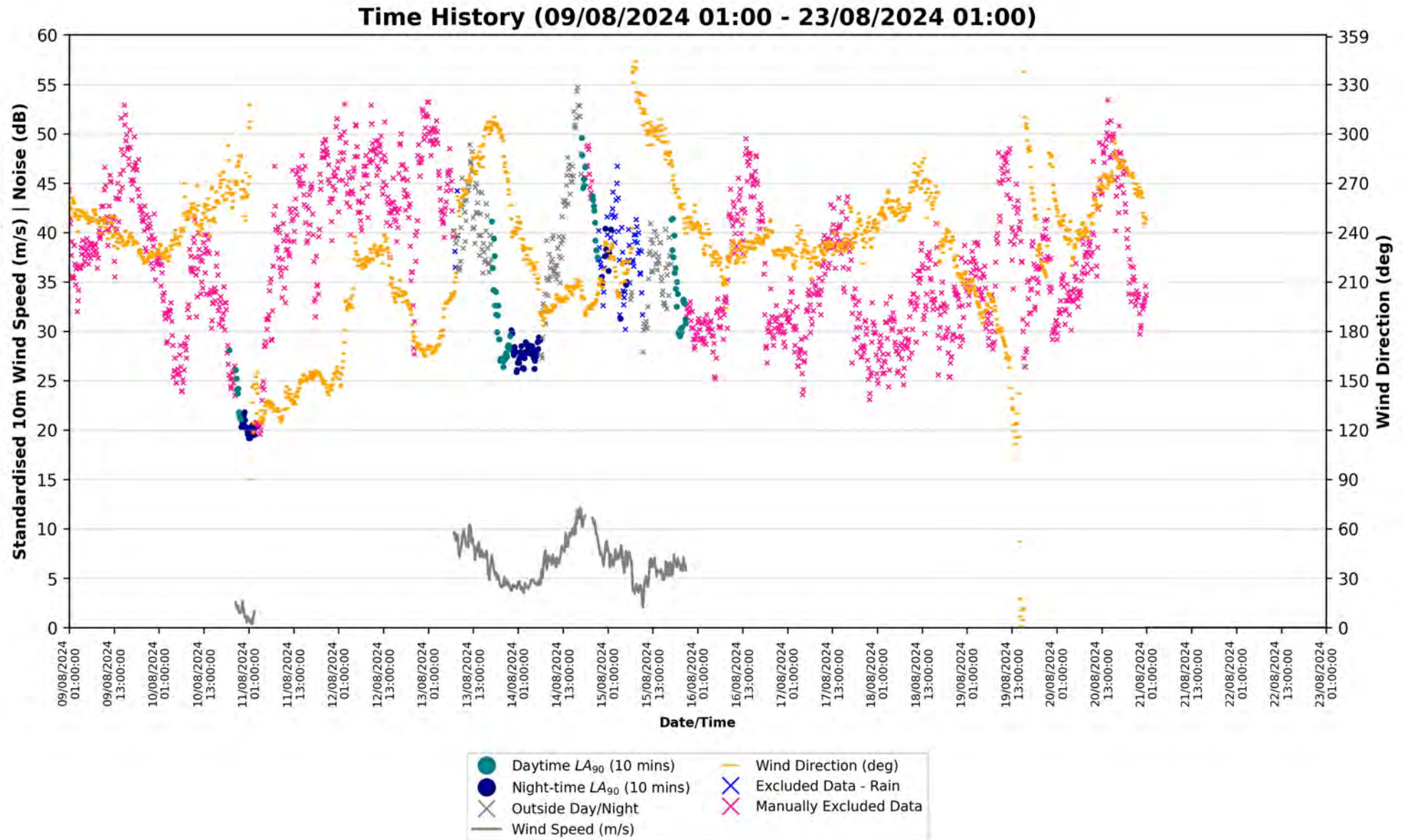
IE00220 - Crumhach Wind Farm

Receptor Name: NML01



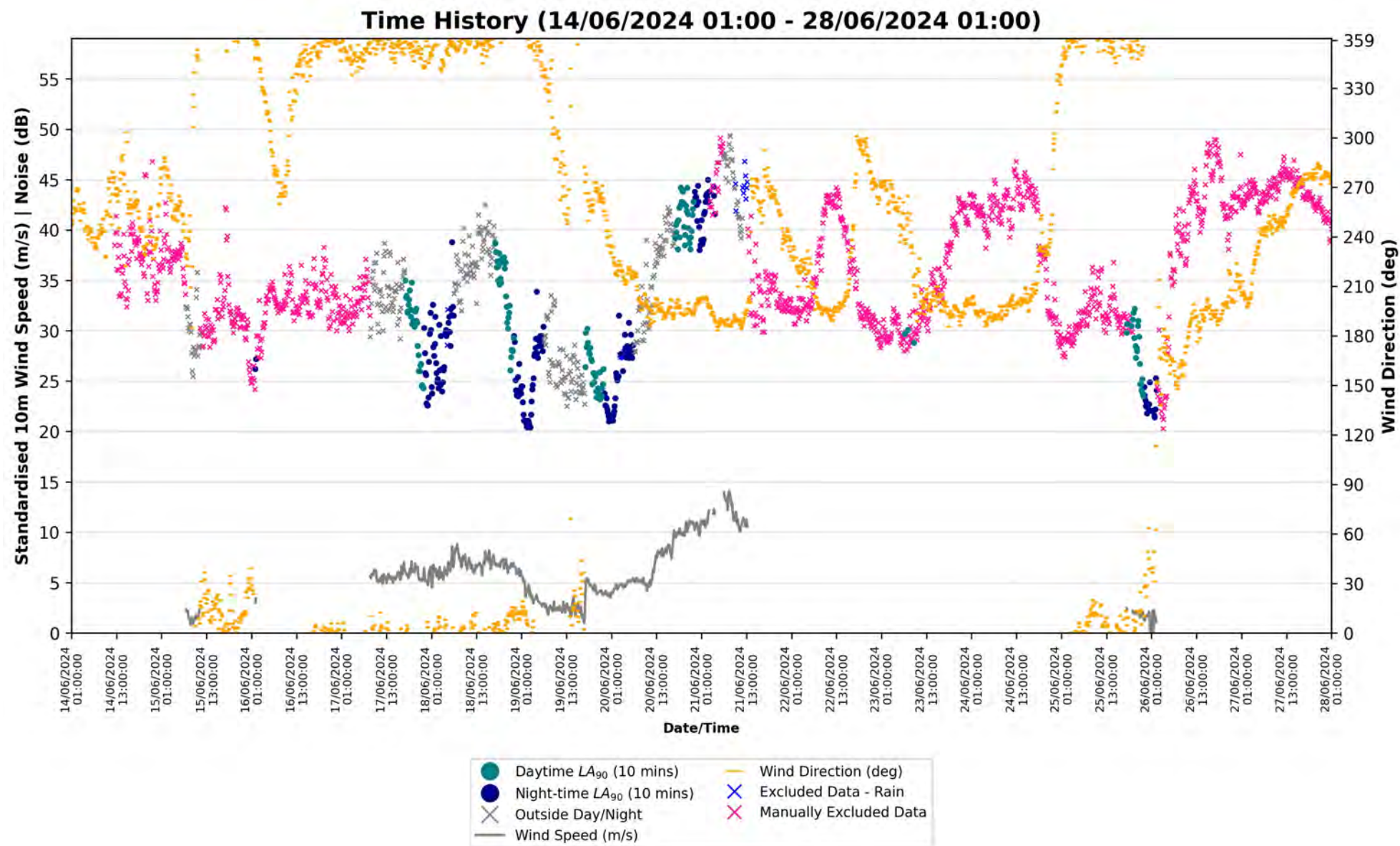
IE00220 - Crumhach Wind Farm

Receptor Name: NML01



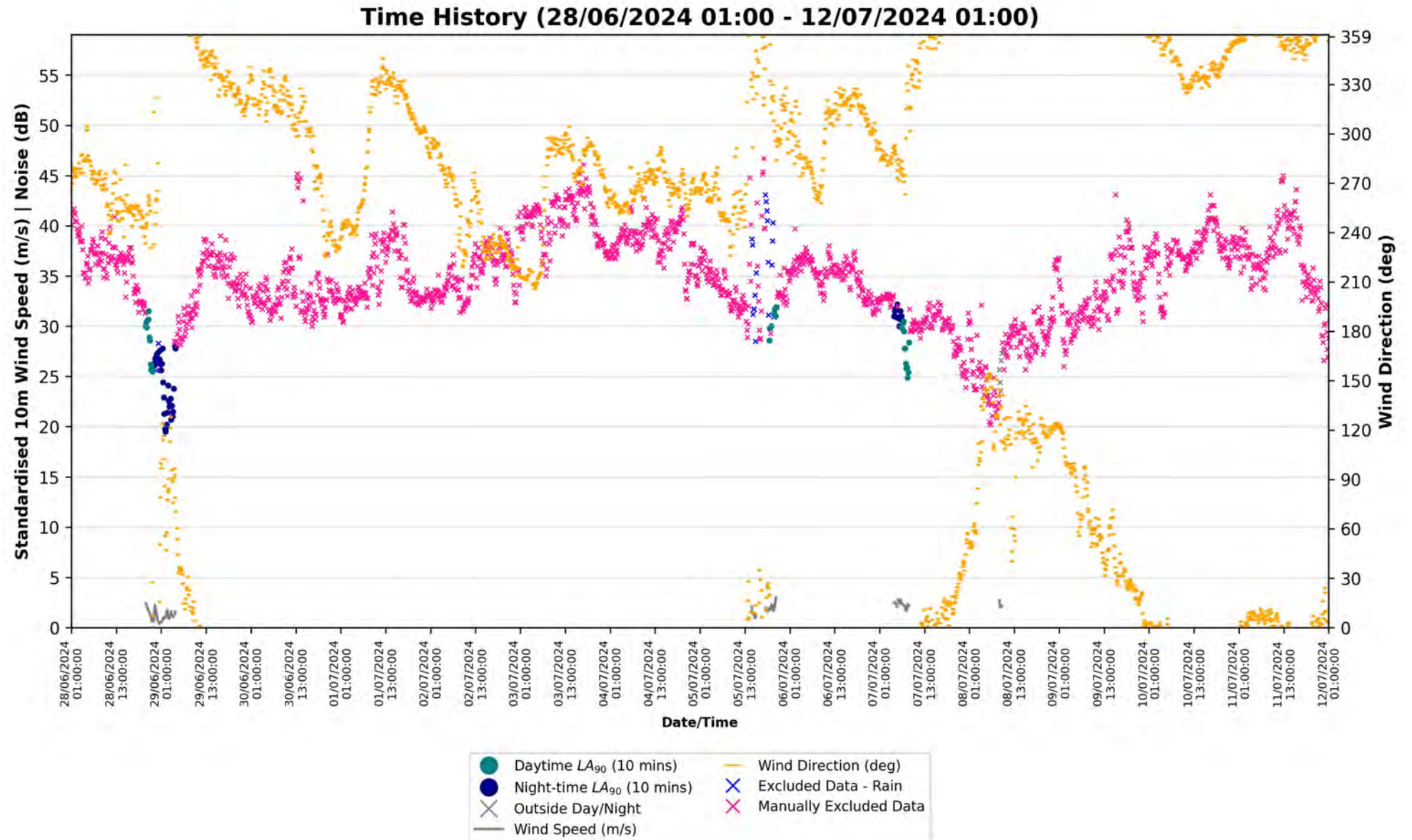
IE00220 - Crumhach Wind Farm

Receptor Name: NML02



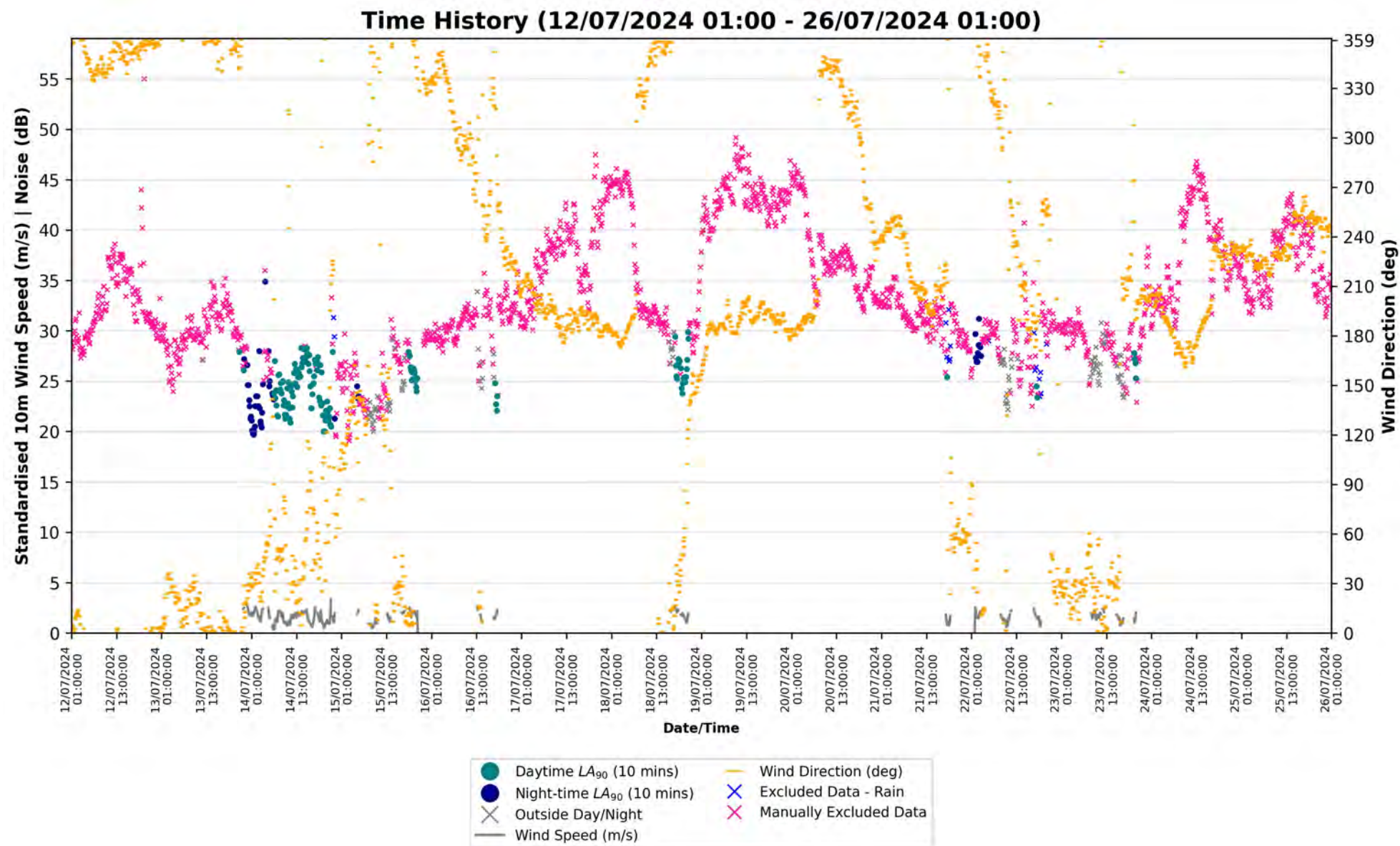
IE00220 - Crumhach Wind Farm

Receptor Name: NML02



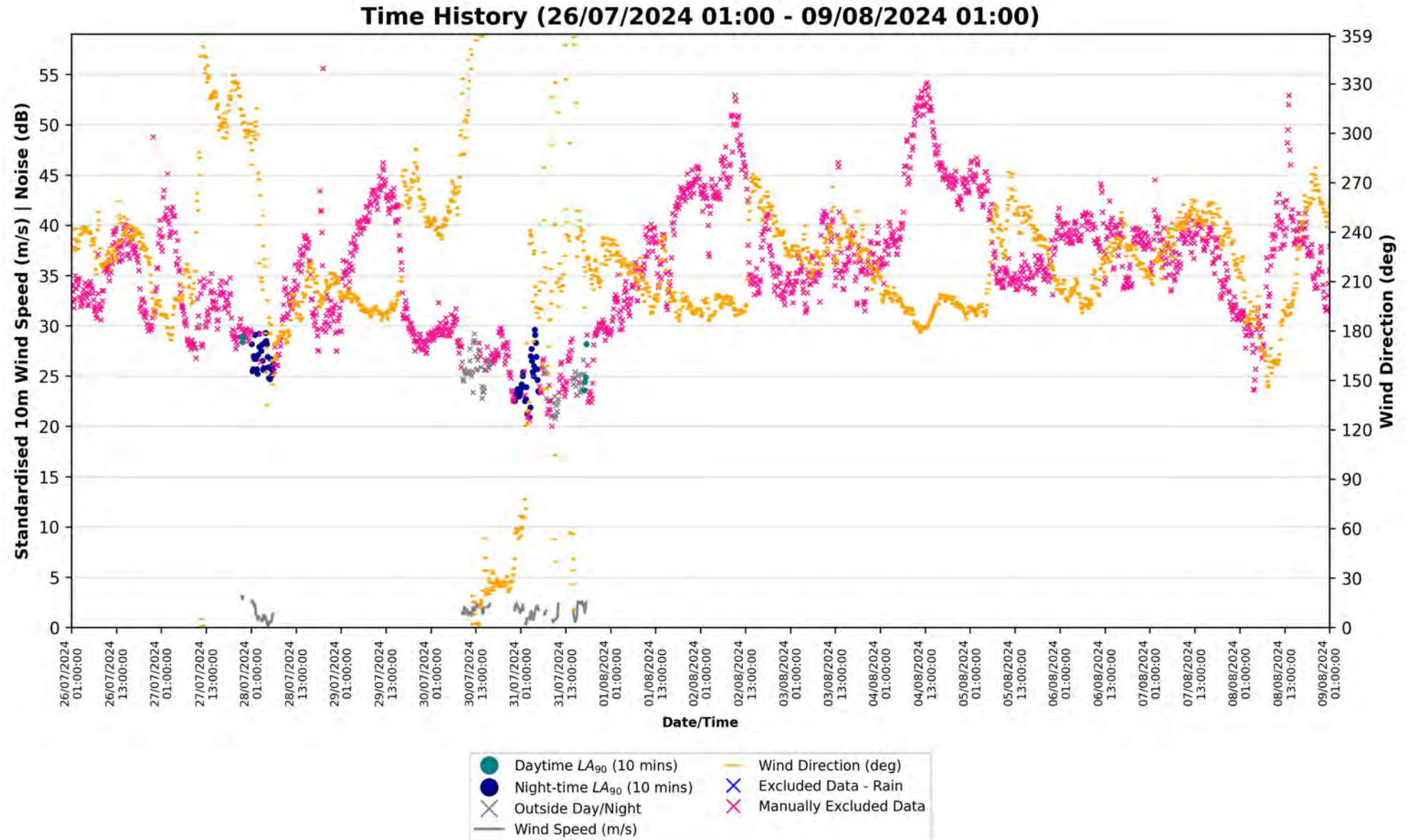
IE00220 - Crumhach Wind Farm

Receptor Name: NML02



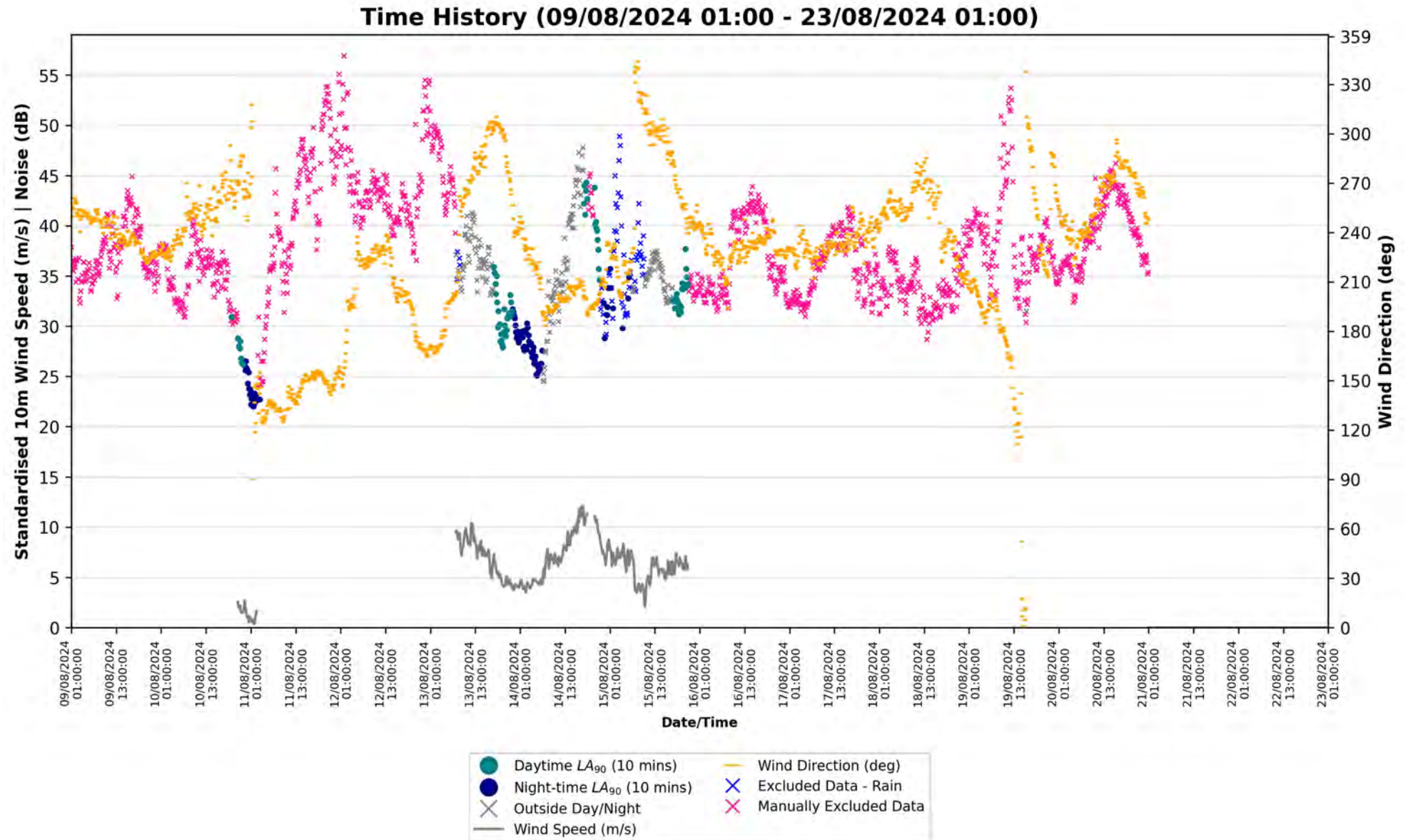
IE00220 - Crumhach Wind Farm

Receptor Name: NML02



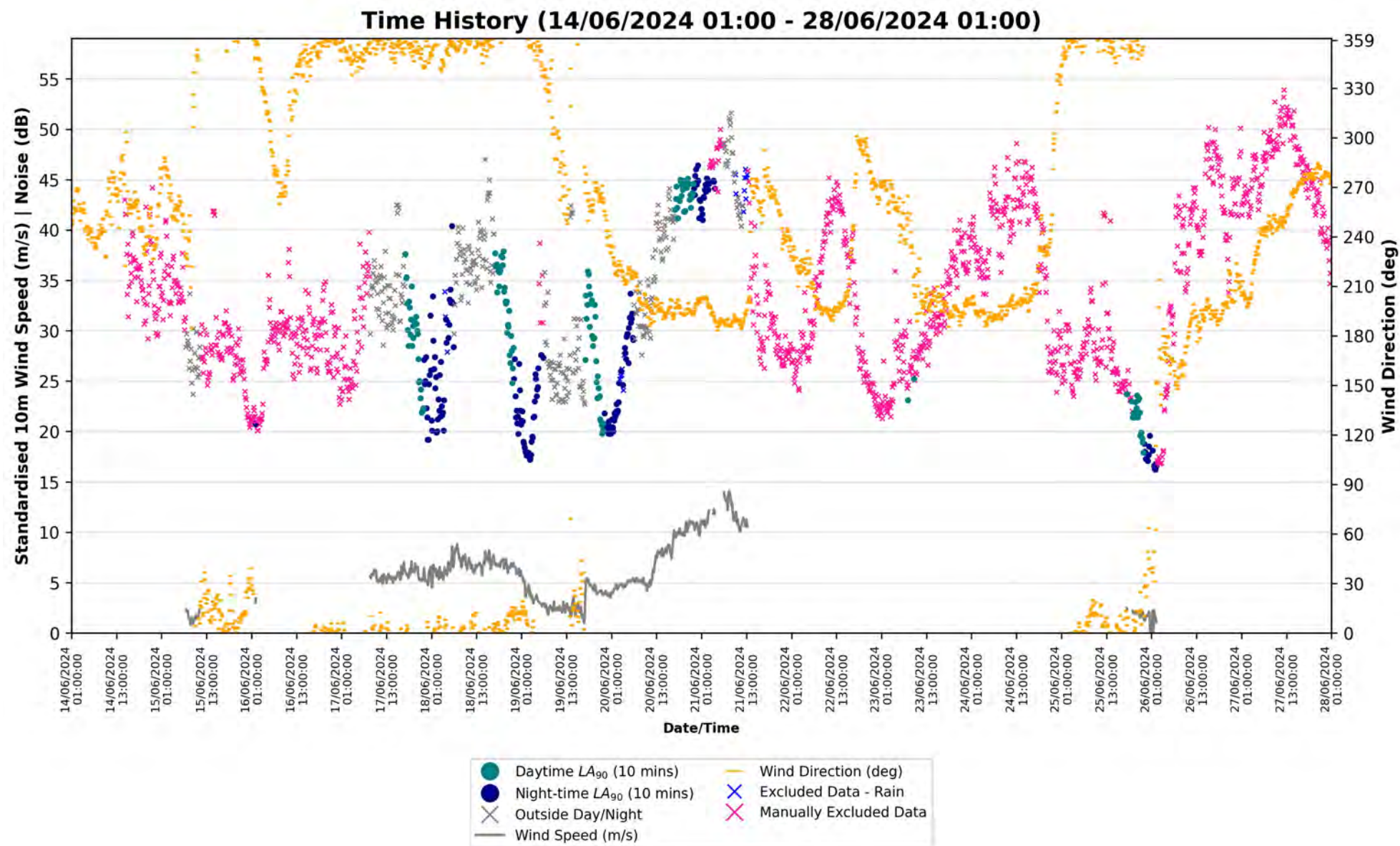
IE00220 - Crumhach Wind Farm

Receptor Name: NML02



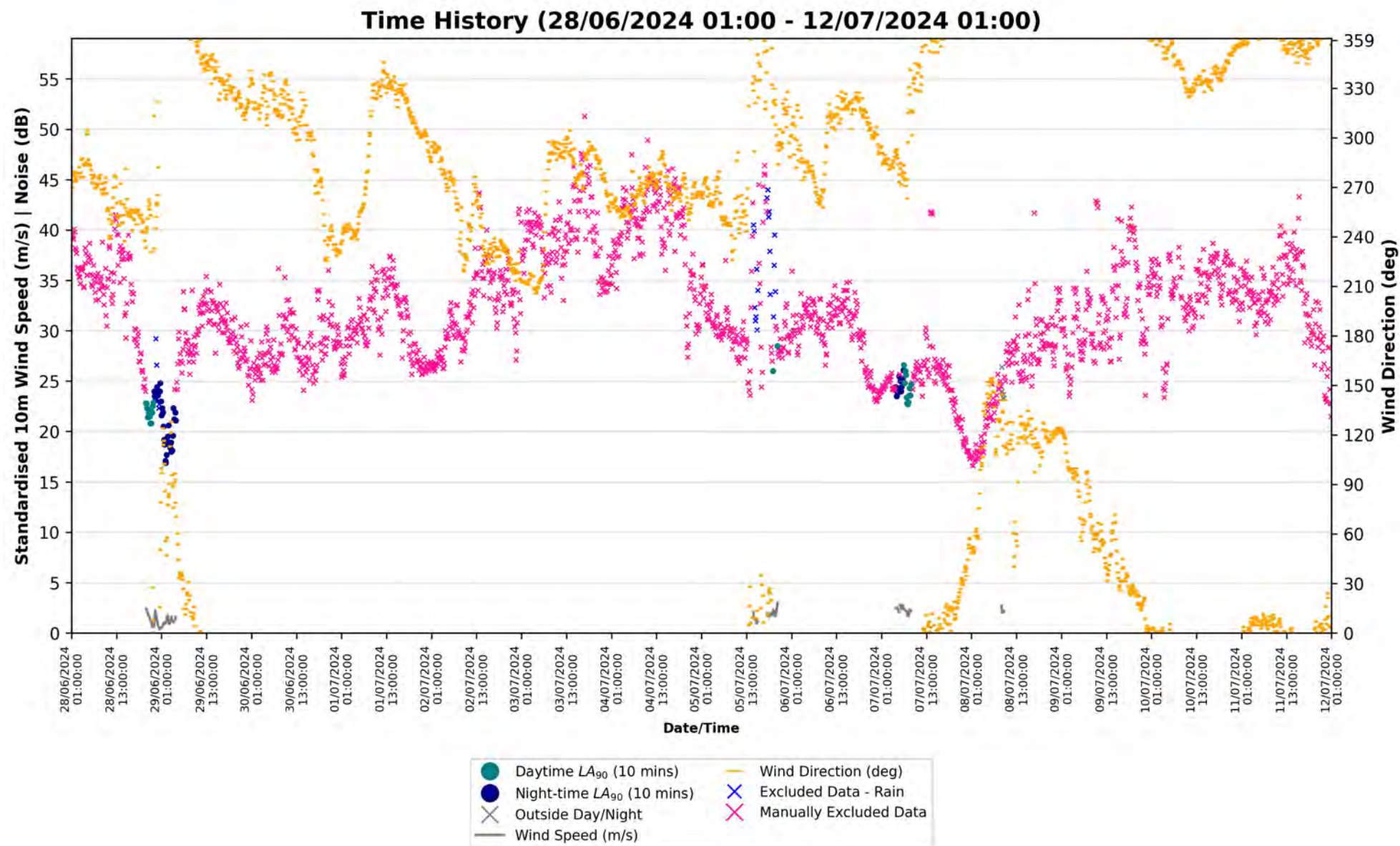
IE00220 - Crumhach Wind Farm

Receptor Name: NML03



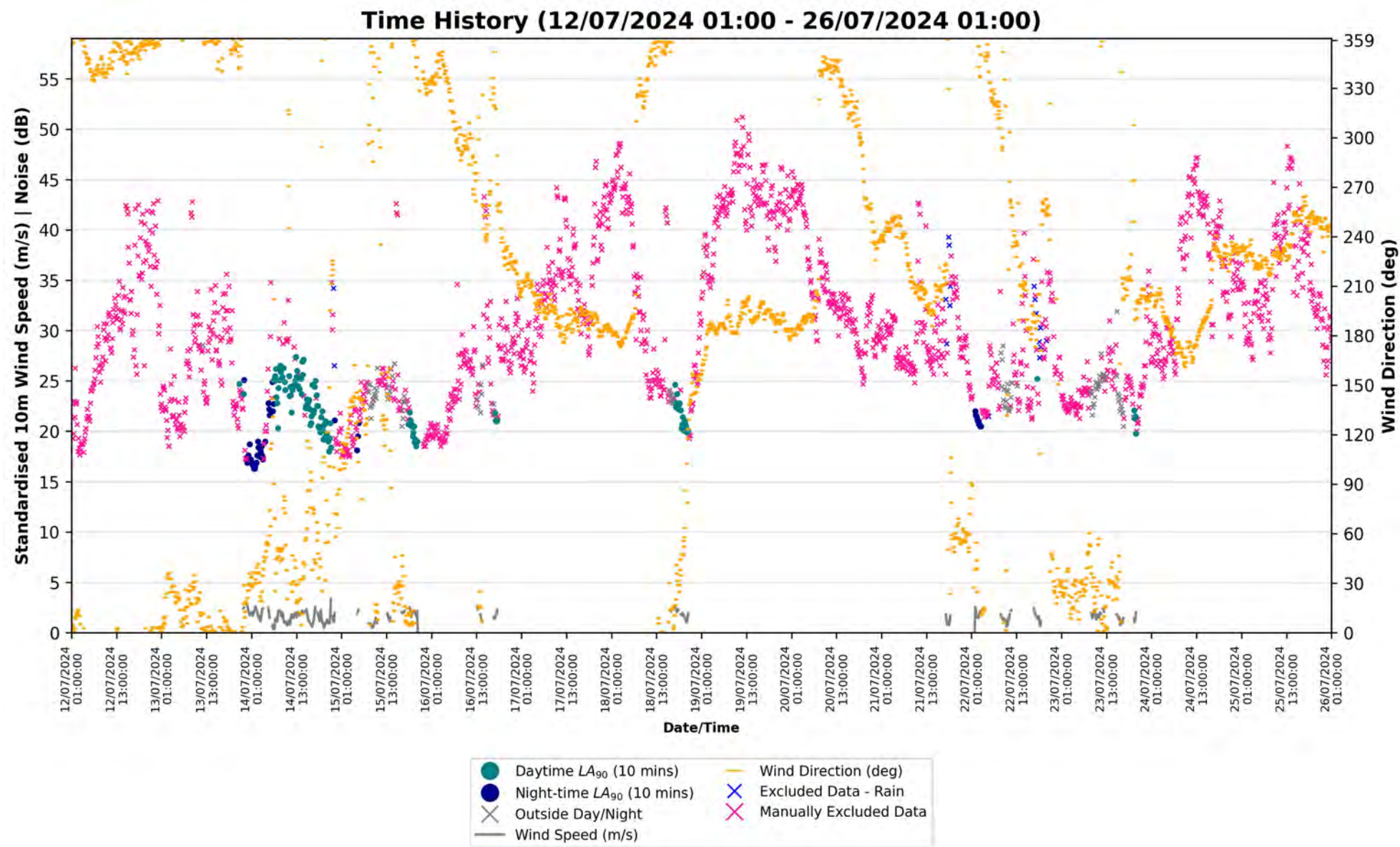
IE00220 - Crumhach Wind Farm

Receptor Name: NML03



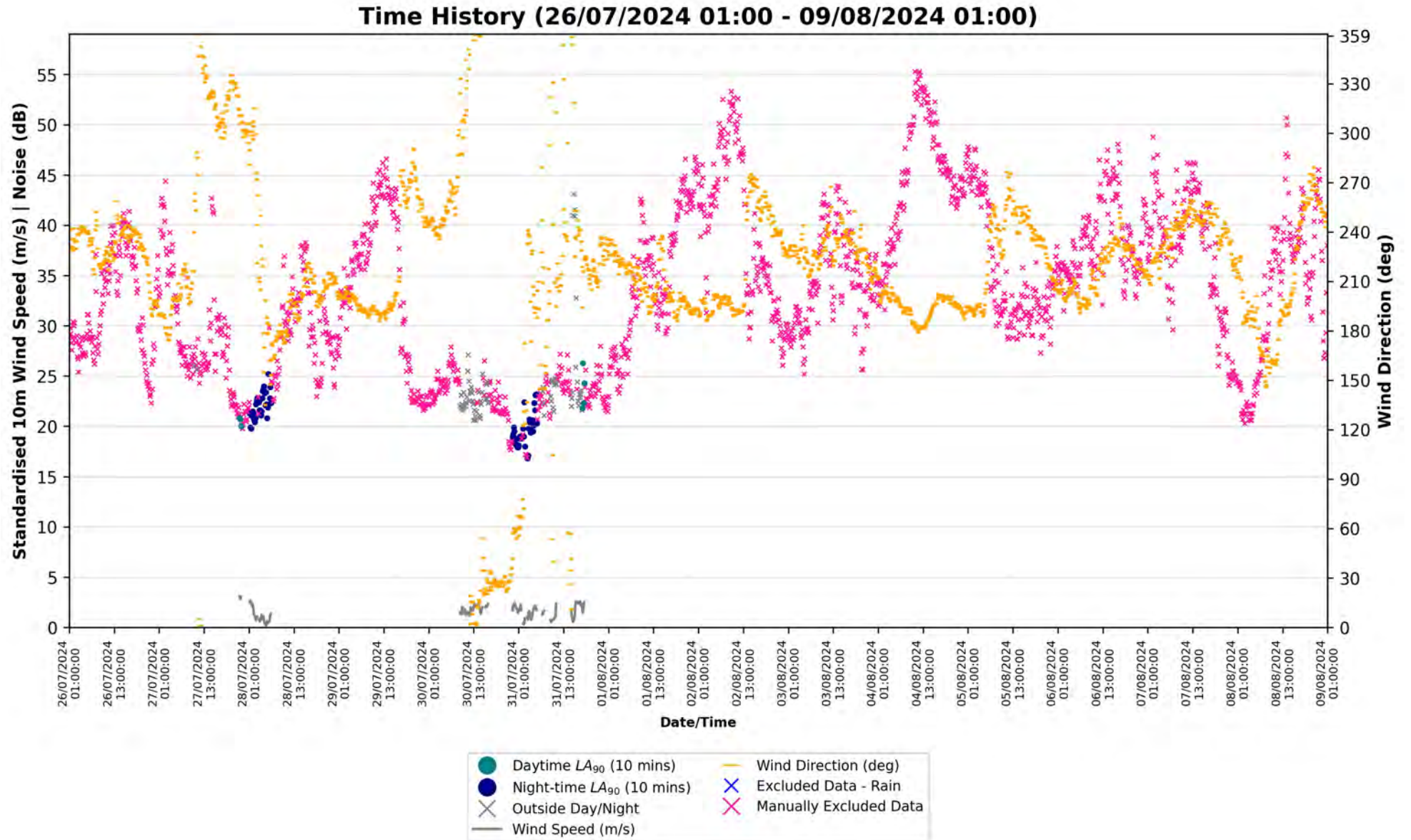
IE00220 - Crumhach Wind Farm

Receptor Name: NML03



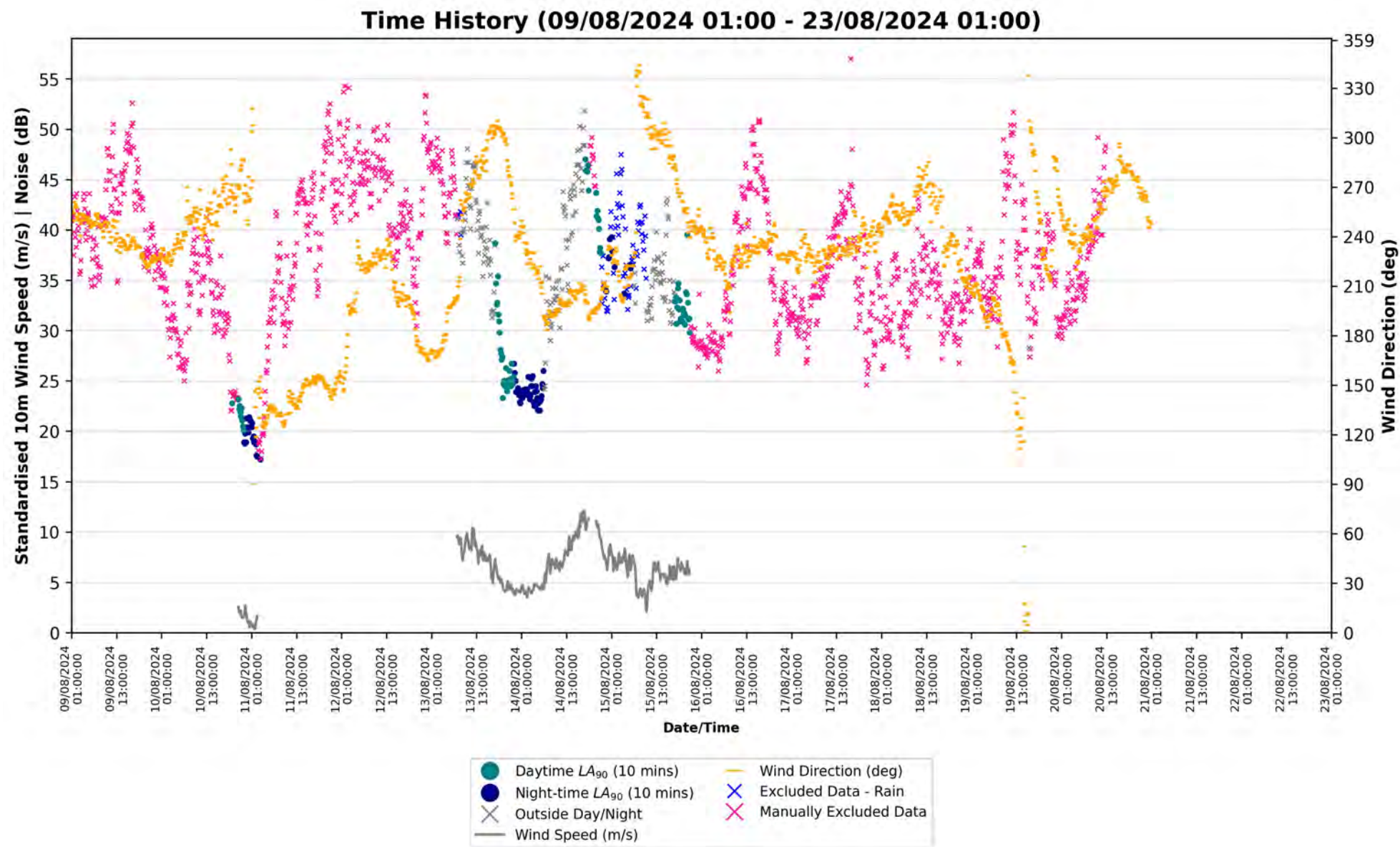
IE00220 - Crumhach Wind Farm

Receptor Name: NML03



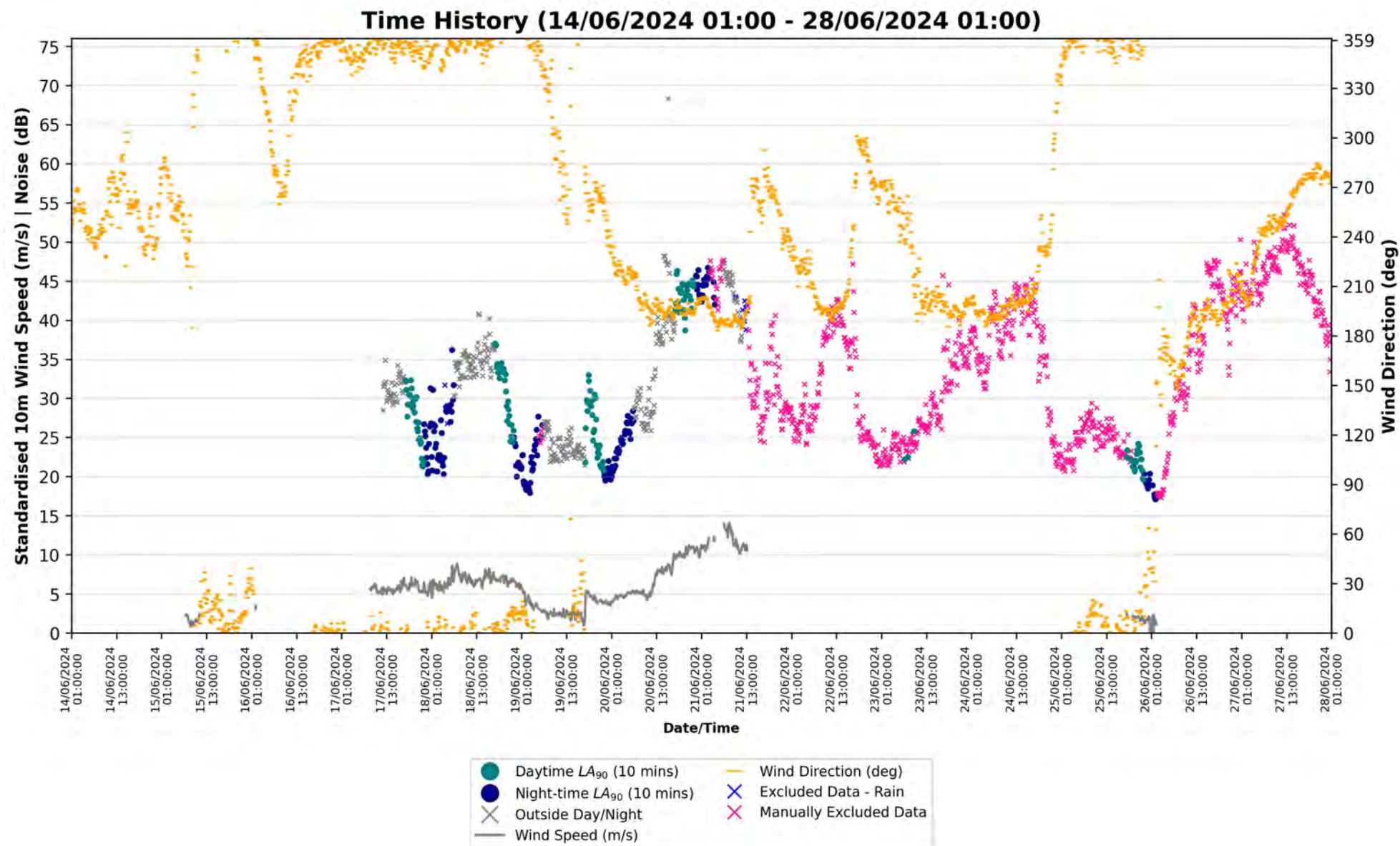
IE00220 - Crumhach Wind Farm

Receptor Name: NML03



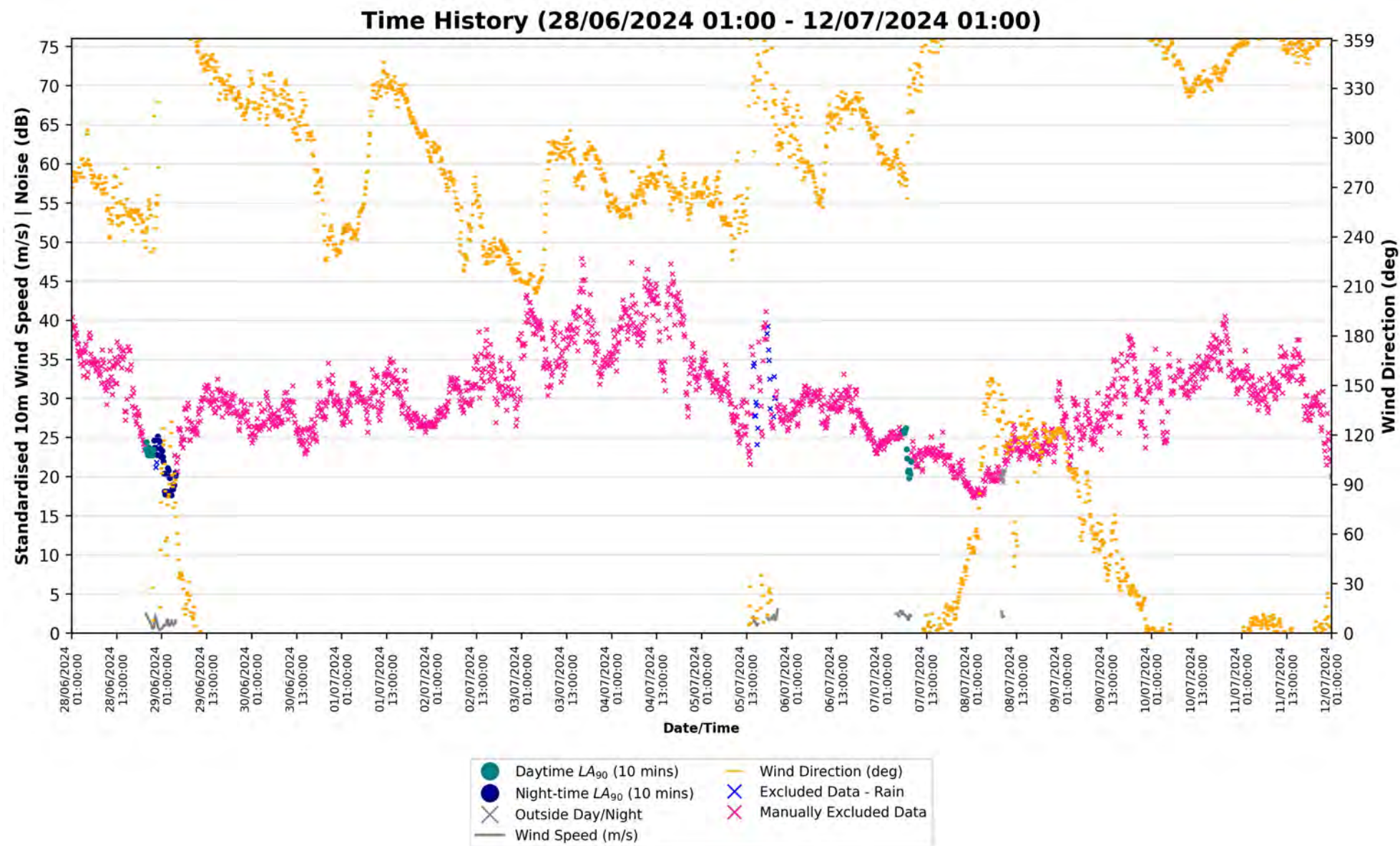
IE00220 - Crumhach Wind Farm

Receptor Name: NML04



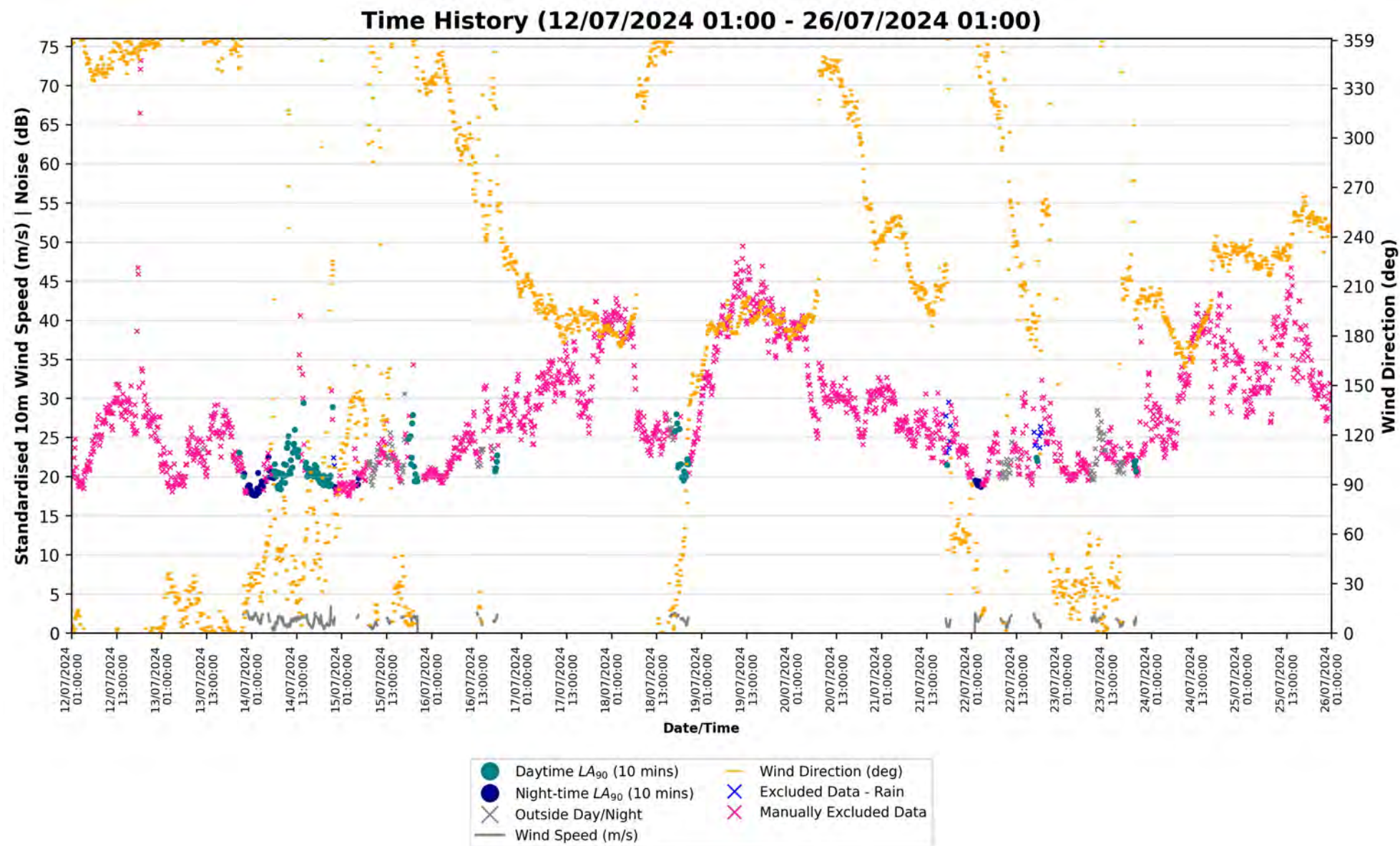
IE00220 - Crumhach Wind Farm

Receptor Name: NML04



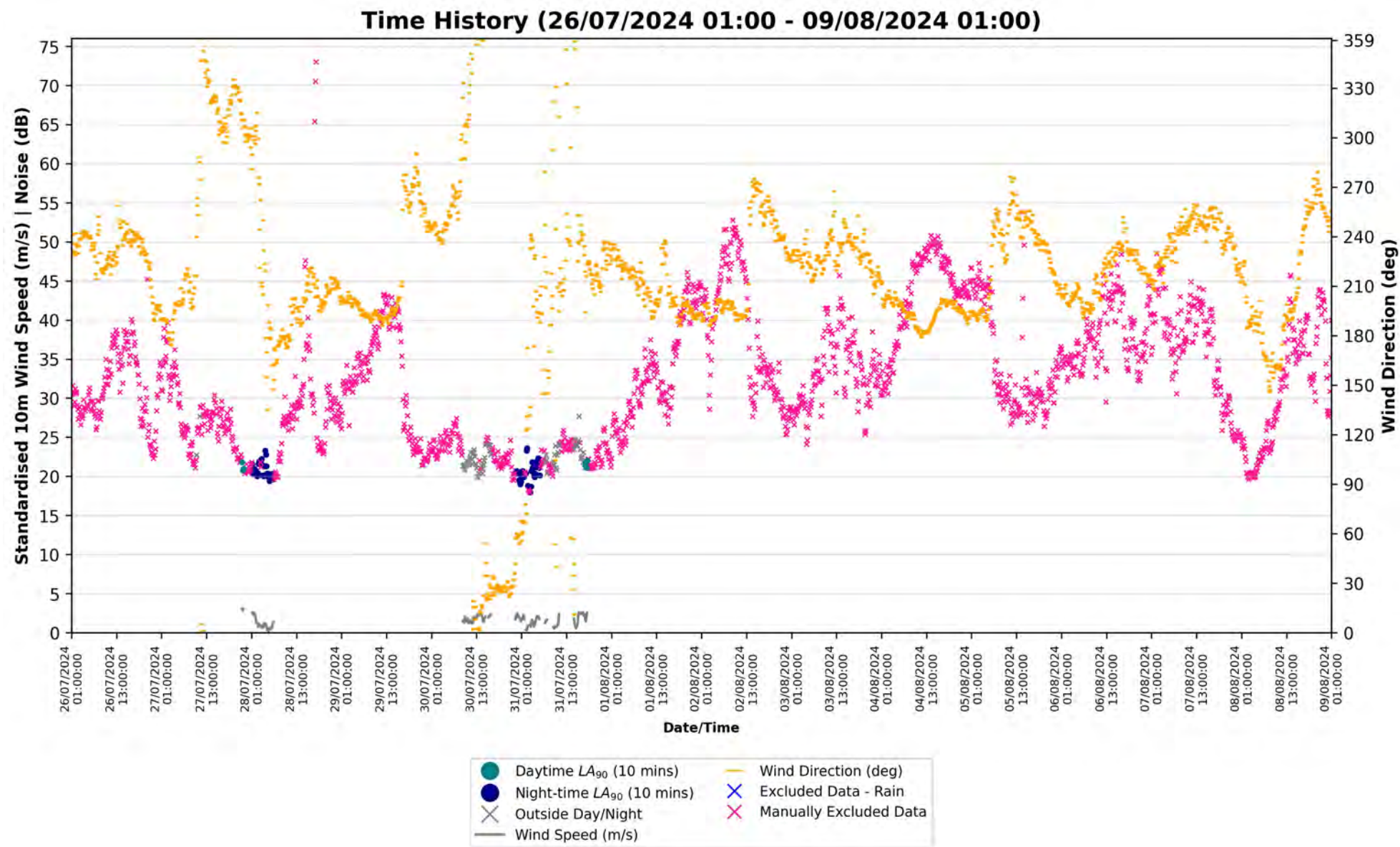
IE00220 - Crumhach Wind Farm

Receptor Name: NML04



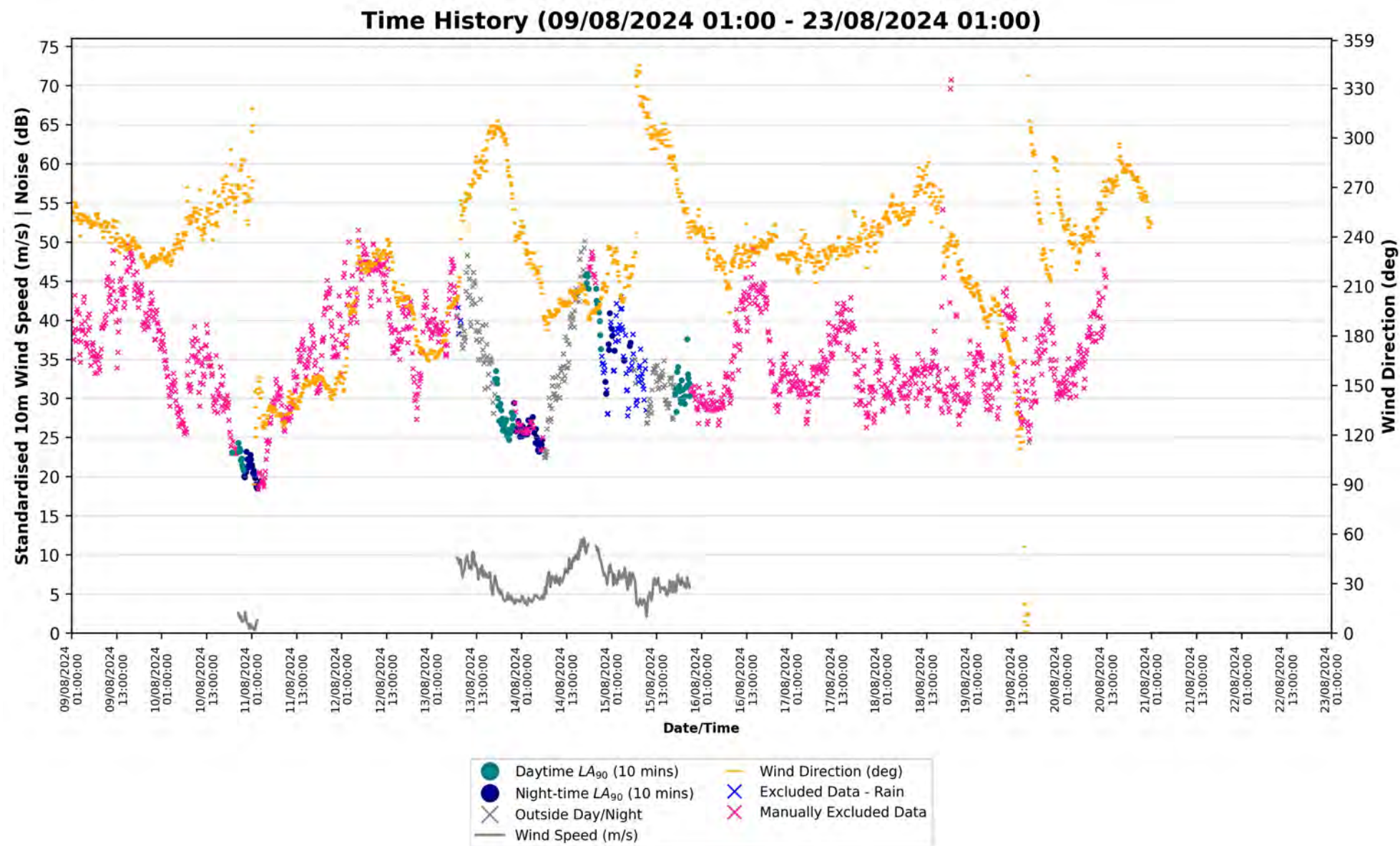
IE00220 - Crumhach Wind Farm

Receptor Name: NML04



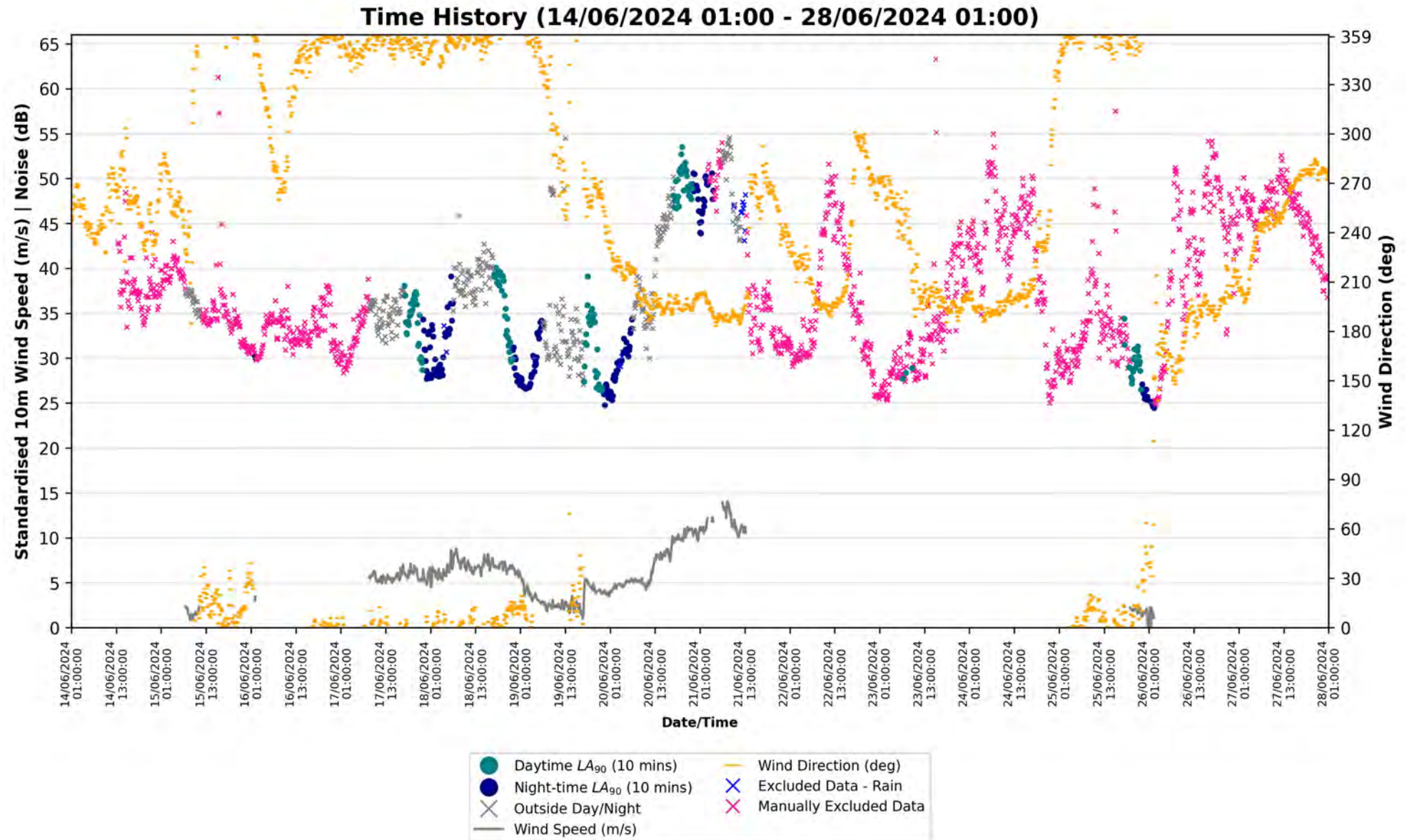
IE00220 - Crumhach Wind Farm

Receptor Name: NML04



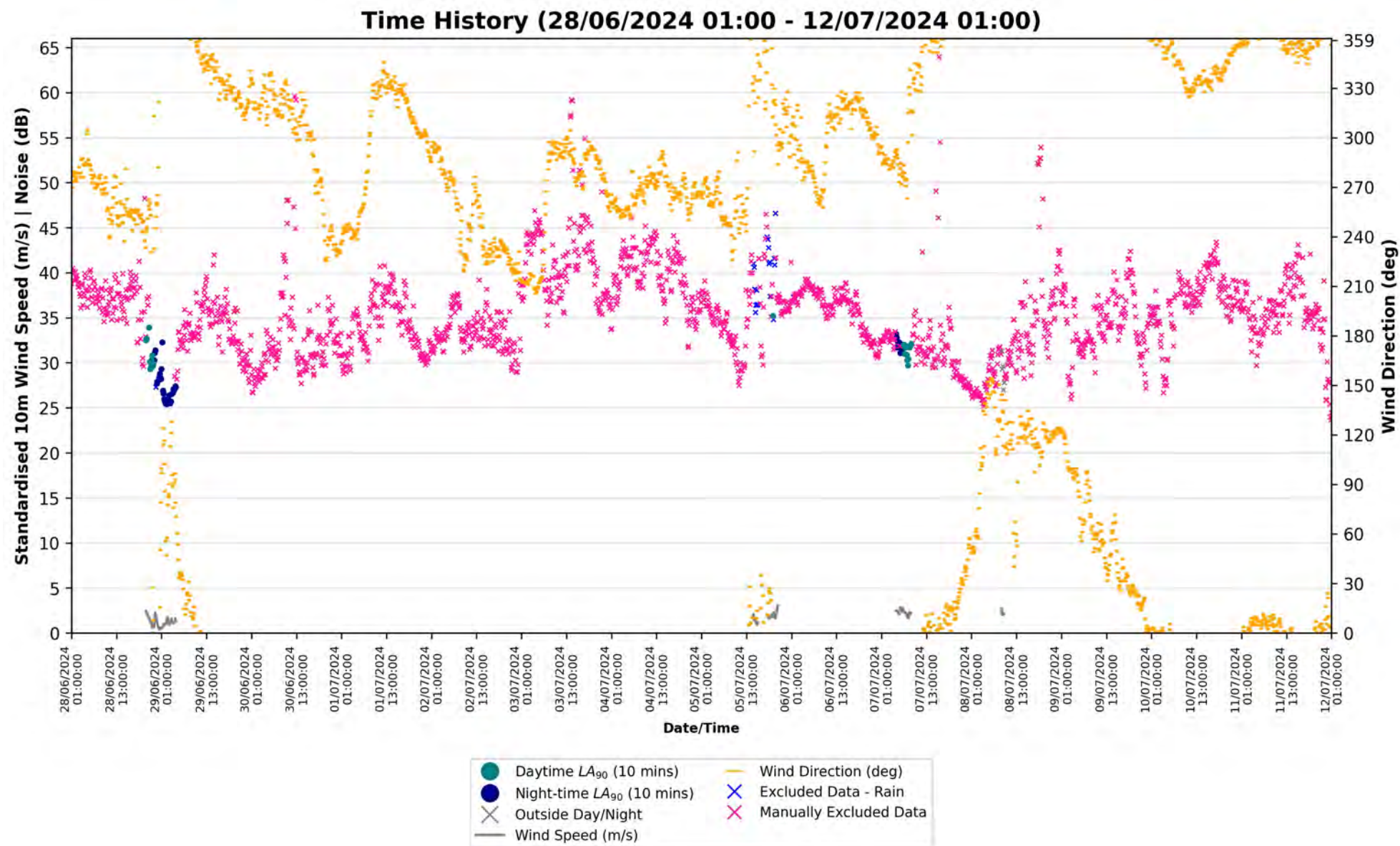
IE00220 - Crumhach Wind Farm

Receptor Name: NML05



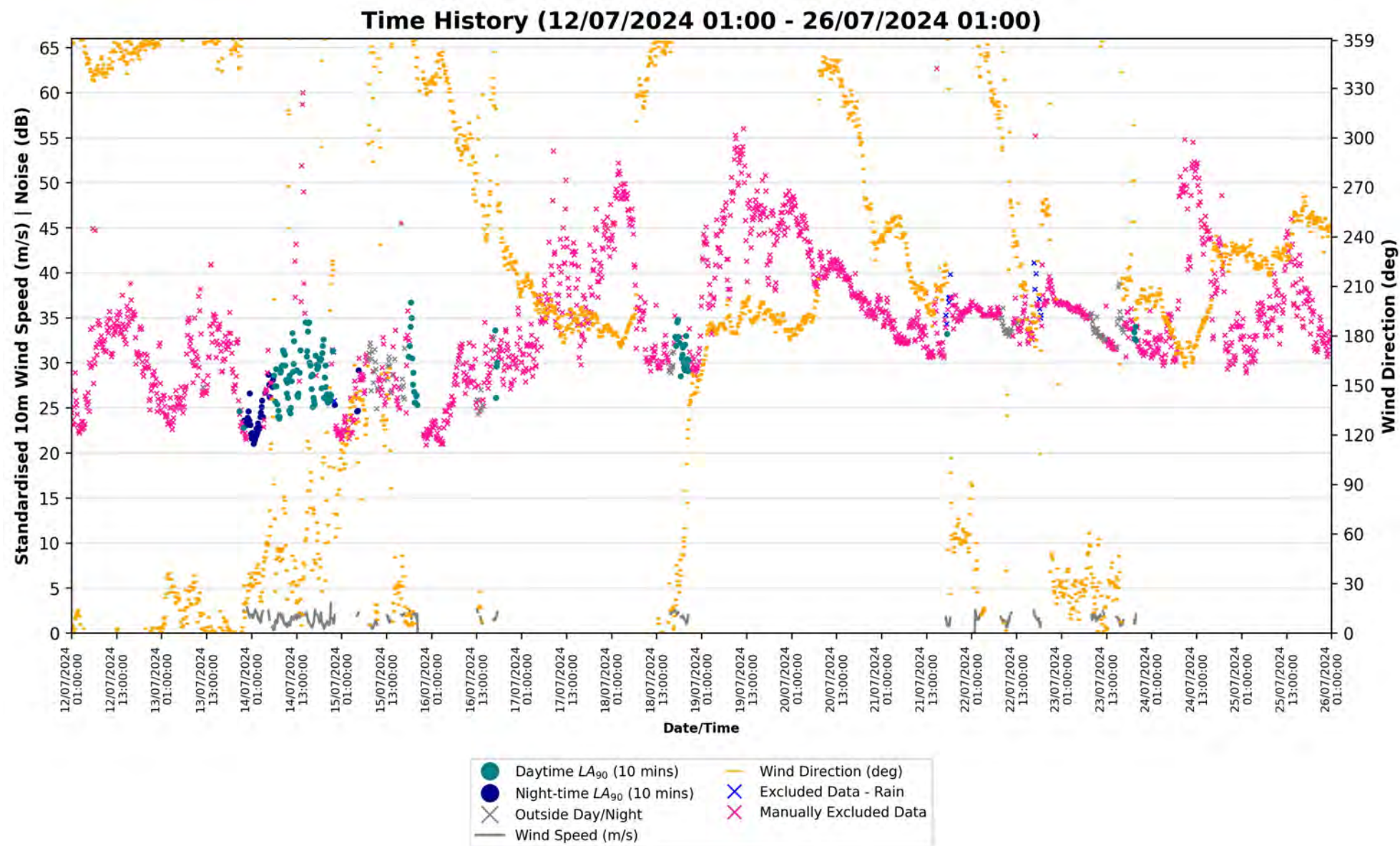
IE00220 - Crumhach Wind Farm

Receptor Name: NML05



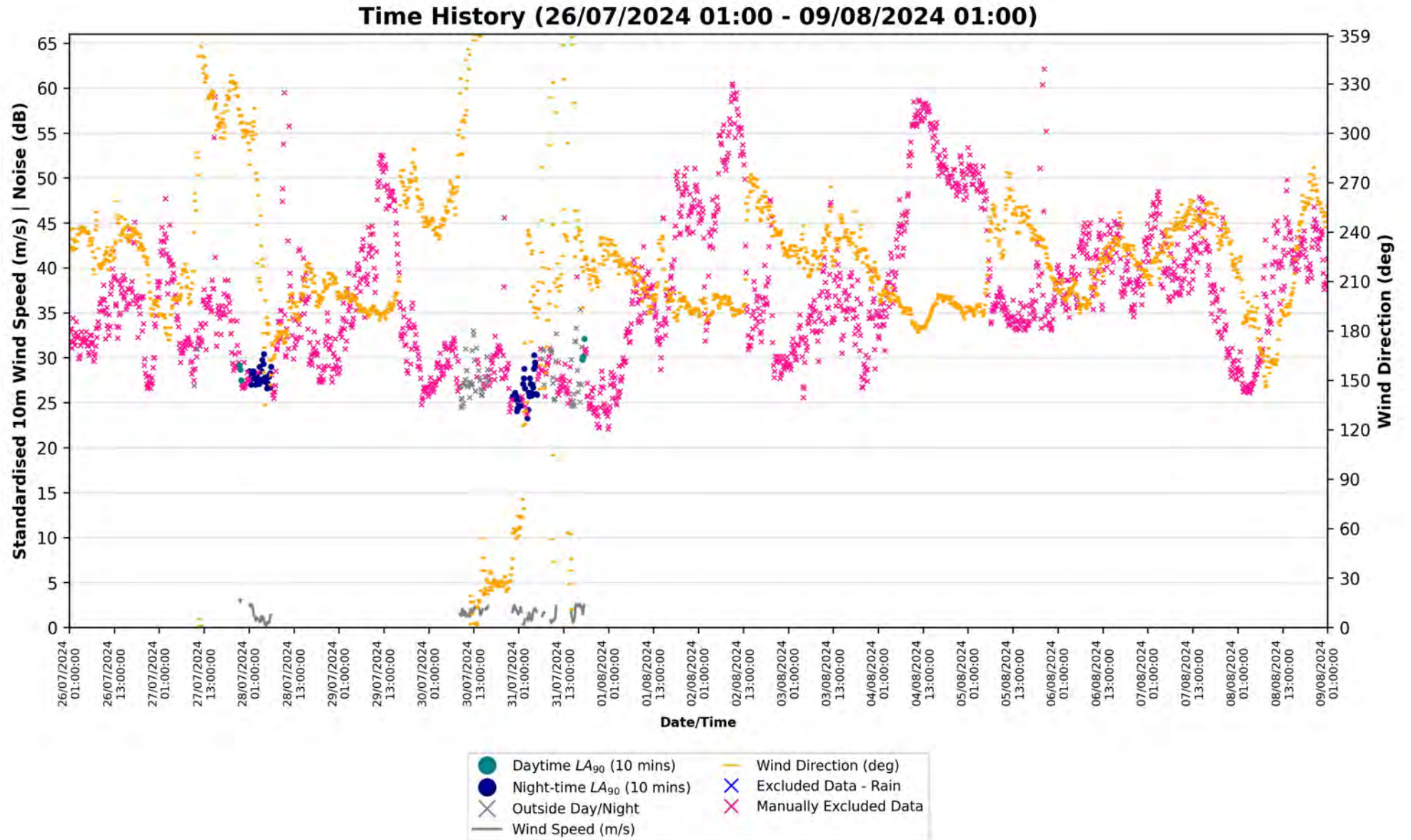
IE00220 - Crumhach Wind Farm

Receptor Name: NML05



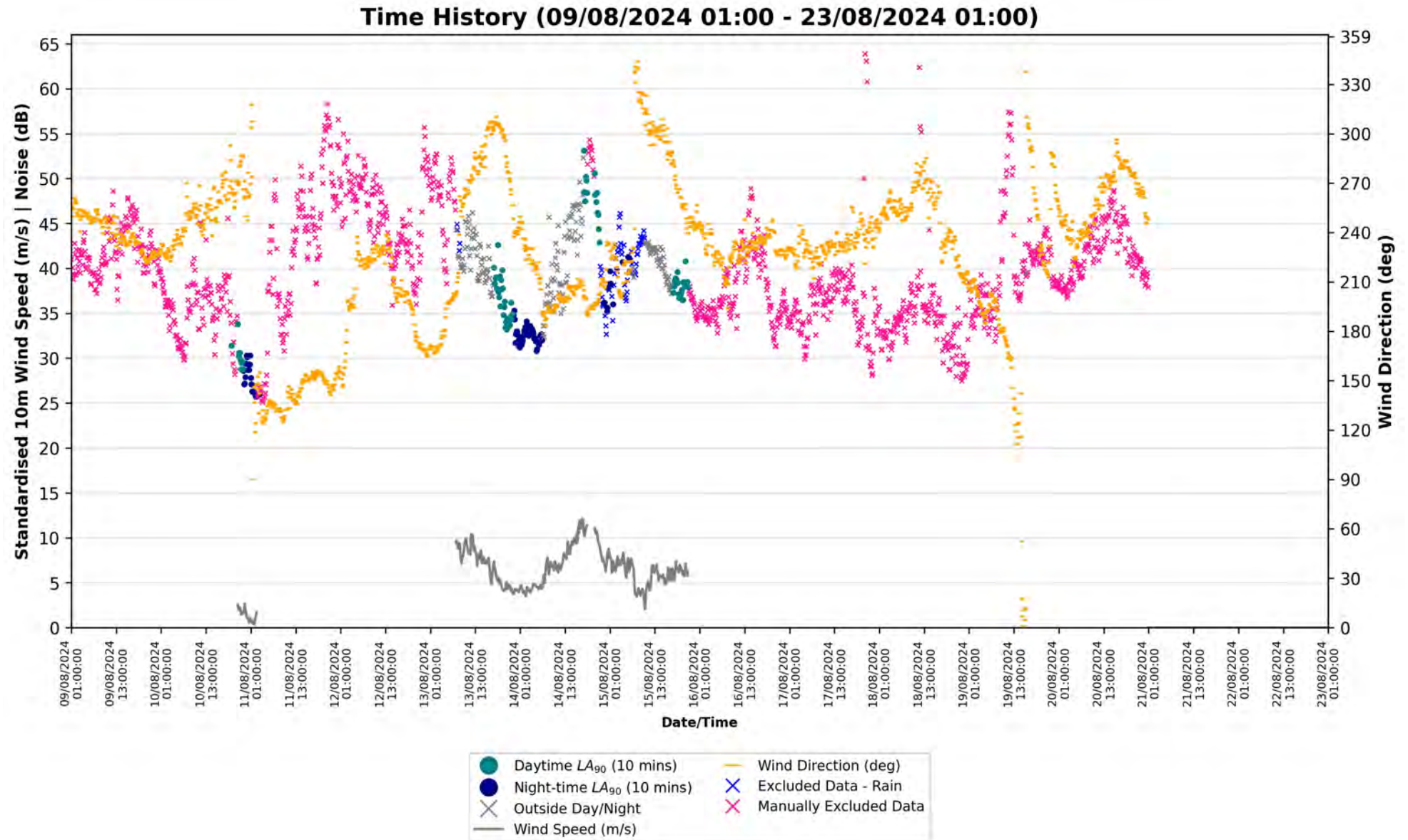
IE00220 - Crumhach Wind Farm

Receptor Name: NML05



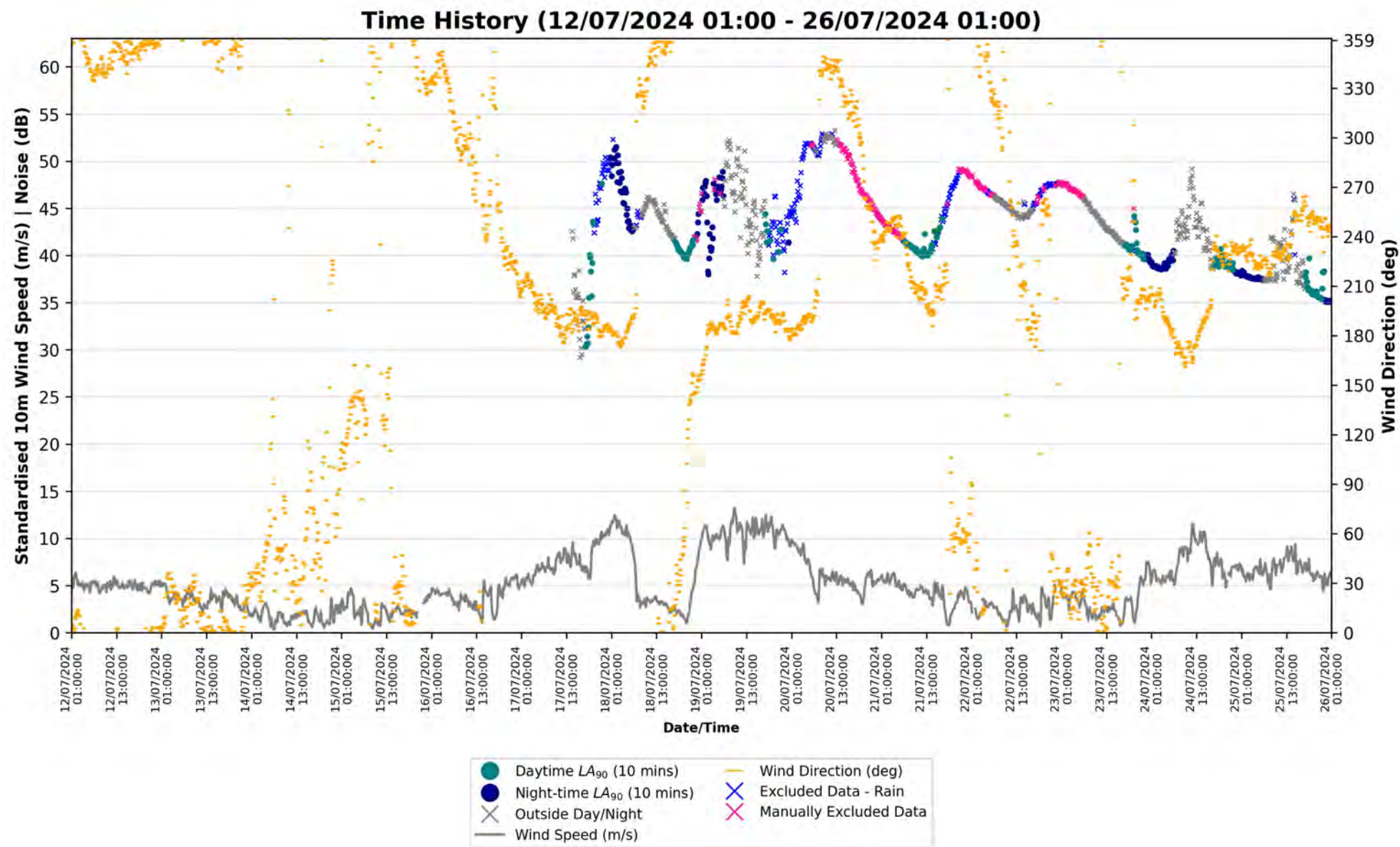
IE00220 - Crumhach Wind Farm

Receptor Name: NML05



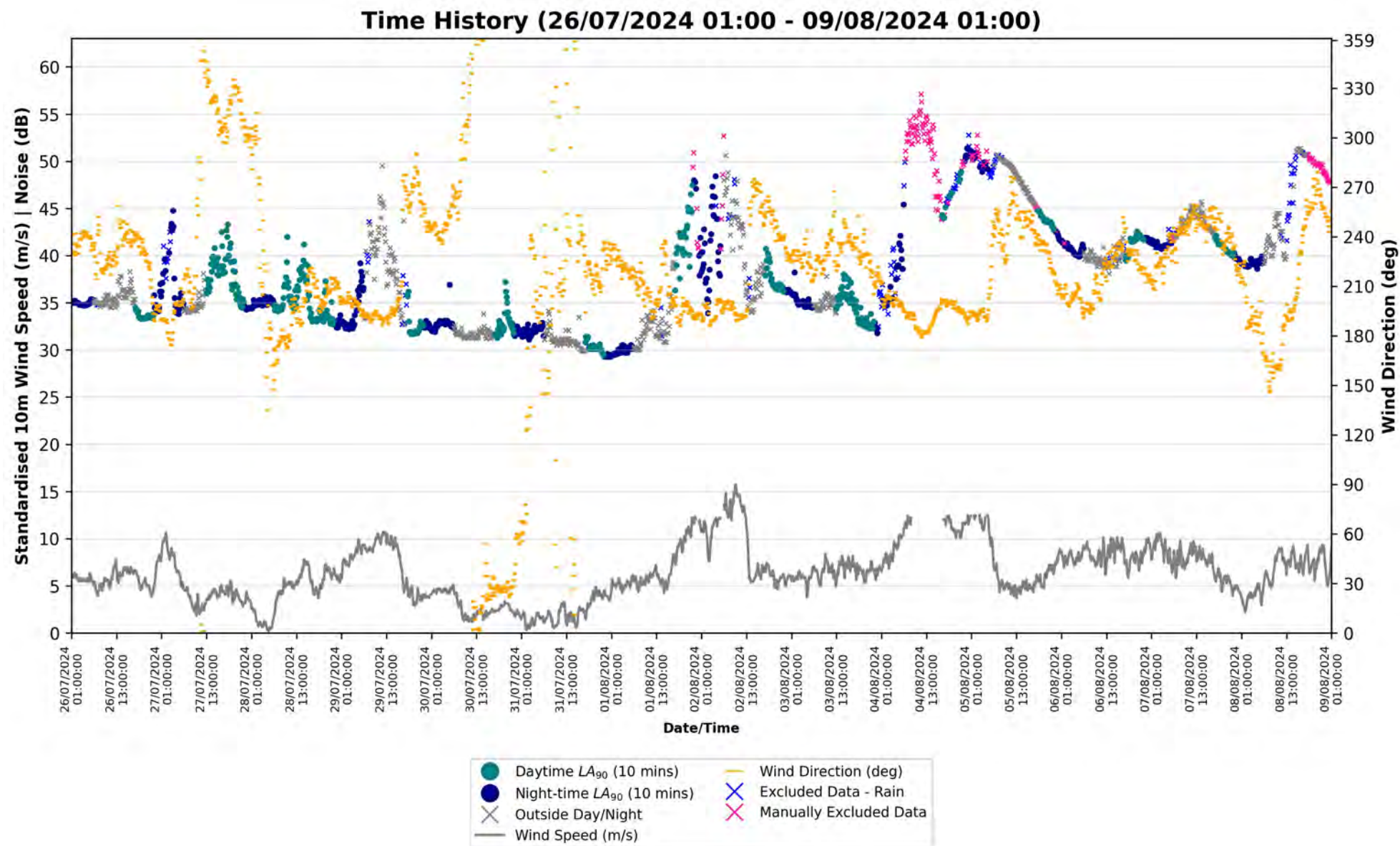
IE00220 - Crumhach Wind Farm

Receptor Name: NML06



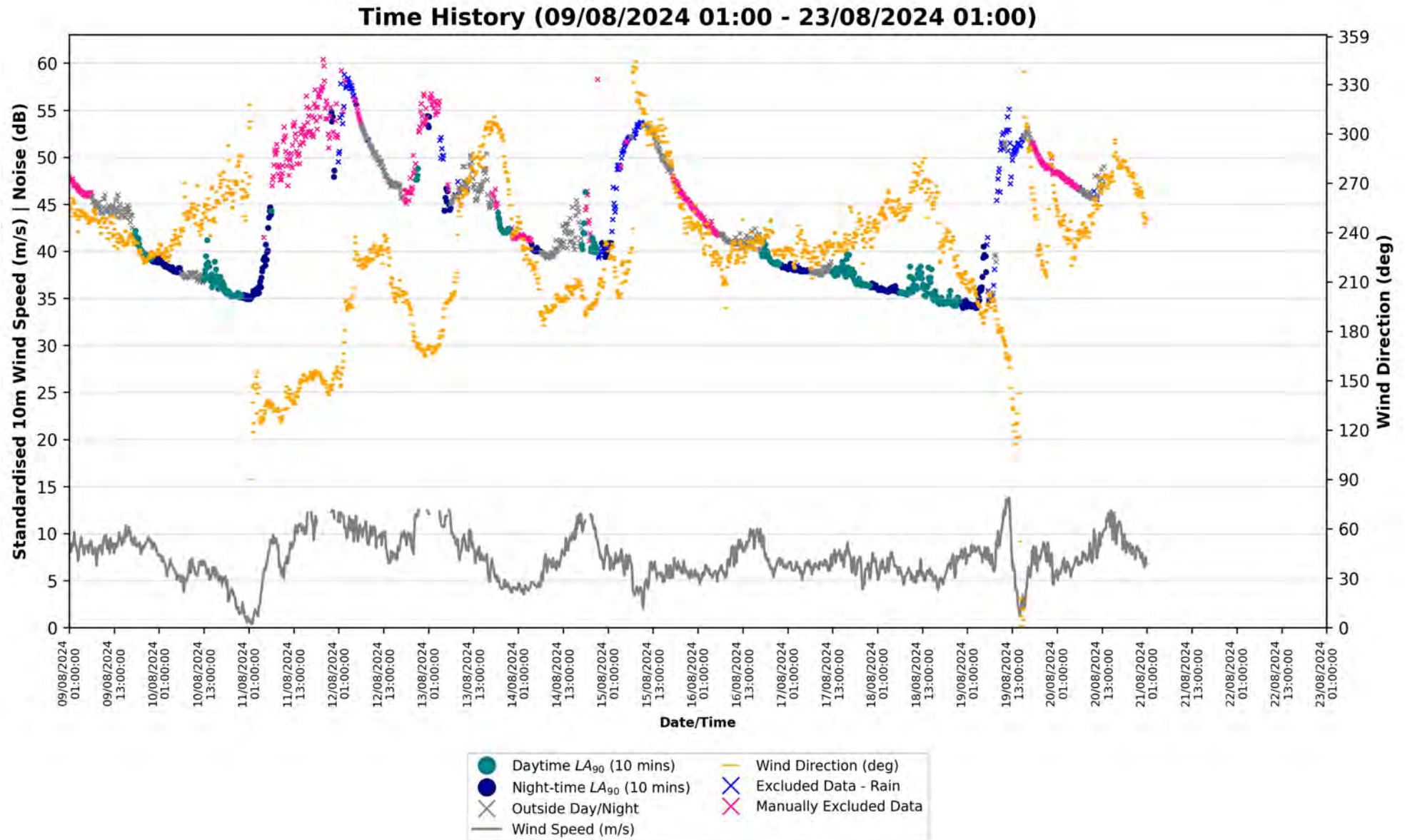
IE00220 - Crumhach Wind Farm

Receptor Name: NML06



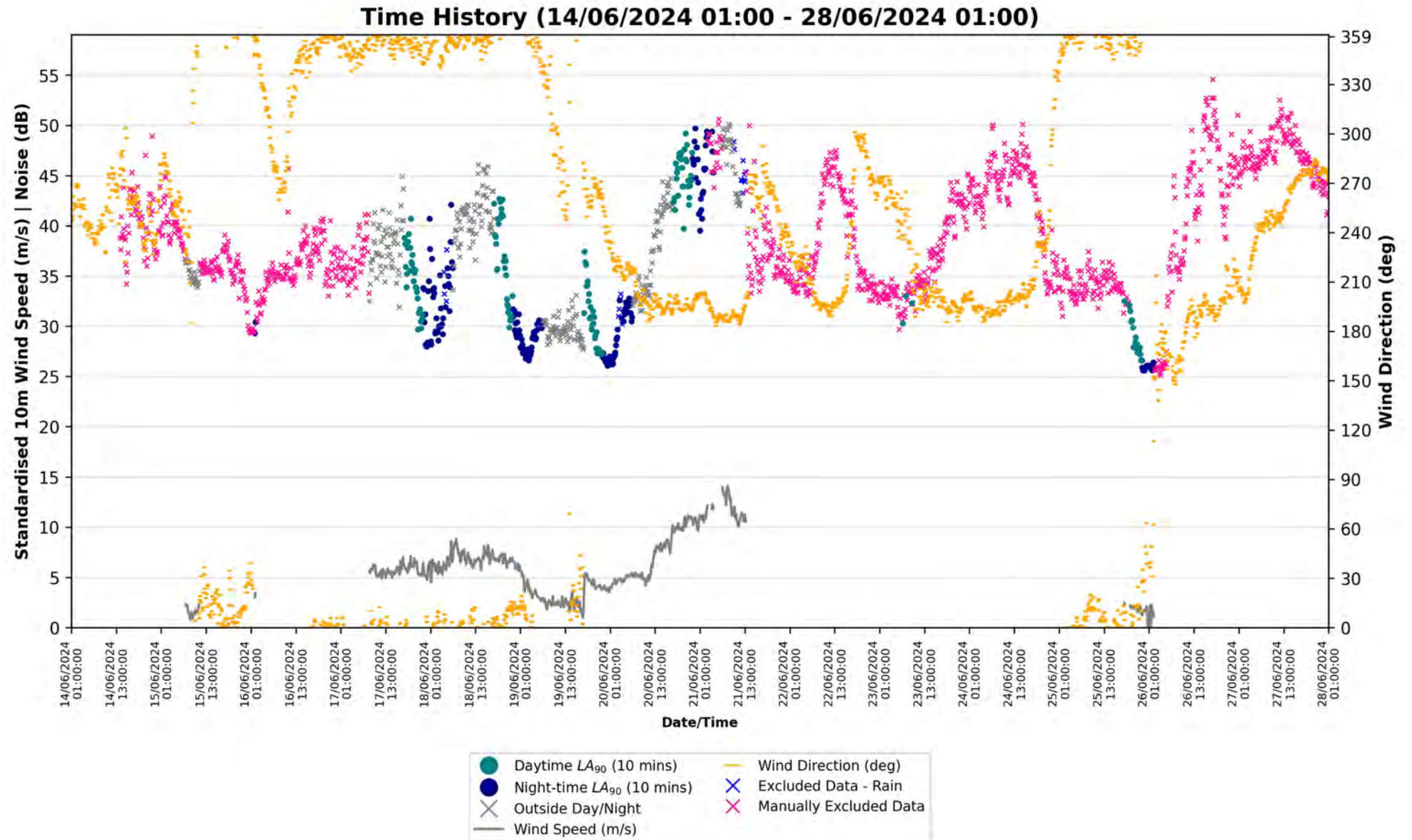
IE00220 - Crumhach Wind Farm

Receptor Name: NML06



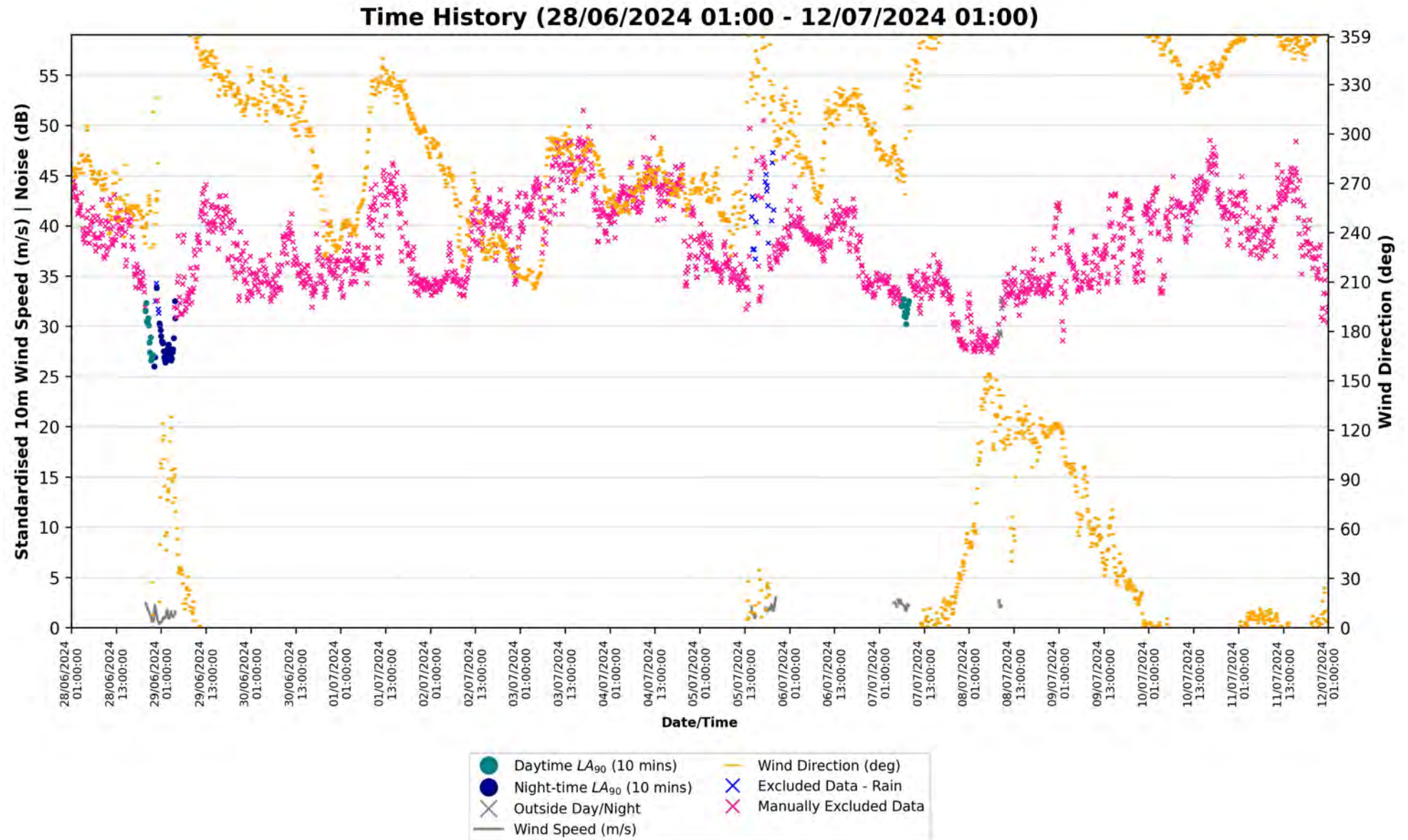
IE00220 - Crumhach Wind Farm

Receptor Name: NML07



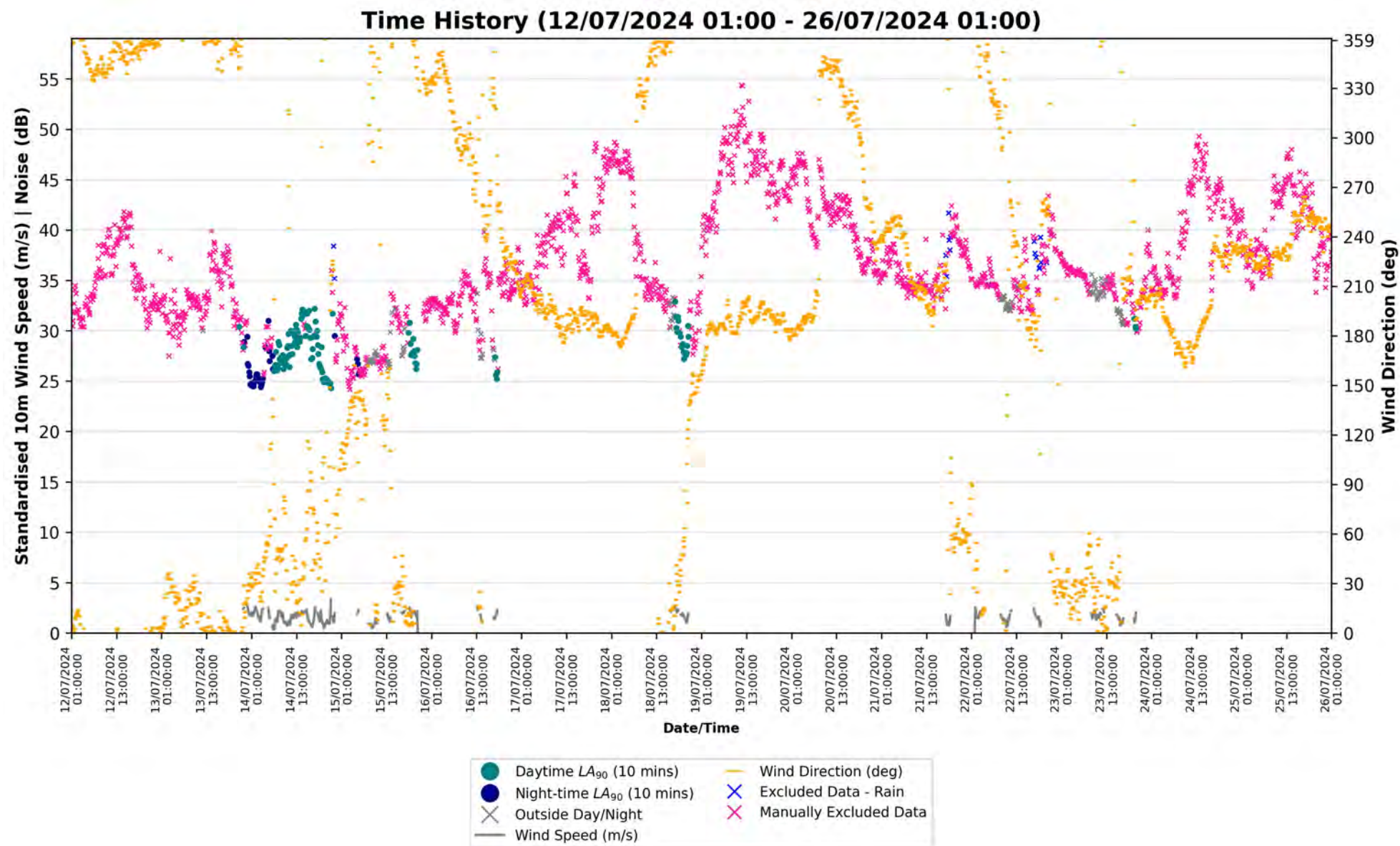
IE00220 - Crumhach Wind Farm

Receptor Name: NML07



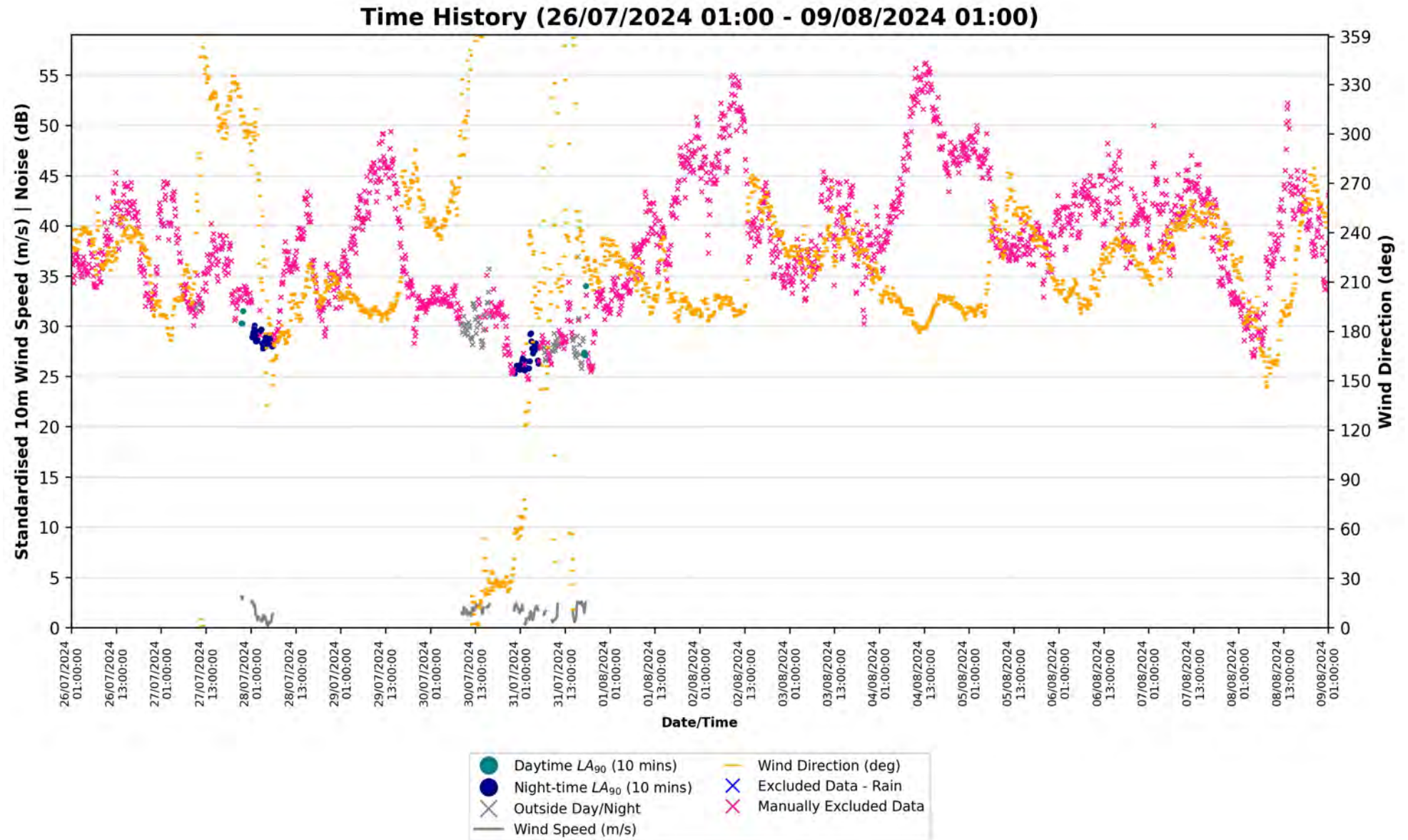
IE00220 - Crumhach Wind Farm

Receptor Name: NML07



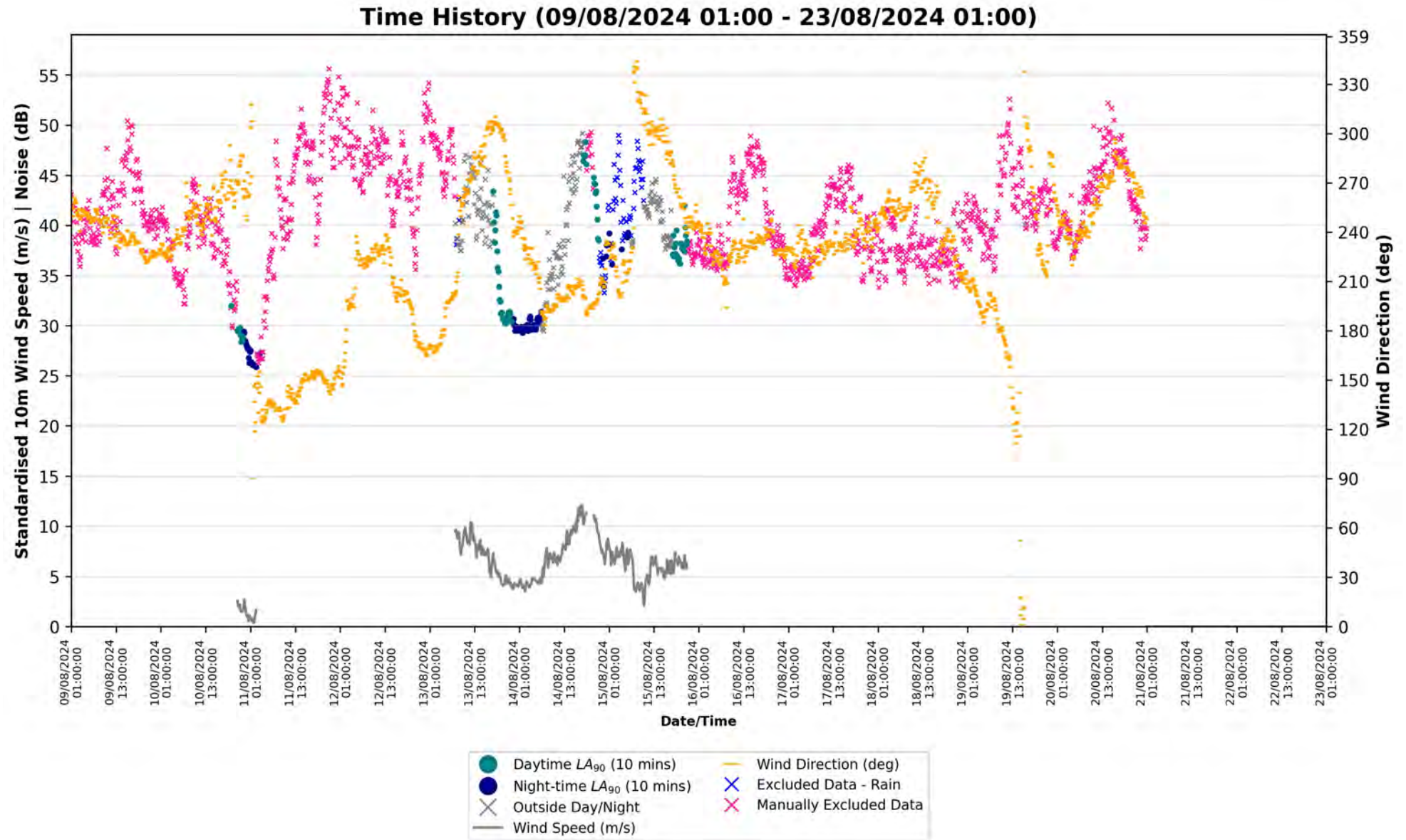
IE00220 - Crumhach Wind Farm

Receptor Name: NML07



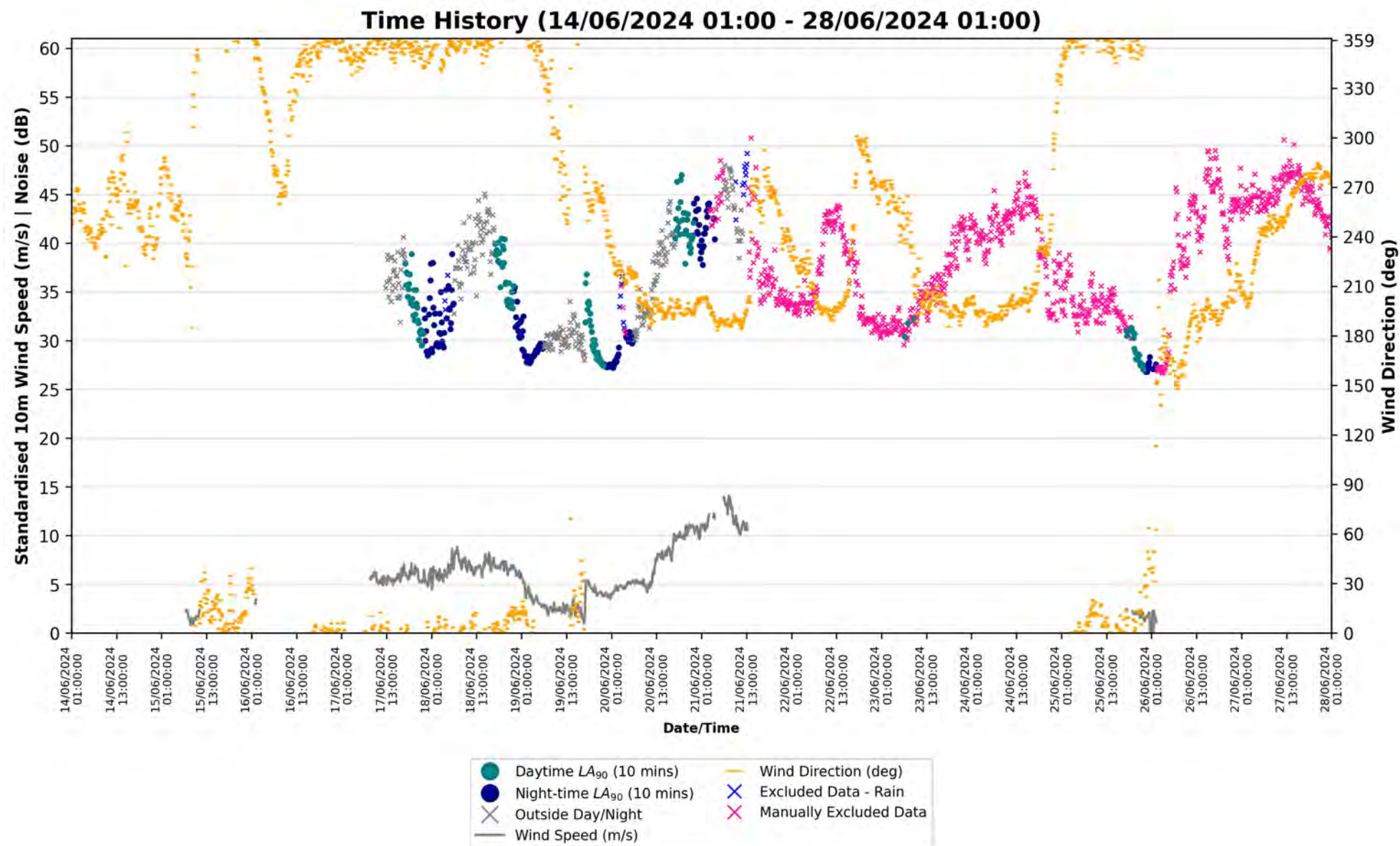
IE00220 - Crumhach Wind Farm

Receptor Name: NML07



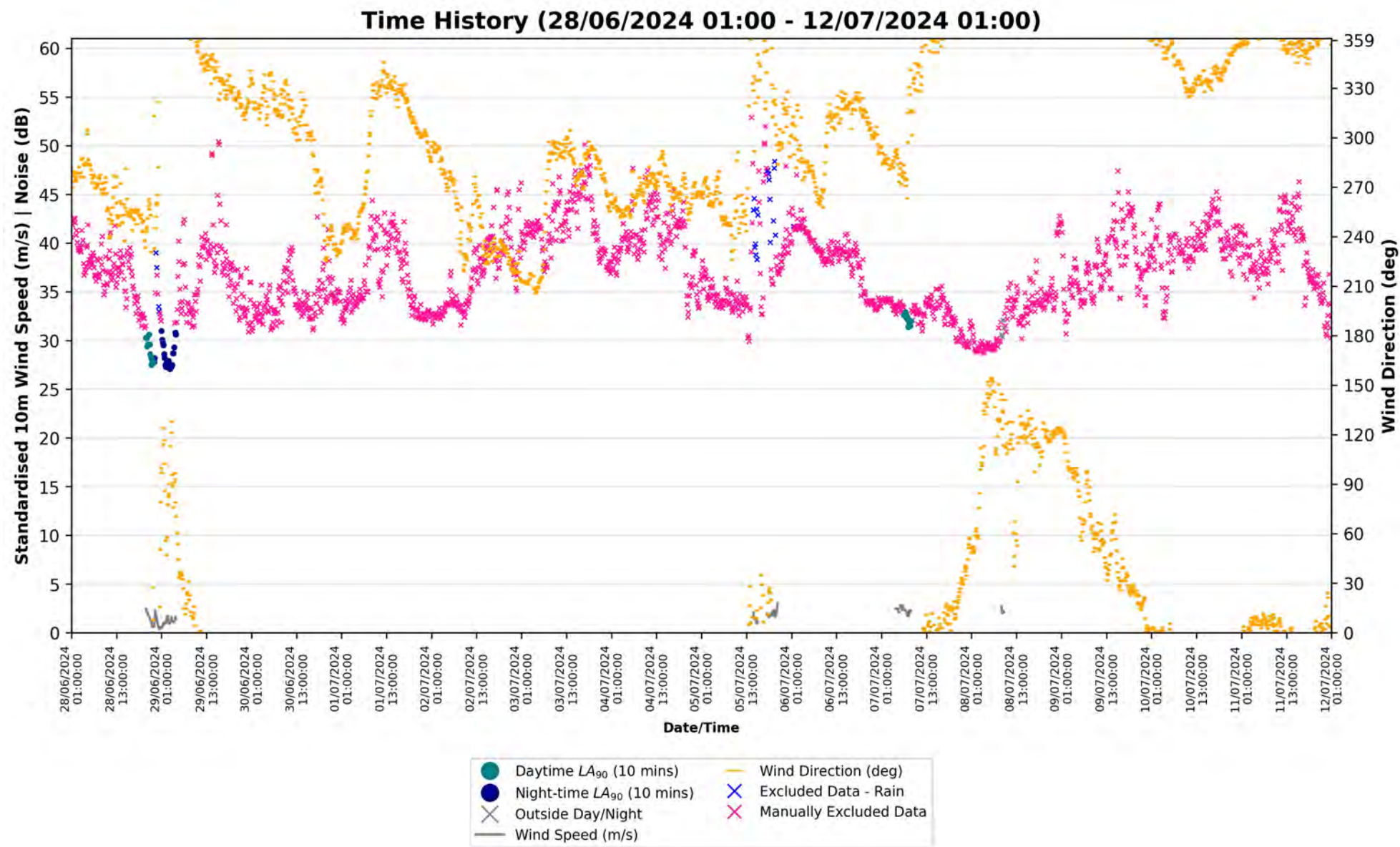
IE00220 - Crumhach Wind Farm

Receptor Name: NML08



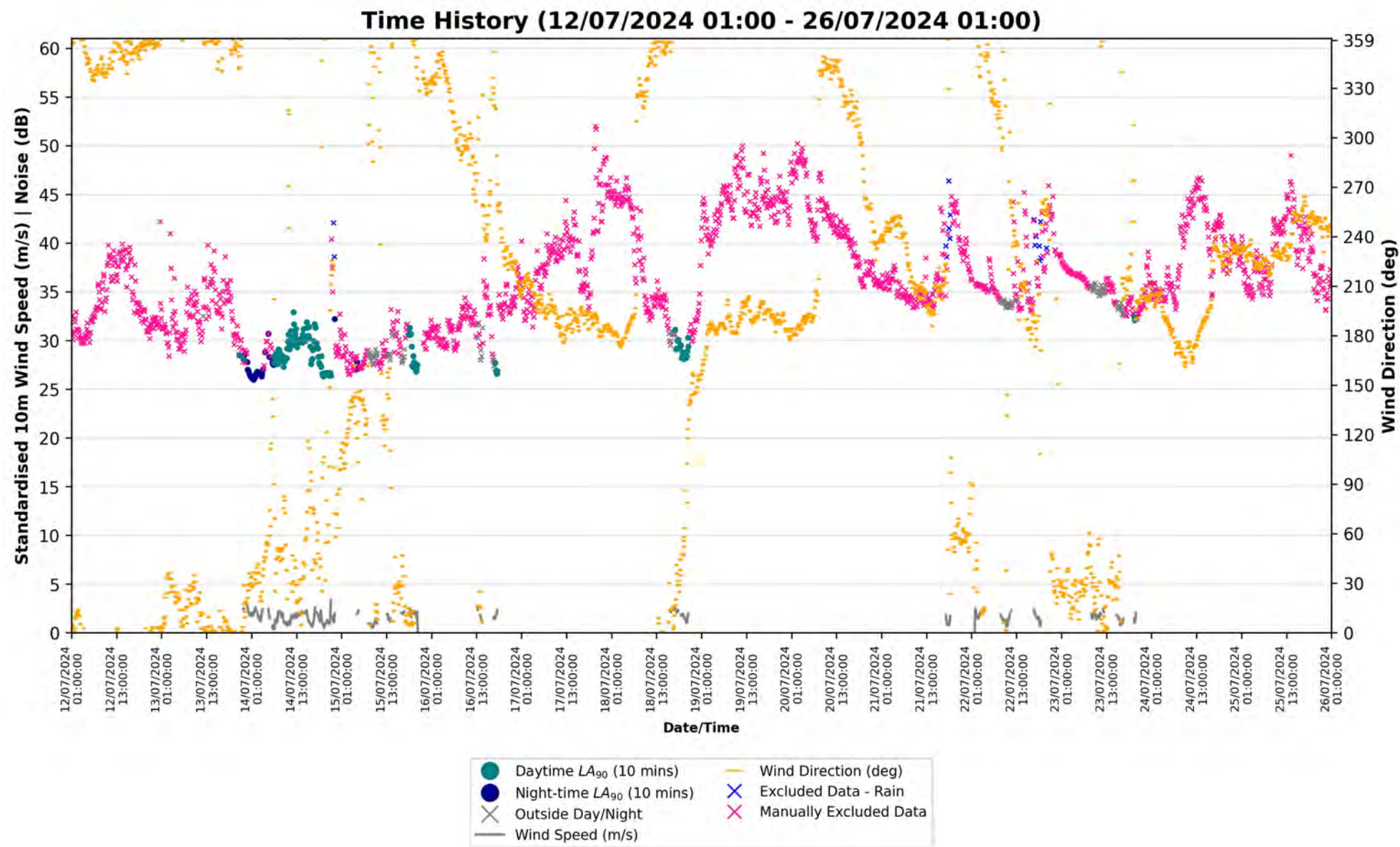
IE00220 - Crumhach Wind Farm

Receptor Name: NML08



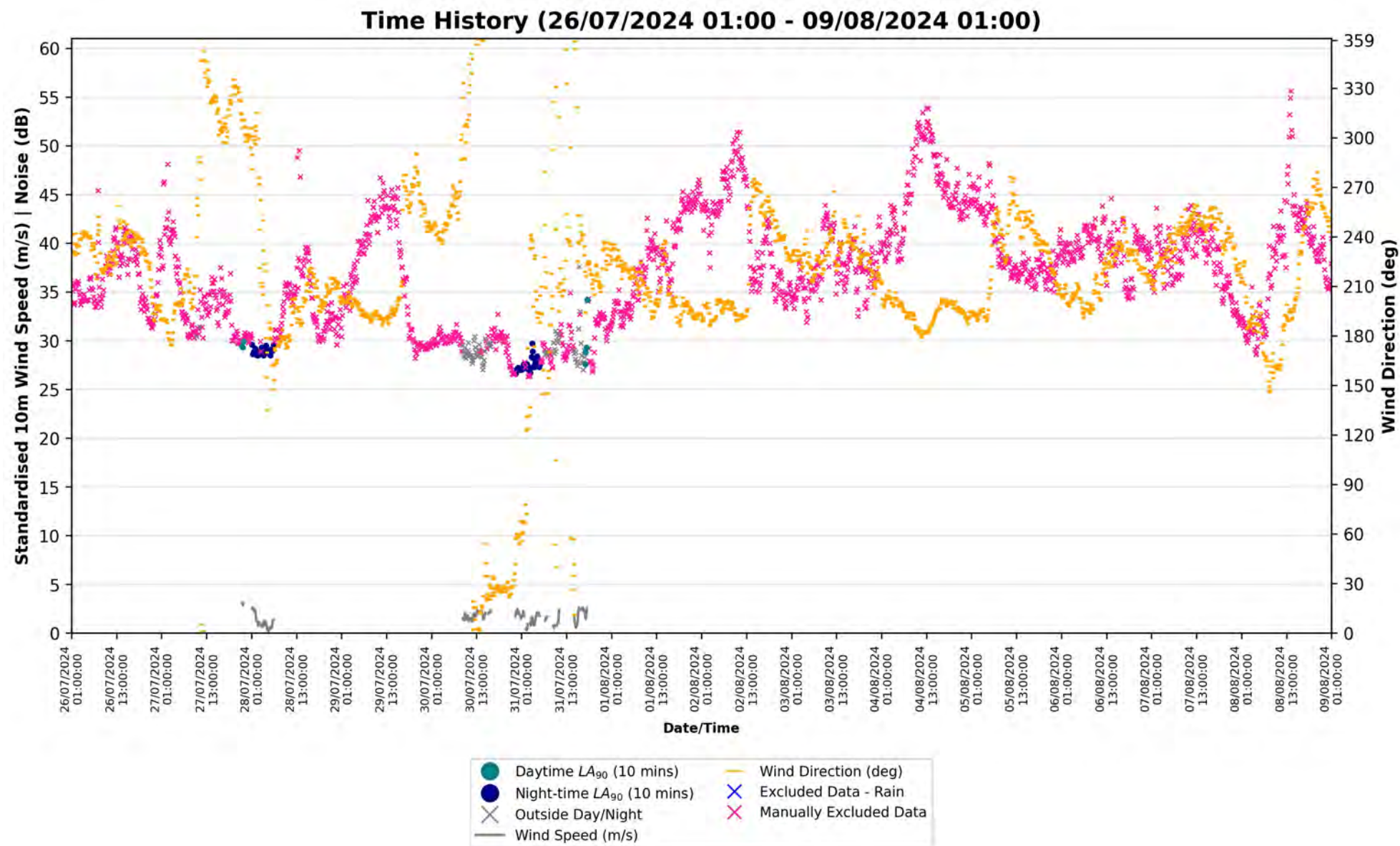
IE00220 - Crumhach Wind Farm

Receptor Name: NML08



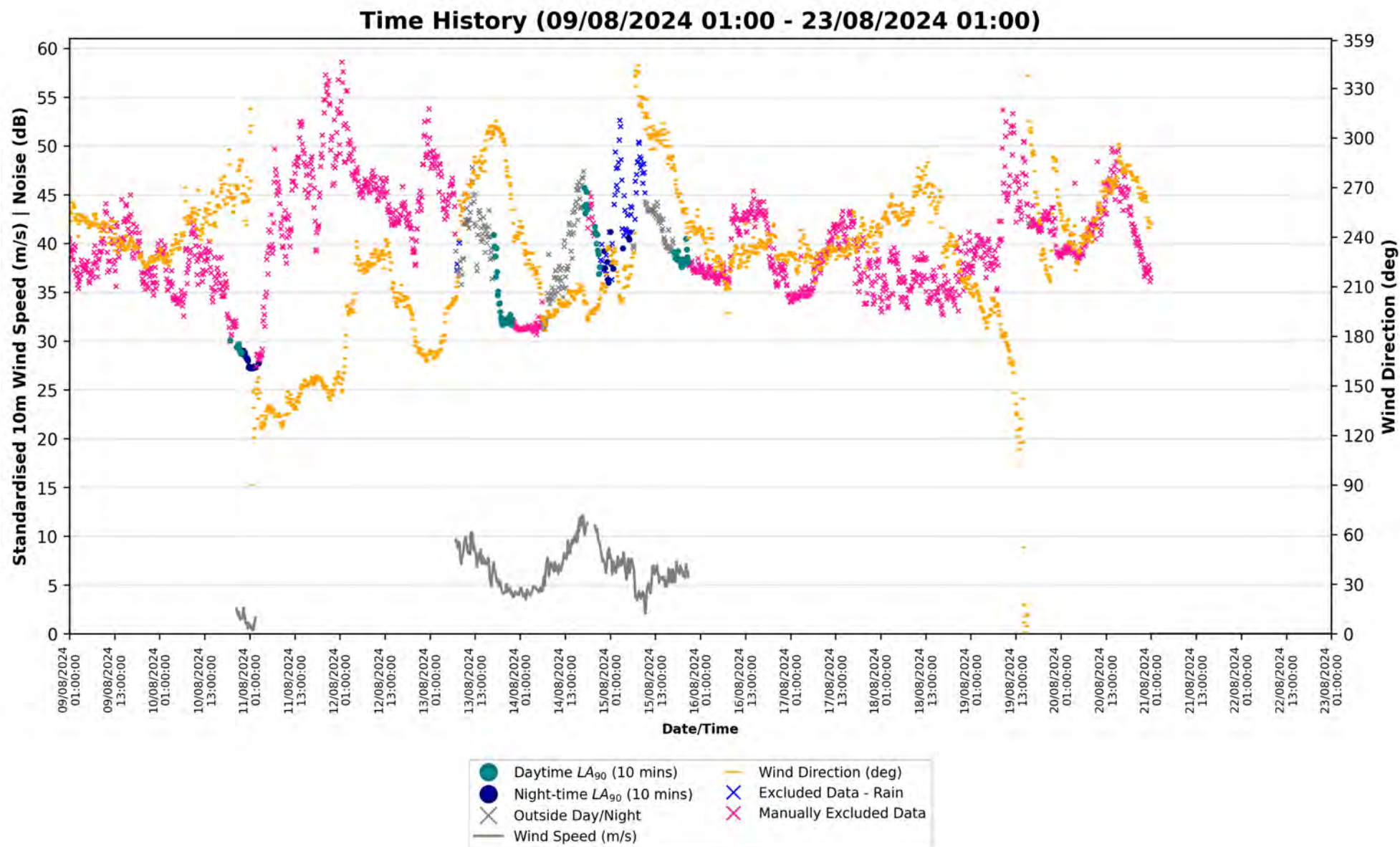
IE00220 - Crumhach Wind Farm

Receptor Name: NML08



IE00220 - Crumhach Wind Farm

Receptor Name: NML08



Annex 5 – NSR Coordinates and Prediction Modelling Results

Table A5.1: Noise Sensitive Receptors

Noise Sensitive Receptor (NSR)	Easting	Northing	Elevation	Background Noise Data Used	Is this NSR also an NAL?
	(m)	(m)	(m AOD)		
NSR001 - Derelict	544958	829578	145	NA	NA
NSR002	545934	829097	195	NML3	Yes - NAL06
NSR003	545958	829173	191	NML3	No
NSR004	545241	829434	159	NML2	Yes - NAL05
NSR005 - Industrial Facility	543464	829087	151	NA	NA
NSR006	547375	830027	167	NML4	No
NSR007	545149	829608	149	NML2	No
NSR008	547849	829933	190	NML4	Yes - NAL08
NSR009	547815	829970	185	NML4	No
NSR010	546932	829944	164	NML4	No
NSR011	544874	829810	134	NML8	No
NSR012	545964	829256	184	NML3	No
NSR013	546624	829710	182	NML4	Yes - NAL07
NSR014	545883	829358	178	NML3	No
NSR015	543312	829194	145	NML1	Yes - NAL02
NSR016 - Derelict	547509	830188	156	NA	NA
NSR017	545878	829392	176	NML3	No
NSR018	545359	829653	153	NML2	No
NSR019	547669	830217	156	NML4	No
NSR020	544709	830068	123	NML7	Yes - NAL04
NSR021	545909	829518	170	NML3	No
NSR022	547747	830300	151	NML5	No
NSR023	545248	829955	136	NML8	No
NSR024	545917	829602	166	NML3	No
NSR025	547832	830352	149	NML5	No
NSR026	547357	830453	145	NML4	No
NSR027	543804	830011	121	NML1	Yes - NAL03
NSR028	547757	830440	143	NML5	No
NSR029 - Derelict	543117	829458	135	NA	NA
NSR030	547001	830458	142	NML4	No
NSR031	545122	830183	122	NML7	No
NSR032	545119	830242	121	NML7	No
NSR033	545108	830272	120	NML7	No
NSR034	543122	829581	133	NML1	No
NSR035	547832	830540	133	NML5	No
NSR036	543170	829643	132	NML1	No
NSR037	545216	830261	122	NML7	No
NSR038	546907	830588	137	NML4	No
NSR039	543102	829650	131	NML1	No
NSR040	545948	830029	148	NML3	No
NSR041	545088	830481	117	NML7	No
NSR042	547884	830718	117	NML5	No
NSR043 - Derelict	544027	830502	111	NA	NA
NSR044	545913	830133	144	NML3	No
NSR045	547660	830832	117	NML5	No
NSR046	548108	830743	115	NML5	No
NSR047	543209	830037	118	NML1	No
NSR048	548147	830765	116	NML5	No
NSR049	542954	829870	122	NML1	No
NSR050	548225	830745	119	NML5	No
NSR051	547973	830869	112	NML5	No
NSR052	544048	830696	108	NML1	No
NSR053	544632	830811	107	NML7	No
NSR054	543013	830023	117	NML1	No

Table A5.1: Noise Sensitive Receptors

Noise Sensitive Receptor (NSR)	Easting	Northing	Elevation	Background Noise Data Used	Is this NSR also an NAL?
	(m)	(m)	(m AOD)		
NSR055	544574	830834	108	NML7	No
NSR056	544630	830836	108	NML7	No
NSR057	544889	830876	110	NML7	No
NSR058 - Derelict	542876	830100	114	NA	NA
NSR059	545844	830527	129	NML3	No
NSR060 - Derelict	542853	830125	113	NA	NA
NSR061	542694	830002	117	NML1	No
NSR062	544896	830984	106	NML7	No
NSR063	547970	831171	105	NML5	No
NSR064	542576	829962	118	NML1	No
NSR065	542181	829488	120	NML1	No
NSR066	548810	830729	123	NML4	No
NSR067	542466	829954	115	NML1	No
NSR068 - Derelict	542282	829757	114	NA	NA
NSR069	542248	829739	115	NML1	No
NSR070	547898	831311	98	NML5	No
NSR071	545742	830821	117	NML3	No
NSR072	544807	831166	96	NML7	No
NSR073	547903	831345	96	NML5	No
NSR074	543082	830631	106	NML1	No
NSR075	543635	831002	104	NML1	No
NSR076	542785	830357	108	NML1	No
NSR077	546829	831366	103	NML4	No
NSR078	547726	831450	88	NML5	No
NSR079	542129	829766	113	NML1	No
NSR080	548128	831354	94	NML5	No
NSR081	543845	831144	100	NML1	No
NSR082	544886	831248	100	NML7	No
NSR083	547843	831479	89	NML5	No
NSR084	541316	828860	125	NML1	Yes - NAL01
NSR085	547810	831523	91	NML5	No
NSR086	542680	830457	106	NML1	No
NSR087	544883	831344	100	NML7	No
NSR088	542659	830470	106	NML1	No
NSR089 - Derelict	542913	830726	105	NA	NA
NSR090	549169	830829	113	NML4	No
NSR091 - Derelict	543210	830977	102	NA	NA
NSR092	542632	830485	105	NML1	No
NSR093	544874	831394	99	NML7	No
NSR094	545722	831145	111	NML3	No
NSR095	549256	830816	113	NML4	No
NSR096	542613	830542	105	NML1	No
NSR097	547715	831671	91	NML5	No
NSR098	542996	830924	100	NML1	No
NSR099	544859	831473	99	NML7	No
NSR100	542589	830581	104	NML1	No
NSR101	550429	830453	147	NML1	Yes - NAL13
NSR102	552926	827309	245	NML1	Yes - NAL12
NSR103	544758	822431	198	NML4	Yes - NAL11
NSR104	539410	826328	124	NML4	Yes - NAL10
NSR105	539680	827953	105	NML4	Yes - NAL09

Table A5.2 Total WEDG Noise Limits Compliance Table at NSRs – Daytime

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR001	Derelict										
NSR002	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	40.1	41.5	41.5	41.5	41.5	41.5	41.5
	Exceedance Level	-	-	-	-4.9	-3.5	-3.5	-3.6	-6.0	-7.9	-7.9
NSR003	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	39.5	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-5.5	-4.1	-4.1	-4.2	-6.6	-8.5	-8.5
NSR004	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.6	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-6.4	-5.0	-5.0	-5.0	-5.0	-7.5	-7.5
NSR005	Lough Easky Water Treatment Works										
NSR006	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.1	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-	-2.9	-6.5	-6.5	-6.5	-8.2	-11.3	-11.3
NSR007	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.5	38.9	38.9	38.9	38.9	38.9	38.9
	Exceedance Level	-	-	-	-7.5	-6.1	-6.1	-6.1	-6.1	-8.6	-8.6
NSR008	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.7	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-3.3	-6.9	-6.9	-6.9	-8.6	-11.7	-11.7
NSR009	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.6	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-	-3.4	-7.0	-7.0	-7.0	-8.7	-11.8	-11.8
NSR010	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.1	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-	-2.9	-6.5	-6.5	-6.5	-8.2	-11.3	-11.3
NSR011	Total WEDG Noise Limit L _{A90} dB	40.0	45.0	45.0	45.0	45.0	45.0	45.9	46.8	47.0	47.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.3	37.7	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-	-8.7	-7.3	-7.2	-8.1	-9.0	-9.2	-9.2
NSR012	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.9	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level	-	-	-	-6.1	-4.7	-4.7	-4.8	-7.2	-9.1	-9.1
NSR013	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.7	39.1	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-	-2.3	-5.9	-5.9	-5.9	-7.6	-10.7	-10.7
NSR014	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.3	39.7	39.7	39.7	39.7	39.7	39.7
	Exceedance Level	-	-	-	-6.7	-5.3	-5.3	-5.4	-7.8	-9.7	-9.7
NSR015	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	35.9	37.3	37.3	37.3	37.3	37.3	37.3
	Exceedance Level	-	-	-	-9.1	-7.7	-7.8	-10.0	-11.3	-11.6	-11.6
NSR016	Derelict										
NSR017	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.1	39.5	39.5	39.5	39.5	39.5	39.5
	Exceedance Level	-	-	-	-6.9	-5.5	-5.5	-5.6	-8.0	-9.9	-9.9
NSR018	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	47.5	47.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.8	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-	-8.2	-6.8	-6.8	-6.8	-6.8	-9.3	-9.3
NSR019	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.9	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-	-5.1	-8.7	-8.7	-8.7	-10.4	-13.5	-13.5
NSR020	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.5	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-10.5	-9.1	-9.1	-11.2	-13.2	-15.1	-15.1

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR021	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.3	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-	-7.7	-6.3	-6.3	-6.4	-8.8	-10.7	-10.7
NSR022	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.1	35.5	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-	-10.9	-9.5	-10.6	-13.6	-16.8	-20.3	-20.3
NSR023	Total WEDG Noise Limit L _{A90} dB	40.0	45.0	45.0	45.0	45.0	45.0	45.9	46.8	47.0	47.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	35.0	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-	-10.0	-8.6	-8.6	-9.5	-10.4	-10.6	-10.6
NSR024	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.8	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-	-8.2	-6.8	-6.8	-6.9	-9.3	-11.2	-11.2
NSR025	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.5	34.9	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-11.5	-10.1	-11.2	-14.2	-17.4	-20.9	-20.9
NSR026	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.6	35.0	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-	-6.4	-10.0	-10.0	-10.0	-11.7	-14.8	-14.8
NSR027	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.4	34.8	34.8	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-11.6	-10.2	-10.3	-12.4	-13.7	-14.0	-14.0
NSR028	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.1	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-11.9	-10.5	-11.6	-14.6	-17.8	-21.3	-21.3
NSR029	Derelict										
NSR030	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.5	34.9	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-6.5	-10.1	-10.1	-10.1	-11.8	-14.9	-14.9
NSR031	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.7	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-	-11.3	-9.8	-9.8	-11.9	-13.9	-15.8	-15.8
NSR032	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.4	34.8	34.8	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-11.6	-10.2	-10.2	-12.2	-14.2	-16.1	-16.1
NSR033	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.3	34.7	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-	-11.7	-10.3	-10.3	-12.4	-14.4	-16.3	-16.3
NSR034	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.2	34.6	34.6	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-	-11.8	-10.4	-10.5	-12.6	-13.9	-14.2	-14.2
NSR035	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.3	33.7	33.7	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-	-12.7	-11.3	-12.4	-15.4	-18.6	-22.1	-22.1
NSR036	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.1	34.5	34.5	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-11.9	-10.5	-10.6	-12.7	-14.0	-14.3	-14.3
NSR037	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.3	34.7	34.7	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-11.7	-10.3	-10.3	-12.3	-14.3	-16.2	-16.2
NSR038	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.7	34.1	34.1	34.1	34.1	34.1	34.1
	Exceedance Level	-	-	-	-7.3	-10.9	-10.9	-10.9	-12.6	-15.7	-15.7
NSR039	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.8	34.2	34.2	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-	-12.2	-10.8	-10.9	-13.0	-14.3	-14.6	-14.6
NSR040	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.6	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-	-10.4	-9.0	-9.0	-9.1	-11.5	-13.4	-13.4
	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR041	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	32.2	33.6	33.6	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-	-12.8	-11.4	-11.4	-13.4	-15.4	-17.3	-17.3

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR042	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.2	32.6	32.6	32.6	32.6	32.6	32.6
	Exceedance Level	-	-	-	-13.8	-12.4	-13.5	-16.5	-19.7	-23.2	-23.2
NSR043	Derelict										
NSR044	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.0	35.4	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-	-11.0	-9.6	-9.5	-9.6	-12.0	-13.9	-13.9
NSR045	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.9	32.3	32.3	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-	-14.1	-12.7	-13.8	-16.7	-19.9	-23.4	-23.4
NSR046	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.6	32.0	32.0	32.1	32.1	32.1	32.1
	Exceedance Level	-	-	-	-14.4	-13.0	-14.1	-17.0	-20.2	-23.7	-23.7
NSR047	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.5	32.9	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-	-13.5	-12.1	-12.1	-14.3	-15.6	-15.9	-15.9
NSR048	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-14.5	-13.1	-14.2	-17.2	-20.4	-23.9	-23.9
NSR049	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.4	32.8	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-	-13.6	-12.2	-12.2	-14.4	-15.7	-16.0	-16.0
NSR050	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.8	31.8	31.8	31.8	31.8	31.8
	Exceedance Level	-	-	-	-14.6	-13.2	-14.3	-17.3	-20.5	-24.0	-24.0
NSR051	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.3	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-14.7	-13.3	-14.4	-17.4	-20.6	-24.1	-24.1
NSR052	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-	-14.5	-13.1	-13.2	-15.3	-16.6	-16.9	-16.9
NSR053	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.6	32.0	32.0	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-	-14.4	-13.0	-13.0	-15.1	-17.1	-19.0	-19.0
NSR054	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.0	32.4	32.5	32.5	32.5	32.5	32.5
	Exceedance Level	-	-	-	-14.0	-12.6	-12.6	-14.8	-16.1	-16.4	-16.4
NSR055	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.8	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-14.6	-13.2	-13.1	-15.2	-17.2	-19.1	-19.1
NSR056	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-14.5	-13.1	-13.1	-15.2	-17.2	-19.1	-19.1
NSR057	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-14.6	-13.1	-13.1	-15.2	-17.2	-19.1	-19.1
NSR058	Derelict										
NSR059	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.2	33.6	33.6	33.6	33.6	33.6	33.6
	Exceedance Level	-	-	-	-12.8	-11.4	-11.4	-11.5	-13.9	-15.8	-15.8
NSR060	Derelict										
NSR061	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.2	31.6	31.7	31.8	31.8	31.8	31.8
	Exceedance Level	-	-	-	-14.8	-13.4	-13.4	-15.5	-16.8	-17.1	-17.1
	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR062	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	30.0	31.4	31.5	31.5	31.5	31.5	31.5
	Exceedance Level	-	-	-	-15.0	-13.6	-13.5	-15.6	-17.6	-19.5	-19.5

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR063	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.4	30.4	30.4	30.4	30.4
	Exceedance Level	-	-	-	-16.0	-14.6	-15.7	-18.7	-21.9	-25.4	-25.4
NSR064	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.0	31.4	31.5	31.6	31.6	31.6	31.6
	Exceedance Level	-	-	-	-15.0	-13.6	-13.6	-15.7	-17.0	-17.3	-17.3
NSR065	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.1	31.5	31.6	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-14.9	-13.5	-13.5	-15.6	-16.9	-17.2	-17.2
NSR066	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.6	30.0	30.0	30.0	30.0	30.0	30.0
	Exceedance Level	-	-	-	-11.4	-15.0	-15.0	-15.0	-16.7	-19.8	-19.8
NSR067	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.7	31.1	31.2	31.3	31.3	31.3	31.3
	Exceedance Level	-	-	-	-15.3	-13.9	-13.9	-16.0	-17.3	-17.6	-17.6
NSR068	Derelict										
NSR069	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.7	31.1	31.2	31.3	31.3	31.3	31.3
	Exceedance Level	-	-	-	-15.3	-13.9	-13.9	-16.0	-17.3	-17.6	-17.6
NSR070	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.5	29.9	29.9	29.9	29.9	29.9	29.9
	Exceedance Level	-	-	-	-16.5	-15.1	-16.2	-19.2	-22.4	-25.9	-25.9
NSR071	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.9	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-	-14.1	-12.7	-12.7	-12.8	-15.2	-17.1	-17.1
NSR072	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.2	30.6	30.7	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-15.8	-14.4	-14.3	-16.4	-18.4	-20.3	-20.3
NSR073	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.3	29.7	29.8	29.8	29.8	29.8	29.8
	Exceedance Level	-	-	-	-16.7	-15.3	-16.3	-19.3	-22.5	-26.0	-26.0
NSR074	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.5	30.9	31.0	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-15.5	-14.1	-14.1	-16.3	-17.6	-17.9	-17.9
NSR075	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.4	30.9	30.9	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-15.6	-14.1	-14.2	-16.3	-17.6	-17.9	-17.9
NSR076	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.4	30.9	30.9	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-15.6	-14.1	-14.2	-16.3	-17.6	-17.9	-17.9
NSR077	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.9	30.3	30.4	30.4	30.4	30.4	30.4
	Exceedance Level	-	-	-	-11.1	-14.7	-14.6	-14.6	-16.3	-19.4	-19.4
NSR078	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.0	29.4	29.4	29.4	29.4	29.4	29.4
	Exceedance Level	-	-	-	-17.0	-15.6	-16.7	-19.7	-22.9	-26.4	-26.4
NSR079	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.2	30.7	30.8	30.9	30.9	30.9	30.9
	Exceedance Level	-	-	-	-15.8	-14.3	-14.3	-16.4	-17.7	-18.0	-18.0
NSR080	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.0	29.4	29.4	29.4	29.4	29.4	29.4
	Exceedance Level	-	-	-	-17.0	-15.6	-16.7	-19.7	-22.9	-26.4	-26.4
NSR081	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.6	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-15.9	-14.5	-14.5	-16.7	-18.0	-18.3	-18.3
NSR082	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.5	30.5	30.5	30.5	30.5
	Exceedance Level	-	-	-	-16.0	-14.6	-14.5	-16.6	-18.6	-20.5	-20.5
	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR083	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	27.9	29.3	29.3	29.3	29.3	29.3	29.3
	Exceedance Level	-	-	-	-17.1	-15.7	-16.8	-19.8	-23.0	-26.5	-26.5

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR084	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.8	30.2	30.4	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-16.2	-14.8	-14.7	-16.7	-18.0	-18.3	-18.3
NSR085	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.8	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-17.2	-15.8	-16.9	-19.9	-23.1	-26.6	-26.6
NSR086	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.6	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-15.9	-14.5	-14.5	-16.6	-17.9	-18.2	-18.2
NSR087	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.7	30.1	30.1	30.2	30.2	30.2	30.2
	Exceedance Level	-	-	-	-16.3	-14.9	-14.9	-16.9	-18.9	-20.8	-20.8
NSR088	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.5	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-15.9	-14.5	-14.6	-16.7	-18.0	-18.3	-18.3
NSR089	Derelict										
NSR090	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.3	28.7	28.7	28.7	28.7	28.7	28.7
	Exceedance Level	-	-	-	-12.7	-16.3	-16.3	-16.3	-18.0	-21.1	-21.1
NSR091	Derelict										
NSR092	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.4	30.5	30.5	30.5	30.5
	Exceedance Level	-	-	-	-16.0	-14.6	-14.7	-16.8	-18.1	-18.4	-18.4
NSR093	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.5	29.9	29.9	30.0	30.0	30.0	30.0
	Exceedance Level	-	-	-	-16.5	-15.1	-15.1	-17.1	-19.1	-21.0	-21.0
NSR094	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	45.0	45.0	45.0	45.1	47.5	49.4	49.4
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.6	31.0	31.0	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-15.4	-14.0	-14.0	-14.0	-16.4	-18.3	-18.3
NSR095	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.1	28.5	28.5	28.5	28.5	28.5	28.5
	Exceedance Level	-	-	-	-12.9	-16.5	-16.5	-16.5	-18.2	-21.3	-21.3
NSR096	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.8	30.2	30.3	30.3	30.3	30.3	30.3
	Exceedance Level	-	-	-	-16.2	-14.8	-14.8	-17.0	-18.3	-18.6	-18.6
NSR097	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	46.1	49.1	52.3	55.8	55.8
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.4	28.8	28.8	28.8	28.8	28.8	28.8
	Exceedance Level	-	-	-	-17.6	-16.2	-17.3	-20.3	-23.5	-27.0	-27.0
NSR098	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.6	30.0	30.1	30.1	30.1	30.1	30.1
	Exceedance Level	-	-	-	-16.4	-15.0	-15.0	-17.2	-18.5	-18.8	-18.8
NSR099	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	47.1	49.1	51.0	51.0
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.2	29.6	29.7	29.7	29.7	29.7	29.7
	Exceedance Level	-	-	-	-16.8	-15.4	-15.3	-17.4	-19.4	-21.3	-21.3
NSR100	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.7	30.1	30.2	30.3	30.3	30.3	30.3
	Exceedance Level	-	-	-	-16.3	-14.9	-14.9	-17.0	-18.3	-18.6	-18.6
NSR101	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.1	29.6	30.2	30.8	30.9	30.9	30.9
	Exceedance Level	-	-	-	-16.9	-15.4	-14.9	-16.5	-17.7	-18.0	-18.0
NSR102	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	45.0	45.0	45.0	45.1	47.3	48.6	48.9	48.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	41.1	42.5	43.4	44.2	44.3	44.3	44.3
	Exceedance Level	-	-	-	-3.9	-2.5	-1.7	-3.1	-4.3	-4.6	-4.6
NSR103	Total WEDG Noise Limit L _{A90} dB	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.5	48.2	50.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	23.9	25.5	25.8	26.3	26.3	26.3	26.3
	Exceedance Level	-	-	-	-21.1	-19.5	-19.2	-18.7	-20.2	-21.9	-23.8
	Total WEDG Noise Limit L _{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR104	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	19.3	20.7	20.8	20.9	20.9	20.9	20.9
	Exceedance Level	-	-	-	-20.7	-24.3	-24.2	-24.1	-25.8	-28.9	-28.9
	Total WEDG Noise Limit L_{A90} dB	40.0	40.0	40.0	40.0	45.0	45.0	45.0	46.7	49.8	49.8
NSR105	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	23.7	25.1	25.2	25.2	25.2	25.2	25.2
	Exceedance Level	-	-	-	-16.3	-19.9	-19.8	-19.8	-21.5	-24.6	-24.6

Table A5.3 Total WEDG Noise Limits Compliance Table at NSRs – Night-time

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR001	Derelict										
NSR002	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	40.1	41.5	41.5	41.5	41.5	41.5	41.5
	Exceedance Level	-	-	-	-2.9	-1.5	-1.5	-1.5	-4.6	-7.5	-9.8
NSR003	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	39.5	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-3.5	-2.1	-2.1	-2.1	-5.2	-8.1	-10.4
NSR004	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.6	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-4.4	-3.0	-3.0	-3.0	-3.0	-6.7	-11.1
NSR005	Lough Easky Water Treatment Works										
NSR006	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.1	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-	-5.9	-4.5	-4.5	-4.5	-7.2	-10.8	-14.0
NSR007	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.5	38.9	38.9	38.9	38.9	38.9	38.9
	Exceedance Level	-	-	-	-5.5	-4.1	-4.1	-4.1	-4.1	-7.8	-12.2
NSR008	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.7	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-6.3	-4.9	-4.9	-4.9	-7.6	-11.2	-14.4
NSR009	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.6	38.0	38.0	38.0	38.0	38.0	38.0
	Exceedance Level	-	-	-	-6.4	-5.0	-5.0	-5.0	-7.7	-11.3	-14.5
NSR010	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.1	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level	-	-	-	-5.9	-4.5	-4.5	-4.5	-7.2	-10.8	-14.0
NSR011	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.0	45.8	47.0	47.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.3	37.7	37.8	37.8	37.8	37.8	37.8
	Exceedance Level	-	-	-	-6.7	-5.3	-5.2	-6.2	-8.0	-9.2	-9.7
NSR012	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.9	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level	-	-	-	-4.1	-2.7	-2.7	-2.7	-5.8	-8.7	-11.0
NSR013	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.7	39.1	39.1	39.1	39.1	39.1	39.1
	Exceedance Level	-	-	-	-5.3	-3.9	-3.9	-3.9	-6.6	-10.2	-13.4
NSR014	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.3	39.7	39.7	39.7	39.7	39.7	39.7
	Exceedance Level	-	-	-	-4.7	-3.3	-3.3	-3.3	-6.4	-9.3	-11.6
NSR015	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	35.9	37.3	37.3	37.3	37.3	37.3	37.3
	Exceedance Level	-	-	-	-7.1	-5.7	-5.7	-7.3	-10.1	-12.4	-13.8
NSR016	Derelict										
NSR017	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	38.1	39.5	39.5	39.5	39.5	39.5	39.5
	Exceedance Level	-	-	-	-4.9	-3.5	-3.5	-3.5	-6.6	-9.5	-11.8
NSR018	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.8	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-	-6.2	-4.8	-4.8	-4.8	-4.8	-8.5	-12.9
NSR019	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.9	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level	-	-	-	-8.1	-6.7	-6.7	-6.7	-9.4	-13.0	-16.2
NSR020	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.5	35.9	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-8.5	-7.1	-7.1	-9.4	-12.2	-14.7	-17.0

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR021	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	37.3	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level	-	-	-	-5.7	-4.3	-4.3	-4.3	-7.4	-10.3	-12.6
NSR022	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.1	35.5	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-	-8.9	-7.5	-7.5	-9.9	-13.4	-17.1	-21.2
NSR023	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.0	45.8	47.0	47.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	35.0	36.4	36.4	36.4	36.4	36.4	36.4
	Exceedance Level	-	-	-	-8.0	-6.6	-6.6	-7.6	-9.4	-10.6	-11.1
NSR024	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	36.8	38.2	38.2	38.2	38.2	38.2	38.2
	Exceedance Level	-	-	-	-6.2	-4.8	-4.8	-4.8	-7.9	-10.8	-13.1
NSR025	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.5	34.9	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-9.5	-8.1	-8.1	-10.5	-14.0	-17.7	-21.8
NSR026	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.6	35.0	35.0	35.0	35.0	35.0	35.0
	Exceedance Level	-	-	-	-9.4	-8.0	-8.0	-8.0	-10.7	-14.3	-17.5
NSR027	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.4	34.8	34.8	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-9.6	-8.2	-8.2	-9.7	-12.5	-14.8	-16.2
NSR028	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.1	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-9.9	-8.5	-8.5	-10.9	-14.4	-18.1	-22.2
NSR029	Derelict										
NSR030	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.5	34.9	34.9	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-9.5	-8.1	-8.1	-8.1	-10.8	-14.4	-17.6
NSR031	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.7	35.2	35.2	35.2	35.2	35.2	35.2
	Exceedance Level	-	-	-	-9.3	-7.8	-7.8	-10.1	-12.9	-15.4	-17.7
NSR032	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.4	34.8	34.8	34.9	34.9	34.9	34.9
	Exceedance Level	-	-	-	-9.6	-8.2	-8.2	-10.4	-13.2	-15.7	-18.0
NSR033	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.3	34.7	34.7	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-	-9.7	-8.3	-8.3	-10.6	-13.4	-15.9	-18.2
NSR034	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.2	34.6	34.6	34.7	34.7	34.7	34.7
	Exceedance Level	-	-	-	-9.8	-8.4	-8.4	-9.9	-12.7	-15.0	-16.4
NSR035	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.3	33.7	33.7	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-	-10.7	-9.3	-9.3	-11.7	-15.2	-18.9	-23.0
NSR036	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.1	34.5	34.5	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-9.9	-8.5	-8.5	-10.0	-12.8	-15.1	-16.5
NSR037	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	33.3	34.7	34.7	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-9.7	-8.3	-8.3	-10.5	-13.3	-15.8	-18.1
NSR038	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.7	34.1	34.1	34.1	34.1	34.1	34.1
	Exceedance Level	-	-	-	-10.3	-8.9	-8.9	-8.9	-11.6	-15.2	-18.4
NSR039	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.8	34.2	34.2	34.3	34.3	34.3	34.3
	Exceedance Level	-	-	-	-10.2	-8.8	-8.8	-10.3	-13.1	-15.4	-16.8
NSR040	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.6	36.0	36.0	36.0	36.0	36.0	36.0
	Exceedance Level	-	-	-	-8.4	-7.0	-7.0	-7.0	-10.1	-13.0	-15.3
	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR041	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	32.2	33.6	33.6	33.7	33.7	33.7	33.7
	Exceedance Level	-	-	-	-10.8	-9.4	-9.4	-11.6	-14.4	-16.9	-19.2

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR042	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.2	32.6	32.6	32.6	32.6	32.6	32.6
	Exceedance Level	-	-	-	-11.8	-10.4	-10.4	-12.8	-16.3	-20.0	-24.1
NSR043	Derelict										
NSR044	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	34.0	35.4	35.5	35.5	35.5	35.5	35.5
	Exceedance Level	-	-	-	-9.0	-7.6	-7.5	-7.5	-10.6	-13.5	-15.8
NSR045	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.9	32.3	32.3	32.4	32.4	32.4	32.4
	Exceedance Level	-	-	-	-12.1	-10.7	-10.7	-13.0	-16.5	-20.2	-24.3
NSR046	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.6	32.0	32.0	32.1	32.1	32.1	32.1
	Exceedance Level	-	-	-	-12.4	-11.0	-11.0	-13.3	-16.8	-20.5	-24.6
NSR047	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.5	32.9	33.0	33.0	33.0	33.0	33.0
	Exceedance Level	-	-	-	-11.5	-10.1	-10.0	-11.6	-14.4	-16.7	-18.1
NSR048	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-12.5	-11.1	-11.1	-13.5	-17.0	-20.7	-24.8
NSR049	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.4	32.8	32.9	32.9	32.9	32.9	32.9
	Exceedance Level	-	-	-	-11.6	-10.2	-10.1	-11.7	-14.5	-16.8	-18.2
NSR050	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.8	31.8	31.8	31.8	31.8	31.8
	Exceedance Level	-	-	-	-12.6	-11.2	-11.2	-13.6	-17.1	-20.8	-24.9
NSR051	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.3	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-12.7	-11.3	-11.3	-13.7	-17.2	-20.9	-25.0
NSR052	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-	-12.5	-11.1	-11.1	-12.6	-15.4	-17.7	-19.1
NSR053	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.6	32.0	32.0	32.0	32.0	32.0	32.0
	Exceedance Level	-	-	-	-12.4	-11.0	-11.0	-13.3	-16.1	-18.6	-20.9
NSR054	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	31.0	32.4	32.5	32.5	32.5	32.5	32.5
	Exceedance Level	-	-	-	-12.0	-10.6	-10.5	-12.1	-14.9	-17.2	-18.6
NSR055	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.8	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-12.6	-11.2	-11.1	-13.4	-16.2	-18.7	-21.0
NSR056	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.5	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-12.5	-11.1	-11.1	-13.4	-16.2	-18.7	-21.0
NSR057	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.4	31.9	31.9	31.9	31.9	31.9	31.9
	Exceedance Level	-	-	-	-12.6	-11.1	-11.1	-13.4	-16.2	-18.7	-21.0
NSR058	Derelict										
NSR059	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	32.2	33.6	33.6	33.6	33.6	33.6	33.6
	Exceedance Level	-	-	-	-10.8	-9.4	-9.4	-9.4	-12.5	-15.4	-17.7
NSR060	Derelict										
NSR061	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.2	31.6	31.7	31.8	31.8	31.8	31.8
	Exceedance Level	-	-	-	-12.8	-11.4	-11.3	-12.8	-15.6	-17.9	-19.3
	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR062	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	30.0	31.4	31.5	31.5	31.5	31.5	31.5
	Exceedance Level	-	-	-	-13.0	-11.6	-11.5	-13.8	-16.6	-19.1	-21.4

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR063	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.4	30.4	30.4	30.4	30.4
	Exceedance Level	-	-	-	-14.0	-12.6	-12.6	-15.0	-18.5	-22.2	-26.3
NSR064	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.0	31.4	31.5	31.6	31.6	31.6	31.6
	Exceedance Level	-	-	-	-13.0	-11.6	-11.5	-13.0	-15.8	-18.1	-19.5
NSR065	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.1	31.5	31.6	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-12.9	-11.5	-11.4	-12.9	-15.7	-18.0	-19.4
NSR066	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.6	30.0	30.0	30.0	30.0	30.0	30.0
	Exceedance Level	-	-	-	-14.4	-13.0	-13.0	-13.0	-15.7	-19.3	-22.5
NSR067	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.7	31.1	31.2	31.3	31.3	31.3	31.3
	Exceedance Level	-	-	-	-13.3	-11.9	-11.8	-13.3	-16.1	-18.4	-19.8
NSR068	Derelict										
NSR069	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.7	31.1	31.2	31.3	31.3	31.3	31.3
	Exceedance Level	-	-	-	-13.3	-11.9	-11.8	-13.3	-16.1	-18.4	-19.8
NSR070	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.5	29.9	29.9	29.9	29.9	29.9	29.9
	Exceedance Level	-	-	-	-14.5	-13.1	-13.1	-15.5	-19.0	-22.7	-26.8
NSR071	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	30.9	32.3	32.3	32.3	32.3	32.3	32.3
	Exceedance Level	-	-	-	-12.1	-10.7	-10.7	-10.7	-13.8	-16.7	-19.0
NSR072	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.2	30.6	30.7	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-13.8	-12.4	-12.3	-14.6	-17.4	-19.9	-22.2
NSR073	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.3	29.7	29.8	29.8	29.8	29.8	29.8
	Exceedance Level	-	-	-	-14.7	-13.3	-13.2	-15.6	-19.1	-22.8	-26.9
NSR074	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.5	30.9	31.0	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-13.5	-12.1	-12.0	-13.6	-16.4	-18.7	-20.1
NSR075	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.4	30.9	30.9	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-13.6	-12.1	-12.1	-13.6	-16.4	-18.7	-20.1
NSR076	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.4	30.9	30.9	31.0	31.0	31.0	31.0
	Exceedance Level	-	-	-	-13.6	-12.1	-12.1	-13.6	-16.4	-18.7	-20.1
NSR077	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.9	30.3	30.4	30.4	30.4	30.4	30.4
	Exceedance Level	-	-	-	-14.1	-12.7	-12.6	-12.6	-15.3	-18.9	-22.1
NSR078	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.0	29.4	29.4	29.4	29.4	29.4	29.4
	Exceedance Level	-	-	-	-15.0	-13.6	-13.6	-16.0	-19.5	-23.2	-27.3
NSR079	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.2	30.7	30.8	30.9	30.9	30.9	30.9
	Exceedance Level	-	-	-	-13.8	-12.3	-12.2	-13.7	-16.5	-18.8	-20.2
NSR080	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.0	29.4	29.4	29.4	29.4	29.4	29.4
	Exceedance Level	-	-	-	-15.0	-13.6	-13.6	-16.0	-19.5	-23.2	-27.3
NSR081	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.6	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-13.9	-12.5	-12.4	-14.0	-16.8	-19.1	-20.5
NSR082	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.5	30.5	30.5	30.5	30.5
	Exceedance Level	-	-	-	-14.0	-12.6	-12.5	-14.8	-17.6	-20.1	-22.4
	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR083	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	27.9	29.3	29.3	29.3	29.3	29.3	29.3
	Exceedance Level	-	-	-	-15.1	-13.7	-13.7	-16.1	-19.6	-23.3	-27.4

Location		Wind Speed (ms ⁻¹) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR084	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.8	30.2	30.4	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-14.2	-12.8	-12.6	-14.0	-16.8	-19.1	-20.5
NSR085	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.8	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-15.2	-13.8	-13.8	-16.2	-19.7	-23.4	-27.5
NSR086	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.6	30.7	30.7	30.7	30.7
	Exceedance Level	-	-	-	-13.9	-12.5	-12.4	-13.9	-16.7	-19.0	-20.4
NSR087	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.7	30.1	30.1	30.2	30.2	30.2	30.2
	Exceedance Level	-	-	-	-14.3	-12.9	-12.9	-15.1	-17.9	-20.4	-22.7
NSR088	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.1	30.5	30.5	30.6	30.6	30.6	30.6
	Exceedance Level	-	-	-	-13.9	-12.5	-12.5	-14.0	-16.8	-19.1	-20.5
NSR089	Derelict										
NSR090	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.3	28.7	28.7	28.7	28.7	28.7	28.7
	Exceedance Level	-	-	-	-15.7	-14.3	-14.3	-14.3	-17.0	-20.6	-23.8
NSR091	Derelict										
NSR092	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.0	30.4	30.4	30.5	30.5	30.5	30.5
	Exceedance Level	-	-	-	-14.0	-12.6	-12.6	-14.1	-16.9	-19.2	-20.6
NSR093	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.5	29.9	29.9	30.0	30.0	30.0	30.0
	Exceedance Level	-	-	-	-14.5	-13.1	-13.1	-15.3	-18.1	-20.6	-22.9
NSR094	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	46.1	49.0	51.3
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	29.6	31.0	31.0	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-13.4	-12.0	-12.0	-11.9	-15.0	-17.9	-20.2
NSR095	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.1	28.5	28.5	28.5	28.5	28.5	28.5
	Exceedance Level	-	-	-	-15.9	-14.5	-14.5	-14.5	-17.2	-20.8	-24.0
NSR096	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.8	30.2	30.3	30.3	30.3	30.3	30.3
	Exceedance Level	-	-	-	-14.2	-12.8	-12.7	-14.3	-17.1	-19.4	-20.8
NSR097	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.9	52.6	56.7
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	27.4	28.8	28.8	28.8	28.8	28.8	28.8
	Exceedance Level	-	-	-	-15.6	-14.2	-14.2	-16.6	-20.1	-23.8	-27.9
NSR098	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.6	30.0	30.1	30.1	30.1	30.1	30.1
	Exceedance Level	-	-	-	-14.4	-13.0	-12.9	-14.5	-17.3	-19.6	-21.0
NSR099	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	45.3	48.1	50.6	52.9
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.2	29.6	29.7	29.7	29.7	29.7	29.7
	Exceedance Level	-	-	-	-14.8	-13.4	-13.3	-15.6	-18.4	-20.9	-23.2
NSR100	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.7	30.1	30.2	30.3	30.3	30.3	30.3
	Exceedance Level	-	-	-	-14.3	-12.9	-12.8	-14.3	-17.1	-19.4	-20.8
NSR101	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	28.1	29.6	30.2	30.8	30.9	30.9	30.9
	Exceedance Level	-	-	-	-14.9	-13.4	-12.8	-13.8	-16.5	-18.8	-20.2
NSR102	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.4	49.7	51.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	41.1	42.5	43.4	44.2	44.3	44.3	44.3
	Exceedance Level	-	-	-	-1.9	-0.5	0.4	-0.4	-3.1	-5.4	-6.8
NSR103	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.2	44.9	47.0	49.8	53.1
	Cumulative Wind Turbine Noise L _{A90} dB	-	-	-	23.9	25.5	25.8	26.3	26.3	26.3	26.3
	Exceedance Level	-	-	-	-19.1	-17.5	-17.4	-18.6	-20.7	-23.5	-26.8
	Total WEDG Noise Limit L _{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5

Location		Wind Speed (ms^{-1}) as standardised to 10 m height									
		3	4	5	6	7	8	9	10	11	12
NSR104	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	19.3	20.7	20.8	20.9	20.9	20.9	20.9
	Exceedance Level	-	-	-	-23.7	-22.3	-22.2	-22.1	-24.8	-28.4	-31.6
	Total WEDG Noise Limit L_{A90} dB	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.7	49.3	52.5
NSR105	Cumulative Wind Turbine Noise L_{A90} dB	-	-	-	23.7	25.1	25.2	25.2	25.2	25.2	25.2
	Exceedance Level	-	-	-	-19.3	-17.9	-17.8	-17.8	-20.5	-24.1	-27.3

Annex 6 – Turbine Coordinates/ Topographical Corrections

Noise Source Reference Table

SRC_ID	Wind Farm	X	Y	Hub Height (m)	Tip Height (m)
1	Crumhach Wind Farm - T1	543507	826746	105.00	180.00
2	Crumhach Wind Farm - T2	543602	826404	105.00	180.00
3	Crumhach Wind Farm - T3	543941	826036	105.00	180.00
4	Crumhach Wind Farm - T4	543655	827452	105.00	180.00
5	Crumhach Wind Farm - T5	543440	827861	105.00	180.00
6	Crumhach Wind Farm - T6	544012	828489	105.00	180.00
7	Crumhach Wind Farm - T7	544519	828995	105.00	180.00
8	Crumhach Wind Farm - T8	545257	828620	105.00	180.00
9	Crumhach Wind Farm - T9	545425	828224	105.00	180.00
10	Crumhach Wind Farm - T10	546041	828377	105.00	180.00
11	Crumhach Wind Farm - T11	546688	828662	105.00	180.00
12	Crumhach Wind Farm - T12	547273	828804	105.00	180.00
13	Crumhach Wind Farm - T13	547412	829297	105.00	180.00
14	Crumhach Wind Farm - T14	547754	828353	105.00	180.00
15	Crumhach Wind Farm - T15	548194	827756	105.00	180.00
16	Crumhach Wind Farm - T16	548570	827462	105.00	180.00
17	Crumhach Wind Farm - T17	548292	828210	105.00	180.00
18	Black Lough Wind Farm T1	539494	825444	78.33	124.33
19	Black Lough Wind Farm T2	539143	825658	78.33	124.33
20	Black Lough Wind Farm T3	538781	825874	78.33	124.33
21	Black Lough Wind Farm T4	539112	826096	78.33	124.33
22	Carrowleagh 1 Wind Farm T1	537610	820223	64.00	99.50
23	Carrowleagh 1 Wind Farm T2	537258	820452	64.00	99.50
24	Carrowleagh 1 Wind Farm T3	537749	820551	64.00	99.50
25	Carrowleagh 1 Wind Farm T4	537437	820754	64.00	99.50
26	Carrowleagh 1 Wind Farm T5	537917	820868	64.00	99.50
27	Carrowleagh 1 Wind Farm T6	537619	821034	64.00	99.50
28	Carrowleagh 1 Wind Farm T7	537941	821174	64.00	99.50
29	Carrowleagh 1 Wind Farm T8	537692	821375	64.00	99.50
30	Carrowleagh 1 Wind Farm T9	538060	821638	64.00	99.50
31	Carrowleagh 1 Wind Farm T10	538406	821708	64.00	99.50
32	Carrowleagh 1 Wind Farm T11	537745	821738	64.00	99.50
33	Carrowleagh 1 Wind Farm T12	538200	821969	64.00	99.50
34	Carrowleagh 1 Wind Farm T13	537858	822057	64.00	99.50
35	Cloonkeelaun Single Wind Turbine - T1	537685	823329	78.33	124.33
36	Cloonkeelaun 2 Wind Turbine - T1	537238	823707	78.33	124.33
37	Cloonkeelaun 2 Wind Turbine - T2	537559	823834	78.33	124.33
38	Strokane Single Turbine (Cloonkeelaun) - T1	537105	823454	103.90	149.90
39	Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	537668	822278	64.00	99.50
40	Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	537831	822602	64.00	99.50
41	Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	537908	822923	64.00	99.50
42	Firlough Wind Farm - T1	536363	820481	107.50	185.00
43	Firlough Wind Farm - T2	536014	820710	107.50	185.00
44	Firlough Wind Farm - T3	535913	821226	107.50	185.00
45	Firlough Wind Farm - T4	535914	821771	107.50	185.00
46	Firlough Wind Farm - T5	535621	822155	107.50	185.00
47	Firlough Wind Farm - T6	535412	822586	107.50	185.00
48	Firlough Wind Farm - T7	536130	822540	107.50	185.00

SRC_ID	Wind Farm	X	Y	Hub Height (m)	Tip Height (m)
49	Firlough Wind Farm - T8	536697	822453	107.50	185.00
50	Firlough Wind Farm - T9	536574	821893	107.50	185.00
51	Firlough Wind Farm - T10	536501	821222	107.50	185.00
52	Firlough Wind Farm - T11	536933	820878	107.50	185.00
53	Firlough Wind Farm - T12	537030	821486	107.50	185.00
54	Firlough Wind Farm - T13	537134	822272	107.50	185.00

Topographical (concave ground/ barrier) Noise Prediction Adjustment Table

Notes/Comments

Requirement to include a concave ground profile correction of +3dB has been calculated in accordance with section 4.3.9 of the IOA GPG (July 2011)

A barrier correction of -2dB is included where the landform completely obscures a turbine at the noise assessment location

Where analysis indicates that both are required the barrier correction take precedence and a correction of -2dB is applied

Wind Farm	Hub	SRC_ID/NSR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Crumhach Wind Farm - T1	105	1		0	0	0		0	0	0	-2	-2	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T2	105	2		0	0	0		0	0	-2	-2	-2	0	0	0	0	0		0	0	-2	0	0	-2
Crumhach Wind Farm - T3	105	3		0	0	0		-2	0	-2	-2	-2	0	0	0	0	0		0	0	-2	0	0	-2
Crumhach Wind Farm - T4	105	4		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T5	105	5		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T6	105	6		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T7	105	7		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T8	105	8		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T9	105	9		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T10	105	10		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T11	105	11		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T12	105	12		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T13	105	13		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T14	105	14		0	0	0		0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0
Crumhach Wind Farm - T15	105	15		0	0	0		0	0	-2	-2	0	0	0	0	0	0		0	0	-2	0	0	-2
Crumhach Wind Farm - T16	105	16		0	0	0		-2	0	-2	-2	0	0	0	0	0	0		0	0	-2	0	0	-2
Crumhach Wind Farm - T17	105	17		0	0	0		0	0	0	0	0	0	0	0	0	3		0	0	0	0	0	0
Black Lough Wind Farm T1	78.33	18		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	0	-2	0		-2	-2	-2	-2	-2	-2
Black Lough Wind Farm T2	78.33	19		-2	-2	-2		-2	-2	-2	-2	-2	0	-2	0	-2	0		-2	-2	-2	0	-2	-2
Black Lough Wind Farm T3	78.33	20		-2	0	-2		-2	0	-2	-2	-2	0	0	0	0	0		-2	0	-2	0	-2	-2
Black Lough Wind Farm T4	78.33	21		0	0	-2		-2	0	-2	-2	-2	0	0	0	0	0		-2	0	-2	0	-2	-2
Carrowleagh 1 Wind Farm T1	64	22		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T2	64	23		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T3	64	24		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T4	64	25		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T5	64	26		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T6	64	27		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T7	64	28		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T8	64	29		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T9	64	30		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T10	64	31		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T11	64	32		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T12	64	33		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T13	64	34		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun Single Wind Turbine - T1	78.33	35		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T1	78.33	36		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T2	78.33	37		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Strokane Single Turbine (Cloonkeelaun) - T1	103.9	38		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	0	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	64	39		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	64	40		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	64	41		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T1	107.5	42		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T2	107.5	43		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T3	107.5	44		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T4	107.5	45		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T5	107.5	46		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T6	107.5	47		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	0	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T7	107.5	48		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	0	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T8	107.5	49		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T9	107.5	50		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T10	107.5	51		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T11	107.5	52		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T12	107.5	53		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2
Firtough Wind Farm - T13	107.5	54		-2	-2	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2		-2	-2	-2	-2	-2	-2

Derelict

Lough Easky Water Treatment Works

Derelict

Wind Farm	Hub	SRC_ID/NSR	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Crumhach Wind Farm - T1	105	1	0	0	0	0	0	0	-2	0	0	0	0	0	-2	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T2	105	2	0	0	-2	0	0	0	-2	0	0	0	0	0	-2	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T3	105	3	0	0	-2	0	0	0	-2	0	0	0	0	0	-2	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T4	105	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T5	105	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T6	105	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T7	105	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T8	105	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T9	105	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T10	105	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T11	105	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T12	105	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T13	105	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T14	105	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T15	105	15	0	0	-2	0	0	0	-2	0	0	0	0	0	-2	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T16	105	16	0	0	-2	-2	-2	0	-2	0	0	0	0	-2	0	0	0	0	0	0	0	0	-2	0
Crumhach Wind Farm - T17	105	17	0	0	0	0	0	3	0	0	0	3	0	3	0	3	0	3	0	0	0	0	0	0
Black Lough Wind Farm T1	78.33	18	-2	-2	-2	-2	-2	0	-2	-2	0	0	0	-2	0	0	-2	0	0	0	0	-2	0	0
Black Lough Wind Farm T2	78.33	19	0	-2	-2	-2	-2	0	-2	-2	0	0	0	-2	0	0	-2	0	0	0	0	-2	0	0
Black Lough Wind Farm T3	78.33	20	0	-2	-2	-2	0	-2	-2	0	0	0	0	-2	0	0	-2	0	0	0	0	-2	0	0
Black Lough Wind Farm T4	78.33	21	0	-2	-2	-2	-2	0	-2	-2	0	0	0	-2	0	0	-2	0	0	0	0	-2	0	0
Carrowleagh 1 Wind Farm T1	64	22	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T2	64	23	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T3	64	24	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T4	64	25	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T5	64	26	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T6	64	27	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T7	64	28	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T8	64	29	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T9	64	30	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T10	64	31	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T11	64	32	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T12	64	33	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T13	64	34	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Single Wind Turbine - T1	78.33	35	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T1	78.33	36	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T2	78.33	37	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2
Strokane Single Turbine (Cloonkeelaun) - T1	103.9	38	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	64	39	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	64	40	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	64	41	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T1	107.5	42	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T2	107.5	43	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T3	107.5	44	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T4	107.5	45	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T5	107.5	46	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T6	107.5	47	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T7	107.5	48	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T8	107.5	49	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T9	107.5	50	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T10	107.5	51	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T11	107.5	52	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T12	107.5	53	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T13	107.5	54	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0	-2	-2	0	-2	-2	0	-2	-2	-2

Wind Farm	Hub	SRC_ID/NSR	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Crumhach Wind Farm - T1	105	1	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0	Derelict	Derelict	Derelict	0	0	0	0	0	-2
Crumhach Wind Farm - T2	105	2	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Crumhach Wind Farm - T3	105	3	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Crumhach Wind Farm - T4	105	4	-2	-2	0	-2	0	0	0	0	0	0	0	0	0				0	0	0	0	0	-2
Crumhach Wind Farm - T5	105	5	0	-2	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T6	105	6	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T7	105	7	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T8	105	8	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T9	105	9	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T10	105	10	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T11	105	11	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T12	105	12	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T13	105	13	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	0
Crumhach Wind Farm - T14	105	14	0	0	0	0	0	0	0	0	0	0	0	0	0				0	0	0	0	0	-2
Crumhach Wind Farm - T15	105	15	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Crumhach Wind Farm - T16	105	16	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Crumhach Wind Farm - T17	105	17	0	0	3	0	3	0	0	3	3	3	3	3	3				3	3	0	3	3	-2
Black Lough Wind Farm T1	78.33	18	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Black Lough Wind Farm T2	78.33	19	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Black Lough Wind Farm T3	78.33	20	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Black Lough Wind Farm T4	78.33	21	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Carrowleagh 1 Wind Farm T1	64	22	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T2	64	23	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T3	64	24	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T4	64	25	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T5	64	26	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T6	64	27	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T7	64	28	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T8	64	29	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T9	64	30	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T10	64	31	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T11	64	32	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T12	64	33	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Carrowleagh 1 Wind Farm T13	64	34	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				-2	-2	-2	0	-2	-2
Cloonkeelaun Single Wind Turbine - T1	78.33	35	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Cloonkeelaun 2 Wind Turbine - T1	78.33	36	-2	-2	-2	-2	0	-2	-2	-2	0	-2	0	0	0				0	0	-2	0	-2	-2
Cloonkeelaun 2 Wind Turbine - T2	78.33	37	-2	-2	-2	-2	0	-2	-2	-2	0	-2	0	0	0				0	0	-2	0	-2	-2
Strokane Single Turbine (Cloonkeelaun) - T1	103.9	38	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	64	39	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	64	40	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	64	41	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Firlough Wind Farm - T1	107.5	42	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Firlough Wind Farm - T2	107.5	43	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2				0	-2	-2	0	-2	-2
Firlough Wind Farm - T3	107.5	44	-2	-2	-2	-2	0	-2	-2	0	-2	0	0	-2	-2				0	0	-2	0	-2	-2
Firlough Wind Farm - T4	107.5	45	-2	-2	-2	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	-2	-2
Firlough Wind Farm - T5	107.5	46	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	-2	-2
Firlough Wind Farm - T6	107.5	47	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Firlough Wind Farm - T7	107.5	48	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Firlough Wind Farm - T8	107.5	49	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Firlough Wind Farm - T9	107.5	50	-2	-2	-2	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Firlough Wind Farm - T10	107.5	51	-2	-2	-2	-2	0	-2	-2	0	-2	0	-2	-2	-2				0	-2	-2	0	-2	-2
Firlough Wind Farm - T11	107.5	52	-2	-2	-2	-2	0	-2	-2	0	-2	0	-2	-2	-2				0	0	-2	0	0	-2
Firlough Wind Farm - T12	107.5	53	-2	-2	-2	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2
Firlough Wind Farm - T13	107.5	54	-2	-2	0	-2	0	-2	-2	0	0	0	0	0	0				0	0	-2	0	0	-2

Wind Farm	Hub	SRC_ID/NSR	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Crumhach Wind Farm - T1	105	1	Derelict	-2	Derelict	0	0	0	-2	0	-2	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T2	105	2		-2		0	0	0	-2	0	-2	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T3	105	3		-2		0	0	0	-2	0	-2	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T4	105	4		-2		0	0	0	-2	0	0	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T5	105	5		0		0	0	0	-2	0	0	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T6	105	6		0		0	0	0	0	0	0	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T7	105	7		0		0	0	0	0	0	0	0	0	0	0	-2	0	-2	-2
Crumhach Wind Farm - T8	105	8		0		0	0	0	0	0	0	0	0	0	0	-2	-2	-2	-2
Crumhach Wind Farm - T9	105	9		0		0	0	0	0	0	0	0	0	0	0	-2	-2	-2	-2
Crumhach Wind Farm - T10	105	10		0		3	0	0	0	3	0	3	0	3	0	-2	-2	-2	-2
Crumhach Wind Farm - T11	105	11		0		0	0	0	0	0	0	3	0	3	0	-2	-2	-2	-2
Crumhach Wind Farm - T12	105	12		0		3	0	0	0	3	0	3	0	3	-2	-2	-2	-2	-2
Crumhach Wind Farm - T13	105	13		0		3	0	0	0	3	0	3	0	3	-2	-2	-2	-2	-2
Crumhach Wind Farm - T14	105	14		-2		3	0	0	-2	3	0	3	0	3	-2	-2	-2	-2	-2
Crumhach Wind Farm - T15	105	15		-2		0	0	0	-2	0	0	0	0	0	-2	-2	-2	-2	-2
Crumhach Wind Farm - T16	105	16	Derelict	-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Crumhach Wind Farm - T17	105	17		-2		3	3	0	-2	3	0	3	3	3	3	-2	-2	-2	-2
Black Lough Wind Farm T1	78.33	18		-2		0	0	0	-2	0	-2	0	0	0	0	0	3	-2	-2
Black Lough Wind Farm T2	78.33	19		-2		0	0	0	-2	0	-2	0	0	0	0	0	0	-2	-2
Black Lough Wind Farm T3	78.33	20		-2		0	0	0	-2	0	-2	0	0	0	-2	0	0	-2	-2
Black Lough Wind Farm T4	78.33	21		-2		0	0	0	-2	0	-2	0	0	0	0	0	-2	-2	-2
Carrowleagh 1 Wind Farm T1	64	22		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T2	64	23		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T3	64	24		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T4	64	25		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T5	64	26		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T6	64	27		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T7	64	28		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T8	64	29		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T9	64	30		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T10	64	31		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T11	64	32		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T12	64	33		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T13	64	34		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Single Wind Turbine - T1	78.33	35	Derelict	-2		0	0	-2	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T1	78.33	36		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Cloonkeelaun 2 Wind Turbine - T2	78.33	37		-2		0	0	0	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Strokane Single Turbine (Cloonkeelaun) - T1	103.9	38		-2		0	0	0	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	64	39		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	64	40		-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	64	41		-2		-2	-2	-2	-2	0	-2	-2	-2	-2	-2	0	-2	-2	-2
Firlough Wind Farm - T1	107.5	42		-2		0	0	-2	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T2	107.5	43		-2		0	0	-2	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T3	107.5	44		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T4	107.5	45		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T5	107.5	46		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T6	107.5	47		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T7	107.5	48		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T8	107.5	49		-2		0	0	0	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Firlough Wind Farm - T9	107.5	50		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T10	107.5	51		-2		0	0	0	-2	0	-2	0	0	0	-2	-2	-2	-2	-2
Firlough Wind Farm - T11	107.5	52		-2		0	0	-2	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Firlough Wind Farm - T12	107.5	53		-2		0	0	0	-2	0	-2	0	0	0	-2	0	-2	-2	-2
Firlough Wind Farm - T13	107.5	54		-2		0	0	0	-2	0	-2	0	0	0	-2	0	-2	-2	-2

Wind Farm	Hub	SRC_ID/NSR	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
Crumhach Wind Farm - T1	105	1	0	Derelict	0	0	0	0	0	0	0	0	-2	-2	0	-2	0	0	-2	0	0	0	0	0
Crumhach Wind Farm - T2	105	2	0		0	-2	0	0	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	0	0	0	0
Crumhach Wind Farm - T3	105	3	0		0	-2	0	0	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	0	0	0	0
Crumhach Wind Farm - T4	105	4	0		0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T5	105	5	0		0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T6	105	6	0		0	0	0	0	0	0	0	0	0	-2	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T7	105	7	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T8	105	8	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T9	105	9	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T10	105	10	0		0	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	0	3	0	3
Crumhach Wind Farm - T11	105	11	0		0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Crumhach Wind Farm - T12	105	12	0		0	0	0	0	0	3	3	3	0	0	0	0	3	0	0	0	0	3	0	3
Crumhach Wind Farm - T13	105	13	0		0	0	0	0	0	3	3	3	0	0	0	0	3	0	0	0	0	3	0	3
Crumhach Wind Farm - T14	105	14	0		0	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	0	3	0	3
Crumhach Wind Farm - T15	105	15	0		0	-2	0	0	-2	0	0	0	0	-2	0	-2	0	0	-2	0	-2	0	0	0
Crumhach Wind Farm - T16	105	16	0		0	-2	0	0	-2	0	0	0	0	-2	0	-2	0	0	-2	0	-2	0	0	0
Crumhach Wind Farm - T17	105	17	3		3	0	0	3	0	3	3	3	0	0	3	0	3	3	0	3	0	3	3	3
Black Lough Wind Farm T1	78.33	18	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	-2	0	0	0
Black Lough Wind Farm T2	78.33	19	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	-2	0	0	0
Black Lough Wind Farm T3	78.33	20	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	-2	0	0	0
Black Lough Wind Farm T4	78.33	21	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	-2	0	0	0
Carrowleagh 1 Wind Farm T1	64	22	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T2	64	23	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T3	64	24	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T4	64	25	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T5	64	26	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T6	64	27	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T7	64	28	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T8	64	29	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T9	64	30	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T10	64	31	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T11	64	32	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T12	64	33	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Carrowleagh 1 Wind Farm T13	64	34	-2		-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Single Wind Turbine - T1	78.33	35	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Cloonkeelaun 2 Wind Turbine - T1	78.33	36	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Cloonkeelaun 2 Wind Turbine - T2	78.33	37	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Strokane Single Turbine (Cloonkeelaun) - T1	103.9	38	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T1	64	39	0		-2	-2	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T2	64	40	0		-2	-2	-2	-2	-2	-2	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Cloonkeelaun Wind Farm (Carrowleagh WF Extension) - T3	64	41	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Firlough Wind Farm - T1	107.5	42	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	0	-2	0
Firlough Wind Farm - T2	107.5	43	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	-2	-2	-2	-2	0	0	0
Firlough Wind Farm - T3	107.5	44	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T4	107.5	45	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T5	107.5	46	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T6	107.5	47	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	0	-2	0	0	0
Firlough Wind Farm - T7	107.5	48	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T8	107.5	49	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T9	107.5	50	0		0	-2	-2	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T10	107.5	51	0		-2	-2	-2	-2	-2	0	0	-2	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T11	107.5	52	0		-2	-2	-2	-2	-2	0	0	0	-2	-2	-2	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T12	107.5	53	0		0	-2	-2	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0
Firlough Wind Farm - T13	107.5	54	0		0	-2	0	-2	-2	0	0	0	-2	-2	0	-2	0	0	-2	-2	-2	0	0	0

Annex 7 – Summary of Wind Turbine Noise Source Data

Wind Turbine Noise Data assumptions

Table A7.1: Sound Power Level Data

Wind Farm	Turbine	Hub height	Added Uncertainty	Reference Wind Speed (ms ⁻¹) Standardised to 10m Height									
				3	4	5	6	7	8	9	10	11	12
Crumhach	Vestas V150 6.0 MW with Serrated Blades	105	2	Restricted / NDA - data available on request									
Crumhach	Nordex N149 5.X MW with Serrated Blades	105	2	Restricted / NDA - data available on request									
Crumhach	Nordex N133 4.8 MW with Serrated Blades	110	2	Restricted / NDA - data available on request									
Carrowleagh 1 Cloonkeelaun	Enercon E70 2.3MW Generic Blades 64 m hub OMII	64	2			95.003	99.776	102.48	104.11	105.5	105.5	105.5	105.5
Black Lough	Enercon E92 2.3MW Generic Blades 78 m hub OMI	78	2				103.8	105.2	106.12	106.92	107	107	107
Strokane	Enercon E92 2.3MW Generic Blades 104 m hub OMI	104	2			101.8	104.2	105.5	106.37	107	107	107	107
Firlough	Nordex N149 5.X MW with Serrated Blades	107.5	2	Restricted / NDA - data available on request									

Table A7.2: Octave Band Data

Wind Farm	Turbine	Reference Wind Speed (m/s)	Octave Band (Hz)								
			63	125	250	500	1000	2000	4000	8000	Overall
Crumhach	Vestas V150 6.0 MW with Serrated Blades		Restricted / NDA - data available on request								
Crumhach	Nordex N149 5.X MW with Serrated Blades		Restricted / NDA - data available on request								
Crumhach	Nordex N133 4.8 MW with Serrated Blades		Restricted / NDA - data available on request								
Carrowleagh 1 Cloonkeelaun	Enercon E70 2.3MW Generic Blades 64 m hub OMII	10	89.4	98	100.5	99.1	97.6	94.3	87.4	79.8	105.5
Black Lough	Enercon E92 2.3MW Generic Blades 78 m hub OMI	10	89	97.4	98.1	100.6	102	98.8	92.9	82.6	107.0
Strokane	Enercon E92 2.3MW Generic Blades 104 m hub OMI	10	89	97.4	98.1	100.6	102	98.8	92.9	82.6	107.0
Firlough	Nordex N149 5.X MW with Serrated Blades		Restricted / NDA - data available on request								