Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Killoshulan Wind Farm, Co. Kilkenny

Chapter 3 – Site Selection and Reasonable Alternatives



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GLOSSARY

NAL (Noise Assessment Location) refers to any location where the immission levels are calculated and assessed.

CNAL (Construction Noise Assessment Location) refers to any location associated with the Proposed Wind Farm and Proposed BESS and Substation where the construction noise immission levels are calculated and assessed.

HDD: Horizontal Directional Drilling.

GNAL (Grid Connection Route Noise Assessment Location) refers to any location associated with the Proposed Grid Connection Route where the noise immission levels are calculated and assessed.

NML (Noise Monitoring Location) refers to any location where baseline or specific noise levels have been measured.

NSR (Noise Sensitive Receptor): identified receptors that are sensitive to noise.

SWL: indicates the sound power level in decibels (dB).

SPL: indicates the sound pressure level in decibels (dB).

Emission refers to the sound level emitted from a sound source, expressed as either a sound power level or a sound pressure level.

Immission refers to the sound pressure level received at a specific location from a noise source(s).

Baseline traffic flow: the traffic count data for a particular road scaled up for the first year of construction.

Proposed Project traffic flow: the traffic flow attributable to the construction of the proposed project only.

Total traffic flow: the baseline traffic flow plus the proposed project traffic flow.

Amplitude Modulation refers 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.

OAM (Other Amplitude Modulation) 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 the blade passing frequency, typically once per second.

Background Sound Level (BS 4142) The sound level of all noise sources in an area except the sound source to be assessed. Described using the metric LA90(t).

Rating Level (BS 4142) refers to the immission level after consideration of the character of the sound. The Rating Level is the Immission Level plus any required character corrections, if this is deemed necessary.

12. NOISE & VIBRATION

12.1 Introduction

The Proposed Project has the potential to create noise and vibration during the construction, operational and decommissioning phases.

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection' and the 'Site'. As identified in Section 1.1, the construction phase includes the construction of the proposed 10 no. wind turbines and associated infrastructure, as well as a 110 kV electrical substation and Battery Energy Storage System (BESS). The construction phase also includes the Proposed 12.6 km underground cable route to the existing 110 kV Ballyragget Substation. The operational phase includes the operation of the proposed 10 no. wind turbines, as well as the onsite BESS. The decommissioning phase includes the decommissioning of the proposed 10 no. wind turbines. The full description of the Proposed Project is detailed in Chapter 4.

This chapter assesses the potential noise and vibration impacts at the nearest Noise Sensitive Receptors (NSRs), which are residential properties located near any of the proposed wind turbines or associated infrastructure.

This chapter considers the likely significant noise and vibration effects associated with the construction, operation and decommissioning of the Proposed Project.

The specific objectives of the chapter are to:

- Describe the existing noise baseline;
- Describe the assessment methodology and significance criteria used in completing the impact assessment;
- Describe the potential effects (including cumulative effects); and,
- Describe the mitigation measures proposed to address any likely significant effects; and assess the residual noise effects remaining, following the implementation of mitigation.

This EIAR Report is supported by the following figures and appendices:

- Figures
  - Figure 12-1: Construction Noise Assessment Locations;
  - Figure 12-2: Grid Connection Route Noise Assessment Locations;
  - Figure 12-3: Wind Farm Operational Noise Monitoring and Assessment Locations;
  - Figure 12-4: Cumulative Wind Farm Locations;
  - Figure 12-5: BESS Noise Assessment Location;
  - Figure 12-6: Construction Traffic –Scoping (Stage 1);
  - Figure 12-7: Construction Traffic Assessment – L4115; and,
  - Figure 12-8: Construction Traffic Assessment – L1818.
- Appendices
  - Appendix 12-1: Construction Noise Report;
  - Appendix 12-2: Wind Turbine Operational Noise Report; and,
  - Appendix 12-3: BESS and Substation Operational Noise Report.

Figures and appendices are referenced in the text where relevant.

12.1.1 Statement of Authority

The noise and vibration assessments were carried out by TNEI Ireland Ltd (TNEI). TNEI is a specialist energy consultancy with an Acoustics team that has undertaken noise assessments for over 5 GW of onshore wind farm developments. The operational, construction, and decommissioning noise assessment was undertaken by Faolán Ly (BSc), who is an Affiliate Member of the Institute of Acoustics. The operational noise assessments (Wind Farm and BESS) was reviewed by Moise Coulon (BSc, Dip), who is a full member of the Institute of Acoustics. The decommissioning, construction, and operational noise assessments were reviewed and approved by Jason Baldwin (BSc, Dip) who is a full Member of the Institute of Acoustics.

12.2 Legislation, Policy and Guidelines

As well as the guidance listed in Section 1.2 of Chapter 1 of this EIAR, this assessment adhered to the following combination of noise related guidance and assessment methodologies:

- British Standard BS 5228: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open developments'[1];
- Department of Environment Heritage and Local Government (DoEHLG) 'Wind Energy Development Guidelines,' 2006[2];
- UK Government Department for Energy Security and Net Zero (DESNZ) 'Assessment and Rating of Wind Turbine Noise' (2026)[3];
- Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (2013) (IOA GPG)[4];
- ISO 9613-2: 2024 'Acoustics – Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors'[5];
- Association of Acoustic Consultants of Ireland 'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments'(2021) (AACI Guidelines)[6].
- Highways England 'Design Manual for Roads and Bridges', 'LA 111: Noise and vibration,' (2020)[7];
- Department of Transport, Welsh Office 'Calculation of Road Traffic Noise (CRTN),' (1988)[8].

The above documents are discussed in detail within Section 2 of Appendices 12-1, 12-2 and 12-3, where relevant, in addition to National and Local Policy.

With regards to national planning policy and guidance, it is noted that the Irish Government Wind Energy Development Guidelines for Planning Authorities (2006) (the Guidelines (DoEHLG, 2006)) are currently under review. A set of draft updated guidelines were issued for consultation in December 2019 (Draft 2019 Guidelines (DoHPLG, 2019)) but these guidelines have not, at the time of writing, been adopted.

In keeping with best international practice, the Draft 2019 Guidelines (DoHPLG, 2019) relied upon some elements of the former UK guidance, ETSU-R-97 *'Assessment and Rating of Noise from Wind*

[1] *British Standards Institute, 2014. Code of practice for noise and vibration control on construction and open sites. Noise. UK : BSI, 2014. BS 5228:2009+A1:2014*
[2] *Department of Environment Heritage and Local Government (DoEHLG) 'Wind Energy Development Guidelines,' 2006.*
[3] *Department for Energy Security and Net Zero (DESNZ), 2026. Assessment and Rating of Wind Turbine Noise. UK Government.*
[4] *Institute of Acoustics, 2013. Good Practice Guidance on the application of ETSU-R-97 for wind turbine noise assessment.*
[5] *(ISO), International Standards Organisation. ISO9613: 2024 'Acoustics – Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors'. 2024.*
[6] *Association of Acoustic Consultants of Ireland, 2021. 'Environmental Noise Guidance for Local Authority Planning & Enforcement Departments.*
[7] *Highways England. (2020) Design Manual for Roads and Bridges (DMRB), LA 111: Noise and vibration. Revision 2. Birmingham: Highways England*
[8] *Department of Transport, Welsh Office. (1988) Calculation of Road Traffic Noise (CRTN). London: HMSO*

Farms[9] and the Institute of Acoustics *'Good Practice Guidelines 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 on June 19th 2026 named 'Assessment and Rating of Wind Turbine Noise' (ARWTN); the assessment core principles are generally the same as ETSU-R-97 and introduces new terminology and clarifications to previous. It is specified in this this update that the IOA GPG is endorsed and should continue to be used. Therefore, any text referencing the IOA GPG, which itself refers to the ETSU-R-97 guidance should be considered to relate to ARWTN.

Significant concerns were raised during the public consultation process on the Draft 2019 Guidelines (DoHPLG, 2019), including those raised by acousticians[10] with significant experience in wind farm noise, regarding the noise section of these draft guidelines and how the authors had misinterpreted existing guidance and 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 2019 Guidelines (DoHPLG, 2019)has not been undertaken.

At the time of writing this report, no further updates on the review process have been issued, however, on the 22nd February 2023, a request for tender (RFT) was published for the review and redraft of the Guidelines (DoEHLG, 2006)by the Department of Environment. The Government of Irelands' Climate Action Plan 2024 includes a 2024 Action (EL/24/5) to 'Publish the Revised Wind Energy Development Guidelines for onshore wind', however timelines for the release are still unclear.

The Guidelines (DoEHLG, 2006), therefore, 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.

In 2018 the World Health Organisation (WHO) issued noise guidelines *'Environmental Noise Guidelines for the European Region'*[11] (the WHO Guidelines) that provide recommendations for protecting human health from exposure to environmental noise. The WHO Guidelines consider noise originating from various sources including wind turbine noise. The WHO Guidelines make a series of 'strong' and 'conditional' recommendations. Two conditional recommendations were made in relation to wind turbine noise. In relation to conditional recommendations the WHO Guidelines notes that:

'A conditional recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply.'

The WHO Guidelines make recommendations based on noise exposure levels characterised using the L_{den} parameter. L_{den} is a weighted annual average sound pressure level over all days, evenings and nights in a year which is commonly used for transportation noise but rarely used for wind turbine noise.

In relation to wind turbine noise the WHO Guidelines state:

> *'Based on all these factors, it may be concluded that the acoustical description of wind turbine noise by means of L_{den} or L_{night} may be a poor characterization of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes.'*

[9] *ETSU for the DTI (Department of Trade and Industry), 1996 . The Working Group on Noise from Wind Turbines ETSU-R-97 The Assessment and Rating of Noise from Wind Farms'.*
[10] *Mackay, J, Singleton, J, Reid, M, Cand, M, Mahon, J, McKenzie, A, Keaney, D, Hayes, M, Bowdler, D, Kelly, D, Jiggins, M, Irvine, G & Lester, M, 2020. Public consultation on the revised wind energy development guidelines: Joint consultation response. Available at: https://www.tneigroup.com/news_event/tnei-submit-joint-consultation-response-and-meet-with-government-regarding-proposed-updates-to-the-irish-wind-farm-noise-guidelines-wedg/*
[11] *World Health Organisation, 2018. Environmental Noise Guidelines for the European Region'*

'Further work is required to assess fully the benefits and harms of exposure to environmental noise from wind turbines and to clarify whether the potential benefits associated with reducing exposure to environmental noise for individuals living in the vicinity of wind turbines outweigh the impact on the development of renewable energy policies in the WHO European Region.'

Notwithstanding the limitations associated with the derivation of the L_{den} threshold levels, serious concerns have been raised about the practicality of using a threshold which is based on a weighed annual average which cannot be directly measured. Given the strength of recommendation and limitations associated with the use of L_{den} it is not considered appropriate to undertake an assessment against L_{den} levels.

The Association of Acoustic Consultants of Ireland (AACI) published the AACI Guidelines in May 2021. The guidance document provides advice to local authority officers involved in the assessment of noise reports, the drafting of noise conditions for planning purposes and permitting, and enforcement activities. Section 17 of the AACI Guidelines covers operational wind farm noise and construction noise guidance is included within Section 27. These are considered further in Section 12.4 below.

12.3 Scoping and Consultation

Section 2.7 of Chapter 2 of this EIAR describes the scoping and consultation exercise undertaken for the Proposed Project. Comments regarding noise and vibration were included in the Scoping Responses from consultees, namely the response from Transport Infrastructure Ireland (May 2026), Kilkenny County Council (June 2026), the HSE (July 2026), and An Coimisiún Pleanála (ACP, September 2026).

12.3.1 Transport Infrastructure Ireland Scoping Response

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)).'

The '*Guidelines for the Treatment of Noise and Vibration in National Road Schemes'* states:

"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."

This guidance is not intended for use for wind farm development or similar. Nonetheless, an assessment has been undertaken to consider whether construction road traffic noise mitigation needs to be incorporated within the Proposed Project.

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

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.

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'*, therefore these have not been considered further.

The 'European Communities (Environmental Noise) Regulations, 2018, (S.I. no. 549 of 2018)' excludes noise from wind turbines and is therefore not considered in relation to operational noise. Construction noise associated with the Proposed Project is inherently temporary and thus will have no impact on future action plans No regular traffic noise impacts will occur during the operational phase of the Proposed Project and noise on the surrounding road network associated with the construction traffic has been assessed aspart of this EIAR. The use of noise barriers is discussed in Section 12.3.4.

12.3.2 Health Service Executive Scoping Response

The HSE response states in relation to Noise and Vibration:

'The potential impacts for noise and vibration from the proposed development on all noise sensitive locations must be clearly identified in the EIAR. The EIAR must also consider the appropriateness and effectiveness of all proposed mitigation measures and evaluate the residual impact against recognised health protection standards. A baseline noise monitoring survey should be undertaken to establish the existing background noise levels. Baseline noise should cover day, evening and night-time periods. Noise from any existing turbines in the area should not be included as part of the background levels. An assessment of the predicted noise impacts during the construction phase and the operational phase of the proposed windfarm development should be undertaken which details the predicted change in the noise environment resulting from the proposed development. It is recommended that changes in the noise environment at Noise Sensitive Locations are shown in a tabulated format that shows the predicted change in the noise environment at each noise sensitive location.'

Each of these HSE requirements are covered within this EIAR. The baseline aspect is considered in Section 12.4.3, The assessment of predicted noise impacts during the construction and operational phases is detailed in Sections 12.6.2 and 12.6.5 respectively.

The HSE response also notes that:

'The applicant should consider the findings of the High court judgement issued in the judicial review of the Derryadd Wind Farm and with regard to general noise considerations of noise and wind farms, the judgement in Margaret Webster and Keith Rollo and Meenacloghspar (Wind) Ltd.'

The findings of the judicial review of the Derryadd Wind Farm found that the open-ended design envelope of the turbine dimensions was beyond acceptable limits. This decision does not influence this Proposed Wind Farm noise assessment as the turbine design envelope is limited to a single set of specified hub height and rotor diameter. There can be a number of candidate turbines which meet this envelope, the final selection of which would have to meet the consented limits.

The second case mentioned above is in referenced the Ballyduff Wind Farm noise nuisance case. The central issue in relation to noise submitted by the plaintiffs was Amplitude Modulation (AM) caused by the turbines. It is not currently possible to predict AM at receptors. Current guidance suggests that AM should be controlled through a suitable planning condition. If AM were to occur, an AM assessment can be undertaken using the methodology outlined in the Operational Noise Assessment (Appendix 12.2). This would determine the degree of AM being experienced and would suggest the mitigation required to reduce the impact at the receptor.

12.3.3 Kilkenny County Council Scoping Response

The Kilkenny County Council (KCC) Scoping document also sets out a number of requirements for the consideration noise and vibration.

'It is recommended that the following items should be comprehensively assessed:

- *'Identification of sensitive receptors including nearby residences, equine facility and the surrounding affected environment;*
- *Baseline noise monitoring survey shall be undertaken to establish existing background noise levels for residential properties, equine facilities and any other sensitive receptors;*
- *Potential impact of traffic noise associated with the construction development and sensitive receptors onsite and to junctions/along the haul route;*
- *Proposed mitigation measures including measures where the risk of potential impacts cannot be eliminated;*
- *Wind data from proposed wind farm site to be obtained for the survey period;*
- *Potential noise impacts from road traffic movements and other ancillary parts of project including substation, and any other permanent source of noise to be assessed;*
- *Cumulative assessment for noise and vibration to include other wind farm developments, other renewable energy projects or any proposed projects which could have the potential to have a likely significant cumulative effect;*
- *'The anticipated noise impact levels on noise sensitive receptors to include AM noise, which will be proximate to the proposed site boundaries shall be clearly detailed in an easy-to-understand measurable form;*
- *Impact of proposed development in terms of noise and vibration during construction, operation and decommissioning (potential impacts on residential amenity and structural damage to buildings) resultant of heavy excavation and drilling; this shall include cumulative impacts with proposed and permitted windfarms and associated grid connections in the wider area;*
- *Impact of specific noises such as drilling and piling shall be specifically addressed;*
- *Additional mitigation measures such as methods of detection and software technology to rapidly switch off relevant turbines when too noisy at nearby receptors and also noise barriers shall also be discussed' ;*
- *Consideration of Environmental Noise Regulations 2006 (SI 140 of 2006), and, compliance with relevant Guidelines as identified by the National Roads Authority – i.e. Guidelines for the treatment of noise and vibration in National Road Schemes (1st Rev., National Roads Authority, 2004).*

Identification of sensitive receptors is addressed in Section 12.5.3, baseline monitoring (including the use of wind data) is addressed in Section 12.5.1, the assessment of road traffic noise from construction is addressed in Section 12.6.4, proposed mitigation measures are covered in Section 12.7, the cumulative assessment for the Proposed Project is covered in Section 12.6.5 and 12.6.6, AM noise is discussed in Section 12.4.1.5, drilling is addressed specifically in Section 12.6.2. No piling is expected to take place for the Proposed Project; therefore, it has not been assessed further.

Ground-borne vibration from the operation of the Proposed Wind Farm is addressed in Section 12.6.3. Live monitoring of noise levels from the Proposed Wind Farms to directly control switch-off may be possible but it is not common practice. The monitoring could be then used to feed into an integrated turbine mitigation system, like what is suggested above. Although this would likely be very resourceful and is deemed unnecessary given that the Proposed Wind Farm will be designed to meet the Total Guidelines (DoEHLG, 2006) limits. Therefore, live shutdowns of turbines should not be required as noise levels will be designed to be within the guideline levels.

The use of barriers for wind farm noise will provide no mitigation or very limited mitigation given the size and height above ground of wind turbines relative to receptors. In general, noise barriers are only effective if placed very close to either the receptor or the source and block the line of sight. It is not feasible to place a noise barrier adjacent to a wind turbine, and a barrier placed next to receptor would have to cover a large area such that line of sight to the nearest turbines is covered. The only relevant noise barrier considered for wind farm noise are those arising due to topography (this is discussed in Appendix 12-2 Section 4.4.16). These topographical barrier effects are duly accounted for in the predictions.

The 'Environmental Noise Regulations 2006 (SI 140 of 2006)' have been replaced by the 'European Communities (Environmental Noise) Regulations, 2018, (S.I. no. 549 of 2018)'. This, as well as the '*Guidelines for the treatment of noise and vibration in National Road Schemes'* are addressed in Section 12.3.1.

12.3.4 An Coimisiún Pleanála Consultation

At a pre-application meeting in September 2026, An Coimisiún Pleanála (ACP) asked the following:

- a specific assessment of BESS noise and "in-combination" assessment of BESS and wind farm noise.
- If curtailment is required for the wind turbines - submit detailed curtailment plan as part of the EIAR.
- Link Noise Monitoring Locations to the group of houses it is used to forecast noise at. Present locations of houses and noise monitoring locations together. A series of maps showing the house IDs is requested in the chapter to allow the public and inspectors to easily identify sensitive receptors against the noise modelling predictions table/assessment.
- Assess the impact of horizontal directional drilling (HDD) works at the River Nore crossing along the grid route.

An assessment of BESS noise has been undertaken, however there are no cumulative operational effects anticipated between wind turbine noise and other noise sources within the Proposed Project. Wind turbines generate noise in windy conditions and are assessed accordingly with specific guidance, whereas other industrial noise sources would be assessed using different standards with a higher focus on low wind conditions when wind turbines may not emit noise. Furthermore, the most recent wind farm noise guidance in the UK, ARWTN (which was used to supplement the operational noise assessment) states in Section 1.6:

'Other elements that may be incorporated into a wind energy development which can produce operational noise, such as battery storage systems, substation(s) and solar installations, are assessed through application of alternate assessment methods, which are not applicable to wind turbine noise, and therefore fall outside of the scope of these guidelines.'

If curtailment is required for the wind turbines, a curtailment plan will be considered in the mitigation sections of this EIAR. The figures as part of this EIAR clearly identify all Noise Sensitive Receptors and associated Noise Monitoring Locations. HDD is assessed in the construction noise assessment.

As part of the Completeness Schedule, ACP also stipulated that mitigation strategy for amplitude modulation and tonal noises be addressed. If AM or tonal noise were to allegedly cause complaints during the operational phase, this would be assessed in accordance with the specific tonal assessment guidance in ARWTN (for wind turbine noise), or BS 4142 (for industrial noise, e.g. BESS). Based on the outcome of such assessment, appropriate mitigation strategy would be derived. Mitigation for Amplitude Modulation is also discussed in Section 12.4.1.5.

In addition, ACP has requested that an Operational Noise Monitoring Proposal be produced. This document would set out the noise monitoring programme for the Proposed Wind Farm while it is operational. This should only be completed if it becomes necessary to undertake compliance monitoring following construction of the Proposed Project, e.g. via a noise condition.

12.4 Assessment Methodology and Significance Criteria

12.4.1.1 Construction Noise Methodology

There is no published statutory Irish guidance that contains suggested noise limits for construction activities, other than for road construction works, however, the AACI Guidelines states:

> *"The chief guidance document applied in the assessment of construction phase noise impacts is British Standard BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 1: Noise (2014)".*

The construction noise assessment has therefore been undertaken using the BS 5228 guidance. The prediction of construction noise levels was undertaken using the calculation methodology presented in ISO 9613:2024, using noise source data for appropriate construction plant from Annex C of the current version of BS 5228.

To undertake an assessment of the construction noise impact in accordance with the BS 5228 criteria, the following steps have been undertaken:

- Identify NSRs and select representative Construction Noise Assessment Locations (CNALs);
- Identify applicable threshold of significant effects;
- Predict noise levels for various construction noise activities;
- Compare predicted noise levels against the applicable thresholds;
- Where necessary, develop suitable mitigation measures to minimise any significant adverse effects during the construction phase; and (if required)
- Assess any residual adverse effects taking into account any identified mitigation measures.

Of the NSRs identified in the surroundings, a total of six have been chosen as CNALs. All six are residential properties. The CNALs represent the closest NSRs or clusters of NSRs to the Proposed Wind Farm and Proposed BESS and substation construction activities. The CNAL are summarised in Table 12-1 below and are shown on Figure 12-1.

Table 12-1: Summary of Construction Noise Assessment Locations

Receptor	ITM X	ITM Y
CNAL01	632856	666845
CNAL02	633644	667794
CNAL03	635112	667755
CNAL04	636156	667868
CNAL05	636632	664404

Receptor	ITM X	ITM Y
CNAL06	634820	665204

The construction phase of the Proposed Wind Farm will include civil engineering works, electrical works, and turbine erection (please refer to Chapter 4 of this EIAR for details). During each phase the plant and equipment, and the associated traffic, would influence the noise generated. The selection of plant and equipment to be used will be determined by the main contractor when they are commissioned, therefore the assessment has been based upon a typical selection of plant for a wind farm project of this size and the indicative construction schedule (included in Chapter 4 of this EIAR). In view of this, the plant has been modelled operating at the closest points to each NSR for a given activity in each construction phase, under a precautionary scenario as it would generate the highest noise levels, whereas in reality only certain plant and equipment will be working at the closest point for short periods of time. In the case of mobile plant, if onsite construction vehicles traffic count data were available for the particular construction activity, this has been modelled as a moving point source along a defined path. If onsite construction vehicles traffic count data were not available, mobile plant was modelled as a line source along its prescribed path, thus averaging out the sound power level across the length of the line, rather than concentrating it in a single location next to the receptor. In both cases, the predicted noise level will represent an average level expected to be received for most of the activity period, however, it should be recognised that when directly opposite a receptor, noise levels would be higher than predicted for a short period of time.

The core hours for the proposed construction works will be 07:00 to 19:00 Monday to Friday, and Saturday 07:00 to 13:00. There will be no working on Sundays and Public Holidays, however, it should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair-weather windows for concrete deliveries, the erection of turbines and the erection and dismantling of cranes.

Chapter 4: Description of the Proposed Project outlines the tasks that will be undertaken during the construction phase, which is estimated to be 24 months. For the purposes of this assessment, noise modelling has been undertaken for Q1 to Q2 of Year 2 only, as Q3 and Q4 of Year 2 will be limited to electrical commissioning and site landscaping which will not result in substantial levels of noise. The modelled construction scenarios are detailed in Table 12-2.

More detailed information on each of the construction scenarios and modelling assumptions can be found within Appendix 12-1 of this EIAR. The noise levels for all scenarios have been calculated at the CNALs and compared to the appropriate BS 5228 thresholds (detailed in Table E.1, Annex E of BS 5228). It is worth noting that for much of the working day, the noise associated with construction activities will be less than predicted as the assessment has assumed all equipment is constantly operating at full power and is located at the closest point to each receptor, whereas in practice equipment load and precise location will vary.

Construction activities associated with HDD at two watercourse crossings along the Proposed 110kV Underground Cabling have been assessed in the same manner as above. Five representative NSRs located near the two separate HDD works have been selected as Grid Connection Noise Assessment Locations (GNALs), as shown in Table 12-2 below and in Figure A1.3 of the Appendix 12.1.

GNALs 1-3 are located near to HDD Location 1 (stone arch bridge located in Ballyconra), and GNALs 4 and 5 are near to HDD Location 2 (River Nore crossing).

Table 12-2: Summary of Grid Connection Noise Assessment Locations

Receptor	ITM X	ITM Y
GNAL01	642044	671877
GNAL02	642201	671877
GNAL03	642219	671864
GNAL04	643500	671899
GNAL05	644484	672090

Construction activities outside the Proposed Turbines, along the Proposed 110kV Underground Cabling or along the turbine delivery route distant road junctions that may need reinforcement have been assessed qualitatively (except for the HDD activities). These activities will be of short duration and best practice during constructions shall minimise any potential impact.

12.4.1.2 Construction Vibration

Without detailed knowledge of the exact construction plant specifications, local geology and test measurements (which cannot be undertaken until construction commences), it is not possible to undertake useful vibration predictions. Rather, it is more appropriate at this stage to advise on a set of appropriate vibration limits that could be used for the protection of the closest receptors.

In relation to potential vibration during the construction phase of the Proposed Project, two sets of vibration limits should be considered: one in regard to potential for damage to buildings and one in regard to the vibration effects on people within buildings.

Threshold values to determine the potential for damage to buildings are detailed in BS 7385-2:1993 (which is also referred to in BS 5228). The unit of measurement used for this assessment method is the Peak Particle Velocity (PPV), which is measured in mm/s or $mm.s^{-1}$. For dwellings, the standard provides the guideline threshold levels, as set out in Table 12-3 below.

Table 12-3: Transient vibration guide values for building damage

Peak Component Particle Velocity (mm/s)	Damage Levels for residential buildings
15 mm/s PPV for a frequency of 4 Hz, rising to 50 mm/s PPV for a frequency of 40Hz and above.	Cosmetic
30 mm/s PPV for a frequency of 4 Hz, rising to 100 mm/s PPV for a frequency of 40Hz and above.	Minor Damage
60 mm/s PPV for a frequency of 4 Hz, rising to 200 mm/s PPV for a frequency of 40Hz and above.	Major Damage

Table B.1 of BS 5228-2, reproduced here as Table 12-4, provides guideline PPV levels that can be used in a construction setting relevant to vibration effects on people within buildings. It is important to note that the levels refer to internal vibration within a building, and not external levels.

Table 12-4: BS 5228-2 Guidance on Effects of Vibration Levels

Vibration Level (A) (B) (C)	Effect
0.14 $mm.s^{-1}$	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 $mm.s^{-1}$	Vibration might be just perceptible in residential environments.

Vibration Level (A) (B) (C)	Effect
1.0 mm.s^{-1}	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm.s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.
(A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient. (B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available. (C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

With due regard to the above, external vibration level limits can be set at 15 mm/s PPV for frequencies between 4 Hz and 40 Hz and 50mm/s for frequencies above 40Hz.

Internal PPV limits can be set at somewhere between 1 mm/s^{-1} and 10.0 mm/s^{-1}, however, it should be noted that the measurement of vibration levels indoors is invasive and can be problematic. It should also be noted that the limits in Table 12-4 are generally considered guideline levels that should not be exceeded regularly or for long periods of time (see note (C) of Table 12-4).

Due to the temporary nature of construction work and separation distances between the key construction activity areas (including from road junction upgrades) on the Proposed Wind Farm site and the nearest receptors, no significant effects are anticipated. Where construction activities on the Proposed 110kV Underground Cabling are close to residential receptors, some local vibration effects may be present, however, levels are expected to be low and of limited duration. Also, similarly to construction noise, good practice during construction will be implemented and will reduce vibration levels from these short-term works to minimum levels. Vibration impacts have not been considered further in the assessment.

12.4.1.3 Construction Traffic Noise Methodology

The assessment of noise from construction activities is typically undertaken in accordance with BS 5228-1:2009+A1:2014, however, there is no specific Irish guidance available for the assessment of noise from construction traffic travelling to/from a designated construction area, for example, on public roads. Therefore, a bespoke assessment methodology has been derived, drawing on guidance presented in Calculation of Road Traffic Noise (CRTN) and Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration.

CRTN provides a methodology for the prediction of road traffic noise, which can be undertaken with due consideration of traffic flows, vehicle speed, percentage of Heavy Goods Vehicles (HGVs), road surface, and gradient.

DMRB provides a methodology for the assessment of road traffic noise on new or upgraded trunk roads. It provides guideline noise levels for road traffic for the short-term i.e. when a new road is first opened, and for the long term, permanent situation. For this assessment, the short-term recommendations have been used, as all traffic noise associated with the construction of the Proposed Project will be temporary in nature.

The assessment of construction traffic noise is undertaken with reference to both existing baseline traffic and proposed construction traffic i.e. it considers the change in traffic flows that may occur during the construction phase.

The assessment methodology follows a three-stage process:

- Stage 1 Scoping – to differentiate between road sections that need further assessment and road sections where negligible noise impacts will occur.
- Stage 2 Simple Assessment – to determine whether road traffic noise is above or below a threshold where adverse effects may occur.
- Stage 3 Detailed Assessment – To determine the magnitude of change for road sections where this threshold is exceeded.

The assessment uses the following terminology:

- Baseline traffic flow. This is the traffic flow without the Proposed Project, for the year of construction.
- Development traffic flow. This is the traffic flow attributable to the construction of the Proposed Project only.
- Total traffic flow. This is the baseline traffic flow plus the Proposed Project traffic flow.

12.4.1.3.1 *Stage 1 Scoping Assessment: Methodology*

The transport assessment provided the details of the main routes to be used by construction vehicles (light and HGV) to access the Proposed Project, this was used to identify relevant assessment roads. These roads are listed in Table 12-13. For each road section to be assessed, the baseline traffic flow is compared to the predicted traffic flow. It is generally recognised that an increase in traffic flow of 25% or a decrease in traffic flow of 20% results in a noise level change of 1 dB, and in respect of the Scoping stage, DMRB states: "is the project likely to cause a change [in the baseline noise level] of 1dB LA10,18hr in the do-minimum opening year (DMOY) compared to the do-something opening year (DSOY)?".

In this case, the DMOY (Do Minimum) is taken as the baseline traffic flow in 2032 without the Proposed Project present and the DSOY (Do Something) is the 2032 baseline traffic flow plus any traffic associated with the construction of the Proposed Project.

Where road sections are determined to have an increase in traffic flow of less than 25%, no further assessment is required, as any increase in traffic flow will be negligible in terms of noise, i.e. less than a 1 dB change. In this instance, construction traffic effects would be considered Not Significant.

12.4.1.3.2 *Stage 2 Simple Assessment: Methodology*

Where the need for further assessment is identified, a study area is defined to consider all NSRs in the vicinity of the road section of interest (i.e. that is to be considered through simple assessment). The study area is usually defined as 600 m from new roads and 50 m from other roads, although variations in the study area are allowed to suit the individual project. In this case, no new public roads are being considered, so the study area has been set to a 50 m radius, either side of all roads of interest.

Road traffic noise levels are then modelled on the road section of interest in accordance with CRTN, as modified by the Appendix A 'Operation Noise Calculations' recommendations in DMRB.

DMRB uses the concept of Observable Adverse Effects Levels to inform noise assessments. The LOAEL i.e. the minimum level required for adverse effects to occur, is defined in DMRB as 55 dB L10,18-hour (façade) for daytime (06:00 – 24:00). Where the predicted noise levels are below 55 dB L10,18-hour, no further assessment is necessary and construction traffic effects would be considered Not Significant.

The SOAEL (Significant Observed Adverse Effect Level) is defined in DMRB to be 65 dB, L10, 18-hour (façade).

12.4.1.3.3 Stage 3 Detailed Assessment: Methodology

If NSRs are identified within the study area with noise levels above 55 dB L10, 18-hour, then the next step is to determine a magnitude of change, as detailed in 3.54a of DMRB. The magnitude of change will be used in combination with additional considerations to determine the criteria for significance. This is detailed in Section 12.4.4.2.

12.4.1.4 Operational Wind Turbines Noise Methodology

The assessment has been undertaken in accordance with the Guidelines (DoEHLG, 2006). The AACI Guidance states the following in relation to the Guidelines (DoEHLG, 2006) :

'The document includes daytime and night-time noise criteria. As criteria included in the document are evidently derived from ETSU-R-97, it is considered more robust to base noise assessments on the ETSU and IOA documents, particularly as the DOEHLG document is somewhat vague. The document has been undergoing a protracted review process for several years.'

The document also provides clarification on how the limits provided in the Guidelines (DoEHLG, 2006) should be interpreted:

- *'Daytime limit of 5 dB above background, subject to a lower fixed limit of 45 dB.*
- *Night-time limit of 5 dB above background, subject to a lower fixed limit of 43 dB (although the DOEHLG wording is particularly vague here).*
- *Where background noise levels are less than 30 dB, a daytime absolute limit set between 35 and 40 dB. No information is provided here with respect to a corresponding night-time limit. In addition, it is not stated if an increase of 5 dB over background is applicable with rising wind speed. This represents an example of the ambiguity of the document.'*

In 2013, the ETSU-R-97 guidance was supplemented by a document produced by the IOA (the IOA GPG), and in June 2026 the ETSU-R-97 guidance itself was refreshed with updated guidance under the title *'Assessment and Rating of Wind Turbine Noise'* (ARWTN). The IOA published a statement highlighting that whilst ARWTN has updated terminology and clarifications, the assessment principles are generally the same as before and advises the continued use of the IOA GPG.

Given the lack of detail in parts of the Guidelines (DoEHLG, 2006), information contained in ARWTN and the IOA GPG has been used to supplement the Guidelines (DoEHLG, 2006). Whilst this assessment adopt core principles of ARWTN, especially for the background survey and analysis, it should be moted that the final criteria used follows the Guidelines (DoEHLG, 2006) , for example fixed minimum (or LLV) in this assessment are specific to the Guidelines (DoEHLG, 2006) and wind speeds are still considered up to 12m/s.

The test applied to operational noise is whether or not the calculated wind farm noise levels at nearby NSRs will be below the noise limits derived in accordance with the Guidelines (DoEHLG, 2006) for both the daytime and night-time periods.

Of the NSRs identified, 13 Noise Assessment Locations (NALs) were selected for a detailed assessment. The NALs were chosen to represent the noise sensitive receptors located closest to the Proposed Wind Farm site. Predictions of wind turbine noise have been made at each of the NALs as detailed in Table 12-5 and shown on Figure 12-3. This approach ensures that the assessment considers the worst case (loudest) noise immission level expected at the NAL. All other NSRs have also been assessed separately in Appendix 12-2.

Table 12-5: Summary of Operational Noise Assessment Locations

Receptor	ITM X	ITM Y	Elevation (m AOD)	Distance to Nearest Turbine (m)	Background Noise Data Used
NAL01 (NSR381)	636290	666025	221.7	743 (T2)	NML5
NAL02 (NSR383)	636333	664308	130.3	850 (T1)	NML5
NAL03 (NSR291)	634725	665192	228.6	975 (T4)	NML6
NAL04 (NSR259)	633960	664440	186.4	1,710 (T5)	NML6
NAL05 (NSR170)	631934	665528	184.6	2,018 (T5)	NML1
NAL06 (NSR210)	632840	666845	246.0	747 (T7)	NML2
NAL07 (NSR245)	633664	667809	288.3	748 (T7)	NML3
NAL08 (NSR276)	634342	667852	280.0	779 (T8)	NML3
NAL09 (NSR305)	635120	667785	230.7	894 (T9)	NML3
NAL10 (NSR365)	636075	668002	173.3	1,376 (T10)	NML4
NAL11 (NSR414)	636865	667255	180.0	1,399 (T10)	NML4
NAL12 (N/A)	637775	669204	178.2	3,415 (T10)	N/A, assessed with limit from Lisdowney Wind Farm condition 11.
NAL13 (N/A)	638525	669902	221.9	4,429 (T10)	

The daytime and night-time periods are not defined within the Guidelines (DoEHLG, 2006), therefore the assessment has considered these periods as detailed within ARWTN. The quiet daytime criteria are based upon background noise levels measured during 'quiet periods of the day' comprising:

- All weekday evenings from 18:00 to 23:00;
- Saturday afternoons and evenings from 13:00 to 23:00; and,
- All day Sunday 07:00 to 23:00.

It should be noted that although the daytime limits are set based upon background data collected only during the quiet daytime period, they apply to the entire daytime period (07:00 – 23:00).

Night-time periods are defined as 23:00 to 07:00, with no differentiation made between weekdays and weekends.

The Guidelines (DoEHLG, 2006) include guidance on how to derive limits for daytime and night-time periods.

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 criteria, is that turbine noise should not exceed for daytime periods:

- 40 dB(A) where background noise levels are below 30 dB; and,
- 45 dB(A) or background noise plus 5 dB, whichever is the greater, where background noise levels are greater than 30.

The daytime fixed minimum limit has been chosen for the daytime period based upon the approach adopted in other recent wind farm consents.

The Guidelines (DoEHLG, 2006) states that a *"fixed limit of 43 dB(A) will protect sleep inside properties during the night"*, however, whilst it is not explicit within the DoEHLG 2006 Guidelines, the addition of a night-time 'background noise +5 dB' parameter is how the AACI Guidance document recommends the night-time limits are interpreted, as detailed in Section 12.4.1.4 above. On that basis, in line with the AACI interpretation, the night-time noise limits used in this assessment have been based on 43 dB or background noise + 5 dB, whichever is the greater.

NAL12 and NAL13 did not use the background noise data gathered at the NMLs to determine their noise limits as they are closer to Lisdowney Wind Farm. Lisdowney Wind Farm has existing conditioned limits (decision notice issued on 23/07/2012, KCC case reference 12/172) which would already apply to NAL12 and NAL13. This decision notice states that at the existing nearest receptors, the wind farm noise levels should be kept below a fixed absolute limit of 45dB(A) LA90 daytime and 43dB(A) LA90 night-time.

Two sets of noise limits have been derived; the Total Guidelines (DoEHLG, 2006) Noise limits which apply to the cumulative noise level of all relevant wind turbine developments which are operating, permitted, and proposed in the area, including the Proposed Wind Farm; and the Site Specific Noise Limits which apply to operational noise from the Proposed Wind Farm only. The Site Specific Noise Limits are 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.

The aim of the operational noise assessment is to establish the Total Guidelines (DoEHLG, 2006) Noise Limits, determine whether a cumulative assessment is required at the nearest NSRs, derive Site Specific Noise Limits and to establish whether the Proposed Wind Farm can operate within those limits. When considering the Total Guidelines (DoEHLG, 2006) Noise Limit, the aim of the assessment was to determine whether the cumulative noise predictions can operate within the Total Guidelines (DoEHLG, 2006) Noise Limit.

The exact model of turbine to be installed as part of the Proposed Wind Farm will be the result of a future tendering process and within the dimensions prescribed in this planning application should planning permission be granted. Achievement of the noise limits determined by this assessment will be a key determining requirement in the final choice of turbine for the Proposed Wind Farm. Whichever turbine model is ultimately selected will need to adhere to the limits set within the consented planning conditions. This can be achieved through implementation of mitigation measures, such as low-noise modes, where required.

This noise assessment models the following candidate wind turbines:

- the Nordex N163 6.X MW with serrated trailing edge blades and a hub height of 103.5 m;

Calculations of operational noise have been undertaken in accordance with International Standard ISO 9613-2, *'Acoustics – Attenuation of sound during propagation outdoors'* (ISO 1996). The model calculates, on an octave band basis, attenuation due to geometric spreading, atmospheric absorption and ground effects. The noise model was set up to provide realistic noise predictions, including mixed ground attenuation (G=0.5) and atmospheric attenuation relating to 70 % relative humidity and 10 °C (Section 4.3 of the IOA GPG). The receiver height modelled was 4 m.

Typically, wind farm noise assessments assume all properties are downwind of all turbines at all times (as this would result in the highest wind turbine noise levels). However, where properties are located in between groups of turbines they cannot be downwind of all turbines simultaneously, so it is appropriate to consider the effect of wind direction on predicted noise levels and therefore the impact of directivity has been considered in the assessment (see Section 4.4 of Appendix 12-2).

In line with the IOA GPG, an assessment has been undertaken to determine whether a concave ground profile correction (+3 dB) or barrier correction (-2 dB), is required due to the topography between the turbines and the NSRs. Propagation across a valley (concave ground) increases the number of reflection paths, and in turn, has the potential to increase sound levels at a given receptor. Terrain screening effects (barrier corrections) act as blocking points, subsequently reductions in sound levels at a given receptor can potentially be observed. Concave and barrier corrections were required for some turbines at several receptors as detailed in Appendix 12-2.

Other topics relating to operational wind farm noise characteristics, such as tonality, Infrasound, ground-borne vibration, Low Frequency Noise (LFN) and amplitude modulation were considered as part of this assessment. There is no evidence that LFN or infrasound[12] or ground-borne vibration has adverse impacts on the health of wind farm neighbours and has therefore been scoped out - more information on LFN is provided in Appendix 12-2. Tonality associated with wind turbines is well understood and has been considered in accordance with the guidance in ARWTN and the IOA GPG. The topic of amplitude modulation is considered in more detail below.

12.4.1.5 Amplitude Modulation

In the context of wind turbine noise, Amplitude Modulation (AM) 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. The AM of aerodynamic noise is an inherent characteristic of wind turbine noise and was originally noted in ETSU-R-97, on page 68, which states:

> *'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.'*

[12] *Institute of Acoustics, 2024. Institute of Acoustics Statement in Respect of Wind Farm Noise Assessment.*

The Acoustics community has sought to make a distinction between the AM originally 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 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 the blade passing frequency, typically once per second. In some literature 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.

The ARWTN guidelines 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.'*

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

A significant amount of research has been undertaken in relation to OAM and a summary of the most relevant research is included in Section 3.3 of Appendix 12-2. 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 through measurements near operational wind farms, in particular the method produced by the Amplitude Modulation Working Group (AMWG), which was formed by the Institute of Acoustics and published in 2015 in a report 'Methods for Rating Amplitude Modulation in Wind Turbine Noise';
- It would be possible to measure and quantify OAM using the AMWG methodology (which provides an AM rating for each 10-minute period) and ARWTN penalty scheme, only during field measurements as part of a noise compliance assessment (required by a condition or complaint); and
- 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 has 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.

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

To ensure that any future complaints relating to noise and OAM can be responded to appropriately, the Applicant proposes to appoint a community liaison officer who would be the first point of contact in the event that noise complaints were to occur, and the mitigation strategy set out in Section 12.7.2 below will be employed.

12.4.1.6 Cumulative Wind Turbine Operational Noise Methodology

The noise assessment considers nearby wind turbine schemes that are operational, permitted and proposed (planning application submitted). The nearby schemes found to be potentially relevant and therefore considered in the assessment are as follows:

- Bruckana Wind Farm (Existing) – 14 x Siemens SWT-3.0-101 MW;
- Lisdowney Wind Farm (Existing) - 4 x Enercon E82 2.3 MW;
- Lisheen 1 Wind Farm (Existing) – 18 x Vestas V90 2.0 MW;
- Lisheen 2 Wind Farm (Existing) – 12 x Vestas V90 2.0 MW;
- Lisheen 3 Wind Farm (Existing) – 8 x Vestas V136 3.45 MW;
- An Cnoc Wind Farm (Existing) – 5 x Enercon E70 2.3 MW;
- Ballybeagh Wind Farm (Existing) – 6 x Enercon E82 2.3 MW;
- Seskin Wind Farm (Proposed) – 8 x Vestas V150 6.0 MW; and,
- Gathabawn Wind Farm (Proposed) – 12 x Vestas V136 4.5 MW.

A cumulative noise assessment was undertaken in accordance with the guidance contained within the IOA GPG. The noise assessment has been undertaken in three separate stages:

- Stage 1 - Establish the 'Total Guidelines (DoEHLG, 2006) Noise Limits' which are applicable for all wind farm schemes in the area;
- Stage 2 – undertake a cumulative assessment, comparing Total Guidelines (DoEHLG, 2006) Noise Limits with cumulative noise predictions. At this stage, the predicted 'likely' cumulative wind turbine noise levels are the actual levels expected at a noise assessment location; and
- Stage 3 – establish the Proposed Wind Farm's Site Specific Noise Limits (at levels at or below the Total Guidelines (DoEHLG, 2006) 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.

The location of the turbines modelled, inclusive of those considered in the cumulative noise assessment (Stage 2), are shown in Figure 12-3.

12.4.2 Potential Effects Scoped Out

12.4.2.1 Decommissioning

Activities that occur during the decommissioning phase of the Proposed Project are unlikely to produce higher noise levels than those produced during construction and many of the activities will be similar in nature, particularly those related to the removal of the proposed turbines at the end of their operational life. As such it is considered that if construction noise levels are predicted to be below the threshold levels, then decommissioning noise will also be within the threshold levels. Decommissioning of the Proposed Project is detailed in Section 4.10 of Chapter 4 of this EIAR and in the Decommissioning Plan.

12.4.3 Method of Baseline Characterisation

12.4.3.1 Extent of the Study Area

Prior to the commencement of the operational noise assessment, initial desktop noise modelling was undertaken in order to identify all NSRs and to select potential Noise Monitoring Locations (NMLs). A total of 184 residential NSRs were identified within a search area of approximately 2 km from the Proposed Wind Farm. Six NMLs were selected to represent background noise levels at all NSRs. The

NSRs and NMLs are all shown on Figure 12-3 and coordinates of the NMLs are also included below in Table 12-6.

12.4.3.2 Field Survey

The noise survey to determine the existing background noise environment at NSRs neighbouring the Proposed Wind Farm was undertaken in accordance with the guidance contained within ARWTN and current good practice (IOA GPG).

Background noise monitoring was undertaken at six NMLs (as shown on Figure 12-3) over the period of the 7th of December 2022 to the 31st of January 2023. The background noise levels measured in 2023 are judged to be representative in 2026 (at the time of writing this EIAR), as there are no significant noise sources in the area (motorway, industries etc) that have been since removed.

The NMLs were installed, where possible within, or in proximity to, the amenity area at the residential dwellings. The noise monitoring equipment was sited with due consideration of local noise sources such as boiler flues, watercourses, and vegetation. Further details on the NMLs can be found within Appendix 12-2.

Table 12-6: Summary of Noise Monitoring Locations

Receptor	ITM X	ITM Y
NML1	631910	664977
NML2	632533	666566
NML3	634614	668001
NML4	636812	667441
NML5	636332	666030
NML6	633907	664410

Simultaneous wind speed/direction data were recorded within the Proposed Wind Farm at various heights using a LiDAR device located at ITM coordinates 634846, 665189. The wind speed data collected at 109 m and 99 m was used to calculate wind speed at 103.5 m (proposed hub height) which was then standardised to 10 m height in accordance with good practice.

Wind speed/direction and rainfall data were collected over the same time scale and averaged over the same ten-minute periods as the noise data to allow analysis of the measured background noise as a function of wind speed and wind direction. All data analysis was undertaken in accordance with ARWTN and the IOA GPG.

12.4.4 Criteria for the Assessment of Effects

The Environmental Protection Agency document *'Guidelines on the information to be contained in Environmental Impact Assessment Reports'* [13] has been adhered to for the assessment of potential effects as summarised below.

[13] *The Environmental Protection Agency, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports*

12.4.4.1 Criteria for Assessing Significance – Construction Noise

The significance criteria adopted for this assessment are based on Appendix E part E.3.2 of BS 5228-1:2009+A1:2014 and detailed in Table 12-7 below.

Table 12-7: Construction Noise Significance Criteria

Significance of Effect	Significance Level	
	Not Significant	Potentially Significant
Category A Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)	≤65dB $L_{Aeq, T}$	>65dB $L_{Aeq, T}$
Category A Evenings and Weekends (19:00 – 23:00)	<55dB $L_{Aeq, T}$	>55dB $L_{Aeq, T}$
Category A Night-time (23:00 – 07:00)	<45dB $L_{Aeq, T}$	>45dB $L_{Aeq, T}$
Note: The L_{Aeq} is the A-weighted, equivalent continuous sound level in decibels measured over a stated period of time, ($L_{Aeq,T}$) where T is the length of the assessment period (Time).		

It should be noted that exceedance of the limit does not in itself indicate a significant effect, rather, the standard states: '*If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect.*'

12.4.4.2 Criteria for Assessing Significance – Construction Traffic Noise

DMRB provides values for Magnitude of Change in the 'short-term' and 'long-term'. Short-term refers to year one/the year of opening, whereas long-term refers to year 15. The assessment for short-term is much more stringent, with a change of +5 dB indicating a Major Magnitude of Change, as opposed to +10 dB for Major, which is used for the long-term.

The values for short-term Magnitude of Change are most appropriate to assess a construction phase, as construction noise will be of a short-duration and temporary i.e. there is no long-term construction noise.

Table 12-8: Construction Traffic Magnitude of impact at receptors (Table 3.17 of LA 111, DMRB)

Short Term Magnitude	Short Term Noise Change (dB LA10, 18-hour)
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	Less than 1.0

As stated previously, as there is no specific methodology for the assessment of construction traffic noise, an 'Initial Assessment of Operational Noise Significance' is then undertaken in line with the DMRB, with due regard to the values presented in Table 12-8, where:

- A Major or Moderate magnitude of change is deemed to be Significant; and,
- A Negligible or Minor magnitude of change is deemed to be Not Significant.
- The levels of magnitude of change in the above bullets are taken directly from DMRB.

The DMRB states: *'Where the magnitude of change in the short term is negligible at noise sensitive buildings, it shall be concluded that the noise change will not cause changes to behaviour or response to noise and as such, will not give rise to a likely significant effect.'*

Where a Minor, Moderate or Major magnitude of change is identified, then additional considerations need to be made to determine the 'Final Operational Significance on Noise Sensitive Buildings' in line with the DMRB. These considerations may include:

- Noise level change (whether the magnitude of change is close to the minor/moderate boundary);
- Differing magnitude of change in the long term to magnitude of impact in the short term;
- Absolute noise level with reference to 55 dB L10, 18-hour (façade) threshold and the SOAEL of 65 dB L10, 18-hour (façade);
- Location of noise sensitive parts of a receptor;
- Acoustic context; and
- Likely perception of change by residents.

12.4.4.3 Criteria for Assessing Significance – Wind Turbine Operational Noise

The Guidelines (DoEHLG, 2006) and ARWTN do not define significance criteria but describe a framework for the measurement of wind farm noise and give indicative noise levels considered to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development. Achievement of the Guidelines (DoEHLG, 2006) derived noise limits ensures that noise from the Proposed Wind Farm will comply with current Government guidance.

In terms of the EIA Regulations, in this noise and vibration assessment the use of the term "significance" refers to compliance or non-compliance with the Guidelines (DoEHLG, 2006) derived noise limits. For situations where predicted wind turbine noise meets or is less than the noise limits defined in the Guidelines (DoEHLG, 2006), then the noise effects are deemed not significant. Any breach of the derived Total Guidelines (DoEHLG, 2006) or Site Specific Noise Limits due to the Proposed Wind Farm has the potential to result in a significant effect.

It is not possible to predict if AM will occur at any given site and if it does, how frequent and sustained it might be. The significance of AM will depend on its intensity, frequency of occurrence and duration, however it has the potential to be significant if it occurs at any wind farm. As it cannot be predicted or assessed in advance, mitigation measures can be adopted. A brief outline of the proposed approach following receipt of AM reported to the Local Authority has been provided in Section 12.7.2.

12.4.4.4 Limitations and Assumptions

The noise data collected during the background noise survey are representative of the typical background noise levels at the nearest NSRs. The guidance in the Guidelines (DoEHLG, 2006) supplemented by ARWTN and the IOA GPG has been followed by suitably experienced Acoustic Consultants to ensure that the data collected is as representative as possible.

For the assessment locations where no background noise measurements were undertaken, noise data collected at proxy locations deemed representative of the background noise environment was used to assess the noise impacts at those receptors.

For construction noise, predictions have been undertaken based on an indicative construction programme and typical activities expected.

No other assumptions or data gaps have been identified.

12.5 Baseline Conditions

12.5.1 Current Baseline

The Proposed Wind Farm is located within a rural location where existing background noise levels at the NSRs are generally considered to be low (<30 dB at low wind speeds as defined in the Guidelines (DoEHLG, 2006)[14]). The predominant sound sources in the area include wind induced noise (wind passing through vegetation), agricultural activity, and birdsong, with cars on local roads also audible on occasions.

Table 12-9 and Table 12-10 provide a summary of the background noise levels measured during the monitoring period during the quiet daytime and night-time periods. Background noise data recorded during periods of rainfall (including the preceding 10-minute period in line with IOA GPG, as well as the 10-minute period post-rainfall) have been excluded from the dataset, as well as other atypical data in accordance with best practice. Further information of the data recorded during the noise survey can be found in Appendix 12-2.

Table 12-9: Summary of Prevailing Background Noise Levels during Quiet Daytime Periods (dB(A))

Noise Monitoring Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	27.9	29.5	30.7	31.4	32.0	32.6	33.3	34.3	35.7	37.8	40.7	44.5
NML2	30.1	32.3	33.7	34.6	35.2	35.6	36.2	37.1	38.6	40.9	44.2	48.8
NML3	24.5	26.0	27.8	29.9	32.2	34.8	37.5	40.5	43.6	46.8	50.2	53.6
NML4	25.3	26.0	26.7	27.5	28.4	29.6	31.1	32.9	35.3	38.2	41.7	45.9
NML5	28.7*	28.7	28.8	29.5	30.7	32.3	34.4	36.8	39.6	42.6	45.8	49.3
NML6	29.1*	29.1*	29.1	29.4	30.3	31.6	33.3	35.5	38.2	41.3	44.8	48.8

Table 12-10: Summary of Prevailing Background Noise Levels during Night-time Periods (dB(A))

Noise Monitoring Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1	23.5*	23.5	23.6	24.0	24.7	25.9	27.6	29.7	32.5	35.8	39.9	44.6

[14] *Section 5.4 of the DoEHLG 2006 Guidelines refers to ' low noise environments where background noise is less than 30 dB(A)'*

Noise Monitoring Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML2	24.4*	24.4	24.7	25.6	27.0	28.8	31.0	33.6	36.5	39.6	42.9	46.3
NML3	23.5	24.5	26.1	28.2	30.7	33.5	36.5	39.6	42.8	45.9	48.8	51.5
NML4	23.9*	23.9*	23.9	24.5	25.8	27.7	30.1	32.8	35.7	38.9	42.1	45.3
NML5	25.4*	25.4*	25.4	26.0	27.4	29.5	32.1	35.2	38.6	42.2	45.9	49.7
NML6	23.6*	23.6*	23.6	24.3	25.7	27.8	30.4	33.4	36.7	40.2	43.9	47.6

** Flatlined where derived minimum occurs at a lower or higher wind speed, see Section 5.8 of Appendix 12.2: Operational Noise Report.*

12.5.2 Future Baseline

Based on available information, the baseline environment is not expected to change significantly with regards to noise over the operational life of the Proposed Project as there are no known plans to introduce significant sources of noise which could influence background noise levels, such as new major road schemes for example.

For construction traffic noise, baseline traffic flow data has been taken from the Traffic Management Plan, Appendix 15-2 and scaled up for a 2032 baseline year.

12.5.3 Summary of Sensitive Receptors

12.5.3.1 Scoped Out Receptors

All of the buildings within c. 2 km of the Proposed Turbines have been identified. NSRs 335, 357, 366, 367, 370 are all either unoccupied or non-residential, therefore they have not been considered as NSRs. It has been assumed that the unoccupied receptors will be remain as so for the lifetime of the Proposed Project. The locations of the NSRs are presented in Figure 12-2.

12.5.3.2 Scoped In Receptors

Of all the NSRs identified within the approximate 2 km search area (see Figure 12-2) around the Proposed Wind Farm, Proposed BESS and Substation, a sample of the nearest and likely to be most sensitive to noise were selected as Noise Assessment Locations (NALs), Construction Noise Assessment Locations (CNALs), and BESS and Substation Noise Assessment Locations (BNALs). Additionally, a sample of NSRs most likely to be affected by HDD activities on the Proposed 110kV Underground Cabling were manually identified as Grid Connection Noise Assessment Locations (GNALs).

These were chosen to represent the noise sensitive receptors located closest to the Proposed Project during either the construction or operational phase. The construction noise assessment for the Proposed Grid Connection also considers the typical noise levels that are likely to occur along the length of the route to address works such as joint bays, turbine delivery route junction improvements and trenching and backfill.

The assessment results for the CNALs, BNALs. GNALs, and NALs have been presented within the main body of this report, whilst noise predictions for all other NSRs have been included for completeness within Annex 4 of Appendix 12-1, and Annex 5 of Appendix 12-2.

For the assessment locations where no background noise measurements were undertaken, noise data collected at proxy locations deemed representative of the background noise environment was used to assess the noise impacts at those receptors.

12.6 Assessment of Likely Effects

12.6.1 'Do-Nothing' Scenario

In this scenario, the Proposed Project would not be constructed, therefore there would be no significant effects in relation to noise. This would be at the expense of renewable energy generation (which will have subsequent knock-on effects on meeting the Government and EU 2030 targets).

If the Proposed Project were not to proceed, the opportunity to capture part of Ireland's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources by 2030 and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment and to diversify the local economy would also be lost.

12.6.2 Potential Construction Noise Effects

Table 12-11 presents the thresholds from BS 5228 Category A (lowest thresholds in the ABC method) and the calculated noise immission levels at each CNAL for all modelled scenarios. Full details of the modelling and assessment can be found in Appendix 12-1.

Table 12-11: Predicted Construction Noise Immission Levels for the Proposed Wind Farm

CNAL	Category A Threshold dB $L_{Aeq, t}$			Immission Level, dB $L_{Aeq, t}$ for each Quarter							
	Daytime (07:00 – 19:00) and Saturdays (07:00 - 13:00)	Evenings (19:00-23:00 weekdays.) Weekends (13:00-23:00 Saturdays and 07:00-23:00 Sundays)	Night-Time (23:00 – 07:00)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Night-time
CNAL01	65	55	45	42	40	45	42	43	33	24	13
CNAL02	65	55	45	43	43	43	44	41	38	33	23
CNAL03	65	55	45	47	53	51	52	51	44	44	33
CNAL04	65	55	45	40	61	41	42	41	38	33	22
CNAL05	65	55	45	62	56	61	58	61	58	33	22
CNAL06	65	55	45	42	42	42	43	42	40	33	24

The Proposed Wind Farm construction noise assessment results show that the predicted construction noise levels are below the 65 dB(A) threshold level at all CNALs for all assessment scenarios (Q1-Q7).

No construction activities are proposed during the night-time, however, a night-time scenario is included in the assessment in case of generator usage at night, for infrastructure such as welfare facilities and lighting only. It should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair-weather windows for concrete deliveries, the erection of turbine blades and the erection and dismantling of cranes. No working shall usually be undertaken outside core hours without prior agreement with the relevant Local Authority (LA). The predicted noise levels for this scenario are below the night-time 45 dBA threshold level.

Construction works related to distant road junction improvements, e.g. along the turbine delivery route, may also occur outside of the assessment locations considered above, in close proximity to some residential receptors. It is possible that noise from these activities may at times exceed the guideline levels, however it should be noted that this will be a short-term, temporary impact. Good practice during construction is recommended and will reduce noise levels from these short-term works to minimum levels. Further detail is provided in Appendix 12-1.

Accordingly, the effect is deemed **not significant for construction associated with the Proposed Project**.

There may be a requirement for HDD at two watercourse crossings. HDD for large crossings will require the use of multiple items of plant including pumps, mud recyclers, drilling rigs and generators. However, a typical piece of plant proposed for the small crossings required for the Proposed Grid Connection is the Vermeer D36 x 50 Directional Drill (or similar). For small crossings, the work will likely be completed within 1 and 2 weeks so it will be short-term activity. The Vermeer D36 plant is much smaller than many DD rigs and requires less associated plant. A single-figure broadband sound power level (SWL) is available for this plant, however no spectral SWL data were available, as such, the one-third octave band SWL for an appropriate engine presented in the standard noise control textbook Engineering Noise Control (Bies and Hansen) has been used to supplement the broadband SWL. No HDD activities will take place outside of the core working hours.

A sample of Grid Connection Noise Assessment Locations (GNALs) have been chosen to represent the closest NSR or group of NSRs to the anticipated HDD construction activities for the Proposed 110kV Underground Cabling HDD. These are shown in Figure 12-2. The most conservative BS 5228 Category A Daytime Thresholds has been adopted at the GNALs. The predicted noise immission levels for these GNALs are shown below.

Table 12-12: Predicted Construction Noise Immission Levels for HDD activities

GNAL	Category A Threshold dB $L_{Aeq,t}$ Daytime (07:00 – 19:00) and Saturdays (07:00 - 13:00)	Daytime Predictions (dB)
GNAL 01	65	56
GNAL 02	65	64
GNAL 03	65	63
GNAL 04	65	44
GNAL 05	65	40

The immission levels resulting from both modelled HDD construction activities meet the 65 dB(A) BS 5228 Daytime Threshold values. Good practice during construction will also be applied. As such, the noise effect from HDD for the Proposed 110kV Underground Cabling are anticipated to be not significant.

For the trenching and backfill activities for the Proposed 110kV Underground Cabling, the amount of required plant is relatively small, typically being based around an excavator. Where trenching and backfill activities occur besides an NSR, the noise levels at that location are likely to be in the region of 75 – 80 dB(A) for a short period of time. It should be noted, however, that this will only occur where construction activities are close to an NSR. To put this into context, trenching and backfill activities are anticipated to move along the Proposed 110kV Underground Cabling at approximately 150 m to 300 m a day, therefore, the length of time when construction activities will be occurring adjacent to any given receptor is only likely to be for a few hours. For the majority of the time, plant and equipment will be located at greater distances and noise levels will be lower. As such, construction activities in any one location will be limited in duration and noise effect from trenching and backfill for the Proposed 110kV Underground Cabling are anticipated to be not significant.

17 no. joint bays will be established at regular intervals along the Proposed 110kV Underground Cabling. The estimated duration is expected to take less than one week per jointing bay (including pulling the cable between each joint bay) and so any effect will be temporary in nature. Therefore, any effects will be considered as 'temporary' at NSRs. Construction of joint bays will require an excavator and dumper, operators of hand tools. There may be a requirement for water to be pumped out of the joint bays in the event of heavy rainfall, and an area of hardstanding may be established for the siting of temporary equipment.

Calculations of the required plant for jointing bays listed above, using data from BS 5228, indicates that noise levels will be below the 65 dB Category A Daytime Threshold from a distance of approx. 50 m. Six of the 17 no. joint bay locations have a residential property close to, or within 50 m of the joint bay location. For these receptors, noise levels may occasionally exceed the BS 5228 Category A Daytime Threshold levels although this will only occur for a brief period of time at any one location. No jointing bay works will take place during the Evening and Weekend Period, or the Night-time period. The model assumes that all construction machinery is operating concurrently and continuously, which in reality will not be the case, as equipment is turned off and on as required. Additionally, as construction noise effects due to the joint bays will be 'temporary', actual immission levels are likely to be lower than predicted. As such, the noise effects of jointing bay for the Proposed 110kV Underground Cabling are anticipated to be not significant.

It should be noted that GNAL01 is one of the residential properties located within 50 m of a joint bay location, where the predicted levels are above 65 dB. This joint bay location can be seen in Figure 12-2. GNALs 2 and 3 are also located within 200 m of this joint bay. Therefore, if the HDD activities near GNAL1, 2, and 3 are conducted concurrently with the joint bay activities, the cumulative predicted levels have the potential to exceed the Category A Daytime Threshold. Therefore, to minimise noise, the works at this joint bay shall be scheduled, if possible, to avoid being at the same time as the HDD works adjacent.

Accordingly, the impact is deemed **not significant for all construction activities (trenching and backfill, HDD, joint bays) associated with** the Proposed 110kV Underground Cabling.

12.6.3 Potential Construction Vibration Effects

As detailed in Section 12.4.1.2, due to the separation distances and temporary nature of work in close proximity to any receptor and key construction activity area, as per the findings of the construction noise assessment, construction vibration effects are deemed **not significant.** Good practice during construction will also be applied.

12.6.4 Potential Construction Traffic Noise Effects

12.6.4.1 Stage 1 – Scoping Assessment

The Stage 1 scoping assessment determines which roads need to be assessed through noise propagation modelling and which roads will experience negligible noise effects. It compares the 2032 future baseline average vehicle movements from 07:00 -19:00 with the 'Total Traffic Flow', which is the 2032 baseline numbers plus the additional construction vehicle movements per working day. All values were provided in the transport assessment as 24-hour flows and have been adjusted to 18-hour traffic flow for the purpose of this assessment (CRTN requires 18h-flows to calculate LA10,18h dB values).

The construction period/activity with the highest percentage increase above the predicted baseline is for the works occurring during concrete pouring within the Proposed Wind Farm. Table 12-13 details the anticipated vehicle flow for this construction period, which is expected to last for only 10 days. For all other construction activities outside of these 10 days, the increase in road traffic during those periods is less than the 25% threshold (as defined in Section 12.4.1.3.1) for all roads listed in Table 12-13.

Table 12-13: Summary of construction related traffic flow increase during concrete pouring

Link	Baseline 18h traffic flow in 2032	Proposed Project Construction traffic flow	Total 18h traffic flow	% increase	Estimated No. of days
1 – R639 – South of L4115 Longfordpass North	3,852	555	4,407	12.6%	10
2 – R693 – East of Urlingford	4,141	558	4,700	11.9%	10
3 – R693 – West of site access	5,903	558	6,461	8.6%	10
4 - L4115 Longfordpass North	1,304	550	1,854	29.6%	10
5 – L1818	1,049	557	1,606	34.7%	10
6 – R693 – East of site access	7,268	564	7,832	7.20%	10

Two roads have been identified as having an increase in road traffic during concrete pouring of more than 25%: L4115 – Longfordpass North, and L1818. These roads are indicated in yellow on Figure 12-6. As such, these roads have been identified for consideration as part of the Stage 2 Simple Assessment.

For the remaining assessment roads, the traffic noise levels will increase by less than 1 dB and therefore the road traffic noise effects are negligible, and no further assessment is required. The roads scoped out of further assessment are shown in green in Figure 12-6.

12.6.4.2 Stage 2 – Simple Assessment

Noise levels from the Total Traffic Flow for assessment roads, have been calculated in accordance with CRTN and DMRB. Figure 12-7 and Figure 12-8 details the noise contour plots for the assessment roads.

A 50 m study around the L4115 and the L1818 roads (henceforth referred to as 'assessment roads') has been defined and all residential NSRs located within these study areas identified.

On each of the contour plots, the boundary of the grey contour areas indicates the 55 dBA line. Accordingly, areas that are red, or purple indicate noise levels in excess of the DMRB threshold value of 55 dB LA10(18-hour).

It can be seen on the figures that there are multiple properties along the road where noise levels, for both scenarios, exceed 55 dB LA10(18-hour) and these are located at close proximity to the road. Both assessment roads include properties where noise levels exceed the DMRB LOAEL value of 55 dB LA10(18-hour), therefore a Stage 3 Detailed Assessment is required.

12.6.4.3 Stage 3 – Detailed Assessment

The Stage 3 Detailed Assessment requires an Initial Assessment of Operational Noise Significance to be carried out to determine the magnitude of change by comparing the Do Minimum and Do Something noise levels. This is detailed in Figure 12-7 and Figure 12-8, where the change in noise level per NSR is indicated with a coloured circle:

- Green indicates a change in noise level of 0 dB to 2.9 dB (minor);
- Yellow indicates a change in noise level of 3 dB to 4.9 dB (moderate); and
- Red indicates a change in noise level greater than or equal to 5 dB (major).

For the L4115, the majority of NSRs are subject to a magnitude of change that is minor, with three NSRs indicating a moderate magnitude of change. For the L1818, the majority of NSRs are subject to a magnitude of change that is moderate, with three NSRs indicating a potential major magnitude of change. To determine the Final Operational Significance on Noise Sensitive Buildings it is necessary to consider the context, which may change the initial findings.

Although some NSRs are predicted to experience a moderate or major magnitude of change, further consideration needs to be given to these predictions. The construction road traffic impacts will only be temporary; the predictions consider a 10-day construction period only. The construction traffic effects predicted during concrete pouring will be limited to a very short period and will cease entirely upon completion. The other construction-phase periods (e.g. turbine construction, site preparation and ground works) have much lower construction traffic flows, and the increase in road traffic during those periods will be less than 25 % for all roads.

Finally, the assessment of road traffic noise is inherently conservative, as it considers maximum levels of traffic flow that may occur throughout an 18-hour period, however, in reality traffic flows will be less for much of the time, resulting in lower levels.

With due regard to the construction traffic flows noise predictions and contextual elements, the assessment concludes that there will be **no significant effect** from construction traffic noise.

12.6.5 Potential Operational Noise Effects

12.6.5.1 Setting the Total Guidelines (DoEHLG, 2006) Noise Limits (Stage 1)

Based on the prevailing background noise levels, the Total Guidelines (DoEHLG, 2006) Noise Limits have been established for NALs 1-11 as detailed in the two tables below (Daytime and Nigh-time). Since NAL12 and NAL13 are both located closer to Lisdowney Wind Farm than the Proposed Wind Farm, the conditioned limits from Lisdowney Wind Farm (condition 11) have been adopted at these two properties.

Table 12-14: Total DoEHLG 2006 Guidelines Noise Limit - Daytime

Noise Assessment Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL1	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
NAL2	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
NAL3	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
NAL4	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
NAL5	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
NAL6	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
NAL7	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL8	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL9	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
NAL10	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
NAL11	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
NAL12	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
NAL13	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Table 12-15: Total Guidelines (DoEHLG, 2006) Noise Limit – Night-time

Noise Assessment Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
NAL2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
NAL3	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
NAL4	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
NAL5	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9	49.6
NAL6	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
NAL7	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL8	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL9	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
NAL10	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
NAL11	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
NAL12	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
NAL13	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

12.6.5.2 Predicting the Likely Effects and the Requirement for a Cumulative Noise Assessment (Stage 2)

A likely cumulative noise assessment was undertaken at the NALs and the results of the cumulative assessment are shown in the two tables below (Daytime and Night-time). The Tables detail the Total Guidelines (DoEHLG, 2006) Noise Limits and predicted likely cumulative Proposed Wind Farm noise levels for daytime hours and night-time hours, when using the Nordex N163 6.X MW with Serrated Blades on a 103.5 m hub, as the candidate wind turbine for the Proposed Wind Farm. To note, 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 5m/s

The results show that the predicted cumulative wind turbine noise immission levels meet the 'Total Guidelines (DoEHLG, 2006) Noise limits' under all conditions, with a small exception of NAL13 in night-time 8-12m/s where there is a marginal exceedance. However, this is not due to the Proposed Wind Farm, as it is not contributing to the cumulative levels at this location. This marginal exceedance is most likely due to cautious predictions in this assessment for both Gathabawn and Lisdowney which are the primary contributing wind farms at NAL13.

The locations where the Proposed Wind Farm is not dominant are NALs 10-13. For NALs 10-11, the Proposed Wind Farms's contribution is slightly above that of Gathabawn Wind Farm. For the further locations NAL12 and NAL13 which are nearer to Lisdowney Wind Farm, the Proposed Wind Farm's contribution is relatively low (30 dB maximum is predicted) and both the Lisdowney Wind Farm and Gathabawn Wind Farm noise are dominant.

Therefore, **no significant effects due to the operation of the Proposed Wind Farm are predicted at these receptors**.

Table 12-16: Compliance Table – Comparison of predicted likely cumulative noise levels (all schemes) against the Total Guidelines (DoEHLG, 2006) Noise Limit at each receptor – Daytime

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-	-	-8.9	-4.4	-3.3	-3.3	-3.3	-5.9	-9.1	-12.6
NAL2	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-12.3	-7.8	-6.7	-6.7	-6.7	-9.3	-12.5	-16.0
NAL3	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-	-9.2	-4.7	-3.6	-3.6	-3.6	-4.9	-8.4	-12.4
NAL4	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-	-15.9	-11.5	-10.4	-10.4	-10.4	-11.7	-15.2	-19.2
NAL5	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	26.3	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-	-18.7	-14.4	-13.3	-13.3	-13.3	-13.3	-14.0	-17.8
NAL6	Total Guidelines (DoEHLG, 2006) Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.9	49.2	53.8
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-	-	-10.4	-5.9	-4.8	-4.8	-4.8	-5.7	-9.0	-13.6
NAL7	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-	-	-10.0	-5.6	-4.6	-5.1	-8.2	-11.4	-14.8	-18.2

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL8	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-	-9.7	-5.2	-4.1	-4.6	-7.7	-10.9	-14.3	-17.7
NAL9	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.5	48.6	51.8	55.2	58.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-	-	-9.9	-5.5	-4.5	-5.0	-8.1	-11.3	-14.7	-18.1
NAL10	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-	-	-8.7	-4.5	-8.6	-8.5	-8.5	-8.5	-10.2	-14.4
NAL11	Total Guidelines (DoEHLG, 2006) Noise Limit	40.0	40.0	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	46.7	50.9
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-	-9.2	-5.2	-9.2	-9.1	-9.1	-9.1	-10.8	-15.0
NAL12	Total Guidelines (DoEHLG, 2006) Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.0	39.5	40.5	40.7	40.7	40.7	40.7	40.7
	Exceedance Level	-	-	-	-	-8.9	-4.4	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
NAL13	Total Guidelines (DoEHLG, 2006) Noise Limit	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.9	41.0	42.6	43.2	43.3	43.3	43.3	43.3
	Exceedance Level	-	-	-	-	-8.1	-4.0	-2.4	-1.8	-1.7	-1.7	-1.7	-1.7

Table 12-17: Compliance Table – Comparison of predicted likely cumulative noise levels (all schemes) against the Total Guidelines (DoEHLG, 2006) Noise Limit at each receptor – Night-time

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.1	40.6	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level	-	-	-	-	-6.9	-2.4	-1.3	-1.3	-1.9	-5.5	-9.2	-13.0
NAL2	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.6	47.2	50.9	54.7
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	32.7	37.2	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level	-	-	-	-	-10.3	-5.8	-4.7	-4.7	-5.3	-8.9	-12.6	-16.4
NAL3	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-	-7.2	-2.7	-1.6	-1.6	-1.6	-3.8	-7.5	-11.2
NAL4	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	29.1	33.5	34.6	34.6	34.6	34.6	34.6	34.6
	Exceedance Level	-	-	-	-	-13.9	-9.5	-8.4	-8.4	-8.4	-10.6	-14.3	-18.0
NAL5	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.9	49.6
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	26.3	30.6	31.7	31.7	31.7	31.7	31.7	31.7
	Exceedance Level	-	-	-	-	-16.7	-12.4	-11.3	-11.3	-11.3	-11.3	-13.2	-17.9
NAL6	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.9	51.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-	-	-8.4	-3.9	-2.8	-2.8	-2.8	-4.4	-7.7	-11.1
NAL7	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.0	39.4	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level	-	-	-	-	-8.0	-3.6	-2.6	-4.2	-7.4	-10.5	-13.4	-16.1

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL8	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.3	39.8	40.9	40.9	40.9	40.9	40.9	40.9
	Exceedance Level	-	-	-	-	-7.7	-3.2	-2.1	-3.7	-6.9	-10.0	-12.9	-15.6
NAL9	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.6	47.8	50.9	53.8	56.5
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	35.1	39.5	40.5	40.5	40.5	40.5	40.5	40.5
	Exceedance Level	-	-	-	-	-7.9	-3.5	-2.5	-4.1	-7.3	-10.4	-13.3	-16.0
NAL10	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	31.3	35.5	36.4	36.5	36.5	36.5	36.5	36.5
	Exceedance Level	-	-	-	-	-11.7	-7.5	-6.6	-6.5	-6.5	-7.4	-10.6	-13.8
NAL11	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.9	47.1	50.3
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	30.8	34.8	35.8	35.9	35.9	35.9	35.9	35.9
	Exceedance Level	-	-	-	-	-12.2	-8.2	-7.2	-7.1	-7.1	-8.0	-11.2	-14.4
NAL12	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.0	39.5	40.5	40.7	40.7	40.7	40.7	40.7
	Exceedance Level	-	-	-	-	-6.9	-2.4	-1.3	-1.3	-1.3	-1.3	-1.3	-1.3
NAL13	Total Guidelines (DoEHLG, 2006) Noise Limit	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Predicted Cumulative Wind Turbine Noise L_{A90}	-	-	-	-	36.9	41.0	42.6	43.2	43.3	43.3	43.3	43.3
	Exceedance Level	-	-	-	-	-6.1	-2.0	-0.4	0.2	0.3	0.3	0.3	0.3

12.6.5.3 Operational Phase - Derivation of Site-Specific Noise Limits for the Proposed Wind Farm (Stage 3)

It is demonstrated in the Stage 2 assessment above that cumulatively, all wind farms (including the Proposed Wind Farm) are predicted to operate within the Total Guidelines (DoEHLG, 2006) Noise Limits.

The IOA GPG then recommends that;

'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.'

To ensure that no cumulative excess of the total Guidelines (DoEHLG, 2006) limits will occur, a set of Site Specific Noise limits for the Proposed Wind Farm are required. 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. The table below summarises the approach adopted at each NAL to derive the Site-Specific Noise Limits.

Table 12-18: Site Specific Noise Limit Derivation Strategy

NAL	Limit Derivation Strategy
NALs 1-6	The likely predicted levels from other schemes were found to be more than 10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limits and as such the entire noise limits has been allocated to the Proposed Wind Farm. This result in Site Specific Noise Limit being equal to the Total WEDG Noise Limit.
NALs 7-11	The likely predicted levels from other schemes (mostly Gathabawn) were found to be within 10 dB of the Total Guidelines (DoEHLG, 2006) Noise Limits by a small margin, as such the Site Specific Noise Limit has been set to the logarithmic subtraction of the cautious predicted cumulative levels from other schemes from the Total Guidelines (DoEHLG, 2006) Noise Limit. This result in Site Specific Noise Limit being nearly equals to the entire Total Guidelines (DoEHLG, 2006) Noise Limit.
NALs 12 - 13	Predicted levels from the Proposed Wind Farm are more than 10 dB below the Total WEDG Noise Limit (which are the conditioned limits for Lisdowney Wind Farm). Therefore, the Site Specific Noise Limits have been set to 10 dB below the Total Guidelines (DoEHLG, 2006) Noise Limit.

The Site Specific Noise Limits were compared to the predictions of the Proposed Wind Farm operating on its own, and the results, based on the candidate turbine for the Proposed Wind Farm (Nordex N163), are summarised below in the two tables below (daytime and night-time).

The Stage 3 assessment shows that the predicted wind turbine noise levels from the Proposed Wind Farm on its own meet the Site Specific Noise Limits at all NALs for both daytime and night-time periods, there will be **no significant effects** at those receptors.

Table 12-19: Compliance Table – Comparison of predicted noise levels from the Proposed Wind Farm against the Site Specific Noise Limits at each receptor – Daytime

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	45.0	44.9	44.9	44.9	44.9	47.5	50.8	54.3
	Predicted Wind Turbine Noise LA90	-	-	-	31.5	36.0	40.5	41.6	41.6	41.6	41.6	41.6	41.6
	Exceedance Level	-	-	-	-8.5	-9.0	-4.4	-3.3	-3.3	-3.3	-6.0	-9.2	-12.7
NAL02	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	47.6	50.8	54.3
	Predicted Wind Turbine Noise LA90	-	-	-	28.0	32.5	37.0	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-12.0	-12.5	-8.0	-6.9	-6.9	-6.9	-9.5	-12.7	-16.2
NAL03	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Wind Turbine Noise LA90	-	-	-	31.3	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-8.7	-9.2	-4.7	-3.6	-3.6	-3.6	-4.9	-8.4	-12.4
NAL04	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	45.0	45.0	45.0	45.0	45.0	46.3	49.8	53.8
	Predicted Wind Turbine Noise LA90	-	-	-	24.4	28.9	33.4	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-15.6	-16.1	-11.6	-10.5	-10.5	-10.5	-11.8	-15.3	-19.3
NAL05	Site Specific Noise Limit LA90	40.0	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.7	49.5
	Predicted Wind Turbine Noise LA90	-	-	-	21.0	25.5	30.0	31.1	31.1	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-24.0	-19.5	-15.0	-13.9	-13.9	-13.9	-13.9	-14.6	-18.4
NAL06	Site Specific Noise Limit LA90	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.9	44.9	45.9	49.2	53.8
	Predicted Wind Turbine Noise LA90	-	-	-	30.0	34.5	39.0	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-15.0	-10.5	-6.0	-4.9	-4.9	-4.9	-5.8	-9.1	-13.7
NAL07	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	44.9	44.8	44.8	45.3	48.5	51.7	55.2	58.6
	Predicted Wind Turbine Noise LA90	-	-	-	29.9	34.4	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-10.1	-10.5	-5.9	-4.8	-5.3	-8.5	-11.8	-15.2	-18.6
NAL08	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	44.9	44.7	44.7	45.2	48.5	51.7	55.2	58.6
	Predicted Wind Turbine Noise LA90	-	-	-	30.5	35.0	39.5	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level	-	-	-	-9.5	-9.8	-5.2	-4.0	-4.6	-7.8	-11.1	-14.5	-17.9
NAL09	Site Specific Noise Limit LA90	40.0	40.0	40.0	40.0	44.9	44.7	44.7	45.2	48.5	51.7	55.2	58.6
	Predicted Wind Turbine Noise LA90	-	-	-	30.1	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2
	Exceedance Level	-	-	-	-9.9	-10.3	-5.7	-4.5	-5.0	-8.3	-11.6	-15.0	-18.4

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL10	Site Specific Noise Limit LA90	39.6	39.6	39.6	39.6	39.6	39.0	44.6	44.6	44.6	44.6	46.4	50.8
	Predicted Wind Turbine Noise LA90	-	-	-	24.7	29.2	33.7	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-14.9	-10.4	-5.2	-9.8	-9.8	-9.8	-9.8	-11.6	-16.0
NAL11	Site Specific Noise Limit LA90	39.6	39.6	39.6	39.6	39.6	39.1	44.7	44.7	44.7	44.7	46.5	50.8
	Predicted Wind Turbine Noise LA90	-	-	-	24.1	28.6	33.1	34.2	34.2	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-	-15.6	-11.1	-6.1	-10.5	-10.5	-10.5	-10.5	-12.3	-16.7
NAL12	Site Specific Noise Limit LA90	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	Predicted Wind Turbine Noise LA90	-	-	-	19.1	23.6	28.1	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-15.9	-11.4	-6.9	-5.8	-5.8	-5.8	-5.8	-5.8	-5.8
NAL13	Site Specific Noise Limit LA90	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	Predicted Wind Turbine Noise LA90	-	-	-	16.9	21.4	25.9	27.0	27.0	27.0	27.0	27.0	27.0
	Exceedance Level	-	-	-	-18.1	-13.6	-9.1	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0

Table 12-20: Compliance Table – Comparison of predicted noise levels from the Proposed Wind Farm against the Site Specific Noise Limits at each receptor - Night-time

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL01	Site Specific Noise Limit LA90	43.0	43.0	43.0	42.9	42.9	42.9	42.8	42.8	43.4	47.1	50.9	54.7
	Predicted Wind Turbine Noise LA90	-	-	-	31.5	36.0	40.5	41.6	41.6	41.6	41.6	41.6	41.6
	Exceedance Level	-	-	-	-11.5	-7.0	-2.4	-1.3	-1.2	-1.9	-5.6	-9.3	-13.1
NAL02	Site Specific Noise Limit LA90	43.0	43.0	43.0	43.0	43.0	43.0	42.9	42.9	43.5	47.2	50.9	54.7
	Predicted Wind Turbine Noise LA90	-	-	-	28.0	32.5	37.0	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level	-	-	-	-15.0	-10.5	-5.9	-4.8	-4.8	-5.4	-9.1	-12.8	-16.6
NAL03	Site Specific Noise Limit LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Wind Turbine Noise LA90	-	-	-	31.3	35.8	40.3	41.4	41.4	41.4	41.4	41.4	41.4
	Exceedance Level	-	-	-	-11.7	-7.2	-2.7	-1.6	-1.6	-1.6	-3.8	-7.5	-11.2
NAL04	Site Specific Noise Limit LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.2	48.9	52.6
	Predicted Wind Turbine Noise LA90	-	-	-	24.4	28.9	33.4	34.5	34.5	34.5	34.5	34.5	34.5
	Exceedance Level	-	-	-	-18.6	-14.1	-9.6	-8.5	-8.5	-8.5	-10.7	-14.4	-18.1
NAL05	Site Specific Noise Limit LA90	43.0	43.0	43.0	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.9	49.6
	Predicted Wind Turbine Noise LA90	-	-	-	21.0	25.5	30.0	31.1	31.1	31.1	31.1	31.1	31.1
	Exceedance Level	-	-	-	-22.0	-17.5	-13.0	-11.8	-11.8	-11.8	-11.8	-13.8	-18.5
NAL06	Site Specific Noise Limit LA90	43.0	43.0	43.0	43.0	43.0	42.9	42.9	42.9	42.9	44.5	47.9	51.3
	Predicted Wind Turbine Noise LA90	-	-	-	30.0	34.5	39.0	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level	-	-	-	-13.0	-8.5	-4.0	-2.9	-2.8	-2.8	-4.5	-7.8	-11.2
NAL07	Site Specific Noise Limit LA90	42.9	42.9	42.9	42.9	42.9	42.7	42.6	44.3	47.7	50.8	53.8	56.5
	Predicted Wind Turbine Noise LA90	-	-	-	29.9	34.4	38.9	40.0	40.0	40.0	40.0	40.0	40.0
	Exceedance Level	-	-	-	-13.0	-8.5	-3.8	-2.6	-4.4	-7.7	-10.9	-13.8	-16.5
NAL08	Site Specific Noise Limit LA90	42.8	42.8	42.8	42.8	42.8	42.6	42.5	44.2	47.6	50.8	53.8	56.5
	Predicted Wind Turbine Noise LA90	-	-	-	30.5	35.0	39.5	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level	-	-	-	-12.3	-7.8	-3.0	-1.8	-3.6	-7.0	-10.2	-13.1	-15.8
NAL09	Site Specific Noise Limit LA90	42.8	42.8	42.8	42.8	42.8	42.6	42.5	44.2	47.6	50.8	53.8	56.5
	Predicted Wind Turbine Noise LA90	-	-	-	30.1	34.6	39.1	40.2	40.2	40.2	40.2	40.2	40.2

NAL		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Exceedance Level	-	-	-	-12.7	-8.2	-3.5	-2.3	-4.1	-7.5	-10.6	-13.6	-16.3
NAL10	Site Specific Noise Limit LA90	42.8	42.8	42.8	42.8	42.8	42.5	42.4	42.4	42.4	43.4	46.9	50.2
	Predicted Wind Turbine Noise LA90	-	-	-	24.7	29.2	33.7	34.8	34.8	34.8	34.8	34.8	34.8
	Exceedance Level	-	-	-	-18.1	-13.6	-8.8	-7.6	-7.5	-7.5	-8.6	-12.0	-15.4
NAL11	Site Specific Noise Limit LA90	42.8	42.8	42.8	42.8	42.8	42.6	42.5	42.5	42.5	43.5	46.9	50.2
	Predicted Wind Turbine Noise LA90	-	-	-	24.1	28.6	33.1	34.2	34.2	34.2	34.2	34.2	34.2
	Exceedance Level	-	-	-	-18.8	-14.3	-9.5	-8.3	-8.3	-8.3	-9.3	-12.7	-16.0
NAL12	Site Specific Noise Limit LA90	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
	Predicted Wind Turbine Noise LA90	-	-	-	19.1	23.6	28.1	29.2	29.2	29.2	29.2	29.2	29.2
	Exceedance Level	-	-	-	-13.9	-9.4	-4.9	-3.8	-3.8	-3.8	-3.8	-3.8	-3.8
NAL13	Site Specific Noise Limit LA90	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
	Predicted Wind Turbine Noise LA90	-	-	-	16.9	21.4	25.9	27.0	27.0	27.0	27.0	27.0	27.0
	Exceedance Level	-	-	-	-16.1	-11.6	-7.1	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0

12.6.5.4 Operational Noise from BESS and 110kV Substation

The operational BESS and 110kV Substation noise assessment results summarised in the table below show that the predicted operational noise levels are below the representative Background Sound Levels at all BNALs for day and night-time periods and therefore there will be **no significant effects**. Full details of the modelling and assessment can be found in Appendix 12-3. BESS assessment locations are shown in Figure 12-5.

Table 12-21: Predicted BESS, 110kV Substation Noise Immission Levels

BNAL	Rating Level (dB)		Background Sound Level (dB)		Difference (+/-)	
	Day	Night	Day	Night	Day	Night
BNAL01	26	26	30	27	-4	-1
BNAL 02	19	19	30	27	-11	-8
BNAL 03	12	12	29	24	-18	-13
BNAL 04	11	11	31	26	-21	-16

12.6.6 Potential Cumulative Effects

Potential cumulative effects from noise between the Proposed Project and other permitted or proposed projects and plans in the area (wind energy or otherwise), as set out in Section 2.9 in Chapter 2 of this EIAR, are set out below. Cumulative wind farms within 10km of the Proposed Wind Farm are shown on Figure 12-4.

12.6.6.1 Construction Phase

The construction activities in close proximity to any receptors are very short term in nature (lasting a few weeks at most) and it is not anticipated that any other proposed development will have construction activity at the same time in close proximity to receptors. Therefore, **no significant cumulative noise effects are anticipated in relation to the construction of the Proposed Wind Farm** and other permitted or proposed projects and plans in the area.

No significant cumulative noise effects are anticipated in relation to construction of the Proposed 110kV Underground Cabling and other permitted or proposed projects and plans in the area, as set out in Section 2.9 in Chapter 2 of this EIAR, as construction activities will be transient in nature along the route and will not be in any one location long enough for a significant effect to occur. If construction timetables from other major cumulative projects show a clear overlap with construction of the Proposed Project, these will be assessed in more detail once information is available.

12.6.6.2 Operational Phase

The Proposed Wind Farm operational noise assessment has already taken cumulative impacts with other permitted nearby wind farms into consideration, as described in the above assessment. The likely cumulative operational noise assessment show that the Proposed Wind Farm can operate concurrently with the operational and permitted wind farms and there will therefore be **no significant cumulative wind turbines operational noise effects** at all NALs.

12.7 Mitigation

12.7.1 Mitigation during Construction

No significant effects resulting from construction noise are predicted. Nevertheless, good practice measures to reduce and control noise during construction activities is recommended and will be detailed in a Construction Environmental Management Plan (CEMP) (Appendix 4-3) to minimise any potential impacts.

The core hours for the proposed works will be 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. There will be no working on Sundays and Public Holidays, however, it should be noted that out of necessity some activity outside of the core hours could arise, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair-weather windows for concrete deliveries, the erection of turbine blades and the erection and dismantling of cranes. If occasional work is undertaken outside of core hours, especially during construction of access tracks at the site entrance, this shall be agreed in advance with the Local Authorities.

Additionally, construction activities close to residential dwellings shall not be undertaken outside of the BS 5228 daytime hours (07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays).

Good onsite practices, both for construction of the Proposed Wind Farm and the Proposed Grid Connection shall be implemented to minimise the likely effects. Particular care will be taken at the joint bays along the Proposed 110kV Underground Cabling. Section 8 of BS 5228-1:2009+A1:2014 recommends a number of simple control measures. Below is a list of recommendations that can be employed onsite during the Proposed Project construction:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate - all major compressors will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines will be shut down between work periods (or when not in use) or throttled down to a minimum;
- Regularly maintain all equipment used onsite, including maintenance related to noise emissions;
- Vehicles will be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures will be provided.
- At any location within 50m of a residential receptor where jointing bay activities are required for the Proposed 110kV Underground Cabling, the installation of temporary boarding or 'acoustic blanket panels' hanging from Heras fencing (or similar) may be considered.

12.7.2 Mitigation during Operation

The exact make and model of wind turbine to be used at the Proposed Wind Farm will be the result of a future tendering process. Achievement of the noise limits determined by this assessment will be a key

determining factor in the final choice of the Proposed Wind Farm turbines. The noise modelling results presented within this EIAR Chapter are based on the Nordex N163 6.X MW turbine.

The assessment shows the predicted wind turbine noise emission levels meet the Site Specific Noise Limits under all conditions and at all locations for both daytime and night-time periods.

Whilst it is not possible to predict if OAM will occur, in the event that complaints are received regarding OAM, mitigation measures are available. The design of such mitigation measures can only be determined once the wind farm is operational if OAM is found to occur frequently and at sustained levels. For the Proposed Project, the developer is committed to investigating noise complaints, inclusive of any complaint which may relate to OAM. To deal with the eventuality of a complaint, the developer proposes the following:

- A community liaison officer will be appointed prior to first generation of electricity and contact details made publicly available;
- Any complaint relating to noise can be reported to the community liaison officer, who will undertake an initial screening of the complaint (review of logs submitted, review of wind conditions and turbine data etc.) and speak to the complainant in person, with an eventual visit to the complainant location if possible;
- Following initial screening, the community liaison officer will be responsible for commissioning a detailed noise complaint investigation. This will include appointing a qualified acoustic consultant to undertake noise measurements at the complaint location and quantify the occurrence and depth (in dB) of OAM for every 10 minutes of the measurement campaign. The measured 10-minute noise levels and OAM depth will also be correlated with 10-minute wind conditions and operational data to find patterns and potential character penalties in accordance with good practice at the time of the assessment; and,
- If frequent and sustained OAM is found, then appropriate mitigation will be designed and implemented and the complainant informed by the community liaison officer. Mitigation measures considered will include changes to the operation of the relevant wind turbine(s) by changing software parameters such as blade pitch for specific wind conditions and time periods, 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.

12.8 Assessment of Residual Effects

12.8.1 Residual Construction Effects

Predicted construction noise and vibration levels are below the assessment criteria at all receptors, for all phases of construction. Due to the low background noise levels at some locations, elements of construction noise could be audible at the closest residential receptor for certain periods during the construction phases. However, with or without the good practice construction mitigation measures outlined above there will be **no significant residual effects**.

For the Proposed 110kV Underground Cabling, accounting for the measures highlighted in BS 5228 at jointing bays, in addition to accounting for the short-term nature of the works, it is considered that there will be **no significant residual effects**.

At residential properties along the local roads, the change in noise levels due to construction traffic will be temporary in nature and there will be **no significant residual effects**.

12.8.2 Residual Operational Effects

The predicted Proposed Wind Farm operational noise levels at all NALs lie below the daytime and night-time Site-Specific Noise Limits. In addition, the cumulative noise predictions from the Proposed Wind Farm and other operational and consented wind farms lie below the Total Guidelines (DoEHLG, 2006) Noise Limits for all NALs (except for NAL13 where the Proposed Wind Farm has been shown to not be contributing to this small exceedance). Whilst it is not possible to predict if OAM will occur, potential mitigation measures to reduce OAM have been identified in Section 12.7.2 above. The detail of the appropriate mitigation to be adopted will be determined once the wind farm is operational if and when OAM were to occur, following on-site noise measurements and assessments triggered by a complaint investigation.

At some locations, under some wind conditions, and for a certain proportion of the time, operational noise from the Proposed Wind Farm will be audible; however, it will be at an acceptable level in relation to the Guidelines (DoEHLG, 2006) and as such, there will be **no significant residual effects from operational wind turbine noise**.

The predicted level of noise from the proposed BESS and 110kV substation will have a low impact in relation to the BS 4142 Guidelines and as such, **there will be no significant residual effects from the operation of the BESS and substation**.

12.8.3 Residual Cumulative Effects

It was found that without mitigation there will be no significant cumulative construction noise and vibration effects. As such there will be **no residual cumulative effects during the construction phase**.

Predicted operational noise levels owing to the Proposed Wind Farm at all the NALs lie below the Total Guidelines (DoEHLG, 2006) Noise Limits during the daytime and night-time periods. There will be **no residual cumulative effects during the operational phase**.

There are no cumulative operational effects anticipated between wind turbine noise and other noise sources within the project. Wind turbines generate noise in windy conditions and are assessed accordingly with specific guidance, whereas other industrial noise sources are assessed using different standards with a higher focus on low wind conditions when wind turbines may not emit noise. As such, there will be **no residual cumulative effects of the project various sources during the operational phase.**

12.9 Summary

Predicted construction noise levels compared with the Category A criteria outlined in Section E.3 of BS 5228: Part 1 2009+A1:2014 indicate that construction noise levels are below the guidelines considered acceptable at all receptors and that predicted levels will be short term. Construction vibration will also likely be at low levels and will be short term. Activities related to decommissioning of the Proposed Wind Farm will use similar plant to that used for construction activities (including decommissioning of the existing turbines) and will occur at the same locations, as such noise level output during the decommissioning phase is expected to be no higher than the construction phase. Therefore, **no significant noise and vibration effects are anticipated for the construction and decommissioning phases.** Good practice during construction and decommissioning is recommended to minimise noise and vibration levels.

During the construction of the Proposed 110kV Underground Cabling there may be short periods of time where noise levels may exceed the BS 5228 threshold levels, however, this will only occur when associated activities occur directly adjacent to a residential property. Where joint bay activities are located within 50 m of residential properties, best practice mitigation measures shall be employed in line with recommendations made in BS 5228. The duration of such activities at any given receptor is anticipated to be short, therefore **no significant effects are anticipated**.

At residential properties along the local roads, the change in noise levels due to construction traffic will be temporary in nature and there will be no significant effects.

The guidance contained within the Guidelines (DoEHLG, 2006) was used to assess the likely operational noise impact of the Proposed Wind Farm. Predicted levels and measured background noise levels indicate that for dwellings neighbouring the Proposed Wind Farm, wind turbine noise will meet the noise criteria established in accordance with the Guidelines (DoEHLG, 2006), and **no significant effects are anticipated for the wind turbine operational noise.** Wind turbine noise will also meet the Site-Specific Noise Limits at all NALs for all wind speeds and directions.

There are a range of wind turbine models that will be appropriate for the Proposed Wind Farm site. The candidate wind turbine used for this assessment was chosen in order to allow a representative assessment of the noise impacts. Should the Proposed Project receive consent, the final choice of wind turbine will be subject to a competitive tendering process. The final choice of wind turbine will, however, have to meet the noise limits determined and contained within any condition imposed.

Whilst it is not possible to predict if OAM will occur, potential mitigation measures to reduce OAM have been identified and the developer is proposing to appoint a community liaison officer with a commitment to investigate complaints which may relate to OAM. However, the detail of appropriate mitigation to be adopted can only be determined once the wind farm is operational, following on-site noise measurements and assessments triggered by a complaint investigation. **In the event that frequent and sustained OAM is identified, suitable mitigation will be implemented and therefore no significant effects are likely as a result of OAM.**

Consideration has been made to operational noise from the proposed BESS and 110kV substation. An assessment undertaken in accordance with BS 4142:2014+A1:2019 found that the Rating Levels from the Proposed BESS and Substation will have a low impact. **Accordingly, no significant effects are anticipated for the operational noise from the BESS and 110kV Substation.**

N

CNAL1
CNAL2
CNAL3
CNAL4
CNAL5
CNAL6
NML1
NML2
NML3
NML4
NML5
NML6
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10

Kilometre
0
1
2
3

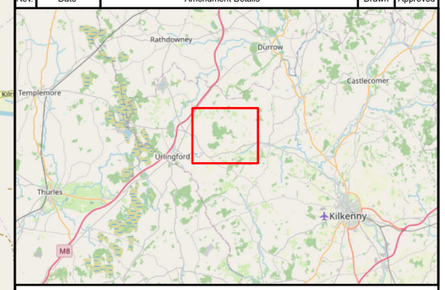
LEGEND

- Construction Noise Assessment Locations (CNALs)
- EIAR Site Boundary
- Met Mast
- Noise Monitoring Locations (NMLs)

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- Non-Residential
- Proposed New Roads
- Upgrades to Existing Roads
- Turbine Hardstands
- Onsite Substation & BESS Compound
- Temporary Construction Compounds
- Borrow Pits

Rev.	Date	Amendment Details	Drawn	Approved
0	08/10/2026	FIRST ISSUE	FL	JB



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Drawing Status: FOR INFORMATION

Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-1 - CONSTRUCTION NOISE ASSESSMENT LOCATIONS

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Drawing Number: IE00061-009

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N

GNAL1

GNAL2

GNAL3

GNAL4

GNAL5

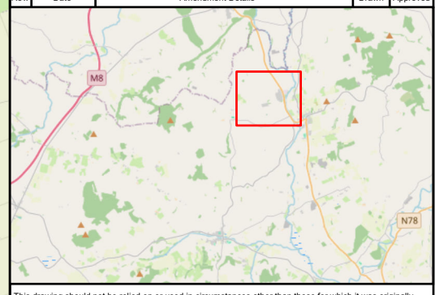
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LEGEND

- EIAR Site Boundary
- Grid Connection Noise Assessment Locations (GNALs)
- Noise Sensitive Receptors (NSRs)
- Horizontal Directional Drilling (HDD) Locations
- Joint Bay Locations
- Proposed Grid Connection Route

Rev.	Date	Amendment Details	Drawn	Approved
1	21/10/2026	SECOND ISSUE	FL	JB
0	02/10/2026	FIRST ISSUE	FL	JB



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Drawing Title: FIGURE 12-2 - GRID CONNECTION NOISE ASSESSMENT LOCATIONS

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LEGEND

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

Cumulative Wind Farms (within 10 km)

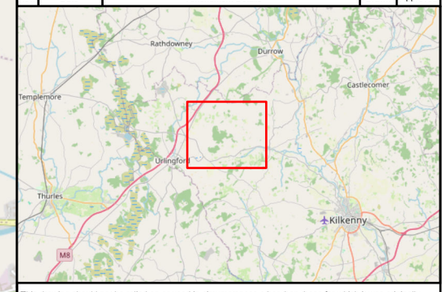
Cumulative Wind Farms (within 10 km)

- Lisdowney
- Gathabawn

Noise Sensitive Receptors (NSRs) Represented By:

- NML1
- NML2
- NML3
- NML4
- NML5
- NML6
- Non-Residential

Rev.	Date	Amendment Details	Drawn	Approved
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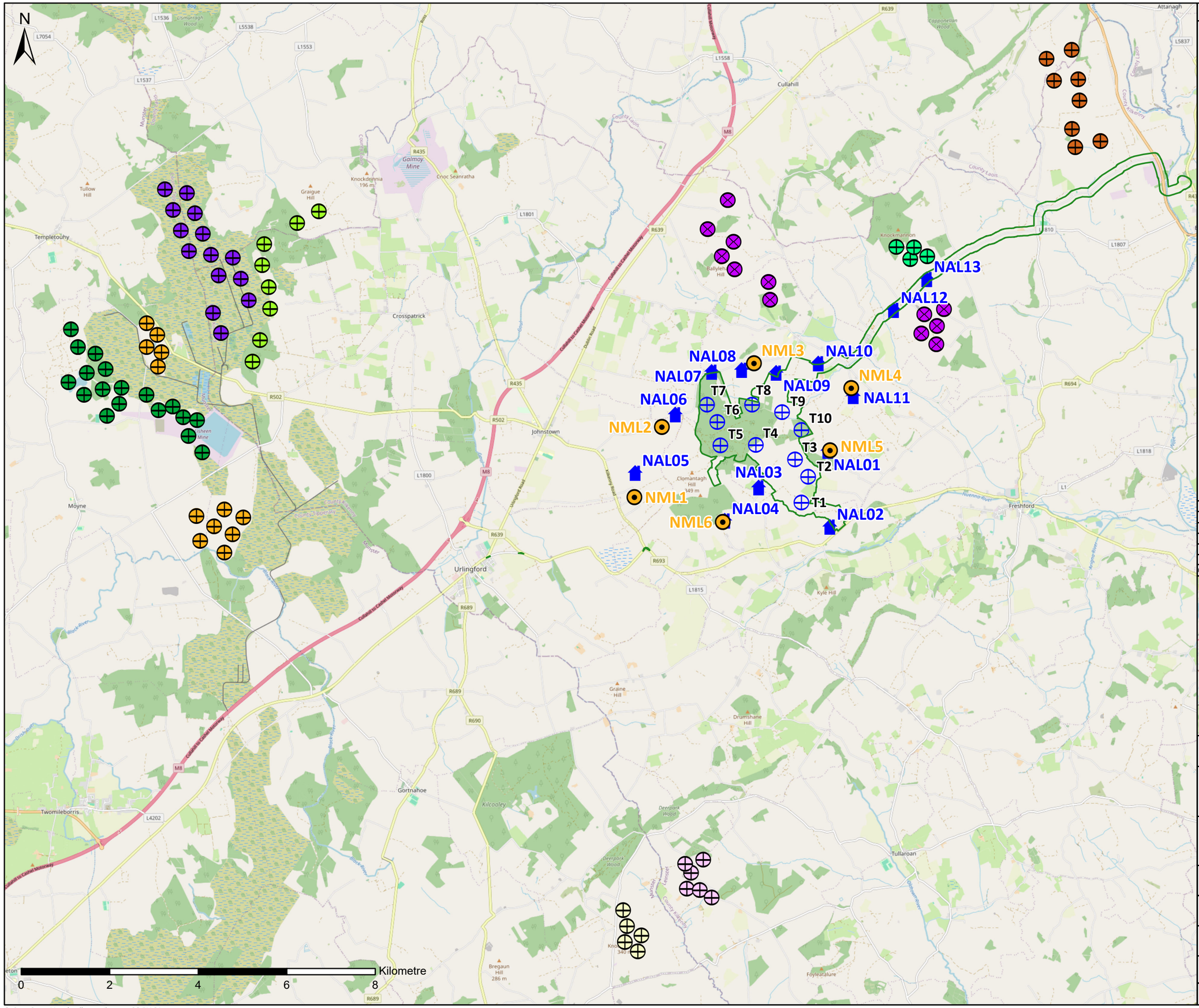
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Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE.12-3 - NOISE MONITORING AND ASSESSMENT LOCATIONS

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Drawing Number: IE00061-012



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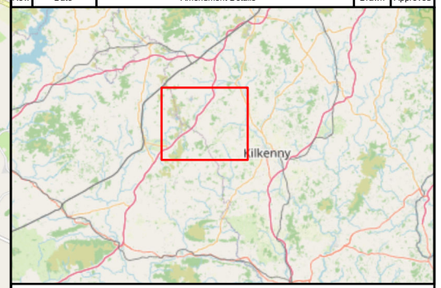
- EIAR Site Boundary
- Noise Monitoring Locations (NMLs)
- Noise Assessment Locations (NALs)
- Killoshulan Wind Farm

Cumulative Wind Farms (within 10 km)

Cumulative Wind Farms (within 10 km)

- An Cnoc
- Ballybeagh
- Bruckana
- Lisdowney
- Lisheen 1
- Lisheen 2
- Lisheen 3
- Seskin
- Gathabawn

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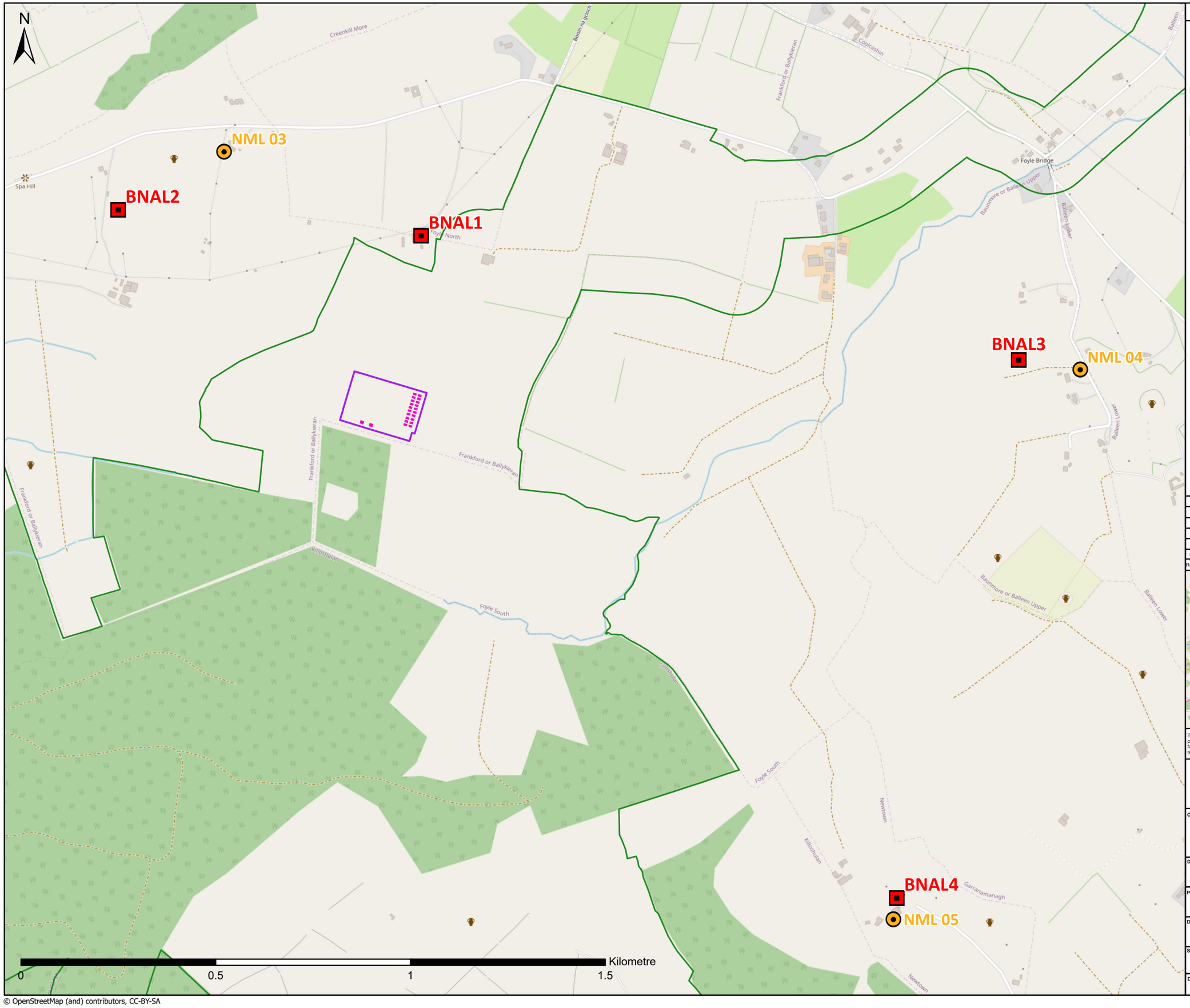
Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-4 - CUMULATIVE WIND FARMS

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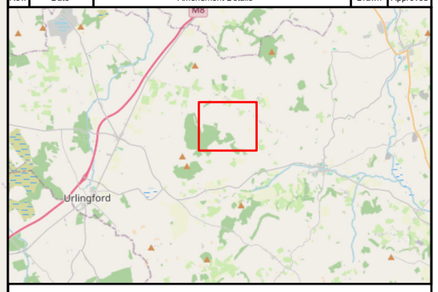
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LEGEND

- Noise Monitoring Locations (NMLs)
- BESS Noise Assessment Locations (BNALs)
- Modelled Noise Sources
- EIAR Site Boundary
- Proposed On-Site Substation & BESS Compound

Rev.	Date	Amendment Details	Drawn	Approved
0	02/10/2026	FIRST ISSUE	FL	MC



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tnei

Client: MKO

Drawing Status: FOR INFORMATION

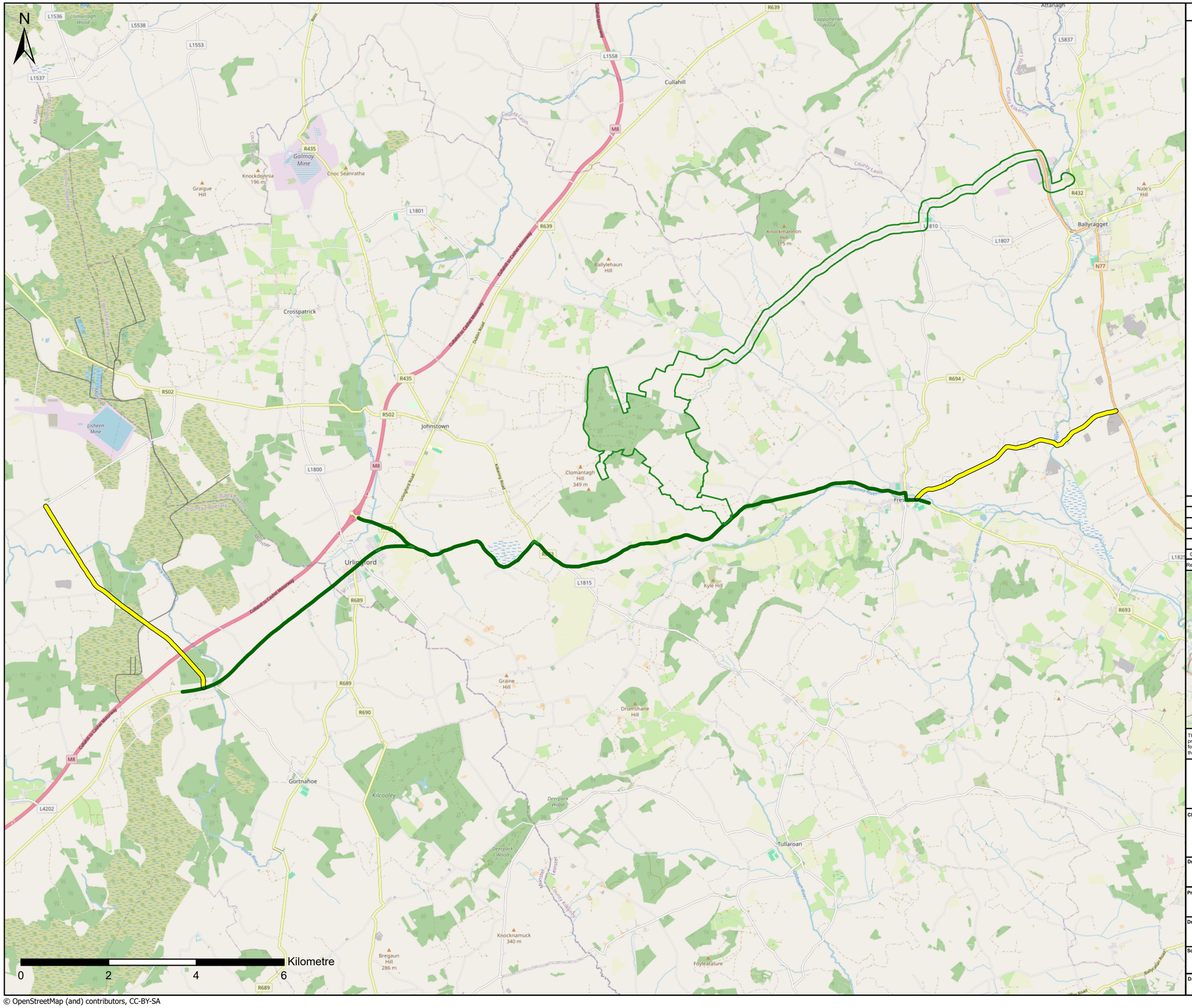
Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-5 - BESS NOISE ASSESSMENT LOCATIONS

Scale:	Size:	Spatial Reference:
1:9,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00061-016

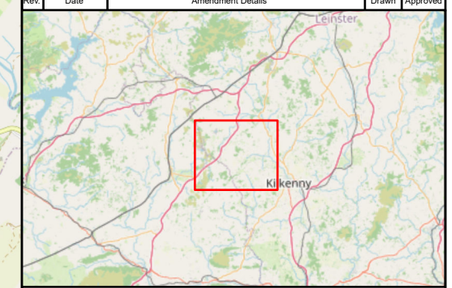
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LEGEND

- EIAR Site Boundary
- Roads Scoped out from Further Assessment - Negligible Impacts
- Roads Requiring Stage 2 or Stage 3 Assessment

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Client

MKO

Drawing Status: FOR INFORMATION

Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-6 - CONSTRUCTION TRAFFIC SCOPING ASSESSMENT

Scale:	Size:	Spatial Reference:
1:80,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00061-018

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N

Black River

Longfordpass

Twomileborris

M8

Cullahill to Cashel Motorway

Kilometre

0 0.5 1 1.5

LEGEND

Assessment Buffer (50 m)

Magnitude of Change - Short-term

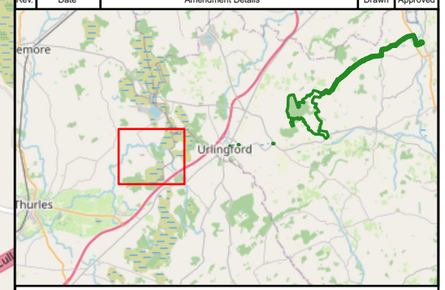
- Major: Greater than or equal to 5.0 dB
- Minor: 1.0 to 2.9 dB
- Moderate: 3.0 to 4.9 dB

5 dB Noise Contours

- 55-60
- 60-65
- ≥ 65

Noise contours indicate the LA10 (18-hour) noise level displayed on a 10 m x 10 m grid at a height of 4 m

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Client: MKO

Drawing Status: FOR INFORMATION

Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-7 - CONSTRUCTION TRAFFIC – LONGFORDPASS NORTH

Scale:	Size:	Spatial Reference:
1:16,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00061-019

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N

Kilometre
0 0.5 1

LEGEND

Assessment Buffer (50 m)

Magnitude of Change - Short-term

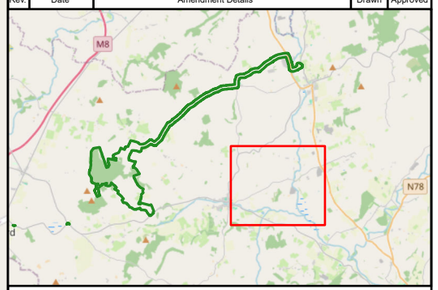
- Major: Greater than or equal to 5.0 dB
- Minor: 1.0 to 2.9 dB
- Moderate: 3.0 to 4.9 dB

5 dB Noise Contours

- 55-60
- 60-65
- ≥ 65

Noise contours indicate the LA10 (18-hour) noise level displayed on a 10 m x 10 m grid at a height of 4 m.

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Client: MKO

Drawing Status: FOR INFORMATION

Project Title: KILLOSHULAN WIND FARM

Drawing Title: FIGURE 12-8 - CONSTRUCTION TRAFFIC – L1818

Scale:	Size:	Spatial Reference:
1:14,648	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00061-020

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