

MWP

Chapter 9 Noise and Vibration
Carrownagowan 110kV Grid Connection

9. Noise and Vibration

9.1 Introduction

This chapter considers the potential effects on noise and vibration sensitive receptors arising from the Proposed Development. A full description of the Proposed Development is provided in **Chapter 2** Description of the Proposed Development of this Environmental Impact Assessment Report (EIAR).

The nature and probability of effects on noise and vibration sensitive receptors arising from the Proposed Development has been assessed in this chapter. The assessment comprises:

- A review of the existing receiving environment;
- Prediction and characterisation of likely impacts;
- Evaluation of effects significance as a standalone project and cumulatively with other projects; and
- Consideration of mitigation measures, where appropriate.

9.1.1 Noise and Vibration Characteristics of the Proposed Development

The Proposed Development is a 110kV underground cable (UGC) grid connection for the permitted Carrownagowan Wind Farm.

There is potential for noise nuisance during the construction of the Proposed Development because of the noise generated by the plant and machinery employed to carry out the works (refer to **Section 2.3.4** of **Chapter 2**).

It is important to note that only a small proportion of receptors will be exposed to potential noise emissions at any one time. The noise emission each will be exposed to will depend on its proximity to the works area. The exposure for any individual receptor will only be for one to three days.

The scale and nature of the plant and machinery is not unusual and typical for road works.

There is a higher tolerance for elevated noise levels if they are known to be temporary, and receptors are forewarned. There is an understanding of the practical nature of such works and the limitations when it comes to noise control and construction activities.

Once operational there will be no further noise emissions associated with the Proposed Development as it will be buried underground and has no inherent noise generating capacity. There may be service and maintenance requirements which have been considered in this assessment.

9.1.2 Competency of Assessor

The assessment was completed by Peter Barry (BSc. MSc.). Peter is a Chartered Environmental Scientist with over 20 years' experience as an environmental scientist and environmental project manager. Peter specialises in Environmental Noise Assessment and has carried out environmental noise monitoring, assessment, prediction, and control for a wide spectrum of developments including renewable energy developments, roads developments, commercial and industrial developments, and residential developments. Peter has presented evidence in court and at oral hearing as expert witness on noise matters.

9.2 Methodology

The methodology adopted for this assessment is in accordance with best practice (refer to **Section 9.2.5**), experience, and professional judgement and is outlined in the following sections. A useful brief guide to the fundamentals of environmental noise and a comparative decibel scale is provided below to assist with the interpretation of the assessment.

9.2.1 Fundamentals of Noise

Fundamentally, noise is vibrations of the air which are detectable by the ear. Sound waves radiate out spherically from a sound source in three dimensions.

The human ear can detect a very wide range of pressure variations. In order to cope with this wide range, a logarithmic scale (decibel (dB) scale) is used to translate pressure values into manageable numbers from 0dB to 140 dB. 0 dB is the threshold of hearing and 120 dB is the threshold of pain.

Measuring in decibels means that a 3 dB increase is equivalent to a doubling of the sound energy and a 10 dB increase in a tenfold increase in energy. For broadband sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions and a 10 dB increase generally appears twice as loud.

A healthy human ear is also sensitive to a large range of frequencies (approximately 20 Hz to 20,000 Hz) and varies in sensitivity depending on the frequency.

The human ear is not equally sensitive to sound at all frequencies and is less sensitive to sound at low frequencies and high frequencies. A -weighting (dB A) is the main way of adjusting measured sound pressure levels (noise) to take account of the uneven human response to frequencies.

Figure 9-1 illustrates some everyday sounds on the dB(A) scale. A quiet bedroom is around 35 dB(A), a busy office around 60dB(A) and a rock concert around 100 dB(A). The illustration is extracted from draft Wind Energy Development Guidelines 2019.



Figure 9-1 The Level of Typical Common Sounds on the dB(A) Scale

9.2.2 Desktop Study

The methodology used for this study included desk-based research of published information, primarily a review of the permitted Carrownagowan Wind Farm EIA, in particular the Noise and Vibration Chapter. Much of the findings contained therein, are also relevant for this assessment. In particular, the assessment of the grid connection.

The Proposed Development description in **Chapter 2** was reviewed and the potential noise sensitive receptors along same identified (refer to **Figures 9-2 to 9-4**). The existing baseline noise environment was characterised and the potential impact on the receiving environment assessed accordingly.

9.2.3 Background Noise Monitoring

Background noise monitoring along the Proposed Development was not deemed necessary because it was possible to characterise the baseline using noise measurements carried out as part of the Carrownagowan Wind Farm planning application. The baseline data, collected in October 2018, was reviewed, and found to be/remain accurate based on a new desktop survey and site visit undertaken in November 2022. No new significant noise sources have been introduced into the area and the noise environment remains unchanged.

The existing noise environment along the Proposed Development can be characterised as an area of low background noise, typical of a rural location with no major dominant noise sources.

9.2.4 Legislation

9.2.4.1 Construction Phase

There are no mandatory noise limits for construction noise in Ireland. Best practice and guidance documents related to environmental noise assessment are referred to in **Section 9.2.5**.

9.2.4.2 Operational Phase

There are no mandatory operational noise limits related to this type of development in Ireland. Best practice and guidance documents related to environmental noise assessment are referred to in **Section 9.2.5**.

9.2.5 Guidelines and Best Practice

9.2.5.1 Construction Phase

British Standard 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open site outlines noise thresholds for significant impacts.

Transport Infrastructure Ireland's (TII) 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014) was also consulted for noise and vibration related impact nuisance thresholds.

9.2.5.2 Operational Phase

There will be no operational phase noise or vibrations because the cable will be buried underground. However, the following guidelines and best practice documents are typically consulted when assessing the operational noise and vibration impact from a Proposed Development on the receiving environment.

- EPA– Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016.
- TII's 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (2004)
- TII 'Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes' (2014)
- Institute of Environmental Management and Assessment (IEMA)'s 'Guidelines for Environmental Noise Impact Assessment' (2014).
- British Standard (BS) 5228 Parts 1 & 2, Code of Practice for Noise and Vibration Control on Construction and Open Sites + A1 2014.
- ISO 9613-2-1996- Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation.

9.2.6 Scope of Assessment

The scope of the assessment has been defined by industry standard best practice and guidance (**Section 9.2.5**) used in Ireland. In general, this includes:

- Establishing the existing or baseline noise conditions at representative noise sensitive receptors .
- Establishing noise limits based on the measured baseline noise levels in accordance with best practice and guidance.

- Using calculation, predict the noise emissions from the Proposed Development at the noise sensitive receptors for comparison against noise threshold criteria.

9.2.6.1 Scoped out from Further Assessment

Traffic noise is assessed in the context of increasing the overall volume on the road. A doubling of sound energy increases noise at the human ear by 3dB¹. If there is a 100% increase in traffic flow, noise exposure levels will therefore increase by 3dB, which is a change in noise level just barely detectable by the human ear. The associated trucks and staff vehicles involved in the grid construction will not be distinguishable from cars trucks and tractors already using the road and will not result in a 100% increase in traffic flow on the existing road network. Traffic noise has therefore been scoped out for further assessment. See **Chapter 14** Materials Assets for information on potential traffic and transport impacts.

There will be no significant sources of vibration during either the construction or operational phases. Therefore, this aspect has been scoped out from further assessment.

Once operational there will be no noise emissions from the buried cable, therefore no noise effects. Logically, therefore, there can be no operational cumulative noise effects with other operational developments. Operational phase cumulative impact has been scoped out for further assessment. Any service and maintenance requirements will be rare and are therefore not considered a potential source of significant effect and noise nuisance.

9.2.7 Assessment Criteria

9.2.7.1 Significance of Effects

Determination of the significance of an effect will be made in accordance with the terminology outlined in the EPA's 'Guidelines on Information to be contained in Environmental Impact Assessment Reports' (2022).

9.2.7.2 Criteria for Evaluating Construction Noise Effects

There is no statutory guidance in Ireland relating to the maximum noise levels permitted during construction works, and in the absence of statutory guidance or other specific limits prescribed by local authorities, the thresholds outlined in the 'British Standard 5228-12009+A1:2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise' has been adopted in this assessment, as they are recognised by the expert community as the most appropriate in the assessment of construction noise. The noise levels, which are reproduced in **Table 9-1**, are typically deemed acceptable.

Table 9-1 Criteria for Evaluating Construction Effects

Assessment category and threshold value period (T)	Threshold values, L _{AeqT} dB		
	Category A ^{Note A}	Category B ^{Note B}	Category C ^{Note C}
Night-time (23:00 to 07:00hrs)	45	50	55
Evening and Weekends ^{Note D}	55	60	65
Daytime (07:00 – 19:00hrs) and Saturdays (07:00 -13:00hrs)	65	70	75

Note A: Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

¹ <https://iosh.com/health-and-safety-professionals/improve-your-knowledge/occupational-health-toolkit/noise/sound-levels-and-their-relevance/#:~:text=The%203dB%20trading%20effect%20means,to%20hazardous%20level%20of%20noise.>

Note B: *Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.*

Note C: *Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.*

Note D: *19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.*

Given the rural nature of the Proposed Development site, all properties will be afforded a Category A designation. Therefore, if the predicted construction noise exceeds 65dB $L_{Aeq(T)}$ then this is assessed as a significant effect.

However, it should be borne in mind, that the criteria above typically apply to large construction sites, with lots of operating machinery, in densely populated areas, and to projects which are likely to continue for a prolonged period where there is potential for significant adverse impacts to residential amenity. They are presented as a guide and for information purposes as to what is generally acceptable for longer term exposure. They are also an average over a 10-hour working day. This allows for the criteria to be exceeded occasionally but for projects to remain compliant when averaged out over a full working day.

9.2.8 Statement on Limitations and Difficulties Encountered

No difficulties or limitations were encountered when undertaking this assessment.

9.3 Baseline Environment

This section describes the existing environment in terms of the noise monitoring locations, existing noise sources at these locations and the prevailing background noise levels.

The main sources of noise in the area include traffic on the local and regional road network, and machinery involved in working agricultural land and forestry activities. Natural noise sources include wind borne noise in vegetation and water in streams and rivers.

9.3.1 Sensitivity of the Baseline Receiving Environment

A noise sensitive receptor is defined by the EPA as, “any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels” (EPA, 2016).

The primary sensitive receptors that may potentially be impacted as a result of the Proposed Development are residents of local dwellings (in typical ribbon style development along the local road network) within 50 m of the route and are shown in **Figures 9-2 to 9-4**. The zone of influence will be significantly diminished beyond 50 m as any noise emissions will dissipate quickly. There are 163 shown in total.

The road along which the grid will be underlain is well trafficked and in this regard these receptors are accustomed to elevated noise levels. Noise environments in proximity to roads are generally considered robust.

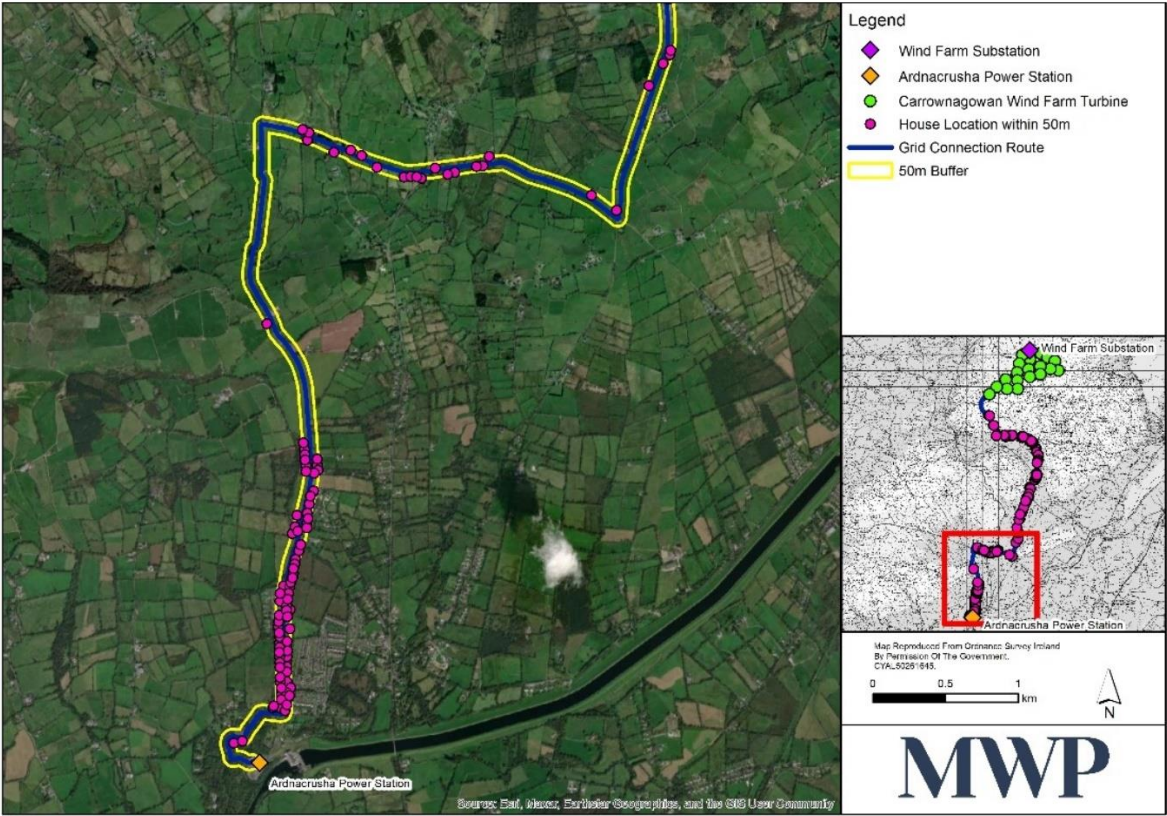


Figure 9-2 House Locations within 50m (southernmost section)

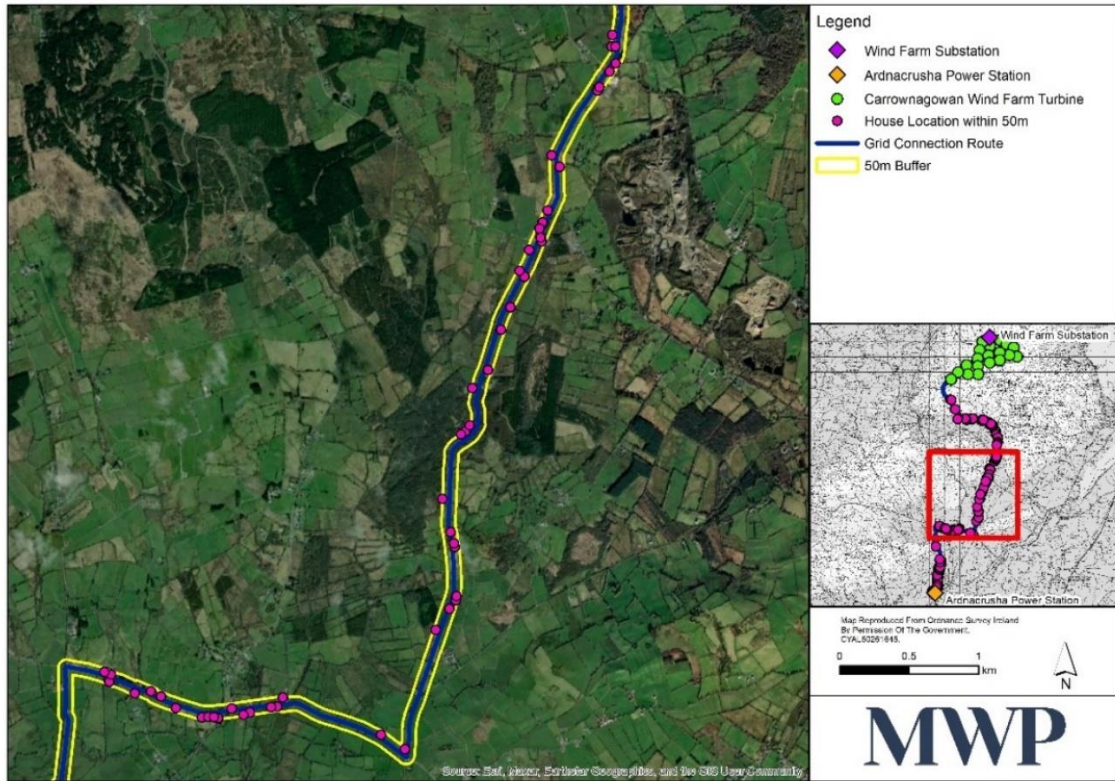


Figure 9-3 House Locations within 50m (middle section)

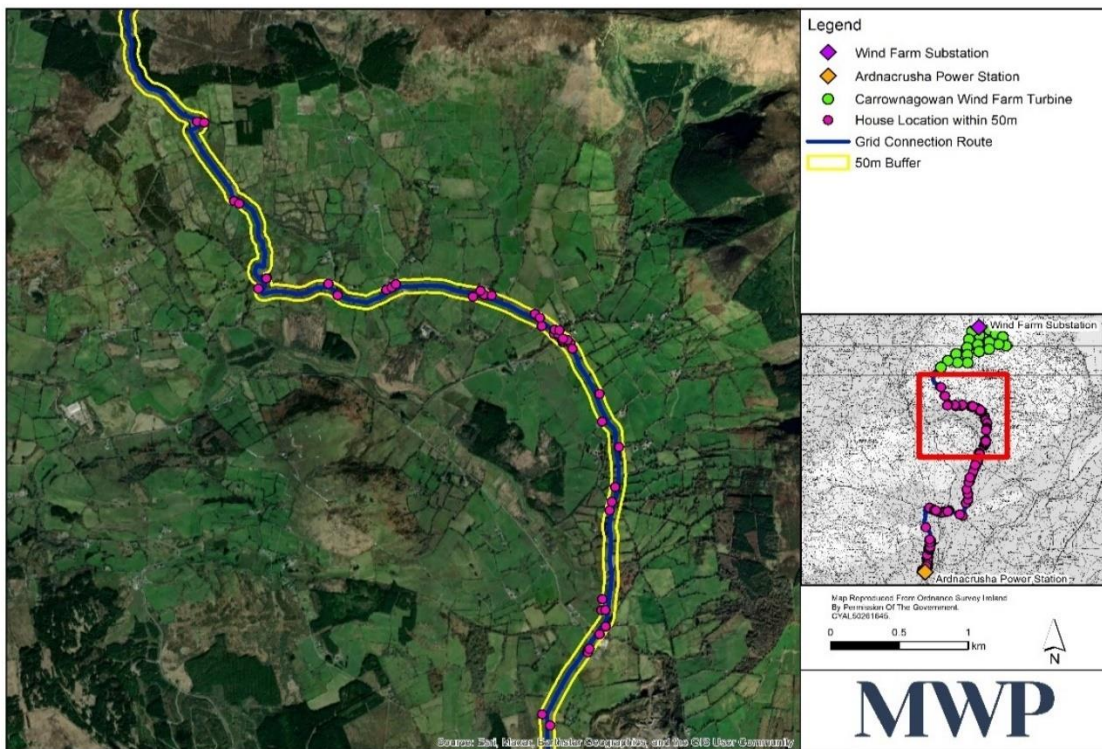


Figure 9-4 House Locations within 50m (northernmost section)

Local residents are sensitive to noise as a distraction or disturbance preventing enjoyment of their property or local amenity area during the day. At night, noise that is too loud can lead to sleep disturbance.

Construction activities will operate between the hours 8.00am to 8.00pm Monday to Friday and 8.00am to 6.00pm on Saturday (if required). There will be no construction works during night-time hours or Sundays. Any deviations to these times will be agreed in advance with Clare County Council.

Local residents can be very sensitive to any new permanent source of noise introduced to their environment, depending on the level and characteristics of the noise that is audible. The Proposed Development will not introduce any new permanent noise source into the receiving environment.

9.3.2 Characteristic of the Existing Noise Environment

In general, the existing noise environment along the Proposed Development can be characterised predominantly as an area of low background noise in calm conditions with passing traffic elevating noise levels. The desktop study and site visit has confirmed there are no dominant noise sources along the Proposed Development. The main contributing noise sources to the existing ambient noise along the Proposed Development are vehicles using the local road, agricultural activity in the surrounding lands, wind borne noise in vegetation, and occasional aircraft noise approaching Shannon airport.

9.4 Assessment of Impacts and Effects

9.4.1 Construction Phase

9.4.1.1 Installation of Underground Cable - Elevated Noise Levels

The majority of the Proposed Development will be located within the curtilage of existing roads, except where it deviates off the road into existing access tracks (within Ardnacrusha), private forestry access tracks, private agricultural lands and permitted internal wind farm access roads. The stretch from the nearest permitted Carrownagowan Wind Farm turbine to the East Clare Way and on to the Broadford to Kilbane road is remote from dwellings (<1 km) and the potential for significant effects is very low.

In general, the construction takes place in distinct stages including 1) the excavation of the trench using an excavator machine, typically a back hoe loader, tracked machine, or directional drilling machine for water crossings 2) a dump truck to take away any spoil which is not used for back fill, 3) the trench surface receives a temporary surface dressing of either spray and chip or macadam and 4) once the overall Proposed Development is completed, the cable route and associated road areas on the local road will reviewed by the Local authority engineers and a full or partial surface reinstatement. The anticipated plant and machinery to be used is listed in **Section 2.3.4 of Chapter 2**.

All the machinery above will not be in operation simultaneously. The resurfacing works will take place after the cabling works are completed. The works move along quickly, therefore the exposure of any noise sensitive receptor is typically not more than 1 to 2 days. The active construction area will generally be only along a 100-200m stretch of any roadway at any one time. The construction works are estimated to take approximately 8 months and will overlap with the wind farm works. During the first 4 months the cable trenches will be constructed. The second 4 months will involve sequentially opening up all joint bays (these are pre-cast concrete chambers that will be required along the Proposed Development over its entire length) and pulling electrical cables through ducts and then joining each cable together. There is anticipated to be 35 joint bays with 1-2 days' work involved at each.

Dwellings along the Proposed Development will experience elevated noise levels from the excavation and road re-surfacing machinery during the period it takes to pass the receptor enroute to the constructed substation. Given the very short time frame, the temporary and minor nature of the works and machinery (back-hoe loader, dump truck and road re-surfacing plant) in combination with the low number of receptors impacted at any one time, the potential impact is not considered significant. Passing traffic is already a contributor of anthropogenic noise emissions to the existing soundscape.

The main item of plant which will be used for the excavation of the trench will be a tracked or wheeled excavator. This is a piece of machinery with similar noise emissions to an agricultural tractor, which are commonplace in the area. Noise emissions for a 30 to 50 tonne tracked excavator is 79dB at 10m. This data is sourced from the British Standard 5228, Code of Practice for noise and vibration control on construction and open sites.

By their nature construction works are highly variable in the equipment used, the on time of each item of equipment, the mobility of the equipment and also in the proximity and exposure of each receptor.

However, for receptors near works areas existing ambient noise levels are likely to be increased temporarily for the duration of the works. As the works are linear the noise levels will decrease quickly as the works proceed along the road.

Noise levels are very unlikely to exceed the criteria set out in **Table 9-1** at distances beyond 20 m. For those receptors within 20 m of a works area any increase above this will only be occasional at worst. Typical mitigation measures that can be considered are outlined in the mitigation section (**Section 9.5.1**) of this document with further guidance contained within the BS 5228 standards. It should be noted that these works will progress along the route and it is envisioned that would be carried out and completed in the vicinity of a property in 2 to 3 days.

There will be a **temporary, negative, and slight to moderate effect** at noise sensitive receptors near construction works areas prior to mitigation.

9.4.1.2 Watercourse Crossing (Directional Drilling) - Elevated Noise Levels

There are a total of nine (9) no. major watercourse crossings along the Proposed Development, eight (8) will be completed by means of Horizontal Directional Drill (HDD) which will require a service trench (launch pit) for the drill in the road either side of the watercourse.

The directional drilling machine will set up at a launch and reception pit (an enlarged portion of on-road trench, i.e. a service trench on either side of the crossing point at an appropriate distance back from the watercourse). The drill will then bore in an arc under the watercourse feature.

Similar effects are anticipated for this work. The works will be temporary, only a matter of days, and the number of receptors effected limited. Once the works are complete there will be no further noise emissions.

There will be a **temporary, negative, and slight to moderate effect** at noise sensitive receptors near construction works areas prior to mitigation.

9.4.2 Operational Phase

There will be no noise and vibration emissions from the Proposed Development as it is underground. In the event of cable repair there will be a requirement to open the cable trench to allow access. This will need machinery typically an excavator. Required maintenance will be occasional and it is very unlikely this will be a significant source of major noise nuisance and disturbance.

There will be **a brief, negative, slight, effect** during the operational phase.

9.4.3 Do-Nothing

Should the Proposed Development not proceed then the noise environment along the Proposed Development is unlikely to change significantly.

9.4.4 Cumulative Impacts and Effects

A list of the projects which have the potential to interact with the Proposed Development are described in **Chapter 2**. Of these, the only four of relevance with the potential for significant cumulative effects are:

- 1) the permitted but not yet unconstructed Carrownagowan Wind Farm development; and
- 2) forestry operations within the Carrownagowan Wind Farm development site.
- 3) proposed Fahey Beg Wind Farm Development
- 4) proposed Drummin Solar Farm Grid Connection

9.4.4.1 Construction Phase, Carrownagowan Wind Farm

The construction works are estimated to take approximately 6-8 months and will overlap with the consented Carrownagowan Wind Farm works. However, given the geographical distance between the wind farm construction works areas and the Proposed Development, (the stretch from Turbine 1 of Carrownagowan Wind Farm to the East Clare Way and on to the Broadford to Kilbane road is remote from dwellings (<1 km)), the potential for significant effects is very low.

The potential cumulative effect will be *temporary, negative* and *imperceptible to slight*.

9.4.4.2 Construction Phase, Forestry

Forestry operations will continue for the duration of the construction phase. Forestry operations will take place with the commercial forestry stand which is at a remove from the grid works area. Any cumulative impact can be avoided through timing.

9.4.4.3 Construction Phase, Other Developments

The Proposed Development has the potential to interact with the proposed Fahey Beg Wind Farm Development Grid Connection in two locations and in one location within Ardnacrusha with the Drummin Solar Farm Grid Connection (**Figure 1-2** and **1-3, Chapter 1**).

As outlined in **Chapter 1**, each project that progresses with a grid connection located within the public road network will have to apply to the local authority for a road opening licence, where timelines will be agreed, and connections sequenced. Early engagement with the local authority will allow them to decide on how the sections of public road are managed during the laying of the underground grid trenching, so as to avoid disruption. In the event that the Fahy Beg underground grid and the Proposed Development construction works need to be done at similar times within the public road network then the Local Authority through the Road Opening Licence process will agree the best solution. The solution may be to close a short section of road and do a traffic diversion, or it may dictate each developer stagger the duration of the overlap on the public road so as to control and manage impacts locally; thereby avoiding any significant cumulative effects.

Any interaction with these developments and the Proposed Development within Ardnacrusha substation will be controlled by the Ardnacrusha Eirgrid Station Manager who will implement their own traffic management measures thereby avoiding potential noise and vibration cumulative impacts.

9.5 Mitigation Measures

9.5.1 Construction Phase

As there will be no significant effects there is no requirement for specific construction phase mitigation measures.

Best practice in the form of BS5228 –1&2:2009 + A1 2014, *Code of Practice for the Control of Noise and Vibration on Construction and Open Sites* will be adopted during the construction phase in order to minimise the noise generated by construction activities and nuisance to neighbours including the following:

- A pre-construction commitment to managing nuisance noise will be agreed through notification and consultation with affected parties, if deemed necessary.
- Working hours at the site during the construction phase will be limited to Standard working hours for construction will be 8.00am to 8.00pm Monday to Friday and 8.00am to 6.00pm on Saturday (if required) (subject to planning consent and local authority stipulated conditions) , with no works on Sundays or Bank Holidays except in exceptional circumstances or in the event of an emergency. Any deviations to these times will be agreed in advance with Clare County Council.
- Construction contractors will be required to comply with the requirements of the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1988 as amended in 1990 and 1996 (S.I. No. 320 of 1988, S.I. No. 297 of 1990 and S.I. No. 359 of 1996), and the Safety, Health, and Welfare at Work (Control of Noise at Work) Regulations, 2006 (S.I. No. 371 of 2006).

The main control measures will be control of noise at source using the following methods in line with Clause 8 'Control of noise' of BS 5228-1:2009+A1:2014:

- Operators of all mobile equipment will be instructed to avoid unnecessary revving of machinery (Clause 8.2.1 General).
- Use of appropriate plant and equipment where possible with low noise level generation where possible (Clause 8.2.2 Specification and substitution).
- All construction plant to be used on site should have effective well-maintained silencers and mufflers (in the case of pneumatic drill) (Clause 8.2.3 Modification of existing plant and equipment).
- Noise generating equipment will be located as far as possible away from local noise sensitive areas identified (Clause 8.2.5 Use and siting of equipment); and
- Regular and effective maintenance of site machinery including a full maintenance schedule to ensure that all pieces of equipment are in good working order. With efficient use of well-maintained mobile equipment, considerably lower noise levels than those predicted can be attained (clause 8.2.6 Maintenance).

In addition, the following best practice measures are proposed:

- Training of site staff in the proper use and maintenance of tools and equipment;
- Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment;
- Machines that could be in intermittent use will be shut down between work periods or will be throttled down to a minimum;
- Plant start-up will be sequential rather than all together;

- Internal access tracks to be well maintained;
- Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from noise-sensitive locations; and
- Drop heights for materials such as gravels will be minimised whenever practicable

9.5.2 Operational Phase

No mitigation measures are required.

9.6 Residual Impacts and Effects

Once the construction works are complete there will be no further noise emissions from construction activities at the works area.

The cable will be buried underground and there will be no noise emissions once operational. Should maintenance or repair be required on the cable for whatever reason, the effects of any associated noise emissions will not be significant. It is not possible to predict the location where this may occur but the equipment to be used will be minor in scale (excavator, hand tools, etc) and any works will be temporary. It is therefore concluded that there will be no significant residual noise or vibration effects from either the construction or operational phases.

9.7 Risk of Major Accidents and Disasters

Not relevant to this Chapter. Please refer to **Chapter 2**.

9.8 Summary

This chapter has assessed the potential impact of operational and construction and noise from the Proposed Development on the residents of nearby receptors. Existing ambient noise levels will be increased temporarily at receptors near the construction works areas. The construction works will progress quickly, meaning the exposure of any receptor will typically be no more than 1 to 2 days. The equipment to be used and the scale of the works are relatively minor.

Once operational there will be no noise or vibration impacts from the Proposed Development. In the event of cable repair there will be a requirement to open the cable trench to allow access. This will need machinery typically an excavator. Required maintenance will be occasional and it is very unlikely this will be a significant source of major noise nuisance and disturbance.

9.9 References

EPA. (2016). *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4), Environmental Protection Agency.

TII. (2014). *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*, Transport Infrastructure Ireland.

IEMA. (2014). *Guidelines for Environmental Noise Impact Assessment*, Institute of Environmental Management and Assessment.

British Standard 5228 Parts 1 & 2, Code of Practice for Noise and Vibration Control on Construction and Open Sites + A1 2014.

ISO 9613-2-1996- Acoustics – Attenuation of sound during propagation outdoors –Part 2: General method of calculation.