

MWP

Volume 1: Non-Technical Summary **Carrownagowan 110kV Grid Connection**

FuturEnergy Carrownagowan DAC

November 2023

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1. Introduction

FuturEnergy Carrownagowan DAC (the ‘Applicant’) is seeking planning consent from An Bord Pleanála under section 182A of the Planning and Development Act 2000 for a grid connection to provide a connection to the national grid from the consented Carrownagowan Wind Farm in Co. Clare (hereafter referred to as the ‘Proposed Development’). The Proposed Development is an integral element of the overall Carrownagowan Wind Farm project.

The location of the Proposed Development site is shown in **Figure 1**.

The application for the Proposed Development is being made directly to An Bord Pleanála as the project is deemed a Strategic Infrastructure Development in accordance with the Planning and Development (Strategic Infrastructure) Act 2006. MWP commenced pre-application consultation for this Application with An Bord Pleanála on the 20th of October 2022 (under Section 182E of the Planning and Development Act 2000 (as amended)) on 20/10/2022. At the conclusion of the pre-application consultation meeting the board indicated a preliminary view that the Proposed Development was strategic infrastructure. On the 4th April 2023, An Bord Pleanála confirmed that the Proposed Development was Strategic Infrastructure. An Bord Pleanála is also the Competent Authority for the purposes of the Environmental Impact Assessment (EIA).

MWP have been engaged by the Applicant to prepare an Environmental Impact Assessment Report (EIAR) to accompany the planning application. A detailed description of the entire project is given in **Chapter 2** of Volume 2 of the main EIAR. This Non-Technical Summary is the first volume of the EIAR for the proposed development. The other three volumes which comprise the EIAR are:

- Volume II: Main EIAR
- Volume III: Appendices

The purpose of this Non-Technical Summary is to provide a concise overview in non-technical terms of the project, environmental effects and mitigation measures presented in detail in the main EIAR, Volume 2.

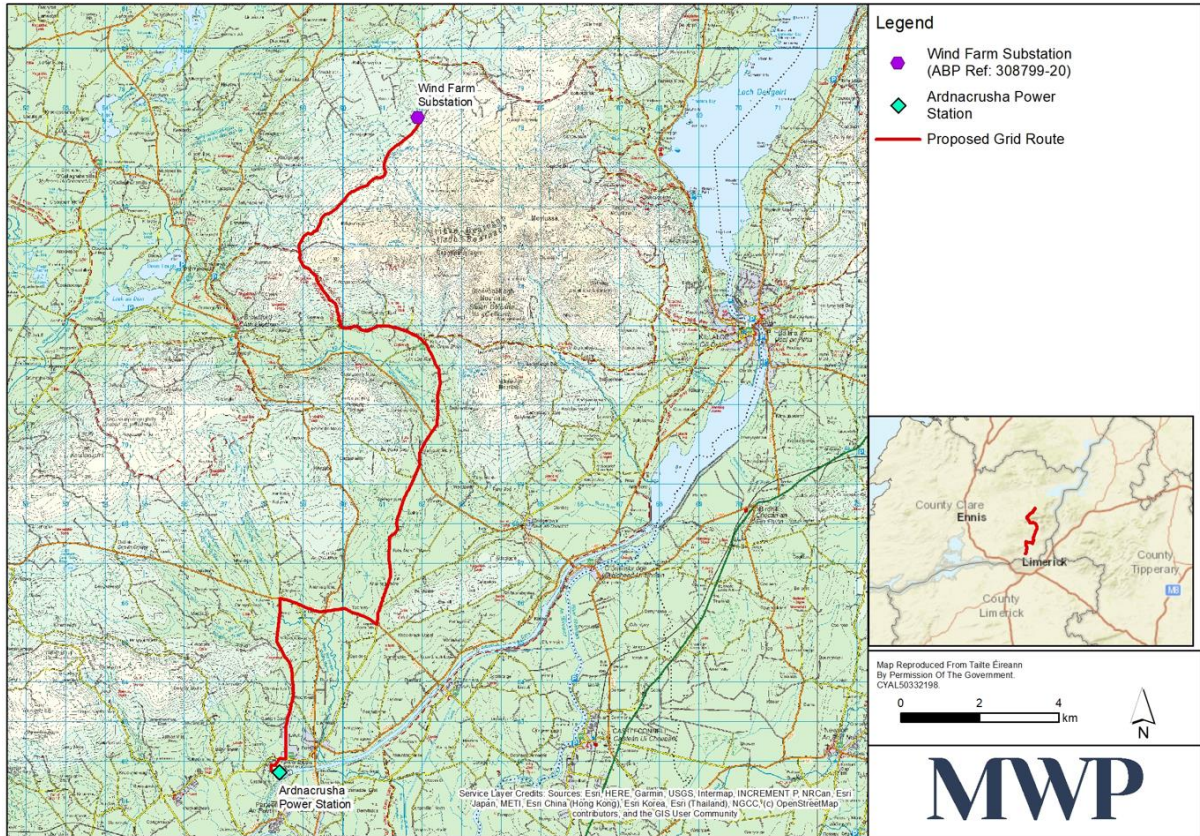


Figure 1 Site Location

1.1 Background

Planning permission was granted by An Bord Pleanála for the Carrownagowan Wind Farm on 29/09/2022 and the Applicant is now seeking permission under section 182A of the Planning and Development Act 2000 (as amended) for the Proposed Development. The Proposed Development was previously assessed as part of the permitted Carrownagowan Wind Farm EIAR; however, while it was assessed in accordance with EIAR requirements, it did not form part of the planning application at that time.

As the project assessed within the 2020 Carrownagowan Wind Farm EIAR included both the wind farm development and the Proposed Development, the previous baseline surveys were used as a reference point for the assessments undertaken for this EIAR. Baseline surveys were repeated where deemed necessary to account for any changes since the 2020 Wind Farm EIAR was completed.

2. Description of the Proposed Development

The individual turbines within the consented Carrownagowan Wind Farm will be connected electrically by underground cables to a new 110kV substation to be constructed within the permitted wind farm site. The permitted Carrownagowan Wind Farm substation will in turn be connected via an underground grid connection cable to the existing ESB owned 110kV substation at Ardnacrusha, County Clare which will allow the electrical energy generated from the wind farm to be exported onto the national grid.

The full length of the Proposed Development is approximately 25 km.

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; and one (1) of the watercourse crossings will be completed by means of over-bridge in road solution. There will be no interactions with any watercourse.

Joint bays are pre-cast concrete chambers will be required along the grid connection route over its entire length. They are required to join cables together to form one continuous cable. They will be located at various points along the Proposed Development approximately every 700 - 850 m depending on gradients, bends etc. It is proposed to install approximately 35 no. joint bays and communication chambers along the Proposed Development.

A 3m wide (in peatland) and a 4 m wide (in non-peatland), paved and gated service track designed for heavy traffic will be installed to provide safe access for inspection, maintenance and fault repair along the cable route where it deviates from the public road. The service track which accompanies the cable route will be suitably designed (i.e., if the road is to be used by heavy vehicles or machinery this should be reflected in the structural design for the road). Joint bays and communication chambers are to be located adjacent to the service track.

2.1 Construction Phase

The active construction area will generally be only along a 100-200 m stretch of any roadway at any one time. The construction works are estimated to take approximately 6-8 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 pulled through ducts and then joining each cable together. There is anticipated to be 35 joint bays with 2-3 days' work involved at each.

2.1.1 Production of Waste

All spoil excavated from the trench, estimated to be approximately 22,204 m³ will be removed offsite to a suitable inert soil facility. Available facilities include Clare Waste & Recycling at Tuamgraney, Inagh Central Waste Management Facility in Ballyduff Beg, Inagh and Enva, located at Smithstown Industrial Estate in Shannon, Co. Clare.

2.2 Operational Phase

It is unlikely that the 110kv underground cable connection link to the existing Ardnacrusha Power station will require much maintenance during its operation. The Proposed Development will be under the control of Eirgrid and any operational or maintenance aspects will be completed by them. The Proposed Development will ultimately be an Eirgrid transmission asset and as such will managed by them.

3. Civil Engineering

The Civil Engineering chapter describes the civil engineering design of the Proposed Development. Fundamental to the design was the requirement to eliminate or minimise adverse effects on the environment arising from the works during the construction phase of the Proposed Development. The full length of the Proposed Development is approximately 25 km.

The Proposed Development will be carried within a single cable trench which will be 825mm wide and a depth of 1,315mm. It is proposed to install approximately 35 no. joint bays and communication chambers along the Proposed Development. Where possible, joint bays will be located in areas where there is suitable widening or grass margin on the road in order to accommodate easier construction and disrupt less traffic. The joint bays, communication chambers and sheath link boxes will be either precast or cast *in situ*.

As outlined earlier, there are a total of 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; and one (1) of the watercourse crossings will be completed by means of over-bridge in road solution.

3.1.1 Directional Drilling under Bridges and Watercourses

The directional drill process will require that the depth of the service trench will deepen in a defined slope as it approaches the watercourse crossing on either side, as to have sufficient passing depth of 1.5 m under the watercourse bed.

The direction drill will be carried out as follows:

- 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. Full and approved traffic management will be incorporated prior to mobilization and set up of the directional drilling rig. A Traffic Management Plan is included in **Appendix 2-3** of Volume III of the EIAR.
- The drilling head of the boring tool has a series of nozzles that feed a liquid bentonite mix along the bore direction, which provides both lubrication and also seals the cut face of the bore.
- Once the bore reaches the far side, the duct is then attached to the drill head and the duct is pulled back along the Proposed Development of the bore to the original drilling point.
- Any bentonite mix is deposited within the bore shaft and spillage is collected at either end of the bore with dedicated sump; all excavated material and excess bentonite will be removed from site and brought to an authorised waste facility. Waste facilities in the waste study area include Clare Waste & Recycling at Tuamgraney, Inagh Central Waste Management Facility in Ballyduff Beg, Inagh and Enva, located at Smithstown Industrial Estate in Shannon, Co. Clare.
- Once the duct is in place under the watercourse, the normal process of road trenching can continue from either side of the watercourse structure.
- The launch and reception pits will be backfilled with appropriate engineered backfill and filled back up to the ground level with a finish to at least pre-existing conditions as agreed with Clare County Council. Suitable warning tapes will also be installed in the pits as per ESN approved design specifications.

3.1.2 Option 2 - Flatbed Formation over Bridges

Where ducts are to be installed over an existing bridge and sufficient cover cannot be achieved by installing a standard trefoil arrangement, the ducts will be laid in a much shallower trench. The ducts will be laid in a flatbed formation over the existing bridge and encased with galvanized steel plates in a concrete surround. This method of duct installation is further detailed in the Construction Methodology report in **Appendix 2-2** of Volume III of the EIAR.

3.1.3 Grid Connection Construction and Existing Underground Services

All relevant bodies i.e. ESB Networks, EirGrid, Gas Networks Ireland, Eir, Clare County Council etc. will be contacted and drawings for all existing underground services along the Proposed Development sought. If the required separation distances cannot be achieved by either going above or below the underground service, then a number of alternative construction options are available as outlined in the previous sections. All excavations will be kept within the public roadway boundaries i.e. in road or grass margins.

3.1.4 Grid Connection Construction Joint Bays and Communication Chambers

Joint bays are pre-cast concrete chambers that will be required along the Proposed Development over its entire length. They are required to join cables together to form one continuous cable. They will be located at various points along the Proposed Development approximately every 700 - 850 m depending on gradients, bends etc. and the proposed locations are shown in the planning application drawings accompanying this EIAR. It is proposed to install 35 no. joint bays and communication chambers along the Proposed Development. These locations will be within the existing/permitted corridor of road network.

4. Alternatives

The Alternatives chapter presents a description of the alternative sites for the Proposed Development that were considered and discusses the rationale for the option chosen.

During the design phase of the consented Carrownagowan Wind Farm, a number of alternatives for the grid connection were considered and are summarised in this chapter:

1. Alternative substation locations (ie. existing grid nodes on the National Electricity Grid) to connect into; and
2. Alternative grid connection route options to Ardnacrusha Sub-station.

The following alternatives were considered for this EIAR:

1. Alternative grid connection designs of the preferred grid connection route option; and
2. Do-nothing alternative.

4.1 Alternative Substation Locations

The two 110kV ESB Substations considered for the Carrownagowan Wind Farm Grid Connection were Ardnacrusha 110kV Substation and Ennis 110kV Substation. Analysis of both options indicated that the Ardnacrusha 110kV Substation is the preferred option for the Proposed Development as opposed to the Ennis 110kV Substation for a number of reasons, including:

- Electrical capacity is available at Ardnacrusha but limited capacity is available at Ennis 110kV Substation;
- A substation expansion options would be required at Ennis 100kV substation; however, expansion options available at Ennis 110kV Substation are limited due to location adjacent to motorway and regional road;
- The Overhead Line routes to Ennis Substation is > 50% longer in comparison to Ardnacrusha Substation and therefore has the potential for increased environmental effects including landscape and visual, water, cultural heritage, biodiversity, and population;
- the Underground cable route to Ennis Substation is > 35% longer in comparison to Ardnacrusha Substation and therefore has the potential for increased environmental effects on traffic, soils, water, cultural heritage, biodiversity, and population; and
- Increased project risks associated with the longer grid connection options to Ennis, i.e. potential environmental impacts and landowner issues.

4.2 Alternative Grid Connection Route Options

Twelve alternative grid connection routes were identified and assessed which included six overhead lines and six underground cable options options. The twelve options were ranked and the highest ranked and most favourable option at an early stage of the process was Option 1, an overhead lines from Carrownagowan to Ardnacrusha Substation using a western corridor. However, the Applicant decided upon an underground cable for the grid connection and thus the option ranked third, which was the preferred underground cable route option, was chosen for the Proposed Development.

The Applicant opted for the underground cable as despite the cost implication, there is less environmental effects involved in utilising the existing road network. It was considered that with an overhead line, there is potential for visual and ecological impacts and uncertainty over ground conditions with respect to constructing the pylon bases. This Option is also in line with current industry and policy as outlined pg. 42 of the 2019 DRAFT Wind Energy Development Guidelines:

"...it is considered that underground grid connections for wind energy projects are the most appropriate environmental and/or engineering solution, particularly in sensitive landscapes where the visual impacts need to be minimised. Therefore, this should be the default approach. However, there may be cases where specific ground conditions would prevent this, e.g. in upland locations where peat stability issues can arise from large-scale excavations".

4.3 Alternative Grid Connection Designs

For this planning application, a number of alternative designs along the route of the preferred grid connection were considered.

Initially, sections of the Proposed Development were located on the public road north of Kilbane. This section was altered in order to preserve access and egress from a traffic management perspective. An ecological survey was conducted in the third-party lands where the grid connection is proposed to traverse. No ecological sensitive receptors were found during this survey and no significant effects from the habitat loss were identified. Please see **Chapter 6** Biodiversity for additional information.

Alternative designs for connecting into Ardnacrusha substation were considered in conjunction with ESB.

Following discussion and on-site engagement with the station manager and other ESB personnel, the preferred route entering the ESB substation building to the West was chosen. This route avoided encountering existing and future cable infrastructure and utilised the existing ESB entrance avenue and ESB tracks.

4.4 Do-Nothing Alternative

The Do-Nothing alternative does not involve any construction works, therefore temporary potential adverse effects of the Proposed Development on the existing environment will be avoided.

Should the Proposed Development not be developed, it would not facilitate the export of green electricity from the permitted Carrownagowan Wind Farm to the National Grid; thereby indirectly contributing to Ireland's renewable energy infrastructure and it will not contribute to Ireland's renewable energy targets. In a do nothing alternative, the Proposed Development would not contribute to Ireland's commitment to meet its EU and national emissions targets.

5. Environmental Assessment

The EIAR has been carried out in accordance with the relevant legislative requirements and guidelines, including the Environmental Protection Agency (EPA) - 'Guidelines on Information to be Contained in an Environmental Impact Assessment Reports, 2022'. Specialist guidance as required for each of the environmental topics has also been used where appropriate.

A summary of each prescribed environmental factor considered in this EIAR is outlined in the following sections.

5.1 Population and Human Health

The scope of the Population and Human Health assessment considers the effects of the construction and operation of the Proposed Development in terms of how the proposal could affect population and settlement, economic activity, employment, land use, amenities and tourism, and health and safety.

The city of Limerick and suburbs (population 102, 287; CSO 2022) to the south, and the towns of Ennis (population 27,923; CSO 2022) to the west and Nenagh (population 9,895; CSO 2022) to the east are the largest urban centres relative to the site of the Proposed Development and are the major service and employment centres in the region.

The Proposed Development will pass through the village of Kilbane and along the western fringe of Ardnacrusha village. The route does not pass through any other community settlements. For the most part settlements patterns along the majority of the Proposed Development typically comprises a mix of small clusters of ribbon residential development and dispersed one off housing. There are approximately 163 dwellings within 50 m of the Proposed Development site.

The land-use along the Proposed Development site comprises mainly transport networks, with sections of agriculture and forestry where the Proposed Development deviates off the public road. The surrounding land use is mainly agriculture land, residential and forestry related.

There are currently a few defined recreational land-uses in the vicinity of the Proposed Development site including Lough Derg and cycleways. Approximately 4.7 km of the East Clare way overlaps with the Proposed Development site along the L8218 and the L30302 towards the village of Kilbane.

During the construction phase, the Proposed Development will have a temporary effect on employment at both the local and national level. It is the intention of the developer to encourage the main contractor to use local sub-contractors, drivers, suppliers and materials as much as possible.

It is not likely that the Proposed Development would directly or indirectly result in any negative effect or reduction in existing economic activity of the area during any phase of the development. During the construction phase aggregates and concrete supply for road construction and foundations will be obtained from local quarries and suppliers, supporting the local economy.

Construction activities can cause a nuisance to the local community and are likely to pose temporary minor disturbances locally. The most notable of these disturbances relates to the generation of additional traffic on the local networks. Here noise and safety implications are also a concern. However, disturbances associated with the additional volumes of traffic will principally be confined to the construction phase and will cease on completion of works. The construction phase will be managed to minimise the impact on the human environment and the local residents. No significant negative effects on the local human environment are expected.

The construction of the Proposed Development will travel southwards along the L8218 and then eastwards along the L30302 to the village of Kilbane. This section of the Proposed Development is part of the East Clare way designated walking route. Therefore this section, approximately 4.7km, of the East Clare walking trail will be

effected during the construction phase due to noise generated. Access for walkers and users of the road network will however not be prohibited.

5.2 Biodiversity

The objectives of the Biodiversity assessment was to:

- Identify and document protected habitats and species in the study area and extending away from it through desk top studies;
- Undertake baseline ecological surveys at the site and evaluate the nature conservation importance of the ecological resources identified using a scientifically robust and objective methodology based on current National and International best practice;
- Predict the potential direct, indirect and cumulative effects of the project on biodiversity; and
- Prescribe mitigation measures, to minimise potential effects on biodiversity

Ecological surveys were completed using a combination of walkover and driven surveys to provide a comprehensive overview of the baseline ecology in the study area. These multi-disciplinary surveys were carried out on the 2nd and 3rd August 2022. Following amendment and finalisation of the site layout, relevant sections of the study area were re-surveyed on 9th November 2022, and 4th April and 16th June 2023. Site visits and surveys were carried out in accordance with best practice and in the expert opinion of the author, are considered sufficient to assess all potential significant ecological effects associated with the Proposed Development. The survey scope and timing were considered sufficient to establish the use of habitats.

The Proposed Development runs under the public road from the permitted Carrowmagowan substation to the substation at Ardnacrusha. The proposed works will be largely confined to existing access tracks and public roads, with the exception of a short sections of peatland recently felled woodland, degraded blanket bog and agricultural lands at the northern extent of the Proposed Development site. Roadside maintenance is obvious throughout, with drains being deepened and roadside hedgerows being cut back, this practice reducing ecological value.

Five invasive alien species species listed on the Third Schedule (Non-native species subject to restrictions under Regulations 49 and 50) of the European Communities (Birds and Natural Habitats) Regulations, 2011, (as amended) were recorded within the study area, namely Himalayan knotweed (*Persicaria wallichii*), Rhododendron ponticum, Japanese knotweed (*Fallopia japonica*), cherry laurel (*Prunus laurocerasus*) and giant rhubarb (*Gunnera tinctoria & manicata*).

Badger (*Meles meles*), pine marten (*Martes martes*), stoat (*Mustela erminea subsp. Hibernica*), hare (*Lepus timidus subsp. Hibernicus*), red squirrel (*Sciurus vulgaris*) and other animals known to occur in the wider area (as per desk study) are evaluated as being of local importance (lower value) in the context of the Proposed Development site. While these animals likely utilise/traverse the Proposed Development site occasionally, it is of no particular importance to this group of fauna.

Birds recorded during the survey on the 14th of April 2023 of the Proposed Development site included the following birds of local importance robin (*Erithacus rubecula*), wren (*Troglodytes troglodytes*) goldcrest (*Regulus regulus*), great tit (*Parus major*), grey heron (*Ardea cinerea*), common starling (*Sturnus vulgaris*) and raven (*Corvus corax*). Avifauna are evaluated as being of local importance (lower value).

The drainage ditches running along the edge of some forest roads do offer some suitable breeding habitat for common frog. This group is evaluated as being of local importance (lower value).

The construction phase of the Proposed Development could result in:

- Temporary alteration of habitats during the installation of ducting;
- Indirect impacts due to increased noise and vibration causing disturbance, and or displacement effects of small mammals as a result of construction activities;
- Indirect water quality impacts on surface waters with negative effects Pollution of rivers and streams; and
- Spread of invasive alien species.

Identified effects during the construction phase are regarded as ‘Short-term’ and range from ‘Imperceptible Negative’, ‘Moderate Negative’ to ‘Slight Negative’. Some interference with habitats may be required during the operational phase if repairs are required. Impacts on habitats and fauna during the operational phase will be less in scale and magnitude as any such works will be shorter in extent. Habitat interference effects are assessed as temporary, negative and of slight significance.

Residual effects on biodiversity including effects on designated sites, habitats, flora, fauna and water quality are not considered significant provided mitigations and best practice methodologies are employed during the construction phase.

The application of construction phase mitigation and protection measures will ensure that no significant residual ecological effects either alone or in combination with other plans or projects, including the other elements of the consented Carrownagowan Wind Farm will arise from the Proposed Development.

With regard to European Sites, a screening for appropriate assessment report was prepared, to determine, on the basis of a preliminary assessment and objective criteria, whether the Proposed Development, alone or in combination with other plans or projects, could have significant effects on a Natura 2000 site in view of the site’s conservation objectives. The screening for appropriate assessment report concluded that it can be excluded, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

5.3 Water

The Proposed Development lies within 2 no. Water Framework Directive catchment units. The Shannon Estuary North (catchment ID 27) contains the northern section of the Proposed Development site while the southern section is mapped in the Lower Shannon (catchment ID 25D). The Proposed Development is mapped within the Owenogarney_SC_010 sub-catchment within the Shannon Estuary North catchment, and within the Lower Shannon catchment is mapped in the Shannon[Lower]_SC_100 and briefly mapped within the Shannon[Lower]_SC_080 sub-catchments.

The Proposed Development site is drained by the Killuran River and the Broadford River within the Shannon Estuary North catchment and Owenogarney sub-catchment and the Blackwater River within the Lower Shannon River catchment.

Groundwater vulnerability along the Proposed Development site ranges from low to extreme, dependent on the depth of soil/subsoil. In some areas the Proposed Development is mapped to have rock at or near the surface. The northern section of the Proposed Development passes through the Tulla-Newmarket GroundWater Body which achieved “Good” status in the latest Water Framework Directive cycle (2016-2021). For a brief period along the L7004 local road east of Broadford the Proposed Development is mapped to overly the Broadford Gravels GWB which also achieved “Good” status in the latest WFD Water Framework Directive cycle.

The southern section of the Proposed Development passes through the Lough Graney GroundWater Body and the very southern section of the Proposed Development is mapped within the Ardnacrusha GWB, all of which received a “Good” status under the Water Framework Directive 2016-2021.

During the construction phase of the Proposed Development a number of activities will take place, some of which will have the potential to significantly affect the hydrological regime or water quality along the Proposed Development site. These significant potential impacts generally arise from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds, with the former having the most potential for impact.

Preventative measures include fuel and concrete management and a waste management plan which are incorporated into the Construction and Environmental Management Plan (**Appendix 2-2**, Volume III).

Overall the Proposed Development presents no significant effects to surface water and groundwater quality provided the proposed mitigation measures are implemented.

No significant cumulative impacts on any of the regional surface water catchment or groundwater bodies will occur as a result of the construction and operation of the proposed development.

5.4 Land and Soils

The majority of the Proposed Development site is located in agricultural areas and pastures and in some smaller areas along forestry and semi natural areas. The very southern part of the Proposed Development at Ardnacrusha is mapped within discontinuous urban fabric (i.e., made ground). The majority of the Proposed Development site is mapped to be underlain by a combination of Old Red Sandstone and Silurian meta-sediments including the Slieve Bernagh Formation, the Broadford Formation and the Cratloes Formation. However, Dinantian sandstone, shales and (impure) limestones and (pure) Waulsortian limestones are mapped at the far southern end of the Proposed Development site. Soils mapped locally along the Proposed Development comprise mainly Acidic deep well drained mineral soils (AminDW) and blanket peat (BktPt) at the northern end of the route, transitioning to Acidic shallow well drained mineral soils (AminSW) through much of the middle section and finally Acidic deep poorly drained mineral soil (AminPD) at the southern end. Subsoils are mapped as mainly sandstone and sandstone/shale tills with smaller sections mapped as bedrock outcrop, alluvium and gravels.

Excavation of soils and subsoil will be required for the formation of trenches to accommodate the high voltage power line along the grid route and for the foundation/construction works within the proposed substation. This will result in a permanent removal of some soil and subsoil at most excavation locations. Any excavated topsoil/subsoil associated with the trench and access tracks in off road sections of the Proposed Development that isn't removed off-site to a licenced facility will be temporarily stored near the excavations and reused for reinstatement works. The handling and management of soil will be undertaken in accordance with the Construction and Environmental Management Plan (**Appendix 2-2**, Volume III). Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Land and landuse changes along the Proposed Development will be of slight significance as the active construction area for the Proposed Development will be small, ranging from 100 to 200 m.

No significant effects on the land, soil and geology on the site of the Proposed development will occur during construction or operation phases.

The assessment confirms there will be no cumulative effects on land soil and geological environment as a result of the Proposed Development.

5.5 Noise and Vibration

Potential noise and vibration effects during construction and operation of the Proposed Development were assessed. Construction noise will occur during excavation and earth moving, laying of electrical cabling, and installation of the joint bays. The construction phase will be temporary.

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. Natural noise sources include wind borne noise in vegetation and water in streams and rivers.

The noise from construction activities has been assessed and is predicted to result in a temporary to short term, slight to moderate adverse effect on noise sensitive receptors. 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 no cumulative effects during the construction phase with other developments. There will be no cumulative operational effects with other development.

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

5.6 Cultural Heritage

The Proposed Development travels through 37 townlands in County Clare, confined largely to existing roadways within a landscape is primarily rural uplands and pasture. There are 16 recorded monuments within the receiving environment, the nearest of which is the church and graveyard (AH13 and AH14) within Trough townland situated to the immediate west of the Proposed Development as it runs along a local road. The Proposed Development also passes through the Zone of Notification for recorded monuments AH03, AH07, AH10, AH11 and AH12.

There is one Protected Structure located along the route of the Proposed Development and two located within 250m. Two of these structures are also included in the National Inventory of Architectural Heritage Building Survey. Two designed landscapes have been identified within the receiving environment, only one of which is recorded by the National Inventory of Architectural Heritage Garden Survey.

The construction of the Proposed Development will not result in any direct negative impacts on previously recorded, or unrecorded, sites of archaeological significance.

The Proposed Development will pass (via the roadway) through the Zone of Notification associated with monuments AH03, AH07, AH10, AH11, AH12, AH13 and AH14. It is possible that archaeological features associated with these monuments may extend beneath the road and thus ground disturbances associated with the excavation of the cable trench have the potential to result in a direct, negative and permanent impact on same. Impacts, prior to the application of mitigation, may range from moderate negative to profound negative, dependent on the nature, extent and significance of any such remains that may be present.

Where the Proposed Development crosses lands that remain undeveloped, it is possible that archaeological features survive within these areas with no surface expression. Ground disturbances associated with the excavation of the cable trench have the potential to result in a direct, negative and permanent impact on any archaeological remains that may be present. Impacts, prior to the application of mitigation, may range from

moderate negative to profound negative, dependent on the nature, extent and significance of any such remains that may be present.

There is one Protected Structure, BH 1 Kilbane Bridge, located along the route of the Proposed Development. However, this structure will be avoided as the cable will be laid beneath the adjacent stream bed (minimum depth of 1.5m). As such, there will be no impacts upon this structure during the construction phase nor to the channel and banks of the watercourse.

No remaining sites of built heritage or cultural heritage significance will be negatively impacted by the construction of the Proposed Development.

All excavations within the Zone of Notification for monuments AH03, AH07, AH10, AH11, AH12, AH 13 and AH14 will be monitored by a suitably qualified archaeologist. All excavations across previously undisturbed greenfields will also be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works the Department of Housing, Local Government and Heritage will be informed immediately and further mitigation will be required, such as preservation in-situ or by record. Any further mitigation will require the approval of the Department of Housing, Local Government and Heritage.

There is no predicted impacts to the archaeological, architectural and cultural heritage resource as a result of the operation of the Proposed Development.

Following the implementation of the above mitigation measures, there will be no significant negative residual impacts on the archaeological, architectural or cultural heritage resource.

5.7 Air and Climate

The potential effects of the Proposed Development on local air quality and climate have been assessed. The effects of construction and operation have been considered.

Representative Environmental Protection Agency ambient air quality data has been used to characterise the existing air quality in the area. The air quality for the region where the is proposed (Rural West Air Quality Index for Health Region 6) is currently ranked as '3 - Good'.

There is the potential for dust nuisance to occur during the construction phase. However, considering the separation distance to nearby dwellings, in addition to strict adherence to best construction practices, the effect on local air quality will not be significant. The movement of machinery, construction vehicles and the use of generators during the construction phase will generate exhaust fumes. Dust and emissions from the construction works will likely result in a temporary, negative and imperceptible effect on sensitive receptors near construction works areas for the duration of the construction phase.

Standard best practice is adhered to during the construction phase in order to minimise fugitive dust emissions in particular.

Once operational, there will be no direct emissions to the atmosphere from the Proposed Development. The electricity generated will displace electricity that would otherwise have been generated by burning fossil fuels. The CO₂ offset by the Proposed Development will further assist Irelands CO₂ reduction commitments under the Paris Agreement and the Climate Action Plan 2021.

As part of the overall Carrowmagowan Wind Farm Project, the Proposed Development is fully aligned with current energy and climate policy, aims and objectives, which primarily seek to increase the production of electricity from renewable sources.

5.8 Material Assets

The Environmental Protection Agency's 'Guidelines on the information to be contained in an Environmental Impact Assessment Report' describes material assets to be taken to mean 'built services' (i.e. built services networks including electricity, telecommunications, gas, water supply and sewerage), 'waste management' and 'infrastructure' (e.g. roads and traffic). These are all considered within this chapter.

The scope of this assessment is made with respect to these topic areas and considers the effects of the construction and operation of the Proposed Development in terms of how the proposal could affect built services, waste management and roads and traffic.

5.8.1 Transport

The Proposed Development will be installed initially within the wind farm site for approximately 4.2 km. The Proposed Development will then be installed within approximately 0.89 km of existing wind farm access roads. From here the Proposed Development will traverse approximately 2.3 km of consented third party lands. The Proposed Development will then travel approximately 16.96 km along a series of public roads to the existing substation in Ardnacrushna, passing through the townlands of Cloongaheen West, Cloongaheen East, Killeagy, Ballymoloney, Ballyquin Beg, Ballyquin More, Springmount, Leitrim, Fahy More South, Aharinaghmore, Tooreen, Cloghera, Trough, Knockdonagh, Roo West, and Lakyle. The Proposed Development will then traverse approximately 0.52 km of consented third party lands in order to access the existing substation in Ardnacrushna.

There will be an increase in local traffic during the construction phase (estimated to take 6-8 months) of the Proposed Development due to construction workers commuting to and from the Proposed Development site each morning and evening, as well as construction vehicles on the existing road network.

The volume of traffic generated by the transportation requirements during the construction phase of the Proposed Development will be minimal and will be within the carrying capacity of the existing road network as described in Section 12.3.2. No mitigation measures were therefore deemed necessary; however, best practice measures will be followed.

The residual effect from additional traffic volumes and traffic management measures during the construction works will likely remain negative, temporary and not significant. The residual effect from heavy vehicle traffic volumes generated by the Proposed Development construction which could result in damage to existing road pavements during the construction works will likely remain negative, temporary, negligible and imperceptible.

There will be no residual effects during the operational phase of the existing transport infrastructure

5.8.2 Built Services

ESB infrastructure in the study area include:

- 38 kV & higher voltage overhead lines;
- 10KV/20KV medium voltage overhead lines;
- 400V/230V low voltage overhead lines; and
- 10KV/20/KV/400V/230V underground cable route.

Inserted gas distribution pipes (medium pressures) along Lackyle Heights where the Proposed Development is located. Eir's eMaps shows a run of trenches containing in service buried conduits (pipes / duct) and telecommunication cables. The maps also show a run of in-service overhead telecommunication cables. These

underground and overhead cables accommodate the fiber and copper cables needed to deliver nationwide fixed, mobile and broadband services.

During the construction phase of the Proposed Development, During the construction phase of the Proposed Development, it will be necessary to excavate close to existing underground services such as water mains, gas networks, telecommunications, or existing cables. In advance of any construction activity, the contractor will undertake detailed surveys and scans of the Proposed Development site to confirm the presence of any services. If found to be present, the relevant service provider will be consulted with in order to determine the requirement for specific excavation or relocation methods and to schedule a suitable time to carry out works.

Some minor alignment alterations may be required if previously unknown services are encountered which will likely result in brief suspension of services. Although the exact number of interruption days for particular utility customers cannot be ascertained at this stage, any service interruptions are likely to be brief and occur rarely if required and will generally occur for a set number of hours per day.

With the implementation of best practice measures outlined in Section 12.5.1.2 of **Chapter 12** Material Assets, the Proposed Development could still require the suspension of services to facilitate some minor alignment alterations if previously unknown services are encountered during the construction phase. Therefore, the residual effect on the existing built services infrastructure will likely remain negative, brief and not significant as no additional mitigation is necessary possible to reduce the effect of the suspension of services from the generation of waste during the construction phase.

There will be no residual effects during the operational phase.

5.8.3 Waste Management

There is a network of waste collection, treatment, recovery, and disposal infrastructure within the Southern Waste Region to manage waste efficiently in the surrounding area. Waste facilities in the waste study area include Clare Waste & Recycling at Tuamgraney, Inagh Central Waste Management Facility in Ballyduff Beg, Inagh and Enva, located at Smithstown Industrial Estate in Shannon, Co. Clare.

As outlined in **Chapter 2** Description of the Proposed Development, it has been calculated that there will be approximately 22,204 m³ of material excavated during the construction of the Proposed Development. All soils and sub soils generated from excavation works within the public road network sections will be disposed of to a licenced facility. Road excavation will generate small quantities of tarmacadam which will require off-site disposal by a permitted waste contractor. Available facilities include Clare Waste & Recycling at Tuamgraney, Inagh Central Waste Management Facility in Ballyduff Beg, Inagh and Enva, located at Smithstown Industrial Estate in Shannon, Co. Clare.

With the implementation of the best practice measures outlined in Section 12.5.1.3 of **Chapter 12** Material Assets, the Proposed Development will still generate solid waste during the construction phase; therefore, the residual effect on waste management infrastructure in the region will likely remain neutral, temporary and imperceptible as no additional mitigation is necessary to reduce the effect from the generation of waste during the construction phase.

5.9 Landscape and Visual

The Proposed Development is largely laid within the existing road corridor. A number of sections of limited length are not on the existing public road. These include short sections at Ardnacrusha, within the ESB facility, at the southern extent of the study area, and within agricultural lands at Cloongaheen West, and within areas of coniferous plantation, to the north of the study area. The main activities in the vicinity of the grid connection are

electricity generation, agriculture, and coniferous forestry, with residential uses immediately adjacent to the road corridor.

Due to the nature of the Proposed Development, the fact that it is a cable located underground, the main landscape and visual effects will occur during the construction phase. These effects will be extremely localised. The nature of the Proposed Development is also that it is reversible and can be removed with minimal landscape and visual effects, similar to the construction phase.

At the construction phase, the significance of the landscape effect is a temporary to short term, imperceptible to not significant, adverse landscape effect and will include some disturbance to the road corridor as well as some limited offroad sections through grassland and forestry plantation in the north of the study area. Short-term adverse visual effects result where vegetation clearance takes some time to re-establish.

Operational phase landscape effects within the road corridor are not likely to arise, as the cable is underground and installed. Any maintenance operations unlikely to result in landscape effects and would be similar to temporary road works. The sections of proposed cable route which are close to or adjacent to the local road (in grassland and through forestry) and track at Cloongaheen West will remain, but effects are considered Not Significant.

The visual effect is a Temporary to Short Term, adverse, Not Significant visual effect. While the majority of the visual effects will be temporary and only in evidence for the period of construction, similar to road works projects, short-term visual effects are expected to arise where the proposed grid connection runs off-road in the northern part of the study area and will reduce after this as vegetation re-establishes.

Operational phase visual effects are not likely to arise where the cable is underground and installed in the road corridor, which is the case for the majority of the cable route. Any maintenance operations unlikely to result in visual effects and would be similar to temporary road works. Visual receptors along the roads and track at Cloongaheen West (including residents as well as those on the parts of the East Clare Way) would continue to notice the visual change as a result of the proposed access track in the off road -section, however over time the surroundings will gradually re-vegetate to minimise effects which are considered not Significant visual effects.

5.10 Interaction of the Foregoing

There is potential for interactions between one aspect of the environment and another which can result in direct or indirect impacts, and which may be positive or negative.

A matrix has been generated to summarise the relevant interactions and interdependencies between specific environmental aspects (Refer to **Table 5-1**). It contains each of the environmental topics, which were considered as part of this environmental impact assessment, on both axes.

Table 5-1 Matrix of Impacts

	Population and Human Health	Biodiversity	Water	Land and Soils	Air Quality and Climate	Noise and Vibration	Cultural Heritage	Material Assets	Landscape and Visual
Population and Human Health					C	C		C	C
Biodiversity			C	C		C			
Water		C		C					
Land and Soils		C	C		C		C	C	
Air Quality and Climate	C			C				C/O	
Noise and Vibration	C	C							
Cultural Heritage				C					
Material Assets	C				C/O				
Landscape and Visual									

	Interaction
	No Interaction

C	Construction Phase Impact
O	Operation Phase Impact