Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Lackareagh Wind Farm, Co. Clare

Chapter 3 –Site Selection and Reasonable Alternatives

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3. SITE SELECTION AND REASONABLE ALTERNATIVES

3.1 Introduction

Article 5(1)(d) of Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification) as amended by Directive 2014/52/EU (the EIA Directive) requires that the Environmental Impact Assessment Report (EIAR) prepared by the developer contains "a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment."

Article 5(1)(f) of the EIA Directive requires that the EIAR contains "any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected."

Annex IV of the EIA Directive states that the information provided in an EIAR should include a "description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the Proposed Project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described using the following references: 'Proposed Project', 'the site', 'Proposed Wind Farm', and 'the Proposed Grid Connection Route'. This section of the EIAR contains a description of the reasonable alternatives that were studied by the developer, which are relevant to the Proposed Project and its specific characteristics, in terms of site location and other renewable energy technologies as well as site layout incorporating size and scale of the project, connection to the national grid and transport route options to the Proposed Project. This section outlines the design considerations for both the Proposed Wind Farm and the Proposed Grid Connection Route. It provides an indication of the main reasons for selecting the chosen option of the 7-turbine layout and associated infrastructure which constitutes the Proposed Wind Farm, the proposed 38kV underground cabling route to Ardnacrusha 110kV substation which constitutes the Proposed Grid Connection Route and includes a comparison of the environmental effects. The consideration of alternatives is an effective means of identifying and avoiding environmental impacts. As set out in the 'Guidelines on The Information to be Contained in Environmental Impact Assessment Reports' (Environmental Protection Agency, 2022), the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

Hierarchy

EIA is concerned with projects. The Environmental Protection Agency (EPA) guidelines state that in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by a higher authority, such as a national plan or regional programme for infrastructure.

Non-environmental Factors

EIA is confined to the environmental effects that influence consideration of alternatives. However, other non-environmental factors may have equal or overriding importance to the developer of a project, for example project economics, land availability, engineering feasibility or planning policy.

Site-specific Issues

The EPA guidelines state that the consideration of alternatives also needs to be set within the parameters of the availability of the land, i.e., the site may be the only suitable land available to the developer, or the need for the project to accommodate demands or opportunities that are site specific. Such considerations should be on the basis of alternatives within a site, for example design and layout.

3.2 Consideration of Reasonable Alternatives

3.2.1 Methodology

The EU Guidance Document (EU, 2017) on the preparation of EIAR outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives, the Developer needs to provide the following:

- A description of the reasonable alternatives studied; and
- An indication of the main reasons for selecting the chosen option with regards to their environmental impacts.

There is limited European and National guidance on what constitutes a 'reasonable alternative' however the EU Guidance Document (EU, 2017) states that reasonable alternatives "must be relevant to the proposed project and its specific characteristics, and resources should only be spent assessing these alternatives".

The guidance also acknowledges that "the selection of alternatives is limited in terms of feasibility. On the one hand, an alternative should not be ruled out simply because it would cause inconvenience or cost to the Developer. At the same time, if an alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible alternative".

The EPA Guidelines (EPA, 2022) state that "It is generally sufficient to provide a broad description of each main alternative, and the key issues associated with each, showing how environmental considerations were taken into account is deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

Consequently, taking consideration of the legislative and guidance requirements into account, this chapter addresses alternatives under the following headings:

- 'Do Nothing' Alternative
- Alternative Site Locations
- Alternative Renewable Energy Technologies
- Alternative Turbine Numbers and Model;
- Alternative Turbine Layout and Development Design;
- Alternative Design of Ancillary Structures
- Alternative Grid Connection Cabling Route Options;
- Alternative Transport Route and Site Access; and
- Alternative Mitigation Measures.

Each of these headings, and how they relate to the Proposed Project, is addressed in the following sections.

When considering the Proposed Project, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.2.2 'Do-Nothing' Alternative

Annex IV, Part 3 of the EIA Directive states that the description of reasonable alternatives studied by the developer should include "an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge." This is referred to as the "do nothing" alternative. EU guidance (EU, 2017) states that this should involve the assessment of "an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario."

An alternative land-use option to developing a renewable energy project at the Proposed Project site would be to leave the site as it is, with no changes made to the current land-use practices of low intensity agriculture and forestry on the Proposed Wind Farm site, and public road corridor, public open space, agricultural land with significant areas of natural vegetation, and transitional woodland shrub along the Proposed Grid Connection Route. In doing so, the environmental effects in terms of emissions are likely to be neutral however, the opportunity to capture the available 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 and the reduction of greenhouse gas emissions. The opportunity to generate local employment and investment would also be lost. It is likely that the trends of population decline that have been recorded within the Population Study Area would continue in the absence of investment, as discussed in Chapter 5 of this EIAR on Population and Human Health. Overall, the potential effect of this is considered to be long term, negative and imperceptible.

The existing land uses can and will continue in conjunction with the Proposed Project. A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this site are presented in Table 3-1 below.

Table 3-1 Comparison of environmental effects when compared against the chosen option of developing a renewable energy project

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
Population & Human Health	No increase in local employment and no long-term financial contributions towards the local community No potential for shadow flicker and noise to affect Sensitive receptors No potential to contribute to the improvement in air quality through the use of renewable energy	Up to approximately 70 jobs could be created during the construction, and operation and maintenance phases of the Proposed Project Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker and noise from the Proposed Wind Farm
Biodiversity (including Bats) and Birds)	No habitat loss No potential for collision risk for birds and bats. Potential for habitat restoration on the Site would be lost	As detailed in Chapter 6, the development has been designed to avoid or mitigate effects on biodiversity. As detailed in the Bat Report in Appendix 6-2 of this EIAR, there is unlikely to be any

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
		significant increase in collision risk to bats from the Proposed Project. As detailed in Chapter 7, Section 7.9.2, the Collision Risk Assessment (CRA) indicates that the impact of the Proposed Project on birds corresponds to a very low to low effect significance (species dependent).
Land. Soils & Geology	Neutral	As detailed in the assessment in Chapter 8, there is no loss of topsoil, subsoil or bedrock as a result of the Proposed Project. Topsoil and subsoil will be relocated within the site.
Water	Neutral	As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	No potential for the opportunity for an overall increase in air quality	As detailed in the assessment in Chapter 10, there will be a significant positive effect on air quality due to the operation of the Proposed Project.
Climate	No potential for an overall reduction in greenhouse gases or assisting in the achievement of renewable energy targets set out in the Climate Action Plan.	As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Project 1,139,775 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise & Vibration	No potential for noise impacts on nearby Sensitive receptors.	Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on Sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phases of the Proposed Project

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
Landscape & Visual	No potential for landscape and visual effects on nearby Sensitive receptors	As detailed in the assessment in Chapter 13, there are no significant landscape effects, no significant visual effects are deemed to arise from residential visual amenity in the landscape surrounding site
Cultural Heritage & Archaeology	No potential for effects on unrecorded, subsurface archaeology.	As detailed in the assessment in Chapter 14, the significance of direct effects will be imperceptible - moderate and no significant effects will occur. There will be no significant direct or indirect impacts on Cultural Heritage.
Material Assets	Neutral	As detailed in Chapter 15, there will be short term negative imperceptible to slight impacts on traffic volumes during the construction phase of the Proposed Project. As detailed in the Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing onsite.
Vulnerability of the Project to Major Accidents and Natural Disasters	No potential to be affected by or to cause major accidents or natural disasters	As demonstrated in Chapter 16, the risk of major accident and/or natural disaster during the construction of the Proposed Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010)

For the reasons set out above, the proposal for a wind energy development at the Proposed Wind Farm site was progressed over a Do-Nothing Scenario despite the potential environmental effects, as it was determined through the iterative design process and site visits carried out by the EIAR team that any potential environmental effects could be eliminated or appropriately mitigated as set out in detail in Chapters 5-16 of this EIAR. By progressing the Proposed Wind Farm, there is an opportunity to enhance the employment and investment in the local area and to capture the available renewable energy resource within County Clare, thus contributing to meeting national and international climate targets. Please refer to Chapter 5 through to Chapter 16 of this EIAR for further details on the effect associated with the progression of the Proposed Project.

3.2.3 Alternative Site Locations

The process of identifying a suitable location for a development such as the Proposed Project is influenced by a number of factors. While wind speeds, the extent of suitable or available land, proximity to the grid connection point, and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will not attract the necessary project finance required to see it built. The Irish Government has outlined the 2030 energy targets for both onshore and offshore wind projects in the 2024 Climate Action Plan (CAP 2024). CAP 2024 states that the target for both onshore and offshore wind energy is 9 Gigawatts (GW) and 5GW respectively. However, at the beginning of the site selection process for the Proposed Project, the planning legislation and regulations surrounding offshore wind energy was limited whilst the legislation and regulations relating to onshore wind energy is well developed and established. The certainty behind the onshore wind planning policies attracted the developers to select an onshore project due to the numerous unknowns regarding offshore wind planning policies, legislation, and regulations. At the time of writing, the Minister for the Environment, Climate and Communications had issued 'Maritime Area Consents' to the first phase of six offshore wind energy developments on 23rd December 2022, highlighting the infancy of the offshore wind planning policy area in Ireland. The planning applications for these 'Phase 1' projects are due to the submitted during 2024.

3.2.3.1 Strategic Site Selection

As set out in Section 1.3 of this EIAR the applicant company, EDF Renewables Ireland (EDF) is part of one of the world's largest electricity companies. EDF Renewables Ireland's team has a wealth of experience in bringing complex development projects to fruition, across onshore and offshore wind, solar PV and battery storage technology, and is supported by more than 400 colleagues in the UK. MKO, on behalf of EDF, undertook a detailed site identification process, through Geographical Information Spatial (GIS) software, within multiple counties which has led to a number of sites which EDF wishes to bring forward to planning, including the Proposed Project site and further sites in Co. Carlow and Co. Kilkenny.

The detailed site identification process undertaken by MKO considered multiple criteria over a two-phase process to identify possible sites, within numerous counties, with the potential to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as, house location data, transport, existing wind energy and grid infrastructure data, land use data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time.

The following is a summary of the methodology used in the screening process. The screening process included the following phases:

- Phase 1: Proximity to the National Grid
- Phase 2: Screening

3.2.3.1.1 *Phase 1 – Proximity to the National Grid*

As part of the site selection process, it was necessary to consider the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

3.2.3.1.2 *Phase 2 - Screening*

This stage in the selection process discounted lands that were not available for development under a number of criteria, as follows:

- Residential Dwelling Locations plus 720m buffer

- Transport corridors
- 110kV/220kV/400kV Electricity Transmission Corridors
- Watercourses/waterbodies plus 50m buffer
- Designated Sites
- Existing wind farm developments and lands committed to permitted/proposed developments.

Phase 1 and Phase 2 as outlined above allowed the screening criteria to be identified, and the screening exercise was subsequently designed to identify a site which was less likely to result in significant environmental effects.

3.2.3.1.3 *Results of the Screening Process*

The application of the above criteria to identify a site relevant to the project and its specific characteristics resulted in the selection of a candidate site in the east of Co. Clare, near the village of Kilbane, as a candidate site to be brought forward for more detailed analysis. This site is now known as the Lackareagh Wind Farm.

Other sites that also emerged from the screening process, as outlined above, for which EDF are in the process of preparing separate planning applications are located in Co. Carlow and Co. Kilkenny.

EDF intended to bring forward all of these sites for wind energy development as all were considered to be viable sites for a wind energy development. Each are projects in their own right which will be subject to EIA. As such, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen options with regards to their environmental impacts will be provided in the EIAR accompanying the applications for the same.

The alternative would be to bring forward a site that did not pass one or all of the above phases of the screening process. In that instance, there may be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated or sensitive areas and visually sensitive (scenic) or amenity areas. There may also be the potential for greater shadow flicker, noise and traffic impacts if the candidate site was located in an area with a higher number of residential dwellings.

3.2.3.2 Planning Policy

A Planning Report has been prepared in support of the Proposed Project and this report accompanies this planning application. The objective of this document is to present a planning policy rationale for the Proposed Project. This report includes an assessment of the relevant international, national, regional, and local planning and renewable energy policy that applies to the Proposed Project (Chapter 2) which highlights the differences existing between local policy and international / national / regional policy. The Proposed Project is considered to be supported by, and consistent with all levels of policy from international to the local level.

This report notes that the Proposed Project adheres to the recommendations and guidance outlined in the '*Draft Revised Wind Energy Development Guidelines - December 2019*' (hereafter referred to as 'Draft DoEHLG 2019 Guidelines') and the '*Best Practice Guidelines for the Irish Wind Energy Industry*' (Irish Wind Energy Association, 2012). The report concludes that the Proposed Project is considered to be in the overriding public interest, as it will contribute to achieving the objectives of the REPowerEU plan, both in relation to the transition to clean renewable energy and energy security for the both the State and the European Union.

The Planning Report analyses the planning policy against which the Proposed Wind Farm will be assessed, the main findings of the report are as follows:

- The Proposed Project is strongly supported by climate and energy policy and law at an EU, national and regional level.
- The Proposed Wind Farm is supported by, and is in compliance with, the policy objectives of the Clare County Development Plan 2023-2029 (the CDP).
- The Proposed Wind Farm has been designed in accordance with the Wind Energy Development Guidelines for Planning Authorities (2006) and the Development Management Standards for Renewable Energy Proposals, as set out in the CDP.
- The Clare Renewable Energy Strategy classifies the Proposed Wind Farm to be in an area '*Open to Consideration*' which is acceptable for wind energy development.

The report concludes that the Proposed Wind Farm site is suitable for wind energy development and the Proposed Project is in accordance with the proposed planning and sustainable development of the area and County Clare as a whole.

3.2.3.3 Suitability of the Candidate Site

The Proposed Project, as a candidate site, was further examined under the following headings in order to confirm its suitability for wind energy development:

- Wind Speeds
- Designated Sites
- Available Set Back from Sensitive Receptors
- Residential Density
- Planning Policy

3.2.3.3.1 *Wind Speeds*

As the cost of building each megawatt of electricity generating capacity in a wind farm is in the region of €1.5 million, it is critical that the most suitable site for the Proposed Project is chosen The Irish Wind Atlas produced by Sustainable Energy Authority of Ireland shows average wind speeds for the country. A suitable wind regime and consistent wind speeds are required for the development of a wind energy project. Wind speeds in the west/southwest of the country are typically between 5 - 9 m/s. the wind energy resource of Ireland's upland areas in the west/southwest, including the site of the Proposed Wind Farm, are among the best in the world, as outlined in Clare's County Development Plan (2023 – 2029). On-site monitoring of the wind resource, which is ongoing, will further verify that with a sufficient turbine height and blade diameter, the wind resource of the site is commercially viable.

3.2.3.3.2 *Designated Sites*

The Proposed Wind Farm is not located within a Special Area of Conservation (SAC) or Special Protection Area (SPA) under the Habitats Directive and Birds Directives respectively. The Proposed Grid Connection Route passes through 1 no. SAC, as detailed further below.

The nearest Natura 2000 site to the Proposed Wind Farm, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA) is the Slieve Bernagh Bog SAC, the boundary of which is located approximately 95m to the north of the Proposed Wind Farm infrastructure at its closest point (i.e. T1 hardstand). The Proposed Grid Connection Route also passes through the Glenomra Wood SAC, which is designated for Old Sessile oak woods with Ilex and Blechnum. However, the underground cabling route is located fully within the public road corridor and will therefore result in no negative impacts on the integrity of the SAC.

The nearest nationally designated site to the Proposed Project, i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) is Glenomra Wood pNHA, which the Proposed Grid Connection Route passes through. The works along the Proposed Grid Connection Route on the local road L3046 which bisects the Glenomra Wood SAC will ensure there is no damage, disturbance or loss

of habitat by erecting temporary fencing either side of the road along that section to ensure no materials are stockpiled or vehicles are parked there which could potentially damage the habitat.

3.2.3.3.3 Residential Density

The Applicant sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity, the study area has emerged as suitable to accommodate the Proposed Project. The population density of the electoral divisions in which the Proposed Wind Farm is located, Lackareagh, Killokennedy, Fahymore, Cloghera and Ballyglass, i.e. the Population Study Area as defined in Chapter 5 of this EIAR, is 10.85 persons per square kilometre, as described in Chapter 5: Population and Human Health, of this EIAR. This is significantly lower than the average national population density of 72.91 persons per square kilometre.

Furthermore, the closest dwelling to the Proposed Project is located (720)m from the nearest turbine (T3). This meets the requirements as set out in the draft Guidelines for a setback distance from occupied dwellings of 4 x tip height from a turbine (i.e. 720m in this case). There are 28 no. inhabitable dwellings located within 1km of the proposed turbine locations with 5 no. of those belonging to the landowners who form part of the Proposed Project.

3.2.3.3.4 Planning Policy

A Planning Report has been prepared in support of the Proposed Project and this report accompanies the planning application. The objective of this document is to present a planning policy rationale for the Proposed Project. The Proposed Wind Farm site is located within an area designated as 'Open to Consideration' in the draft Clare County Project Plan 2023 – 2029. Wind energy developments proposed within this area will be judged on a 'case by case basis' on whether they are suitable for the area. The area that the Proposed Project is located within has favourable environmental characteristics. A robust assessment of wind energy constraints in Co. Clare has indicated that the Proposed Wind Farm site has development potential and can contribute towards the wind energy targets, as set out in international, national and local policy. This report includes an assessment of the relevant international, national, regional and local planning and renewable energy policy that applies to the Proposed Project (Chapter 2) which highlights the differences between local policy and international/national/regional policy.

This report notes that the Proposed Project has fully considered the recommendations and guidance outlined in the Draft DoEHLG 2019 Guidelines and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012). The report concludes that the Proposed Project is in the overriding public interest, as it will contribute to achieving the objectives of the REPowerEU plan, both in relation to the transition to clean renewable energy and energy security for both the State and the European Union.

3.2.3.3.5 Summary

From the review of the criteria set out above, which is heavily weighted towards minimising any potential negative environmental effects, the Proposed Project site was identified as a suitable location for the provision of renewable energy development of the scale proposed. The Proposed Wind Farm is located on agricultural land and existing commercial forestry which allows the site to take advantage of existing access roads (which will be upgraded) and highlights the suitability of the Proposed Wind Farm site as it can make sustainable use of these established items of infrastructure. The candidate site does not overlap with any environmental designations, is accessible in terms of connection to the national grid and is also located in an area with a relatively low population density with appropriate annual wind speeds.

Once the current candidate site emerged as a suitable location, the Applicant approached the landowners in order to assemble the Proposed Project. Arising from the site assembly discussions, the

current site layout was identified and brought forward as being capable of accommodating a cohesive viable area of sufficient size to cater for the Proposed Project.

3.2.4 Alternative Renewable Energy Technologies

The Proposed Project will be located on a site where agriculture and commercial forestry will continue to be carried out around the footprint of the Proposed Wind Farm.

Both onshore and offshore wind energy technology wind energy development and solar energy developments will be required to ensure that Ireland reaches the target set in the Climate Action Plan to source 80% of our electricity from renewable energy by 2030. It is not a case of 'either' 'or'. When considering other renewable energy technologies in the area, the Applicant considered a commercial solar energy production as an alternative on the Proposed Wind Farm.

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic (PV) arrays (panels). During the initial stages of the Proposed Project design, a combination of solar energy and wind energy were considered for the Proposed Project at this site. However, this was subject to land availability at the time and the Proposed Project was progressed. To achieve the same electricity output from solar energy, as is expected from the Proposed Wind Farm (46.2MW), a larger development footprint would be required. As detailed in Section 1.1.1 in Chapter 1, the site encompasses an area of approximately 291 hectares and the permanent footprint of the Proposed Project measures approximately 8.4 hectares, which represents approximately 2.9% of the site. In order to achieve a c. 46.2MW output using solar PV arrays, there would be a requirement of approximately 73.9ha, which represents approximately 25.3% of Proposed Project site.

In addition, a solar development would have a higher potential environmental effect on Traffic & Transport (construction phase) and Biodiversity and Birds (habitat loss) at the site, as detailed below. Considering the hydrology and farming practices in the area, it has been determined that wind energy is the most suitable renewable energy technology for the site.

A comparison of the potential environmental effects of the development of a solar PV array when compared against the chosen option of developing wind turbines at the Proposed Wind Farm is presented in Table 3-2 below.

Table 3-2 Comparison of environmental effects when compared against the chosen option (wind turbines)

Environmental Consideration	Solar PV Array (with up to 46.2 MW Output)	Chosen Option (Wind Turbines)
Population & Human Health (including Shadow Flicker)	Relatively lower long-term financial contributions towards the local community (i.e., community benefit fund) n a per MWh basis. No potential for shadow flicker to affect Sensitive receptors Potential for glint and glare impacts on local receptors. Based on the renewable energy outputs associated with solar PV, using solar PV at the site would have a positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g. nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity.	Higher long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker from the Proposed Project. No potential for glint and glare impacts on Sensitive receptors. Based on the assessment included in Chapter 10, the Proposed Project will have a significant positive effect on human health due to the production of clean renewable energy and the offsetting of emissions (e.g. nitrogen, sulphur dioxide) which are produced from fossil fuel powered sources of electricity.
Biodiversity & Ornithology	Larger development footprint would result in greater potential habitat loss. No potential for collision risk for birds. Potential for glint and glare impacts on birds.	As detailed in Chapter 6, the development has been designed to avoid or mitigate the impacts on biodiversity. As detailed in Chapter 7, Section 7.9.2, the CRA indicated that the impact of the Proposed Project on birds corresponds to a Very Low to low effect significance (species dependent). No potential for glint and glare on birds.
Land, Soils & Geology	The limited excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated. To achieve the same/similar MW output, the footprint required for solar PV would be	As detailed in the assessment in Chapter 8 and the mitigation measures proposed, no significant effects on soils and subsoils will occur.

Environmental Consideration	Solar PV Array (with up to 46.2 MW Output)	Chosen Option (Wind Turbines)
	much greater, leading to more widespread area of groundworks.	
Water	The limited excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated, therefore reducing the potential for silt-laden runoff to enter receiving waterbodies.	As detailed in the assessment in Chapter 9 and the mitigation measures proposed, no significant effects on surface water or groundwater quality will occur.
Air Quality	Reduced capacity factor of solar PV array technology would result in more reliance on fossil fuels for energy generation and therefore decreased air quality improvements.	As detailed in the assessment in Chapter 10, the Proposed Project will provide an alternative to electricity generated from fossil fuel sources and will result in long-term, significant, positive impact on air quality.
Climate	Reduced capacity factor of solar PV array technology would result in less carbon offset.	As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Project, 1,139,775 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise & Vibration	Potential for short-term noise impacts on nearby Sensitive receptors during the construction phase.	Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on Sensitive receptors due to an increase in noise levels from the Proposed Project during the construction and operational phases.
Landscape & Visual	Solar Panelling potentially less visible from surrounding area due to screening by vegetation and topography	As detailed in the assessment in Chapter 13, the landscape value and sensitivity of the Proposed Project site was deemed to be low.
Cultural Heritage & Archaeology	Neutral	As detailed in the assessment in Chapter 14, there will be no significant effects to known cultural heritage assets or recorded archaeological monuments. There will be no

Environmental Consideration	Solar PV Array (with up to 46.2 MW Output)	Chosen Option (Wind Turbines)
		significant direct or indirect impacts on Cultural Heritage.
Material Assets	Potential for greater traffic volumes during construction phase due to number of solar panels required to achieve the same output. Greater potential for impacts on waste management due to increased plant onsite giving rise to hazardous waste materials No material difference for impacts on gas, water or aviation. No potential for impacts on telecommunications	As detailed in Chapter 15, there will be a short term negative slight impact on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all of the mitigation measures will be agreed with the roads authority prior to construction works commencing onsite. No material difference for impacts on gas, water, or aviation. There will be a positive effect on electricity supply with the provision of an estimated 46.2 MW to the national grid and powering of 35,770 Irish households with renewable energy per year.
Major Accidents & Natural Disasters	Larger footprint would lead to the disturbance of larger sections of peat, which has the potential to increase the risk of peat movement/landslide on the Proposed Wind Farm site.	Smaller footprint allows for the avoidance of areas of deeper peat, thus reducing the risk of any potential peat movement/landslide on the Proposed Wind Farm site.

While there are positive and negative environmental aspects of both renewable energy development options, neither are likely to have significant adverse effects in principal; however, given the particular suitability of the site for wind energy development, the smaller area of land required to construct and operate the development, and the greater positive effect of wind energy generation from a climate and air quality perspective, it was considered the more suitable option and the most efficient method of electricity production with less potential for significant environmental effect.

3.2.5 Alternative Turbine Numbers and Model

The proposed turbines will have a potential power output of 6.6 megawatts (MW). It is proposed to install 7 no. turbines at the Proposed Wind Farm site which could achieve approximately 46.2 MW output under the maximum scenario of turbine parameters that are being assessed within the EIAR. Please refer to Chapter 1, Table 1-3 for details on the three scenarios that are being assessed within this EIAR. Such a wind farm could also be achieved on the Proposed Wind Farm site by using smaller turbines (for example 2.5MW machines). However, this would necessitate the installation of over 18 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the wind resource available having regard to the nature of the Proposed Wind Farm. A larger

number of smaller turbines would result in the wind farm occupying a greater footprint within the site, with a larger amount of supporting infrastructure being required (i.e. hardstands, foundations, roads, etc.) and increasing the potential for environmental impacts to occur. The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential for the Proposed Wind Farm. The 7-turbine layout selected for the Proposed Wind Farm has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines.

The turbine model to be installed on the Proposed Wind Farm will have an overall ground-to-blade tip height range of 179.5m – 180m, a rotor diameter range of 149m – 155m, and a hub height range of 102.5 – 105m. For the purposes of this EIAR, a range of turbines within the proposed dimensions has been assessed (e.g. tallest turbine within defined range has been assessed for visual effect, widest rotor diameter within the defined range has been assessed for shadow flicker etc). the EIAR therefore provides a robust assessment of the turbines that could be considered within the overall development description. The use of alternative smaller turbines at the Proposed Wind Farm would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Wind Farm and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing a smaller number of larger wind turbines on the Proposed Wind arm is presented in Table 3-3 below.

Table 3-3 Comparison of the environmental effects when compared against the chosen option (larger wind turbines)

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 7-no. turbine layout
Population & Human Health (incl. Shadow Flicker)	Likely potential for increased shadow flicker effects on nearby Sensitive receptors due to the increased numbers of turbines	Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker from the Proposed Wind Farm.
Biodiversity & Ornithology	Larger development footprint would result in greater potential for habitat loss	Smaller footprint would result in less habitat being lost. As detailed in Chapter 6, the Proposed Wind Farm has been designed to avoid or mitigate effects on biodiversity. As detailed in Chapter 7, Section 7.9.2. the CRA indicated that the effect of the Proposed Wind Farm on birds corresponds to a very low to low effect significance (species dependent).
Land, Soils & Geology	Larger development footprint would result in a greater volume of peat and spoil to be excavated and stored	Smaller footprint would result in smaller volume of soils to be excavated and managed.

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 7-no. turbine layout
		As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur.
Water	Larger development footprint, therefore, increasing the potential for silt-laden runoff to enter receiving watercourses	Smaller footprint would result in smaller volume of soils to be excavated and managed. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Increased potential for effects on air quality due to increased vehicles emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase.	A smaller development footprint would result in less dust and vehicle emissions during the construction phase.
Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase	As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Wind Farm (1,139,775) tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise & Vibration	Potential for increased noise effects on nearby Sensitive receptors.	Potential for less noise effects on nearby Sensitive receptors during the construction and operational phase. Based on the assessment detailed in Chapter 12 and the mitigation measures proposed, there will be no significant effects on Sensitive receptors to an increase in noise levels from the Proposed Project during the construction and operational phase.
Landscape & Visual	A larger number of turbines could have a greater visual effect on the R466 Scenic Route	The Proposed Wind Farm is an appropriately designed and suitably scaled project, no significant visual effects are deemed to arise from residential visual amenity in the landscape surrounding site and 'Moderate' residual visual

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 7-no. turbine layout
		effects will only occur for a relatively small number of properties in the area.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for effects on unrecorded, subsurface archaeology	As detailed in the assessment in Chapter 14, there will be no significant effects to known cultural heritage assets or recorded archaeological monuments.
Material Assets	Greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.	Less traffic volumes due to smaller footprint and less component deliveries. As detailed in Chapter 15, there will be short term negative imperceptible to slight effect on traffic volumes during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site.
Major Accidents & Natural Disasters	Larger footprint would lead to the disturbance of larger sections of peat, which has the potential to increase the risk of peat movement/landslide on the Proposed Wind Farm site.	Smaller footprint allows for the avoidance of areas of deeper peat, thus reducing the risk of any potential peat movement/landslide on the Proposed Wind Farm site

For the reasons outlined in Table 3-3 above, the proposal for a 7-turbine layout comprising larger turbines was considered to be the more environmentally prudent approach than a larger number of smaller turbines.

3.2.6 Alternative Turbine Layout and Development Design

The design of the Proposed Project has been informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. The aim of this collaborative process was to reduce the potential for environmental effects while designing a project capable of being constructed in the most environmentally prudent manner as possible.

Throughout the preparation of this EIAR, the layout of the Proposed Wind Farm has been revised and refined to consider the findings of all site investigations, which have brought the design from its first initial layout to the current proposed layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities as detailed in Section 2.5 of Chapter 2.

3.2.6.1 Constraints and Facilitators Mapping

The design and layout of the Proposed Project follows the recommendations and guidelines set out in the 'DoEHLG 2006 Guidelines and the Draft DoEHLG 2019 Guidelines and the '*Best Practice Guidelines for the Irish Wind Energy Industry'* (Irish Wind Energy Association, 2008).

The DoEHLG 2006 Guidelines were the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments were outlined in the document Draft DoEHLG 2019 Guidelines. A consultation process in relation to the Draft DoEHLG 2019 Guidelines closed on 19th February 2020. The proposed changes presented in the Draft DoEHLG 2019 Guidelines give certain focus on the setback distance from residential properties (four times the proposed maximum tip height), along with shadow flicker and noise requirements relative to Sensitive receptors. At time of writing, the Draft DoEHLG 2019 Guidelines have not yet been adopted, and the relevant guidelines for the purposes of section 28 of the Planning and Development Act 2000, as amended, remain those issued in 2006. The constraints mapping process involves the placing of buffers around different types of constraints to clearly identify the areas within which no development works will take place. The size of the buffer zone for each constraint has been assigned either using guidance presented in the Draft DoEHLG 2019 Guidelines or based on industry best practice due to the more stringent measures required, ensuring compliance with the DoEHLG 2006 Guidelines.

Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects and the commitment within the Climate Action Plan 2024 to publish Draft Revised Wind Energy Development Guidelines (refer to Section 1.5.1 of Chapter 1 of the EIAR), it is possible that the Draft DoEHLG 2019 Guidelines are adopted during the consideration period for the Proposed Project. Should the Draft DoEHLG 2019 Guidelines be adopted in advance of a planning decision being made on the Proposed Project, the Proposed Project will be capable of achieving the requirements of the Draft DoEHLG 2019 Guidelines as currently proposed.

The constraints map for the Proposed Wind Farm, as shown in Figure 3-1, was produced following a desk study of all site constraints. Figure 3-1 encompasses the following constraints and associated buffers:

- Residential dwellings plus a minimum 720-metre buffer (achieving the requirement for a 4 x tip height separation distance from properties in line with the new Draft Guidelines).
- Avoidance of all Natura 2000 sites
- Telecommunications links plus operator-specified buffer;
- Natural watercourses plus 50-metre buffer;
- Archaeological Sites or Monuments, 30-metre buffer, plus 'Zone of Notification' as required by the National Monuments Service (ROI)

Facilitators at the site build on the existing advantages and include the following:

- Available lands for development;
- Good wind resource
- Positive wind energy policy
- Existing access points and general accessibility of all areas of the site due to existing road infrastructure, and,
- Limited extent of constraints

The inclusion of the constraints on a map of the study area allows for a viable area to be identified. An initial turbine layout is then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required between the turbines. Following the mapping of all known constraints, detailed site investigations were carried out by the project team. The ecological assessment of the Proposed Project encompassed habitat mapping and extensive surveying of birds and terrestrial and aquatic fauna. This assessment, as described in Chapter 6 of this EIAR on Biodiversity, optimised the decision on the siting of turbines and the carrying out of any development

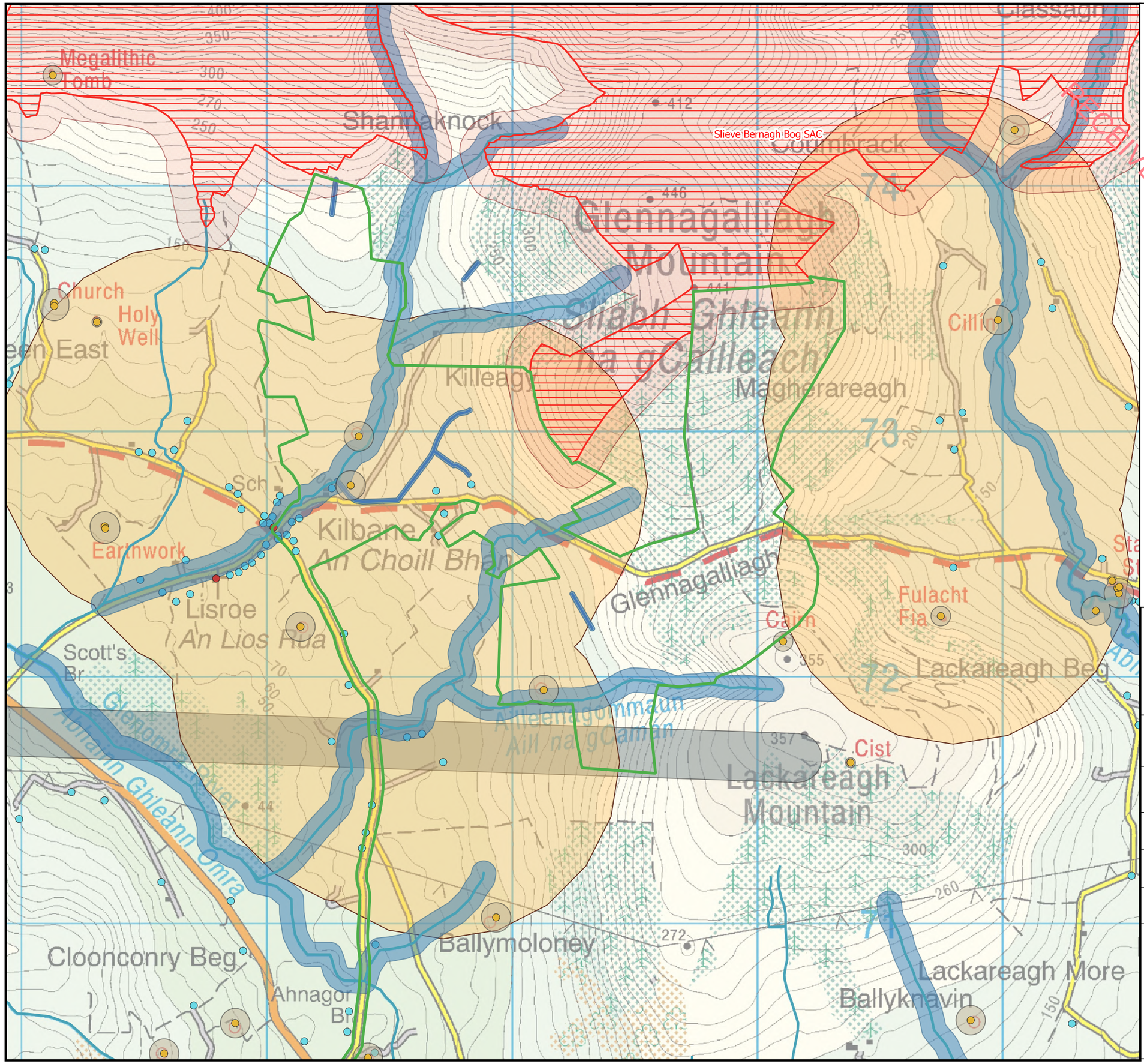
works, such as the construction of roads. The hydrological assessment, as described in Chapter 9 of this EIAR, optimised the decision on the siting of turbines, roads and the proposed onsite 38kV substation in order to maintain 50m buffers from natural watercourses. Where specific areas were deemed as being unsuitable for the siting of turbines or roads, etc., alternative locations were proposed and assessed, considering the areas that were already ruled out of consideration. The turbine layout for the Proposed Wind Farm has also been informed by the results of the geometric assessment, noise, landscape, and visual and shadow flicker assessments as they became available.

3.2.6.2 Turbine Layout

The final proposed turbine layout takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on the results of all site investigations that have been carried out during the EIAR process. As information regarding the Proposed Project was compiled and assessed, the proposed layout has been revised and amended to take account of the physical constraints of the Proposed Wind Farm and the requirement for buffer zones and other areas in which no turbines could be located. The selection of turbine number and layout has also had regard to site topography, wind-take, noise and shadow flicker impacts and the separation distance to be maintained between turbines. The EIAR and Proposed Project design process was an iterative process, where findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

The development of the final Proposed Wind Farm turbine layout has resulted following feedback from the various assessment carried out as well as ongoing negotiations and discussions with landowners and the local community.

There were several reviews of the specific locations of the various turbines during the optimisation of the Proposed Wind Farm site layout. The initial constraints study identified a significant viable area within the overall study area of the site. The initial turbine layout comprised 7 no. turbines within a similar sized study area to the Final Layout. The proposed 7-turbine final layout has been refined following feedback from the project team, landowners, neighbours and the need to ensure sufficient separation distances are maintained for on-site constraints. The Proposed Wind Farm went through 4 separate iterations. All 4 Proposed Wind Farm layout iterations have not been included, but Figure 3-2 to Figure 3-5 below gives an indication of how the design of the turbine layout evolved during the design process.



Map Legend

- EIAR Site Boundary

Hydrology

- Watercourses
- 50m Watercourse Buffer

Dwellings

- Derelict
- Dwelling
- Planning Application
- 720m Housing Buffer

Telecoms

- Telecoms Line Plus 100m buffer

Cultural Heritage

- National Monuments
- SMR Zone

Designated Sites

Designated Sites

- Special Area of Conservation (SAC)
- 100m SAC Buffer

Drawing Title: Constraints and Facilitators

Project Title: Lacakreagh Wind Farm, Co. Clare

Drawn By	Checked By
CJ	NMcH
Project No. 220245	Drawing No. Figure 3-1
Scale 1:15,000	Date 2024-07-31

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3.2.6.2.1 Proposed Layout Iteration No. 1

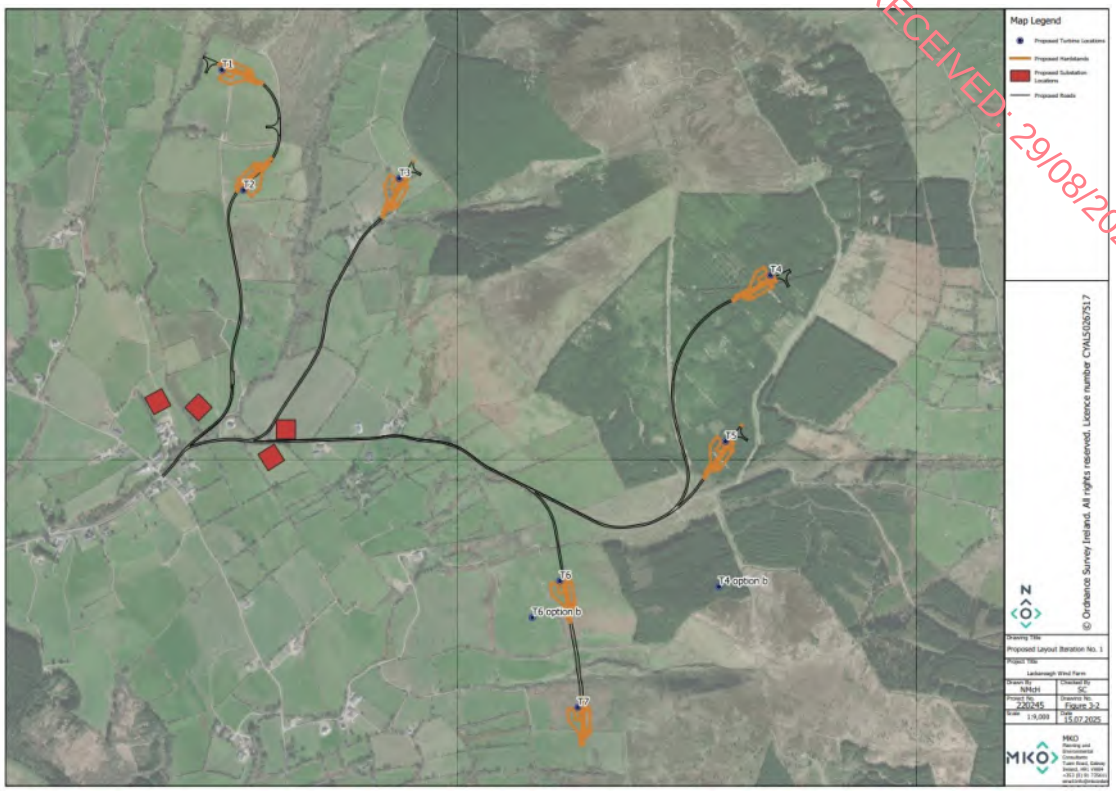


Figure 3-2 Proposed Layout Iteration No. 1

Iteration no. 1 which is presented in Figure 3-2 above is the initial turbine layout which was based on a preliminary constraint mapping exercise and identification of a viable area for turbine siting. Proposed Layout Iteration No. 1 included for 7 no. turbines, with 2 no. turbines (T4 and T6) having alternative options for their locations. This initial layout included for an indicative road layout also. This initial layout was examined against constraints from a desk-based perspective where it was identified that the proposed infrastructure was encroaching on the following constraints:

- T1 hardstand and turbine area located within a 50m watercourse buffer;
- Section of T2 access road located within 50m watercourse buffer;
- T3 hardstand located within 50m watercourse buffer;
- T6 hardstand located within 10m drain buffer
- All 4 no. substation location options located within 50m watercourse buffer, and
- T7 blades encroaching upon a telecoms buffer.

The constraints as identified above were examined relative to the layout, and the decision was made that several infrastructure elements would need to be microsited away from these sensitivities to avoid having any significant effects on water quality, or interruption to telecommunications services.

3.2.6.2.2 Proposed Layout Iteration No. 2

Figure 3-3 Proposed Layout Iteration No. 2

Proposed Layout Iteration No. 2 took into consideration the constraints identified during the initial desktop review of Proposed Layout Iteration 1. This proposed layout iteration included 7 no turbines and associated hardstands, with two options for T4 and T6 respectively being considered. This proposed layout included for indicative roads layout, 2 no. substation location options, a proposed battery energy storage location. This layout included for an alternative point of entry to the Proposed Wind Farm which would enter the site from the south/southeast and largely make use of existing forestry roads.

Due to the topography of the Proposed Wind Farm site, both this access route and a number of infrastructure elements were identified as being unsuitable for the accommodation of turbine delivery vehicles, and unsuitable for the safe construction of infrastructure. On this basis, AFRY Ireland Ltd. was contracted to produce a geometric site layout design, which took account of the topography onsite, as well as the environmental considerations identified at both desktop and site survey stage.

3.2.6.2.3 Proposed Layout Iteration No. 3

Figure 3-4 Proposed Layout Iteration No. 3

Proposed Layout Iteration No. 3 was produced by AFRY Ireland Ltd and contained 7 no turbines with associated hardstands, a meteorological mast, a borrow pit location, a temporary construction compound, a component set-down area, and a 38kV substation location with a BESS compound included within the same footprint. A cut and fill assessment was carried out on this proposed layout by AFRY Ireland Ltd, in which large volumes of cut were identified in certain areas in order to facilitate the siting of Proposed Wind Farm infrastructure. In the interest of minimising earthworks and associated impacts, the blade fingers were removed from some of the proposed hardstands. Turbine components were instead to be stored in the component set-down area, or on the hardstands and blade fingers of neighbouring hardstands. Junctions leading onto the L7080 (the Gap Road) were also reviewed by Alan Lipscombe Traffic and Transport, who identified ways in which proposed junctions could be optimised from a health and safety point of view.

3.2.6.2.4 Proposed Layout Iteration No. 4 – Final Proposed Wind Farm Layout

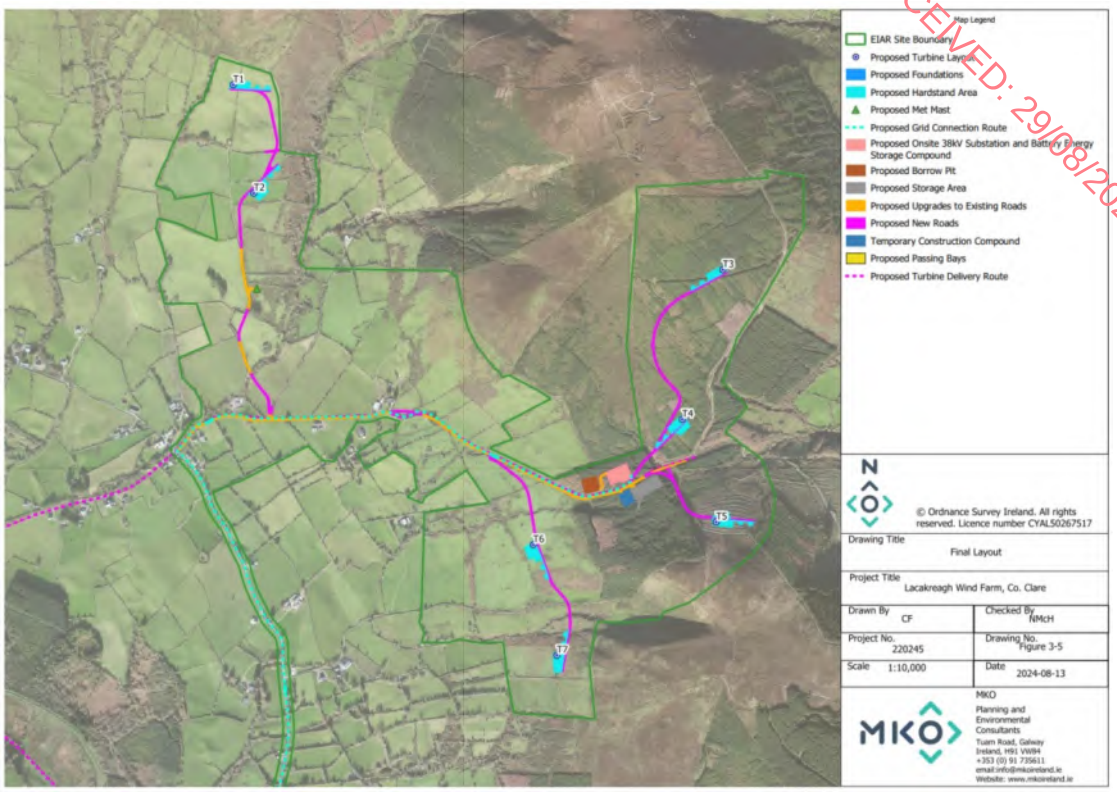


Figure 3-5 Proposed Layout Iteration No. 4 - Final Proposed Wind Farm Layout

Iteration No. 4 as presented in Figure 3-5 comprises of 7 no. turbines with a maximum overall ground-to-hub height range of 179.5 – 180m, a rotor diameter range of 149m – 155m, and a hub height range of 102.5 to 105m, one met mast (36.5m), a temporary construction compound, an onsite 38kV substation and battery energy storage system compound, a borrow pit, a turning area and a grid connection underground electrical cabling route which is further detailed in Section 3.2.8.

Each layout, as presented in the previous sections, presents consecutive improvements when examined against environmental, ecological, topographical and hydrological constraints. Iteration no. 4 as presented in Figure 3.5 above is the most environmentally prudent version of all layouts presented above. The final layout takes account of all site constraints and design constraints (e.g. setback distances from Sensitive receptors, suitable slopes for development, and distances between turbines onsite, etc.) the layout also takes account of the results of all site investigations and baseline assessments that have been carried out throughout the EIAR process.

The final chosen turbine layout is considered the optimal layout given the fact that it has the least potential for environmental effects.

A comparison of the potential environmental effects of initial iterations of the turbine layout as compared against the final turbine layout are presented in Table 3-4 below.

Table 3-4 Comparison of environmental effects when compared against the chosen option (final layout)

Environmental Consideration	Initial Turbine Layouts and all associated infrastructure	Iteration No. 4 and Chosen Option of the Final 7 No. Turbine Layout and all associated infrastructure
Population & Human Health (incl. Shadow Flicker)	The Applicant has committed to a zero shadow flicker scenario, so no shadow flicker effects would have been anticipated.	The Applicant has committed to a zero shadow flicker scenario, so no shadow flicker effects are anticipated.
Biodiversity & Ornithology	Larger development footprint owing primarily to access road arrangements, would result in greater potential habitat loss. Greater potential for negative effects on aquatic species in Iteration 1 owing to siting of infrastructure within watercourse buffers.	As detailed in Chapter 6, the development has been designed to avoid or mitigate the impacts on biodiversity. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Wind Farm on birds corresponds to no significant effect.
Land, Soils & Geology	Greater potential impact on identified soils and subsoils due to location of infrastructure on steep slopes in Iteration 1	A smaller footprint would result in smaller volume of soils to be excavated and managed. The layout has been optimised in order to reduce cut and fill volumes as much as possible. As detailed in the assessment in Chapter 8, no significant effects on soils or subsoils will occur.
Water	A number of infrastructure elements included within Layout Iteration 1 were located within designated setback buffers for watercourses, which had an increased potential for sild-laden runoff to enter surface water systems. Larger development footprint associated with Layout Iteration 2 and 3 would result in a greater potential for silt-laden runoff to enter watercourses.	Smaller footprint would result in reduced potential for silt-laden runoff to enter natural watercourses. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	The absence of an onsite borrow pit would lead to all materials needed to construct the Proposed Wind Farm being imported to the site, leading to a larger volume of vehicle exhaust emissions and dust	As detailed within the assessment in Chapter 10, there will be no significant effects on air quality

Environmental Consideration	Initial Turbine Layouts and all associated infrastructure	Iteration No. 4 and Chosen Option of the Final 7 No. Turbine Layout and all associated infrastructure
	emissions being emitted in order to construct the Proposed Wind Farm.	
Climate	The absence of an onsite borrow pit would lead to all materials needed to construct the Proposed Wind Farm being imported to the site, leading to a larger volume of vehicle exhaust emissions and dust emissions being emitted in order to construct the Proposed Wind Farm.	As detailed in the assessment in Chapter 11, over the proposed 35-year lifetime of the Proposed Project, the Proposed Wind Farm will displace 1,139,775 tonnes of carbon dioxide from traditional carbon-based electricity generation.
Noise & Vibration	The proximity of the proposed substation locations to occupied dwellings had the potential to lead to negative effects in relation to noise and vibration during the construction, operational and decommissioning phases The noise impacts are considered neutral regarding turbines for all proposed layout iterations	Based on the assessment detailed in Chapter 12 and the mitigation presented therein, there will be no significant effects on Sensitive receptors due to an increase in noise levels from the Proposed Project during the construction, operational and decommissioning phases.
Landscape and Visual	Visual impacts are considered neutral for Proposed Layout Iteration 1, 2 and 3 as they all contained 7 no. turbine layouts	As detailed in the assessment in Chapter 13, the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Cultural Heritage & Archaeology	Neutral	Neutral
Material Assets	Turbine locations were encroaching on buffer zones of telecoms links identified by various telecoms operators. If turbine locations remained unchanged, there would have been potential negative effect on telecommunications operations in the area.	Turbines are located outside of operator-specified buffers, no potential for impact on telecommunications networks.
Major Accidents and Natural Disasters	A larger development footprint could have a greater potential for risks relating to landslide and peat movements due to increased land disturbance and larger excavation footprint.	As detailed in Chapter 16, the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' The highest potential risk scenarios to the Proposed Project (i.e. Contamination, Fire/Explosion, Collapse/Damage to Structures)

Environmental Consideration	Initial Turbine Layouts and all associated infrastructure	Iteration No. 4 and Chosen Option of the Final 7 No. Turbine Layout and all associated infrastructure
		are considered to be unlikely to occur at any phase of the Proposed Project. A detailed risk assessment on potential risks relating to major accidents and natural disasters is provided in Chapter 16 of this EIAR.

3.2.6.3 Road Layout

Access tracks are required onsite to enable transport of infrastructure and construction materials within the Proposed Wind Farm. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. It was decided at an early stage during the design process of the Proposed Wind Farm that the maximum possible use would be made of existing roadways and tracks where available to minimise the potential for impacts by using new roads as an alternative.

As the overall Proposed Project layout was finalised, the most suitable routes between each component of the development were identified, considering the existing roads and the physical constraints of the Proposed Project. Locations were identified where upgrading of the existing road would be required and where new roads are to be constructed, in order to ensure suitable access to and linkages between various project elements, and efficient movement around the Proposed Project site.

An alternative option to making maximum use of the existing road network within the Proposed Wind Farm would be to construct a new road network, having no regard to existing toads or tracks. This approach was not favoured, as it would require unnecessary disturbance to the local environment and create the potential for additional environmental impacts to occur. It would also result in an unnecessary requirement for additional cut and fill material to be used in the construction of new roads.

3.2.7 Alternative Design of Ancillary Structures

The ancillary structures required for the Proposed Project include a temporary construction compound, a proposed blade transition area, met mast, borrow pit and underground electrical cabling. The siting of the proposed onsite 38kV substation and the met mast locations have been summarised in Section 3.2.6 above.

3.2.7.1 Construction Compound

The temporary construction compound will be used for the storage of all construction materials, turbine components, staff facilities and car parking areas for staff and visitors. The use of a single temporary construction compound was deemed preferable to the alternative of multiple smaller compounds, as the compound is located centrally within the Proposed Wind Farm site and is well connected to the internal Proposed Wind Farm access roads. As the Proposed Project layout became more refined, the location of the temporary construction compound was sited to facilitate the most efficient flow of construction vehicles within the Proposed Wind Farm. The construction compound is located strategically within the centre of the site, in close proximity to the proposed onsite 38kV substation and the vehicle turning area. As a result, vehicle emissions and the potential for dust arising will be reduced. Further information on the siting of the temporary construction compound is set out above in Section 3.2.6.

3.2.7.2 Onsite Borrow Pit

In order to facilitate the construction of the Proposed Project, the majority of the crushed stone and hardcore materials that will be required for the construction phase will be sourced from within the Proposed Wind Farm site through a combination of the onsite borrow pit and the cut and fill exercise which will be carried out to facilitate the construction of the onsite infrastructure. This was deemed the more environmentally prudent approach over importing all stone and hardcore materials into the site from a nearby quarry location due to the volume of material to be generated during the construction phase, and the availability of suitable material on the site. The borrow pit is strategically located near the centre of the Proposed Wind Farm site and is served by existing access roads. As a result, vehicle emissions and the potential for dust arising will be reduced.

It should be noted also that in order to facilitate the construction of the Proposed Project, deliveries of ready-mix concrete and dressing material for onsite access roads will need to be sourced and imported from nearby quarry locations. Further details on the traffic movement associated with these deliveries can be found in Chapter 15 Section 15.1.

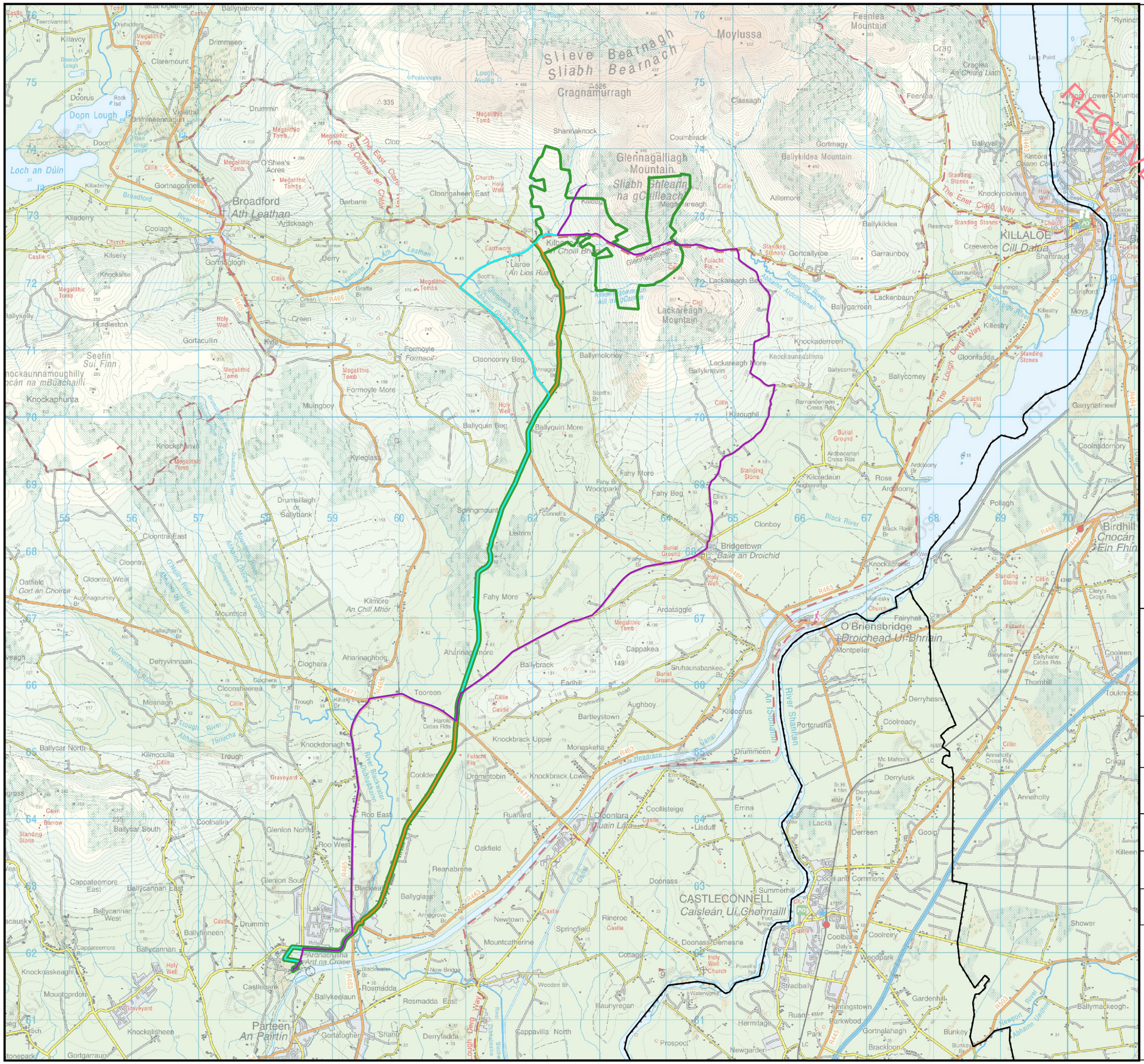
3.2.8 Alternative Grid Connection Cabling Route Options

The Proposed Wind Farm will connect to the national grid via underground electrical cabling, located almost entirely within the public road corridor. Underground electrical cables will transmit the power output from each wind turbine to the proposed onsite 38kV substation, and from there to the existing Ardnacrusha substation. The Proposed Grid Connection Route constitutes a 38kV underground cable, and measures approximately 14.7km in length and will form part of a subsequent planning application.

A key consideration in determining the grid connection method for a proposed wind energy development is whether the cabling is buried underground or run as an overhead line. While overhead lines are less expensive and allow for easier repairs when required, underground cables have no visual impact. For this reason, it was considered that underground lines would be a preferable alternative to overhead lines. The DoEHLG 2006 Guidelines and the Draft DoEHLG 2019 Guidelines also indicate that underground cables are the preferred option for connection of a wind energy development to the national grid. The Proposed Grid Connection Route will follow the route of existing public roads, thereby minimising the amount of ground disturbance required. The Proposed Wind Farm will have an estimated maximum exporting capacity of 46.2MW; this is such that it can connect to either 38kV substation or a 110kV substation using a step-up transformer. From an early stage, Ardnacrusha 110kV substation was identified as the most viable option due to its proximity to the Proposed Wind Farm.

On this basis, there were a number of routes identified and assessed which would connect the Proposed Wind Farm to Ardnacrusha 110kV substation.

TLI Group were engaged by the applicant to carry out a preliminary grid roue assessment for the Proposed Project. A desktop analysis was undertaken using identified constraints to identify three potential routes from the Proposed Wind Farm site to Ardnacrusha substation. Figure 3-6 below illustrates all three underground grid connection (UGC) route options proposed which are further detailed below.



Drawing Title: Proposed Grid Connection Route Options	
Project Title: Lacakreagh Wind Farm, Co. Clare	
Drawn By: CJ	Checked By: NMcH
Project No.: 220245	Drawing No.: Figure 3-6
Scale: 1:55,000	Date: 2024-08-14

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The layout in the Grid Connection Route Options Iteration No.1 as presented in Figure 3-6 comprises three grid connection options:

- Options 1a: UGC route from onsite 38kV substation to Ardnacrusha, shown in blue on Figure 3-6
- Option 1b: UGC route from onsite 38kV substation to Ardnacrusha, shown in green on Figure 3-6
- Option 1c: UGC route from onsite 38kV substation to Ardnacrusha, shown in orange on Figure 3-6

The outputs from the TLI preliminary desktop grid assessment are summarised below in Table 3-5.

Table 3-5 Comparison Summary Table - sourced from TLI Preliminary Route Development Assessment

Assessment Criteria	Option 1a – UCG to Ardnacrusha 110kV substation (Blue)	Option 1b – UCG to Ardnacrusha 110kV substation (Green)	Option 1c – UCG to Ardnacrusha 110kV substation (Orange)
Length (km)	14.7	15.2	20.4
Length of Cable within Private Land (m)	0	0	0
Railway Crossings	0	0	0
Bridge Crossings (Possible HDD)	3	3	7
Length of route shared with existing/proposed UGC (km)	9.7	11.1	7.4
Watercourse/culvert crossings	9	7	22
Sharp bends	9	6	11

Option 1a, as presented in Figure 3-6, is an underground grid connection cable route connecting the proposed onsite 38kV substation to the existing Ardnacrusha 110kV substation. The Ardnacrusha 110kV substation is located approximately 12 km south/southwest of the Proposed Wind Farm site (straight line distance). The Proposed Grid Connection Route electrical cabling would run along a combination of local and regional roads, measuring approximately 14.7km in length. The most notable constraint along this route is the crossing of the Blackwater Bridge. This bridge has formed part of the assessment of the Proposed Grid Connection Route and was identified as a major constraint due to its status as a Protected Structure, the presence of existing services, the lack of cover, and the bridge's proximity to residential properties. For these reasons, the use of Horizontal Directional Drilling (HDD) was deemed unsuitable. Section 3.2.8.1.1 below identifies further the design process and subsequent mitigation of potential negative effects on this bridge. Of the 3 no. potential routes identified, this route is the shortest.

Option 1b, as presented in Figure 3-6, also connects the proposed onsite 38kV substation to the existing 110kV Ardnacrusha substation via underground cable. The grid connection cabling route would run along a combination of local and regional roads, measuring approximately 15.2km in length. This route is broadly similar to Option 1a as described above, but periodically splits off to more westerly routes towards Ardnacrusha 110kV substation. Option 1b includes for a number of bridge crossings which would have to be traversed via HDD. Option 1b also faces major congestion constraints when

examined against other existing and proposed services within the road corridor, as can be seen in Table 3-5 above.

Option 1c, also presented in Figure 3-6 above, proposes to connect the proposed onsite 38kV substation to Ardnacrusha 110kV via an underground cable route measuring approximately 20.4km. Route Option 1c follows the same initial trajectory as Option 1b, before diverging to take a more easterly route. The most significant constraint identified along this route was a bridge located just outside of Bridgetown. This bridge is also a protected structure listed on the National Architectural Heritage Registry, Reg. No. 20404518. The bridge is described within the registry as 'double-arch rubble stone road bridge over river, built circa 1850, with cut stone voussoirs and V-cutwaters'. Option 1c is the longest of all 3 no. routes assessed and possesses the largest number of bridge crossings that would require potential HDD. Both the status and the layout of the bridge crossing outlined above provided very significant design challenges and was considered to be the least favourable option.

Based on this assessment, Option 1a was brought forward as the most preferable option due to the factors outlined above. Option 1a, henceforth referred to as the Chosen Route, is presented in Figure 3-6. This route was considered optimal given it has the least potential for environmental effects when compared to Option 1b and Option 1c (as detailed above).

The Chosen Route is examined in further detail in Section 3.2.8.1.1 below.

3.2.8.1.1 Chosen Route (Option 1a)– Final Grid Connection Layout

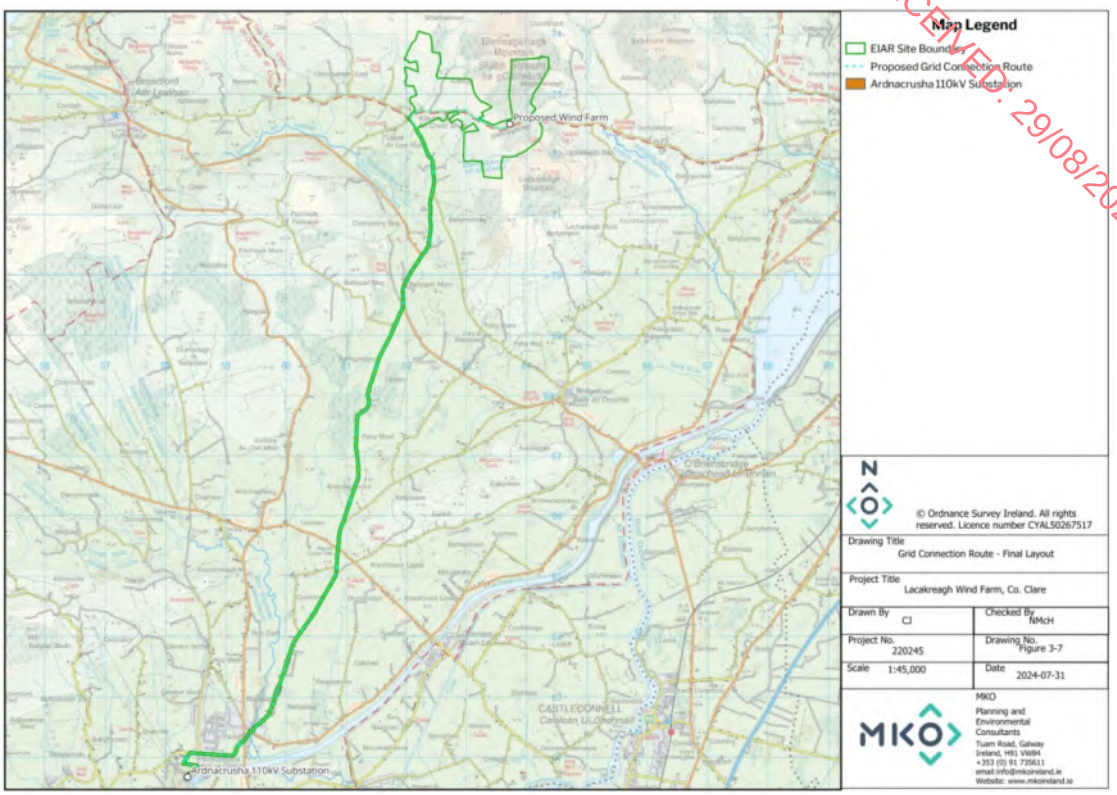


Figure 3-7 Grid Connection Route - Final Layout

The layout in the Chosen Route as presented in Figure 3-7, comprises 14.7km of underground 38kV electrical cabling connecting the proposed onsite 38kV substation to the existing Ardnacrusha 110kV substation.

The final underground cable route as presented in Figure 3-7 above takes account of all route constraints (e.g. ecology, archaeology, hydrology, etc). Ecological site visits identified a large and seemingly untreated stand of the invasive species giant hogweed (*Heracleum mantegazzianum)* along both sides of the riverbank. During eDNA sampling carried out in the Blackwater River at this bridge crossing, the presence of Lamprey was identified, which is a protected species. The presence of these ecological constraints further reinforced the need to avoid HDD at this location, and so the concept of strapping the cable to the bridge was identified in its place. Strapping was deemed the most appropriate crossing methodology for this bridge as all works will occur upon the bridge, i.e. no instream works, or ground-disturbing works will be required. This bridge has been identified as a protected structure, however consultation with a member of the Heritage Department from Clare County Council (in the form of an onsite meeting) confirmed that, once particular protection measures were put in place the works were ultimately reversible and would not cause structural harm to the bridge. The specific measures identified were, that the works were to be supervised by a suitably qualified archaeologist, and the contractor carrying out the works was suitably qualified and understood the protection measures that needed to be implemented, Further information regarding the construction methodology and the mitigation measures to be put in place can be found in Chapter 4 and Chapter 14 of this EIAR.

During the environmental field work carried out on this route, a total of 12 no. watercourse crossings were identified. The crossing methodologies to be implemented in the construction of the Proposed Grid Connection Route are identified in Chapter 4 of this EIAR.

A comparison of the potential environmental effects of Option 1a (the Chosen Route) and option 1b and 1c are presented in Table 3-6 below.

Table 3-6 Comparison of environmental effects when compared against the chosen option (Option 1a – Ardnacrusha 110kV Substation)

Environmental Consideration	Option 1a (Chosen Route) – Ardnacrusha 110kV substation	Option 1b - Ardnacrusha 110kV substation	Option 1c - Ardnacrusha 110kV substation
Population & Human Health	The Chosen Route is the shortest of all routes assessed and will therefore lead to the shortest possible construction period, therefore leading to the shortest disruption period to local road users. Please refer to Chapter 5 of this EIAR for further details.	Option 1b is longer than the Chosen Route and therefore would have led to a longer disruption period to local road users	Option 1c was the longest of all potential routes assessed and would have led to the longest construction period, and longest disruption period to local road users
Biodiversity (including Birds)	The Chosen Route passes through the Glenomra Woods SAC, however, the Chosen Route is located fully within the existing road corridor and therefore will have no potential to negatively affect the integrity of the Glenomra Woods SAC and a Low potential for impact on sensitive ecological receptors. As detailed in Chapter 6, works along the Proposed Grid Connection Route on the local road L3046 which bisects the SAC will ensure no damage, disturbance or loss of habitat occurs by erecting temporary fencing either side of the road along that section to ensure no materials are stockpiled or vehicles are parked there which could potentially damage the habitat	Low potential for impact on sensitive ecological receptors as there is no interaction between Option 1b and any European designated sites.	Low potential for impact on sensitive ecological receptors as there is no interaction between Option 1c and any European designated sites.

Environmental Consideration	Option 1a (Chosen Route) – Ardnacrusha 110kV substation	Option 1b - Ardnacrusha 110kV substation	Option 1c - Ardnacrusha 110kV substation
	Please refer to Chapter 6 of this EIAR for further details.		
Land, Soils & Geology	Neutral – there is no material difference in environmental effect between all options considered.	Neutral – there is no material difference in environmental effect between all options considered.	Neutral – there is no material difference in environmental effect between all options considered.
Water	The Chosen Route had 9 potential culvert crossings and 3 no. possible HDD bridge crossings. As detailed in the assessment in Chapter 9, no significant effects on surface water quality or groundwater quality will occur. Please see Chapter 9 for further details.	Option 1b had the fewest watercourse crossing locations (i.e. 7 no. culvert crossings and 3 no. bridge crossings).	Option 1c had by far the highest number of watercourse crossings associated with it (22 no. culvert crossings and 7 no. bridge crossings) and therefore had the largest potential for negative effects on water quality.
Air Quality	The Chosen Route is the shortest of all potential routes assessed, measuring approximately 14.7km in length. The Chosen Route would therefore have the least potential for production of vehicle emissions which lead to a degradation in air quality and the release of dust particles during the construction phase. Please refer to Chapter 10 for further details.	Option 1b is longer than the Chosen Route and would therefore have a higher potential for the release of harmful particles associated with vehicle emissions and dust emissions during the construction phase.	Option 1c is the longest of all potential routes assessed, measuring approximately 6km longer than the Chosen Route. Option 1c would therefore have the highest potential for production of vehicle emissions which lead to a degradation in air quality and the release of dust particles during the construction phase.

Environmental Consideration	Option 1a (Chosen Route) – Ardnacrusha 110kV substation	Option 1b - Ardnacrusha 110kV substation	Option 1c - Ardnacrusha 110kV substation
Climate	The Chosen Route is the shortest of all 3 no. routes assessed, measuring approximately 14.7km from the proposed onsite 38kV substation to the existing Ardnacrusha 110kV substation. Of all options assessed, the Chosen Route would lead to the smallest volume of vehicle emissions being produced during the construction phase. Please refer to Chapter 11 of this EIAR for further details.	Option 1b is longer than the Chosen Route and would therefore have a longer construction period attached with it, leading to a higher volume of vehicle emissions to be produced.	Proposed Grid Route Option 1c measures approximately 5.2km longer than option 1b and approximately 6km longer than the Chosen Route. Therefore, Option 1c would have the largest amount of vehicle emissions associated with its construction phase.
Noise & Vibration	Potential for impact on nearby Sensitive receptors during the construction phase. Given the fact that the Chosen Route is the shortest of all potential routes assessed, it poses the least risk to potential effect on nearby noise Sensitive receptors. Please refer to Chapter 12 of this EIAR for further details.	Potential for impact on nearby Sensitive receptors during the construction phase. Option 1b is longer than the Chosen Route and there has the potential for a more prolonged effect on nearby noise Sensitive receptors.	Potential for impact on nearby Sensitive receptors during the construction phase. Route 1c is the longest of all potential routes assessed and therefore had the highest risk of effecting a larger number of nearby noise Sensitive receptors.
Cultural Heritage & Archaeology	Option 1 may include the strapping of the Proposed Grid Connection Route cable to a protected structure.	Neutral – there is no material difference in environmental effect between all options considered.	Neutral – there is no material difference in environmental effect between all options considered.

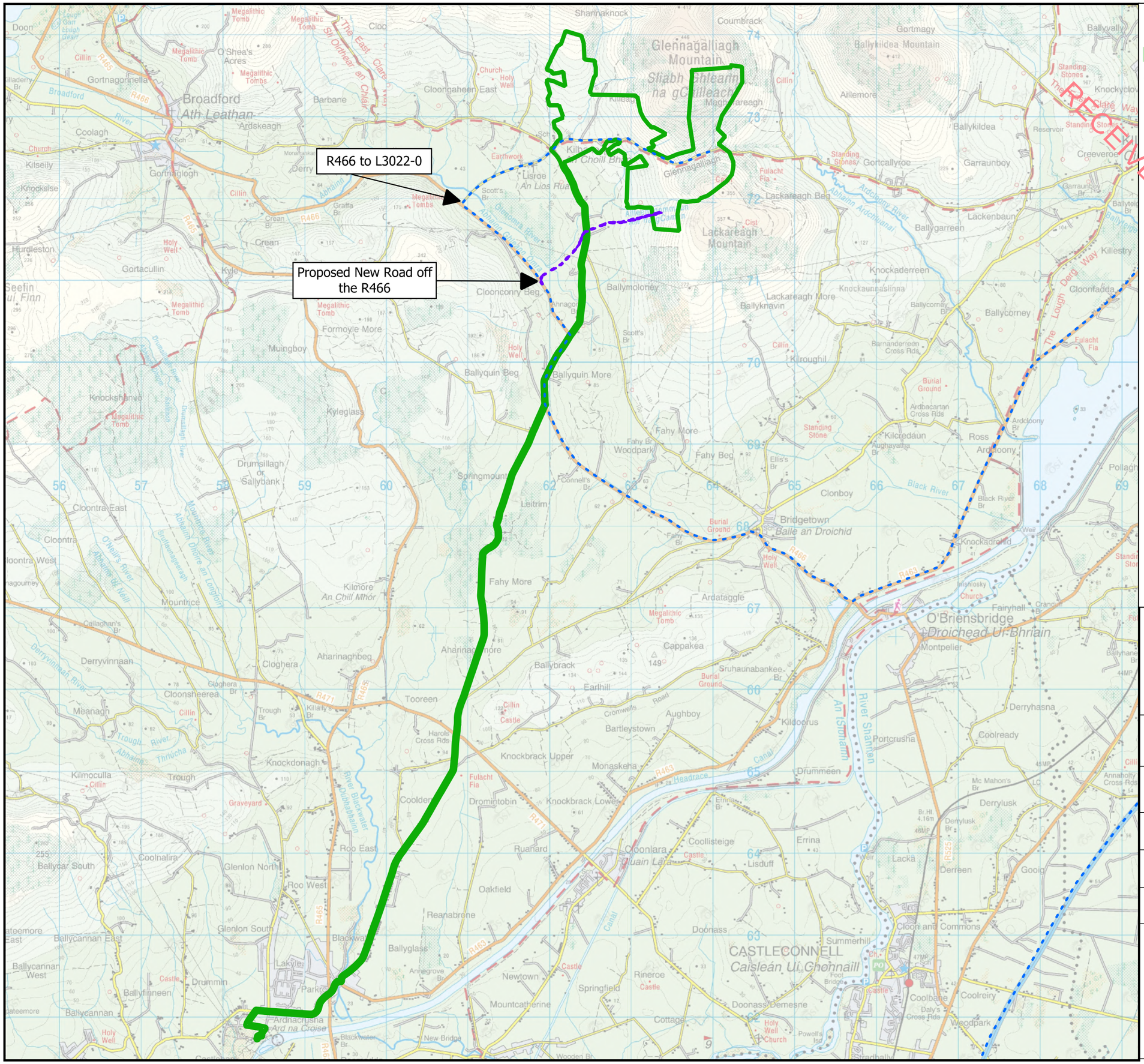
Environmental Consideration	Option 1a (Chosen Route) – Ardnacrusha 110kV substation	Option 1b - Ardnacrusha 110kV substation	Option 1c - Ardnacrusha 110kV substation
Landscape & Visual	Option 1 may include the strapping of the Proposed Grid Connection Route cable to a protected structure, which will have a slight negative visual impact on the existing structure.	Neutral – there will be no visual effects associated with the underground electrical cabling route	Neutral – there will be no visual effects associated with the underground electrical cabling route
Material Assets	The Chosen Route is the shortest of all potential routes assessed so this option poses the least impact on traffic movements and traffic disruptions. As detailed in the Traffic Management Plan (Appendix 15-2) incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site	Potential for more traffic voles and disruption than the Chosen Route due to the fact that this route is longer.	Option 1c is the longest of all potential routes assessed, and therefore would have the potential for more traffic volumes and disruption to traffic when compared to the Chosen Route and Option 1b.
Major Accidents and Natural Disasters	The Chosen Route is the shortest of all routes considered and therefore has the least potential for causing a major accident of natural disaster during its construction phase. As detailed in Chapter 16, the risk of a major accident and/or natural disaster during the construction of the Proposed Project is considered 'low'	Potential for smaller impact than Option 1c as the route is shorter.	Largest potential for major accident/ natural disaster due to the fact that Option 1c is the longest of all routes considered.

3.2.9 Alternative Transport Route and Site Access

Wind turbine components (blades, nacelles, and towers) are not manufactured in Ireland and therefore must be imported from overseas and transported overland to the Proposed Wind Farm site. Regarding the selection of a transport route to the Proposed Wind Farm, alternatives were considered in relation to turbine components, general construction related traffic and site access locations.

Wind turbine components will be delivered from the Port of Foynes (Shannon) to the Proposed Wind Farm. Key considerations in determining the turbine delivery route are road widening requirements, modifications to street furniture, vertical alignment of roads, and structural assessment of road infrastructure due to the abnormal sized loads of wind turbine components. Collett were engaged by the Applicant to carry out a preliminary assessment on the proposed turbine delivery routes for the Proposed Project. It was deemed suitable that the turbines be delivered from the Port of Foynes (Shannon), however there were 2 no. options considered for the entrance into the site.

A desktop analysis was undertaken using identified constraints to identify three potential routes of entry into the Proposed Wind Farm site coming from the Port of Foynes. Figure 3-8 below demonstrates both proposed site access points and routes which are further detailed below.



Map Legend

- EIAR Site Boundary
- TDR Route A (Chosen Option)
- TDR Route B

Drawing Title
Turbine Delivery Route Options

Project Title
Lacakreagh Wind Farm, Co. Clare

Drawn By	Checked By
CJ	NMcH
Project No. 220245	Drawing No. Figure 3-8
Scale 1:45,000	Date 2024-08-01

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3.2.9.1 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the Proposed Project include the Port of Galway, the Port of Waterford and the Port of Ringaskiddy. Shannon Foynes Port is the principal deepwater facility on the Shannon Estuary and caters for dry bulk, break bulk, liquid and project cargoes. Port of Galway and Dublin Ports also offers a roll-on roll-off procedure to facilitate import of wind turbines. The Port of Waterford offers Lift-On Lift-Off, Bulk Handling, Project Pilotage, Towage & Tugs, Rail Transport, Cruise, Storage and Rental services. All four ports, and indeed others in the state, offer potential for the importing of turbine components. The primary chosen port of entry is the Port of Foynes (Shannon) due to its proximity to the Proposed Wind Farm site and the road network which exists between the Port and the Proposed Wind Farm site, and the storage capacity for wind farm infrastructure is available.

3.2.9.1.1 *Turbine Delivery Route A – Chosen Option*

Turbine Delivery Route A – Chosen Option utilises, insofar as possible, the existing road network that exists within the vicinity of the Proposed Wind Farm site. This route accesses the site via an existing road network through Kilbane village and the L7080 Local Road. This approach was deemed the most environmentally prudent as it made use of the existing road network insofar as possible.

3.2.9.1.2 *Turbine Delivery Route B*

It was considered that the turbines be delivered via a proposed new access road which would leave the R466 Regional Road and enter the Proposed Wind Farm site at T7 to the south. This option would necessitate the construction of approximately 1.8km of new road which would traverse agricultural grasslands. This approach was considered less favourable due to the presence of the existing road network which had the potential to be upgraded to accommodate the Proposed Wind Farm site entrance.

3.2.10 Alternative Mitigation Measures

Mitigation by avoidance has been a key aspect of the Proposed Project's evolution through the selection and design process. Avoidance of the most ecologically sensitive areas of the site limits the potential for environmental effects. As noted above, the site layout aims to avoid any environmentally sensitive areas. Where the loss of habitat occurs on the site, this has been mitigated with the proposal of habitat enhancement and improved habitat connectivity with hedgerow replanting within the Proposed Wind Farm; please see Appendix 6-4, Biodiversity Enhancement and Management Plan, for further detail on enhancement measures the Proposed Wind Farm site. Any forestry felled within the footprint of the Proposed Wind Farm will be replaced offsite, with no net loss. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential environmental effects and risk associated with this.

The best practice design and mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the site and any identified environmental receptors. The alternative is to either not propose these measures or propose measures which are not best practice and effective and neither of these options is sustainable.