Environmental Impact Assessment Report

Proposed Clonberne Wind Farm Development, Co. Galway

Chapter 3 – Site Selection and Reasonable Alternatives

DOCUMENT DETAILS

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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 13th 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 'Proposed Grid Connection'. 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 Proposed Project, connection to the national grid and transport route options to the Site. This section also outlines the design considerations in relation to the renewable energy development, including the construction compounds and Grid Connection. It provides an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects. The consideration of alternatives is an effective means of 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 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 potential significant 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 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 is addressed in the following sections.

When considering the Proposed Project i.e. Proposed Wind Farm and Proposed Grid Connection, given the intrinsic link between layout and design, the two will be considered together in this chapter. As such, the Proposed Project will be used as a reference to the Proposed Wind Farm and the Proposed Grid Connection and will assess them as one. Section 1.1.1 in Chapter 1: Introduction outlines the references to the Proposed Project, Proposed Wind Farm and the Proposed Grid Connection as well as the 'Site'.

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 Project, and public road corridor, open space, discontinuous urban fabric and agriculture along the Proposed Grid Connection. 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 trend of population increase that has 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 impact of this is considered to be long term, negative and slight.

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 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 opportunity for the investment of a Community Benefit scheme into the local communities. No potential for shadow flicker and noise to affect sensitive receptors. No potential for positive effects on air quality and climate change targets. No potential to supply an estimated 57,816 homes with clean renewable electricity	Up to approximately 100 jobs could be created during the construction, operation, and maintenance phases of the Proposed Project. As detailed in Chapter 4 Description of the Proposed Project, a Community Benefit scheme will be set up and the provision of a fund of approximately €400,000 per annum to be distributed to the local community. This will equate to potential funding of €6 million to the local community. 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 Project. As detailed in Chapter 10 Air Quality, there will be a significant

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
		positive effect on air quality due to the operation of the Proposed Project. As detailed in Chapter 11 Climate, the Proposed Project will displace approximately 72,217 tonnes of carbon dioxide per annum traditional carbon-based electricity generation. This will have a long-term significant positive effect on climate.
Biodiversity (including Birds)	No habitat loss. No opportunity for biodiversity net gain. No opportunity for the implementation of invasive species management plan. No potential for collision risk for birds and bats.	As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity. As detailed in the Biodiversity Enhancement Plan in Appendix 6-6, proposed measures are outlined to offset the loss of linear vegetation, woodland and scrub habitats, cutover bog habitats and *Molinia* meadows associated with the Proposed Project and provide a net gain for both linear hedgerow and treeline habitat within the Site. As detailed in the Invasive Species Management Plan in Appendix 6-4, a proposed management plan provides for the management of Rhododendron, a Third Schedule invasive species, only within or directly adjacent to the Site. As detailed in the Bat Report in Appendix 6-2 of this EIAR, there is unlikely to be any significant increase in collision risk to bats from the Proposed Project. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicates that the impact of the Proposed Project on birds corresponds to a **Very Low** effect significance.
Land, Soils & Geology	Neutral. There is no material environmental effect difference between the options considered.	As detailed in the assessment in Chapter 8, there is no loss of topsoil or subsoil as a result of the Proposed Project. Topsoil and subsoil will be relocated within the site.

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
Water	Neutral. There is no material environmental effect difference between the options considered.	As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air	Neutral. No potential for positive effects on air quality.	As detailed in Chapter 10, there will be a significant positive effect on air quality due to the operation of the Proposed Project.
Climate	Will not assist in achieving the renewable energy targets set out in the Climate Action Plan. No potential for positive effects on climate change targets.	As detailed in the assessment in Chapter 11, over the proposed 35 year lifetime of the Proposed Project, 72,217 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 phase.
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology.	As detailed in the assessment in Chapter 13, the significance of direct effects will be slight - not significant and no significant effects will occur. There will be no significant direct or indirect impacts on Cultural Heritage.
Landscape & Visual	No potential for landscape and visual impacts on nearby sensitive receptors.	As detailed in the assessment in Chapter 14, the lack of nearby highly sensitive landscape and visual receptors, and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Material Assets	Neutral. There is no material environmental effect difference between the options considered. No potential for impacts to existing telecommunication links.	As detailed in Chapter 15, there will be short term negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. As detailed in the Three Impact Assessment in Appendix 15-5, an agreement with Three regarding mitigation measures has been

Environmental Consideration	Do Nothing Alternative	Chosen option of developing a renewable energy project
		achieved in order to avoid impact to their existing telecommunication link.

3.2.3 Alternative Site Locations

The process of identifying a suitable wind farm site is influenced by a number of factors, while wind speeds, the area of suitable or available land, proximity to a grid connection point and planning policy are all very important, a wind farm project must be commercially viable/competitive, as otherwise it will never attract the necessary project finance required to build it.

The Proposed Project site has been identified as having potential for a wind energy development as a result of a nationwide search of suitable lands. The site selection process has been constraints and facilitators led. Facilitators are factors that give an advantage to a proposed project, while constraints are restrictions that inform the location and design of a project by highlighting sensitivities. A nationwide constraints analysis was undertaken and included avoidance of environmental designations (Natura 2000 sites), review of national, regional and local policies and objectives, suitable wind speeds, adequate setbacks from sensitive receptors, proximity to national grid nodes, avoidance of direct impacts on known cultural heritage assets, access and constructability

3.2.3.1 Strategic Site Selection

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 Subject Development was chosen.

As set out in Section 1.3 of this EIAR the applicant for the Proposed Project is Clonberne Windfarm Limited. Clonberne Windfarm Limited is a subsidiary company of Cregmore Construction Ltd., which is an Irish-owned, Galway-based company with extensive experience in the design, construction and operation of wind energy developments throughout Ireland, with projects currently operating in Galway. Cregmore Construction Limited have wide ranging experience in the area of electricity connections to the national grid and electricity substation development and various other utilities projects.

Sites selected for the development of a wind farm must be suitable for consideration under a number of criteria, such as:

- **Planning Policy:** Site location relative to Galway County Development Plan Wind Energy Capacity's classification of areas considered that have capacity for wind farm development from a planning policy perspective;
- **Environmental Sensitivities**: Located outside areas designated for protection of ecological species and habitats;
- **Grid Connection**: Access to the national electricity grid possible within a viable distance;
- **Sensitive Receptors**: Capable of complying with required setbacks from sensitive receptors.
- **Site Scale:** Sufficient area of unconstrained land that could potentially accommodate a wind farm development and turbine spacing requirements;

The criteria above will be explained further below in so far as they influenced the site selection exercise undertaken.

3.2.3.1.1 *Planning Policy*

Galway County Development Plan 2015 – 2021

The Wind Energy Strategy for the Galway County Development Plan 2015 – 2021 set out areas that were designated as being Acceptable in Principle, Open to Consideration, Strategic Areas, and Not Normally Permissible. When the site for the Proposed Project was identified, it was located within an area which was designated as 'Acceptable in Principle' and 'Open to Consideration' for potential for wind development.

Galway County Development Plan 2022-2028

Chapter 14 of the GCDP deals with Climate Change, Energy and Renewable Resource. This section of the GCDP sets out its aim as being '*To reduce the carbon footprint by integrating climate action into the planning system in support national targets, support indigenous renewable sources in order to reduce dependence on fossil fuels and improve security of supply and the move to a competitive low carbon economy.'*

This section of the GCDP sets out a number of Climate Action Policy Objectives which took direction from national and local policy such as the National Policy Framework, the Draft National Energy and Climate Plan (NECP) 2021 – 2030, The Climate Action Plan, and the County Galway Climate Change Adaptation Strategy 2019 – 2024. The GCDP sets out the 10 Climate Change Policy Objectives as listed below:

- **CC1 Climate Change:** Support and facilitate the implementation of European, national and regional objectives for climate adaptation and mitigation taking into account other provisions of the Plan (including those relating to land use planning, energy, sustainable mobility, flood risk management and drainage) and having regard to the Climate mitigation and adaptation measures.
- **CC2 Transition to a low carbon, climate resilient society:** It is the Council's policy objective to support the transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, by way of reducing greenhouse gases, increasing renewable energy, and improving energy efficiency.
- **CC3 County Galway Climate Adaptation Strategy 2019 – 2024:** To implement the County Galway Climate Adaptation Strategy 2019-2024 as appropriate.
- **CC4 Local Authority Climate Action Plan:** Support the preparation of a Climate Action Plan for County Galway.
- **CC5 Climate Adaptation Mitigation:** To promote, support and direct effective climate action policies and objectives that seek to improve climate outcomes across County Galway through the encouragement and integration of appropriate mitigation and adaptation considerations and measures into all development and decision-making processes.
- **CC6 Local Authority Renewable Energy Strategy (LARES):** To support the implementation of the Renewable Energy Strategy contained in Appendix 1 of the Galway County Development Plan to facilitate the transition to a low carbon county.
- **CC7 Climate Action Fund:** Support the delivery of sustainable development projects under the European Green Deal and utilise the Climate Action Fund/ Just Transition Fund established under the National Development Plan to encourage public and private climate mitigation and adaptation projects in line with criteria set out by the Fund at that time.
- **CC8 Climate Action and Development Location:** To implement, through the plan and future local areas plans, policies that support and encourage sustainable compact growth and settlement patterns, integrate land use and transportation, and maximise

opportunities through development location, form, layout and design to secure climate resilience and reduce carbon dioxide and greenhouse emissions.

- **CC9 Mainstreaming Climate Change Adaptation:** Galway County Council shall incorporate climate change adaptation into land use planning, building layouts, energy, transport, natural resource management, forestry, agriculture and marine waters.
- **CC10 Green Infrastructure:** Galway County Council shall promote the benefit of open spaces and implement the integration of green infrastructure/networks (e.g. interconnected network of green spaces (including aquatic ecosystems) and other physical features on land) into new development and regeneration proposals in order to mitigate and adapt to climate change.

The GCDP also sets out its Energy Strategy, in which it states that '*an efficient and secure energy supply is essential to the future growth and sustainable development of County Galway.'* It goes on to state that '*Energy efficiency, renewable energy development and progression towards a low carbon economy are therefore central themes of this Plan'.* The GCDP sets out a number of Policy Objectives for Electricity and Gas Networks, and are highlighted below:

EG 2 Electricity Transmission Networks:

- To support the development of the transmission grid network in order to sustainably accommodate both consistent and variable flows of renewable energy generated in County Galway
- Proposed renewable energy generation projects shall fully consider the capacity of the existing transmission grid network in determining the optimal grid connection for the project, in accordance with the proper planning and sustainable development of the area.
- In respect of proposed renewable energy developments, transmission grid capacity should be considered as a constraint where the Transmission Development Plan, or any other equivalent plan of the TSO, does not identify infrastructure reinforcement measures unless transmission grid capacity can be demonstrated.
- Notwithstanding ecological and environmental considerations, grid connection routing for development proposals should show all alternative routes that were considered, and should avoid materially impacting the road network, where possible. Undergrounding should be considered where it will significantly negate any identified impacts.
- It is important that the necessary transmission and distribution infrastructure is facilitated and put in place in order to maximise the renewable energy potential of County Galway. Liaison with Eirgrid, as a TSO, and alignment with their transmission plans and strategies will be of vital important in this respect.

In relation to renewable energy generation, the GCDP acknowledges that a secure and resilient supply of energy is critical to a well-functioning economy, being relied upon for heating, cooling, and to fuel and transport, power industry and generate electricity. In order to facilitate the sustainable growth of renewable energies, Local Authority Renewable Energy Strategy (LARES) have been prepared for the county as part of the plan. The LARES outlines the potential for a range of renewable resources, including wind energy. The LARES was developed with the following Policy Objectives for Renewable Energy at its core:

- **RE1 Renewable Energy Generation and ancillary facilities:** To facilitate and support appropriate levels of renewable energy generation and ancillary facilities in the county to meet national, regional and county renewable energy targets, to facilitate a reduction in CO_2 emissions and the promotion of a low carbon economy.
- **RE2 Local Authority Renewable Energy Strategy**: The policy objectives and Development Management Standards set out in the Local Authority Renewable Energy Strategy for County Galway shall be deemed the policy objectives and

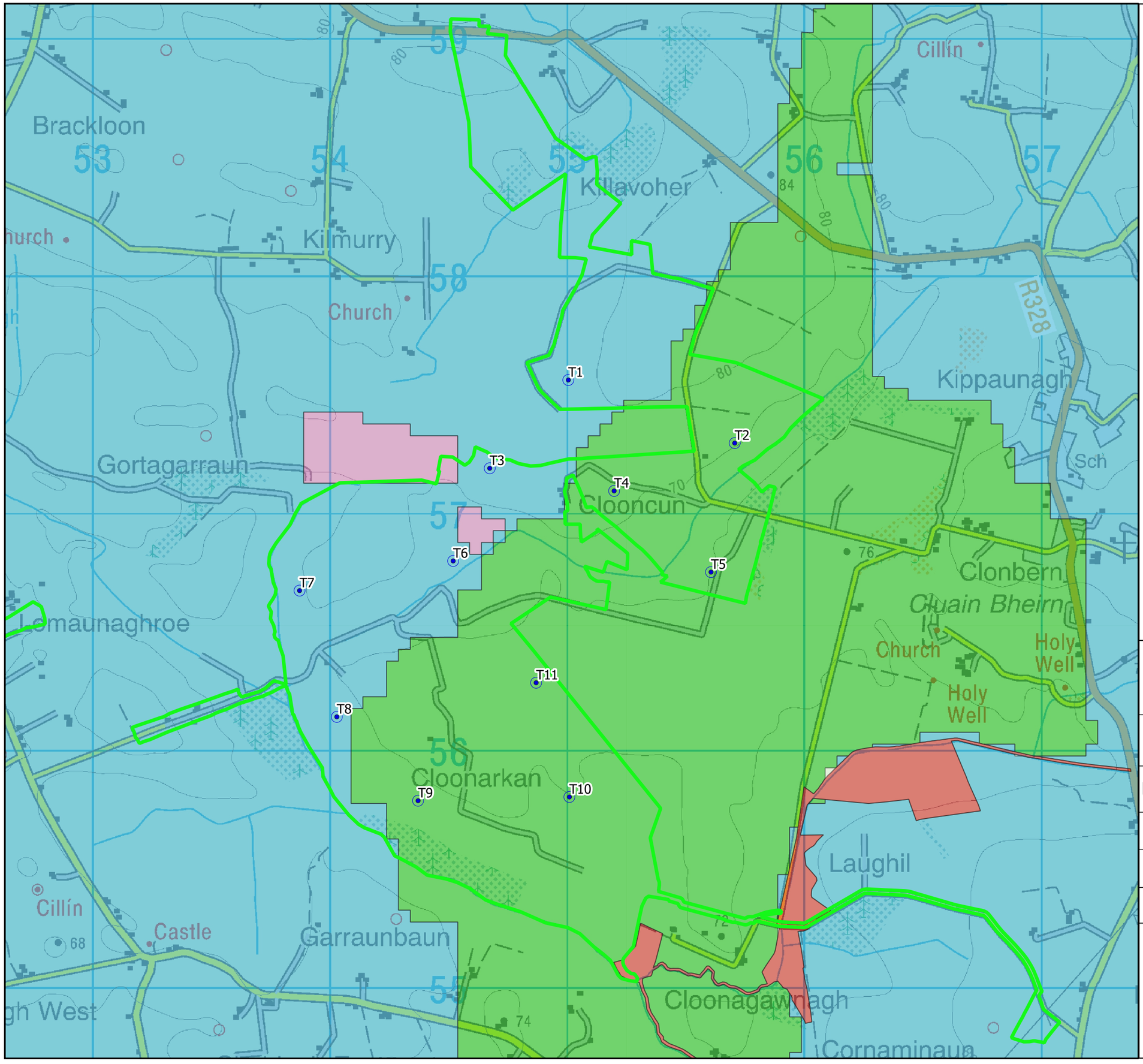
development management standards for the purpose of the Galway County Development Plan 2022-2028.

- **RE3 Wind Energy Developments**: Promote and facilitate wind farm developments in suitable locations, having regard to areas of the County designated for this purpose in the Local Authority Renewable Energy Strategy. The Planning Authority will assess any planning application proposals for wind energy production in accordance with the Local Authority Renewable Energy Strategy, the Guidelines (or any updated/superseded documents), having due regard to the Habitats Directive and to the detailed policy objectives and Development Standards set out in the Local Authority Renewable Energy Strategy.
- **RE5 Renewable Energy Strategy**: Support and facilitate the sustainable development and the use of appropriate renewable energy resources and associated infrastructure within the County having due regard to the Habitats Directive and to the detailed policy objectives and Development Standards set out in the Local Authority Renewable Energy Strategy as follows:
    - Renewable Energy Transmission
    - Renewable Energy Generation
    - 'Strategic Areas' for renewable energy development
    - Onshore Wind Energy
    - Solar Energy
    - Bioenergy /Anaerobic Digestion
    - Micro-renewables
    - Marine Renewables
    - Hydro Energy
    - Geothermal Energy
    - Alternative Technologies
    - Energy Efficiency & Conservation
    - Sustainable Transport
    - Auto production
    - Battery Storage
    - Repowering/Renewing Wind Energy Developments
    - Community Ownership
- **RE7 Renewable Energy Generation**: Transition to a Low Carbon Economy: To facilitate and support appropriate levels of renewable energy generation in County Galway, considering the need to transition to a low carbon economy and to reduce dependency on fossil fuels.

In addition, to support the implementation of the Renewable Energy Strategy contained in Appendix 1 of the Galway County Development Plan, the LARES identifies areas for the development of wind energy projects within the County. The LARES identifies areas under the following categories:

- Acceptable in Principle
- Open to Consideration
- Generally to be Discouraged
- Not Normally Permissible

Based on Figure 3-1 below the Proposed Project site is located within an area that is classified as **'Acceptable in Principle'** and **'Open to Consideration'**. Areas classified as 'Acceptable in Principle' are defined as "areas where wind energy development will be facilitated as an appropriate landuse." Areas classified as "Open to Consideration" are defined as "areas where wind energy development is likely to be favourably considered – subject to the results of more detailed assessment of policies and potential effects."



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Galway WES

- Acceptable in Principle
- Generally to be Discouraged
- Not Normally Permissable
- Open to Consideration

Drawing Title

Galway WES

Project Title

Proposed Clonberne Wind Farm Development

Drawn By	Checked By
EC	JF/OC
Project No.	**Drawing No.**
180740	Fig. 3-1
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3.2.4 Alternative Renewable Energy Technologies

The Proposed Project will be located on a site where small-scale agriculture and forestry practices will continue to be carried out around the footprint of the Proposed Project.

Both onshore and offshore wind energy development will be required to ensure Ireland reaches the target set in the Climate Action Plan to source 80 per cent 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 offshore wind and commercial solar energy production as an alternative on the Proposed Project.

3.2.4.1 Offshore Wind

Although the screening exercise was based on identifying lands for onshore wind development; another alternative source of renewable electricity generation would be offshore wind energy.

Cregmore Construction Ltd, the parent company of Clonberne Windfarm Ltd, has a keen interest in offshore wind farms and has explored potential offshore sites. However, it is considered that due to delays with the regulatory process for offshore development, a combination of both onshore and offshore wind farm development will continue to be required to deliver on the ambitious renewable energy targets set under the Climate Action Plan 2024 (CAP) which include focusing on onshore wind energy developments to reach the 2025/2030 renewable energy targets. As such, Cregmore Construction's primary focus remains to be onshore wind farms and they will continue to explore potential development offshore in tandem with delivering suitable sites onshore such as this Proposed Project Site.

The Applicant, as mentioned above, is a subsidiary company of Cregmore Construction Ltd, which is an Irish-owned, Galway-based company with extensive experience in the design, construction, and operation of wind energy developments throughout Ireland, with projects currently operating in Galway. The Applicant is committed to playing a key role in helping the State achieve its CAP objectives while building upon its proven record of generating clean renewable energy to the national grid. As such, the option of an offshore project is not considered to be a reasonable alternative at this time.

3.2.4.2 Solar Energy

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 Project (c. 79.2MW), a larger development footprint would be required. As detailed in Section 1.1.1 in Chapter 1, the EIAR Site Boundary encompasses an area of approximately 353 hectares and the permanent footprint of the Proposed Project measures approximately 33.7 hectares, which represents approximately 9.5% of the Site. In order to achieve a c. 79.2MW output using solar PV arrays, there would be a requirement of approximately 158.4ha[1], which represents approximately 45% of the Proposed Project site.

[1] *Approximately 1.6 - 2 ha are required for each MW of solar panels installed based on approximately 4000 panels per MW (taken from the Sustainable Energy Authority Solar Energy FAQ publication which can be accessed here: https://www.seai.ie/publications/FAQs_on_Solar_PV.pdf). For the purposes of comparison, a minimum value of 1.6 ha has been assumed.*

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. Taking into account 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 Project 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 79.2 MW Output)	Chosen Option (Wind Turbines)
Population & Human Health (incl. Shadow Flicker)	Relatively lower long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis). No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local receptors.	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 local receptors.
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 impacts on biodiversity. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Project on birds corresponds to a **Very Low** effect significance. No potential for glint and glare impacts on birds.
Land, Soils & Geology	Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated.	As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur.
Water	Shallower 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, no significant effects on surface water or groundwater quality will occur.
Air	Reduced capacity factor of solar PV array technology would result in more reliance on fossil fuels for energy generation and therefore	As detailed in the assessment in Chapter 10, the Proposed Project will provide an alternative to electricity generated from fossil fuel

Environmental Consideration	Solar PV Array (with up to 79.2 MW Output)	Chosen Option (Wind Turbines)
	decreased air quality improvements.	sources and will result in a 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, 72,217 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. This will have a long-term significant positive effect on climate.
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 phase.
Cultural Heritage & Archaeology	Neutral. There is no material environmental effect difference between the options considered.	As detailed in the assessment in Chapter 13, the significance of direct effects will be slight - not significant and no significant effects will occur. There will be no significant direct or indirect impacts on Cultural Heritage.
Landscape & Visual	Panelling potentially less visible from surrounding area due to screening by vegetation and topography.	As detailed in the assessment in Chapter 14, the lack of highly sensitive landscape and visual receptors, and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Material Assets	No potential impact on existing telecommunication links.	As detailed in Chapter 15, there will be short term negative imperceptible to slight impact on traffic volumes during the construction phase of the Proposed Project. As detailed in the Three Impact Assessment in Appendix 15-4, an agreement with Three regarding mitigation measures has been achieved in order to avoid impact to their existing telecommunication link.

For the reasons set out above, the proposal for a wind energy development at the Proposed Project was considered to be the most efficient method of electricity production given the good available wind resource at this location and the lack of project-level constraints in the wider area.

3.2.5 Alternative Turbine Numbers and Model

The proposed wind turbines will have a potential power output in the 4 and 7 megawatt (MW) range. It is proposed to install 11 turbines at the Proposed Project which could achieve approximately 79.2 MW output (mid-range capacity). Such a wind farm could also be achieved on the site of the Proposed Project by using smaller turbines (for example 3 MW or 4MW machines). However, this would necessitate the installation of over 20 to 27 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 Project. A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the Proposed Project, with a larger amount of supporting infrastructure being required (i.e., 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 of the Proposed Project. The 11-turbine layout selected for the Proposed Project 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 other alternatives considered included an 18- turbine layout which is discussed in further detail in Section 3.2.6 below.

The turbine model to be installed on the Proposed Project will have an overall blade tip height of 180 metres; a rotor diameter of 162 metres; and hub height of 99 metres. This EIAR provides a robust assessment of a candidate turbine that is within the overall development description. The use of alternative smaller turbines at the Proposed Project would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Project 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 Project is presented in Table 3-3 below.

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

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 11 no. turbine layout
Population & Human Health (incl. Shadow Flicker)	Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number 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 Project.
Biodiversity & Ornithology	Larger development footprint would result in greater potential habitat loss.	Smaller footprint would result in less habitat being lost. As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Project on

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 11 no. turbine layout
		birds corresponds to a **Very Low** effect significance.
Land, Soils & Geology	Larger development footprint would result in greater volume of spoil to be excavated and stored.	Smaller footprint would result in smaller volume of soils to be excavated and managed. 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 less potential for silt-laden run-off to enter a watercourse. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air	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.	A smaller 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 Project, 72,217 tonnes of carbon dioxide willbe displaced from traditional carbon-based electricity generation. This will have a long-term significant positive effect on climate.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors.	Potential for less noise impacts 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 due to an increase in noise levels from the Proposed Project during the construction and operational phase.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	As detailed in the assessment in Chapter 13, the significance of direct effects will be slight - not significant and no significant effects will occur.

Environmental Consideration	Larger number of smaller turbines	Chosen option of a 11 no. turbine layout
		There will be no significant direct or indirect impacts on Cultural Heritage.
Landscape & Visual	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Material Assets	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components. Potential for greater impact to existing telecommunication links.	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 impact on traffic volumes during the construction phase of the Proposed Project. As detailed in the Three Impact Assessment in Appendix 15-4, an agreement with Three regarding mitigation measures has been achieved in order to avoid impact to their existing telecommunication link.

3.2.6 Alternative Turbine Layout and Design

The design of the Proposed Project has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. The aim being to reduce potential for environmental effects while designing a project capable of being constructed and viable.

Throughout the preparation of the EIAR, the layout of the Proposed Project has been revised and refined to take account of 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 Sections 2.6 and 2.7 of Chapter 2.

3.2.6.1 Constraints Mapping

The design and layout of the proposed wind energy development follows the recommendations and guidelines set out in the '*Wind Energy Development Guidelines'* (Department of the Environment, Heritage and Local Government, 2006) and the '*Best Practice Guidelines for the Irish Wind Energy Industry*' (Irish Wind Energy Association, 2008).

The '*Wind Energy Development Guidelines for Planning Authorities'* (DoEHLG, 2006) (the 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 Wind Energy Development Guidelines (December 2019) (draft Guidelines). A consultation process in relation to the draft Guidelines closed on 19th February 2020. The proposed changes presented in the draft 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 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. 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 the final guidelines in 2024 (refer to Section 1.5.3.2 in Chapter 1), it is possible that the draft Guidelines are adopted during the consideration period for the Proposed Project. Should the draft 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 Guidelines as currently proposed.

The constraints mapping process involves the placing of buffers around different types of constraints so as 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 using guidance presented in the Guidelines.

The constraints map for the Proposed Project, as shown in Figure 3-2, was produced following a desk study of all site constraints. Figure 3-2 encompasses the following constraints and associated buffers:

- Residential dwellings plus a minimum 720-metre buffer (achieving the requirement for a 4x tip height separation distance from properties in line with the new draft Guidelines). There are 3 No. unoccupied dwelling located within 720 metres from any proposed turbine location all belonging to landowners who form part of the Proposed Project.
- Natura 2000 sites plus 200-metre buffer;
- Telecommunication Links plus operator specific buffer;
- Natural Watercourses plus 50-metre buffer;
- Site Specific Flood Modelling for 100-yr and 1000-yr events; and
- Archaeological Sites or Monuments, 50-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;
- Existing access points and general accessibility of all areas of the site due to existing road infrastructure; and
- Limited extent of constraints;
- Supportive Wind Energy policy for the area by Galway County Council.

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 other 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 of the Proposed Project encompassed site specific flood modelling for 100-yr and 1000-yr events. This assessment, as described in Chapter 9 of this EIAR on Water, optimised the decision on the siting of turbines, roads and the onsite substation. Where specific areas were deemed as being unsuitable for the siting of turbines or roads, etc., alternative locations were proposed and assessed, taking into account the areas that were already ruled out of consideration. The turbine layout for the Proposed Project has also been informed by the results of noise, landscape and visual and shadow flicker assessments as they became available.

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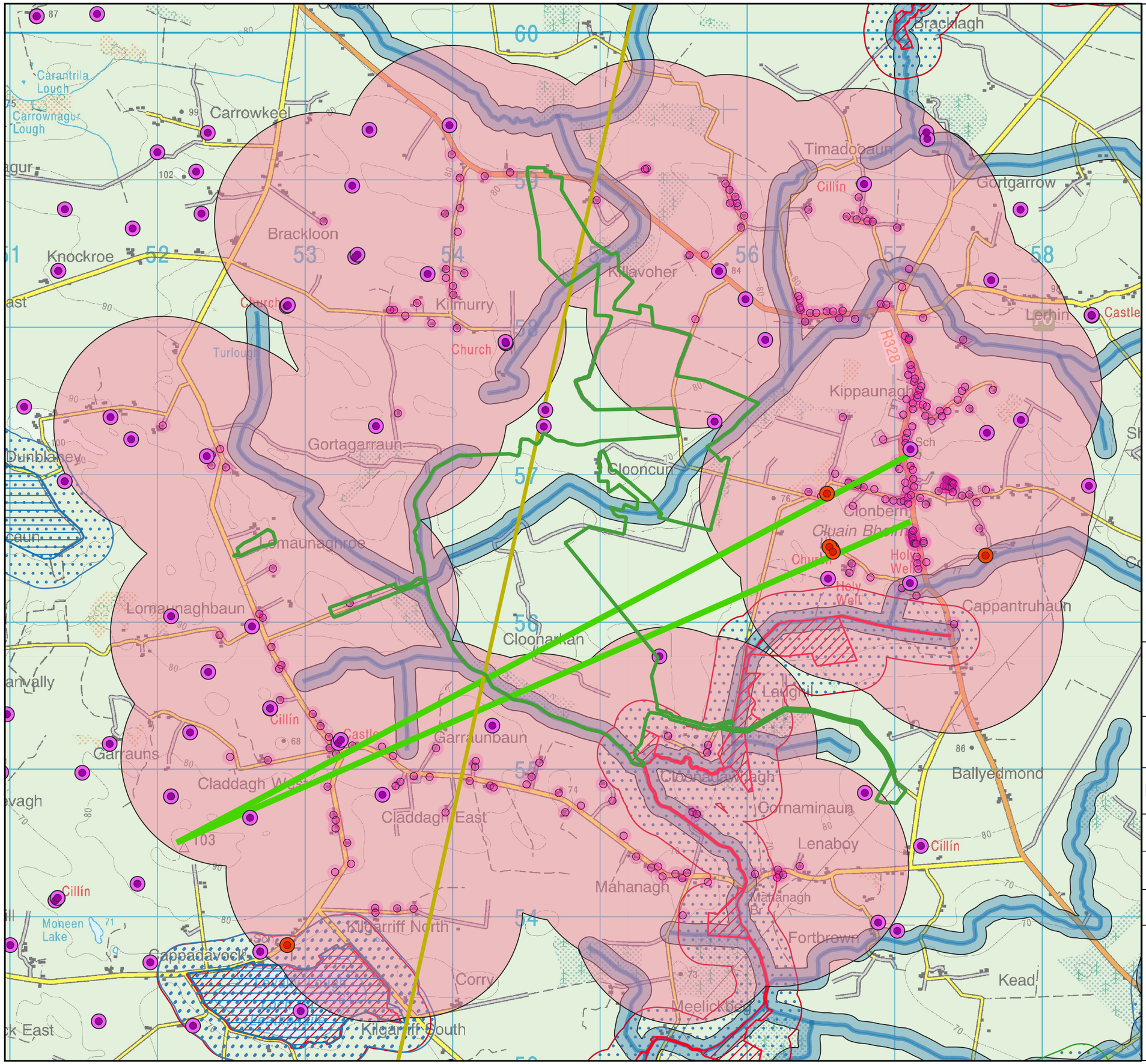

Map Legend

- EIAR Site Boundary

Hydrology

- Watercourses
- 75m Watercourse Buffer

Sensitive Receptors

- Sensitive Receptors
- 740m Sensitive Receptor Setback

Designated Areas

- Natural Heritage Area (NHA)
- 200 NHA Buffer
- Proposed Natural Heritage Area
- 200 pNHA Buffer
- Special Area of Conservation (SAC)
- 200m SAC Buffer

Heritage

- National Inventory of Architectural Heritage (NIAH) Sites
- 50m NIAH Sites Buffer
- National Monuments
- 50m National Monuments Buffer

Telecommunications

- Three Link
- Enet Link

Drawing Title

Constraints and Facillitators

Project Title

Proposed Clonberne Wind Farm Development

Drawn By	Checked By
EC	JF/OC
Project No. 180740	Drawing No. Fig. 3-2
Scale 1:25,000	Date 2024-04-10

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3.2.6.2 Turbine Layout

The final Proposed Project site layout takes account of all site constraints and the distances to be maintained between turbines and other infrastructure 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 site of the Proposed Project was compiled and assessed, the proposed layout has been revised and amended to take account of the physical constraints of the site 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 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 Project layout has resulted following feedback from the various studies and assessments 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 Project layout. The initial constraints study identified a significant viable area within the overall study area of the Proposed Project site. The initial turbine layout consisted of 18 no. turbines within a larger viable area. However, the proposed 11-turbine layout was decided upon following feedback from the project team, landowners, neighbours, and the need to ensure sufficient separation distances are maintained for on-site constraints. The Proposed Project underwent 6 separate iterations. While all 6 versions have not been included, Figures 3-3 to 3-6 below indicate how the turbine layout evolved throughout the design process.

3.2.6.2.1 Proposed Layout Iteration No. 1

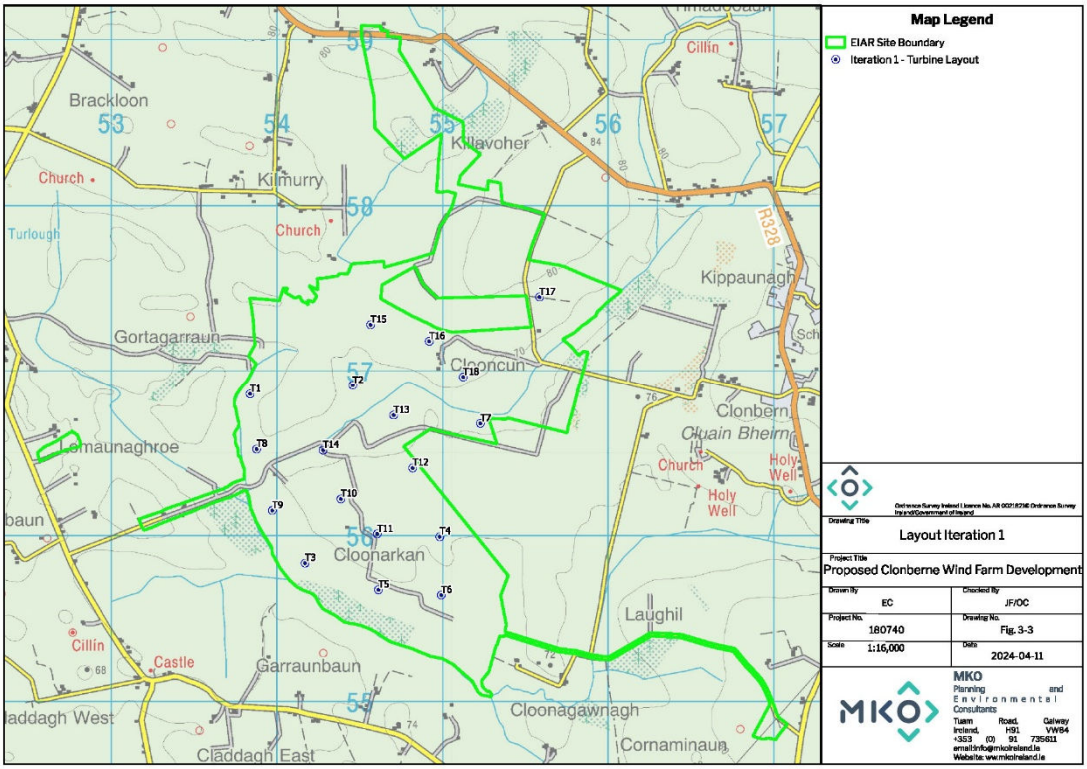


Figure 3-3 Proposed Layout Iteration No. 1

Iteration No. 1, which is presented in Figure 3-3, is the initial turbine layout which was based on a preliminary constraints mapping exercise and the identification of a viable area for turbine siting. A smaller turbine model with the dimensions of 150 tip height and 100m rotor diameter was considered for this exercise, which allowed for the siting of 18 no. turbines within the overall study area. However, it was concluded that this approach would be inefficient and infringe upon the sensitivities of the receiving environment to a higher degree. Therefore, it was determined that fewer turbines of a larger turbine model should be installed within this area.

3.2.6.2.2 Proposed Layout Iteration No. 2

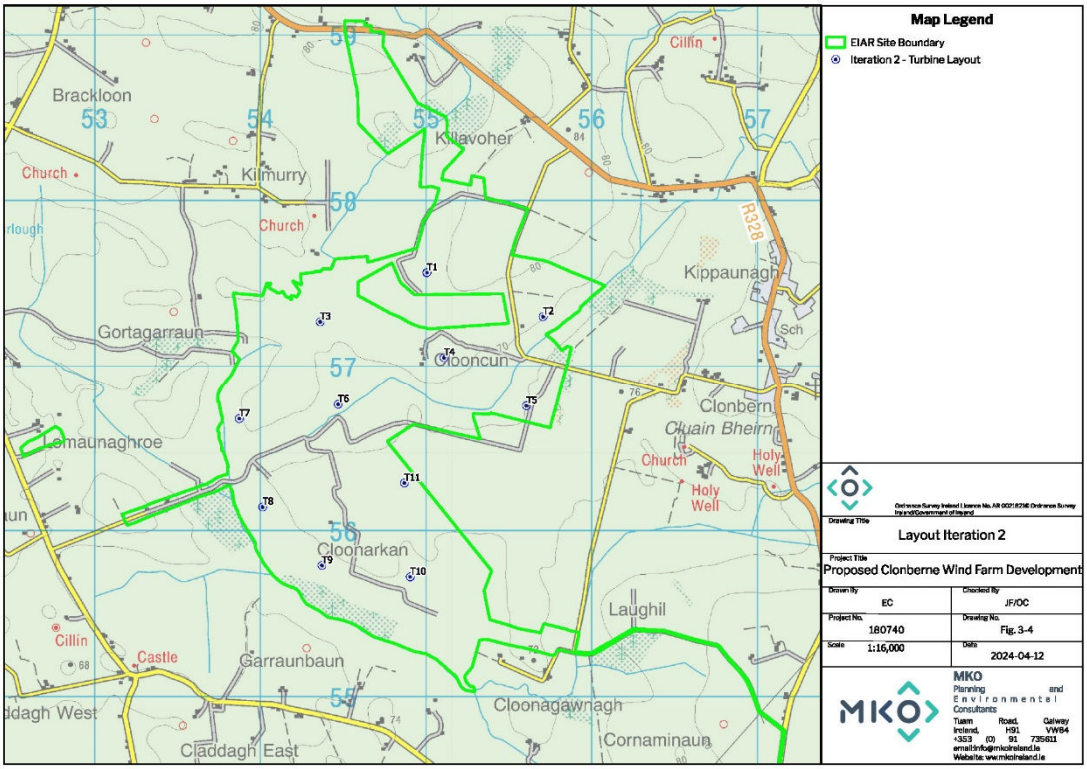


Figure 3-4 Proposed Layout Iteration No. 2

Following the findings of Iteration No. 1 in Section 3.2.6.2.1., Iteration No. 2 considered 11. No. turbines of a 180m tip height and 162m rotor diameter, hardstands, and access roads. This then provides a substation option, the location of which had been associated with the underground grid connection cabling routes that were under consideration at that time. The alternative underground electrical cabling routes are further detailed in Section 3.2.8 below.

The layout derived from Iteration No. 2 was then presented to the project team for further investigations and assessments. These investigations included detailed habitat surveys and mapping, ecological surveys, hydrological and geotechnical investigations of the site of the Proposed Project. Detailed hydrological monitoring also commenced for the Proposed Project for the purposes of site-specific flood modelling.

3.2.6.2.3 Proposed Layout Iteration No. 3

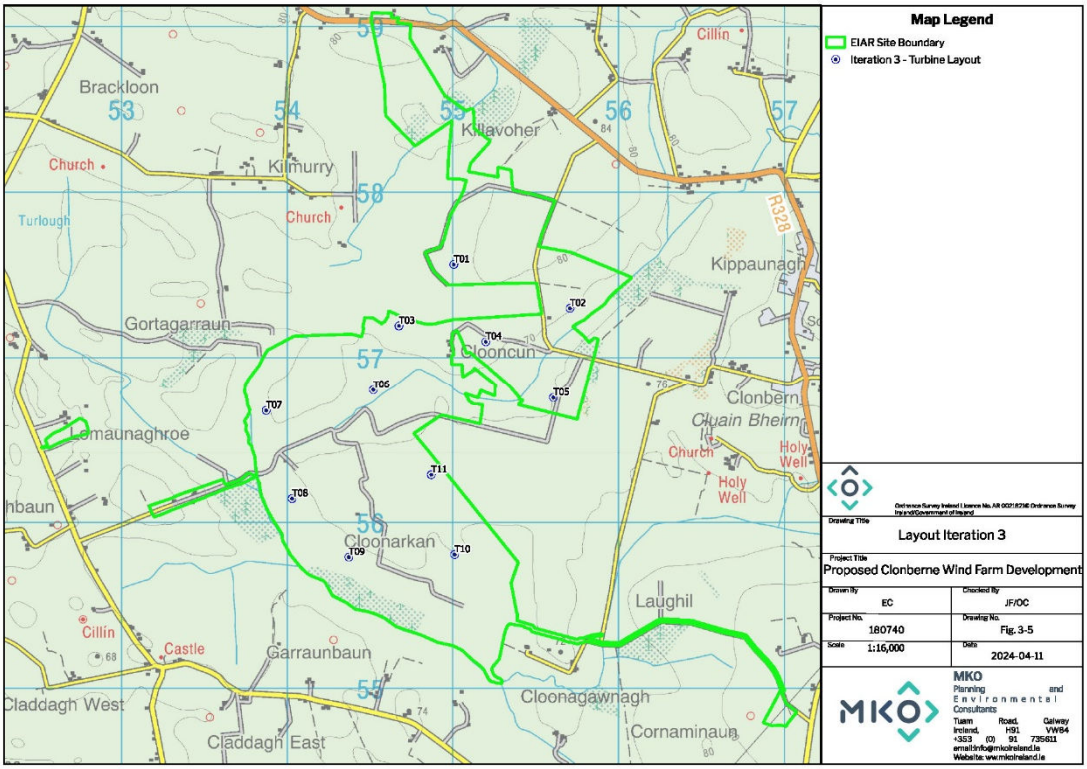


Figure 3-5 Proposed Layout Iteration No. 3

Iteration No. 3, presented in Figure 3-5, comprised 11 No. turbines, and one on-site substation location and associated grid connection option. As previously mentioned in Section 3.2.6.2.2, Iteration 2 was subject to detailed investigations that led to the further refinement of the layout, leading to the following changes:

- Turbine 3 was moved east due to landowner agreements.
- Turbine 6 was moved north-west of its former position due to an ecological constraint.
- Turbine 7 was relocated south-west from its former position to avoid a degraded raised bog.
- Turbine 8 was relocated to ensure appropriate setback from a dwelling,

The substation option in the south-east was moved north of the previous location to reduce the requirement of forestry felling in this area. This location is the preferred location as it shortened the length of the proposed grid connection route to the national grid connection point.

Turbine delivery site entrance and junction options were also considered by the EIAR team and subject to site investigation (See Section 3.2.9 for further information).

3.2.6.2.4 Proposed Layout Iteration No. 4 – Final Proposed Project Layout

Iteration No. 4 as presented in Figure 3-6 comprised of 11 No. turbines with an overall blade tip height of 180 metres; rotor diameter of 162 metres; hub height of 99 metres, 2 No. construction compounds, 1 No. onsite substation and 1 No. underground electrical cabling route which is further detailed in Section 3.2.8.

Two temporary construction compounds were added to the layout. The first is located north of Turbine No. 1. The second is located at the western section of the site. This was included to provide an

additional and more centralised compound to service the internal works of the site (See also Section 3.2.7.1).

Informed by detailed auto-track assessments, refinements were made to the Proposed Project access junctions for the facilitation of turbine delivery to the site as well as adjustments to the internal road network. This also led to the repositioning of turbine hardstands throughout the iterative process. The initial site boundary was at this stage amended to focus on the final iterations of the layout.

The revisions to the layout were found to have no greater environmental, ecological, and hydrological effects when compared to the other options considered (Iteration No. 1 to 3). The final proposed turbine layout as presented in Figure 3-6 has had regard to all site constraints (e.g. ecology, ornithology, hydrology, etc.) and design constraints (e.g. setback distances from houses, distances between turbines, etc.). The layout also takes account of the results of all site investigations and baseline assessments that have been carried out during the EIAR process.

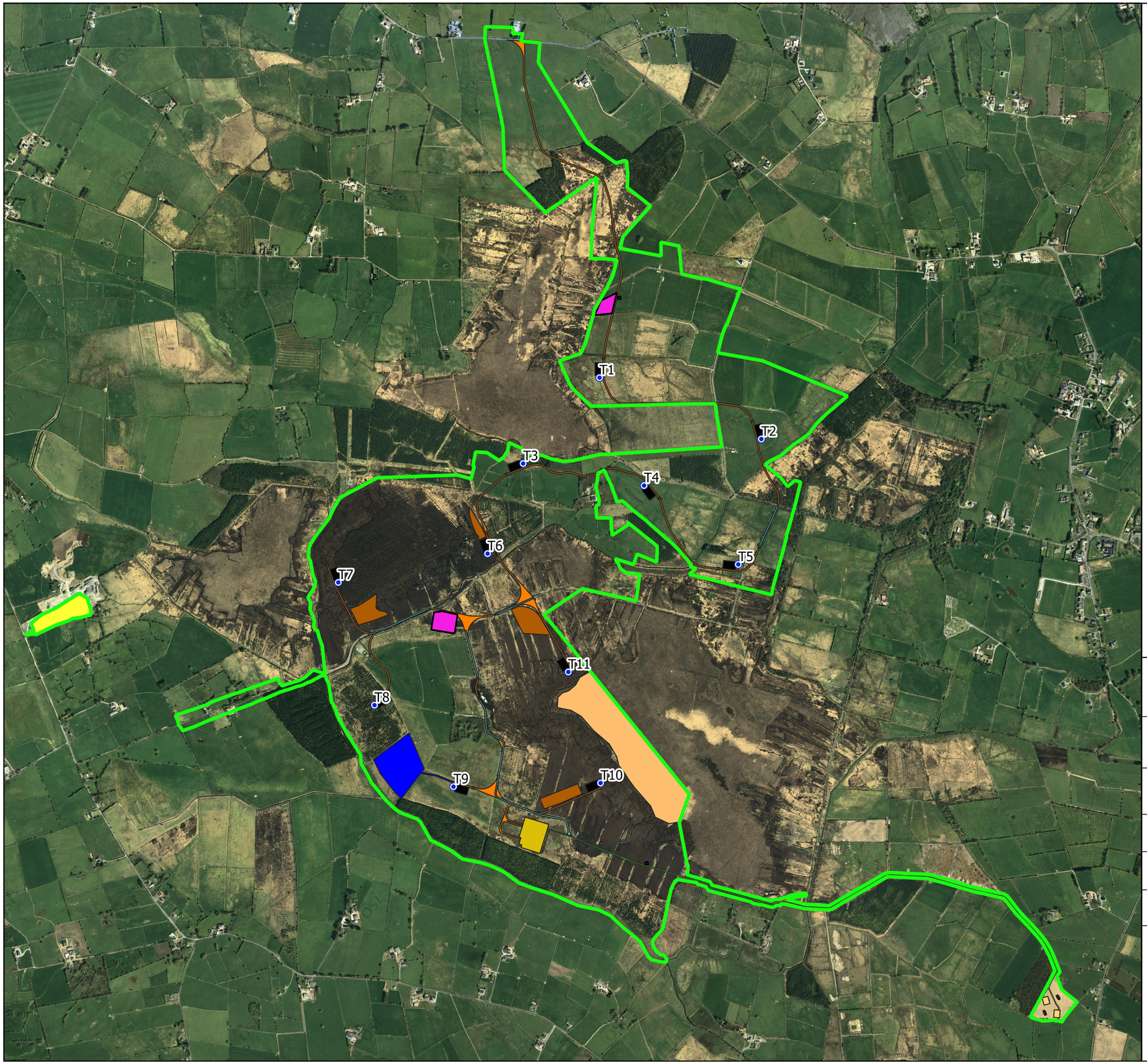
The final chosen turbine layout is considered the optimal layout given it has the least potential for environmental effects.

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	Chosen Option of the Final 11. No Turbine Layout and all associated infrastructure
Population & Human Health (incl. Shadow Flicker)	Likely potential for increased shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines	Potential for reduced shadow flicker impacts on nearby sensitive receptors due to the reduced number 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 Project.
Biodiversity & Ornithology	Larger development footprint would result in greater potential habitat loss. Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated set-back buffers (i.e. identified bat roost).	As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity. As detailed in Chapter 7, the Collision Risk Assessment (CRA) indicated that the impact of the Proposed Project on birds corresponds to a **Very Low** effect significance.
Land, Soils & Geology	Neutral. There is no material environmental effect difference between the options considered.	Smaller footprint would result in smaller volume of soils to be excavated and managed. As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur.

Environmental Consideration	Initial Turbine Layouts and all associated infrastructure	Chosen Option of the Final 11. No Turbine Layout and all associated infrastructure
Water	Increased potential for displacement of flood waters during 100-yr and 1000-yr events due to location of infrastructure in site-specific flood modelled zones.	The proposed layout has been designed to avoid flood modelled zones. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Climate	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Noise & Vibration	A larger number of turbines could have a greater noise impact.	Based on the assessment detailed in Chapter 11 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 phase.
Landscape & Visual	A larger number of turbines could have a greater visual impact.	As detailed in the assessment in Chapter 12, the lack of highly sensitive landscape and visual receptors, and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Cultural Heritage & Archaeology	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Material Assets	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Turbine Foundations
- Proposed Crane Platform Hardstanding
- Proposed Substation
- Proposed New Roads
- Proposed Existing Roads to be Upgraded
- Proposed Construction Compound
- Proposed Borrow Pit
- Proposed Passing Bays
- Proposed Peat Repository Areas
- Proposed Spoil Storage Area
- Proposed Peatland Enhancement Area
- Proposed TDR Accommodation Areas
- Proposed Cable in the Public Road
- Proposed Operational Access Road
- Proposed Cable Route and Cable Access Track
- Proposed Grid Connection Masts
- Proposed Grid Connection Compounds
- Proposed 38kV Line to Cable Interface End Masts

N

Drawing Title

Layout Iteration 4

Project Title

Clonberne WF

Drawn By	Checked By
JF	OC
Project No.	Drawing No.
180740	Fig. 3-6
Scale	Date
1:16,000	2024-06-26

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3.2.6.3 Road Layout

Access tracks are required onsite in order to enable transport of infrastructure and construction materials within the Proposed Project. 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 of the Proposed Project that 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, taking into account 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 within the Proposed Project.

An alternative option to making maximum use of the existing road network within the Proposed Project would be to construct a new road network, having no regard to existing roads or tracks. This approach was not favoured, as it would require unnecessary disturbance to the Proposed Project 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 Infrastructure

The ancillary structures required for the Proposed Project include roads, construction compound, substation, and associated cabling and borrow pit.

3.2.7.1 Construction Compounds

The temporary construction compounds (TCC) will be used for the storage of all construction materials, turbine components, staff facilities and car-parking areas for staff and visitors. While earlier iterations of the layout proposed only one temporary construction compound to the north, a second one was added to the western end of the site. The rationale for the addition that was no refuelling activities or storage of hydrocarbons should be undertaken at the first TCC as it is underlain by the Gurteen Cloonmore Group Water Scheme.

Furthermore, the use of two temporary construction compounds was deemed preferable to the alternative of a single large compound. Principally, it will result in shorter distances for traffic movements within the site during construction. The construction compounds are located strategically within each section of the site to facilitate the construction of the various infrastructure components. As a result, vehicle emissions and the potential for dust arising will be reduced. The two temporary construction compounds can be viewed in Proposed Layout Iteration No. 4 (See Section 3.2.6.2.4).

3.2.7.2 Borrow Pit

A large volume of the material required for the construction of access roads and turbine bases will be obtained from one borrow pit, which is proposed to be located approximately 1km west of Proposed Turbine No. 7. The use of an onsite borrow pit represents the efficient use of existing onsite resources and reduces the volume and the need to transport large volumes of construction materials along the local public road network to the site. The location for the borrow pit was identified taking into the account the site characteristics, including the topography, ground conditions, habitat types and surface water features.

Three alternative locations in addition to chosen location for the borrow pits were considered in the initial phases of layout design. These locations are shown in Figure 3-7. Each potential location had

regard to the constraints of the site and was subject to detailed geotechnical site investigations that are outlined in Appendix 8-1 and 8-2 of this EIAR.

The chosen borrow pit was selected due to the presence of competent or usable at an acceptable level below surface level. Developing borrow pits at other locations would results in a significant increase of volumes of overburden to be excavated to access the usable rock underneath, therefore requiring the management of higher volumes of extracted material on site. The extraction and management of such higher volumes of excavated materials has the potential to lead to adverse environmental effects in relation to peat instability and dust emissions.

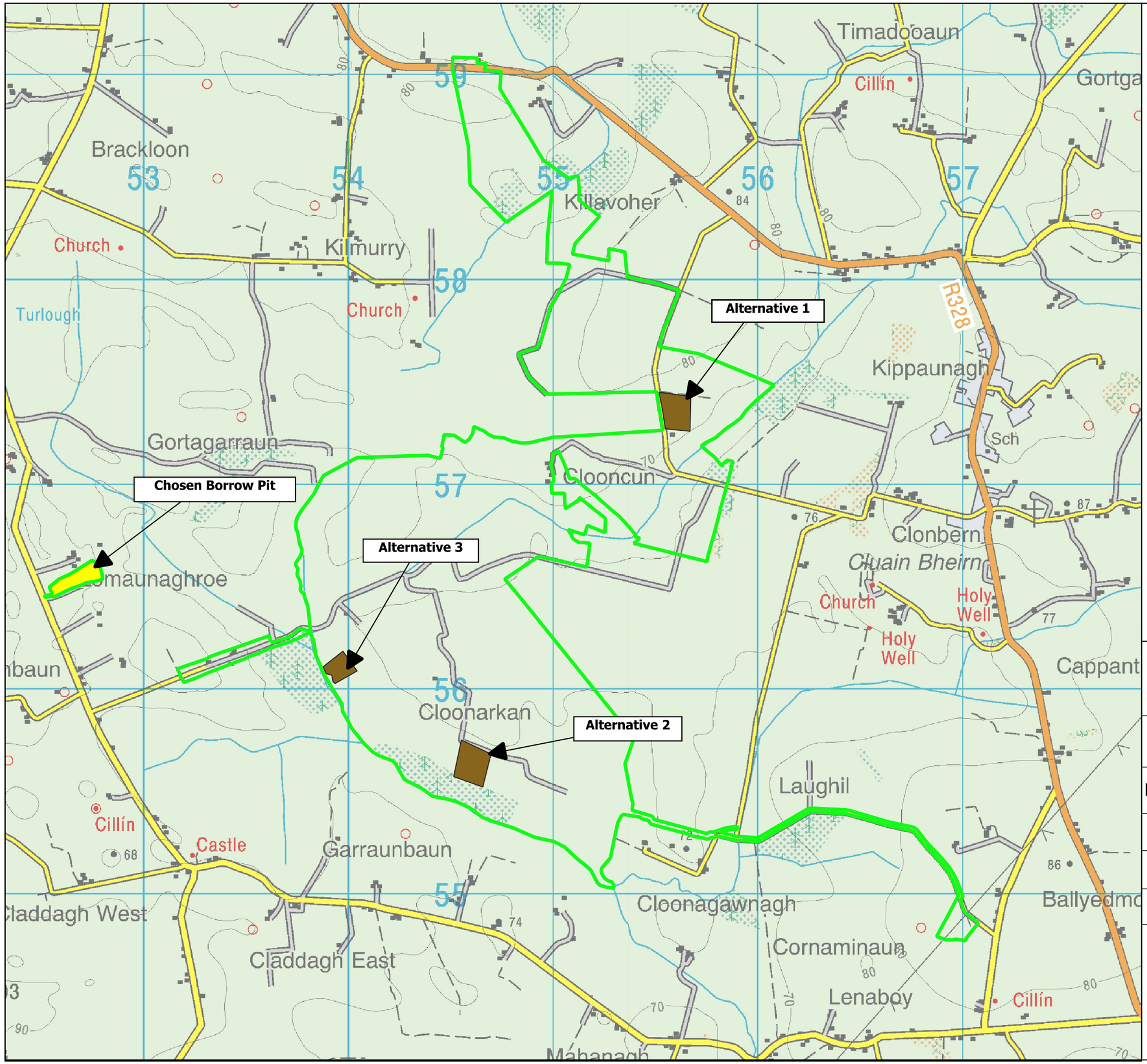
A comparison of the potential environmental effects of the alternative borrow pit locations when compared against the chosen location is presented in Table 3-5.

Table 3-5 Comparison of environmental effects when compared against the chosen option (borrow pits)

Environmental Consideration	Location 1	Location 2	Location 3	Chosen Option
Population & Human Health (incl. Shadow Flicker)	Neutral	Neutral	Neutral	Neutral
Biodiversity & Ornithology	Neutral	Neutral	Neutral	Neutral
Land, Soils & Geology	Increased volume of overburden to be excavated and managed in order to access usable rock.	Increased volume of overburden to be excavated and managed in order to access usable rock.	Increased volume of overburden to be excavated and managed in order to access usable rock.	Increased volume of overburden to be excavated and managed in order to access usable rock.
Water	Neutral	Neutral	Neutral	Neutral
Air	Potential increase in dust emissions due to increased volumes of overburden to be excavation.	Potential increase in dust emissions due to increased volumes of overburden to be excavation.	Potential increase in dust emissions due to increased volumes of overburden to be excavation.	Potential increase in dust emissions due to increased volumes of overburden to be excavation.
Climate	Potential increase in vehicular emissions due to increased volumes of overburden to be excavation.	Potential increase in vehicular emissions due to increased volumes of overburden to be excavation.	Potential increase in vehicular emissions due to increased volumes of overburden to be excavation.	Potential increase in vehicular emissions due to increased volumes of overburden to be excavation.

Environmental Consideration	Location 1	Location 2	Location 3	Chosen Option
Noise & Vibration	Neutral	Neutral	Neutral	Neutral
Landscape & Visual	Potential increase in visual impact owing to the considerable depth required to supply the necessary volumes of stone material	Potential increase in visual impact owing to the considerable depth required to supply the necessary volumes of stone material	Potential increase in visual impact owing to the considerable depth required to supply the necessary volumes of stone material	Potential increase in visual impact owing to the considerable depth required to supply the necessary volumes of stone material
Cultural Heritage & Archaeology	Neutral	Neutral	Neutral	Neutral
Material Assets	Neutral	Neutral	Neutral	Neutral

While a certain volume of more durable, crushed stone for the finished surface layer of the site roads and hardstanding areas will be sourced from fully authorised local quarries, an alternative to using an on-site borrow pit was the option of sourcing of all stone and hardcore materials from a licenced quarry or quarries in the vicinity of the site. The movement of the volume of material required for the construction of the 11 no. turbine wind farm would have resulted in a significant increase in construction traffic and heavy loads, in combination with the potential for an increase in noise and dust emissions along the haul route. This was, therefore, considered a less preferable option.



Map Legend

- Proposed Wind Farm Site Boundary
- Chosen Borrow Pit
- Alternative Borrow Pit Locations

Drawing Title

Proposed Borrow Pits Locations

Project Title

Proposed Clonberne Wind Farm Development

Drawn By	Checked By
EC	JF/OC
Project No.	**Drawing No.**
180740	Fig. 3-7
Scale 1:18,000	**Date** 2024-04-12

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3.2.7.2.1 *Transport of Materials from the Borrow Pit*

Material required for the construction of on-site infrastructure will be obtained from one proposed borrow pit as shown on Figure 3-7. The proposed borrow pit is located in the western section of the site. The location of the proposed borrow pit can be seen on the final site layout iteration in Figure 3-6.

The use of this borrow pit eliminates the need to transport large volumes of construction material along the local public road network to the site. The location for the borrow pit was chosen considering the site characteristics, including topography, ground conditions, accessibility, habitat and surface water features.

3.2.8 Alternative Grid Connection Cabling Route Options

The Proposed Grid Connection has been proposed to connect to the national grid via underground electrical cabling, located primarily within the public road corridor via a loop-in to the Cashla – Flagford 220kV line at Laughil. Underground electrical cables will transmit the power from each wind turbine to the proposed onsite substation.

A key consideration in determining the grid connection method for a proposal wind energy development is whether the cabling is underground or run as an overhead line. While overhead lines are less expensive and more accessible for easier repairs when required, underground lines will have no visual impact. For this reason, it was considered that underground lines would be a preferable alternative to overhead lines. The Wind Energy Guidelines (DoHLG, 2006) (the Guidelines) also indicate that underground cables are the preferred option for connection of a wind energy development to the national grid. The underground electrical cabling will follow the route of existing public roads, thereby minimising the amount of ground disturbance required.

The Megawatt (MW) output of the Proposed Project is such that it needs to connect to a substation or an existing overhead line with voltage of 110kV or higher, within the national grid. There is one existing 110kV electricity substation located within 25km of the Proposed Project, namely,

- Cloon 110kV Electricity Substation, Tuam, Co. Galway

Therefore, an underground grid connection cabling route to both the Cloon 110kV substation (Option 1), the existing Lanesborough – Cloon 110kV overhead line in the townland of Ballinphuill (Option 2), the existing Lanesborough – Cloon 110kV overhead line in the townland of Cloonkeenlenanode (Option 3) and the existing Cashla - Flagford 220kV overhead line in the townland of Laughil (Option 4 – chosen) were considered and assessed in order to determine which route would be brought forward as part of the planning application. This assessment outlines a number of routes from the Proposed Project to both connection points, which were considered during the iterative design process.

The Grid Connection to the existing Cashla - Flagford 220kV overhead line in the townland of Laughil was chosen and the proposed underground electrical cabling route have been revised and refined to take account of the findings of the site investigations and baseline assessments, which have brought the design from its initial Grid Connection option as presented in Figure 3-9 to the current layout as presented in Figure 3-11.

3.2.8.1 Grid Connection Route Options Iteration No. 1

The layout in the Grid Connection Route Options Iteration No. 1 as presented in Figure 3-8 comprise three Grid Connection Route Options,

Option 1: Grid connection to the existing Cloon 110kV Substation
Option 2: Grid connection onto the existing 110kV Cloon - Lanesborough Overhead Line at Cloonkeenleananode along the L6501

Option 3: Grid Connection onto the existing 110kV Cloon – Lanesborough Overhead Line at Cloonkeenleananode via Clonberne village along the R328
Option 4: Grid Connection onto the existing 220kV Cashla – Flagford Overhead Line at Laughil

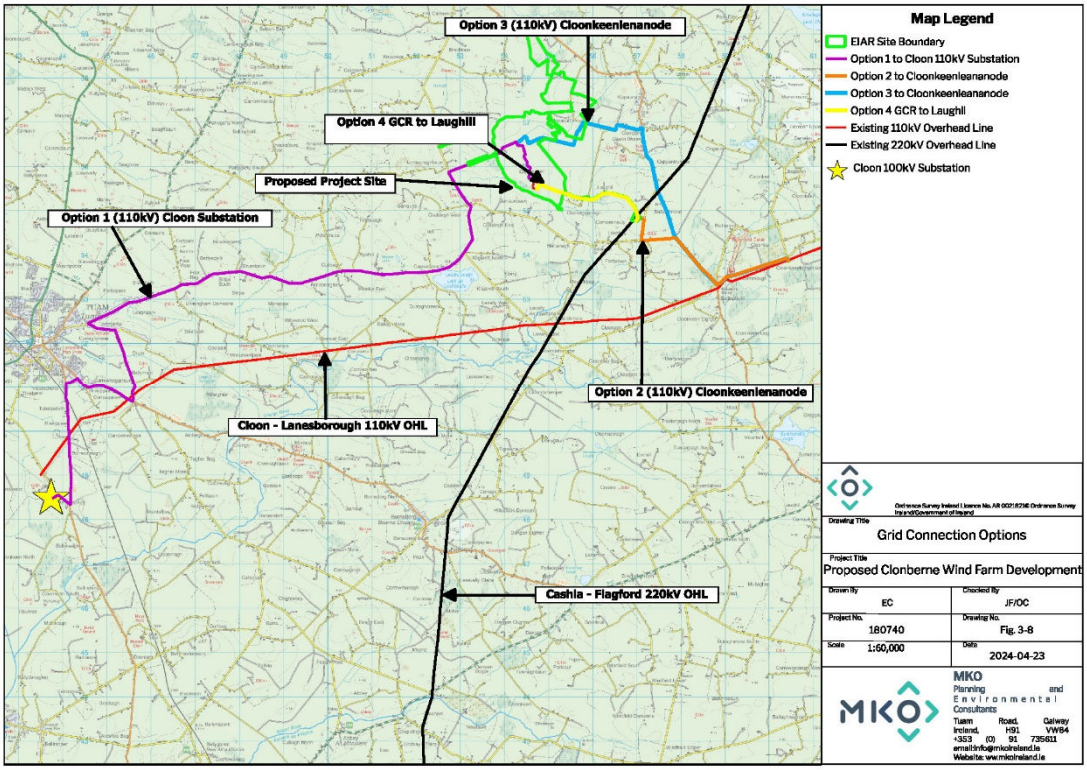

Figure 3-8 Grid Connection Options – Iteration 1

Option 1 accounted for a connection from the proposed on-site substation, running westwards along Local (Primary) Road L-2235 through to Tuam, where it turned southwards on to Regional Road R-347 and finally connected to the Cloon 110kV Substation at Cloonascragh. However, Option 1 was not considered a viable option due to its length of c.20km from the Proposed Project site, which would have been more disruptive to traffic along those roads and generated higher volumes of dust due to roadworks during installation of underground cabling.

Option 2 considered a grid connection to exit the Proposed Project site via L6501 at the south of the Proposed Project site. The grid connection would travel south along the L2224, eats along the L2223 before entering onto the R328. At McGann's Cross, the grid connection turns east onto the L6308 and connects to the existing 110kV Lanesborough-Cloon overhead line in the townland of Cloonkeenleananode. The length of the grid connection is approximately 9.3km. This option was considered viable for further consideration and brought forward in the iterative process.

Option 3 considered a grid connection to exit the Proposed Project site through the Local (Secondary) Road L-6474 to Clonberne and turn southwards, following the R328. At McGann's Cross in the townland of Ballinphuill, the grid connection turns east and travels east along the L6308 and connects to the existing 110kV Lanesborough-Cloon overhead line in the townland of Cloonkeenleananode. The length of the grid connection is approximately 7.8km. This option was considered viable for further consideration and brought forward in the iterative process.

Option 4 considered connecting the on-site substation to the national grid through the existing 220kV Cashla – Flagford overhead line at Laughil along the public road corridor of Local (Secondary) Road L-6501. The length of this proposed grid connection is approximately 2.7km.

In Table 3-6 below, a comparison of environmental effects of Options 1, 2, 3 and 4 are compared against each other. Options 1, 2, 3, and 4 have been shown in Figure 3-9 with the existing ecological and hydrological constraints at the site.

Ecological, Hydrological and Geotechnical Constraints and Facilitators

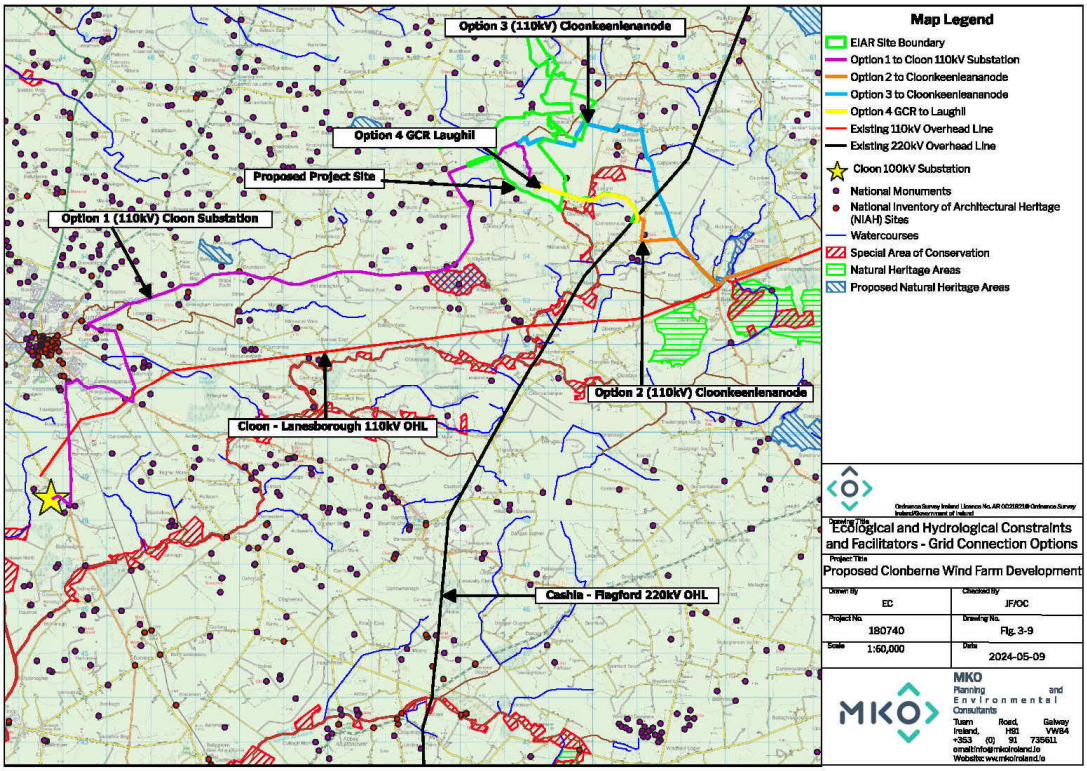

Figure 3-9 Ecological and Hydrological Constraints and Facilitators – Grid Connection Options

The three Grid Connection Route Options (2, 3, and 4) were then presented to the project team for initial feasibility assessments, taking account of all site constraints (e.g. ecological, archaeology, hydrology, peat depths, etc). Some of these constraints have been presented in Figure 3-9 above. As mentioned above, Option 1 was discounted as an option due to the length of the grid route to Cloon 110kV Substation.

The chosen Options 4 for the Grid Connection were considered optimal, given that they had the least potential for environmental effects in comparison to Options 1, 2 and 3, for which distance is considered (Option 1), and the preference to avoid bringing a grid connection cable through the village of Clonberne and the challenges and possible disruptions that would arise in relation to existing services and utilities (Option 3).

The chosen Option 4 was further circulated within the project team for detailed investigations and assessments. These investigations included habitat mapping, ecological surveying, hydrological and geotechnical investigations.

3.2.8.2 Grid Connection Route Options Iteration No. 2

Figure 3-10 Grid Connection Options – Iteration 2

The layout in Grid Connection Route Options Iteration No. 2, as presented in Figure 3-10, comprise the chosen Grid Connection Option 4 (2.8km of cabling connecting the Proposed Project to the existing 220kV Cashla – Flagford Overhead Line at Laughil).

This iteration has considered two cable alignment options identified at Laughil going south-east from the L-6501. The two alternatives for approaching this junction are:

Alternative 1: Installation of the underground cabling off-road
Alternative 2: Installation of the underground cabling on-road

It was determined that the former option would require the excavation and management of higher volumes of overburden and consequently longer periods of traffic flows disruption and dust generation. Therefore, the latter was chosen as the preferred option.

3.2.8.3 Grid Connection Route Iteration No. 3 – Final Grid Connection Layout

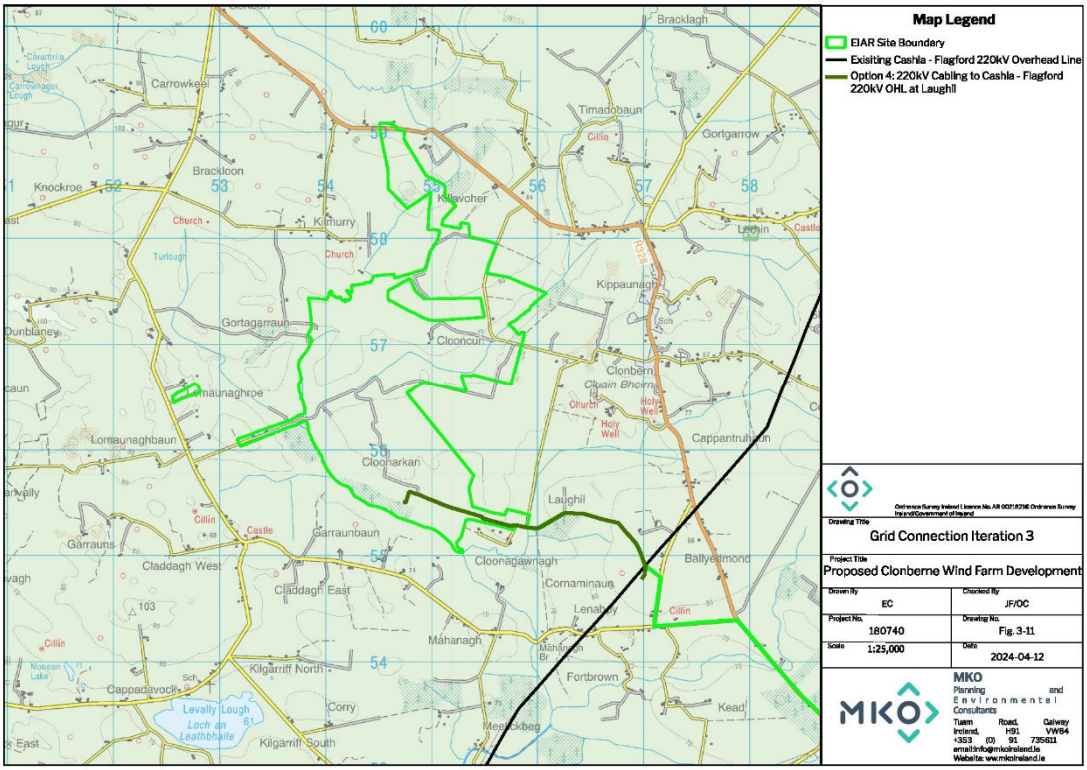

Figure 3-11 Grid Connection Options – Iteration 3

The layout in Grid Connection Route Option Iteration No. 3, as presented in Figure 3-11, comprise of Grid Connection Option 4 (2.8km of cabling connecting the Proposed Project to the existing 220kV Cashla – Flagford Overhead Line at Laughil).

The revisions to the layout were found to have no greater environmental, ecological, hydrological effects when compared to the other options considered (Iterations No. 1 and 2). The final underground cabling options as presented in Figure 3-11 take account of all site constraints (e.g., ecology, archaeology, hydrology, peat depths, etc.) and design constraints (e.g., third-party lands). The final underground cable routes also take account of the findings from the site investigations and baseline assessments that have been carried out during the EIAR process.

A comparison of the potential environmental effects of Options 1, 2 and 3, when compared against the chosen option (Option 4) have been presented in Table 3-6 below.

Table 3-6 Comparison of environmental effects when compared against the chosen option (Option 2)

Environmental Consideration	Option 1	Option 2	Option 3	Option 4
Population & Human Health (incl. Shadow Flicker)	Neutral - Option 1 is in the public road network. There is no material environmental effect difference between the	Neutral - Option 2 is in the public road network. There is no material environmental effect difference between the	Neutral - Option 3 is in the public road network. There is no material environmental effect difference between the	Neutral – Option 4 is in the public road network. There is no material environmental effect difference between the

Environmental Consideration	Option 1	Option 2	Option 3	Option 4
	options considered.	options considered.	options considered.	options considered.
Biodiversity & Ornithology	There is a potential for greater sensitive ecological receptors during the construction phase. While Option 1 does not infringe upon any Protected Areas along its route, it is sited alongside Levally Lough SAC and pNHA.	Low potential for impact on sensitive ecological receptors during the construction phase.	There is a potential for impacting greater sensitive ecological receptors during the construction phase. Option 3 infringes upon Lough Corrib SAC and south-western end of the Richmond Esker Nature Reserve pNHA. As detailed in Chapter 6, the nearest Natura 2000 site is the Lough Corrib SAC, and the development has been designed to avoid or mitigate impacts on biodiversity	There is a potential for impacting sensitive ecological receptors during the construction phase. Option 4 infringes upon Lough Corrib SAC as it exits the site onto the public road. As detailed in Chapter 6, the nearest Natura 2000 site is the Lough Corrib SAC, and the development has been designed to avoid or mitigate impacts on biodiversity
Land, Soils & Geology	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Water	Option 1 has six EPA watercourse crossings. There is a potential for greater hydrological impacts during the construction phase.	Option 2 has four EPA watercourse crossings. There is a potential for greater hydrological impacts during the construction phase.	Option 3 has four EPA watercourse crossings. There is a potential for greater hydrological impacts during the construction phase.	Option 4 has one EPA watercourse crossing. However, as detailed in Chapter 9, no significant effects on surface water or groundwater quality will occur.

Environmental Consideration	Option 1	Option 2	Option 3	Option 4
Air	Option 1 is approximately 20km, therefore holding the potential of higher volumes of dust emissions and vehicles emissions impact associated with it.	Option 2 is approximately 9.3km and significant shorter than Option 1. However, it holds the potential of greater emissions associated with vehicular movement and dust compared to Option 2.	Option 3 is 7.8km in length, making it the most viable option of the three 110kV options. As substantiated by the assessment in Chapter 10, no significant effects on air quality and climate will occur over the proposed lifetime of the Proposed Project.	Option 4 is 2.8km in length and particularly viable due to its close proximity to the existing 220kV National Grid Infrastructure. As substantiated by the assessment in Chapter 10, no significant effects on air quality will occur over the proposed lifetime of the Proposed Project.
Climate	Option 1 is approximately 20km, therefore holding the potential of higher volumes of vehicles emissions impact associated with it.	Option 2 is approximately 9.3km and significant shorter than Option 1. However, it holds the potential of greater emissions associated with vehicular movement compared to Option 3.	Option 3 is 7.8km in length, making it the most viable option of the three 110kV options. It holds the potential of least emissions associated with vehicular movement of the three 110kV options.	Option 4 is 2.8km in length and particularly viable due to its close proximity to the existing 220kV National Grid Infrastructure. As substantiated by the assessment in Chapter 11, there will be long-term significant positive effects on climate will occur over the proposed lifetime of the Proposed Project.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors during the construction phase. Given the maximum potential length of Option 1 is greater than that of Options 2 and 3, there is the	Potential for increased noise impacts on nearby sensitive receptors during the construction phase. Given the maximum potential length of Option 2 is greater than Options 3 and 4, there is the potential for	Based on the assessments detailed in Chapter 11 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from	Based on the assessments detailed in Chapter 11 and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to an increase in noise levels from

Environmental Consideration	Option 1	Option 2	Option 3	Option 4
	potential for greater noise impacts associated with Option 1 when compared to Options 2 and 3.	greater noise impacts associated with Option 3.	the Proposed Project during the construction phase.	the Proposed Project during the construction phase.
Landscape & Visual	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.
Cultural Heritage & Archaeology	Neutral. There is no material environmental effect difference between the options considered.	Neutral. There is no material environmental effect difference between the options considered.	Potential for a greater impact to cultural heritage and archaeological sites due to the presence of a feature of Local Cultural Heritage Merit (CH1) which is located within 100m of the proposed grid connection route. As outlined in Chapter 13, there will be no direct impacts to CH1 due to it being located to the east of the public road and it does not lie directly on the proposed grid connection route.	Potential for a greater impact to cultural heritage and archaeological sites due to the presence of a feature of Local Cultural Heritage Merit (CH1) which is located within 100m of the proposed grid connection route. As outlined in Chapter 13, there will be no direct impacts to CH1 due to it being located to the east of the public road and it does not lie directly on the proposed grid connection route.
Material Assets	Potential for greater traffic volumes during construction phase due to longer route and requirement for more construction material and works required	Compared to Options 3 and 4, Option 2 holds more potential for greater traffic volumes during construction phase due to longer route and requirement for more construction	Potential for less traffic volumes during construction phase of Option 3, given the shorter length of the cable when compared to Options 1 and 2.	Potential for less traffic volumes during construction phase of Option 4, given the shorter length of the cable when compared to Options 1, 2., and 3.

Environmental Consideration	Option 1	Option 2	Option 3	Option 4
	along the public roads.	material and works required along the public roads.	As detailed in Chapter 15, the impact will be slight and short-term.	As detailed in Chapter 15, the impact will be slight and short-term.

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 Project. With regard to the selection of a transport route to the Proposed Project, alternatives were considered in relation to turbine components, general construction-related traffic, and site access locations.

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 Port of Galway, Shannon Foynes Port and Dublin Port. 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. All three ports and indeed others in the state, offer potential for the importing of turbine components. The primary chosen port of entry is Galway Port due to its proximity from the port to the M17 motorway, in which the exit to the national and regional roads towards the Proposed Project is accessible.

3.2.9.2 Delivery to Site

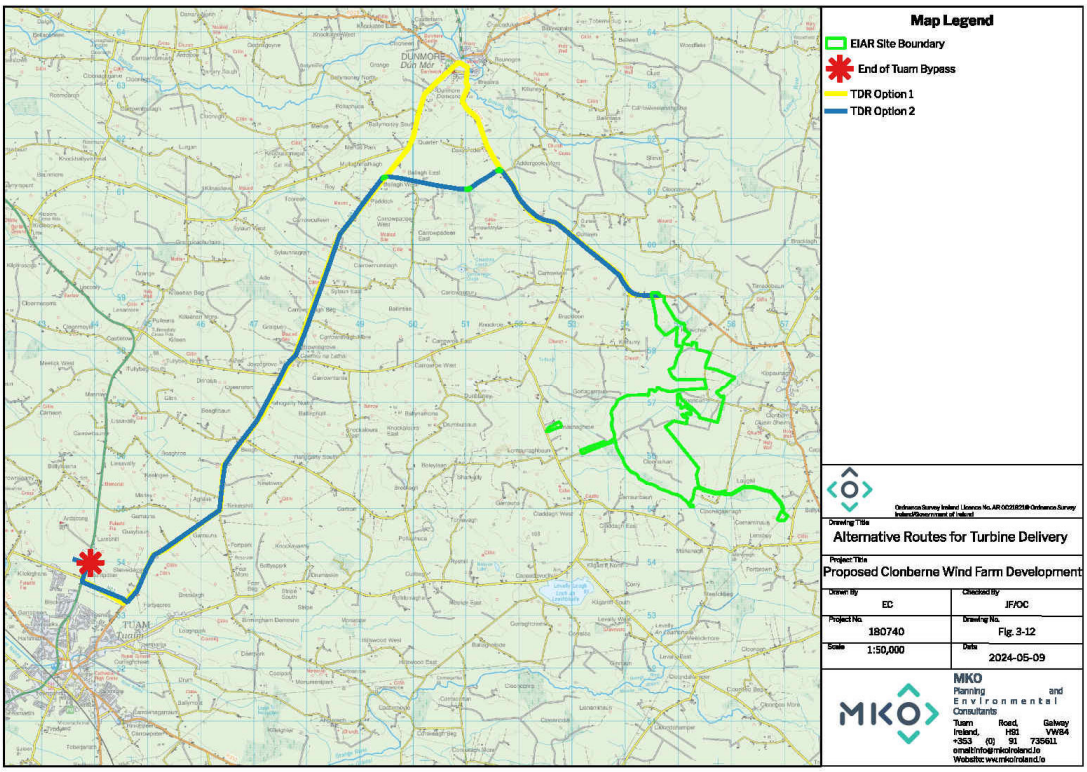

Figure 3-12 Alternative Routes for Turbine Delivery

For turbine components and construction material transport, cognisance was taken of the haul routes that were previously used for other wind farm developments in the wider area in addition to the general preference to minimise the requirement for significant accommodation or widening works along the public road network and associated environmental effects.

From the selected Port of Entry, Galway Port, the turbines will be transported along the M17 Motorway to Tuam and then the N17 Tuam by-pass and then the N83 National Road. The route then continues on to the L6466 in Ballagh West and joins the R328 Regional Road in Lissybroder for approx. 4km towards Proposed Project entrance.

In assessing the most suitable route for turbine transport, two options (as outlined in Figure 3-12) were considered from the end of the N17 Tuam by-pass:

- Option 1: Take the N83 and continue to the R328 via the L6517 in Dunmore
- Option 2: Take the N83 and continue to the R328 via L6466 in Ballagh West.

An assessment of the options was carried out, taking account of criteria such as third-party land requirements, existing road upgrades, new road construction requirements and associated environmental effects. Option 2 was chosen over Option 1 as Option 2 required no blade oversail over third-party dwellings along the proposed turbine delivery route. Option 1 would have required the turbine blade to oversail dwellings in the town of Dunmore as the turbine delivery vehicles turn onto the L6517 from the N83 and when the vehicle turns onto the R328 from the L6517. Option 1 would have also required third party lands in which to successfully manoeuvre these aforementioned turning locations.

Option 2 was chosen over Option 1 due to the shortened delivery route to the Proposed Project site and the lack of blade oversail above buildings compared to Option 1 which travels through Dunmore.

Option 2 has been proven suitable for the transport of turbine components, and the transport analysis (as presented in Chapter 15 of this EIAR), shows that only minor accommodation works will be required to accommodate the proposed turbines. The turbine delivery transport route will utilise the motorway network, national and primary roads available to ensure the road network holds the capacity to manage large loads. When considering turbines transport routes, alternative routes comprising of a more direct route with greater stretches of secondary and local roads were considered less optimal due to the increased possibility of road and roadside disruption and a greater need to carry out works.

The delivery of turbine components including blades, tower sections and nacelles is a specialist operation owing to the oversized loads involved. As detailed in Chapter 15 of this EIAR, turbines components will be delivered to site using a blade lifter where required at various location on the delivery route to raise the rear tip of the blade. When considering turbines transport routes, alternative modes of transport were also considered. Alternatively, depending on the selected turbine delivery route and the turbine manufacturer, a blade adapter or blade transporter may also be used, if deemed appropriate, for delivery of turbines to the Proposed Project.

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 loss of habitat occurs in the Site, this has been mitigated with the proposal of habitat enhancement and improved habitat connectivity with hedgerow replanting on the Proposed Project. Any forestry felled within the footprint of the Proposed Project 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.