3. SITE SELECTION AND REASONABLE ALTERNATIVES

3.1 Introduction

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

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

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

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this EIAR, the various project components are described using the following references: 'Proposed Project', 'the Site', 'the Proposed Wind Farm' and 'the 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 Proposed Wind Farm and Proposed 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' (EPA, 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 (EPA, 2022) state that in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by a higher authority, such as a national plan or regional programme for infrastructure.

Non-environmental Factors

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

Site-specific Issues

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

3.2 Consideration of Reasonable Alternatives

3.2.1 Methodology

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

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

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

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

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

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

- 'Do Nothing' Alternative
- Alternative Site Locations
- Alternative Renewable Energy Technologies
- Alternative Project Design Options
    - Alternative Turbine Numbers and Model;
    - Alternative Turbine Layout and Development Design;
    - Alternative Road Layout
    - Alternative Stone Resource Options
    - Alternative Design of Ancillary Structures
    - Alternative Grid Connection Cabling Route Options;
    - Alternative 110kV Substation Options
    - Alternative Transport Route and Site Access; and
- Alternative Mitigation Measures.

Each of these is addressed in the following sections.

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

3.2.2 'Do Nothing' Alternative

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

An alternative land use option to developing a renewable energy project at the Proposed Project Site would be to leave the Site as it is, with no changes made to the current land use practices of low intensity agriculture on the Proposed Wind Farm; and public road corridor, and discontinuous urban fabric along the Proposed Grid Connection underground cabling route. In doing so, the environmental effects in terms of emissions are likely to be neutral.

However, by implementing the 'Do-Nothing' alternative, 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.

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

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

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
Population & Human Health	No increase in local employment and no long-term financial contributions towards the local community. No potential for shadow flicker and noise to affect sensitive receptors. No potential for effects on visual amenity due to the construction and operation of turbines. No potential for positive effects on air quality and climate change targets. No potential to supply an estimated 40,880 homes with clean renewable electricity	Approximately 100 jobs could be created during the construction, operation, and maintenance phases of the Proposed Project. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects related to shadow flicker and noise from the Proposed Project.
Biodiversity (including Birds)	No habitat loss.	As detailed in Chapter 6, the development has been

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
	No potential for collision risk for birds and bats No potential biodiversity enhancement measures would be put in place.	designed to avoid or mitigate impacts on biodiversity. As detailed in the Bat Report in Appendix 6-2 of this EIAR, there is unlikely to be any significant effect in relation to 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 Development on birds corresponds to a **Low – Very Low** effect significance.
Land, Soils & Geology	Neutral	As detailed in the assessment in Chapter 8, no significant effects on land, land use, peat, soil and bedrock will occur.
Water	Neutral	As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Will not provide the opportunity for an overall increase in air quality .	As detailed in the assessment in Chapter 10, wind farms are not a recognised source of pollution. No significant effects on air quality will occur.
Climate	Will not provide the opportunity for a contribution to the reduction of greenhouse gases. Will not assist in achieving the renewable energy targets set out in the Climate Action Plan	As detailed in the assessment in Chapter 11, over the proposed 30-year lifespan of the Proposed Project, 50,822 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

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
Landscape & Visual	No potential for landscape and visual impacts on nearby sensitive receptors.	As detailed in the assessment in Chapter 13, 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.
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology.	As detailed in the assessment in Chapter 14, 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 and Archaeology.
Material Assets	Neutral	As detailed in Chapter 15, there will be temporary imperceptible to slight negative effect on traffic volumes on the local road network during the construction phase of the Proposed Project. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site
Vulnerability of the Project to Major Accidents and Natural Disaster	No potential to be affected by or to cause major accidents or natural disasters	As demonstrated in Chapter 16, the risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the 'Guide to Risk Assessment in Major Emergency Management' (DoEHLG, 2010). The Proposed Project will be designed and built in accordance with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. With the implementation of all mitigation and monitoring

Environmental Consideration	Do-Nothing Alternative	Chosen Option of developing a renewable energy project
		measures detailed in the EIAR, there will not be significant residual effects associated with the construction, operation and decommissioning of the Proposed Project.

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 Proposed Project is chosen.

As set out in Section 1.3 of this EIAR, the applicant company, Laurclavagh Ltd is associated with Enerco Energy Ltd. which is an Irish-owned Cork-based company with extensive experience in renewable energy and is responsible for projects throughout Ireland. By Q3 2023, Enerco associated companies had over 875 Megawatts (MW) of wind generating capacity in commercial operation or under construction, with a further 500MW of projects at various stages of development in its portfolio. All of which urgently need to be provided to assist Ireland in meeting its renewable energy targets. Enerco Energy Ltd. invests a significant amount of time and resources identifying and investigating sites for renewable energy proposals throughout the Country.

Site selection 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 – 2022

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 'Open to Consideration' for potential for wind development.

It is the aim of this Environmental Impact Assessment Report to demonstrate that the site selected for the Proposed Project is suitable for wind energy development.

Galway County Development Plan 2022 – 2028

The Galway County Development Plan 2022-2028 (GCDP) was subject to a Draft Ministerial Direction. Consequently, all zonings, policy objectives and additional provisions which were the subject of the Direction will be amended accordingly. The GCDP was adopted on the 9th of May and became effective on the 20th of June 2022. 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 CO2 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 3-2 the entire Proposed Project Site is located within an area that is classified as 'Generally to be Discouraged'. These areas:

'may or may not be appropriate, depending on the character of the landscape and the potential impact of the proposed development. Any impact on the environment must be low and subject to proper planning and sustainable development, and the guidelines set out in this policy document'.

The purpose of the following assessments is to outline how the Proposed Project is deemed to be '*appropriate'* in the context of the above statement, and the design of various infrastructural elements have taken into account the site-specific constraints and utilised natural features to the advantage of the project.

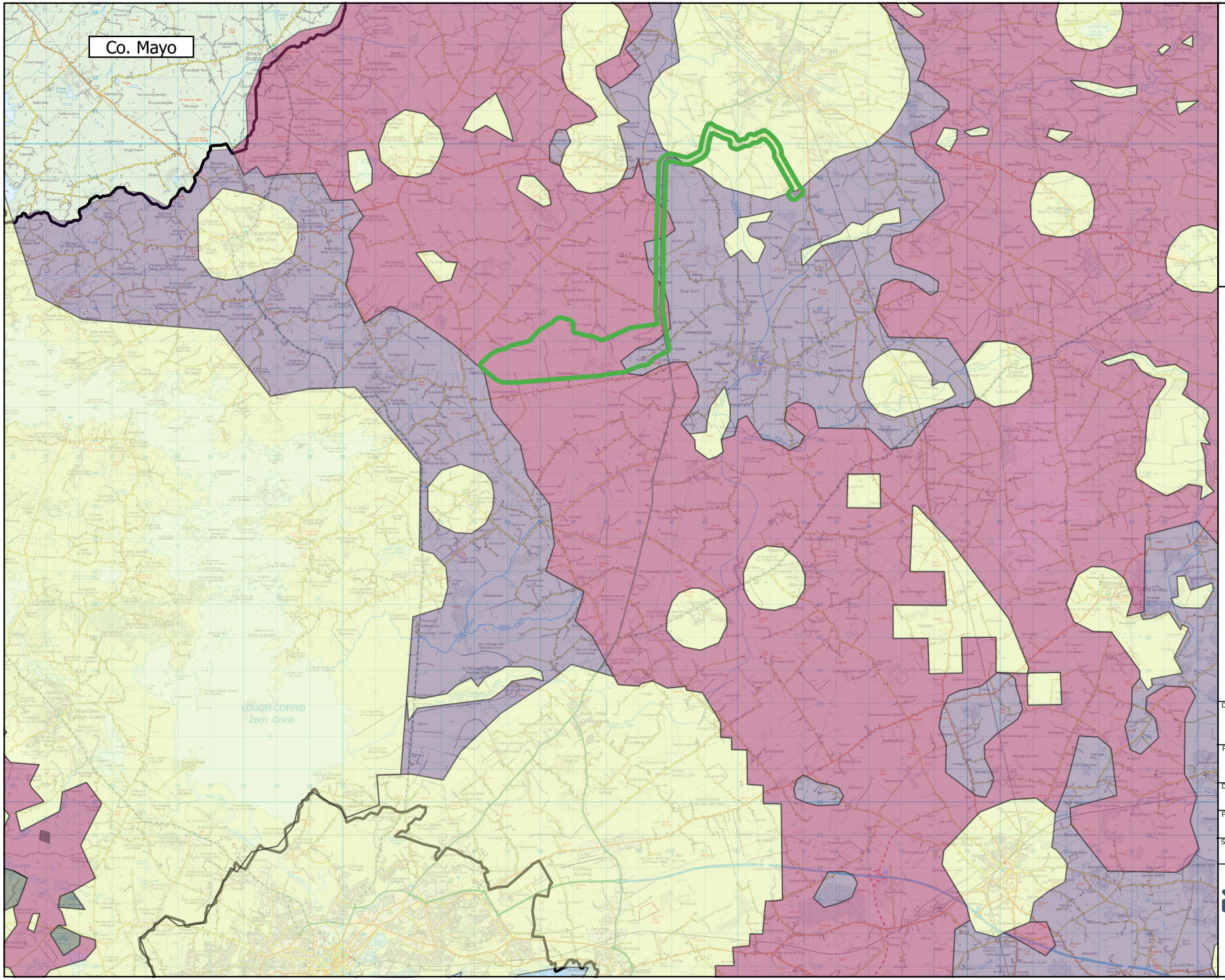
Comparison between GCC Plans

As detailed above, the Proposed Project is located within an area which had previously been designated as 'Open to Consideration', within the Galway County Development Plan 2015 – 2021. However, as per the current Galway County Development Plan (2022 – 2028), has been altered to 'Generally to be Discouraged'. It is the purpose of this EIAR to demonstrate that the site upon which the Proposed Project is sited is suitable for wind energy development, based on a detailed assessment of the Site over the broader consideration of the Site in CDP process.

As per objective RE1 of the current Galway County Development Plan, it is a key aim 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'.* Through the impact assessments included within this EIAR (Chapters 5 – 17) it has been demonstrated that the Proposed Project represents an 'appropriate level' of renewable energy development. As detailed in Section 3.2.5.2.1 of this Chapter, it can be seen that the Proposed Project achieves setback distances from all known constraints.

As per objective RE3, it is the aim of the current Plan to '*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'.* As is displayed in this EIAR, the site of the Proposed Project has been shown to be appropriate for wind energy development.

The Planning Report, which accompanies this planning application conducted a 'sieve mapping' exercise which takes into account all constraints available from the opportunity and sensitivity factors set out in the Local Authority's Renewable Energy Strategy (LARES) in order to determine lands suitable (in principle) for wind energy development. The Proposed Wind Farm site scores well when examined across the opportunity and sensitivity factors as set out in the LARES. From a review of the sieve mapping exercise, it appears that the area in which the Proposed Wind Farm is located has been designated as 'Generally to be Discouraged' due to population density. This has been strongly considered and comprehensively assessed within the Planning Report.



Map Legend

- EIAR Site Boundary

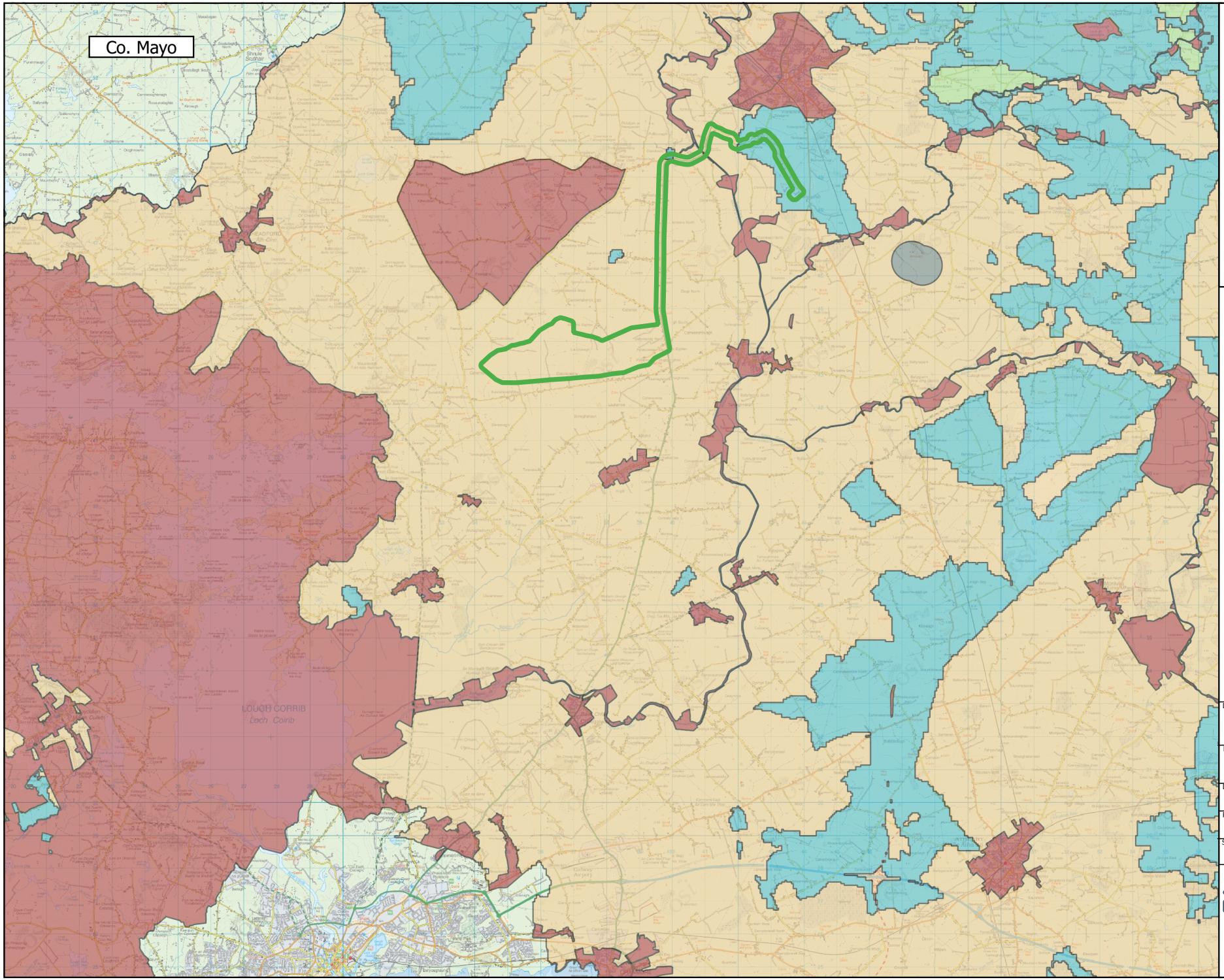
County Galway Wind Energy Designation 2015-2021

- Acceptable in Principle
- Low Wind
- Open to Consideration
- Strategic Areas
- Not Normally Permissible

N

Drawing Title	County Galway Wind Energy Designation 2015-2021
Project Title	Laurclavagh Renewable Energy Development
Drawn By	KB
Checked By	ÓM
Project No.	210627
Drawing No.	Figure 3-1
Scale	1:150,000
Date	2024-02-02

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie



Map Legend

- EIAR Site Boundary

County Galway Wind Energy Designations 2022-2028

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

N

Drawing Title: County Galway Wind Energy Designations 2022-2028

Project Title: Laurclavagh Renewable Energy Development

Drawn By	Checked By
KB	ÓM
Project No.	Drawing No.
210627	Figure 3-2
Scale	Date
1:150,000	2024-02-13

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3.2.3.1.2 Environmental Sensitivities

The Proposed Project site is not located within any area designated for ecological protection.

The nearest Natura 2000 site to the Proposed Project Site, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA) is Lough Corrib SAC, the boundary of which is located approximately 2.1km to the east of the EIAR Site Boundary at its closest point. Lough Corrib SAC has many qualifying interests relating to both freshwater and terrestrial habitats and species. The Proposed Grid Connection underground cabling route passes over this SAC at the watercourse crossing over the Clare River on the N83.

The nearest nationally designated site to the Proposed Project Site i.e. Natural Heritage Area (NHA) or proposed Natural Heritage Area (pNHA) is Belclare Turlough pNHA, which is located approximately 1.3km west of the Proposed Project Site.

3.2.3.1.3 Grid Connection

The Proposed Project intends to connect to the National Grid via an underground electrical cabling route through the Local, Regional and National Roads connecting the Proposed Wind Farm to the Cloon 110kV substation, in the townland of Cloonascragh, near Tuam, Co. Galway. Details regarding potential alternative grid connection cabling route options are considered and presented in Section 3.2.8.

3.2.3.1.4 Sensitive Receptors

The applicant sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity, the study area has emerged as suitable to accommodate the Proposed Project. The recommended setback distance (min. 500m recommended by the Guidelines & 4 x turbine tip height recommended in the draft Guidelines) to sensitive receptors is being achieved by the proposed turbines. The population density of the Population Study Area as described in the Population and Human Health section of this EIAR is 46.6 persons per square kilometre, as described in Chapter 5 of this EIAR. This is slightly higher than the average national population density of 70.05 persons per square kilometre.

3.2.3.1.5 Site Scale

The Proposed Project Site, covering a total of 944 hectares, comprises mix of agri-pastural land, one-off housing and public road corridor and has an elevation range of 50m AOD to 38m AOD. The adjacent land use predominantly comprises the same. The Site benefits from existing farm roads (approx. 1.5km). The Site will be easily accessible via a proposed temporary road off the N83 National Road to the east of the Site. As discussed above, the Site comprises habitats of low ecological value, with some smaller areas of valuable Annex 1 habitats. All Site infrastructure is accommodated within habitats of low ecological values, maintaining setback distances from sensitive ecological receptors.

As such, with its proximity to grid, accessibility, relatively flat topography, low ecological value habitats and achievable setbacks from sensitive receptors, the Proposed Project Site affords a largescale area that is sufficiently unconstrained to accommodate an 8-turbine wind farm development.

3.2.3.1.6 Summary

From the review of the criteria set out above the Proposed Wind Farm was identified as a suitable location for the provision of a renewable energy development of the scale proposed. The Proposed Wind Farm is located close to the N83 National Road, on agricultural land which allows the Site to take advantage of the existing access roads (which will be upgraded) and highlights the suitability of the Proposed Wind Farm as it can make sustainable use of these established items of infrastructure.

The Proposed Wind Farm site is designated as 'Generally to be Discouraged' under the Galway County Development Plan Wind Energy Strategy, and as such, '*may or may not be appropriate, depending on the character of the landscape and the potential impact of the proposed development. Any impact on the environment must be low and subject to proper planning and sustainable development, and the guidelines set out in this policy document'*.

It can be demonstrated by the above information, and the assessment undertaken within the chapters in this EIAR, that the Site of the Proposed Project is suitable for wind energy and in accordance with current County Policy. It is noted that the Site was designated as 'Open to Consideration' in the Galway CDP 2015 – 2021.

Once the current Proposed Wind Farm emerged as a suitable location for the provision of the Proposed Project, the applicants approached the relevant landowners in order to assemble the land necessary for the Proposed Wind Farm. Arising from the site assembly discussions, the current Proposed Wind Farm was identified and brought forward as being capable of accommodating a cohesive viable area of sufficient size to cater for the Proposed Project. While the outcome of the site selection process has identified the Proposed Wind Farm as a suitable location for a renewable energy development of the nature proposed, it does not preclude other sites within the vicinity being brought forward for consideration in the future.

From the review of the criteria set out above, the Proposed Grid Connection was identified as a suitable location for the provision of a connection of the Proposed Wind Farm to the National Grid. The underground electrical cabling route is located primarily in the public road corridor and overlaps with the River Corrib SAC when crossing the River Clare. However, there are no instream works proposed as part of the Proposed Grid Connection underground cabling route construction, so no significant impacts have been identified.

3.2.4 Alternative Renewable Energy Technologies

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

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% 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 Wind Farm.

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.

Enerco Energy 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 2023 which include focusing on onshore wind energy developments to reach the 2025/2030 renewable energy targets. As such, Enerco'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 is an associated company of Enerco Ltd, an Irish owned developer with extensive experience in the design, construction and operation of onshore wind energy developments throughout Ireland, with projects currently operating or in construction in Counties Cork, Kerry, Limerick, Clare,

Galway, Mayo and Donegal. By Q3 2023, Enerco and its associated companies had over 875 Megawatts (MW) of onshore wind generating capacity under construction or in commercial operation, with a further 500MW of projects at various stages in its portfolio to assist in meeting Ireland's onshore renewable energy targets. 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 same time and the Proposed Wind Farm was progressed. To achieve the same electricity output from solar energy as is expected from the Proposed Wind Farm (c. 50MW), 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 944ha and the permanent footprint of the Proposed Project measures approximately 13.8ha.

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 Wind Farm is presented in Table 3-2 below.

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

Environmental	Solar PV Array (with up to 56 MW Output)	Chosen Option
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 (including Birds)	Larger development footprint would result in greater potential habitat loss. No potential for collision risk for birds.	As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. The Proposed Project includes for a biodiversity net gain

	Potential for glint and glare impacts on birds.	proposal providing a local boost to biodiversity Please see Appendix 6-4 for details. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.
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, there is no loss of topsoil or subsoil as a result of the Proposed Project. Topsoil and subsoil will be relocated within the Proposed Project Site. 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.	Project design specific drainage design removes the potential for significant environmental effects. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Increased potential for dust and other noxious emissions due to larger volume of transport movements to and from site and larger volume of plant and ground works on site due to the larger footprint. Reduced capacity factor of solar PV array technology would result in less carbon offset	Reduced potential for dust and other noxious emissions due to smaller volume of plant and ground works on site due to a smaller footprint.
Climate	Reduced capacity factor of solar PV array technology would result in less carbon offset	As detailed in the assessment in Chapter 11 Climate, over the proposed 30-year lifetime of the Proposed Wind Farm, 50,822 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 56MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2023.

Noise & Vibration	Potential for short term noise impacts on nearby sensitive receptors during the construction phase. Larger traffic movements and increased plant on site due to the larger footprint/ground disturbance could lead to larger noise and vibration output 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	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	As detailed in Chapter 13, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the construction, operation and decommissioning phases. Archaeological monitoring under licence of the smaller footprint will be implemented during the construction phase.
Landscape & Visual	Panelling potentially less visible from surrounding area due to the screening by vegetation and topography	As detailed in the assessment in Chapter 14, the landscape value of the Proposed Wind Farm is deemed to be of 'Low' value and sensitivity and the strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Material Assets	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output. Greater potential for impacts on waste management due to increased plant on site giving rise to increase in hazardous waste materials. No material difference for impacts on gas, water, aviation. No potential for impacts on telecommunications.	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. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site. No material difference for impacts on gas, water, aviation. Buffers implemented on telecommunication links. There will be a positive effect on electricity supply with the

		provision of an estimated 56MW to the national grid and powering of 40,880 Irish households with renewable electricity per year.

For the reasons set out above, the proposal for a wind energy development at the Proposed Wind Farm was considered to be the most efficient method of electricity production with the lesser potential for significant environmental effects.

3.2.5 Alternative Project Design Options

3.2.5.1 Alternative Turbine Numbers and Model

The proposed wind turbines will have a potential power output in the 4.5 - 7 megawatt (MW) range. It is proposed to install 8 turbines at the Proposed Wind Farm which could achieve an output of 56 MW. Such a wind farm could also be achieved on the Proposed Wind Farm by using smaller turbines (for example 2.5 MW machines). However, this would necessitate the installation of over 22 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the wind resource available having regard to the nature of the Proposed Wind Farm. A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the Proposed Wind Farm, 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 Wind Farm. The 8-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 a 9-turbine layout which is discussed in further detail in Section 3.2.6 below.

The turbine model to be installed on the Proposed Wind Farm will have an overall ground to blade tip height of 185m; a rotor diameter 163m; and a hub height of 103.5 metres. The use of alternative smaller turbines at the Proposed Wind Farm would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the Proposed Wind Farm and would potentially require a larger development footprint. This alternative would potentially lead to additional environmental effects.

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

Table 3-3 Comparison of environmental effects when compared to the chosen option (8 wind turbines, higher MW output)

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
Population & Human Health	Greater potential for shadow flicker and noise impacts on nearby sensitive receptors due to the increased number of turbines. However, these can be curtailed to meet threshold criteria. Smaller turbines would be less visually obstructive in the skyline; however, the larger development footprint would spread further across the landscape potentially occupying a larger portion of a viewpoint.	Decreased potential for shadow flicker due to greater setbacks from houses, greater separation between turbines thus reducing aggregated shadow flicker time. There is no potential for significant noise and vibration effects from the proposed turbines. Furthermore, noise emissions can be curtailed to meet threshold criteria. Fewer turbines may occupy a smaller portion of a viewpoint. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on population and human health from shadow flicker, noise and vibration and visual amenity during the construction, operation and decommissioning phases. of the Proposed Project
Biodiversity & Birds	Larger development footprint would result in greater potential for habitat loss	As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. As per Chapter 6 of this EIAR, there are no significant long-term negative effects expected on biodiversity receptors. The Proposed Project includes for a biodiversity net gain proposal providing a local boost to biodiversity and water quality. Please see Appendix 6-4 for details. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
Land, Soils, & Geology	Larger development footprint would result in greater volume of spoil to be generated, excavated and sorted. Neutral-Geotechnical investigations followed by careful design would lead to no significant environmental impacts	Smaller footprint would result in smaller volume of soils to be excavated and managed. As detailed in Chapter 4 and 8, the Proposed Wind Farm has been designed to utilise the existing roads to minimise ground disturbance where possible. The Spoil Management Proposal discussed in Chapter 4 sets out the optimal treatment for spoil generated on site without creating significant impacts for biodiversity, hydrology, land use etc. Neutral-Geotechnical investigations followed by careful design would lead to no significant environmental impacts. As detailed in the assessment in Chapter 8, no significant effects on soils and subsoils will occur.
Water	Project design specific drainage design removes the potential for significant environmental effects. Larger development footprint, therefore, increasing the potential for silt-laden runoff to enter receiving waterbodies.	Project design specific drainage design removes the potential for significant environmental effects. Smaller footprint would result less potential for silt laden run-off to enter a waterbody. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	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.	Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the site. As detailed in Chapter 10, there will be no significant effects on air quality during the construction, and decommissioning phases.

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
		There will be a Long-term Moderate Positive Impact on air quality by during the operational phase.
Climate	There would be an increased potential for vehicle emissions and dust emissions due to an increased volume of construction material and turbine component deliveries to the Site.	Decreased potential for vehicle emissions and dust emissions due to a decreased volume of construction material and turbine component deliveries to the Site. As detailed in the assessment in Chapter 11 Climate, over the proposed 30-year lifetime of the Proposed Wind Farm, 50,822 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 56MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2024.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors due to reduced separation distance between sensitive receptors and turbine locations and additional turbine generators.	Potential for decreased noise levels at nearby sensitive receptors due to increased separation distance between sensitive receptors and turbine locations. Based on the assessment detailed in Chapter 12, there will be no significant effects on sensitive receptors during the construction operational and decommissioning phases from the Proposed Project.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Smaller development footprint would decrease the potential for impacts on unrecorded, subsurface archaeology. As detailed in the assessment in Chapter 13, there will be no significant direct or indirect effects on known or unknown archaeology and cultural heritage during the

Environmental Considerations	Larger number of smaller turbines	Chosen option of an 8-turbine layout
		construction, operation and decommissioning phases. Archaeological monitoring under licence of the smaller footprint will be implemented during the construction phase.
Landscape & Visual	Smaller turbines may be less visually intrusive on the landscape. Equally, a larger number of smaller turbines would be spread over a wider area, taking up a greater portion of a viewpoint	As detailed in the assessment in Chapter 14, there will be no significant landscape and visual effects during the construction, operation and decommissioning phases. The proposed turbines are suitable sited and scaled within the landscape.
Material Assets – Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.	Potential for smaller traffic volumes during the construction phase due to a smaller development footprint and requirement for fewer construction materials and turbine components. 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. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the roads authority prior to construction works commencing on site.
Material Assets- Utilities, Waste Management, Telecommunications and Aviation	No material difference between the two options for gas, water, Waste Management, Telecommunications and Aviation.	
Vulnerability to Major Accidents Natural Disasters	No material difference between the two options difference between the two options	No material difference between the two options difference between the two options

3.2.5.2 Alternative Turbine Layout and Development Design

The design of the Proposed Wind Farm 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 this EIAR, the layout of the Proposed Wind Farm 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 Chapter 2 of the EIAR.

3.2.5.2.1 *Constraints and Facilitators Mapping*

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

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 sensitive reeptors (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, the Guidelines. The Climate Action Plan 2023 states that the new draft Guidelines will be published in 2023 with the final guidelines adopted by 2024.

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. Should the draft Guidelines be adopted in advance of a planning decision being made on Laurclavagh Renewable Energy Development, the Proposed Project will be capable of achieving the requirements of the draft Guidelines as currently proposed.

The constraints map for the Proposed Wind Farm, 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:

- Sensitive Receptors; a minimum 740-metre setback from third party sensitive receptors and a minimum 500m setback form sensitive receptors involved in the Proposed Project (achieving the Guidelines recommended setback of 500m and 4 x tip height separation distance from third party sensitive receptors in line with the draft Guidelines).
- Natura 2000 sites plus 200-metre buffer;
- Telecommunication Links plus operator specific buffer; and
- Archaeological Sites or Monuments, 30-metre buffer, plus 'Zone of Notification' as required by the National Monuments Service (ROI)
- Sensitive ecological receptors plus 30m buffer (50m buffer in breeding season).

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

- Available lands for development;
- Good wind resource;
- Proximity to national grid node;
- Existing access points and general accessibility of all areas of the Site due to existing road infrastructure; and
- Limited extent of constraints.

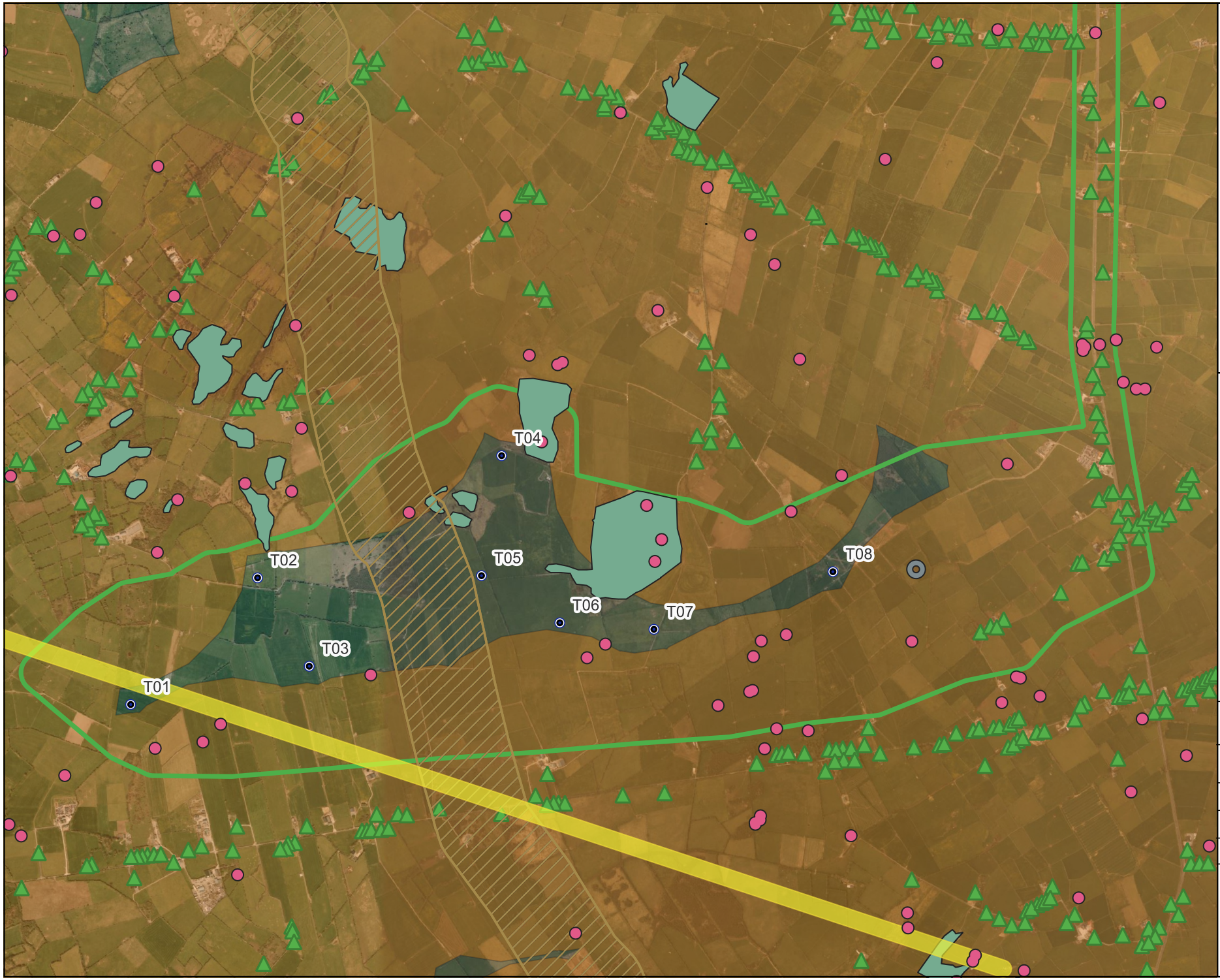
The inclusion of the constraints on a map of the study area allows for a viable area to be identified. An initial turbine layout is then developed to take account of all the constraints mentioned above and their

associated buffer zones and the separation distance required between the turbines. Following the mapping of all known constraints, detailed site investigations were carried out by the project team.

The ecological assessment of the Proposed Wind Farm 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 wind farm included collecting data from local private and public wells to monitor groundwater levels over time. As detailed in Chapter 9, this data, which was collected over approximately 2 years, was used to design the turbine foundations and other infrastructure on the Proposed Wind Farm. Geophysical surveys were also carried out on the Proposed Wind Farm. These geophysical surveys were used to identify suitable areas for turbines to be sited in relation to the underlying limestone bedrock.

The turbine layout for the Proposed Wind Farm has also been informed by the results of noise, landscape and visual and the separation distance to be maintained between turbines. Thus, the baseline environmental assessment of the Site and wind farm design 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.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Dwellings
- 740m Dwellings Buffer
- National Monuments Plus 30m Buffer
- Potential Enclosure
- 30m Enclosure Buffer
- Annex I Habitats
- Gas Networks Ireland Pipeline and 225m Buffer
- Vodafone Telecoms Link and Buffer

N

Drawing Title
Constraints and Facilitators

Project Title
Laurclavagh Renewable Energy Development

Drawn By	Checked By
KB	OM
Project No.	Drawing No.
210627	Figure 3-3
Scale	Date
1:25,000	2024-02-27

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3.2.5.2.2 *Alternative Wind Farm Site Layout Iterations*

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

The development of the final Proposed Wind Farm site 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 Wind Farm site layout. The initial constraints study identified a significant viable area within the overall study area of the Proposed Project site. The initial turbine layout comprised 9 no. turbines, however the proposed 8-turbine layout was refined following feedback from the environmental project team, landowners, and the need to respect on-site constraints. The Proposed Wind Farm site layout went through several iterations, Figure 3-3 to Figure 3-6 below gives an indication of how the design of the turbine layout evolved during the design process.

Proposed Layout Iteration No. 1

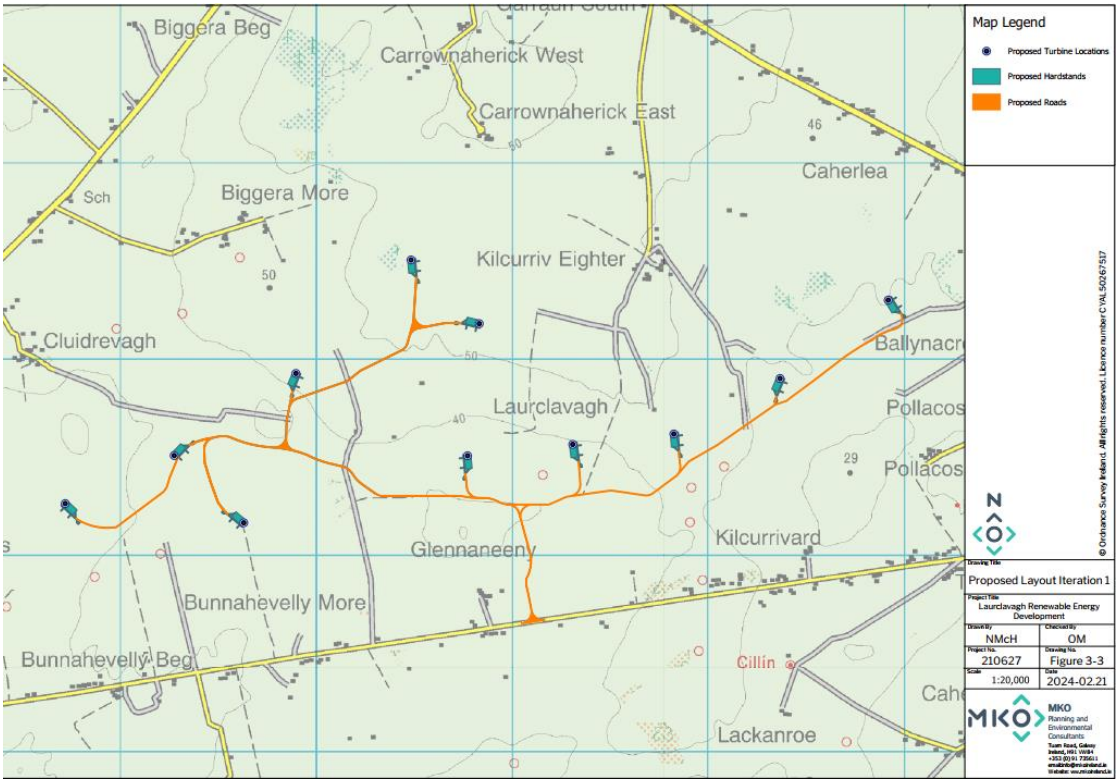


Figure 3-4 Proposed Layout Iteration - Option 1

Iteration No.1 as shown above in Figure 3-4 shows the original proposed layout for the Proposed Wind Farm. As can be seen in the figure above, this layout comprised of 11 no. turbines and was determined on the basis of a desk study. The proposed entrance to the Proposed Wind Farm came from the south of T7 and T8, originating off the L2122. Other access routes off the L2122 were also explored, but this option was deemed the most viable.

Upon review of desk-based constraints in relation to the layout, the following amendments were made to the 11-turbine layout:

- T01 – Moved slightly to accommodate a telecommunications buffer;
- T02 – Moved due to wind take;
- T03 – Moved due to wind take;
- T04 – Dropped due to constraints (habitat, housing and underground gas pipeline buffer);
- T05 – moved due to wind take;
- T06 – Moved due to wind take;
- T07 – moved due to wind take;
- T08 – Moved due to wind take;
- T09 – Dropped due to proximity to substation and landowner constraints;
- T10 – moved due to wind take;
- T11 – Dropped due to landowner constraints.

Proposed Layout Iteration No. 2

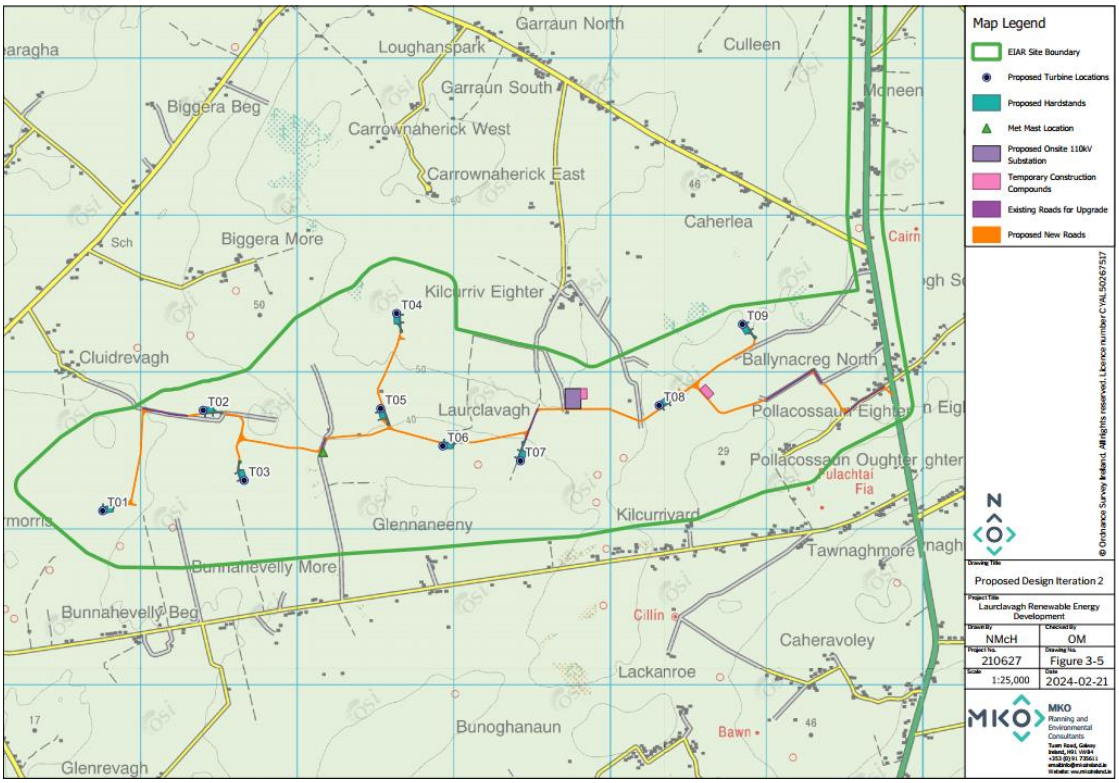


Figure 3-5 Proposed Layout Iteration No. 2

Iteration No. 2 which is presented in Figure 3-5 above, is the initial turbine layout which was based on a preliminary constraints mapping exercise and identification of a viable area for siting of turbines. Constraints that were considered include relevant setback from dwellings (740m in the case of the Proposed Project), setback from any telecommunication links, setback from National Monuments plus 30m buffer, and avoidance of ecologically sensitive and designated habitats. A larger viable area for the 9 no. turbine layout was identified within the overall study area during the constraints mapping process. It was determined that it would be more environmentally sensitive and efficient to allow for fewer turbines and a larger turbine model within this area.

Initially, the Applicant considered upgrading and utilising the L61461 Local Road for concrete deliveries and HGV access during construction. On review, this option was deemed inappropriate from a traffic management perspective. Therefore, a temporary road was proposed of the N83 in order access the Proposed Wind Farm site. The site entrance was designed in such a way as to avoid construction traffic queueing along the N83 National Road. A section of temporary road was proposed approximately 70m south of the existing junction with the L61461. This section of temporary road would act as the entrance point for all construction phase traffic, with all traffic then existing the Proposed Wind Farm site via the existing L61461 Local Road.

Detailed geophysical surveys were carried out on the turbine locations for this area in order to determine if the turbines were sited on appropriate competent stratum. The results of this geophysical assessment were analysed in relation to the above layout and are detailed further in Section 9: Water and its appendices. It was determined that some locations for the proposed infrastructure would benefit from some micro siting and so further iteration was necessary.

Proposed Layout Iteration No. 3

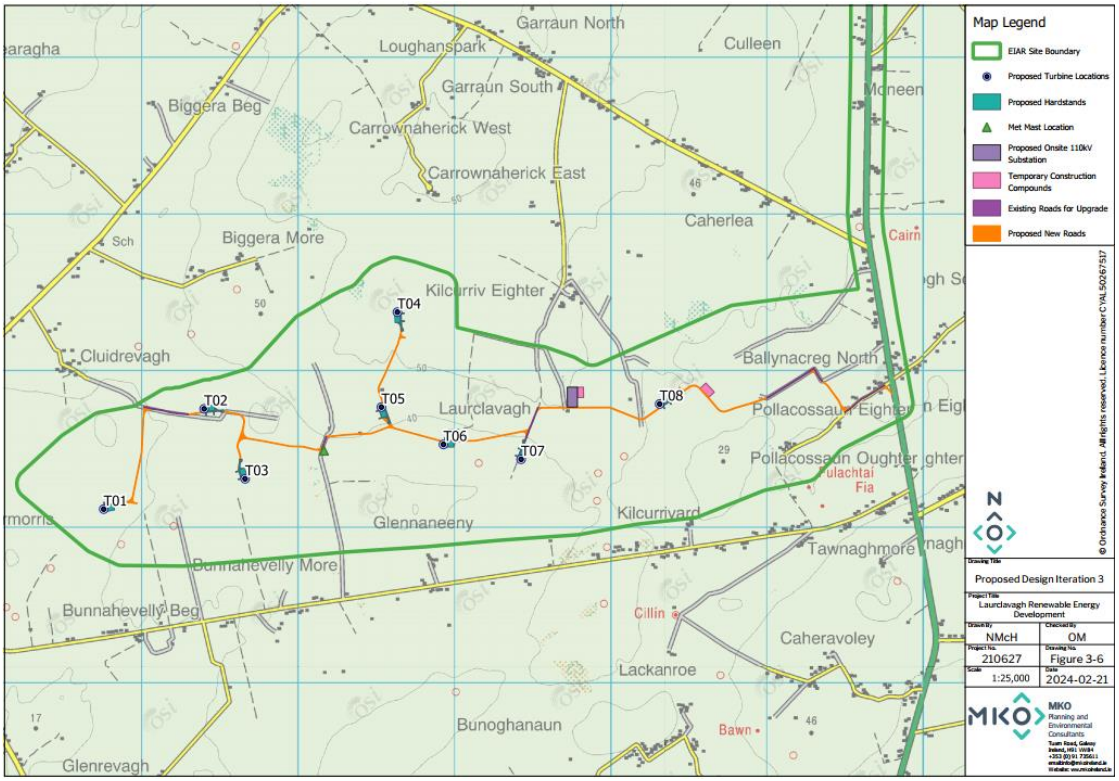


Figure 3-6 Proposed Layout Iteration No. 3

Proposed Layout iteration No. 3 which is presented in Figure 3-4 comprises of 8 no. turbines, hardstands, onsite 110kV substation and associated construction compound (part of the Proposed Grid Connection), construction compound, meteorological mast and associated hardstand, and access roads. The layout in Iteration No.3 was presented to the project team for detailed investigations and assessment. These investigations included habitat mapping, intrusive site investigation surveys, ecological surveying, and hydrological investigations of the proposed site layout.

The results of this round of surveying detected the presence of sensitive ecological receptors, leading to the micro-siting of site access roads to avoid these. The results of the detailed hydrological surveying and further site investigation works were also taken into account. The results of these surveys led to the micro siting of some sections of access road and turbine hardstands.

Proposed Layout Iteration No. 4- Final Proposed Wind Farm Site Layout

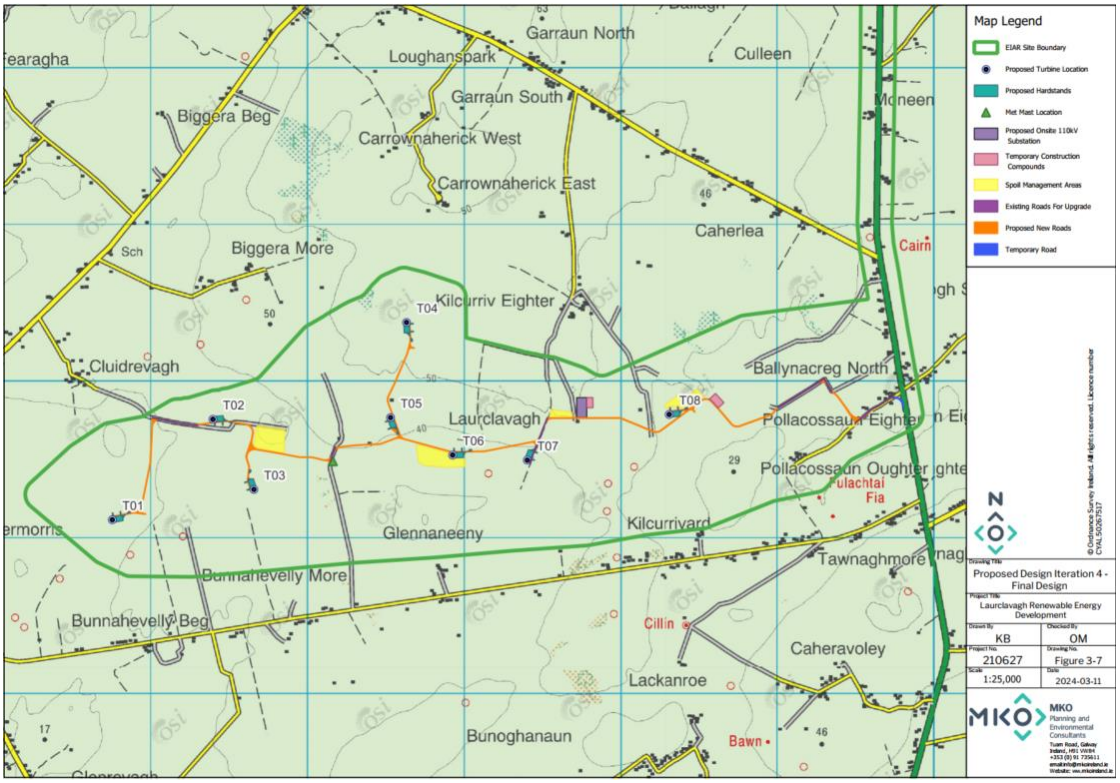


Figure 3-7 Proposed Layout Iteration No. 4 - Final Proposed Wind Farm Site Layout

Iteration No.4 as presented in Figure 3-7 comprised of 8 no. turbines with a maximum overall ground-to-blade tip height of 185 metres, rotor diameter of 163 metres, hub height of 103.5 metres, one met mast, a construction compound, one onsite substation and one underground electrical cabling route which is further detailed in Section 3.2.7. For this layout, the internal road network was realigned on account of ecological constraints which were identified and outlined in Section 3.2.6.2.4 above.

The revisions to the layout were found to have a positive effect on the environmental, ecological and hydrological elements of the Site when compared to the other options considered.

As part of the final design iteration, enhancement and replanting measures were developed in order to ensure no net loss of biodiversity occurred, and that the project had a positive effect on local biodiversity. Measures such as hedgerow replanting and calcareous grassland enhancement have been proposed as part of the Proposed Wind Farm, with further details being available in Appendix 6-4 Biodiversity Enhancement Management Plan.

The internal road layout was also finalised as part of this Proposed Layout Iteration. As can be seen in Figure 3-6 above, the section of temporary road was redesigned at the entrance of the Proposed Wind Farm in order to facilitate the ingress of construction traffic off the N83 National Road and to facilitate all turbine infrastructure deliveries. This section of road was designed in order to allow construction traffic to exit the N83 National Road safely, turning left only into the Site, and to safely facilitate the delivery of turbine components. Further detail on the above is included in Chapter 4 of the EIAR.

The final proposed turbine layout as presented in Figure 3-6 takes account of all site constraints (e.g. ecology, ornithology, hydrology, archaeology, etc) and design constraints (e.g. setback distances from houses and distances between turbines on site 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 to the chosen option.

Environmental Consideration	Initial Turbine Layout and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
Population & Human Health (incl Shadow Flicker)	No material environmental difference for population or human health. Potential for increased shadow flicker impacts on nearby sensitive receptors	No material environmental difference for population or human health. 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 for habitat loss, however, habitat enhancement and replacement would mitigate against this. Greater potential impact on identified sensitive ecological receptors due to location of infrastructure within designated setback buffers (i.e. identified bat roost) With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk for a 9-turbine wind farm would not be significant.	As detailed in Chapter 6 Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity including bats and downstream aquatic receptors. The Proposed Project includes for a Habitat Enhancement proposal, providing a local boost to biodiversity. Please see Appendix 6-x for details. With the implementation of the mitigation measures described in Chapter 7 Ornithology, the residual effects for collision risk are not significant.
Land, Soils & Geology	Neutral. Geotechnical investigations followed by careful design would lead to no significant environmental impacts. Potential geotechnical issues could have arisen had the micro-siting of infrastructure not taken place.	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 during the construction, operation or decommissioning phases. Geotechnical investigations followed by careful design would lead to no

Environmental Consideration	Initial Turbine Layout and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
		significant environmental impacts.
Water	Increased potential for impacts on groundwater schemes due to the location of infrastructure. Project design specific drainage design removes the potential for significant environmental effects.	Project design specific drainage design removes the potential for significant environmental effects. Groundwater loggers were also placed onsite for a period of a minimum of 11 months, and a maximum of 24 months in order to model the characteristics of the groundwater levels and flow in the area surrounding the Site.
Air Quality	Neutral- Larger development footprint may result in marginally greater emissions	As detailed in Chapter 11, there will be no significant effects on air quality during the construction, and decommissioning phases. There will be a Long-term Moderate Positive Impact on air quality by during the operational phase.
Climate	More turbines increase the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels.	Fewer turbines reduced the potential to maximise the use of the site wind resource and the opportunity to further reduce the country's dependence on fossil fuels. As detailed in the assessment in Chapter 11, over the proposed 30-year lifetime of the Proposed Wind Farm 50,822 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation. The addition of an estimated 56MW clean energy to the national grid will be a positive contribution to the States renewable energy targets set out in the Climate Action Plan 2024.
Noise & Vibration	A larger number of turbines could have a greater noise impact. However, noise emissions can be controlled where deemed necessary.	Fewer turbines will generate reduced noise levels; fewer turbines sited 4x tip height from sensitive receptors.

Environmental Consideration	Initial Turbine Layout and all associated Infrastructure	Chosen Option of the Final 8 Turbine Layout and all associated infrastructure
		Based on the assessment 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 Wind Farm during the construction, operational and decommissioning phase. Predicted noise levels from the chosen layout indicate that the Proposed Wind Farm noise levels fall within best practise noise criteria as recommended in the Guidelines.
Landscape & Visual	Potential for greater visual impacts due to the wider visual extent of the proposed turbines.	Reduced visual impacts due to the reduced visual extent of the proposed turbines. The strategic siting of infrastructure will mitigate any potential for significant landscape and visual effects.
Cultural Heritage & Archaeology	Neutral- Larger development footprint may result in a marginally greater potential for impacts on unknown subsurface archaeology	Neutral- smaller development footprint has a marginally reduced potential for impacts on unknown subsurface archaeology
Material Assets	No material difference between the two options	No material difference between the two options
Vulnerability to Major Accidents Natural Disasters	No material difference between the two options	No material difference between the two options

3.2.5.3 Alternative Road Layout

Access tracks are required onsite in order to enable transport of infrastructure and construction materials within the Proposed Wind Farm. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. Approximately 6.4km of new internal tracks are required for the Proposed Project along with approximately 1.5km of existing farm tracks, which is currently used by the landowners in their daily farming activities. These tracks will be utilised where possible; however, some require upgrading/widening to facilitate the movement of abnormal loads through the Site. As the turbine layout was finalised, the most suitable routes between each component of the Proposed Project were identified, taking into account the shortest routes and existing farm tracks and filtering out the physical and environmental constraints of the Site and the associated buffers, and utilising the most direct route between turbines in order to minimise the footprint. Additionally, turning areas were designed and sited for minimum environmental effect along internal roads.

From the second design iteration, it was decided that a section of temporary road be proposed at the entrance to the Proposed Wind Farm in order to prevent construction traffic queueing along the public N83 National Road. This alternative strategy to letting traffic queue on the public road corridor was deemed to be the safer approach from a traffic management perspective. Further detail on the above is included in Chapter 15 of the EIAR.

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

3.2.5.4 Alternative Stone Resource Options

The possibility of having a borrow pit onsite from which materials such as stone would be won, and spoil materials would be stored in, was considered at the inception of this project. However, due to the ground conditions onsite (underlying areas of limestone, exposed limestone pavement and the presence of underground caverns) it was decided following recommendation by the Project Hydrologist that the more environmentally prudent option was to source materials from offsite quarries and manage spoil using alternative strategies. This concept is discussed in further detail in Section 3.2.5.6.1 below.

3.2.5.4.1 *Deliveries of Materials from Nearby Quarries*

Site investigation works were carried out at the Proposed Wind Farm to determine if it would be feasible to provide onsite borrow pits as an alternative to sourcing materials from nearby quarries. The use of onsite borrow pits would eliminate the need to transport large volumes of construction material along the local public road network at the Site. However, when considering the Site characteristics, including the topography, ground conditions, and surface features, it was determined that onsite borrow pits would potentially create larger local impact than the minor traffic generation associated with deliveries of materials from off-site sources to the Proposed Wind Farm.

In order to facilitate the construction of the Proposed Project, stone material will need to be imported from nearby quarries. There are several quarries in the surrounding area of the Proposed Project, such as:

1. *Two Mile Ditch Quarry – Stone and concrete*
2. *Coshla Quarries – Stone*
3. *Harrington Concrete & Quarries – Stone and concrete*
4. *BGN Sand & Gravel Limited – Sand and Gravel*
5. *Mortimer Quarry – Stone, Tarmac & Asphalt*

The locations of these quarries and Ready-Mix Concrete (RMC) batching plants together with the routes to the Proposed Project site are shown in Figure 4-21 of Chapter 4 of this EIAR. Deliveries of stone and ready-mix concrete for use in construction of the Proposed Wind Farm and Proposed Grid Connection, as discussed in further detail in Chapter 15 of this EIAR.

A comparison of the potential environmental effects of the chosen option of obtaining all stone material offsite when compared to the alternative of using onsite borrow pits is presented in Table 3-7 below.

Table 3-5 Comparison of environmental effects when compared against the chosen option (Deliveries of Materials from Nearby Quarries)

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
Population & Human Health	Less potential for impact on residential amenity when compared to quarries, due to vehicular and dust emissions from additional traffic associated with movement of material on and off-site. Potential for increased impact on residential amenity due to increased noise and dust emissions associated with excavation of material at onsite borrow pits.	Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased traffic movements. Potential for reduced impact on residential amenity due to reduced noise and dust emissions associated with the absence of excavation of material at onsite borrow pits. Based on the assessment detailed in Chapter 5 and the mitigation measures proposed, there will be no significant effects on residential amenity from the Proposed Project.
Biodiversity & Ornithology	Larger development footprint which would result in larger amounts of habitat loss due to onsite excavations.	No borrow pit exaction therefore no habitat loss. As detailed in Chapter 6, the development has been designed to avoid or mitigate impacts on biodiversity.
Land, Soils & Geology	Potential for increased impact on lands, soils and geology due to the presence of underground caverns to facilitate the excavation of material at onsite borrow pits.	No borrow pit exaction therefore no impact on land, soils and geology. As detailed in the assessment in Chapter 8, no significant effects on bedrock, soils and subsoils will occur.
Water	A drainage plan for onsite borrow pits would be required to be incorporated into project drainage design. Excavation of a borrow pit could lead to potentially significant impacts on groundwater onsite due to the characteristics limestone bedrock and groundwater systems	No requirement for drainage from onsite borrow pits to be incorporated into Proposed Project drainage design. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur.
Air Quality	Potential for less vehicular and dust emissions compared to delivery of materials to site which would result in additional traffic associated with movement of material on and off-site. Potential for more dust emissions due to onsite excavation of borrow pits.	Potential for increased vehicular and dust emissions which would result in increased traffic associated with movement of material on and off-site. Potential for reduced dust emissions due to the absence of onsite excavation of borrow pits.

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
Climate	Potential for more exhaust emissions due to the transport of materials to site.	As detailed in the assessment in Chapter 11, no significant effects on air quality and climate will occur. Over the proposed thirty-year lifetime of the Proposed Project, 50,822 tonnes of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise & Vibration	Potential for increased noise and vibration impacts during construction phase on nearby sensitive receptors due to excavation of material from onsite borrow pits. Potential of reduced noise and vibration impacts during construction phase on nearby sensitive receptors due to reduced traffic movements.	Potential for reduced noise impacts on nearby sensitive receptors during construction phase due to the absence of excavation of material from onsite borrow pits. Potential of increased noise and vibration impacts on nearby sensitive receptors during construction phase due to increased traffic movements. 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 phase.
Landscape & Visual	Neutral (as onsite borrow pits would be reinstated following use)	Neutral
Cultural Heritage & Archaeology	Larger development footprint, therefore increasing potential for impacts on sub-surface archaeology	No borrow pit excavation therefore no impact on sub surface 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 and Archaeology
Material Assets	Less potential for impact on public road network compared to delivery of materials to site which would cause additional traffic.	Increased potential for impact on public road network compared to the development of an on-site borrow pit however as detailed in Chapter 14, the impact will be slight and short term. A detailed Traffic Management Plan incorporating all the mitigation measures will be agreed with the

Environmental Consideration	Obtaining all stone from onsite borrow pits	Chosen Option of obtaining all stone material offsite (Deliveries of Materials from Nearby Quarries)
		roads authority prior to construction works commencing on site.

3.2.5.5 Alternative Design of Ancillary Structures

The ancillary structures required for the Proposed Project include underground electrical cabling and an on-site meteorological mast.

3.2.5.5.1 *Alternative Internal Site Cabling Route*

The internal 33kV site cabling will follow the internal road network throughout the Site, connecting all 8 no. turbines to the onsite 110kV substation. While this means that a longer cable route will be needed, it was considered the more environmentally prudent option. The alternative to this would be to lay the cables 'as the crow flies' between the turbines and the onsite 110kV substation, however, this would lead to a greater environmental disturbance and a greater volume of spoil created.

3.2.5.5.2 *Alternative Meteorological Mast Location*

The meteorological mast is located near the centre of the Proposed Wind Farm, adjacent to an area of existing road. Existing road will be used to access the proposed met mast location. The met mast is located in an agricultural field, which was shown to be an area of low ecological value.

While other locations to situate the proposed met mast within the Proposed Wind Farm site were examined, the above location was deemed to be most suitable due to its proximity to existing roadways and the low ecological value of the habitat.

3.2.5.6 Alternative Grid Connection Cabling Route Options

The Proposed Wind Farm will connect to the national grid via underground electrical cabling, located within the public road corridor. Underground electrical cables will transmit the power output from each wind turbine to the proposed onsite 110kV substation, and from there to the existing Cloon 110kV substation, via an underground electrical cabling route, measuring approximately 14.3km in length.

A key consideration in determining the grid connection method for a proposed wind energy development is whether the cabling is underground or run as an overhead line. While overhead lines are less expensive and allow for easier repairs when required, underground lines will have no visual impact. For this reason, it was considered that underground lines would be a preferrable alternative to overhead lines. The Wind Energy Guidelines (DoEHLG, 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.

Additionally, consideration was given to installation of the grid connection within private lands adjacent to the public road network, however, the closest existing substation to the Proposed Wind Farm is Cloon 110kV substation, which is located 5.8km northeast of the Proposed Wind Farm, as the crow flies. It was considered that this was not a feasible option, due to the need for constructing 5.8km of new road across private lands to facilitate the construction and operation of the underground cabling.

The Megawatt (MW) output of the Proposed Wind Farm is such that it needs to connect to a 110kV substation. There are 4 no. existing 110kV electricity substation located within 25km of the Proposed Wind Farm, namely:

- Cloon 110kV Substation
- Galway 110kV Substation
- Salthill 110kV Substation
- Cashla 220kV Substation

Initial grid studies identified Cloon 110kV substation as the optimum connection node for the Proposed Project. An underground grid connection underground cabling route to Cloon 110kV Substation was considered and assessed to identify whether it was a viable option. This assessment outlines a number of routes from the Proposed Wind Farm to Cloon 110kV substation, which were considered during the iterative design process.

The Proposed Grid Connection to Cloon 110kV substation and the proposed underground electrical cabling route has 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 option as presented in Figure 3-7 to the current layout as presented in Figure 3-10.

3.2.5.6.1 Proposed Grid Connection underground cabling Route Iteration No.1

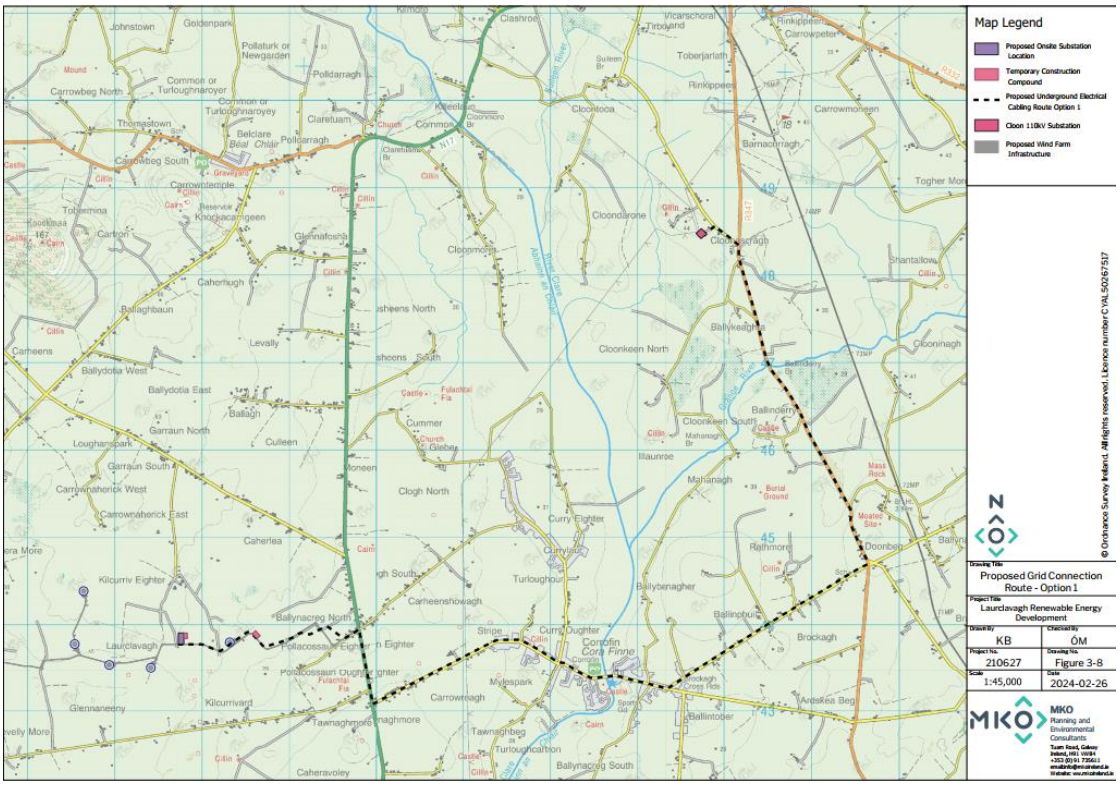


Figure 3-8 Proposed Grid Connection Route Options - Iteration 1

The first option examined to connect the Proposed Wind Farm to Cloon 110kV substation from the south. This route was approximately 14.2km long, and involved the crossing of 2 no. mapped watercourses, and traversing through the village of Corofin, Co. Galway.

An in-depth desk study was carried out on this route in which it was discovered that the watercourse crossing over the river, the Corofin Bridge, was a designated NIAH site and National monument. The population density along this proposed route was also relatively high for the area.

It was determined, based on the above, that it would be appropriate to seek out a less constrained alternative underground cabling route.

3.2.5.6.2 *Proposed Grid Connection underground cabling Route Iteration No. 2*

Figure 3-9 Proposed Grid Connection Route Option Iteration 2

The option of breaking the existing 110kV line which runs in a north south direction from Cloon 110kV Substation and Cashla 220kV Substation, approximately 1km east of the Proposed Wind Farm, was briefly considered as a Proposed Grid Connection Option. This approach was deemed non-viable due to the fact that the cable would have been routed off-road and the Applicant failed to achieve landowner agreement for this grid option. Therefore, alternative options were examined instead.

3.2.5.6.3 *Proposed Grid Connection underground cabling Route Iteration No. 3 – Final Proposed Grid Connection Layout*

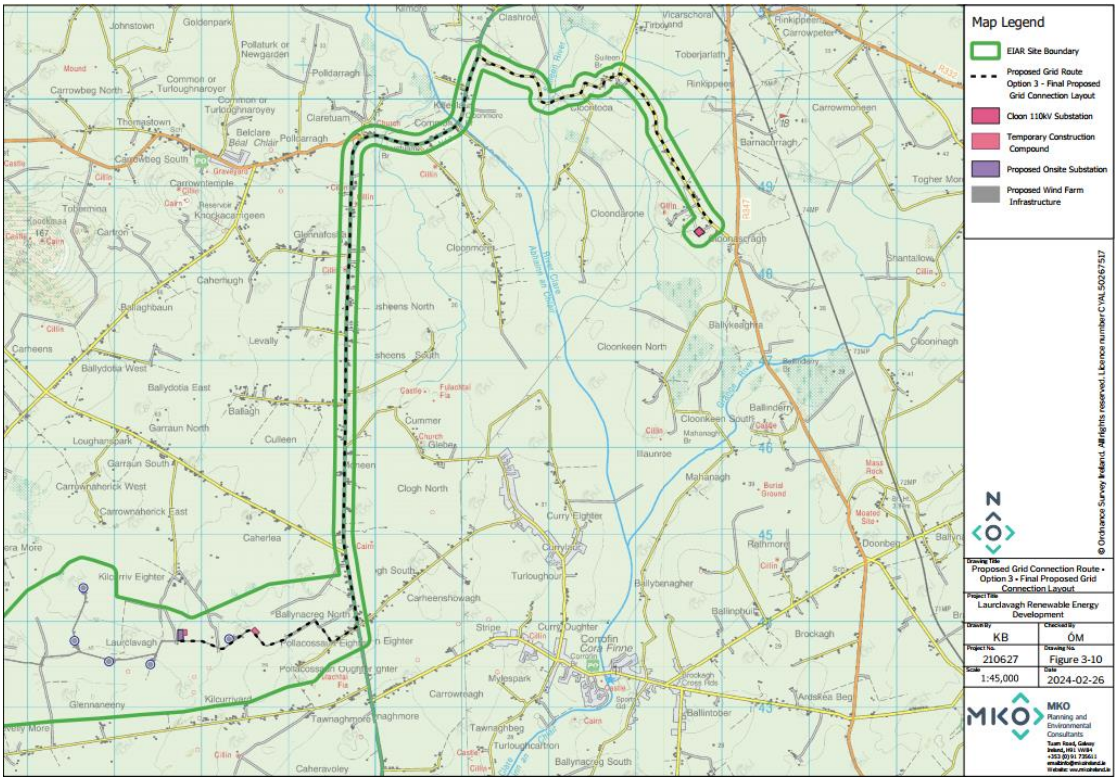


Figure 3-10 Proposed Grid Route Options - Iteration 3 - Final Proposed Grid Connection Layout

The final Proposed Grid Connection underground cabling route measures approximately 14.3km in length, and travels from the Proposed Wind Farm site roads before merging onto the L61461 travelling east before turning north towards Tuam on the N83 National Road, it then turns right onto the L6141 Local Road heading east/southeast towards Cloon 110kV substation.

This proposed underground cabling route involves crossing over 4 no. EPA marked watercourse crossings, and the M17 Motorway. This was considered to be the most environmentally prudent option for a grid connection as it encountered fewer environmental constraints. It was also considered that the N83 National Road, having a wide carriageway, would pose less of a disruption to traffic movements during the construction period.

Table 3-6 Comparison of environmental effects when compared against the chosen option substation)

Environmental Consideration	Option 1 – Cloon 110kV Substation via Corofin village	Grid Route Option 3 (Chosen Option) – Cloon 110kV Substation via northern route
Population & Human Health	Option 1 is in the public road network. The route as displayed in Option 1 travelled via the village of Corofin. By utilising public roads through an urbanised area, the potential to disrupt a larger percentage of the population was interpreted as a material environmental effect.	The chosen option, Option 3, is in the public road network. This route utilises roads in rural areas only, and does not travel through any urbanised areas, thus lessening the potential to disrupting local road users
Biodiversity (including Birds)	Potential for greater impact on sensitive ecological receptors during the construction phase as Option 1 passed over a bridge which was identified from a desk-based perspective as a probable location of a Potential Roosting Feature (PRF) for Bats. The bridge in question was a stone arch bridge, which is a known preferred roosting location for bats.	Low potential for impact on sensitive ecological receptors during the construction phase. As detailed in Chapter 6, the Proposed Grid Connection underground cabling route passes through 1 no. mapped SAC (River Corrib SAC). However, no instream works are proposed as part of the crossing methodology for this SAC. Therefore, as detailed in the Natura Impact Statement no adverse impacts on the SAC are anticipated.
Land, Soils, & Geology	Approximately 3.7km of this grid route option is mapped to pass through road corridor which is mapped through peaty soils. This cable route was proposed to be located fully within the public road corridor. Potential for greater impact on peat soils.	Approximately 4km of this proposed grid route is mapped to in road corridor which is mapped through peaty soils. The Proposed Grid Connection underground cabling route will be located fully within the road carriageway. Peat depths were taken at relevant intervals along road, which showed that there were no areas of deep peat. Therefore, no significant effect from a peat and spoil management or peat stability point of view were identified.
Water	Option 1 has 2 no. EPA mapped watercourse crossings	Option 3 has 4 no EPA mapped watercourses. There are no instream works proposed as part of the crossing methodologies for any of these watercourse crossings. As detailed in the assessment in Chapter 9, no significant effects on surface water or groundwater quality will occur
Air Quality	Neutral	Neutral
Climate	Neutral – Grid Connection Route Option 1 measured approximately 14.2km in	Neutral – Grid Connection Route Option 3 measured approximately

Environmental Consideration	Option 1 – Cloon 110kV Substation via Corofin village	Grid Route Option 3 (Chosen Option) – Cloon 110kV Substation via northern route
	length and is located fully in the road corridor. No material differences between grid options from a climate perspective	14.3km in length and is located fully in the road corridor. No material differences between grid options from a climate perspective
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors during the excavation of the cable route when it passes through the village of Corofin	Less potential for noise impacts on nearby sensitive receptors as Grid Connection Option 3 does not pass through any towns or villages.
Landscape and Visual	Neutral – there is no material environmental effect difference between both options considered.	Neutral – there is no material environmental effect difference between both options considered.
Cultural Heritage & Archaeology	Grid Connection Option No. 1 involves the crossing of a bridge in Corofin village which is designated as a as a National Monument (GA02578)	Grid Connection Option 3 does not pass through any bridges or other structures designated as National Monuments
Material Assets	Neutral - Grid Connection Route Option 1 measured approximately 14.2km in length and is located fully in the road corridor. No material differences between grid options from a material assets (traffic) perspective	Neutral - Grid Connection Route Option 3 measured approximately 14.3km in length and is located fully in the road corridor. No material differences between grid options from a material assets (Traffic) perspective

Proposed Grid Connection Iteration 2, as outlined in 3.2.5.8.2 above, was not considered in Table 3-6 above as it was screened out at an early stage due to landowner constraints, and no survey work was carried out on this route.

3.2.5.7 Alternative 110kV Substation Option

One onsite 110kV substation is located within the Proposed Project site. It had been proposed to construct a 'loop-in' substation, which would allow the Proposed Project to connect directly into the existing 110kV overhead line that travels in a north-south direction from Cloon 110kV Substation to Cashla 220kV substation. This 110kV overhead line is located approximately 2.7km to the east of T8. This option, however, was deemed unviable due to landowner constraints, and other options were examined instead.

The proposed onsite 110kV substation is located in the eastern portion of the Proposed Wind Farm site and is sited on agricultural grassland. This grassland is of low ecological value and is screened from sensitive receptors by topography and vegetation from the north and south. From the south, the landscape gently slopes upwards to the north where the proposed onsite 110kV substation is located. There is a dense line of vegetation to the north of this field, this will further reduce the visibility of the onsite 110kV substation from the north. The proposed onsite 110kV substation location is also well screened from sensitive receptors as it is located c. 500m from the nearest sensitive receptor. Geophysical surveys and intrusive ground investigations were carried out at the location of the proposed onsite 110kVsubstation in order to determine whether the ground conditions were suitable of hosting the proposed onsite 110kV substation. The results of these surveys showed that the ground conditions were suitable, and therefore, no micro siting of the substation compound was needed.

This location was deemed to be suitable due to the habitats it is located on, the available natural screening, its proximity to sensitive receptors and the existing ground conditions.

3.2.5.8 Alternative Transport Route and Site Access

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

3.2.5.8.1 *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 and ease of access to the Proposed Wind Farm.

3.2.5.8.2 *Delivery to Site*

From the selected Port of Entry, Galway Port, the turbines will be transported north through the city via the Lough Atalia Road, then merging onto the R339 continuing north, then taking a left turn onto the R336 Tuam Road, and north again through the junction with Bothar na dTreabh and north towards the Proposed Wind Farm on the N83 Galway – Tuam road. The entrance to the Proposed Wind Farm for all construction traffic comes off the N83 National Road via a temporary road. As detailed in Chapter 15 of this EIAR, all construction traffic will then exit the site via the L61461 local road approx. 60m north of the temporary site entrance.

This route has been proven suitable for the transport of turbine components, and the transport analysis (as presented in Section 15.1 of this EIAR), shows that the only minor accommodation works will be required to accommodate the proposed turbines. The turbine transport route will utilise the national and roads available to ensure the road network holds the capacity to manage large loads.

All construction traffic will use the designated haul routes only. An alternative to this would be to allow for more direct access to the site using multiple approach routes; however, this is more likely to give rise to additional traffic and road impacts.

The delivery of turbine components including blades, tower sections and nacelles is a specialist operation owing to the oversized loads involved. As detailed in Section 15.1 of this EIAR, turbine components will be delivered to site using a blade trailer. When considering turbines transport routes, alternative modes of transport, as well as alternative points of access 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 Wind Farm.

There were a number of alternative access points to the Proposed Wind Farm considered for the delivery of turbine components, and also construction materials.

As detailed in Figure 3-4 above, an access point to the south of the Proposed Wind Farm off the L-2122 was considered. This potential access point was ruled out due to alignment issues for oversized loads and requirements for significant upgrade works.

Access from the north of the Proposed Wind Farm site off the L-2111 was also briefly considered, but was also discounted due to the same reasons as outlined above.

Access into the Proposed Wind Farm site was considered the most appropriate from the N83 National Road, and the L61461 Local Road.

3.2.6 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 and geotechnically unstable areas of the site limits the potential for environmental effects. As noted above, the 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 Wind Farm.

It is proposed to replant approximately 3.6km of hedgerow within the Site in order to replace the hedgerow which is proposed to be removed in order to facilitate the Proposed Project. A biodiversity Management and Enhancement Plan (BMEP) has been prepared in conjunction with Chapter 6: Biodiversity, of this EIAR. The BMEP outlines the replanting and habitat enhancement measures which will be put in place to replace habitat which will be lost in order to facilitate the Proposed Project, and to also provide additional habitat enhancement measures, leading to a net gain in local biodiversity. The replanting of hedgerow was deemed necessary in order to replace the habitat which is being lost. These replanting and enhancement measures will have a long-term slight positive effect on biodiversity This enhancement will also have a long-term slight positive effect on biodiversity within the Site. Further detail on this biodiversity enhancement can be found in Chapter 6 and Appendix 6-4 of this EIAR.

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.