



GALETECH
ENERGY SERVICES

Islandmore Wind Farm

Environmental Impact Assessment
Report

Chapter 2: Assessment of Project
Alternatives

Islandmore Wind Farm Limited

Contents

2.1	Introduction.....	1
2.2	Alternatives Considered.....	1
2.3	Assessment of Alternatives	2
2.3.1	'Do Nothing' Alternative	2
2.3.2	Alternative Technologies	3
2.3.3	Alternative Locations	3
2.3.4	Alternative Design & Layouts.....	9
2.3.5	Alternative Grid Connections.....	13
2.3.6	Alternative Haul Routes.....	15
2.4	Conclusion	16

2.1 INTRODUCTION

The presentation and consideration of the various reasonable project alternatives investigated is an important requirement of the EIAR process and the single most effective means of avoiding likely significant effects on the environment. As described in **Chapter 1**, the EIAR process is highly iterative involving a constant interchange between project designers and competent experts, with designers continually adjusting the design in response to identified environmental constraints, and vice versa, including with the embedding of mitigation measures in the emerging project design. The purpose of this chapter is to record the key outcomes of this process and to document the assessment of the range of alternatives considered.

The EIA Directive requires that an EIAR must 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 environmental effects'.

This provision requires an EIAR to present transparent and objective evidence on the range of reasonable alternatives which were examined, analysed and evaluated, and which led to the adoption and selection of the final project as described in **Chapter 3**. The *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022) state that it is generally sufficient to provide a broad description of each of the main alternatives considered, identifying the key issues associated with each of them, and to demonstrate how environmental constraints were taken into account. A detailed assessment (or 'mini-EIA') of each alternative is not required.

2.2 ALTERNATIVES CONSIDERED

The consideration of alternatives is a dynamic process, and alternatives may be identified at many levels and stages during the evolution of a project, from strategic site location selection through to site layouts, design, technologies and on to mitigation and any monitoring measures. Alternatives that are available for consideration at the earlier stages of a project, particularly at the feasibility and scoping stages, are considered to represent the greatest opportunity for the avoidance of likely significant effects on the environment. As environmental issues emerged during the EIAR/project design process, alternative designs were also considered, and additional mitigation options considered towards the end of the process.

The reasonable alternatives considered in undertaking this EIAR were as follows: -

- 'Do Nothing' alternative;
- Alternative locations;
- Alternative technologies;
- Alternative design and layouts;
- Alternative grid connections; and,
- Alternative haul routes.

Each of these alternatives were considered relevant to the project and its specific characteristics and are discussed in further detail below, including an assessment and

comparison of likely significant environmental effects and indicating the main reasons for choosing the project, as proposed.

2.3 ASSESSMENT OF ALTERNATIVES

2.3.1 'DO NOTHING' ALTERNATIVE

Current national Government policy in respect of energy production and the reduction of greenhouse gas emissions are all collectively very strongly supportive of the rapid, increased generation of renewable electricity, including wind energy, to reverse climate breakdown and the transition of energy production away from fossil fuels.

The *Climate & Low Carbon Development (Amendment) Bill 2021* provides for one of the most ambitious decarbonisation pathways anywhere in the world. To achieve a 51% reduction in greenhouse gas emissions by 2030, the *Climate Action Plan 2025* commits to a renewable energy generation target of at least 80% by 2030. It is acknowledged that onshore wind will continue to play a vital role in achieving this target, particularly over the next five years, with an installed capacity target of 9 gigawatts (GW) by 2030.

The Government's *Wind Energy Development Guidelines for Planning Authorities 2006* (DoEHLG, 2006) and subsequent updated *Draft Revised Wind Energy Development Guidelines 2019* (DoHPLG, 2019) establishes a land-use planning framework whereby planning authorities can proactively support the development of wind energy projects at appropriate locations. In accordance with these land-use policies, the *Roscommon County Development Plan 2022-2028*, and accompanying Strategic Environmental Assessment (SEA), is generally highly supportive of wind energy development at designated locations within the county.

In the 'Do-Nothing' alternative, the status quo in terms of the local environment of the project site would remain unchanged with gradually evolving managed farmland, maturing commercial forestry, woodland scrub, upland peat bogs and cutaway bog. It is also likely that in the 'Do Nothing' scenario, there would be some further commercial afforestation and small-scale domestic cutover peat extraction¹.

The quantum of renewable energy produced in this part of County Roscommon would also remain unchanged. Therefore, due to the critical importance of onshore wind energy in the transition to a low carbon economy in national, regional and local policies, and the recognised imperative of generating electricity from renewable sources, as outlined above, the 'Do Nothing' alternative was not considered a reasonable alternative.

It was considered that there is potential within County Roscommon to deliver further wind energy generation capacity. At present, according to the *Roscommon County Development Plan 2022-2028*, the total installed renewable energy capacity is 112MW²; with the potential for 262MW to be produced. The Sliabh Bawn Wind Farm is the largest operational wind farm in County Roscommon with a total capacity of 58MW; while the permitted, not yet constructed, Seven Hills Wind Farm has a predicted capacity of 102MW.

¹ In this EIAR 'cutover' bog refers to small areas of peatlands that have been domestically cut for peat extraction and which generally have greater and often more variable depths of peat remaining. 'Cutaway' bog, on the other hand, refers to large areas of peatlands that were industrially cut in the past, often leaving little (up to 50 cm) or no peat layer remaining.

² Section 8.5 of the *Roscommon County Development Plan 2022-2028*.

Accordingly, given the very strong policy imperative for the generation of renewable energy at appropriate locations and the clear requirement for additional renewable energy generation to reduce greenhouse gas emissions, it was concluded that the 'Do Nothing' option was not an appropriate or reasonable alternative.

2.3.2 ALTERNATIVE TECHNOLOGIES

Wind energy is recognised in government policy as a proven and cost-effective renewable energy generation technology in the context of Ireland's abundant wind resource. The only other onshore technology reasonably available that could possibly meet the objectives of the project would be the development of a ground-mounted solar energy project. As discussed above, the *Climate Action Plan 2025* recognises that onshore wind will continue to play a vital role in decarbonising Irish electricity generation with a target of at least 9GW by 2030. Solar energy, while remaining rapidly emerging technology, has a corresponding target of 8GW by 2030.

Solar energy production, however, requires a significantly larger direct land take and would result in substantial changes to existing land uses and agricultural practices. In contrast, a wind energy project will not result in any substantive alteration to current land uses, and agricultural and other activities can co-exist and continue with only minor, temporary disturbance during the construction phase. For example, a 7.2MW wind turbine and ancillary infrastructure (such as those proposed) is estimated to require a direct land take of c. 1 hectare (2.5 acres) while a solar development with an output of 7.2MW would require a footprint area of c. 9 hectares (22 acres). As such, the comparable land take for a solar energy project (of an equivalent installed capacity) required to meet the objectives of the project would have a direct footprint of c. 67 hectares thus substantially altering existing land uses and practices.

A wind energy development would also result in a substantially reduced likelihood of significant impacts on habitats arising from land use changes when compared to a similarly scaled solar energy development.

Moreover, in the context of this particular geographical location, a solar energy project would not generate renewable electricity in a similarly efficient manner as a wind energy development. The 2013 Sustainable Energy Association of Ireland (SEAI) Wind Speed Atlas identifies the project site as having a wind speed of between 8.3m/s and 8.7m/s at 100m height which makes this location highly viable for wind energy production.

The *Renewable Electricity Support Scheme (RESS) High Level Design*, published by the Government, considers that onshore wind has a generating capacity of 31% while solar has a capacity factor of 11%; thus illustrating the substantially greater efficiencies offered by onshore wind energy developments compared to solar energy developments. In order to generate renewable electricity, a project must be successful in a competitive auction held periodically by EirGrid under the auspices of the RESS and, in light of the generating capacity figures set out above, a solar development at this particular location would be significantly less competitive in any such auction process. On this basis, other technologies were considered inferior and not considered a reasonable alternative to achieve the objectives of the project at this location.

2.3.3 ALTERNATIVE LOCATIONS

Strategic site selection to avoid intrinsic environmental sensitivity is the principal mitigation option for onshore wind energy projects. Some locations have more

inherent environmental sensitivities than others and an assessment of alternative locations can therefore avoid such locations in favour of locations which have fewer constraints and more capacity to sustainably assimilate a wind energy project. Where a mapped wind energy strategy has been prepared and adopted by the relevant planning authority, this will have been subject to a higher tier SEA that takes account of strategic environmental opportunities and constraints in the designation of specific locations as suitable or unsuitable for wind energy generation.

The *Roscommon County Development Plan 2022-2028* includes a Renewable Energy Strategy which designates areas which are classed as 'Most Favoured', 'Less Favoured' and 'Not Favoured' for wind energy development. To avoid duplication of assessments, this prior assessment of strategic alternatives was also considered in this EIAR in the assessment of possible alternative locations.

There is a well-established and widely used methodology for the selection of wind energy development locations used by developers and which generally accord with the criteria set out in the *Wind Energy Development Guidelines for Planning Authorities 2006*. The methodology is based on a screening process and applying key sieve analysis criteria (not listed in order of importance), as follows: -

- Available wind resource;
- Land use context;
- Electricity grid availability and capacity;
- Residential amenity and community;
- Environmental constraints (including natural and archaeological heritage);
- Landscape and visual capacity;
- Accessibility;
- Energy and land-use planning policies; and,
- Other Factors.

In the first instance, the entire county of Roscommon was identified as a strategic search area given that there are currently relatively few other existing, permitted or proposed wind farms in the County. On the basis of an assessment of *inter alia* land use characteristics, rural dwelling densities and a general absence of national and European designated nature conservation sites, 3 no. possible locations were identified as potentially suitable for the development of a wind energy project, as follows: -

- Option L1: Comprising lands to the north of Ballaghaderreen in north County Roscommon;
- Option L2: Comprising lands to the west and southwest of Termonbarry in east County Roscommon; and,
- Option L3: Comprising lands to the southwest of Athlone in southwest County Roscommon.

Each of the options were consequently selected for further detailed technical and environmental assessment, as detailed below. The alternative locations are illustrated at **Annex 2.1. Table 2.1** below provides an overview of a comparative assessment of environmental constraints and opportunities associated with both alternative locations and the emerging preferred location based on each environmental factor. In undertaking this assessment, the general environmental factors included in Article

3(1) of the EIA Directive were used as a framework for analysis.

Location	Option L1	Option L2	Option L3	Emerging Preferred Option
Factor				
Population & Human Health	Generally low density of dwellings in vicinity of identified location; however, density levels increase notably with increased proximity the nearest urban settlement of Ballaghaderreen located c. 2km to the south.	Low density of dwellings within the immediate environs of the identified location; however, increased levels along public roads in around the perimeter of the location. Approximately 3km to the nearest urban settlement (Lanesborough).	Low density of dwellings in vicinity of identified; however, increased levels of residences along public roads around the perimeter of the location. Approximately 6km to the nearest urban settlement (Ballinasloe).	Option L1, L2 or L3
Biodiversity	This location comprises a mix of land cover and significant areas of intact peat, cutover peat, forestry and agricultural pasture. The location does not include any sites designated for nature conservation; however, there are a number of Natura 2000 sites within 10km including; the Tullaghanrock Bog Special Area of Conservation (SAC), the Callow Bog SAC, the River Moy SAC and the Lough Gara Special Protection Area (SPA). In the northern extent of the location, the Owengarve [Sligo] River provides a direct hydrological connection to the River Moy SAC. In the southern extent of the location, the River Lung provides a direct hydrological connection to the Tullaghanrock Bog SAC, Callow Bog SAC and the Lough Gara SPA.	Comprises a mix of land cover including agricultural pasture, forestry and significant areas of cutaway and intact peat. This location does not include any sites designated for nature conservation; however, there are a number of Natura 2000 sites within 10km including; the Lough Ree SAC and Lough Ree SPA and the Corbo Bog SAC. The Curraghroe stream, Feorish Stream and River Shannon which surround the site, are considered to be at risk due to poor ecological status and increasing nutrient loads.	Comprises a mix of land cover and significant areas of cutaway bog. This location does not include any sites designated for nature conservation; however, there are a number of Natura 2000 sites within 10km including; the River Shannon Callows SPA, the River Suck Callows SPA, the Middle Shannon Callows SPA, the Lough Ree SAC and Lough Ree SPA. The Ballydangan River, located to the east of the site, and the Cuilleen Stream to the west are considered to be at risk due to their poor ecological status.	Option L1
Land & Soil	Predominately underlain by intact/cutaway bog, sandstone and siltstone. Landcover includes a mixture of peat bogs, forest and semi-natural areas and agricultural areas (pastures). Landslide susceptibility classified as	Predominately underlain by intact/cutaway bog, limestone and shale. Landcover includes a mixture of peat bogs and pockets of scrub and agricultural pasture. Landslide susceptibility classified as low.	Predominately underlain by peaty soils, limestone and shale. Landcover includes a mixture of peat bogs and pockets of scrub and agricultural pasture. Landslide susceptibility is classified as low. Several karst features recorded	Option L1 or L2

	low. No mapped karst features within 2km of the location.	No mapped karst features within 2km of the location.	within and surrounding the site including enclosed depressions, swallow holes, springs and turloughs.	
Water	The lower-order Owengarve [Sligo] River flows through the northern extent of the location and is within the Killala Bay Catchment Area. The Owengarve [Sligo] River provides a direct hydrological connection to the River Moy SAC. In the southern extent of the location, the lower-order River Lung provides a direct hydrological connection to the Tullaghanrock Bog SAC, Callow Bog SAC and the Lough Gara SPA. Tributaries of the Lung River which traverse the southern extent of the site and tributaries of the Owengarve River to the south while recorded as moderate and good status respectively, they are still considered to be at risk owing to an increasing trend in measured nutrients.	There are no watercourses directly traversing through the location. The Curraghroe stream, Feorish Stream and River Shannon surround the site and are part of the Shannon Catchment Area. The Curraghroe stream and the Feorish Stream are considered to be at risk due to their 'Poor' ecological status and increasing nutrient loads. The southeastern extent of the site encroaches on the fluvial flood extents of the River Shannon.	There are no watercourses directly traversing through the location. The Dolanstown-Kilcashel River, located to the east of the site, and the Ardnaglug Stream, located to the west of the site, are located within the Shannon catchment. The Ardnaglug Stream is considered to be at risk due to its poor ecological status. The site is not located within any mapped fluvial or pluvial flood extents.	Option L1
Air Quality & Climate	No constraints identified. Wind energy development in this location would result in a positive overall impact.	No constraints identified. Wind energy development in this location would result in a positive overall impact.	No constraints identified. Wind energy development in this location would result in a positive overall impact.	Option L1, L2 or L3
Landscape	Located within the 'Ballaghaderreen and Bockagh Hill Uplands' landscape character and is of 'Moderate Value' per the Landscape Character Values Map (Figure 2) of the Roscommon County Development Plan 2022-2028. The Renewable Energy Strategy designates this location as 'Most Favoured' for Wind Energy	Located within the 'Slieve Bawn and Feorish Bogland Basin' landscape character area and is of 'Very High Value' per the Landscape Character Values Map (Figure 2) of the Roscommon County Development Plan 2022-2028. The Renewable Energy Strategy designates this location as 'Less Favoured' for Wind Energy Development.	Located within the 'Brideswell Esker Belt' landscape character area and is of 'Moderate Value' per the Landscape Character Values Map (Figure 2) of the Roscommon County Development Plan 2022-2028. The Renewable Energy Strategy designates this location as 'Most Favoured' for Wind Energy Development'.	Option L1 or L3

	Development'			
Cultural Heritage	No recorded cultural heritage features and/or protected structures within this location or its general environs.	Multiple recorded cultural heritage features recorded at this location and in the wider environs including ringforts and trackways and the Cloontuskert Architectural Conservation Area.	1 no. cultural heritage feature recorded within the location. Several cultural heritage features are present in the surrounding area.	Option L1
Noise & Vibration	Due to the limited number of receptors (dwellings) in the vicinity and availability of separation distances, likely effects are assessed as low.	Due to the limited number of receptors (dwellings) in the vicinity and availability of separation distances, likely effects are assessed as low.	Due to the limited number of receptors (dwellings) in the vicinity and availability of separation distances, likely effects are assessed as low.	Option L1, L2 or L3
Shadow Flicker	Due to the limited number of receptors (dwellings) in the vicinity and available separation distances, likely effects are assessed as low.	Due to the limited number of receptors (dwellings) in the vicinity and available separation distances, likely effects are assessed as low.	Due to the limited number of receptors (dwellings) in the vicinity and available separation distances, likely effects are assessed as low.	Option L1, L2 or L3
Material Assets (Transport & Access; Aviation; and Telecommunications)	Location can be readily accessed via national, regional and local roads; with the N5 national primary road being located within close proximity of this location. Permanent and temporary upgrade works to the public road network are likely to be required. Existing telecommunication masts in wider vicinity of identified location but no likely significant telecommunications constraints identified. A number of aviation installations are located in the wider landscape including Ireland West Airport (14km) and Tibohine Airfield (7.5km distant).	No likely significant transport constraints identified. Location can be readily accessed via the N5 national primary route. Temporary upgrade works would likely be required. Existing telecommunication masts in wider vicinity of identified location but no likely significant telecommunications constraints identified. Abbeyshrule Aerodrome is located in excess of 25km from the identified location.	While access is achievable from the local road network, it is likely that notable upgrade works would be required to carriageways and junctions. Existing telecommunication masts in wider vicinity of identified location but no likely significant telecommunications constraints identified. No aviation installations within the wider environs of the identified location.	Option L1 or L2

Table 2.1: Environmental Assessment of Alternative Locations

Based on this analysis, it was determined that, although each location was assessed to be generally suitable for a wind energy development, Option L1 was the emerging preferred location from an environmental constraints and opportunities perspective for the following reasons: -

- The location has been designated as 'Most Favoured' within the Renewable Energy Strategy of the *Roscommon County Development Plan 2022-2028* and is not the subject of any specific protective landscape designations being predominantly designated as having a low level of landscape sensitivity;
- The location has a generally low population density with the availability of a suitably large land bank with a low number of proximate residential dwellings. The *Draft Revised Wind Energy Development Guidelines 2019* propose a setback distance of 4-times overall tip height between a wind turbine and the nearest point of the curtilage of any residential property, subject to a mandatory minimum setback of 500m. These setback distances can be achieved at this location for all non-involved (third party) dwellings;
- The absence of any European designated nature conservation sites (Natura 2000) or other national nature conservation designations on, or in the immediate vicinity, of the location;
- The absence of significant watercourses and flood risk;
- The absence of any particular cultural heritage constraints within the location of its environs; and,
- The location is well served by the national road network with the N5 national primary route located within close proximity. Any substantial road upgrades to accommodate the delivery of turbine components would only likely be required between the N5 and the identified location.

Importantly, from a technical and commercial viability perspective, Option L1 has an estimated wind speed of approximately 8.5m/s at 100m height (according to the SEAI Wind Speed Atlas which is sufficient to ensure the viability of a wind energy development at this location whereas Option L2 and Option L3 have estimated wind speeds of 7.6m/s and 8.0m/s, respectively, at 100m height.

On the basis of this assessment, it was decided to undertake further analysis of Option L1 as the emerging preferred location and to discontinue further analysis of Options L2 and L3 as reasonable alternatives.

2.3.4 ALTERNATIVE DESIGN & LAYOUTS

Following the identification of Option L1 as the emerging preferred location, an iterative process was undertaken to determine the precise siting, design and layout of the wind turbines and associated infrastructure. A number of alternative layouts were evaluated to consider how different elements of the project could be arranged such that there would be no likely significant adverse effects on the environment.

The aim was to adopt the combination of design and layout options that presents the best balance between the avoidance of likely significant environmental effects and the achievement of the objectives of the project. Again, this process involved an ongoing dialogue between technical designers and environmental experts throughout the design process, with the designers continuously adjusting and readjusting the design in response to these environmental assessments. Feedback from the scoping process, including public consultation and stakeholder engagement discussed in **Chapter 1**, also informed this process.

The alternative layouts considered were highly dependent on the specific turbine technology to be installed, with larger turbines requiring increased inter-turbine spacing to minimise wake effects and maintain correct operational performance. A series of wind modelling analyses, using specialist software, examined a range of site layouts and turbine designs to establish turbine technology, including hub, rotor and overall height parameters. These iterations were also heavily influenced by the following localised environmental considerations: -

- Recorded habitat sensitivities;
- Ground conditions and peat characteristics;
- Visual impact;
- Inter-visibility/visual clutter; and,
- Setback to existing/permitted residential dwellings.

The location of ancillary wind farm infrastructure; including crane hardstands, access tracks, site entrances and underground cabling; is also intrinsically linked to the precise layout of wind turbines. The routing of access tracks is more flexible and can be altered to reflect any changes to turbine locations or identified environmental constraints. Through the iterative turbine design and layout process described above, the most appropriate access track routes were identified for each alternative considered, taking into account the land boundaries, existing ground conditions, the presence of peat, sensitive habitats and, insofar as possible, to reduce the overall project footprint.

Consideration was firstly given to the size and height of the turbines to be installed, including the possibility of a project comprising of a larger number of small-to-medium sized turbines with an overall tip height of c. 105m. Given the relatively low numbers of dwellings within the local vicinity, it was considered possible to achieve appropriate setback distances and therefore to install a larger number of smaller turbines. A comparable example of such a development would be the Mountain Lodge/Bindoo/Edrans/Carrickallen wind farm complex in County Cavan where a total of 65 no. turbines are currently in operation generating a total output of 103MW. This wind farm complex has a large spatial extent and covers an area of c. 1,135 hectares (2,804 acres).

Having assessed the availability of land within Option L1, it was considered that the location could accommodate up to 30 no. wind turbines of up to 105m in height with an electrical output of c. 45MW. However, a project with a smaller number (10-12 no.) of larger turbines of up to 185m in height could, on the other hand, generate between approximately 50MW-85MW, depending on the turbine technology installed, with a much smaller physical footprint and spatial extent. Installing larger turbines would also result in a considerably reduced likelihood of significant adverse environmental effects; particularly in respect of likely landscape, noise and shadow flicker impacts; and substantially more efficient renewable energy generation output.

The results of these analyses determined that, having regard to the project objectives and its specific locational characteristics, 2 no. main project design options could be reasonably considered from a technical and environmental perspective, as follows: -

- Option D1: 12 no. turbines (3 no. with a maximum tip height of up to 185m and 9 no. with a tip height of up to 150m; c. 62MW); and,
- Option D2: 10 no. turbines (3 no. with a maximum tip height of up to 185m and 7 no. with a tip height of up to 150m; c. 53MW).

The layout of each option is provided at **Annex 2.2. Table 2.2** provides an overview of the environmental constraints and opportunities associated with each of the two identified options and provides a recommendation of the emerging preferred alternative based on each environmental factor. Again, in undertaking this assessment, the general environmental factors included in Article 3(1) of the EIA Directive were used as a framework for analysis.

Design & Layout	Option D1	Option D2	Emerging Preferred Option
Factor			
Population & Human Health	Low number of dwellings in vicinity of turbines.	Low number of dwellings in vicinity of turbines.	Option D2
Biodiversity	Removal of peat, forestry and semi-natural areas likely to be required. Turbine layout avoids watercourses. 2 no. turbines located on Annex 1 habitats.	Extent of peat, forestry and semi-natural areas removal will be marginally reduced compared to Option D1. Turbine layout avoids watercourses. No turbines located within Annex 1 habitats; however, some encroachment likely by ancillary infrastructure.	Option D2
Land & Soil	Lands predominantly underlain by peat and peaty subsoils, overlying silt, clay, and sand underlain by sandstone bedrock. 2 no. turbines located in areas of intact bog.	Lands predominantly underlain by peat and peaty subsoils, overlying silt, clay, and sand underlain by sandstone bedrock. No turbines located in intact bog.	Option D2
Water	No particular constraints identified. Turbine layout avoids watercourses; however, access tracks will be required to cross watercourses at 1 no. location (Access between T3 & T4) Proposed turbine on the edge of a river buffer.	No particular constraints identified. Turbine layout avoids watercourses.	Option D2
Air & Climate	No likely significant adverse effects. Project would result in a likely positive overall environmental impact. Positive impact enhanced due to increased renewable energy generation compared to Option D2.	No likely significant adverse effects. Project would result in a likely positive overall environmental impact.	Option D1
Landscape	No protected landscape designations or designated scenic views in immediate vicinity. Lands fully located within an area 'Most Favoured' for Wind Energy Development' as identified within the <i>Roscommon County Development Plan 2022-2028 – Renewable Energy Strategy</i> .	No protected landscape designations or designated scenic views in immediate vicinity. Lands fully located within an area 'Most Favoured' for Wind Energy Development' as identified within the <i>Roscommon County Development Plan 2022-2028 – Renewable Energy Strategy</i> . The marginally reduced footprint of Option D2 compared to Option D1 will marginally reduce the spatial extent of the project and reduce the likelihood of landscape and visual effects and	Option D2

		cumulative effects.	
Cultural Heritage	No significant likely effects identified.	No significant likely effects identified.	Option D1 or Option D2
Noise & Vibration	No significant likely effects identified due to the setback distances available to the nearest dwellings.	No significant likely effects identified due to the setback distances available to the nearest dwellings.	Option D1 or Option D2
Shadow Flicker	No significant likely effects identified due to the setback distances available to the nearest dwellings.	No significant likely effects identified due to the setback distances available to the nearest dwellings.	Option D1 or Option D2
Material Assets (Transport & Access; Aviation and Telecommunications)	Layout would require the construction and upgrade of a number of new site entrances. Additionally, road and junction upgrades likely to be required due to characteristics of existing road network. No significant risk of interference with aviation activities likely; however, consultation with Ireland West Airport and other stakeholders required. No significant risk of interference with existing telecommunication links likely; however, consultation with service providers required	Layout would require the construction and upgrade of a number of new site entrances. Additionally, road and junction upgrades likely to be required due to characteristics of existing road network. Due to the reduced number of tall structures, the possibility of significant interference with aviation receptors is reduced. Similarly, while no significant risk of interference with existing telecommunication links has been identified, the potential for interference is reduced when compared to Option D1. Consultation with service providers required.	Option D2

Table 2.2: Environmental Assessment of Alternative Site Designs and Layouts

Based on this appraisal, it was concluded that Option D2 (10 no. turbines) was the emerging preferred project design and layout for the following reasons: -

- The reduction in turbine numbers, and consequently ancillary infrastructure, minimises the interaction between construction activities and ecological receptors. In particular, the extent of habitats which would be disturbed has been reduced;
- A reduced number of turbines will reduce the likelihood of adverse air quality effects (i.e. temporary dust impacts and vehicular movements etc,) which may arise during the construction phase due to the reduced requirement for excavations, plant & machinery, and materials to be brought to site;
- A reduced number of turbines significantly reduces the direct footprint of the project and, consequently, the likelihood of significant visual impacts. The generous intra-turbine spacing also reduces the likelihood of visual clutter and is evaluated to be more appropriate in this landscape;
- The limited spatial extent of the project and regular spacing between turbines accords with Section 6.9.2 of the Wind Energy Development Guidelines for Planning Authorities 2006 and *Draft Revised Wind Energy Guidelines 2019* for 'Hills and Uplands' landscape character types;
- Option D2 provides for appropriate separation distances to dwellings which reduces the likelihood of significant noise, vibration, and shadow flicker effects; and,

- A consolidated project of 10 no. turbines will require fewer materials (e.g. aggregates and concrete) to be imported to the site. Therefore, fewer vehicular movements will be required during the construction phase thus reducing the likelihood of significant effects on the local road network.

Subsequent to the conclusion that Option D2 was the emerging preferred project design and layout, a technical appraisal of available turbine technology was carried out to determine which turbine model(s) was (were) optimal for the site. A number of turbine types, models and manufacturers were assessed and it was concluded that, at that time, the Vestas V162-7.2MW turbine and the Vestas V136-4.5MW turbine were most suitable for installation at this location (see **Chapter 3** for further details).

2.3.5 ALTERNATIVE GRID CONNECTIONS

The method of connection to the national electricity grid is also an integral element of the overall project which falls to be considered in the EIAR.

In Ireland, the point of connection to the national grid is determined by way of a separate and subsequent statutory process under the auspices of EirGrid/ESB Networks, as grid network operators. While it cannot be determined with complete certainty as to the precise method of connection, a detailed technical analysis was carried out by the Developer of the existing grid network and grid capacity in the region, alongside the predicted electrical output of Option D2, above.

Following this evaluation, a further technical evaluation was completed to identify suitable substations on the national electricity grid to which to connect and the most suitable method of providing this connection. As a result of this analysis, 2 no. grid connection options were identified as being generally viable alternatives, as follows:-

- **Option G1:** Construction of a 110kV substation at the project site (wind farm) and installation of a 110kV underground electricity line (c. 5km in length) within the carriageways of the L55018, L1203, L12032, and L12034 local public roads to the existing Tonroe 110kV substation at Ballaghaderreen, Co. Roscommon, which is located approximately 1.9km to the south of Option D2;
- **Option G2:** Construction of a 110kV substation at the project site (wind farm) and installation of a 110kV underground electricity line (c. 7km) within the carriageways of the L55018, L5501, L5506, L55019, L1203, L12032, and L12034 local public roads to the existing Tonroe 110kV substation at Ballaghaderreen, Co. Roscommon, which is located approximately 1.9km to the south of Option D2.

Other electricity substations, such as the existing 38kV substation at Gorteen (County Sligo), the 38kV substation at Charlestown (County Mayo) and the 110 kV substation at Cunghill (County Sligo) were not considered to be reasonable alternatives to connect the project to the national grid due to the lack of available capacity on the network to accommodate a development of this scale or due to distance.

The location of each of these grid connection options are illustrated at **Annex 2.3** and further evaluated at **Table 2.3** below.

Design & Layout	Option G1	Option G2	Emerging Preferred Option
Factor			
Population & Human Health	Relatively low density of dwellings along the route of the underground electricity line and in the vicinity of	Relatively low density of dwellings along the route of the underground electricity line and in the vicinity of	Option G1 or Option G2

	substation. Likelihood of temporary disruption to local residents and traffic during construction works.	substation. Likelihood of temporary disruption to local residents and traffic during construction works.	
Biodiversity	Identified substation location and electricity line route is generally not sensitive due to being predominately located within carriageway of public roads. The route crosses a number of lower order watercourses and bridge crossings.	Identified substation location and electricity line route is generally not sensitive due to being predominately located within carriageway of public roads. The route crosses a number of lower order watercourses and bridge crossings.	Option G1 or G2
Land & Soil	No likely significant constraints identified.	No likely significant constraints identified.	Option G1 or Option G2
Water	No fluvial flood zones are mapped along the electricity line route. Flooding is not identified as likely. The route crosses lower order watercourses on 4 no. occasions; while the electricity substation is located within proximity of an unnamed watercourse.	No fluvial flood zones are mapped along the electricity line route. Flooding is not identified as likely. The route crosses lower order watercourses on 5 no. occasions; while the electricity substation is located within proximity of an unnamed watercourse.	Option G1
Air & Climate	No likely significant constraints identified. Project would result in a positive overall effect.	No likely significant constraints identified. Project would result in a positive overall effect.	Option G1 or G2
Landscape	Landscape effects from electricity cables largely imperceptible due to nature of the underground electricity line. No designated scenic views in the immediate vicinity.	Landscape effects from electricity cables largely imperceptible due to nature of the underground electricity line. No designated scenic views in the immediate vicinity.	Option G1 or G2
Cultural Heritage	The underground electricity line is located in close proximity (within 100m) of a cultural heritage feature but does not impinge on the footprint of any feature. The substation is not located in close proximity to any feature.	The underground electricity line is located in close proximity (within 100m) of a cultural heritage feature but does not impinge on the footprint of any feature. The substation is not located in close proximity to any feature	Option G1 or Option G2.
Noise & Vibration	Construction activities would take place in the immediate vicinity of a greater number of dwellings along the route in comparison to Option G2. Substation location is remote from dwellings and noise is unlikely to affect local residents.	Construction activities would take place in the immediate vicinity of dwellings along the route of the underground electricity cable. Substation location is remote from dwellings and noise is unlikely to affect local residents.	Option G2
Shadow Flicker	Not applicable	Not applicable	Not applicable

Material Assets (Transport & Access; Aviation Telecommunications)	Short-term, temporary effects likely on transport and access during construction due to requirement for temporary road closures and diversions. No likelihood of significant effects on aviation or telecommunications.	Short-term, temporary effects likely on transport and access during construction due to requirement for temporary road closures and diversions. Over a substantial distance, the route follows public roads which would likely require upgrading to accommodate the delivery of wind turbine components to Location L1. Consequently, works could be undertaken concurrently thus reducing the extent of disruption to local road users. No likelihood of significant effects on aviation or telecommunications.	Option G2
--	--	--	-----------

Table 2.3: Environmental Assessment of Alternative Grid Connection Options

Based on this appraisal, it was concluded that neither Option G1 nor G2 were considered likely to give rise to significant effects. However, following consultation with the Roads Department of Roscommon County Council who expressed a preference for Option G2 given that many of the involved roads would be the subject of upgrade works to accommodate the delivery of wind turbine components, Option G2 was, therefore, selected as the preferred route for infrastructure connecting the wind farm to the national electricity network and has been assessed throughout this EIAR. The grid connection infrastructure will be subject to a separate future development consent process, including EIA. However, as also discussed above, it may be the case that EirGrid/ESB Networks ultimately direct the Developer to undertake an alternative mode of connection. In such an eventuality, a further development consent process, including EIA, will also be required.

2.3.6 ALTERNATIVE HAUL ROUTES

2.3.6.1 Turbine Components

It should be noted that there are a number of ports of entry for turbine components into Ireland and, therefore, an exact haul route cannot be confirmed until the completion of the turbine tendering process i.e. prior to construction. The turbine manufacturer will ultimately determine the port of entry and, subsequently, the chosen haul route. However, given the relative proximity of Option L1 to the N5 national primary road, it can be confirmed that turbine components will travel along this route to its junction with the R293.

It is likely that turbine components will enter via the Port of Galway; however, components may also enter via Dublin Port or the Port of Waterford. Turbine components travelling between any of the aforementioned ports and the junction of the N5 and R293 will utilise national (including motorway) routes which are regularly used in the transportation of turbine components and will not require any particular modification works.

For the purposes of this EIAR, the Port of Galway has been selected (for assessment purposes only) as the most likely port of entry for turbine components. It is envisaged that, from the Port of Galway, the turbines will be transported by specialised heavy-goods vehicles (HGVs) for the transport of turbine components along the L5048, R339, L5034, R336, N6, M6, M17, N17, N5, R293, L5501 and various local roads in the

immediate vicinity of the project site before accessing the site via the proposed site entrances.

As the delivery vehicles approach the vicinity of the wind farm site, it will be necessary to transition from the national road network to local roads. Due to the more constrained nature of these roads, a combination of temporary and permanent works will be required to facilitate safe turbine delivery. These works will include road widening, junction modifications, removal of street furniture, and reprofiling of certain road sections. In some cases, permanent upgrades will be implemented to improve long-term access and benefit the local community.

The necessary works are described in detail at **Chapter 3**.

2.3.6.2 Construction Materials

The construction phase of the project will require materials, such as stone aggregates and concrete, to be imported to the project site from selected suppliers. No concrete batching will be undertaken at the project site, and all concrete will be imported from local suppliers.

A range of potential local suppliers have, therefore, been identified and the potential haul routes to the main site entrance are illustrated at **Annex 2.4**. Potential suppliers include: -

- Harrington Concrete & Quarries, Cloghvoley, Kilkelly, County Mayo;
- Hanly Quarries, Laragan, Elphin, County Roscommon;
- Maloney Quarries, Collagh, Swinford, County Mayo;
- Austin Grogan & Sons Limited, Cave, Ballyhaunis, County Mayo;
- Roadstone Boyle, Rathdiveen, Boyle, County Roscommon;
- Ward Bros. Quarry, Ballyfeeney, Kilglass, Strokestown, County Roscommon; and,
- Harrington Concrete & Quarries, Carrowscoltia, County Mayo.

The selection of construction material suppliers will be subject to a competitive tendering process prior to the commencement of development. Therefore, it is not currently possible to determine the precise material haul routes. While it is evaluated that there is no likelihood of significant adverse effects on either the road network or third party access as a result of the movement of construction related vehicles using any of the likely haul routes; in order to reduce any minor effects yet further, the chosen suppliers will be instructed to utilise motorway, national and regional roads, and avoid local roads, insofar as is possible and practicable. Thus, while the indicative haul routes presented at **Annex 2.4** do not necessarily represent the most direct route to the project site, they are deemed to be the most appropriate to ensure the protection of the road network in the region.

2.4 CONCLUSION

This chapter has provided a description of the reasonable alternatives, which are relevant to the project and its specific characteristics which have been assessed, evaluated and analysed, and an indication of the main reasons for selecting the preferred option, including a comparison of environmental effects. The 'Do Nothing' Alternative; Alternative Technologies; Alternative Locations; Alternative Design & Layouts; Alternative Grid Connections and Alternative Haul Routes have all been discussed and analysed.

The objective of this process was to avoid any likely significant adverse effects on the environment through the selection of a location for the project which avoided inherent environmental sensitivities, in favour of a location which had fewer constraints and greater capacity to sustainably assimilate the project. Once the preferred location was identified, a series of alternative designs and layouts were evaluated through a recursive, iterative design process, intended to resolve any likely significant environmental effects through an examination of localised constraints, including in the embedding of mitigation measures in the emerging preferred project design and in the design and routing of off-site/secondary developments, which allowed the project designers to make informed decisions based on these constraints.

The final project assessed in this EIAR has therefore adopted the combination of design and layout options that strike the best balance between the avoidance of any likely significant environmental effects and achievement of the objectives of the project.