

3 REASONABLE ALTERNATIVES

3.1 INTRODUCTION

This chapter of the EIAR contains a description of the reasonable alternatives that were studied, which are relevant to the proposed project and its specific characteristics, and provides details of the main reasons for the option chosen, taking into account the likely significant effects on the environment. Alternatives were assessed taking commercial, construction, operational and environmental constraints and facilitators into consideration.

The proposed project is described in detail in Chapter 2 – Description of the Proposed Project and cross-references are included within this chapter, where relevant.

3.2 STATEMENT OF AUTHORITY

This chapter was prepared by Sinéad Ryan, Associate Director in TOBIN. Sinéad holds a BSc in Environmental Science and an MSc in Environmental Engineering. She has over twenty years' experience in environmental management roles across the public, industrial and consultancy sector, including over ten years' experience in wind farm EIA and in project management of wind energy planning submissions. Sinéad has particular experience in feasibility and constraints analysis of potential wind energy sites throughout Ireland and as a result has developed extensive experience in the consideration and assessment of alternatives.

3.3 RELEVANT LEGISLATION AND GUIDANCE

The following legislation is applicable to the description of reasonable alternatives in an EIA context and was adhered to in the preparation of this chapter:

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (herein referred to as the “EIA Directive”)

The following documents and guidance were also consulted:

- Department of Environment, Community and Local Government (2017) *Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems - Key Issues Consultation Paper*;
- Environmental Protection Agency (EPA) (2022) *Guidelines on the Information to be contained in EIARs*;
- European Union (2017) *Environmental Impact Assessment of Projects - Guidance on the preparation of the EIAR*;
- Department of Housing, Planning and Local Government (2018) *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*;
- Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2012).

3.3.1 EIA Directive

Article 5 of the amended EIA Directive, relating to the preparation of an EIAR by the developer, was amended to state the following should be included regarding alternatives:



“...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)(d)).

This is further reinforced in Annex IV of the amended EIA Directive (Information Referred to in Article 5(1) (Information for the EIAR)) which states that:

“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.”

3.3.2 EU EIA Guidance

The Environmental Impact Assessment of Projects - Guidance on the preparation of the EIAR (European Union, 2017) states the following in relation to alternatives:

“must be relevant to the proposed project and its specific characteristics, and resources should only be spent on assessing these alternatives” and 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”¹.

3.3.3 EPA EIA Guidance

Section 3.4 (Consideration of Alternatives) of the EPA Guidelines on the Information to be Contained in EIARs (May 2022) states: *‘The presentation and consideration of the various alternatives investigated by the developer is an important requirement of the EIA process’ and that ‘Effect avoidance is principally achieved by consideration of alternatives. Where significant adverse effects are identified then alternative options are identified and evaluated. The objective is to adopt the combination of options that presents the best balance between avoidance of significant adverse environmental effects and achievement of the objectives that drive the project.*

It is also noted that *‘Analysis of high-level or sectoral strategic alternatives cannot reasonably be expected within a project level EIAR’ and “that the amended Directive refers to ‘reasonable alternatives... which are relevant to the proposed project and its specific characteristics’.²”*

Section 3.4 outlines the different types of alternatives that may be considered, including:

- Alternative Locations;
- Alternative Layouts;
- Alternative Designs;
- Alternative Processes; and
- Alternative Mitigation Measures.

The purpose of alternatives analysis is therefore principally to examine the different possibilities for meeting the Project's need and objectives and to determine whether or not the

¹ https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

² https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf



Project objectives can be met by different means that avoid, minimise, or mitigate potential significant environmental effects of the project.

3.4 METHODOLOGY

In accordance with the aforementioned requirements of the EIA Directive and taking into account the aforementioned guidance documents, this chapter addresses alternatives under the following headings:

- 'Future Baseline', i.e. without the proposed project proceeding (Section 3.5).
- Alternative Locations (Section 3.6);
- Alternative Design/Layouts (Section 3.7);
- Alternative Technology (Section 3.8);
- Alternative Timelines and Construction Methodology (Processes) (Section 3.9);
- Alternative Mitigation Measures (Section 3.10)

When considering a wind farm development, given the intrinsic link between turbine layout and design, both will be considered collectively in this chapter. During the design phase of the proposed project, alternative wind farm layouts and scales, alternative grid connection options and alternative turbine delivery route options were fully considered in order to find the optimum design solution with the least environmental impact. This chapter initially outlines the site selection process, followed by the design evolution process and the reasonable alternatives considered during that process, including a comparison of the environmental effects and, finally, the key reasons for proceeding with the option chosen.



3.5 FUTURE BASELINE SCENARIO

The 'Future Baseline Scenario' is to not develop the proposed project and to allow the existing environment to remain and evolve as it is, with no changes to the current land-use practices. A comparison of the likely significant residual effects of the environmental aspects of the proposed project and the 'Future Baseline' is provided in Table 3-1.

In a 'Future Baseline' scenario, the prospect of capturing a valuable renewable energy resource at this location would be lost and as a result the opportunity to contribute to meeting binding Government and EU targets to produce electricity from renewable resources and the reduction of greenhouse gas emissions would also be lost. Furthermore, the chance to generate additional local employment and investment would not occur, the local economy would remain less diverse and continue to rely primarily on agriculture and forestry as its main source of income.

The 2009 EU Renewable Energy Directive (2009/28/ EC) (anecdotally referred to as RED I) set Ireland a legally binding target to meet 16% of our energy requirements from renewable sources by 2020. In 2018, the Directive was recast (2018/2001/EU) (RED II) to move the legal framework to 2030 targets, setting a new binding target of at least 32% with a clause for a possible upwards revision by 2023. The RED II Directive was amended by the RED III Directive (EU/2023/2413), which entered into force on 20 November 2023. The RED III Directive has been transposed into Irish legislation by way of European Union (Planning and Development) (Renewable Energy) Regulations 2025 (S.I. 274 of 2025) with the majority of the provisions coming into effect on 7th August 2025. RED III sets an EU-wide target of 42.5% renewable energy consumption by 2030. In July 2024, Ireland set its national contributions to this target in its updated NECP - Ireland's overall RES target is now 43% by 2030. Ireland's renewable energy share of gross final consumption was 14.6% in 2024, which remains significantly below the RED III and adopted NECP target.

The Climate Action and Low Carbon Development (Amendment) Act 2021 provides a legislative framework for the achievement of climate goals, including the following:

- Establishment of a 2050 target in law – known as the 'National 2050 Climate Objective' by committing to a climate resilient and climate neutral economy by the end of the year 2050;
- Annual revisions of the Climate Action Plan and the requirement to prepare a National long-term Climate Action Strategy at least every decade;
- Obligation for greater climate action at regional and local level, with local authorities required to develop five-year Climate Action Plans with mitigation and adaptation measures included.

The 2025 Climate Action Plan (CAP25) retains one of the most important measures of the previous Action Plans (CAP23 and CAP24), namely to:

- Increase the share of electricity demand generated from renewable energy sources of 80% by 2030, indicatively comprised of:
 - At least 5 GW of offshore renewable energy;
 - 9 GW of onshore wind capacity;
 - 8 GW of solar photovoltaic (PV) capacity including 2.5 GW of non-new grid solar; and
 - Green hydrogen production from renewable electricity surplus generation.



According to recent figures published by Wind Energy Ireland, the total installed onshore wind capacity in Ireland in February 2026 was just over 5 GW, therefore a further 4 GW is required to be installed between 2026 and 2030 to meet the binding CAP target of 9GW.

Energy Security in Ireland to 2030 published by the Department of Climate, Energy and the Environment in November 2023 and updated in February 2026, outlines a strategy to ensure energy security in Ireland to 2030, while ensuring a sustainable transition to a carbon neutral energy system by 2050. The report sets out that Ireland's future energy will be secure by moving from an oil- and gas-based energy system to an electricity-led system, which will be renewables-led.

Under the 'Future Baseline' scenario, the proposed project would not go ahead, there would be no opportunity to supply additional renewable energy to the National Grid at this location, and the current land-uses (primarily commercial forestry and agriculture) would remain and evolve as they are. The prospect of creating sustainable energy, and therefore the potential contribution of the project to Ireland's renewable energy and GHG reduction targets set out in the CAP25 would be lost. The proposed project will reduce Ireland's greenhouse gas emissions by approximately 51,333 to 67,373 tonnes of CO₂e for every year of operation, based on a power output ranging from 77-110.8 MW (refer to Chapter 12 – Climate). In a 'Future Baseline' scenario, these savings would not occur. Importation and use of fossil fuels would continue, and Ireland's energy security would remain vulnerable. According to EirGrid's *All-Island Generation Capacity Statement 2021 – 2030*, the growth in energy demand for the next ten years will be between 18% (low demand scenario) and 43% (high demand scenario)³. Furthermore, EirGrid's most recent annual *All-Island Resource Adequacy Assessment*⁴(February 2026), which looks at the balance between electricity demand and supply in Ireland over 10 years, found that to meet the country's likely electricity demand between 2026-2028 "additional capacity is required".

In addition, the proposed project will provide employment both in the local area and to the wider economy through the construction and operational phases as described in Chapter 4 - Population and Human Health. Under the 'Future Baseline' scenario, the socio-economic benefits associated with the proposed project would not occur and a Community Benefit Fund, required for participation in the Renewable Electricity Support Scheme (RESS), would not be established.

In the scenario where the proposed project does not proceed and the land-uses continue as they are currently, the opportunity to contribute to meeting binding Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions would be lost.

³<http://www.eirgridgroup.com/site-files/library/EirGrid/208281-All-Island-Generation-Capacity-Statement-LR13A.pdf>

⁴ https://cms.eirgrid.ie/sites/default/files/publications/AIRAA-2026-2035_Ireland.pdf



Table 3-1: Residual Effects of Proposed Project relative to Future Baseline Scenario

Environmental Topic	Residual Effects of Proposed Project	Future Baseline Scenario
Population and Human Health	<ul style="list-style-type: none"> No residual effects during construction, operation or decommissioning due to the design of the project (appropriate siting and setback distances, use of borrow pits to reduce traffic effects), and implementation of best practice measures to control and manage dust, noise and water effects. Long-term positive economic benefit to local area due to employment creation and community benefit fund. 	<ul style="list-style-type: none"> No potential for construction, operation or decommissioning phase effects as a result of the proposed project. No increase in employment as a result of the proposed project. No long-term investment in sustainability in the locality. No community benefit fund. Forestry would continue to be clear-felled / managed. Agricultural practices would continue.
Biodiversity	<ul style="list-style-type: none"> No significant residual effects on majority of identified important ecological features. Significant residual effects at a local geographic scale through loss of a combined total of approx. 9.7 ha of cutover bog, upland blanket bog, dry siliceous heath/dry humid acid grassland, mixed broadleaf woodland, potential marsh fritillary habitat and approx. 1.53 km of treelines and hedgerows. However, effects will be reduced to no significant residual effects through a combination of replanting and habitat recreation compensation measures. Other biodiversity enhancement measures proposed, which will have a net positive effect. 	<ul style="list-style-type: none"> Forestry would continue to be clear-felled / managed. Agricultural practices would continue. No potential for construction/operation/decommissioning phase effects. No biodiversity enhancement works would occur.
Ornithology	<ul style="list-style-type: none"> No significant residual effects predicted for most identified important ornithological features. A significant residual effect was identified at the assessment stage for breeding hen harrier, at the national scale and in relation to the Leitrim Uplands non-designated important breeding area for hen harrier, due to operational displacement of nesting and foraging habitat. However, effects are addressed through the provision of compensatory nesting enhancement areas and extensive foraging habitat enhancement, for the operational lifetime of the wind farm, and is therefore reduced to no significant residual effects. The management measures proposed for hen harrier will also provide ancillary benefits to other upland bird species. 	<ul style="list-style-type: none"> Forestry would continue to be clear-felled / managed. Agricultural practices would continue. No potential for construction, operation or decommissioning phase effects to bird populations. No biodiversity enhancement works would occur.



Environmental Topic	Residual Effects of Proposed Project	Future Baseline Scenario
Land, Soils and Geology	<ul style="list-style-type: none"> • Not significant, imperceptible residual effects on land use, land contamination, mineral/aggregate resources, soil compaction and erosion potential, peat and soil stability, and geological heritage sites following implementation of mitigation measures. • Peat Stability Risk Assessment concludes low to negligible hazard ranking for instability due to the design of the project and the proposed mitigation measures. 	<ul style="list-style-type: none"> • Forestry would continue to be clear-felled / managed. • Agricultural practices would continue. • No potential for construction/operation/decommissioning phase effects.
Hydrology and Hydrogeology	<ul style="list-style-type: none"> • No significant residual effects on surface water quality or flow, groundwater quality or flow, or flood risk, following implementation of mitigation measures. 	<ul style="list-style-type: none"> • Forestry would continue to be clear-felled / managed. • Agricultural practices would continue. • No potential for construction/operation/decommissioning phase effects.
Noise and Vibration	<ul style="list-style-type: none"> • Not significant residual effects associated with construction activities following implementation of mitigation measures outlined in Chapter 9 – Noise and Vibration and Appendix 2-4 CEMP. • Temporary moderate effect along the grid route at certain dwellings during construction. • New sources of noise (wind turbines and substation) introduced during operation, however levels will be below proposed threshold values at sensitive receptors, therefore residual effects will be not significant. • No significant vibration effects during construction, operation or decommissioning. 	<ul style="list-style-type: none"> • No potential for sensitive receptors to experience construction noise during the construction works. • No potential for sensitive receptors to experience operational noise from wind turbines or substation.
Shadow Flicker	<ul style="list-style-type: none"> • No significant residual effects at any identified sensitive receptor due to a combination of distance from turbines and implementation of a defined turbine shutdown scheme whereby a built-in shadow flicker control system to automatically shut down turbines. 	<ul style="list-style-type: none"> • No potential for shadow flicker due to absence of wind turbines.
Air Quality and Climate	<ul style="list-style-type: none"> • Not significant to imperceptible residual effects on nearby human receptors and sensitive designated habitats arising from fugitive dust emissions following mitigation during construction. • Long-term positive effect on air quality and climate due to avoidance of burning of fossil fuels and the net displacement of between 51,333 and 67,373 tonnes of CO2 per annum. 	<ul style="list-style-type: none"> • No potential for construction phase effects such as dust emissions. • Missed opportunity to contribute to the reduction of carbon and greenhouse gas emissions.



Environmental Topic	Residual Effects of Proposed Project	Future Baseline Scenario
Landscape and Visual	<ul style="list-style-type: none"> • Wind turbines will be prominent features within the immediate and surrounding area, however they are set back from surrounding receptors and fully comply with the current WEDG's (2006) and the Draft Revised WEDG's (2019) in relation to visual amenity offsets. • Residual visual effects ranging from moderate to imperceptible at most viewpoints and overall not significant. • Partially or fully screened from all designated scenic or amenity areas. 	<ul style="list-style-type: none"> • Existing landscape and visual amenity in the area will remain unchanged, though any cumulatively considered projects will continue to operate or be built.
Cultural Heritage	<ul style="list-style-type: none"> • Imperceptible to slight direct residual effects on identified monuments/features due to embedded mitigation (avoidance) and implementation of additional mitigation during construction, as outlined in Chapter 14 – Cultural Heritage and Appendix 2-4 CEMP. • Indirect visual effects on identified and unknown monuments/features not significant. 	<ul style="list-style-type: none"> • No potential effects on archaeology, architecture or cultural heritage, though any cumulatively considered projects will continue to operate or be built.
Traffic & Transportation	<ul style="list-style-type: none"> • Moderate localised short-term residual effects on local roads in the vicinity of the site due to increase in traffic during construction and decommissioning. 	<ul style="list-style-type: none"> • No potential increased traffic volumes on local roads. • No works required at existing or new entrances for the proposed wind farm, along the grid connection route or turbine delivery route.
Material Assets	<ul style="list-style-type: none"> • No residual effects on identified material assets (telecoms, electrical, water, wastewater or waste infrastructure) due to embedded mitigation, i.e. the wind farm has been designed to avoid these assets. • Positive effect due to provision of new electricity generation and transmission assets. 	<ul style="list-style-type: none"> • No potential for effects on identified material assets other than those that may be associated with existing land-uses (forestry agriculture, traffic and use of L6184 local road)
Major Accidents & Natural Disasters	<ul style="list-style-type: none"> • No significant effects from, or to, the proposed project as a result of major accidents and natural disasters 	<ul style="list-style-type: none"> • No potential for major accidents or natural disasters, though any cumulatively considered projects will continue to operate or be built.



3.6 ALTERNATIVE LOCATIONS

The Applicant, FuturEnergy Lissinagroagh Designated Activity Company is owned by FuturEnergy Ireland, which is a Coillte and ESB joint venture company formed in November 2021. The company has extensive experience in the selection of suitable sites for wind energy developments and regularly examine potential sites throughout Ireland.

In 2014, Coillte's Renewable Energy Development Team undertook a detailed screening process of their land portfolio (c. 441,000 hectares or 7% of Ireland's land area) using Geographical Information System (GIS) software applying a number of criteria and stages to assess the potential of a large number of possible sites to assess their suitability to accommodate a wind energy development. The GIS database drew upon a wide array of key spatial datasets such as forestry data, Ordnance Survey land-use data, house location data, transport, existing wind energy and grid infrastructure data, and environmental data such as ecological, landscape and archaeological designations and policy-supported areas potentially suitable for wind development that were available at the time.

The following is a summary of the methodology used in this screening process:

3.6.1 Phase 1 – Initial Screening

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

- Committed lands for other developments;
- Millennium Sites - this is a Coillte environmental designation – these sites were planted and managed for provision of a tree for every household in the country as part of the Millennium tree planting project);
- Life Sites – also a Coillte environmental designation – these former forested sites were cleared and are now managed for biodiversity;
- Wild Nephin Properties – also a Coillte designation. Since 2014 these properties have been incorporated into National Parks;
- Farm Partnerships and Leased Lands;
- National Parks;
- Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA).

County Development Plans and Renewable Energy Strategies were reviewed, and only sites which were assigned at a minimum) “open for consideration” for wind farm development or with more favourable zoning of “acceptable in principle” or “strategic for wind development” were considered.

Sites with an average wind speed at 100 metres above ground level of less than 6.5 m/s were discounted as these would potentially be unsuitable for a commercially viable wind energy development. In addition, sites with a contiguous area of less than 300 hectares were discounted.

3.6.2 Phase 2 – Grid Constraints

As part of the site selection process, the potential for grid connection was assessed, including assessing the distance to potential connection nodes and the available capacity at the nodes to accommodate the connection.



3.6.3 Phase 3 – Detailed Assessment

A screening process was conducted across the country in 2014 and again in 2017 which identified a number of suitable sites, which were then taken forward for detailed assessment, namely:

- Croagh, Co. Leitrim;
- Carrownagowan, Co. Clare;
- Glenard, Co. Donegal;
- Bottlehill (Coom), Co. Cork; and
- Castlebanny, Co. Kilkenny.

In 2017, Coillte once again examined its land portfolio for potential sites for wind energy development using the same site selection process described above, but on this occasion reducing the required contiguous site area from 300ha to 100ha.

The proposed sites that emerged from this process are as follows:

- Ballinagree Co. Cork;
- Croaghaun, Co. Carlow;
- Gortyrhilly, Co. Cork;
- Inchamore Co. Cork;
- Cahermurphy, Co. Clare; and
- Lissinagroagh, Co. Leitrim.

The sites identified in this process, including Lissinagroagh were transferred into the FEI development portfolio. Each are projects in their own right which are/will be subject to EIA. As such a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts has been provided in the EIAR accompanying the applications for same.

It should be noted that the Applicant continuously assesses lands for wind farm development opportunities, on its own and in conjunction with other developers. Sites previously identified or not progressed for various reasons, including local county development plan wind designations or commercial viability, have been and will be brought forward as circumstances evolve. Such circumstances may include an increased national ambition for onshore wind development, changes on foot of cyclical review/updates to local wind energy policies in county development plans, or third-party lands becoming available and resulting in new commercial opportunities/joint venture projects.

The alternative to this would be to bring forward a site that did not pass one or all of the above phases of the screening process. In that instance, there would be the potential for the construction and operation of a wind energy development to have an adverse effect on ecologically designated or sensitive areas and visually sensitive (scenic) or amenity areas. There would also be the potential for greater shadow flicker, noise and traffic impacts if the candidate site was located in an area with a higher number of residential dwellings. In addition, a site with an average wind speed less than 7m/s (at 80m above ground level) and/or not located within practical proximity of existing grid infrastructure and may not be economically viable.



A summary of the site selection criteria and rationale for selection of the chosen option (site) is provided in Table 3-2.



Table 3-2: Site Selection Criteria and Rationale for Selection of Chosen Option

Criterion	Rationale for Selection
Grid Access/Capacity	The proposed project will include an onsite 110 kV substation which will be directly connected to the grid at the existing 220kV ESBN Srananagh substation by way of a 32 km underground cable. While there are other nodes in closer proximity to the site (Corderry 110kV substation ca. 13.5km south and Cathaleen Falls 110kV substation ca. 21km north), there is currently no available capacity at these nodes due in the main to the operational wind farms and other electricity-generating facilities in South Leitrim and Donegal. A connection to Srananagh therefore is the most technically and economically feasible option.
County Development Plans and Zoning	12 of the 14 proposed turbines within the proposed wind farm site are located within an 'Available Area' for wind energy development as defined in the Leitrim County Development Plan Renewable Energy Strategy 2023-2029. Two turbines (T10 and T12) are located immediately west and southwest of the Available Area boundary. The designation within the current CDP is informed by a range of environmental and planning constraints, including European and Ramsar sites, heritage assets, settlement patterns, and established infrastructure, in addition to the application of standard setback distances (including the 500 m buffer to residential receptors, as per the Wind Energy Development Guidelines 2006 and the draft 2019 Guidelines). In this regard, and with reference to landscape and visual, T10 and T12 do not give rise to any conflict with these underlying constraints. The turbines are appropriately sited with respect to sensitive receptors and are located well beyond the prescribed visual amenity setback distances, thereby ensuring that residential amenity and visual considerations are adequately protected.
Proximity to Houses	The proposed wind farm site is in a relatively remote location surrounded by a mixture of forestry and agricultural land. It was therefore considered that the setback distance requirements of 500 m (specified in the current Wind Energy Guidelines 2006), could easily be met at this location. The nearest residential dwellings are more than 4 x tip height (740 m) from the proposed turbine locations, which also meets the setback requirements of the Draft Revised Wind Energy Development Guidelines 2019, which are not yet in force.
Wind Resource Assessment	SEAI's Wind Atlas (https://maps.seai.ie/apps/WindAtlas/) was consulted to determine the mean wind speed at the proposed wind farm site. The site has a wind speed of between 7.0 m/s and 8.2 m/s at 100 m above ground level and was considered to be suitable in the context of operational efficiency and the nature of modern-day turbine technology. The site was therefore identified as suitable for wind energy.
Ecological Sensitivity	The proposed wind farm site is not located within any Natura designated sites i.e. SACs, SPANHAs or pNHAs. Within the proposed wind farm site, it is anticipated that no instream works will be required on any watercourses and clear span bridges will be used where



Criterion	Rationale for Selection
	proposed tracks cross watercourses., Within the grid connection works areas, horizontal directional drilling (HDD) will be used to cross watercourses, ensuring no instream works are required. Eleven (11) existing bridge crossings are required of which eight (8) will be crossed using in-road HDD, two (2) using off-road HDD and one (1) will be a standard crossing within the bridge deck.
Archaeological Sensitivity	There are no known recorded monuments or buildings within the proposed wind farm site, proposed GCR or TDR. There will be no direct effects on recorded archaeological, architectural or cultural heritage assets as a result of the construction of the proposed project. There will be likely direct effects to previously unrecorded cultural heritage sites, although these will not be significant as any remains that are encountered during the course of monitoring or test trenching will be subject to preservation by record or preservation in-situ.
Landscape Capacity/ Cumulative Impact	<p>There is one operational wind farm located west of the proposed wind farm site, namely Faughary Wind Farm, comprising three turbines, 119 m in height. There are two further wind farms within 10km, namely Carrickeeny Wind Farm (4 turbines) located approximately 8km to the west and Tullynamoyle (19 turbines) located approximately 10 km to the south. The proposed Croagh Wind Farm (10 turbines) is located approximately 17km to the southwest and Tullynamoyle New (4 turbines) adjacent to the operational Tullynamoyle Wind Farm.</p> <p>In terms of landscape capacity, it is therefore considered that there are relatively few turbines in proximity to the proposed wind farm site and it is anticipated that the proposed turbines, whether considered in isolation or cumulatively with nearby wind energy developments, will not have significant landscape or visual effects.</p>
Land Use	The land use/activities on the site are primarily commercial forestry and agriculture. The topography of the proposed wind farm site varies from around 170 m AOD to 380 m AOD. The highest points are Saddle Hill (375 m AOD) to the northwest and Dough Mountain to the southeast (472 m AOD), within the site broadly spread across the intervening side slopes and the lower lying commercial forestry and agricultural lands. As part of the Coillte forestry plantation, many parts of the proposed wind farm site which are currently forested will be clear-felled at some point in the future as part of the ongoing forestry growth cycle, while agricultural areas will continue to be managed as they are currently. Based on the above, the land use at the site was found to be compatible with wind energy development.
Flood Risk Analysis	There is no history of flooding within or in the vicinity of the proposed wind farm site. The closest historic flood event, attributed to fluvial flooding from the Ballagh River, occurred approximately 3.5 km to the north of the site at Rossinver. Within the site itself extensive arterial drainage has been undertaken within the Coillte plantations, therefore, the site is currently well-drained. It is anticipated that surface water arising in developed areas of the site will be managed by a dedicated stormwater drainage system designed in accordance with Sustainable Drainage Systems (SuDS) principles, limiting discharge from the site to greenfield runoff rates.



Criterion	Rationale for Selection
Supporting Transport Infrastructure	<p>The transport infrastructure in the surrounding area is deemed to be sufficient to accommodate the proposed project. The site is in proximity to and readily accessible from the N16 national primary road from Sligo merging with the A4 to Enniskillen, the R282 regional road from Manorhamilton to Rossinver, and the supporting local road network. The site can be accessed from the south via the L61842 local road diverging from the L6184 off the N16 east of Manorhamilton and from the west via the L61801 diverging from the R282.</p> <p>With access to the site achievable from both the west and south, there are options for temporary and permanent access points for construction and operational traffic. This will also reduce the number of construction vehicles seeking to access the site at one particular location. Within the existing Coillte landholdings, there are forest roads which provide good coverage and are well maintained and in good condition. There are also several local roads both within and adjacent to the turbine locations.</p> <p>The road network from Killybegs to the site for turbine delivery is predominantly national road (N56, N15, N16) and the grid connection route between the site and the existing ESN Srananagh substation in south Co. Sligo is also accessible from a network of local and regional roads.</p>



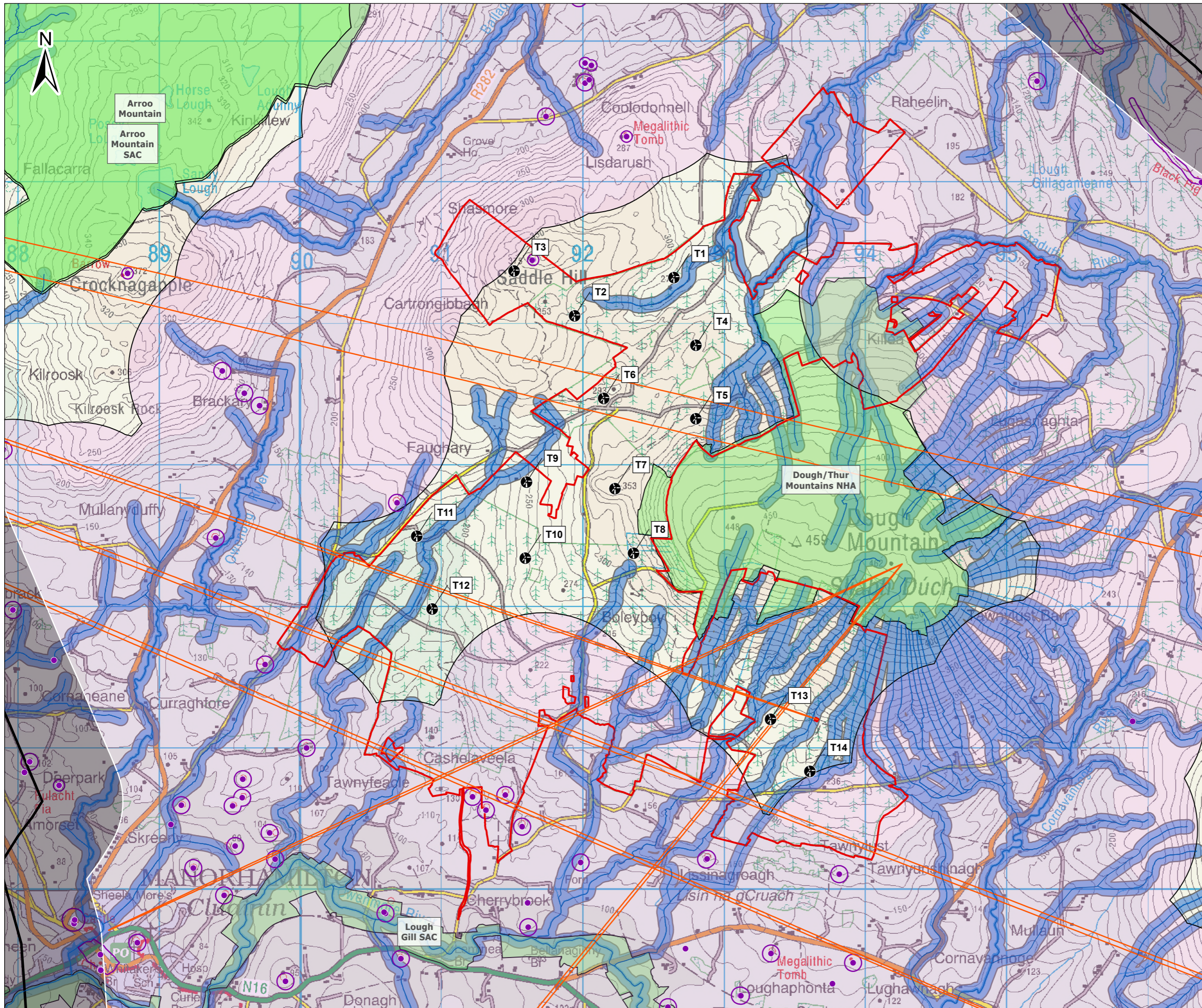
3.7 ALTERNATIVE DESIGNS & LAYOUTS

As part of the EIA process, surveys of the proposed project study area and surrounds were carried out to establish the baseline environment. Potential constraints to development, e.g. existing infrastructure, sensitive receptors, watercourses, ecologically sensitive areas, archaeological sites, telecommunication links etc. were identified and mapped. These were revised and refined as further detailed assessment was undertaken. Separation distances to identified constraints were determined using GIS (refer to Figure 3-1).

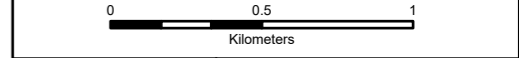
Stakeholder consultation for the proposed project included EIA scoping consultation with statutory and non-statutory bodies and consultation with the local community. The feedback from consultation informed the site layout/design. Refer to Section 1.8.2 of Chapter 1 – Introduction.

The site layout design stage considered the size, number and positioning of turbines and layout of associated site infrastructure i.e. internal access tracks, temporary construction compounds, substations, etc. Alternatives considered for each of these elements are documented in the following sections. It was an iterative process comprising input from the design team, environmental specialists, internal and external stakeholders. As an iterative process, potential environmental effects were reduced or eliminated through changes to the design, where possible. The constraints which were identified are provided as Figure 3-1. Constraints and environmental sensitivities were first identified, and buffers applied in order to determine a viable area within the site to accommodate development. The constraints identified are presented in Figure 3-1 and resulting design solutions are listed in Table 3-3.





- Legend**
- Wind Farm Study Area
 - Turbine Locations
 - Rivers/Streams
 - Rivers/Streams Buffer (50m)
 - Recorded Sites or Monuments (SMR)
 - Recorded Sites or Monuments (SMR) - Zone of Notification
 - Residential Dwelling Buffer (740m/ 4 x tip height)
 - Designated Sites (SACs, NHA, pNHAs)
 - Telecom Links
 - 110kV Overhead Line
 - 110kV Overhead Line Buffer (570.5m/3.5 x rotor diameter)



Spatial Reference
 Datum: IRENET95
 EPSG: 2157

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A	18/02/2026	Draft issue	S.P	S.R
Rev	Date	Description	By	Chkd.

Client:

Project:
 Lissinagroagh Wind Farm

Title:
 Figure 3-1:
 Constraints Map

Scale @ A3: 1:25,000

Prepared by: S.Pezzetta Checked by: S.Ryan Date: February 2026

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Map Ref: 10955-065-ENV.C-P.App.BO-TOB-A Draft: A

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3.7.1 Siting and Layout of Wind Turbines

The initial constraints study (Figure 3-1) identified a significant viable area within the proposed wind farm site (Figure 3-2), in which potential turbine layouts were developed. The location of individual turbines is influenced by a range of design constraints and facilitators. Information and data regarding the proposed site was compiled and assessed through baseline studies, constraints identification and analysis and consultation with relevant statutory and non-statutory bodies (listed in Section 1.8.2, Chapter 1 – Introduction). The number, size and location of turbines were revised and amended to take account of the constraints (and associated buffer zones) including visual, noise, ecological, telecoms and topographical (slope) constraints. The layout was optimised using appropriate wind farm design software to optimise the energy yield from the site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance.

Consideration was also given to relevant guidance, namely the current 2006 WEDGs, the 2012 IWEA Guidelines, the 2022 EPA EIAR Guidelines and the 2019 Draft Revised WEDGs, in particular with regards to setback distances to dwellings.

Within the viable area which emerged, two main alternative designs/layouts (to the proposed final design/layout) were considered throughout progressive stages of the design. These alternative designs / layouts are illustrated in Figure 3-2 and Figure 3-3. The adjustments through each layout iteration resulted in changes to the turbine locations to ensure sufficient distances were maintained from sensitive receptors and other identified constraints illustrated in Figure 3-1, and also to maintain the required separation distances between turbines themselves.

Initial Layout

The initial site layout (Figure 3-2) contained twenty (20) turbines within the viable area.

Layout 2

Further ecological and ornithological surveys undertaken at the site indicated the presence of sensitive ecological receptors, including hen harrier breeding and foraging areas and Annex 1 habitats. As a result, the layout was adjusted to avoid these areas and the number of turbines was reduced to eighteen (18) (Figure 3-2).

Final Layout

Intrusive ground investigations were subsequently undertaken (refer to Appendix 2-6 A, B, C) to determine ground conditions at the turbine and substation locations, primarily to inform constructability in the steeper areas. Ground truthing and surveying of mapped watercourses, drainage features and karst features was also undertaken. As a result of the information gathered, four (4) turbines in the southeast were removed from the layout to avoid watercourses and their associated buffers and elevated areas, which would be difficult to access. The final layout contains fourteen (14) turbines, a substation in the west adjacent to the L61801 public road, three borrow pits, two (2) construction compounds and two (2) site entrances (see Figure 3-3).

A summary of the design layouts considered is set out in Table 3-3. The potential environmental effects of the initial layout (20 turbines) and the second layout (18 turbines) when compared with the current proposed layout (14 turbines), are provided in Table 3-4.



Table 3-3: Summary of Layout Design Changes

	Initial Layout - 20 Turbines	Layout 2 - 18 Turbines	Final Layout - 14 Turbines
No. of Turbines	20	18	14
Distance to Houses	>750m	>750	>760m
Turbine Height (m)	180 - 185	180-185	180-185
Potential Output (MW)	114 - 144	102.6 - 129.6	77 - 100.8
New Internal Access Tracks Required (km)	8.1	8.7	7.95
No. of Site Accesses	3	3	2 (+ 1 for TDR only)
No. of Site Compounds	3	3	2



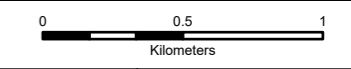


Legend

- Application Boundary
- Turbine Layout

Site Layout

- Construction Compounds
- Substation Locations
- Met Mast Location
- Site Access Tracks
- Site Access Entrance / Crossing Locations



Spatial Reference
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Rev	Date	Description	By	Chkd.
A	27/04/2026	First issue	S.P	S.R

Client:
FuturaEnergy Ireland

Project:
Lissinagroagh Wind Farm

Title:
Figure 3-2:
Initial Layout - 20 Turbines
and Layout 2 - 18 Turbines

Scale @ A3: 1:27,000

Prepared by: S. Pezzetta Checked by: S. Ryan Date: April 2026

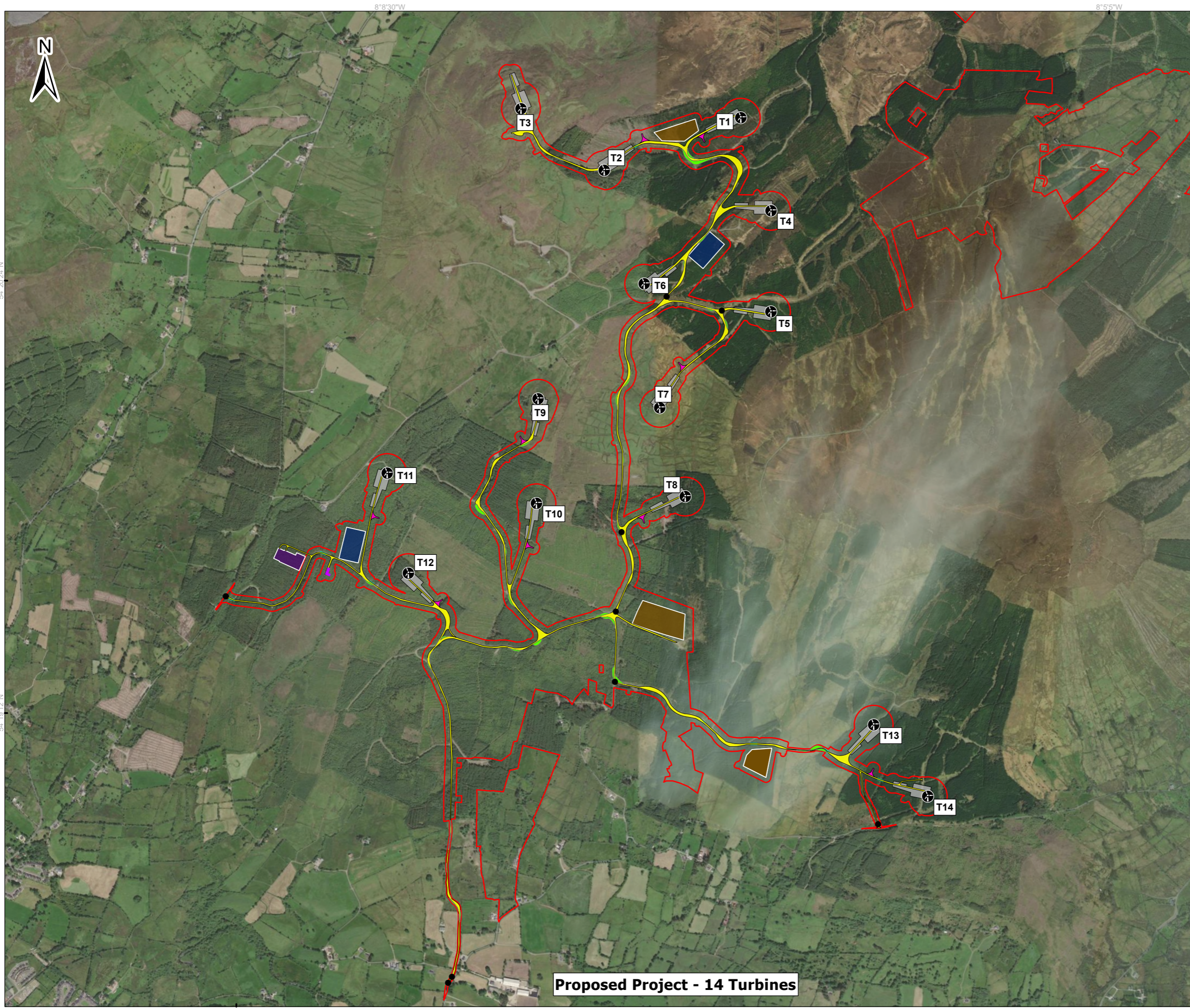
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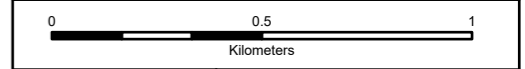
Map Ref: 10955-092-20..18.WTGs-INFRA-TOB-A Draft: A

First Layout - 20 Turbines

Second Layout - 18 Turbines



- Legend**
- Application Boundary
 - ⊕ Turbine Layout
- Site Layout**
- Construction Compound
 - Substation Location
 - Borrow Pits
 - Clear Span Bridge
 - Turbine Hardstands
 - Site Access Tracks
 - Met Mast Location
 - Oversail Areas
 - Turning Bays
 - Site Access Entrance / Crossing Locations



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Rev	Date	Description	By	Chkd.
A	27/04/2026	First issue	S.P	S.R

Client:

Project:
 Lissinagroagh Wind Farm

Title:
 Figure 3-3:
 Proposed Project - 14 Turbines

Scale @ A3: 1:18,000

Prepared by: S. Pezzetta Checked by: S. Ryan Date: April 2026

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Map Ref: 10955-093-P.App.BO-INFRA-TOB-A Draft: A

Proposed Project - 14 Turbines

54°10'12"N

590000

8°8'30"W

8°5'5"W



Table 3-4: Likely Significant Effects of Alternative Layouts Relative to Final Layout

Environmental Factor	Initial Layout – 20 Turbines	Layout 2 – 18 Turbines	Final Layout– 14 Turbines
Population and Human Health	<p>The number of turbines and size of the development footprint would require a large construction works area and a construction period of 24-30 months resulting in higher potential for traffic, dust and noise effects for residential dwellings and road users during construction, albeit temporary.</p>	<p>The lower number of turbines and smaller footprint compared to Layout 1 would require a slightly smaller construction works area and a shorter construction period resulting in a lower potential for temporary traffic, dust and noise effects for residential dwellings and road users during construction.</p>	<p>Reduced potential for significant effects on sensitive receptors due to lower number of turbines, shorter construction period and smaller footprint compared to Layouts 1 and 2.</p> <p>A minimum setback distance of 760m from the nearest sensitive receptor was achieved with this layout compared to Layouts 1 and 2 (750m).</p> <p>Existing access tracks utilised as much as possible to minimise need for construction of new tracks.</p>
Biodiversity & Ornithology	<p>The number of turbines and size of the development footprint would result in a greater potential for loss, disturbance and displacement of sensitive habitats and/or species.</p> <p>Further ecological and ornithological baseline surveys were undertaken to determine location and extent of sensitive ecological and ornithological habitats including hen harrier nesting and foraging areas and Annex I habitats.</p>	<p>The lower number of turbines and smaller footprint compared to Layout 1 with less construction works would slightly reduce potential for loss, disturbance and displacement of sensitive habitats and/or species identified through baseline surveys.</p> <p>Two turbines removed from Layout 1 to avoid sensitive ecological and ornithological features, including hen harrier nesting and foraging areas and Annex I habitats.</p>	<p>The further reduction in the number of turbines and ancillary infrastructure and smaller footprint compared to Layouts 1 and 2, with less construction works required would result in a further reduction in the potential for disturbance and displacement of sensitive habitats and/or species identified through baseline surveys.</p> <p>A further four turbines removed from the design to avoid sensitive ecological and ornithological features identified through further detailed baseline surveys, including hen harrier nesting and foraging areas, Annex I habitats and watercourses in the southeast of the site.</p>



Environmental Factor	Initial Layout – 20 Turbines	Layout 2 – 18 Turbines	Final Layout– 14 Turbines
Land, Soils and Geology	<p>Larger footprint requiring excavation, disturbance of soil and larger quantities of construction materials.</p> <p>Requirement for additional new access tracks in undisturbed elevated areas.</p>	<p>Reduced footprint requiring excavation, less disturbance of soil and lower quantities of construction materials.</p>	<p>Further reduction in potential for significant effects due to smaller footprint requiring excavation, less disturbance of soil and lower quantities of construction materials.</p> <p>Existing access tracks utilised as much as possible to minimise need for construction of new tracks compared to previous layouts.</p>
Hydrology and Hydrogeology	<p>Larger footprint requiring excavation, longer construction period and a greater requirement for surface water management and control measures.</p>	<p>Reduced footprint requiring excavation, slightly shorter construction period and a reduced requirement for surface water management and control measures compared to Layout 1.</p>	<p>Reduced potential for significant effects on hydrology and hydrogeology due to smaller footprint requiring excavation, shorter construction period and less surface water management and control measures.</p>
Shadow Flicker	<p>Neutral as irrespective of the number of turbines, the Applicant commits to the elimination of shadow flicker at identified sensitive receptors through the implementation of Shadow Flicker Control Modules (automatic shutdown of pre-determined turbines at pre-programmed times).</p>	<p>Neutral as irrespective of the number of turbines, the Applicant commits to the elimination of shadow flicker at identified sensitive receptors through the implementation of Shadow Flicker Control Modules (automatic shutdown of pre-determined turbines at pre-programmed times).</p>	<p>Neutral as irrespective of the number of turbines, the Applicant commits to the elimination of shadow flicker at identified sensitive receptors through the implementation of Shadow Flicker Control Modules (automatic shutdown of pre-determined turbines at pre-programmed times).</p>
Telecommunications & Aviation	<p>Larger number of turbines will result in greater potential for significant effects on identified telecoms links and aviation flight paths/radar.</p> <p>However, layout was designed to ensure all identified links avoided or mitigated, therefore net effect is neutral.</p>	<p>Reduced number of turbines compared to Layout 1 will reduce potential for significant effects on identified telecoms links and aviation flight paths/radar.</p> <p>However, layout was designed to ensure all identified links avoided or mitigated, therefore net effect is neutral.</p>	<p>Lower number of turbines will reduce potential for significant effects on identified telecoms links and aviation flight paths/radar.</p> <p>However, layout was designed to ensure all identified links avoided or mitigated. therefore net effect is neutral.</p>



Environmental Factor	Initial Layout – 20 Turbines	Layout 2 – 18 Turbines	Final Layout– 14 Turbines
Air Quality	Larger number of turbines, larger footprint for construction works and longer construction period resulting in greater potential for dust and fugitive emissions from traffic and earthworks.	Reduced number of turbines, footprint and construction period compared to Layout 1 resulting in reduced potential for dust and fugitive emissions from traffic and earthworks.	Further reduction in number of turbines, footprint and construction period resulting in reduced potential for dust and fugitive emissions from traffic and earthworks.
Climate	Larger number of turbines will make a greater contribution to National renewable energy and GHG reduction targets.	Reduced number of turbines compared to Layout 1, therefore a lower contribution to National renewable energy and GHG reduction targets.	Further reduction in number of turbines therefore a lower contribution to National renewable energy and GHG reduction targets.
Landscape & Visual	Larger number of turbines within a larger footprint will have greater potential landscape and visual effects.	Lower number of turbines within a reduced footprint compared to Layout 1.	Further reduction in potential for significant effects on landscape and visual receptors due to lower number of turbines within a smaller area.
Noise and Vibration	Neutral – required setback of 500m and four times the tip height (740m) adhered to for all turbine layouts, thereby ensuring noise levels are within acceptable levels.	Neutral – required setback of 500m and four times the tip height (740m) adhered to for all turbine layouts, thereby ensuring noise levels are within acceptable levels.	Neutral – required setback of 500m and four times the tip height (740m) adhered to for all turbine layouts, thereby ensuring noise levels are within acceptable levels. A minimum setback distance of 760m from the nearest sensitive receptor was achieved with this layout.
Cultural Heritage	All recorded sites/monuments avoided by design irrespective of the number of turbines. Greater potential for significant effects on unknown features due to larger footprint requiring excavation, disturbance of soil. Greater potential for significant indirect effects due to larger number of turbines.	All recorded sites/monuments avoided by design irrespective of the number of turbines. Reduced potential for significant effects on unknown features due to smaller footprint requiring excavation, and disturbance of soil. Reduced potential for significant indirect effects due to reduced number of turbines	All recorded sites/monuments avoided by design irrespective of the number of turbines. Reduced potential for significant effects on unknown features due to smaller footprint requiring excavation, and disturbance of soil compared to Initial Layout & Layout 2. Reduced potential for significant indirect effects due to reduced number of turbines.



Environmental Factor	Initial Layout – 20 Turbines	Layout 2 – 18 Turbines	Final Layout – 14 Turbines
Traffic	Greater potential for significant effects on roads and traffic due to larger number of turbines and resulting construction traffic.	Reduced potential for significant effects on roads and traffic due to reduced number of turbines and resulting construction traffic	Reduced potential for significant effects on roads and traffic due to lower number of turbines and resulting construction traffic.



3.7.2 Internal Access Tracks

The location of the proposed internal site access tracks was determined by the number and location of wind turbines, the onsite substation, the feasibility of turbine delivery and the proximity to existing forestry roads. As layout designs changed, so did the positioning of access tracks to consider environmental constraints such as watercourses and associated buffer zones.

The proposed project will include the construction of approximately 8 km of new internal access tracks and upgrading of approximately 8 km of existing forestry tracks, which will include passing bays. The presence of existing forestry tracks played an important role in determining where the proposed site roads would be located. They were used where possible to minimise the length of new site access roads to be constructed. Locations of new tracks were also chosen to avoid or minimise the number of watercourse crossings required. At the locations where watercourse crossings are required for access, clear span bridges will be constructed at all but one crossing location to avoid in-stream works and the upgrade of an existing culvert will avoid the need to construct a new culvert.

The locations of the proposed new and upgraded access tracks are shown on Drawing 10955-2010 (Site Layout Plan) and construction details are shown on Drawing 10955-2033 (Track Construction Details).

An alternative to utilising the existing access track network within the site would be to construct a new road network, having no regard to existing roads. This approach was considered unfavourable, as it would require unnecessary disturbance and create the potential for additional adverse effects to occur. It would also result in an unnecessary requirement for additional cut and fill material to be used in the construction of new roads.

3.7.3 Site Access

An existing forestry access on the L61801 Local Road, approximately 2.5km northeast of Manorhamilton, will be upgraded for use as a site access during the construction and operational phases (referred to as Permanent Access 1 on Drawing 10955-2070 Site Access Tracks and Entrance Locations), as shown on Figure 3-4.

A second existing forestry access track on the L61844 to the southeast will be upgraded for use as a temporary access during the construction phase only.

An access point will also be provided on the L6184 to the south through private lands for turbine deliveries during the construction phase or operational phase if required. As a result of engagement with landowners along the L6184, this access point was not considered for use by other vehicles during construction and operation to avoid higher volumes of traffic accessing the site from the N16 to the south and to meet landowner access requirements.

All permanent accesses have been designed to provide adequate visibility in accordance with TII guidance. Visibility splays for the permanent access points are shown on Drawings 10955-2071 to 2077.

Further details are provided in Chapter 2 – Description of the Proposed Project, Chapter 16 - Traffic and Transportation and Appendix 16-1 - Traffic Management Plan.



3.7.4 Wind Farm Substation

The proposed onsite 110kV substation site was chosen following an analysis of the site constraints (setbacks from watercourses, turbine locations and avoidance of unsuitable ground conditions such as steep terrain).

Two substations locations were considered at the outset (see Figures 3-2, 3-3), but the proposed location was selected as the preferred location for the following reasons:

- To minimise the distance to the proposed grid connection point, which is located 32km to the southwest;
- To avoid the need for extensive underground 110kV cabling works within the site, thereby reducing the potential for derating of the grid connection as a result of crossing any internal cables;
- Adjacent to the existing site access road network and main entrance to the wind farm during construction and operation;
- Set within existing partially-felled commercial coniferous forestry avoiding more sensitive habitats;
- Not within 50m of natural watercourses; and
- Located on relatively flat ground that is not prominent on the landscape.



Table 3-5: Likely Significant Effects of Alternative Substation Locations relative to Chosen Location

Environmental Factor	Substation Option 1 (east)	Substation Option 2 (southwest)	Current Design Proposal (west)
Population and Human Health	Greater potential for significant effects due to visibility, proximity to sensitive receptors (residential dwellings) along the L61844 local road and sloped terrain requiring more earthworks and related construction activity/traffic.	Reduced potential for significant effects due to greater screening, although closer to sensitive receptors compared to Option 1.	Further reduced potential for significant effects compared to Options 1 and 2 due to greater screening and distance from sensitive receptors.
Biodiversity	Greater potential for significant effects due to longer grid connection cable.	Reduced potential for significant effects compared to Option 1 due to greater screening and lands identified as suitable for biodiversity enhancement.	Further reduced potential for significant effects compared to Options 1 and 2 due to greater screening from sensitive receptors.
Land, Soils and Geology	Greater potential for significant effects due to sloped terrain requiring more earthworks and longer distance to grid connection point.	Reduced potential for significant effects compared to Option 1 due to flatter terrain and shorter distance to grid connection point.	Further reduced potential for significant effects compared to Options 1 and 2 due to flatter terrain and shorter distance to grid connection point.
Hydrology and Hydrogeology	Greater potential for significant effects due to sloped terrain requiring more earthworks and surface water run-off requiring management, and longer distance to grid connection point requiring more watercourse crossings.	Reduced potential for significant effects compared to Option 1 due to flatter terrain and shorter distance to grid connection point with fewer watercourse crossings.	Further reduced potential for significant effects compared to Options 1 and 2 due to flatter terrain and shorter distance to grid connection point with fewer watercourse crossings.
Air Quality and Climate	Greater potential for dust and vehicle emissions due to longer grid connection cable, increasing the potential for construction impacts.	Reduced potential for dust and vehicle emissions compared to Option 1 due to flatter terrain/less earthworks and shorter grid connection cable.	Further reduced potential for dust and vehicle emissions effects compared to Options 1 and 2 due to flatter terrain/less earthworks and shorter grid connection cable.



Environmental Factor	Substation Option 1 (east)	Substation Option 2 (southwest)	Current Design Proposal (west)
	No significant difference with regard to climate effects.	No significant difference with regard to climate effects.	No significant difference with regard to climate effects.
Landscape & Visual	Greater potential for significant effects due to open and sloped terrain/visibility and proximity to sensitive receptors.	Reduced potential for significant effects compared to Option 1 due to greater screening, although closer to sensitive receptors.	Further reduced potential for significant effects compared to Options 1 and 2 due to greater screening and distance from sensitive receptors.
Noise and Vibration	Greater potential for significant effects due to proximity to sensitive receptors and more open terrain.	Reduced potential for significant effects compared to Option 1 due to greater screening, although closer to sensitive receptors.	Further reduced potential for significant effects compared to Options 1 and 2 due to greater screening and distance from sensitive receptors.
Material Assets	No likely significant adverse effects	No likely significant adverse effects	No likely significant adverse effects
Cultural Heritage	Greater potential for significant effects on unknown archaeological features due to sloped terrain requiring more earthworks and longer grid connection route.	Reduced potential for significant effects on unknown archaeological features compared to Option 1 due to flatter terrain in existing coniferous forestry requiring less earthworks and slightly shorter grid connection route.	Further reduced potential for significant effects on unknown archaeological features compared to Options 1 and 2 due to flatter terrain in existing coniferous forestry requiring less earthworks and shorter grid connection route.
Traffic and Transportation	The longer grid connection will require the most deliveries of construction materials to site	The slightly shorter grid connection will reduce traffic movements to/from the site during construction.	The shorter grid connection will reduce traffic movements to/from the site during construction.



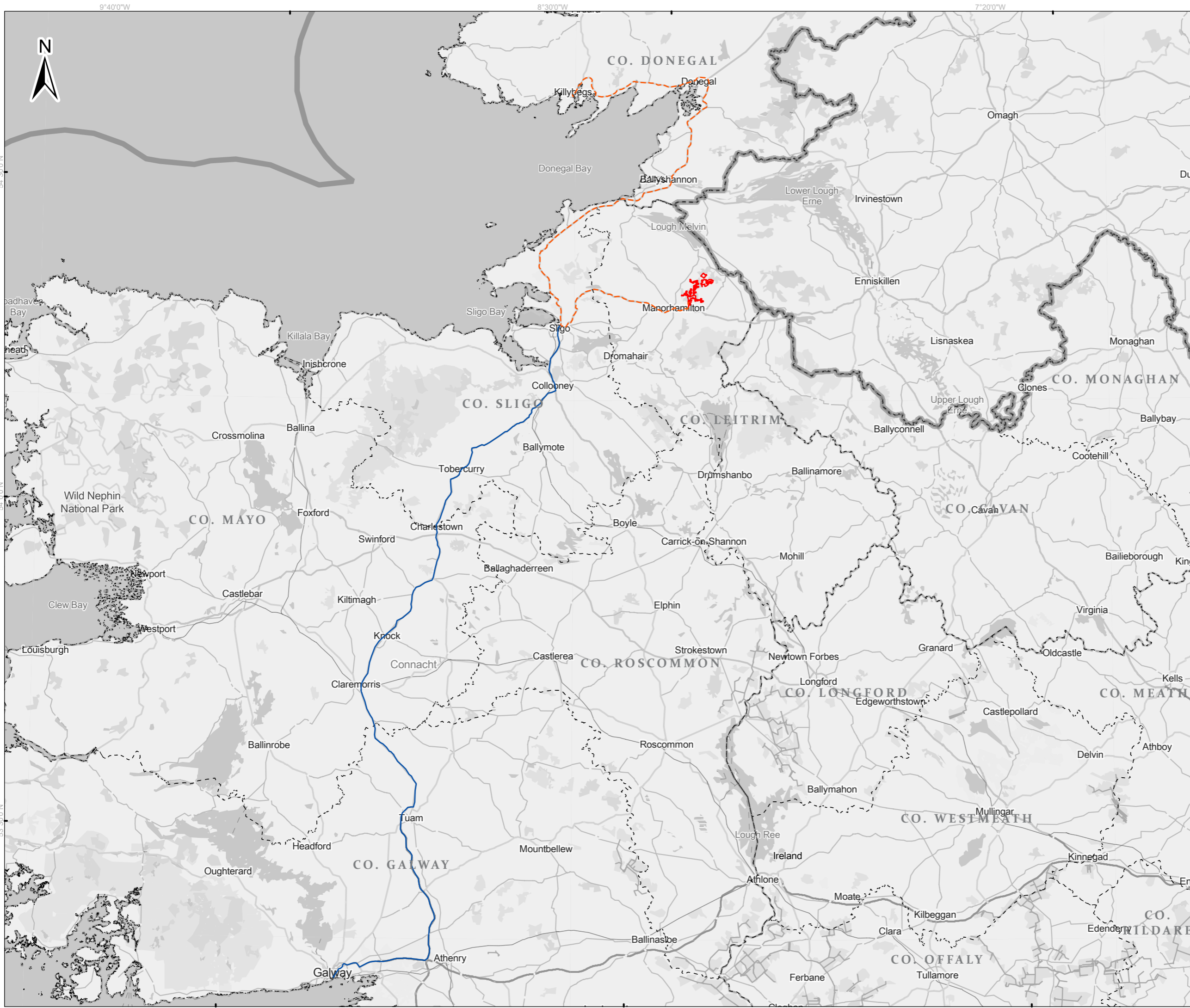
3.7.5 Turbine Delivery

3.7.5.1 Port of Entry

The proposed wind farm site is located approximately 2.5km north of the N16 National Primary Road at its closest point providing relatively straightforward access to the national road network in the northwest of the country. Given the proximity of the site to the national road network, a number of alternative ports of entry for turbine delivery to the proposed wind farm site are feasible and were considered.

The port of entry chosen is Killybegs Port in Co. Donegal, which is the closest port of entry to the site. This port has also been successfully used for the delivery of wind turbines for other Irish wind farm projects. When compared to the other alternative port studied (Galway), this option has a number of advantages. It is closer to the site and therefore minimises the travel distance and associated traffic and air quality impacts arising from the delivery vehicles and reduces the number of potential pinch points to overcome (i.e. bends or obstructions on the public road network for abnormal loads).





- Legend**
- Application Boundary
 - Proposed Turbine Delivery Route
 - Alternative Turbine Delivery Route
 - County Boundaries



Spatial Reference
 Datum: IRENET95
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Rev	Date	Description	By	Chkd.
A	27/04/2026	First issue	K.K	S.R

Client:

Project:
 Lissinagroagh Wind Farm

Title:
 Figure 3-4:
 Proposed and Alternative
 Turbine Delivery Route (TDR)

Scale @ A3: 1:600,000

Prepared by: K.Kale
 Checked by: S.Ryan
 Date: April 2026

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Map Ref: 10955-067-A.TDR-P.App.BO-TOB-A
 Draft: A

Table 3-6: Likely Significant Effects of Alternative Port of Entry relative to Chosen Option

Environmental Topic	Alternative Port – Galway	Chosen Option – Killybegs
Population and Human Health	<p>Longer route requiring more enabling works (widening of the road, removal/ movement of street furniture, etc. at a greater number of pinch points) with associated longer travel time for abnormal load vehicles requiring traffic management and greater vehicle emissions.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with shorter travel time for abnormal load vehicles requiring traffic management and less vehicle emissions.</p> <p>Lower potential for significant effects.</p>
Biodiversity and Ornithology	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>
Land, Soils and Geology	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>
Hydrology and Hydrogeology	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>



Environmental Topic	Alternative Port – Galway	Chosen Option – Killybegs
Climate and Air Quality	<p>Longer route with longer travel time for abnormal load vehicles requiring traffic management and greater vehicle emissions.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with shorter travel time for abnormal load vehicles requiring traffic management and less vehicle emissions.</p> <p>Lower potential for significant effects.</p>
Landscape and Visual	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>
Noise and Vibration	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>
Cultural Heritage	<p>Longer route requiring more enabling works (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points (bends/obstructions) to facilitate abnormal load deliveries.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with less pinch points (bends or obstructions such as trees, hedgerows) requiring temporary removal to facilitate abnormal load deliveries.</p> <p>Lower potential for significant effects.</p>
Traffic and Transportation	<p>Longer route with longer travel time for abnormal load vehicles requiring traffic management and greater vehicle emissions.</p> <p>Resulting greater potential for significant effects.</p>	<p>Shorter route with shorter travel time for abnormal load vehicles requiring traffic management and less vehicle emissions.</p> <p>Lower potential for significant effects.</p>



3.7.5.2 Turbine Delivery Route

The proposed TDR extends from Killybegs Port to Donegal via the N56, then to Sligo via the N15 and finally to the site via the N16. At Killybegs Port, the route travels along the R263 Regional Road before joining the N56 National Secondary Road and running south eastwards to Donegal. East of Donegal, the route joins the N15 National Primary Road running south-westwards towards Bundoran. Southwest of Bundoran on the N15, the route enters Co. Leitrim and continues south eastwards to Sligo. At the junction of the N15 and N16 in Rathquarter, Sligo, the route turns left onto the N16 National Primary Road travelling northeast through Manorhamilton on the N16 for 2.5 km before exiting the N16 on the L6184 Local Road for 0.6 km to the proposed wind farm access point. The total length of the route is 123 km. Further details regarding the proposed TDR are provided in Chapter 2 - Description of the Proposed Project, Appendix 2-1 TDR Report and Chapter 16 - Traffic and Transportation.

A number of alternative route options were considered between Killybegs Port and the site. Option 1 considered an exit off the N15 using a slip road onto the R280 south of Bundoran, Co. Donegal travelling along the R280 through Kinlough to Manorhamilton. Once on the R280, the route continues south, crossing the Drowes River and passing through the village of Kinlough and Glenade towards Manorhamilton. On the approach to Manorhamilton, the route takes a diversion to avoid the town at the roundabout on the R280 and follows Castle Street south for approximately 300m to the junction with Castle View. Turning left at this junction, the route continues north, and after approximately 300m, it joins with the R280 before turning left on to the R282. After approximately 300m, the road continues with a right turn, continuing north east for approximately 1km, before taking the L61801 Local Road for 2 km. The route then takes a continuing north east to enter the site from the north west. Option 2 considered accessing the R282 in Manorhamilton using the N16. Both of the options outlined above involve a considerable number of potential pinch points requiring temporary removal of street furniture, other structures (e.g. walls) and vegetation, particularly at private properties requiring private land agreements.

Option 1 involves greater distance on the R280, a Regional Road with significant constraints, i.e. varying widths of up to 5m, no hard shoulders or verges, poor horizontal and vertical alignment at certain locations and areas of bog rampart. It also passes through the villages of Kinlough and Glenade. Option 1 was subsequently discounted. Routing from the N16 onto the R282 in Manorhamilton and accessing the site from the west or northwest was discounted due to the presence of significant pinch points and requirement for third party lands. Continuing the route on the N16 through Manorhamilton and accessing the site from the L6184 for a short distance was assessed as the most feasible option for turbine delivery.

A subsequent study focused on the N16 route and the options to access the site from the northwest by exiting the N16 to the west of Manorhamilton and accessing the site from the south by continuing on the N16 through Manorhamilton. The realignment of the N16 east of Sligo was completed during 2024 and removes a number of constraints on this route which had been identified earlier in the project design. Due to the completion of the realignment works on the N16, it was concluded that continuing on the N16 and accessing the site from the south was the most feasible option.

Table 3-7: Comparison of Likely Significant Effects of Alternative TDR Options & Chosen Option

Environmental Factor	Alternative TDR Options	Proposed TDR
Population & Human Health	<p>All options considerably longer than chosen option requiring more enabling/accommodation works, (widening of the road, temporary removal/ movement of street furniture, hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater impact to residents along the route.</p> <p>The route on the R280 is a regional road with varying road widths of up to 5m, no hard shoulders or verges, and poor horizontal and vertical alignment at certain locations. This route also passes through 2 villages (Kinlough and Glenade).</p> <p>Greater potential for significant effects on residential receptors.</p>	<p>Shortest route to the site and utilises national road to within 600m of the site reducing the extent of enabling/accommodation works needed along local roads.</p> <p>Lower potential for significant effects on residential receptors.</p>
Biodiversity & Ornithology	<p>All options considerably longer than chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater potential for significant effects on biodiversity and ornithology.</p>	<p>Shortest route to the site and utilises national road to within 600m of the site reducing the extent of vegetation removal required.</p> <p>Lower potential for significant effects on biodiversity and ornithology.</p>
Land, Soils and Geology	<p>All options considerably longer than chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater potential for significant effects on land, soils and geology.</p> <p>The route on the R280 is a regional road with varying road widths of up to 5m, no hard shoulders or verges, and poor horizontal and vertical alignment at certain locations. This route also passes through 2 villages (Kinlough and Glenade).</p>	<p>Shortest route to the site and utilises national road to within 600m of the site reducing the extent of enabling works (road widening) required.</p> <p>Lower potential for significant effects on land, soils and geology.</p>



Environmental Factor	Alternative TDR Options	Proposed TDR
Hydrology and Hydrogeology	All options are considerably longer than the chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater potential for significant effects on hydrology and hydrogeology.	Shortest route to the site and utilises national road to within 600m of the site reducing the extent of road widening, watercourse crossings required. Lower potential for significant effects on hydrology and hydrogeology.
Air Quality & Climate	All options considerably longer than the chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater potential for significant effects on air quality and climate.	Shortest route to the site and utilises national road to within 600m of the site reducing the extent of construction works required and associated dust and traffic volume. Lower potential for significant effects on air quality and climate.
Landscape & Visual	The additional accommodation works required along the longer route may have a greater potential visual impact, however this would be temporary and very localised in nature, so would not be significant. However, overall greater potential for significant effects on landscape and visual compared to chosen option.	Shorter route reducing the likely visual impacts from accommodation works along a longer route and from passing vehicles at more residential properties.
Noise and Vibration	Significantly longer route which would require more enabling works at pinch points, more traffic resulting in greater potential for significant effects from noise and vibration. This option would be anticipated to have a greater impact than the chosen TDR.	Shortest TDR route by approximately 9 km reducing the noise and vibration impacts from accommodation works and traffic passing along a longer route.
Cultural Heritage	All options are significantly longer than the chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a greater number of pinch points, resulting in a greater potential for significant effects on unidentified cultural heritage features.	Shortest route to the site and utilises national road to within 600m of the site reducing the extent of road widening, vegetation removal required. Lower potential for significant effects on unidentified cultural heritage features. Identified features are avoided by design.
Traffic and Transportation	All options are significantly longer than the chosen option which would require more enabling/accommodation works, (widening of the road, temporary removal of hedgerows, trees etc.) at a	Shortest route to the site and utilises national road to within 600m of the site reducing the extent of vegetation removal required.



Environmental Factor	Alternative TDR Options	Proposed TDR
	greater number of pinch points, resulting in a greater potential for significant effects on traffic and road network.	Lower potential for significant effects on traffic and road network.



3.7.6 Grid Connection

The proposed project includes an onsite 110kV substation in the west of the site, which will provide a connection point between the proposed wind farm and the proposed grid connection point at the existing Srananagh substation via approximately 32 km of underground cable. The total length of the connection is approximately 32 km, of which 30.6 km will be in the public road corridor. The remainder is located within Coillte lands, other private lands and a short section within the proposed wind farm site. Refer to Figure 2-2, Chapter 2 - Description of the Proposed Project and Appendix 2-2 Substation and Grid Connection Drawings.

The initial screening process highlighted the nearby existing electrical grid infrastructure and the available capacity in the area. Based on the scale of the proposed project, it was anticipated that a 110kV connection would be required to accommodate the likely output from the project.

TLI were engaged in 2020 to examine the various underground cable (UGC) options for a dedicated 110kV grid connection to an existing ESB Substation and to explore the possibility to Loop-In to the existing 110kV OHL from Cathaleen Falls, Co. Donegal to Srananagh, Co. Sligo, which traverses close to the proposed wind farm site. The routes are illustrated on Figure 3-5. The TLI Preliminary Route Development Report is provided as Appendix 3-1.

A summary of the options assessed is provided below.

Cathaleen Falls - Srananagh OHL Loop In to Proposed Onsite Substation Options:

- OHL Loop In UGC Route Option 1 (Green) – 6.8 km
- OHL Loop In UGC Route Option 2 (Ruby) – 5.6 km
- OHL Loop In OHL Route Option 1 (Peach) – 2.7 km

The study concluded that there was little to no available capacity for a Loop-In connection to the existing OHL west of the site therefore these options were discounted.

The existing Srananagh 220kV Substation was identified as the nearest node with capacity to connect the wind farm to the National Grid and the assessment also concluded that a dedicated 110kV UGC would be the preferred connection method. A number of alternative routes Srananagh were assessed as follows:

- UGC Route Option 1 (Orange) – 33.5 km
- UGC Route Option 2 (Cyan/Green-Blue) – 29.9 km
- UGC Route Option 3 (Purple) – 30.3 km
- UGC Route Option 4 (Blue) – 36.4 km

UGC Route Option 1

UGC Option 1 will connect the proposed onsite 110 kV substation with Srananagh substation located 33.5km away mostly along the existing public road network (L61801 local road, R282 regional road, R280/Castle Street, L2136, N16 (crossing and short section), L4171, L4165 and L5204, see Figure 3-5). Most of the route is on public roads, with the exception of a new crossing of the River Bonet through third party lands in Drumlease and Milltown Forest. In total, eleven (11) existing bridge crossings are required, of which eight (10) will involve in-road HDD (Horizontal Directional Drill), two (2) will involve off-road HDD and one (1) will be a standard crossing within the bridge deck.

This grid connection option is being carried forward in the project planning application.



UGC Route Option 2

UCG Option 2 will connect the proposed onsite 110 kV substation with Srananagh substation located 29.9 km away mostly along the existing public road network (L6184 local road, N16, R280 regional road, R287, L4252 and L5204, see Figure 3-5). Most of the route is on public roads and is shorter than Option 1, however there are a greater number of bridge crossings, multiple culverts required, private land crossings, and works within Lough Gill SAC/pNHA.

UGC Route Option 3

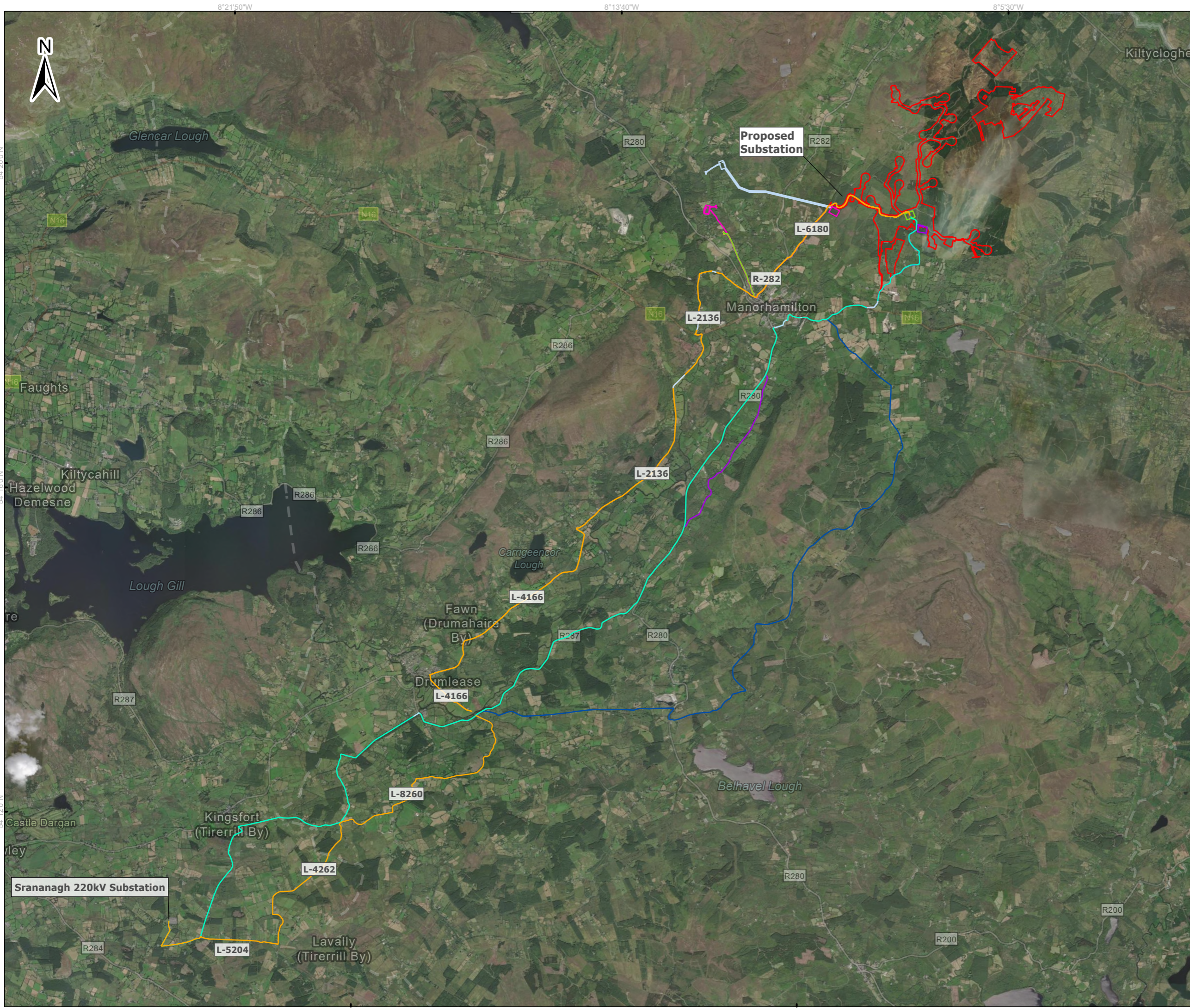
UCG Option 3 is a variation of Option 1 and 2 and will connect the proposed onsite 110 kV substation with Srananagh substation located 30.3 km away mostly along the existing public road network (L6184 local road, N16, L62031, R280 regional road, R287, R289, L4252 and L5204, see Figure 3-5). Most of the route is on public roads, however twelve (12) bridge crossings, two (2) other watercourse crossings and multiple culverts are required, private land crossings, and works within Lough Gill SAC/pNHA.

UGC Route Option 4

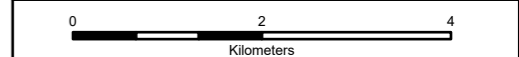
UCG Option 3 is a variation of Option 1 and 2 and will connect the proposed onsite 110 kV substation with Srananagh substation located 36.4 km away mostly along the existing public road network (L6184 local road, N16, L62031, R280 regional road, R287, R289, L4252 and L5204, see Figure 3-5). Most of the route is on public roads, however twelve (12) bridge crossings, two (2) other watercourse crossings and multiple culverts are required, private land crossings, and incursions of Lough Gill SAC.

The potential environmental effects of the grid connection options considered for the proposed project are outlined in Table 3-8.





- Legend**
- Application Boundary
 - Proposed UGC Route Option 1 (33.5km)
 - Proposed UGC Route Option 2 (29.9km)
 - Proposed UGC Route Option 3 (30.3km)
 - Proposed UGC Route Option 4 (36.4km)
 - Proposed OHL Loop In - UGC Option 1 (6.81km)
 - Proposed OHL Loop In - UGC Option 2 (5.57km)
 - Proposed OHL Loop In Option 1 (2.72km)



Spatial Reference
 Datum: IRENET95
 EPSG: 2157

Copyrights:
 Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community,

Rev	Date	Description	By	Chkd.
A	27/04/2026	First issue	S.P	S.R

Client:

Project:
 Lissinagroagh Wind Farm

Title:
 Figure 3-5:
 Alternative Grid Connection Routes

Scale @ A3: 1:80,000

Prepared by: S.Pezzetta Checked by: S.Ryan Date: April 2026

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Map Ref: 10955-066-A.GCR-P.App.BO-TOB-A Draft: A

Table 3-8: Likely Significant Effects of Alternative Grid Connection Options relative to Chosen Option

Environmental Factor	UGC 2	UGC 3	UGC 4	Chosen Route (UGC 1)
Population & Human Health	Shorter route than proposed option but more crossing points and HDD, with resulting potential for disturbance to sensitive receptors during construction works.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for disturbance to sensitive receptors during construction works.	Longer route than proposed option with more crossing points and HDD, with resulting potential for disturbance to sensitive receptors during construction works.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on sensitive receptors
Biodiversity & Ornithology	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects to biodiversity and ornithology.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects to biodiversity and ornithology.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects to biodiversity and ornithology.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on biodiversity and ornithology.
Land, Soils and Geology	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on land, soils and geology.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on land, soils and geology.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects on land, soils and geology.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on land, soils and geology
Hydrology and Hydrogeology	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on hydrology and hydrogeology.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on land, hydrology and hydrogeology.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects on hydrology and hydrogeology.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on hydrology and hydrogeology.



Environmental Factor	UGC 2	UGC 3	UGC 4	Chosen Route (UGC 1)
Noise and Vibration	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects from noise and vibration during construction works.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects from noise and vibration during construction works.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects from noise and vibration during construction works.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on from noise and vibration during construction works.
Air Quality and Climate	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on air quality during construction works. Neutral effect on climate.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on air quality during construction works. Neutral effect on climate.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects on air quality during construction works. Neutral effect on climate.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on air quality during construction works. Neutral effect on climate.
Landscape & Visual	Shorter route than proposed option but more crossing points and HDD, with resulting potential for landscape and visual effects.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for landscape and visual effects.	Longer route than proposed option with more crossing points and HDD, with resulting potential for landscape and visual effects.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects for landscape and visual effects.
Cultural Heritage	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on cultural heritage.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for on cultural heritage.	Longer route than proposed option with more crossing points and HDD, with resulting potential for on cultural heritage.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on cultural heritage.
Traffic & Transportation	Shorter route than proposed option but more crossing points	Shorter route than proposed option but more crossing points	Longer route than proposed option with more crossing	Slightly longer than Option 2 and 3, but less crossings and



Environmental Factor	UGC 2	UGC 3	UGC 4	Chosen Route (UGC 1)
	and HDD, with resulting potential for increase in construction traffic and traffic management requirements during construction.	and HDD, with resulting potential for increase in construction traffic and traffic management requirements during construction.	points and HDD, with resulting potential for increase in construction traffic and traffic management requirements during construction.	HDD, reduced potential for effects on cultural heritage.
Material Assets	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on material assets.	Shorter route than proposed option but more crossing points and HDD, with resulting potential for effects on material assets.	Longer route than proposed option with more crossing points and HDD, with resulting potential for effects on material assets.	Slightly longer than Option 2 and 3, but less crossings and HDD, reduced potential for effects on material assets.



3.8 ALTERNATIVE TECHNOLOGY

The process selection for alternative renewable energies, was carried out after the proposed project site was chosen as a suitable site for wind energy development. As described previously the site selection process was driven by the suitability of areas within the Coillte landbank for wind energy and site assessment of private land holdings for potential wind farm development.

While solar energy could in theory be implemented at the site as a reasonable alternative to wind energy, it would be less productive in terms of energy output for the same footprint and would contribute less towards meeting Ireland's renewable energy targets. It would also be restricted in certain parts of the site which have steeper slopes. The environmental and financial impacts would be more extensive in terms of the larger areas of forestry required to be felled and replanted elsewhere to accommodate a solar farm.

The capacity factor⁵ of solar energy is significantly lower than that of onshore wind energy, requiring approximately three times the capacity of the proposed wind farm development, (approx. 231-302.4 MW) to produce the same amount of energy. Based on the requirement of solar farms needing 1.6-2 hectares per MW⁶, the land area required to be permanently felled would be in the region of 379 to 605 hectares. This area of land would also have to be acquired and replanted elsewhere. There are likely to be increased effects on land use, geology, and hydrology as well as biodiversity, as a result of increased felling works. For these reasons, solar was not considered as an option at the proposed wind farm site.

⁵ Capacity factor for solar is a measure of how much energy a solar system produces compared to the maximum energy that can be produced.

⁶<https://voltaic.ie/faqs/solar-farms/#:~:text=How%20much%20land%20is%20required,around%204%2C000%20panels%20per%20MW>). Accessed on 01/09/23.



Table 3-9: Likely Significant Effects of Solar PV compared to Wind Energy

Environmental Topic	Solar PV Array	Wind Turbine (Chosen Option)
Population and Human Health, including Shadow Flicker	<p>No potential for shadow flicker to affect sensitive receptors.</p> <p>Potential for glint and glare impacts on local road users and residential receptors.</p>	<p>Based on the assessment detailed in Chapter 4 – Population and Human Health, 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.</p>
Biodiversity & Ornithology	<p>Larger development footprint would result in greater direct habitat loss. No potential for collision risk for birds or bats. Potential for glint and glare impacts on birds.</p>	<p>As detailed in Chapter 5 - Biodiversity, the development has been designed to avoid or mitigate impacts on biodiversity and compensation is proposed to ensure no significant residual effects.</p> <p>As detailed in Chapter 6 - Ornithology, the Collision Risk Assessment (CRA) indicated that there is no likely significant effect of the proposed wind turbines on bird collision risk.</p> <p>No potential for glint and glare impacts on birds</p>
Land, Soils and Geology	<p>Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated. However, the disturbance would occur over a much larger area.</p>	<p>As detailed in the assessment in Chapter 7 – Land, Soils & Geology, no significant effects on soils and subsoils will occur. Most of the excavation work will be localised to turbine locations and where sections of new roads connected to existing roads are required.</p>
Geotechnical/Peat Stability	<p>Shallower excavations involved in solar PV array developments would result in reduced potential for peat instability when compared with wind farm excavations.</p>	<p>The findings of the Peat Stability Assessment Report (Appendix 7-1) indicate that the site has an acceptable margin of safety, a Low to Negligible risk of peat failure and is suitable for the proposed wind farm.</p>
Hydrology & Hydrogeology	<p>A solar PV array development would require a significantly larger area of forestry to be permanently felled and replaced with renewable energy development therefore increasing the potential for silt laden runoff to enter receiving watercourses. Shallower excavations involved in solar PV array developments would result in reduced volume of spoil to be excavated, therefore</p>	<p>As detailed in the assessment in Chapter 8 – Hydrology and Hydrogeology and the mitigation measures proposed, no significant effects on surface water or groundwater quality are anticipated.</p>



Environmental Topic	Solar PV Array	Wind Turbine (Chosen Option)
	reducing the potential for silt laden runoff to enter receiving waterbodies.	
Air & Climate	Solar PV array technology would result in a longer carbon payback period	As detailed in the assessment in Chapter 12 - Climate, over the proposed 35-year lifetime of the proposed wind farm, an estimated 51,333 to 67,373 tonnes per annum of carbon dioxide will be displaced from traditional carbon-based electricity generation.
Noise and Vibration	Lower potential for adverse noise effects on nearby sensitive receptors from operation of solar farm (inverters and transformers).	Based on the assessment detailed in Chapter 12 - Noise and Vibration, and the mitigation measures proposed, there will be no significant effects on sensitive receptors due to noise levels from the proposed wind farm during the construction, operational and decommissioning phases.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology	As detailed in the assessment in Chapter 14, the likely direct effects on Cultural Heritage features will be Not Significant. The significance of indirect effects on Cultural Heritage (archaeology, architecture and cultural heritage) will be Imperceptible to Moderate.
Landscape and Visual	Potentially less visible from surrounding area due to screening from forestry and topography.	As detailed in the assessment in Chapter 14 - Landscape and Visual, the proposed turbines have been sited to minimise potential adverse effects on identified sensitive landscape and visual receptors.
Traffic and Transportation	Potential for greater traffic volumes on the external road network during construction phase due to the number of solar panels required to achieve the same output.	As detailed in Chapter 16 - Traffic and Transportation, there will be a temporary negative 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 (Appendix 16-1).
Material Assets	Less potential for effects on telecommunications, aviation or waste management services.	Consultation with relevant telecoms providers, the IAA and desktop analysis indicate that the proposed turbine positions will not adversely impact telecommunications links or aviation paths/instrumentation.



3.9 ALTERNATIVE TIMELINES AND CONSTRUCTION METHODOLOGY

Throughout the design and assessment process other aspects of the proposed project underwent consideration in order to finalise the design. A summary of this process is provided here.

The construction methods for the proposed project are dependent on a number of factors specific to the site and design, and have been considered in relation to ground conditions, foundation installation and turbine erection. Site-specific information gathered through intrusive site investigation and environmental surveys was taken into consideration when reviewing alternative methodologies for construction. Alternative stream crossing methodologies for the grid connection were considered at the outset, such as trenching with over-pumping, but this was quickly considered to be too risky for water quality in the area and was thus ruled out. Directional drilling will be used instead to avoid disturbance and minimise risks to the watercourses.

The operational lifespan of the wind farm turbines was discussed when reviewing the different turbine types and specifications available on the market. Turbines are generally designed to last for 35 years therefore the operational lifespan of the proposed project was centred around this.

Alternative shorter timelines for the proposed project in terms of operational lifespan were not considered as modern turbines are now expected to have a 35 year lifespan, so any shorter timeline would reduce efficiency, resulting in unnecessary waste production and reduced contribution of energy.

3.10 ALTERNATIVE MITIGATION MEASURES

Mitigation by avoidance has been a key aspect of the proposed project's evolution through the design and impact assessment process. Avoidance of the most ecologically sensitive areas of the site limits the potential for environmental effects. As noted above, the site layout aims to avoid environmentally sensitive areas. Where loss of habitat occurs within the site, this has been mitigated by proposing enhancement lands as described in Chapter 5 – Biodiversity. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential adverse environmental effects this would have.

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 /or effective and neither of these options is acceptable or sustainable.

3.11 CONCLUSIONS

A study of the reasonable alternatives in terms of project design, technology, location, size, mitigation and scale has been undertaken and presented in this chapter. The options which are relevant to the proposed project and its specific characteristics as a large-scale wind farm in an upland rural area have been discussed. The overriding reason for selecting the chosen options is to maximise the renewable energy production from the site while minimising the environmental impact. For each alternative, a comparison of the potential environmental



effects has been provided, showing the reasons for the chosen option being favoured relative to the others.

As discussed above the siting and design of the proposed wind farm project has evolved through the consideration of alternatives and allowing for stakeholder input into the process. This included initial consideration of the need for renewable energy, the site selection process, the consideration of alternative layouts, scales, and design processes.

Reasonable alternatives were considered with specific regard to the characteristics of the project. Comparisons of environmental effects were noted. The alternatives chosen focused on mitigation by design in order to avoid the potential for such effects on the environment.

When weighed against all of the alternatives and constraints/facilitators outlined in this chapter, it is concluded that the location of the proposed project is highly suitable for a wind energy development with regard to a number of criteria including:

- Optimal wind speed,
- Minimisation of environmental effects,
- Distance from dwellings and
- Landscape character and compatibility with CDP-designated suitable areas for wind energy development.

