3 ALTERNATIVES CONSIDERED

3.1 INTRODUCTION

This Chapter of the Environmental Impact Assessment Report (EIAR) provides 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. Alternatives were assessed taking commercial, construction, operational and key environmental constraints into consideration.

3.2 STATEMENT OF AUTHORITY

This chapter has been prepared by Ms. Sarah Moore with the assistance of Ms. Shirley Bradley of Jennings O'Donovan & Partners Limited.

Ms. Sarah Moore is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Environmental Science from University of Limerick and a MSc (Dist) in Environmental Engineering from Queen's University, Belfast. She has worked in environmental consultancy for over fourteen years and has prepared AA Screenings, Environmental Reports and wind farm EIARs, including the consideration of alternatives.

Ms. Shirley Bradley is a Graduate Environmental Scientist with a First-Class Honours Degree (BSc. Hons) in Environmental Science from the Institute of Technology, Sligo. She was also awarded with the Governing Body award for a BSc in Environmental Protection. Shirley's key capabilities are in report writing, assisting Senior Consultants and GIS.

3.3 METHODOLOGY

3.3.1 Requirements for Alternatives Assessment

Article 5(1) of the EIA Directive (2011/92/EU) as amended requires:

"Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report. The information to be provided by the developer shall include at least: ...

(d) 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";

Annex IV of the EIA Directive as amended (Information Referred to in Article 5(1) (Information for the Environmental Impact Assessment Report) states that:

"… 2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of environmental effects".

The Environmental Protection Agency (2022) states that "*It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option".*

The EPA guidance documents on EIAR preparation[1] [2], stipulates the following:

"The presentation and consideration of the various alternatives investigated by the applicant is an important requirement of the EIA process…. and the alternatives can include:

- *alternative locations;*
- *alternative designs; and*
- *alternative processes*".

The objective is for the Developer to present 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.

In an effective EIA process, different types of alternatives may be considered at several key stages during the process. As environmental issues emerge during the preparation of the EIAR, alternative designs may need to be considered early in the process or alternative mitigation options may need to be considered towards the end of the process. These various levels of alternatives are set out in chapter.

Taking the legislative and guidance requirements into account, this chapter addresses alternatives under the following headings:

- 'Do Nothing' Option
- Strategic Site Selection

[1] EPA. (2002). Guidelines on the information to be contained in Environmental Impact Statements.
[2] EPA. (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.

- Alternative Wind Farm Design and Layout
- Alternative Turbine Numbers and Specifications
- Alternative Transport Route and Site Access
- Alternative Grid Connection Location
- Alternative Grid Connection Routes
- Alternative Mitigation Measures

When considering a wind farm development, given the intrinsic link between layout and design, the two will be considered together in this chapter.

3.3.2 Approach to Alternatives

The Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (European Union, 2017) states that reasonable 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"*.

3.4 'DO-NOTHING' ALTERNATIVE

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

Ireland has adopted binding agreements to reduce dependency on fossil fuels and increase energy production from sustainable sources, creating a requirement for the nation to transition to a low carbon economy. The binding EU targets have been transposed into Irish National Policy in the 2021 Climate Action Plan which focuses up to 13 GW future electricity production on the wind energy sector. This demonstrates the significance of wind energy in the Irish energy context and highlights the need for the proposed Gortyrahilly Wind Farm in reaching both EU and national renewable energy targets.

Ireland is obliged to ensure that 32% of the total energy consumed in heating, electricity and transport is generated from renewable resources by 2030 and reduce its greenhouse gas emissions by at least 55% by 2030, relative to its 1990 levels, with an overall objective of carbon neutrality by 2050. This is in order to help reduce the nation's CO_2 emissions and to promote the use of indigenous renewable sources of energy. These targets have been incorporated into national policy in the Climate Action Plan (2021) which aims to:

- Reduce CO_2 eq. emissions from the electricity sector by 62-81%.
- Deliver an early and complete phase-out of coal and peat fired electricity generation. (Note although peat-fired electricity generation has ceased in Ireland, coal and oil fired plants are still operational. Tarbert Power Station (620 MW) was supposed to close by 2023, and Moneypoint Power Station (915 MW) was supposed to close by 2025. This is now delayed arising from concerns about security of electricity supply. This delay means that more carbon emissions will arise. It highlights the urgency of constructing this and other wind farms).
- Increase electricity generated from renewable sources to 80%, indicatively comprised of:
    - Up to 8 GW onshore wind energy.

Furthermore, the Climate Action and Low Carbon Development (Amendment) Act (2021) will act to reduce 51% emissions over a ten-year period to 2030, in line with the programme for Government which commits to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieving net zero emissions by 2050.

Under a 'Do Nothing' alternative, the Development will not be constructed. The land upon which Development will occur would remain unchanged. The main land use of the Site would remain as commercial forestry and agriculture. Consequently, the environmental impacts, identified in the EIAR, positive and negative, would not occur. However, in the "Do-Nothing" scenario, the prospect of creating sustainable energy through County Cork's wind energy resource would be lost at this Site.

The nation's ability to produce sustainable energy and reduce greenhouse gas emissions to meet EU targets and National targets, as set out above, would be stifled. This may result in the nation incurring significant financial penalties from the EU if targets are not achieved.

The Development has the potential to prevent approximately between 87,977 and 103,687 tonnes of CO_2 emissions per annum, or between 3,079,195 and 3,629,053 tonnes of CO_2 emissions will be displaced over the proposed 35year lifetime of the wind farm, see **Chapter 10: Air and Climate** for details on the Carbon Calculator method. This would otherwise be released to the atmosphere through the burning of fossil fuels in the "Do-Nothing" scenario. This would result in continued global warming and fail to limit warming as agreed to in the Paris Agreement (2015). This will result in continued negative impacts to air quality and climate.

According to EirGrid Group's All-island Generation Capacity Statement 2021 – 2030 (EirGrid, 2021), the growth in energy demand for the next ten years on the Island of Ireland will be between 18% and 43%. In the 'Do-nothing' scenario, importation of fossil fuels to maintain growing energy supply will continue and Ireland's energy security will remain vulnerable. A "Do-nothing" scenario would contribute to strain on existing energy production and may impact on economic growth if energy demand cannot be met. The delay in closing Tarbert and Moneypoint means we continue to rely on imported fossil-fuels with unpredictable pricing, a vulnerable supply chain and higher carbon emissions.

Under the "Do-Nothing" scenario, the socio-economic benefits associated with the Development will be lost. These benefits include between 188 to 295 No. jobs during the construction phase of the project, and between 2 and 3 long-term jobs once operational. Furthermore, under the "Do-Nothing" scenario the local community will not benefit economically from the community benefit fund associated with the project which could be used to improve physical and social infrastructure within the vicinity of the Project

The potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this Site are presented in **Table 3.1**. Refer to each respective chapter for full details of residual impacts.

Table 3.1: Environmental effects of 'Do-Nothing' compared with a wind farm development

Criteria	Residual Impact of the Project	Do-Nothing Alternative
Population & Human Health (incl. Shadow Flicker)	Positive impact on recreation and health gain due to the upgrade of roads. Long-term positive economic benefit to local area due to job creation and Community Benefit fund.	No increase in local employment and no financial gains for the local community. No upgrading of local tracks used for walking and cycling. No potential for shadow flicker or noise to affect sensitive receptors.
Terrestrial Ecology	Slight negative impact on species and habitat. Positive benefit from proposed biodiversity enhancements.	The ecology of the Site would be expected to remain similar as at present though any increase in grazing pressure could be detrimental to the quality of peatland

Criteria	Residual Impact of the Project	Do-Nothing Alternative
		habitats which adjoin the site. Also, any further afforestation on heath and bog habitats would be detrimental.
Aquatic Ecology	Neutral	If the development does not proceed, lands at and in the vicinity of the Site will continue to be used for forestry and agricultural purposes. This 'Do-Nothing' scenario would result in no significant change to aquatic ecology and habitats within or downstream of the Site subject to the continuation of current activities and practices.
Ornithology	Slight negative impact on birds.	Without the proposed wind farm development proceeding, it is expected that the present main land uses on Site, namely livestock grazing and forestry, will continue. It is possible that further afforestation would occur on the Site in the future. The value of the Site for birds would be expected to remain similar as at present though any increase in grazing pressure could be detrimental to the quality of peatland habitats of the Site which could affect species such as Red Grouse. Also, any further afforestation on heath and bog habitats would be detrimental to peatland bird species, including Red Grouse, Meadow Pipit and Skylark.
Soils & Geology	Imperceptible residual impact following implementation of mitigation measures.	Should the proposed development not proceed, the existing land-use practices will continue with associated modification of the existing environment, including the underlying soils and geology, through agriculture and commercial forestry.
Hydrology & Hydrogeology	Non-significant impacts following implementation of mitigation measures.	Should the proposed development not proceed, the existing land-use practice of commercial afforestation and agricultural activities will continue with

Criteria	Residual Impact of the Project	Do-Nothing Alternative
		associated gradual alteration of the existing environment and associated pressures on surface water and groundwater quality.
Air & Climate	Slight to moderate temporary localised residual impacts arising from fugitive dust emissions during construction. Long-term positive impact on air quality and climate due to avoidance of burning of fossil fuels and the net displacement of between 87,977 and 103,687 of CO_2 per annum.	There will be no increase in air quality or a reduction of greenhouse gas emissions. By the Development not proceeding it will not assist in achieving the renewable energy targets set out in the Climate Action Plan. Fossil fuel power stations will be the primary alternative to provide the required quantities of electricity resulting in greenhouse gas and other air pollutant emissions.
Noise	Non-significant to slight temporary noise impacts associated with construction activities. Temporary moderate impact along the grid route at certain dwellings during construction. Long-term slight to moderate negative impact on the dwellings closest to the project as a result of the operational phase.	Neutral
Landscape & Visual	Aside from design iterations, which are embedded in the assessed project, other specific landscape and visual mitigation measures are not considered necessary / likely to be effective. Thus, the impacts assessed in Chapter 12, Section 12.4 and 12.5 are the equivalent of residual impacts in this instance. The proposed development will bring about a notable change in the landscape, but not necessarily a negative one, because the landscape at Gortyrahilly is quite robust, and has the capacity to accept this level of change. Therefore, there is no significant impact	Neutral
Material Assets	Positive impact by offsetting use of fossil fuel. Positive impact due to provision of electricity infrastructure.	No offset to fossil fuel use. No provision of additional electricity infrastructure in the local area.
Cultural Heritage	Slight-moderate indirect visual impacts on nearby monuments. No residual impacts envisaged that cannot be reversed following decommissioning.	Neutral

Criteria	Residual Impact of the Project	Do-Nothing Alternative
Traffic and Transportation	Moderate localised short-term impact due to construction and decommissioning activities.	Neutral

3.5 STRATEGIC SITE SELECTION

3.5.1 Strategic Site Screening

The project Developers, FEI and SSE, continuously examine the lands under their stewardship and otherwise for candidate sites for wind energy development.

There have been two main screening exercises undertaken Coillte's Renewable Energy Development Team (now FEI) one in 2014 and one in 2017. The purpose of the site identification exercise was to identify an area that would be capable of accommodating a wind farm development while minimising the potential for adverse impact on the environment. To satisfy this requirement, a significant landholding that would yield a sufficient viable area for the siting of each element of the Development was required

In 2014 Coillte's Renewable Energy Development Team (now FEI) undertook a detailed screening process, through Geographical Information Spatial software (GIS), using a number of criteria and stages to assess the potential of a large number of possible sites, on lands within its stewardship (c. 441,000 hectares), suitable 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 data, house location data, transport, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations available at the time

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

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:

1. Committed Lands for other developments
2. 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)

3. Life Site (This is a Coillte environmental designation – these former forested sites were cleared and are managed for biodiversity)
4. Wild Nephin Properties (This is a Coillte designation. Since 2014 these properties have been incorporated into National Parks)
5. Farm Partnerships and Leased Lands
6. National Parks
7. Natura 2000 and Nationally Designated Sites (SAC, SPA, NHA, pNHA)

Coillte also reviewed the relevant local authority's County Development Plan (CDP) and/or Renewable Energy Strategy (RES) provisions and did not proceed with further analysis where the policy context was not supportive of wind farm development. In this regard, areas were not brought forward for further analysis if they were not identified as being at least "open for consideration" for wind farm development.

Lands where the average wind speed at 80 metres above ground level was less than 7 meters per second was and, therefore, potentially not suitable for a commercially viable wind energy development were also discounted at this stage. In addition, sites with a contiguous area of less than 50 hectares were discounted.

Phase 2 – Grid Constraints

The electricity transmission system is the backbone of the nation's power system, efficiently delivering large amounts of power from where it is generated to where it is needed. As part of the Site selection process, it was necessary to consider in principle the potential for grid connection, including in terms of distance to potential connection nodes and the grid capacity at the nodes, in the local area, to accommodate the connection.

Phase 3 – Screening

The next stage of screening out lands from further analysis was due to the presence of the following:

1. Sensitive Amenity or Scenic Areas designation in CDPs (at the time of the screening process);
2. Lands utilised for other wind farm developments;
3. Telecommunications masts and links;
4. Sensitive habitat/species of bird;
5. Land Ownership title Issues;
6. Relatively high residential density in vicinity;
7. Unfavourable slopes and ground conditions.

This stage of screening was generally applied using Coillte's in-house expertise and local knowledge and was subsequently validated externally in terms of the engineering considerations and the likelihood of obtaining a successful grant of planning permission based on industry trends in 2014.

Results of the Screening Process

Sites that emerged from the 2014 site selection process described above are listed below and have been brought forward as separate planning applications alone or with co-development partners:

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

Each is a project in its own right and is 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 regard to their environmental impacts is provided in the EIAR accompanying applications.

In 2017 Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above but this time reducing the required contiguous Site area from 300ha to 50ha. The proposed Site emerged from this process and the process described in Section 2.3.3 below. Other sites which also emerged and for which FEI are in the process of preparing separate planning applications or are in the planning system are:

- Ballinagree, Co. Cork;
- Croaghaun, Co. Carlow;
- Gortyrahilly, Co. Cork;
- Inchamore Co. Cork;
- Lissinagroagh, Co. Leitrim.

Similar to the sites which emerged in 2014; the sites which emerged in 2017 are projects in their own right which will be subject to EIA. Ballinagree and Croaghaun planning applications have been submitted.

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, or will be, provided in the EIAR accompanying the applications for same.

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.

As stated above, Coillte conducted two reviews of its land in recent years in which it examined candidate sites for wind energy development. However, as also stated above Coillte (now FEI) continuously assesses its lands for wind opportunities and other sites can emerge periodically.

SSE regularly undertakes similar screening exercises and identified Gortyrahilly as a suitable site in a similar manner. The process of engaging with landowners in the area to establish interest in the project was being advanced by SSE at the same time as Coillte identified the opportunity through its screening process. The opportunity to optimize development at this location was recognised and the two companies proceeded to investigate the location in further detail.

3.5.2 Suitability of the Candidate Site

It is critical for the Developer and their project team to ensure that the most suitable site for development of a proposed wind farm is identified and progressed through planning due to the financial commitments involved i.e., the cost of building each megawatt (MW) of electricity-generating capacity in a wind farm is in the region of €1.8 million to €2.0 million.

The site suitability has been fully informed by national, regional and local policy constraints and the location accords with these policies and objectives. (See Planning Statement accompanying this application.)

The site was further examined in the context of the following elements which are considered decisive in determining viability for a wind farm project:

- National Grid Connection Capacity
- Designated sites
- Wind Speeds
- Population Density

3.5.2.1 National Grid Connection

Potential grid connectivity and constraints were also considered during the strategic site selection process as detailed in the strategic screening exercise. The Site was found to be in proximity to two nodes on the national transmission system Ballyvouskill 220kV GIS substation and Cloonkeen 110kV substation. These were assessed at a high level for connection and capacity. Ballyvouskill was selected because it had capacity available and because of its closer proximity to the Site (ie. within 14km as the crow flies).

The assessment of the grid route options is described in detail in **Section 3.6.4.3**.

3.5.2.2 Designated Sites

It is preferable that wind energy development is not located in an area designated as a Natura 2000 site. The Project is not located within any area designated for ecological protection. The nearest Natura 2000 site, i.e., Special Area of Conservation (SAC) or Special Protection Area (SPA) to the Project is Killarney National Park, Macgillycuddy's reeks & Caragh River Catchment SAC. A section of the grid connection route is located along the route of an existing forestry road which runs parallel to the Clydagh River. The closet distance between the cable route corridor and this SAC is 41m. St Gobnets Wood SAC is the closest Natura 2000 site to the Site, situated 3.75km north-east of the Site at the nearest point. The nearest national designated site, i.e. Natural Heritage Area (NHA) to the Project is Sillahertane Bog NHA, which is located approximately 2km to the west of the Site. Please note that there is no connectivity between Silahertane Bog NHA and the Development. The nearest proposed Natural Heritage Area (pNHA) to the project is Killarney National Park, Macgillycuddy's reeks & Caragh River Catchment pNHA which is located 41m from the grid route corridor at the closet point.

3.5.2.3 Wind Speeds

Wind speed was assessed at the Site in order to determine if wind energy development would be feasible. Wind speed analysis through the Irish Wind Atlas produced by Sustainable Energy Authority of Ireland (SEAI) was used to determine average wind speeds for the country. With the upland nature of the landscape, the Wind Atlas shows that wind speeds on the Site are consistent with a wind farm development (6.5ms^{-1} at 30m, 7.0ms^{-1} at 75m, 7.4ms^{-1} at 100m and 8.10ms^{-1} at 150m).

3.5.2.4 Population Density

Areas with low housing density are preferable for wind energy development so as to minimise potential disturbance to residential amenity.. Having reviewed the settlement patterns in the vicinity of the Site, the study area has emerged as suitable to accommodate the proposal. The population density of the Study Area (as described in the **Chapter 4: Population and Human Health**) is 10.6 persons per square kilometre[3]. This is significantly lower than the average rural population density of 27 persons per square kilometre in rural areas[4]. The low population density of the Site provides greater capacity for wind energy development, allowing for a greater number of turbines to be constructed while maintaining appropriate setback distances from dwellings as set out in the Wind Energy Development Guidelines.

3.5.2.5 Summary

From the review of the criteria set out above, the Site was identified as a suitable candidate site for the provision of a wind farm of the scale proposed. The Site is located predominantly within agricultural land and existing commercial forestry which allows the Site to take advantage of existing access roads (which will be upgraded in specific locations). This combined with the proximity to the existing Ballyvouskill substation further highlights the suitability of the Site as it can make further sustainable use of these established items of infrastructure. The Site is also designated as 'Open to Consideration' within the Cork County Development Plan, does not overlap with any designated sites and is located in an area with a relatively low population density with appropriate annual wind speeds.

3.6 WIND FARM DESIGN AND LAYOUT

The design of the Development has been informed by the designers, Developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists, telecommunication specialists, and traffic consultants. The aim is to reduce potential for environmental effects while designing a project capable of being constructed and viable and maximising wind resource. Throughout the preparation of the EIAR, the layout of the Development has been revised and refined to take account of the findings of all site investigations, which have brought the design from its first initial layout to the current

[3] https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/ [Accessed, 22/06/2022]
[4] https://www.cso.ie/en/releasesandpublications/ep/p-cp2tc/cp2pdm/pd/ [Accessed 22/06/2022]

proposed layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities and as detailed in **Section 1.10** of **Chapter 1: Introduction**.

3.6.1 Constraints Led Approach

The design and layout of the Development follows the recommendations and industry guidelines set out in the 'Wind Energy Development Guidelines' (Department of the Environment, Heritage and Local Government, 2006), 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012) and the Draft Revised Wind Energy Development Guidelines, December 2019. The layout and design were an iterative process which followed the constraints-led design approach.

The constraints-led design approach consists of the identification of environmental sensitivities within the Site by the design team with a view to identifying suitable areas in which wind turbines may be located. The resulting area is known as the 'Developable Area'.

The constraints identification process included the gathering of information through detailed desk-based assessments, field surveys and consultation. Sensitive receptors were mapped and the design constraints were applied. Setback buffers were placed around different types of constraints to clearly identify the areas within which no development works will take place. The size of the buffer zone for each constraint has been assigned using guidance presented in the Department of the Environment, Heritage and Local Government Wind Energy Guidelines (DoEHLG, 2006) and other relevant Best Practice standards, which are identified in each chapter of this EIAR. The proposed set backs comply with the Draft Wind Energy Guidelines 2019 requirements.

The constraints map for the Site, as shown in **Figure 3.1** encompasses the following constraints and associated buffers:

- 750m buffer of residential dwellings (exceeding the requirement for a 4 x tip height separation distance from the curtilage of properties in line with the new draft guidelines)
- Operator specific buffer of Telecommunication Links
- 65m buffer of Watercourses
- 100m buffer of Archaeological Sites or Monuments

This demonstrates the avoidance of significant impacts on the receiving environment through mitigation by design.

The Site layout design builds on the existing site characteristics and includes the following:

- Available lands for development
- Separation distance from landowners not involved in the Project (77.5m)
- Distance from designated sites
- Good wind resource
- Existing access points and general accessibility of all areas of the Site due to existing road infrastructure
- Avoidance of environmental constraints identified from desk studies

The inclusion of the constraints on a map of the study area allowed for a viable developable area to be identified. An initial turbine layout was then developed to take account of all the constraints mentioned above and their associated buffer zones and the separation distance required between the turbines.

Following the mapping of all known constraints, detailed site investigations were carried out by the project team. The ecological assessments of the Site encompassed habitat mapping and extensive surveying of birds and other fauna. These assessments, as described in **Chapter 5: Aquatic Ecology**, **Chapter 6: Terrestrial Ecology** and **Chapter 7: Ornithology**, optimised the decision on the siting of turbines as explained in Section 3.6.2.

Similarly, the hydrological and geotechnical investigations of the Site informed the proposed locations for turbines, roads and other components of the Development, such as the substation and the construction compound. This included peat depth and peat stability analysis (**Chapter 8: Soils and Geology**) and the identification of watercourses, groundwater constraints, flood risk and wells (**Chapter 9: Hydrology and Hydrogeology**). Where specific areas were deemed as being unsuitable (e.g., unstable peat giving high risk for slippage) for the siting of turbines or roads, etc., alternative locations were proposed and assessed, taking into account the areas that were already ruled out of consideration. The turbine layout for the proposed wind farm has also been informed by wind data which has been collected from an on-site meteorological mast and the results of noise assessments as they became available.

3.6.2 Turbine Layout

The final proposed turbine layout of the Development takes account of all site constraints and the distances to be maintained between turbines and from houses, roads, etc. The layout is based on the results of all site investigations that have been carried out during the EIAR process.

The selection of turbine number and layout has had regard to wind-take by siting the turbines to achieve optimal performance (three times the rotor diameter (3d) in the crosswind direction and seven times the rotor diameter (7d) in the prevailing downwind direction), noise by ensuring no turbines are constructed in a location that would lead to noise impacts (750m buffer from residential buildings), shadow flicker by maintaining a 750m buffer from sensitive receptors and when the control system detects that the sunlight is strong enough to cast a shadow, and the shadow falls on a property or properties, then the turbine will automatically shut down.) The EIAR and wind farm design process was an iterative process. As information regarding the Site was compiled and assessed, the number of turbines and the proposed layouts have been revised and amended to take account of the physical constraints of the Site. The requirement for buffer zones and other areas in which no turbines could be located was also compiled and assessed. Findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

The Development of the final proposed wind farm layout has resulted following feedback from the various studies and assessments carried out as well as ongoing negotiations and discussions with landowners and the local community. The specific locations of the various turbines were reviewed during the optimisation of the Site layout. This was achieved by strictly adhering to the Developable Area for the location of the turbines and avoiding known constraints for the site infrastructure.

Preliminary Layouts

In 2019, the Developer looked at layouts with 25 No. smaller turbines, 19 No. smaller turbines or 13 No. larger turbines at the selected Site as shown in **Figure 3.2a, 3.2b** and **3.2c.** A landscape and visual impact assessment was undertaken for the 25 turbine layout. It identified at least seven turbines located in groups, pairs and singles that were physically and/or visually isolated from the main cluster. Furthermore, the majority of isolated turbines trailed to the west where they would have been potentially visible at close quarters on both sides of the S25 designated scenic route and closer to the S24 Scenic route. They also linked towards the considerable number of cumulative developments just over the dividing ridge and county border in Kerry, thereby creating potential cumulative impacts from an uninterrupted trail of turbines running for many kilometres. Finally, the northernmost turbines were potentially visible in an awkward manner from the nearest settlement of Coolea.

At the preliminary design stage not all constraints were known.

First Layout

In 2020 a constraints study was undertaken for the Site using all criteria outlined in 3.6.1, The study identified a significant viable area within the overall study area suitable for 12 No. turbines. In line with the 2006 Wind Energy Guidelines a separation distance between the turbines of three times the rotor diameter (3d) in the crosswind direction and seven times the rotor diameter (7d) in the prevailing downwind direction was applied to ensure optimal performance.

The first layout in shown in **Figure 3.3**.

Second Layout

Following the design of the first layout, additional lands to the east and north-east were acquired through landowner agreements. A new constraints map was developed for the larger site and showed the areas of the additional lands that could be developed. The number of turbines were increased from 12 No. to 15 No. because of the additional lands and discussions with the wind turbine supplier allowed the separation distance to reduce from 7d to 5d.

Following scoping feedback turbine No. 1, 4 and 8 were moved to avoid interference with a communication link traversing the Site. Results of the initial geotechnical site investigation were also used to further refine the layout allowing the avoidance of deep peat and a reduction in the volume of excavated peat to be managed on site.

The location of the substation was moved following the recording of an archaeological enclosure (CO069-002---) during a field survey by the Project archaeologist. The location of the substation was moved to ensure a 40m buffer from the archaeological site was maintained as advised by the Project Archaeologist.

The second layout is shown in **Figure 3.4**.

Third Layout

The third and final turbine layout as presented in **Figure 3.5** takes account of all site constraints (e.g., ecology, ornithology, hydrology, peat depths etc.) and design constraints (e.g., setback distances from houses and third-party lands/infrastructure and distances between turbines on-site etc.). The layout also takes account of the results of all detailed site investigations and baseline assessments that have been carried out during the EIAR process.

The third layout involved adjusting the Redline Boundary and the removal of T1 (Second Layout) as it was not possible for the Developer to secure a landowner agreement for this land. The final layout of the wind farm is for 14 No. turbines.

A comparison of the potential environmental effects of the two wind turbine layouts when compared against the final layout are presented in **Table 3.2**.

Table 3.2: Environmental effects from first and second layout iteration compared to the final layout

Criteria	First Layout	Second Layout	Third and Final Layout
Population & Human Health (incl. Shadow Flicker)	No material environmental difference for population or human health.	No material environmental difference for population or human health.	No material environmental difference for population or human health.
Biodiversity	No significant environmental impacts	No significant environmental impacts	No significant environmental impacts
Ornithology	No significant environmental constraints	No significant environmental constraints	No significant environmental constraints
Soils & Geology	Slight increase in the volume of peat and spoil to be managed.	This layout was amended following initial geotechnical investigations to avoid areas of deep peat where possible and reduce the volume of peat and spoil to be managed.	Neutral
Hydrology & Hydrogeology	An increase in the volume of peat and spoil to be managed on site would increase the potential for silty runoff to enter receiving watercourses.	Neutral	Neutral
Air & Climate	Slight increase in the carbon payback time.	Neutral	Neutral
Noise	Neutral	Neutral	Neutral
Material Assets	Potential for impact to exiting telecoms	Neutral as the location of three turbines were moved	Neutral

Criteria	First Layout	Second Layout	Third and Final Layout
	link traversing the Site.	to avoid interference with the telecoms link.	
Landscape & Visual	Neutral	Neutral	Neutral
Cultural Heritage	Potential impact due to the presence of an archaeological site within 20m of the substation. Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.	Neutral – the substation location was moved to maintain a 40m buffer from the archaeological site following advice from the Project archaeologist.	Neutral
Traffic and Transport	Neutral	Neutral	Neutral

3.6.3 Site Access Road Layout

Roads must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. It was decided during the initial design of the Development existing roads would be utilised where possible to minimise the potential for impacts by constructing new roads as an alternative.

As the overall site layout was finalised, the most suitable routes between each component of the Development were identified, taking into account the existing roads and the physical constraints of the Site. Locations were identified where upgrading of the existing road would be required. This included where sections of new roads would need to be constructed, in order to ensure suitable access to and linkages between the various project elements, and efficient movement around the Site.

An alternative option to utilising the existing road 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 to the Site and create the potential for additional environmental impacts to occur. It would also result in an unnecessary requirement for additional cut and fill material to be used in the construction of these new roads. A comparison of the potential environmental effects of constructing an entirely new road network when compared with maximising the use of the existing road network is presented in **Table 3.3**.

Table 3.3: Environmental effects from constructing a new Site Access Road network compared to utilising existing Site Access Roads and creating new Site Access Roads where required

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Neutral
Biodiversity	Larger development footprint will result in greater habitat loss.
Ornithology	Larger development footprint will result in greater habitat loss which could impact birds.
Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated and stored. Larger volume of stone required from on-site borrow pit for road construction.
Hydrology & Hydrogeology	Larger development footprint and increased number of new watercourse crossings, therefore, increasing the potential for silty runoff to enter receiving watercourses.
Air & Climate	Potential for greater dust emissions due to the requirement of an increased volume of stone from the on-site borrow pit. Potential for greater vehicular emissions due to increased volume of construction traffic. However, these will not be significant.
Noise	Neutral
Material Assets	Larger development footprint will result in greater land-take and a change in land use.
Landscape & Visual	Potential for visual and landscape impacts due to the construction of new roads. However, this will not be significant following revegetation after construction.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic and Transport	Neutral

3.6.4 Location of Ancillary Structures

The ancillary infrastructure required for the Development include a temporary construction compound, electricity substation, grid connection and borrow pits.

3.6.4.1 Construction Compound

The use of a single temporary construction compound as opposed to two smaller compounds located in different areas of the Site is proposed and will result in less disturbances to the Site and a reduced visual impact. A comparison of the potential environmental effects of constructing a single, large construction compound when compared against constructing two smaller compounds is presented in **Table 3.4**.

Table 3.4: Environmental effects from constructing two smaller construction compounds compared to one large construction compound

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Neutral
Biodiversity	Potential for a greater impact to the Site ecology by constructing two construction compounds in different areas of the Site
Ornithology	Potential for a greater impact to the Site ornithology by constructing two construction compounds in different areas of the Site.
Soils & Geology	Neutral
Hydrology & Hydrogeology	The use of multiple construction compounds sites has the potential to increase the risk of erosion and increase risk to watercourses.
Air & Climate	Neutral
Noise	Potential for increased noise impacts on nearby sensitive receptors.
Material Assets	Neutral
Landscape & Visual	Neutral
Cultural Heritage	Neutral
Traffic and Transport	More efficient movement and management of material across the Site.

3.6.4.2 Onsite Substation incorporating Control Building

The north and south of the Site were assessed for locating the Onsite Substation. Having regard for the Site constraints, the grid connection to Ballyvouskill and the EirGrid requirement to maintain 3.5 times the turbine fall over distance, the location of the Onsite Substation including Control Building the north of the Site was selected as the location of the Onsite Substation.

It should also be noted that the operational lifespan of the proposed turbines is 35 years (following which they may be replaced and are proposed to be decommissioned).

3.6.5 Grid Connection Routes

A key consideration in determining the Grid Connection technology for a proposed wind energy development is whether the cabling is undergrounded or run as an overhead line. While overhead lines are less expensive and allow for easier repairs when required, underground lines will have no visual impact. A comparison of the potential environmental effects of constructing overhead lines when compared against constructing underground lines is presented in **Table 3.5**.

Table 3.5: Environmental effects from overhead lines compared to underground lines

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential to impact property prices due to visual impact.
Biodiversity	Neutral
Ornithology	Neutral
Soils & Geology	Neutral
Hydrology & Hydrogeology	Neutral
Air & Climate	Neutral
Noise	Neutral
Material Assets	Neutral
Landscape & Visual	Potential for greater visual impact due to overground poles and cables.
Cultural Heritage	Neutral
Traffic and Transport	Neutral

Five underground cabling route options to Ballyvouskill were initially considered and assessed as part of a civil and structural due diligence to determine which route would be brought forward as part of the planning application. The five routes, Route A, B, C, D and E are shown on **Figure 3.6**. Route D has three route options for connection to Ballyvouskill. The initial grid route assessment found a combination of Route B, C and E combined with Route D Option 2 or Option 3 was the most favourable as a lot of the route is within Coillte lands and there are less bridge crossings.

On review, a combination of Route B (excluding the section running towards the Sullane), Route C, Route D Option 3 and Route E was chosen as the grid route. This route was selected as it avoided utilising the alternative Route A. The risks associated with the constructability of Route A were the Macroom to Millstreet bypass, crossing a protected bridge, and existing services in the road. The selected grid route has less bridges along the route and a lot of the route is within Coillte lands. The route between the other wind farms in development (Inchamore and Cummeennabuddoge) is more efficient and will reduce cost overall by building a grid route that will allow other wind farms to tie in the future. A comparison of the potential environmental effects of constructing Route A compared against the chosen option (combined Routes B, C, D and E) is presented in **Table 3.6**.

Table 3.6: Environmental effects of grid Route A compared against the chosen option (combined Routes B, C, D and E)

Criteria	Route A	Route Option (combined options B, C, D, E)
Population & Human Health (incl. Shadow Flicker)	Neutral	Neutral
Terrestrial Ecology	Route A travels along public roads within St Gobnets Wood SAC and Mullaghanish to Musheramore Mountains SPA with some off-road sections proposed and is hydrologically connected.	The chosen route (combined options B, C, D and E) is hydrologically connected to Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment with route D travelling along public roads within Mullaghanish to Musheramore Mountains SPA and Route E hydrologically connected to St Gobnets Wood SAC and pNHA.
Aquatic Ecology	Route A drains to Sullane and Foherish catchments with 14 stream crossings along the route. Annex II Freshwater Pearl Mussel (*Margaritifera margaritifera*) and Atlantic Salmon (*Salmo salar*) present within both river systems.	Route B and C drains to the River Flesk (which is hydrologically connected To Killarney National Park, Macgillycuddy Reeks and Caragh River Catchment SAC), and Foherish River. Route D drains to the Garrane stream, a tributary of the Foherish River. Route B and Route E drain to the Sullane River. There are Annex II Freshwater Pearl Mussel ((*Margaritifera margaritifera*) and Atlantic Salmon

Criteria	Route A	Route Option (combined options B, C, D, E)
		(*Salmo salar*) present within the above mentioned river systems.
Ornithology	Route A runs through St. Gobnet's Wood SPA and Mullaghanish to Musheramore Mountains SPA.	Neutral
Soils & Geology	Route A is typically adjacent to farmland, with rushes frequently present which suggests a soft peaty soil underlies the area, although areas with till, weathered rock and rock outcrops were also observed.	The chosen grid route option will run mostly along existing local roads and boreens. There are some sections which will run down steep slopes on occasion and through Coillte forestry areas. This will require the felling of some trees to allow for the installation of grid connection cables. These forestry areas are likely to be underlain by peaty soil over till/weathered rock. However, weathered rock and rock outcrops were observed. In areas of peat either a geotextile membrane will be incorporated into the floor of the trench to support the ducts or the peat will be excavated down to the top of the till/weathered rock stratum. No special measures are anticipated for areas of till, weathered rock or road hardcore, which will be excavatable. In areas where rock is present along the edge of the road the trench excavation process may be hindered by this rock. The chosen option facilitates the connection of the two other proposed wind farms which will lessen the cumulative impact of cable installation, overall on soils and geology.
Hydrology & Hydrogeology	Route A has six bridge crossings which would increase the potential for silty runoff and hydrocarbons to enter receiving watercourses.	There are three bridge crossings and less potential for silty runoff and hydrocarbons to enter receiving watercourses.
Air & Climate	Neutral	Neutral

Criteria	Route A	Route Option (combined options B, C, D, E)
Noise	Neutral	Neutral
Material Assets	Neutral	Neutral
Landscape & Visual	Neutral	Neutral
Cultural Heritage	Neutral	Neutral
Traffic and Transport	Some temporary road closures will be necessary of narrow roads and boreens to facilitate the installation of cables.	Some temporary road closures will be necessary of narrow roads and boreens to facilitate the installation of cables.

3.6.5.1 Borrow Pits

Fill material required for the construction of access roads and turbine bases will be obtained from two onsite borrow pits and will be located to the north of Turbine No. 3 and the north-west of Turbine No. 11. The use of borrow pits represent an efficient use of existing onsite resources and eliminates the need to transport large volumes of construction materials along the local public road network to the Site. The location for the borrow pits were identified following detailed geotechnical site investigations and site-specific constraints outlined in **Section 3.8.1**. The borrow pits will provide up to 59,053m^3 of site won general fill. The proposed borrow pits shall also be reinstated with excavated soil material which will avoid the need to export excess spoil to off-site facilities.

An alternative to using onsite borrow pits was the option of sourcing all stone and hardcore materials from locally licensed quarries. The transport of such material to Site would result in a significant increase in construction traffic and heavy loads and was therefore considered the least preferable option.

A comparison of the potential environmental effects of using onsite borrow pits in comparison to using an offsite quarry is presented in **Table 3.7**.

Table 3.7: Environmental effects from utilising local quarries compared to the on-site borrow pits

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Potential for increased noise, vehicular and dust emissions from transporting material from offsite quarry locations to the site which could have adverse health

Criteria	Comment
	effects. Increased HGV disturbance will lead to increased environmental nuisance.
Terrestrial Ecology	Neutral
Aquatic Ecology	Neutral
Ornithology	Neutral
Soils & Geology	Effect on local quarry resource.
Hydrology & Hydrogeology	Neutral
Air & Climate	Potential increase in dust emissions and vehicle emissions associated with off-site vehicle movements.
Noise	Whilst there would be less noise generated from the Site as a result of using an offsite source, there will be an increase in noise emissions from the transport of material from offsite quarry locations on public roads. This will impact on dwellings and facilities situated along these roads.
Material Assets	Effect on local quarry resource.
Landscape & Visual	Neutral
Cultural Heritage	Neutral
Traffic and Transport	Additional HGV trips required for importation of fill.

3.7 ALTERNATIVE RENEWABLE ENERGY TECHNOLOGIES

Forestry and agriculture will continue to be carried out on the Site around the footprint of Development. An alternative source of renewable energy considered for Site following its identification was solar energy. Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic arrays (panels). The capacity factor of solar energy is significantly lower than that of onshore wind energy, requiring approximately 3 times the capacity of the Development (i.e. X3 x Y92.4 MW = 2797.2 MW) to produce the same amount of energy. Solar farms require 1 hectare per MW, the land area required would be in the region of 297 hectares. This compares to a footprint of 13.96 ha for the 14 no. proposed turbines. **Table 3.2 7** outlines the potential impact from the development of a solar photovoltaic array when compared to against the select a wind farm energy development. The selected wind farm energy development is the most efficient method of energy production with the lesser potential for significant, adverse environmental effects.

Table 3.27: Environmental effects from a solar photovoltaic array compared to a wind farm development

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local road users and at dwellings.
Biodiversity	Larger development footprint would result in greater habitat loss.
Ornithology	Potential for mimicry of sensory cues i.e., glint and glare similar to water leading to bird fatalities caused by collision. This can be mitigated.
Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated.
Hydrology & Hydrogeology	A solar PV array development would require a larger development footprint therefore increasing the potential for silty laden runoff to enter receiving watercourses.
Air & Climate	Reduced capacity factor of solar PV array technology would result in a longer carbon payback period.
Noise	Potential for transformers to cause noise impacts on nearby sensitive receptors.
Material Assets	The larger development footprint will would have a greater impact on the land use (Forestry and Agriculture) of the Site.
Landscape & Visual	Potentially less visible from surrounding area due to screening from existing forestry and topography. More of a visual impact due to their land take and slope of the land.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic & Transport	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output.

3.8 ALTERNATIVE TURBINE NUMBERS AND SPECIFICATIONS

Consideration was given to an appropriate limited range of turbine dimensions that would allow suitable flexibility at procurement stage. This is necessary because of the rate of change in technology and the length of time required to progress a project from early planning stage to turbine purchase. Different models that are currently available may not be available in a number of years' time and models that are not available now are likely to become available. The Developer undertook a review of currently available technology and chose a range of dimensions that ensures the best chance of a competitive procurement process for the proposed limited range of dimensions.

The result was the proposed limited range of dimensions as set out below:

- A tip height range of 179m to 185m.
- A hub height range of 102.5 to 110.5.
- A rotor diameter range of 149m to 155m.

The range of dimensions are shown on **Figure 2.3**.

The proposed wind turbines will have a potential power output in the 5.6 to 6.6 MW range. It is proposed to install 14 no. turbines at the Site which could achieve 78.4 MW to 92.4 MW output. A wind farm with the same potential power output could also be achieved on the Site by using smaller turbines (for example 3.5 MW machines). However, this would necessitate the installation of up to 28 turbines to achieve a similar output. Furthermore, the use of smaller turbines would not make efficient use of the wind resource available having regard to the nature of the Site. Taller wind turbines with larger rotor diameters allow wind turbines to sweep more area, capture more wind, and produce more electricity

A larger number of smaller turbines would result in the wind farm occupying a greater footprint within the Site, with a larger amount of supporting infrastructure being required (i.e., roads etc) and increasing the potential for environmental impacts to occur.

The proposed number of turbines takes account of all site constraints and the distances to be maintained between turbines and features such as roads and houses, while maximising the wind energy potential of the Site. The 14 No. turbine layout selected for the Site has the smallest development footprint, while still achieving the optimum output.

The turbine model to be installed on the Site will be the subject of a competitive tendering process and will be within the following dimensions. The height of the turbines that will be selected for construction on the Site will have an overall ground to blade tip height ranging from 179m to 185m, a rotor diameter ranging from 149m to 155m and a hub height ranging from 102.5m to 110.5m. The use of alternative smaller turbines at this Site would fail to make the most efficient use of the wind resource passing over the Site.

Following the establishment of the developable area of the Site, as part the design alternative process, different turbine heights were considered before settling on the maximum tip height range of 179m to 185m as now proposed. The relationship between the turbine height and density (number of turbines) required to achieve a particular output was a key design consideration.

From research carried out by Betakova *et al*. (2015) people have highlighted that when given an option, they tend to prefer a scenario of fewer larger turbines.
"People prefer reducing the number of turbines by replacing smaller turbines with larger ones even though larger ones might be visible from a larger number of residences"

One such study commissioned by Fáilte Ireland in 2008 found that:
"In terms of the size and composition of wind farms, tourists tended to prefer farms containing fewer turbines. If both produced the same amount of electricity, tourists also preferred wind farms containing a small group of large turbines (55%) to a large group of smaller turbines (18%)."[5]

On the basis of these factors and through design stage analysis, consideration was given to the approach that the slightly increased sense of visual dominance imparted by taller turbines is preferable to the reduced level of permeability and increased visual array associated with a greater number of shorter turbines required to achieve the same output. Moreover, the perceived visual dominance of taller turbines is further offset by increased setback distances from residential receptors.

The consideration to provide fewer, larger turbines with greater power output is in line with industry trends. This option increases energy efficiency, improving the energy output to the national grid per turbine, thus reducing the cost of energy for the consumer. The use of less turbines also reduces the impact on the receiving environment with less land-take required to accommodate the wind farm and less associated construction works as detailed above. Recent permitted wind farm applications in Ireland tend towards larger/taller turbines (i.e., the larger turbine tip heights that are available on the market in Ireland). Examples of recent consented wind farms which include larger/taller turbines are the Ardderroo Wind Farm, Co. Galway (ABP ref. PL07 .303086) which consists of 25 no. wind turbines at 178.5m tip height. Coole Wind Farm, Co. Westmeath (ABP ref. PL25M.300686) which consists of 13 no. wind

[5] https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf [Accessed 11/02/2022]

turbines of 175m tip height, and Derrinlough Wind Farm (ABP ref. PA19.306706) which consists of 21 no. wind turbines of 185m tip height.

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing a smaller number of larger wind turbines are presented in **Table 3.8**.

Table 3.8: Environmental effects from a large number of smaller wind turbines compared to the Development

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impact on nearby sensitive receptors.
Biodiversity	Larger development footprint would result in greater habitat loss.
Ornithology	The presence of more turbines would increase the potential effects on birds.
Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated.
Hydrology & Hydrogeology	The larger development footprint would increase the potential for silty runoff to enter receiving watercourses.
Air & Climate	Neutral
Noise	Potential for increased noise impacts on nearby sensitive receptors.
Material Assets	Neutral
Landscape & Visual	A larger number of smaller turbines would have a greater visual impact.
Cultural Heritage	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Traffic and Transport	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.

3.9 ALTERNATIVE TURBINE HAUL ROUTE

Alternative ports of entry and transport routes to the Site were considered the latter in relation to turbine component delivery and general construction-related traffic.

3.9.1 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the Development include Ringaskiddy Port, Co. Cork and the Foynes Port, Co. Limerick. Both Ports offer a roll-on roll-off procedure to facilitate import of wind turbines. Ringaskiddy Port was selected as the port of entry for this project because it is located closer to the Site and a number of the existing wind farms in the locality have successfully utilised this port. This reduces the work required on the Turbine Delivery Route.

3.9.2 Turbine Component Delivery to Site

Turbine component delivery routes from Ringaskiddy Port included the N40, N22 and a combination of different local roads that exist between the N22 and the Site. In terms of the local roads, cognisance was taken of the haul route used for the recently constructed Derragh Wind Farm, which is located directly to the south of the Site. That route utilised the N40 and N22 to the townland of Lackaneen, east of the village of Lissacressig, before travelling towards the Site via a network of local roads to the existing site entrance in the townland of Cloontycarthy. That route had been the subject of a full route survey and swept path analysis survey prior to construction of Derragh Wind Farm. Road widening occured along 1.6km of the turbine transport route to accommodate the large vehicles used to transport turbine components to the Derragh Wind Farm site. A temporary bridge will be installed over the Sullane River at Gortnatubbrid Td., Ballyvourney, as the existing triple-arch bridge on the Sullane River at Ballyvourney is unsuitable for deliveries of turbines of the dimensions proposed at Gortyrahilly without significant structural modifications. The method statement for the temporary bridge crossing is attached as **Appendix 2.6**. Therefore, by utilising this route less works are required compared with alternative local roads that have not been previously used for turbine delivery.

A section of this route has proven suitable for the transport of turbine components for the Development. The transport analysis (as presented in **Chapter 15: Traffic and Transportation**) shows that only minor additional accommodation works will be required to accommodate the proposed turbines.

3.9.2.1 Civil Construction Haul Route

The local road network was assessed for the Civil Construction Haul Route. A number of the local roads were not suitable as they were too small or they would have required upgrade works. Cognisance was also taken of the construction haul routes used for the recently constructed Derragh Wind Farm.

The proposed Civil Construction Haul Route is shown on **Figure 15.3**.

Specific grades of rock fill will be required as fill under turbine foundations while sub-base and base course materials for the Access Track and Turbine Hardstand construction will be sourced on site from borrow pits. Concrete, crushed stone and concrete blocks for construction of the Development will come from licenced quarries in the locality such as:

- McGroup Keim Quarry
- Coppeen Concrete, Enniskeane
- Mid-Cork Quarries, Gortnadiha
- McSweeney Bros, Kilmichael
- Keohane Readymix, Ballygurteen
- Murray Bros Tarmacadam Ltd, Ardcahan

These quarries will also be the source of crushed stone and road surfacing for widening works to the turbine haul route (L-3405-0 and L-7405-0) and for grid connection works.

From Keim, trucks will follow the R582 in a south-easterly direction to the New Macroom By-Pass (N22) and will then follow the L-3402 to the site.

For the quarries to the south, trucks will use the R587, then the R584 to the new Macroom By-Pass (N22) and then follow the L-3402 to the site.

For the grid connection, general material excavated from trenches in public roads will be disposed of to a licenced facility while excavated road surfacing material will be recycled. General soil waste will be transported to one or more of the following licensed facilities:

- Tomas Mullins, Scrahanagown, Coolea, Co. Cork
- Richard & Dennis Carroll Plant Ltd., Clonfadda, Macroom, Co. Cork
- Ciaran Ryan Plant Hire Ltd., Ballymacorcoran, Clondrohid, Co. Cork
- Séan Ó Luasa, Na Foithrí (Fuhirees), Cúil Aodha, Maighchromth, Co. Chorcaí

Soil and stone spoil from road widening on the Turbine Haul Route will be disposed of to the same facilities.

Excavated road surfacing materials will be recycled and used for temporary reinstatement of trenches. Bitumen and supplementary road surfacing for trench reinstatement can be sourced from Lehane Tarmacadam, Kilbarry, Macroom, Co. Cork or McSweeney Bros, Kilmichael or Murray Bros Tarmacadam Ltd., Ardcahan.

Grid construction traffic will use the grid route and link with the N22 at Cummeenavrick or will be serviced from the wind farm site or will be serviced using the L-3400 through Coolea.

3.10 ALTERNATIVE MITIGATION MEASURES

Mitigation by avoidance has been central to the Project's evolution. By avoiding the ecologically sensitive areas of the Site the potential for environmental effects is limited. As noted above, the site layout aims to avoid any environmentally sensitive areas through the application of site-specific constraints. Where loss of habitat occurs at the Site, this has been mitigated with the proposal of enhancement lands.

The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential environmental effects and risk associated with this. The best practice design and mitigation measures set out in this EIAR will contribute to reducing any risks and have been designed to break the pathway between the Site and any identified sensitive receptors.

3.11 CONCLUSION

A description of the reasonable alternatives 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 [maximum 92.4 MW output, 14 no. turbine with a tip height range of 179m to 185m, a hub height range of 102.5 to 110.5 and a rotor diameter range of 149m to 155m – large scale wind farm], and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects has been provided.