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 Mr. Andrew O'Grady of Jennings O'Donovan & Partners Limited. Mr. O'Grady is a Senior Environmental Consultant and holds a Bachelor (Hons.) Degree in Geography from University of Coventry and a MSc. in Environmental Resources Management from the Free University, Amsterdam. He has worked in environmental consultancy for over fifteen years and has prepared various Environmental Reports and EIARs.

3.3 METHODOLOGY

3.3.1 Requirements for Alternatives Assessment

Article 5(1) of the EIA Directive (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".

In 2022, the Environmental Protection Agency (EPA) published the 'Guidelines on the information to be contained in Environmental Impact Assessment Reports', which 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], stipulate 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:

- *a 'do-nothing' alternative (where appropriate);*
- *alternative locations;*
- *alternative layouts;*
- *alternative designs;*
- *alternative processes; and*
- *alternative mitigation measures."*

As stated in the 2022 EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports:

The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. 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. A detailed assessment (or 'mini-EIA') of each alternative is not required[3].

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 this chapter, **Chapter 3**, of the EIAR.

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

- 'Do Nothing' Alternative
- 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.
[3] Ref CJEU Case 461/17.

- Alternative Turbine Numbers and Specifications
- Alternative Layout and Design
- Alternative Transport Route and Site Access
- Alternative Grid Connection
- 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 Tullaghmore 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 would occur would have slight/not significant change. 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 Galway's wind energy resource would be lost at this Site.

A comparison of the potential environmental effects of the 'Do-Nothing' Alternative when compared against the chosen option of developing a renewable energy project at this site are presented in **Table 3.1**. 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	Comment
Population & Human Health (incl. Shadow Flicker)	No increase in local employment and no financial gains for the local community. No potential for shadow flicker to affect sensitive receptors.
Biodiversity	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 habitats on site. No opportunity for biodiversity enhancements.
Ornithology	Without the proposed wind farm development proceeding, it is expected that the current land uses on site, namely livestock grazing, will continue. 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 on site which could affect species such as Red Grouse.
Soils & Geology	Should the proposed development not proceed, the existing land-use practices will continue with associated modification of the existing environment.
Hydrology & Hydrogeology	Should the proposed development not proceed, the existing land-use practice of agricultural activities will continue with associated gradual alteration of the existing environment and associated pressures on surface water and groundwater quality.
Air & Climate	There will be no increase in air quality or a reduction of greenhouse gas emissions provided by the Development. The Development will not assist in achieving the renewable energy targets set out in the Climate Action Plan.
Noise	No potential for noise impacts on nearby sensitive receptors.
Landscape & Visual	No potential for views from sensitive receptors such as the 'Quiet Man Bridge'.
Material Assets	Neutral
Cultural Heritage (Including architectural and archaeological aspects)	Neutral
Material Assets	Neutral

Criteria	Comment
Traffic and Transport	No potential for increased traffic during construction.

3.5 STRATEGIC SITE SELECTION

3.5.1 Project Site requirements

EMPower carried out an initial mapping exercise to identify suitable sites for wind farms in 2018 across the entire country. From this, four potential sites for a wind farm were identified in County Galway.

This exercise utilised a large number of spatial datasets such as ordnance survey land data, house location data, transport, forestry data, existing wind energy and grid infrastructure data and environmental data such as ecological designations, landscape designations and wind energy strategy designations. The site selection exercise was carried out throughout Ireland, with four sites identified in County Galway. This facilitates an assessment of alternatives relative to the proposed Tullaghmore Wind Farm site. The four sites assessed are shown on **Figure 3.1**.

Residential and commercial building locations were attained from Eircode's database of 2.2 million address points in Ireland. A buffer of 500m was applied to each building point, provisionally ensuring an adequate setback distance from each dwelling ensuring compliance with all relevant wind energy guidelines. As potential Study Area assessments progressed this dwelling setback distance was further refined to comply with project and area specific details. The 2018 EMPower GIS screening process outlined certain areas that warranted further study and some areas were not considered for further study.

Study Areas not selected for further study were largely excluded because of some or all of the following:

- Count Development Plan Zone
- Wind Resource
- Designated European Sites
- Tourism
- Ornithology
- Grid Risk
- Planning Precedence
- Terrain / Land Use
- Housing Density

EMPower's 2018 Project Screening Process, examined Ireland for the potential to accommodate wind energy projects. County Galway was examined with a focus on developing sites within the vicinity of Galway County Council's designated areas of ''Strategic'', ''Open to Consideration'' and ''Acceptable in principle'' as outlined in the Galway County Council Wind Energy Strategy 2015 to 2021.

Table 3.2: Examination of Alternative Sites

Criteria	Cregdull	Frenchfort	Lettermuckdou	Tullaghmore
Number of Turbine Units	13	11	19	16/6
CDP Wind Dev. Zone	CDP 2015 – 2021 – 'Not Normally Permissible' Draft CDP 2022 – 2028 – 'Generally to be Discouraged'.	CDP 2015 – 2021 – Not Normally Permissible Draft CDP 2022 – 2028 – part of site in 'Open to Consideration' with majority being in 'Generally to be Discouraged'.	CDP 2015 – 2021 – 'Not Normally Permissible' Draft CDP 2022 – 2028 – 'Not Normally Permissible'	CDP 2015 – 2021 – 'Not Normally Permissible' / 'Acceptable in Principle' Draft CDP 2022 – 2028 – 'Not Normally Permissible'
Wind Resource	Class 3 (7.8m/s)	Class 3 (8.1m/s)	Class 2 (8.5m/s)	Class 2 (8-9m/s)
Designated sites	Direct Connectivity via the Clare and Cregg Rivers to Lough Corrib SAC immediately west.	Direct Connectivity to Galway Bay SAC Complex and the inner Galway Bay SPA approx. 5km Southwest. NHA and pNHA also present within 1 to 2km.	Immediately adjacent to Connemara Bog Complex SAC, SPA and pNHA	Lough Corrib SPA and SAC, approximately 1km to the north. Connemara Bog Complex SAC approx. 1.5km to the south.
Tourism	CDP 2015 – 2021 – 'Low' landscape value and 'Low' Sensitivity. No focal points/scenic views. Draft CDP 2022 – 2028 Appendix 4 Landscape Character Assessment characterises site as located in Central Galway Complex Landscape classed as having many areas with local sensitivities – often on account of local amenities or historic sites. Open countryside offers frequent extensive panoramic views from local highpoints.	CDP 2015 – 2021 – 'Low' landscape value and 'Low' Sensitivity. No focal points/scenic views. Draft CDP 2022 – 2028 Appendix 4 Landscape Character Assessment characterises site as located in Central Galway Complex Landscape classed as having many areas with local sensitivities – often on account of local amenities or historic sites. Open countryside offers frequent	CDP 2015 – 2021 - 'High' Value Landscape with 'High' sensitivity. Close to areas of 'Unique' landscape. In/close to an area with a designated view/focal point. Draft CDP 2022 – 2028 Appendix 4 Landscape Character Assessment characterises site as located within Uplands and Bog Landscape classed as having Nationally iconic landscapes of scenic, cultural, ecological and historic significance. High sensitivity throughout. 12 Bens	CDP 2015 – 2021 - The landscape value rating is 'High' with 'High' Sensitivity – Views from the N59 and Connemara/Maam Cross. Scenic Views from R345 north of Lough Corrib. Close to areas of 'Unique' landscape. Draft CDP 2022 – 2028 Appendix 4 Landscape Character Assessment characterises site as - located within Uplands and Bog Landscape classed as having Nationally iconic landscapes of scenic, cultural, ecological and historic significance. High sensitivity throughout. 12 Bens

Criteria	Cregdull	Frenchfort	Lettermuckdou	Tullaghmore
	High - Within 5km of the Galway Airport and Cregg Airstrip. Located immediately east of the N84.	extensive panoramic views from local highpoints. High - Within 5km of the Galway Airport and Cregg Airstrip. Located either side of the M6 Galway to Dublin route.	and Raised Lakes are vulnerable.	and Raised Lakes are vulnerable.
Ornithology risk	Low - Area not known to have Annex 1 birds present.	Low - Area not known to have Annex 1 birds present.	Moderate – in close proximity to Connemara Bog Complex SPA qualifying interests of which are Cormorant (*Phalacrocorax carbo*), Merlin (*Falco columbarius*), Golden Plover (*Pluvialis apricaria*) and Common Gull (*Larus canus*)	Moderate – Immediate area not known to have Annex 1 bird species present - Reversible Residual Impact on birds. Annex 1 bird species are present in the wider area. Site in proximity to Lough Corrib SPA whose qualifying interests are: Gadwall (*Anas strepera*), Shoveler (*Anas clypeata*), Pochard (*Aythya ferina*), Tufted Duck (*Aythya fuligula*), Common Scoter (*Melanitta nigra*), Hen Harrier (*Circus cyaneus),* Coot (*Fulica atra*), Golden Plover (*Pluvialis apricaria*), Black-headed Gull (*Chroicocephalus ridibundus*), Common Gull (*Larus canus*), Common Tern (*Sterna hirundo*), Arctic Tern (*Sterna paradisaea),* Greenland White-fronted Goose (*Anser albifrons flavirostris*) and Wetland and Waterbirds.
Grid risk	Moderate – Approximately 6.5km north of Galway Substation. Casla substation also provides option but both routes potentially interact with very dense traffic volumes and road use given slight short-term	Low – in very close proximity to Casla substation which should provide the potential for a suitable connection.	Moderate – approx. 8km south of Screebe substation. Slight short-term impact on public road.	Moderate – Distribution and Transmission grid lines just south of project. 16km from Screebe Substation. Slight short-term impact on public road.

Criteria	Cregdull	Frenchfort	Lettermuckdou	Tullaghmore
	impact on road network.			
Planning precedence in area	None - No other wind farms granted planning in the area.	None - No other wind farms granted planning in the area.	Rossaveal operational single turbine project approximately 6.5km to the south.	Galway wind park turbines located within 9.5km Southeast of the Tullaghmore Study Area. Consented Ardderroo Wind Farm located 15km Southeast of the Tullaghmore Study Area
Terrain / Land use	Flatland, bog, Agricultural, Turbary	Agriculture, pastureland, grazing, tillage	Rural general, peat harvesting, Turbary, bog	Strong rural area, agriculture and forestry.
Housing Density	Medium	Medium	Low	Very Low

The sites considered for a wind energy development as detailed in **Table 3.2** presented a range of different environmental constraints and sensitivities. When compared, the proposed Tullaghmore project was found to have the greatest capacity for a wind energy development due to its robust receiving environment and lack of significant environmental constraints.

The proposed Tullaghmore Wind Farm Study Area is located approximately 30km north-west of Galway city, 9km northwest of Oughterard and approximately 5km east of Maam Cross. The region is situated within Uplands and Bog Landscape character area and the Lake Environs area. The Tullaghmore Study Area is located between an area designated as ''Not Normally Permissible' and 'Acceptable in Principle'. Accordingly, the principle of a wind farm at the study area is acceptable in planning terms, subject to other development control considerations, including demonstration of no adverse impacts on the receiving environment. The proposed Tullaghmore Wind Farm project's comparative advantage is demonstrated across numerous categories as set out in **Table 3.2**. Based on the analysis completed, it was deemed to present a viable opportunity from a technical, financial, and planning perspective, while imposing the least impact on its receiving environment, in comparison to the alternative sites considered above.

3.1.1 Preliminary Constraints Mapping and Landscape Study

Constraints mapping was carried out at the preliminary stage of the project (Q3-Q4 2020) for the selected site. The constraints mapping process involved the placing of buffers around different types of constraints to identify clearly the areas within which no development works could take place. A description of the constraints and buffers applied are outlined in **Section 3.8.1**.

Following the application of constraints, a 16 No. turbine layout was developed. A Landscape Capacity Assessment was undertaken for the proposed 16 No. turbine layout. The Landscape Capacity Assessment used a number of visualisation tools and techniques to gauge the capacity of the Site to absorb a wind farm. This was also to determine the most appropriate spatial and vertical extent of wind turbines within each of the available lands. The findings of the assessment were used to determine the most appropriate turbine layout for the Site. Due to the distance between the proposed development and existing and permitted turbines, cumulative effects arising were not considered to be significant. In conclusion, the study found that the visual impact of a 16 No. turbine wind farm was acceptable with regard to the existing and permitted wind farms in the area. As outlined in **Section 3.8**, which details the evolution of the layout, it is now proposed to have 6 No. turbines on the Site.

3.5.2 Suitability of the Candidate Site

It is critical for the Developer and their project team to see that the most suitable site for the development of a proposed wind farm is identified and progressed through planning. This is 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 selection process for the current proposal has been fully informed by national, regional and local policy constraints at a macro level as well as site specific constraints that influence the turbine layout and project design on site at a micro level. The main policy, planning and environmental considerations for the selection of a potential wind farm site include:

- Site location relative to the Galway County Wind Energy Strategy's classification of areas considered suitable for wind farm development from a planning policy perspective
- Access to the national electricity grid possible within a viable distance
- Located outside areas designated for protection of ecological species and habitats
- Located predominantly within an existing commercial forestry which allows the site to take advantage of existing access roads
- Consistently high average annual wind speeds; Low population density; and Visual Amenity

3.5.2.1 Galway County Development Plan 2022-2028

In the Wind Energy Strategy that accompanies the CDP, the area of the 16 turbine preliminary layout site is partly in an area classed as 'Acceptable in Principle' for wind energy development. That is the western part of the site which is forested. The rest of the site is located in an area classed as 'Not Normally Permissible'.

County Development Plan Policies and Objectives

The CDP has the following strategic aim:

"*To reduce the County's CO_2 emissions by achieving national, regional and any local targets for achieving a low carbon economy by 2050; and increase energy efficiency in Local Authority activities through its development management functions.*

To reduce County Galway's dependency on imported fossil fuels and to provide alternative energy sources by harnessing the County's potential for renewable energy sources while strengthening the grid transmission networks"

CC 1 Climate Change

"*Support and facilitate the implementation of European, national and regional objectives for climate adaptation and mitigation taking into account other provisions of the Plan (including those relating to land use planning, energy, sustainable mobility, flood risk management and drainage) and having regard to the Climate mitigation and adaptation measures."*

CC 2 Transition to a low carbon, climate-resilient society

"*It is the Council's policy objective to support the transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, by way of reducing greenhouse gases, increasing renewable energy, and improving energy efficiency."*

CC 6 Local Authority Renewable Energy Strategy (LARES)

"*To support the implementation of the Renewable Energy Strategy contained in Appendix 1 of the Galway County Development Plan to facilitate the transition to a low carbon county."*

RE1 Renewable Energy Generation and Ancillary Facilities

"*To facilitate and support appropriate levels of renewable energy generation and ancillary facilities in the county to meet national, regional and county renewable energy targets, to facilitate a reduction in CO_2 emissions and the promotion of a low carbon economy."*

RE 3 Wind Energy Developments

"*Promote and facilitate wind farm developments in suitable locations, having regard to areas of the County designated for this purpose in the Local Authority Renewable Energy Strategy. The Planning Authority will assess any planning application proposals for wind energy production in accordance with the Local Authority Renewable Energy Strategy, the DoEHLG Guidelines for Planning Authorities on Wind Energy Development, 2006 (or any updated/superseded documents), having due regard to the Habitats Directive and to the detailed policy objectives and Development Standards set out in the Local Authority Renewable Energy Strategy."*

RE 7 Renewable Energy Generation -Transition to a Low Carbon Economy

"*To facilitate and support appropriate levels of renewable energy generation in County Galway, considering the need to transition to a low carbon economy and to reduce dependency on fossil fuels.*"

EG 2 a) and e) support the development of the transmission grid network in the county and liaison with EirGrid.

(a) To support the development of the transmission grid network in order to sustainably accommodate both consistent and variable flows of renewable energy generated in County Galway.

(e) It is important that the necessary transmission and distribution infrastructure is facilitated and put in place in order to maximise the renewable energy potential of County Galway. Liaison with EirGrid, as a TSO, and alignment with their transmission plans and strategies will be of vital important in this respect.

The Renewable Energy Strategy contains the following objectives:

Objective 13 states:

"To increase renewable energy generation levels from wind energy developments in County Galway, given the recognised wind energy potential of the County."

Objective 14 states:

"*All onshore wind energy developments shall comply with the National Wind Energy Development Guidelines or any subsequent version thereof."*

Objective 15 states:

"*Wind energy development proposals in the areas that are 'Acceptable in Principle' for renewable energy development will be considered in accordance with the LARES and the proper planning and sustainable development of the area."*

Objective 16 states:

"*Wind energy development proposals in areas that are identified as 'Open to Consideration' for wind energy development will be considered in accordance with the LARES and the proper planning and sustainable development of the area."*

Objective 17 states:

"*Wind energy development proposals in areas that are identified as 'Generally to be Discouraged' for wind energy development will be considered in accordance with the LARES and the proper planning and sustainable development of the area."*

Objective 18 states:

"*Wind energy development proposals in areas that are identified as 'Not Normally Permissible' for wind energy development will be considered in accordance with the LARES and the proper planning and sustainable development of the area.*"

3.5.2.2 National Grid Connection

The Site is located within 18km of the existing ESB Screebe 110kV substation and there are 110kV overhead lines that cross the south of the Site. Therefore, a wind energy development at this location has a number of route options to enable connection to the national electricity grid.

3.5.2.3 Designated Sites

The Site 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) is Lough Corrib SPA 730m north of the Site at the nearest point.

3.5.2.4 Wind Speeds

The Irish Wind Atlas produced by Sustainable Energy Ireland shows 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 (7.6m/sec at 30m, 8.0m/sec at 75m, 8.4m/sec at 100m and 8.4m/sec at 150m/s).

3.5.2.5 Population Density

The applicants sought to identify an area with a relatively low population density. 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 2.9 persons per square kilometre. This is significantly lower than the average national population density of 68.1 persons per square kilometre.

3.5.2.6 Summary

From the review of the criteria set out above, the Site was identified as a suitable location for the provision of a wind farm of the scale proposed (the initial 16 turbine layout which has now reduced to 6). The Site was located predominantly within agricultural land and existing commercial forestry which allows the Site to take advantage of some existing access roads (which will be upgraded) on the eastern side of the site, this when combined with the proximity to the existing Screebe 110kV substation further highlights the suitability of the

Site as it can make further sustainable use of these established items of infrastructure. The Site does not overlap with any environmental designations and is located in an area with a relatively low population density with appropriate annual wind speeds.

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.

It should be noted here that due to issues with a third-party landowner, the present site under consideration, and the subject of this Application, is considerably reduced with the land under forestry on the eastern side of the site now being excluded from the Development. Therefore, there is now a 6 No. turbine development being taken forward.

3.6 ALTERNATIVE TURBINE NUMBERS AND SPECIFICATIONS

The proposed wind turbines will have a potential power output in the 6.8MW range. It is proposed to install 6 No. turbines at the Site which could achieve 40.8MW output. A wind farm with the same potential power output could also be achieved on the Site by using smaller turbines (for example 3.5MW machines). However, this would necessitate the installation of up to 10-11 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.

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. access tracks 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 6 No. turbine layout selected for the Site has the smallest development footprint, while still achieving the optimum output at a more consistent level than would be achievable using different turbines.

The turbine model to be installed on the Site will be the subject of a competitive tendering process. For the purposes of the EIA assessments, a Vestas V162 (6.8MW) turbine has been chosen. Vestas V150 turbines were also considered during the design stages but were not considered as suitable for the site. The maximum height of the turbines that will be selected for construction on the Site will have an overall ground to blade tip height of 185 metres.

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 3.3**.

Table 3.3: Environmental Effects of 16 No. to six No. Wind Turbines Compared to the Development

Criteria	16 No. Turbines	Six No. Turbines
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impact on nearby sensitive receptors.	Less potential for shadow flicker impact on nearby sensitive receptors.
Biodiversity	Larger development footprint would result in greater habitat loss.	Less habitat loss.
Ornithology	The presence of more turbines would increase the potential collision risk for birds.	Less turbines will decrease the potential collision risk for birds.
Soils & Geology	Larger development footprint would result in greater volumes of peat and spoil to be excavated.	A smaller volume of peat and spoil will be generated.
Hydrology & Hydrogeology	The larger development footprint would increase the potential for silt laden runoff to enter receiving watercourses.	Less disturbance of soils and a decreased potential for silt laden runoff.
Air & Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of construction material and turbine component deliveries to the Site.	A decreased volume of vehicles and construction materials will decrease the potential for dust and vehicle emissions.
Noise	Potential for increased noise impacts on nearby sensitive receptors.	A smaller number of turbines will provide fewer sensitive receptors. Those impacted by the larger number of turbines may not now be impacted due to their location.
Material Assets	Potential for increased impact on existing telecommunication links traversing the Site.	Less potential for impact on existing telecommunication links traversing the Site.

Criteria	16 No. Turbines	Six No. Turbines
Landscape & Visual	A larger number of turbines would have a greater visual impact.	A smaller number of turbines will have a lesser visual impact.
Cultural Heritage (Including architectural and archaeological aspects)	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology including on the archaeological setting in the landscape.	With a smaller developable area, there is a lower risk of disturbing 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.	Less construction materials are required and therefore less vehicle movements.

3.7 ALTERNATIVE LAYOUT AND DESIGN

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 of this is to reduce potential for environmental effects while designing a project capable of being constructed and viable. Throughout the preparation of the EIAR, the layout of the 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 proposed layout. The design process has also taken account of the recommendations and comments of the relevant statutory and non-statutory organisations, the local community and local authorities as detailed in **Section 1.10** of **Chapter 1: Introduction**.

3.7.1 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 setbacks comply with the Draft Wind Energy Guidelines 2019 requirements.

The constraints map for the Site, as shown in **Figure 3.2** encompasses the following constraints and associated buffers:

- 740m buffer of residential dwellings (exceeding the requirement for four times the tip height separation distance from the curtilage of properties in line with the new draft guidelines)
- Operator specific buffer of Telecommunication Links
- 50m 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
- 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 6: Terrestrial Ecology** and **Chapter 7: Ornithology**, optimised the decision on the siting of turbines and the carrying out of any development works, such as the construction of roads.

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.

3.7.2 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. As information regarding the Site was compiled and assessed, the number of turbines and the proposed layout have been revised and amended to take account of the physical constraints of the Site. The requirement for buffer zones and other areas in which no turbines could be located was also compiled and assessed. The selection of turbine number and layout has had regard to wind-take, noise and shadow flicker impacts and the separation distance to be maintained between turbines. The EIAR and wind farm design process was an iterative process. 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. There were several reviews of the specific locations of the various turbines during the optimisation of the Site layout. The initial constraints study identified a significant viable area within the overall study area, suitable for approximately 16-17 No. turbines. The initial turbine layout,

shown in **Figure 3.2** occupied the viable area within the wider study area. However, the proposed turbine layout was refined following feedback from the project team and applicant. The chosen turbine layout is considered optimal as the alternative, earlier iterations of the layout had the potential for greater environmental effects.

The first iteration of the turbine layout, shown in **Figure 3.3a and 3.3b**, looked at a 17-turbine layout. It involved repositioning all turbine locations to achieve greater separation distances between turbines and residential dwellings and avoiding areas of blanket bog and sensitive habitat. This layout was refined five times with relatively minor movements of turbine positions and access track alignments following a design team workshop and feedback from ongoing environmental studies.

The second iteration of the proposed turbine layout, illustrated in **Figure 3.4** involved reducing the number of possible turbines to 16 with two turbines being omitted and an additional location on the east of the site added. Turbines 16 and 17 were moved further north due to being inside the buffer zone for the 220kV and 110kV power lines which run along the southern part of the site. This led to Turbine 13 being omitted due to increased wake effects and the proximity of the telecoms link making it difficult to move further north. T2 was omitted due to its elevated location on the top of the hill and wake effects due to the reworking of the layout.

The third main change is shown on the drawings in **Figure 3.5**. This involved the reduction of the Development from 16 turbines to 6 turbines. This was due to the landowner on the eastern side of the site withdrawing from the project. This layout has been changed slightly on four occasions, following a design team workshop and more detailed design of the internal Site Access Tracks layout. Tracks were also realigned to take account of hydrological buffers and to avoid areas of deeper peat. The location of Turbine 4 was moved slightly further north to maintain a distance of 740m from the revised curtilage of a house.

It was also at this point that the boundary of the Site for the purposes of the EIAR was defined. The initial boundary was amended to focus on the final iteration of the layout and proposed entrance and access route. The final proposed turbine layout as presented in **Figure 1.2** 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 site investigations and baseline assessments that have been carried out during the EIAR process. A comparison of the potential environmental effects of

the layout as presented in the initial, first, second and third iterations when compared against the final layout are presented in **Table 3.4**.

Table 3.4: Environmental Effects from Initial, First and Second Layout Iteration Compared to the Final Layout

Criteria	Initial Layout (Figure 3.2)	First Iteration (Figures 3.3a & 3.3b)	Second Iteration (Figure 3.4)	Third Iteration (Figure 3.5)
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.	No material environmental difference for population or human health.
Biodiversity	No significant environmental	No significant environmental	No significant environmental	Smaller scheme likely to have less potential for significant environmental effects.
Ornithology	No significant environmental	No significant environmental	No significant environmental	Smaller scheme likely to have less potential for significant environmental effects.
Soils & Geology	Slight increase in the volume of peat and spoil to be managed.	This layout was amended following initial geotechnical investigations to reduce areas of deep peat and reduce the volume of peat and spoil to be managed.	Neutral	Smaller scheme likely to have less potential for significant environmental effects.
Hydrology & Hydrogeology	An increase in the volume of peat and spoil to be managed on site would increase the potential for silt laden runoff to enter receiving watercourses.	Neutral	Neutral	Smaller scheme likely to have less potential for significant environmental effects.
Air & Climate	Slight increase in the carbon payback time.	Neutral	Neutral	Smaller contribution to reduction in CO_2 emissions.
Noise	Neutral	Neutral	Neutral	Smaller scheme likely to have less potential for significant environmental effects.
Material Assets	Potential for impact to exiting telecoms link traversing the Site.	Neutral	Neutral	Smaller scheme likely to have less potential for

Criteria	Initial Layout (Figure 3.2)	First Iteration (Figures 3.3a & 3.3b)	Second Iteration (Figure 3.4)	Third Iteration (Figure 3.5)
				significant environmental effects.
Landscape & Visual	Neutral	Neutral	Less turbines reduces effects	Smaller scheme likely to have less potential for significant effects.
Cultural Heritage	Neutral	Neutral	Neutral	Smaller scheme likely to have less potential for significant environmental effects.
Traffic and Transport		Neutral	Neutral	Smaller scheme likely to have less potential for significant environmental effects.

3.7.3 Site Access Track Layout

Site Access Tracks are required onsite to enable transport of infrastructure and construction materials within the Site. Tracks 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. This has meant that the existing entrance on the N59 has been used in the design which includes an existing section of access track which can be upgraded and used, meaning somewhat less new access track needs to be constructed.

At the outset it was planned to reuse as much of the existing access tracks on the site as possible to reduce effects on habitats. The eastern part of the original site had a number of existing forestry access tracks. However, the site of the reduced project of 6 turbines has very little existing access track that can be reused. Therefore, mostly new Site Access Tracks will need to be constructed.

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

3.7.4 Location of Ancillary Structures

The ancillary infrastructure required for the proposed development include a temporary construction compound, electricity substation and grid connection.

3.7.4.1 Construction Compound

The temporary construction compound will be used as a secure storage area for construction materials and to contain temporary site accommodation units for sealed type staff welfare facilities. The compound will contain cabins for offices space, meeting rooms, canteen area, a drying room, parking facilities, and similar personnel type facilities. The temporary construction compound is located on the south of the Site near the entrance to the Site off the N59. It is accessed off the existing access track that will be upgraded within the Site. The use of a single temporary construction compound as opposed to two smaller compounds located in different areas of the Site will result in less disturbances to the Site and a reduced visual impact. A number of locations were assessed for the location of the temporary compound. The current proposed location is considered the most suitable due to its location to the site entrance and its location on cutover peat which will reduce the effects on more valuable peatland on other parts of the Site.

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 3.5**.

Table 3.5: Environmental Effects from Constructing a 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	Increased amounts of peat extraction required if constructed on other part of the Site.
Hydrology & Hydrogeology	The use of multiple construction compounds sites has the potential to increase the risk of erosion and increase risk to watercourses.

Criteria	Comment
Air & Climate	The use of multiple construction compounds sites has the potential to increase the number of potential dust sources on the Site.
Noise	Potential for increased noise impacts on nearby sensitive receptors.
Material Assets	Neutral
Landscape & Visual	Potential for greater visual and landscape impacts due to the construction of tracks.
Cultural Heritage	Neutral
Traffic and Transport	Less efficient movement and management of material across the Site.

3.7.4.2 On-Site Substation

A number of locations for the On-Site Substation were assessed In order to provide flexibility to the electrical network provider and having regard for the Site constraints the location of the onsite substation is restricted to the north of the Site. It should also be noted that while the operational lifespan of the proposed turbines is expected to be 35 years (following which they may be replaced or decommissioned). The electricity substation and associated infrastructure will become an ESB asset. It will then be a permanent feature of the proposal as it will be required to continue to form part of the electrical infrastructure of the area. This will be in the event that the remainder of the Site is decommissioned. The various locations assessed for the substation location are shown on **Figures 3.4** and **3.5**. The current location was chosen due to its location in the middle of the site in an area of shallow peat.

3.7.4.3 Grid Connection

A key consideration in determining the grid connection method 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. For this reason, it was considered that underground lines would be a preferable alternative to overhead lines. The draft Wind Energy Guidelines 2019 also indicate that underground cables are the preferred option for connection of a wind energy development to the national grid. Therefore, the preferred option is an underground cable duct but with second option of part overhead line and part underground cable duct to allow flexibility going forward as the final connection method being decided by the ESB.

For the original proposed 17 and 16 turbine layouts, the output capacity would have been in the region of 84 to 96MW. This would have made viable the construction of a 110kV substation and a loop in connection to the existing 110kV Screeb to Knockranny overhead lines that pass through the southern part of the Site through an application to Eirgrid. However, with the reduction to 6 turbines and an output capacity of 40.8MW, the current proposal is for a 38kV substation to be constructed on Site with a grid connection to the existing ESB 110kV Screebe substation.

Connections to Knockranny and Galway substations were considered in a study undertaken by Mullan Grid. However, these were discounted due to the long distances involved with Knockranny being located approximately 13.5km to the southeast (approximately 26.5km by road) and Galway being located approximately 32km southeast (approximately 38km by road).

The Applicant contracted TLI to undertake a review of grid options for the Development. Three grid connection cabling route options to Screebe were considered and assessed as part of the initial design process to determine which route would be brought forward as part of the planning application. Three main options were considered:

- UGC Option A - UGC from Screebe Substation to Tullaghmore Wind Farm utilising sections of UGC in public road, primarily regional roads, and private lands. [18.65km]
- UGC Option B - UGC from Screebe Substation to Tullaghmore Wind Farm utilising sections of UGC in public road and private lands & OHL in private lands. [UGC: 8.82km OHL: 7.38km]
- UGC Option C - UGC from Screebe Substation to Tullaghmore Wind Farm utilising sections of UGC in public road and private lands. [UGC: 18.30km]

Option A is the chosen option and is assessed further in this EIAR. This is due to the fact that underground connections are preferred, and Option A does not require any Third-Party lands but is entirely contained within the public road network. Option B would have an effect on areas of blanket bog and require an overhead line which would be visible on the landscape and the consent of a number of third-party landowners would be required. **Table 3.6** shows a comparison of the potential effects of Option A v Option B. The grid connection options are shown on **Figure 3.6**.

Option C was an alternative UGC leaving the site and travelling down the local road to the N59 which was considered. However, following discussions with Galway County Council

Roads Engineer, this was discounted as the water levels are quite high in that area and the disruption to local residents was considered to be too great.

Table 3.6: Environmental Effects from Option A v Option B

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Option B likely to have less vehicular movements and road closures so less disruptions.
Biodiversity	Option B will have increased amount of peatland bog habitat affected from OHL. Vehicular movements on bogland habitat. Likely to require tree felling.
Ornithology	Option B will have increased amount of peatland bog habitat affected from OHL. Likely to require tree felling.
Soils & Geology	Option B will have more effects on soils and geology from OHL.
Hydrology & Hydrogeology	Option A has increased number of watercourse crossings but land likely to be very wet.
Air & Climate	Option B will likely involve less vehicular movements and decrease in air quality effects.
Noise	Option A will have increased noise generated on site from increased road opening and backfilling activities.
Material Assets	Neutral
Landscape & Visual	Option B will have landscape effects from OHL.
Cultural Heritage	Option A likely to have less potential for cultural heritage impacts as all in existing roads. This includes impacts on the archaeological setting in the landscape.
Traffic and Transport	Option B likely to have less vehicular movements and road closures so less disruptions.

3.7.4.4 Borrow Pits

Fill material required for the construction of Site Access Tracks and Turbine Foundations will be obtained from excavations at Turbine Foundations and from areas of cut on-site and also from rock imported from a local quarry. Due to the blanket bog habitat on-site, no borrow pits are proposed to minimise effects on blanket bog habitat.

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 On-Site Borrow Pits Compared to Local Quarries

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Less vehicular movements and potential health benefits.
Biodiversity	Increased amount of blanket bog habitat affected.
Ornithology	Increased amount of blanket bog habitat affected.
Soils & Geology	Losing additional peat resources
Hydrology & Hydrogeology	Neutral
Air & Climate	Less vehicular movements and decrease in air quality effects.
Noise	Increased noise generated on site from rock breaking activities.
Material Assets	Neutral
Landscape & Visual	No landscape effects from importing rock.
Cultural Heritage (including architectural and archaeological aspects)	Neutral
Traffic and Transport	Decreased vehicular movement on local roads.

3.7.4.5 Alternative Spoil Storage Sites

Spoil material will be generated from excavations to construct the infrastructure on site. This will be mostly in the form of peat and subsoils. This spoil will be required to be permanently stored as it is excavated on site. Generally, it is preferred to store spoil as close as possible to the site from where it was excavated. However, the site is covered in valuable habitat and therefore, a second option of taking spoil off-site for disposal has been considered as an alternative to on-site storage.

A comparison of the potential environmental effects of storing spoil on-site in comparison to using an offsite storage is presented in **Table 3.8**.

Table 3.8: Environmental Effects from Utilising On-Site Storage Compared to Off-Site

Criteria	Comment
Population & Human Health (incl. Shadow Flicker)	Less vehicular movements and potential health benefits.
Biodiversity	Increased amount of blanket bog habitat affected. No enhancement of areas of degraded peat habitat.
Ornithology	Increased amount of blanket bog habitat affected.
Soils & Geology	More likely to have bog slide if peat stored on slopes.
Hydrology & Hydrogeology	Increased risk of sediment laden runoff to watercourses. Increased risk of peat instability.
Air & Climate	Less vehicular movements and decrease in air quality effects.
Noise	Less noise generated from vehicular movements.
Material Assets	Neutral
Landscape & Visual	No landscape screening of infrastructure from spoil bunds.
Cultural Heritage (including architectural and archaeological aspects)	Neutral
Traffic and Transport	Less vehicular movement on local roads.

3.8 ALTERNATIVE TURBINE HAUL ROUTE AND SITE ACCESS

Wind turbine components (blades, nacelles and towers) are not manufactured in Ireland and therefore must be imported from overseas and transported overland to the Site. Alternative transport routes to the Site were considered in relation to turbine components, general construction-related traffic, and site access locations.

3.8.1 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the proposed development include Galway Port and Foynes Port. Both Ports offer a roll-on roll-off procedure to facilitate importation of wind turbines. Galway 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 vicinity of the Site and therefore less requirements for works to facilitate turbine deliveries on the route.

3.8.2 Delivery to Site

In assessing the most suitable route for turbine transport, cognisance was taken of the haul route used for the recently constructed Galway Wind Park, which is located directly to the southeast of the Site. The route utilised the N59 to the site. However, the deliveries did not have to pass through Oughterard which has a significant pinch point on a bridge over the Owenriff River. The route had been the subject of a full route survey and swept path analysis survey prior to construction. Therefore, the alternative of using the R336 to Maam Cross and then travelling east on the N59 to the Site was examined and found be a more favourable route to the Site.

A section of this route has proven suitable for the transport of turbine components for the Development. The updated transport analysis (as presented in **Chapter 14: Traffic and Transportation**) shows that only relatively minor accommodation works will be required to accommodate the proposed turbines at 4 locations requiring third party lands. The turbine transport route will utilise the national and primary roads available which ensures the road network holds the capacity to manage large loads.

The Turbine Components Haul Route is shown on **Figure 2.4** and the potential concrete and aggregate suppliers for the project are shown on **Figure 14.3.5.**

It is proposed that the turbine components will be delivered via Galway Port. The following route is proposed:

- Loads would exit the harbour and join Lough Atalia Rd northbound before merging with the R339 northbound;
- Loads would then turn left onto the R338 westbound and merge with the N6;
- Loads would continue on the R338 southbound before turning right to join the R337 westbound;
- Loads would merge with the R336 westbound and continue west and north to Maam Cross; and
- Loads would turn right onto the N59 eastbound to the site access junction.

For the civils works during construction, it is envisaged that hardcore materials for Site Access Roads and Turbine Hardstands construction will be sourced from one of the local quarries, such as that to the south of Maam Cross on the R336, in the area subject to quality and quantity being available. There are no local concrete manufacturers. Therefore, concrete for construction of the Development will come from Athenry or Galway and use the N59 to access the Site.

3.9 ALTERNATIVE MITIGATION MEASURES

Mitigation by avoidance has been central to the Project's evolution. By avoiding the ecologically sensitive areas of the Site as much as possible, the potential for environmental effects is reduced. 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 at least partly 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.

3.10 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 Development and its specific characteristics [maximum 40.8MW output, 6 No. turbine with a tip height of 185m, a hub height of 104m and a rotor diameter of 162m – 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.