3. CONSIDERATION OF REASONABLE ALTERNATIVES

3.1 Introduction

3.1.1 Overview

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

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

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

This section of the EIAR contains a description of the reasonable alternatives that were considered by the developer for the Proposed Development, in terms of site location, size and scale, other land-use options for the site, construction methodologies, as well as site layout, grid connection routes and transport route options to the site. This section also outlines the design considerations in relation to the Proposed Development. It provides an indication of the main reasons for selecting the chosen design and layout option, including a comparison of the environmental effects.

The consideration of alternatives is an effective means of avoiding potential environmental impacts. As set out in the Environmental Protection Agency's (EPA) document: '*Guidelines on The Information to be Contained in Environmental Impact Assessment Reports'* (EPA, 2022), the presentation and consideration of reasonable alternatives investigated is an important part of the overall EIA process.

It is important to acknowledge that although the consideration of alternatives is an effective means of avoiding environmental impacts, there are the existence of difficulties and limitations when considering alternatives. These include hierarchy, non-environmental factors and site-specific issues as outlined below.

Hierarchy

EIA is concerned with projects. The Environmental Protection Agency's Draft Guidelines (EPA, 2022) state that in some instances neither the applicant nor the competent authority can be realistically expected to examine options that have already been previously determined by a higher authority, such as a national plan or regional programme for infrastructure which have been examined by means of a Strategic Environmental Assessment.

Non-environmental Factors

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

Site-specific Issues

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

3.1.2 Methodology

The EU guidance document: *Guidance on the preparation of the Environmental Impact Assessment Report* (EU, 2017), outlines the requirements of the EIA Directive and states that, in order to address the assessment of reasonable alternatives, the Developer needs to provide the following:

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

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

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

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

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

- 'Do Nothing' Alternative;
- Alternative Locations;
- Alternative Technologies;
    - Alternative Turbine Numbers and Model
    - Alternative Turbine Layout and Development Design;
- Alternative Construction Methods
- Alternative Grid Connections
- Alternative Transport Routes and Site Access and,
- Alternative Mitigation Measures.

Each of these is addressed in the following sections.

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

While environmental considerations have been at the core of the decision-making process for all of the project processes and infrastructure components as detailed below, it should be noted that the majority of alternative options considered under the headings listed above and detailed below are unlikely to have significantly, greater environmental effects than the chosen option.

3.2 'Do-Nothing' Alternative

Article IV, Part 3 of the EIA Directive states that the EIAR should include *"an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge"*. This is referred to as the *"do nothing"* alternative. The European Commission document *'Guidance on the Preparation of the Environmental Impact Assessment Report'* (EU, 2017) states that this should involve the assessment of *"an outline of what is likely to happen to the environment should the Project not be implemented – the so-called 'do-nothing' scenario."*

An alternative land-use option to developing a renewable energy project at the Proposed Development site would be to leave the site as it is, with no changes made to the current land-use practice of small-scale agriculture. The site would continue to be managed under the existing farming practices for this 'Do-Nothing' alternative.

In implementing the 'Do-Nothing' alternative, however, the opportunity to capture a significant part of Roscommon and Ireland's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. At present, there is a total of 112MW of renewable energy being generated in County Roscommon, with the potential for 262MW to be produced[1]. If the Proposed Development where to receive a grant of permission, the development would double the current capacity and contribute to County Roscommon's renewable energy targets. The opportunity to generate local employment, development contributions, rates and investment in the local area would also be lost. On the basis of the positive environmental effects arising from the project, when compared to the do-nothing scenario, the do–nothing scenario was therefore not the chosen option.

The existing agriculture and small-scale farming practices can and will continue in conjunction with the proposed use of the 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 below.

Table 3-1 Comparison of environmental effects when compared against the chosen option (developing the Proposed Development at this site)

Environmental Consideration	Do-Nothing Alternative
Population & Human Health (incl. Shadow Flicker)	No increase in local employment and no long-term financial contributions towards the local community. No potential for shadow flicker to affect sensitive receptors.

[1] *Roscommon County Development Plan – 2022-2028 – Renewable Energy Strategy*

Environmental Consideration	Do-Nothing Alternative
Biodiversity & Ornithology	No habitat loss
Land, Soils & Geology	Neutral
Geotechnical	Neutral
Water	Neutral
Air & Climate	Will not provide the opportunity for an overall increase in air quality or reduction of greenhouse gasses. Will not assist in achieving the renewable energy targets set out in the Climate Action Plan.
Noise & Vibration	No potential for noise impacts on nearby sensitive receptors
Landscape & Visual	No change to existing character and use of the site
Cultural Heritage & Archaeology	No potential for impacts on unrecorded, subsurface archaeology
Material Assets	Neutral

3.3 Alternative Site Locations

3.3.1 Previous Site History

The Proposed Development site, as detailed in Chapter 1, Section 1.2, was subject to two previous planning applications in October 2011 and September 2013 for a total of 35 no. turbines (16 no. turbine development in the Phase 1 and 19 no. turbines in the Phase 2).

The Proposed Development considered a number of constraints during the design process to reduce the site from the initial 35 no. turbine layout from the previous applications at the site, to the proposed 20 no. turbine layout as discussed in Section 3.5.2.1 below.

The Roscommon County Development Plan (CDP) 2022-2028 contains a Renewable Energy Strategy (RES) which identifies, in broad strategic terms, three categories of 'Wind Energy Development Potential' for large scale commercial wind energy developments. The majority of the wind turbines and associated works are located in an area deemed 'Most Favoured' with 4 no. wind turbines located in 'Not Favoured' area.

3.3.2 Strategic Site Selection

The cost of building each megawatt of electricity-generating capacity in a wind farm is in the region of €1.5 million. It is therefore critical that the most suitable site for the Proposed Development was chosen.

The site selection process for the Proposed Development has been fully informed by national, regional and local policy at a macro level (see Chapter 2: Background to the Proposed Development), as well as site-specific factors that influence the turbine layout and project design on site at a micro level (see Section 3.4 below).

The key policy, planning and environmental considerations for the selection of a potential wind farm site included:

- Site location relative to both Roscommon County Council's Renewable Energy Strategy (RES) classification of areas considered suitable for wind farm development;
- Low population density;
- Consistent wind speeds;
- Protection of visual amenity;
- Low potential for impact on designated National and European sites
- Located outside areas designated for protection of ecological species and habitats;
- Access to the national electricity grid possible within a viable distance;
- Sufficient area of unconstrained land that could potentially accommodate wind farm development and turbine spacing requirements.

These criteria are explained further below in so far as they influenced the site identification exercise undertaken in respect of the ultimate selection of the Seven Hills Wind Farm proposal. From an early stage in the design process, it was also considered optimal to seek a site capable of accommodating a large number of turbines within reasonable proximity to each other. This would limit the geographical spread of the turbines, consolidate supporting infrastructure and also reduce the number of clusters of turbines that may be required. The development of multiple, separate wind farm sites spread throughout a wider area would require supporting infrastructure (i.e., roads and cabling etc.) to run from each wind farm site to the connecting substation thereby increasing the amount of infrastructure required for development and increasing the potential for environmental impacts to occur. Therefore, the provision of a centralised location would concentrate the necessary infrastructure into a single geographic area.

3.3.2.1 Planning Policy

Section 2.2. in Chapter 2 of this EIAR sets out in detail the planning policies of Roscommon County Council with regard to wind energy development. As detailed in that section of this EIAR and as shown in Figure 2-2, the majority of the wind turbines and associated works are located in an area deemed 'Most Favoured' with 4 no. wind turbines located in 'Not Favoured' area. The proposed site location was therefore deemed suitable for the Proposed Development from a planning policy perspective.

3.3.2.2 Population Density

The applicants sought to identify an area with a relatively low population density. Having reviewed the settlement patterns in the vicinity, the study area emerged as suitable to accommodate the Proposed Development. The population density of the Study Area, as described in Chapter 5: Population and Human Health of this EIAR, is 6.4 persons per square kilometre. This is significantly lower than the average national population density of 68.1 persons per square kilometre[2].

3.3.2.3 Wind Speeds

The Irish Wind Atlas produced by Sustainable Energy Authority Ireland (SEAI, 2013)[3] shows average wind speeds for the country. With the upland nature of the landscape, the Wind Atlas shows that wind speeds on the Proposed Development site range from 8.70m/s to 8.9m/s at a 150m elevation. Such wind

[2] *Census of Ireland 2016 (www.cso.ie).*
[3] *SEAI Irish Wind Atlas - https://gis.seai.ie/wind/*

speeds indicated that this site is viable for commercial wind energy development. On-site monitoring of the wind resource verified that with a sufficient turbine height and blade diameter, the wind resource of the site is commercially viable.

3.3.2.4 Visual Amenity

The Roscommon County Development 2022-2028 identifies the value of the landscape character within the county and the Landscape Character Assessment (LCA) is also one of the main policy areas which will inform the issue of suitability of wind farms within the County. The Proposed Development is sited in a Landscape Character Area (LCA) designated as 'Moderate' Value which is the lowest LCA value rating of LCAs in County Roscommon, as stated in the current Roscommon County Development Plan 2022-2028.

3.3.2.5 Designated Sites

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

The closest Natura 2000 site, i.e. Special Area of Conservation (SAC) or Special Protection Area (SPA), is the Killeglan Grassland SAC, located approximately 570 metres southwest of the EIAR Site Boundary at its nearest point (Southern Cluster). Lough Croan Turlough SPA and SAC is located approximately 1km to the north of the EIAR Site Boundary.

The closest national designated site, i.e. Natural Heritage Area (NHA) or proposed NHA (pNHA), is the Feacle Turlough pNHA, which is located approximately 13 meters to the south of the EIAR Site Boundary. The Suck River Callows Natural Heritage Area (NHA) is the nearest NHA to the site, located approximately 2.1km to the west of the EIAR Site Boundary at its nearest point.

3.3.2.6 Access to the National Grid

The nearest existing grid infrastructure is an existing 110kV substation located in the townland of Monksland, approximately 11.3km to the east/southeast of the Proposed Development site. The Proposed Development intends to connect to the National Grid via an underground cable through the Regional Roads connecting the proposed Seven Hills to this substation in Monksland. Details regarding potential alternative grid connection options considered are presented in Section 3.6 below.

3.4 Alternative Renewable Energy Technologies

The Proposed Development will be located on a site where small-scale agriculture will continue to be carried out around the footprint of the wind farm.

When considering other renewable energy technologies in the area, the Applicant considered commercial solar energy production as an alternative on the site.

Commercial solar energy production is the harnessing and conversion of sunlight into electricity using photovoltaic arrays (panels). To achieve the same electricity output, as is expected from the proposed wind energy development (c.120MW), from solar energy would require a significantly larger development footprint. In addition, a solar development would have a higher potential environmental effect on Hydrology & Hydrogeology, Traffic & Transport (construction phase) and Biodiversity and Birds (habitat loss, glint and glare) at the site as detailed below. Taking into account the hydrology and farming practices in the area, as well as the area being located within an area designated as 'Most Favoured' for wind energy development in the Renewable Energy Strategy for Roscommon, it has been determined the wind energy is the most suitable renewable energy technology for the site.

A comparison of the potential environmental effects of the development of a solar PV array when compared against the chosen option of developing a proposed wind farm at this site is presented in Table 3-2 below.

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

Environmental Consideration	Solar PV Array (with up to 120 MW Output)
Population & Human Health (incl. Shadow Flicker)	Relatively lower long-term financial contributions towards the local community (i.e., community benefit fund) on a per MWh basis). No potential for shadow flicker to affect sensitive receptors. Potential for glint and glare impacts on local road users
Biodiversity & Ornithology	Larger development footprint would result in greater potential habitat loss. No potential for collision risk for birds. Potential for glint and glare impacts on birds.
Land, Soils & Geology	Larger development footprint would result in greater volume of spoil to be excavated. Larger impact on the karst landscape.
Geotechnical	Shallower excavations involved in solar PV array developments would decrease the potential for slope stability risk.
Water	A solar PV array development would require a significantly larger area of cut and fill to provide a more even topography, therefore increasing the potential for silt-laden runoff to enter receiving waterbodies.
Air & Climate	Reduced capacity factor of solar PV array technology would result in a longer carbon payback period.
Noise & Vibration	No potential for noise impacts on nearby sensitive receptors.
Landscape & Visual	Panelling potentially less visible from surrounding area due to screening by vegetation and topography. A significant volume and area of panels would be required to achieve the MW outputs and so the landscape and visual effect would potentially be extensive.
Cultural Heritage & Archaeology	Neutral
Material Assets	Potential for greater traffic volumes during construction phase due to the number of solar panels required to achieve the same output.

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

3.4.1 Alternative Turbine Numbers and Model

As discussed in Section 3.3.1, the suitability of the area for wind energy as identified under the various previous CDP and Renewable Energy Strategy (RES) within various Roscommon County Development Plan' including the most recent 2022 – 2028 was used to identify the site of the Proposed Development. This application considered a number of environmental constraints during the design process which led to a reduction in the number of turbines at the site from the 35 no. turbines assessed as part of the previous applications, down to 20 no. turbines, assessed as part of the Proposed Development application.

For the purposes of this EIAR, a wind turbine model with a rated output of 6.0 MW has been chosen as this is considered to be representative of the typical turbine capacity currently available. Therefore, based on 20 no. wind turbines, the proposed wind turbines will have a combined output of approximately 120 MW. Such a wind farm could also be achieved on the proposed site by using smaller turbines (for example 4.0 MW machines). However, this would necessitate the installation of 30 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.

Turbine Number

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 receptors such as roads, houses and waterbody features such as surrounding turloughs while maximising the wind energy potential of the site.

The 20 no. turbine layout selected for the Proposed Development has the smallest development footprint of the other alternatives considered, while still achieving the optimum output at a more consistent level than would be achievable using different turbines. The other alternative considered was a 21 no. turbine layout which is discussed in further detail in Section 3.4.2.2 below.

Turbine Model

The turbine model to be installed on the site will be the subject of a competitive tendering process. The height of the turbines that will be selected for construction on the site will be 180 metres when measured from ground level to blade tip. This planning application will be assessing and applying for a turbine with a tip height of 180m, a rotor diameter of 162m and a hub height of 99m. The EIAR therefore provides a robust assessment of the turbine that is being applied for within the overall development description.

The use of alternative smaller turbines at this site would not be appropriate as they would fail to make the most efficient use of the wind resource passing over the site. In order to generate the same amount of energy as the Proposed Development with smaller turbines, there would be a requirement for a larger number of turbines which would require a larger development footprint. This alternative would potentially lead to additional environmental effects

A comparison of the potential environmental effects of the installation of a larger number of smaller wind turbines when compared against the chosen option of installing fewer, larger wind turbines is presented in Table 3-3.

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

Environmental Consideration	Larger number of smaller turbines
Population & Human Health (incl. Shadow Flicker)	Greater potential for shadow flicker impacts on nearby sensitive receptors due to the increased number of turbines.
Biodiversity & Ornithology	Larger development footprint would result in greater potential habitat loss. Greater potential collision risk for birds due to the presence of more turbines
Land, Soils & Geology	Larger development footprint would result in greater volume of spoil to be excavated and stored.
Geotechnical	Neutral
Water	Larger development footprint, therefore, increasing the potential for silt-laden runoff to enter receiving watercourses.
Air & Climate	Increased potential for vehicle emissions and dust emissions due to an increased volume of material and turbine component deliveries to the site during the construction phase.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors.
Landscape & Visual	A larger number of smaller turbines could have a greater visual impact.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials and turbine components.

3.4.2 Alternative Turbine Layout and Development Design

The design of the Proposed Development has been an informed and collaborative process from the outset, involving the designers, developers, engineers, landowners, environmental, hydrological and geotechnical, archaeological specialists and traffic consultants. The aim being to reduce potential for environmental effects while designing a project capable of being constructed and commercially viable.

Throughout the preparation of the EIAR, the layout of the Proposed 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 that is the subject of this application for planning permission. The design process has also taken account of the recommendations and comments of the local community, relevant statutory and non-statutory organisations and local authorities as detailed in Section 2.5 of Chapter 2.

3.4.2.1 Constraints and Facilitators Mapping

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

The '*Wind Energy Development Guidelines*' (DoEHLG, 2006) are currently the subject of a targeted review. The proposed changes to the assessment of impacts associated with onshore wind energy developments are outlined in the document '*Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review'* (2013), the '*Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach'* (June 2017), and the '*Draft Revised Wind Energy Development Guidelines, December'* (2019). Cognisance has been given to these draft guidelines when considering constraints and facilitators on the Proposed Development site. Further details on these documents are provided in Section 2.2 in Chapter 2 of this EIAR.

Constraints are restrictions that inform the design of a project by highlighting onsite sensitivities and providing appropriate setback buffers. The constraints mapping process involves the placing of buffers around different types of constraints so as to identify clearly the areas within which no development works will take place. The size of the buffer zone for each constraint mapped on the Proposed Development site was assigned using guidance presented in the documents listed above, as applicable.

Facilitators are factors that give an advantage to a proposed design layout, such as existing road infrastructure within a site. Mapping the constraints and facilitators for a wind farm project identifies a viable area within which wind turbines could be accommodated. Once the viable area is established, the siting requirements of the wind turbines in terms of separation distances etc. are considered and a preliminary layout can be developed for the site.

The constraints and facilitators map for the site of the Proposed Development, as shown in Figure 3-1, was produced following a desk study of all site constraints. Figure 3-1 encompasses the following constraints and associated buffers:

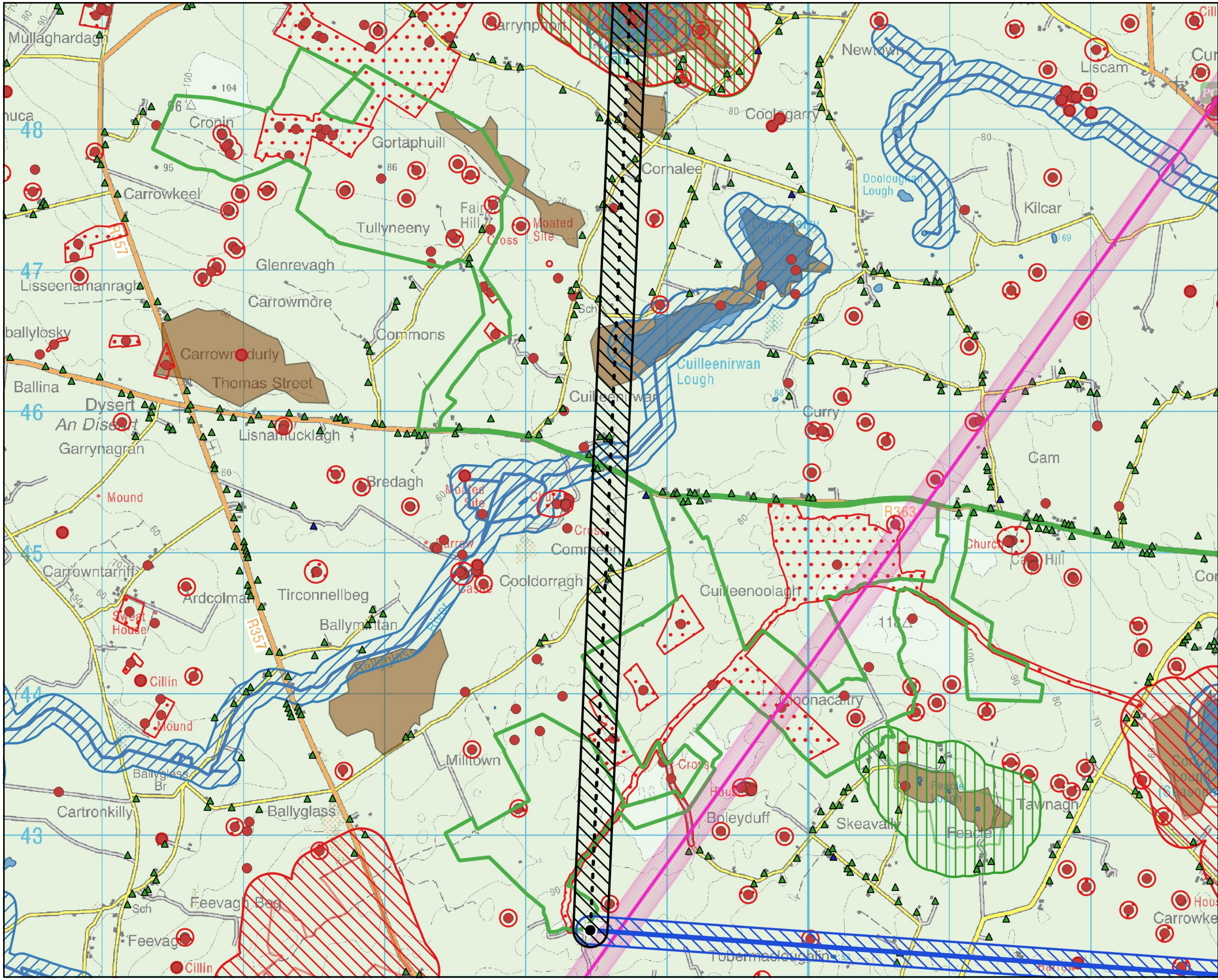
- Residential dwellings plus a minimum 720-metre buffer (4 x tip height achieved from non-participating properties houses as proposed within the *'targeted review of the Wind Energy Development Guidelines 2006'*);
- Designated Sites plus 200-metre buffer;
- Telecommunication Links plus operator specific buffer;
- Rivers, Streams and Lakes plus 100-metre buffer;
- Avoidance of turlough features;
- Archaeological Sites or Monuments, 50-metre buffer, plus 'Zone of Notification' as determined by the National Monuments Service (ROI).

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

- Size of available lands for development;
- Separation distance from third-party dwellings;
- Good wind resource;
- Existing access and general accessibility of all areas of the site due to existing road infrastructure; and
- Limited extent of constraints as detailed above.

The inclusion of the constraints on a map of the study area allows for a viable area to be identified. A preliminary wind farm layout was then developed to take account of the constraints mentioned above and their associated buffer zones, and the separation distance required between turbines and other infrastructure.

Following the mapping of all known constraints, detailed site investigations were carried out by the project team. The ecological assessment of the site encompassed habitat mapping and extensive surveying of birds and other fauna. This assessment, as described in Chapter 6 of this EIAR on Biodiversity, optimised the decision on the siting of turbines and the carrying out of any development works, such as the construction of roads. The hydrological and geotechnical investigations of the site examined the proposed locations for turbines, roads and other components of the Proposed Development. Where specific areas were deemed as being unsuitable for the siting of turbines, 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 Development has also been informed by wind data and the results of noise assessments as they became available.



Map Legend

- EIAR Site Boundary
- Housing
- National Monuments
- SMR Zone of Archaeolgical Potential
- Streams and Rivers
- Lakes
- Watercourses 100m Buffer
- Turloughs
- Special Area of Conservation (SAC) & 200m Buffer
- Proposed Natural Heritage Area & 200m Buffer
- Ripplecom Telecom Link and Fresnel Zone
- Three Telecom Link and 100m Buffer
- 2RN Telecom Link and Fresnel Zone

Drawing Title	
Constraints Map	
Project Title	
Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 3-1
Scale: 1:35000	Date: 03.06.2022

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3.4.2.2 Site Layout Iterations

The final Proposed Development site layout takes account of all site constraints and the distances to be maintained between turbines and other infrastructure 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 of the Proposed Development was compiled and assessed, the proposed layout has been revised and amended to take account of the physical constraints of the site and the requirement for buffer zones and other areas in which no turbines could be located. The EIAR and Wind Farm design was an iterative process, where findings at each stage of the assessment were used to further refine the design, always with the intention of minimising the potential for environmental impacts.

The development of the final proposed Wind Farm layout has resulted following feedback from the various studies and assessments carried out.

During the optimisation of the site layout, there were a number of iterations and reviews of the layout. The site layout design process took account of ecological, environmental, archaeological, hydrological and geological constraints, with the goal of achieving the optimal site layout which will result in the lowest possible impact upon the receiving environment. Some examples of the various stages of site layout for the Proposed Development can be seen on Figure 3-2 – Figure 3-7 below.

3.4.2.2.1 *Previous Planning Applications Site Layout*

As discussed in Section 3.4 above, the suitability of the area for wind energy as identified under the various Renewable Energy Strategy (RES) within previous and current Roscommon County Development Plan's. was used to identify the site of the Proposed Development as a suitable location for wind energy development. The Proposed Development considered a number of constraints during the design process which reduced the number of turbines within the site from the 35 no. turbine layout from the previous planning applications shown below in Figure 3-2.

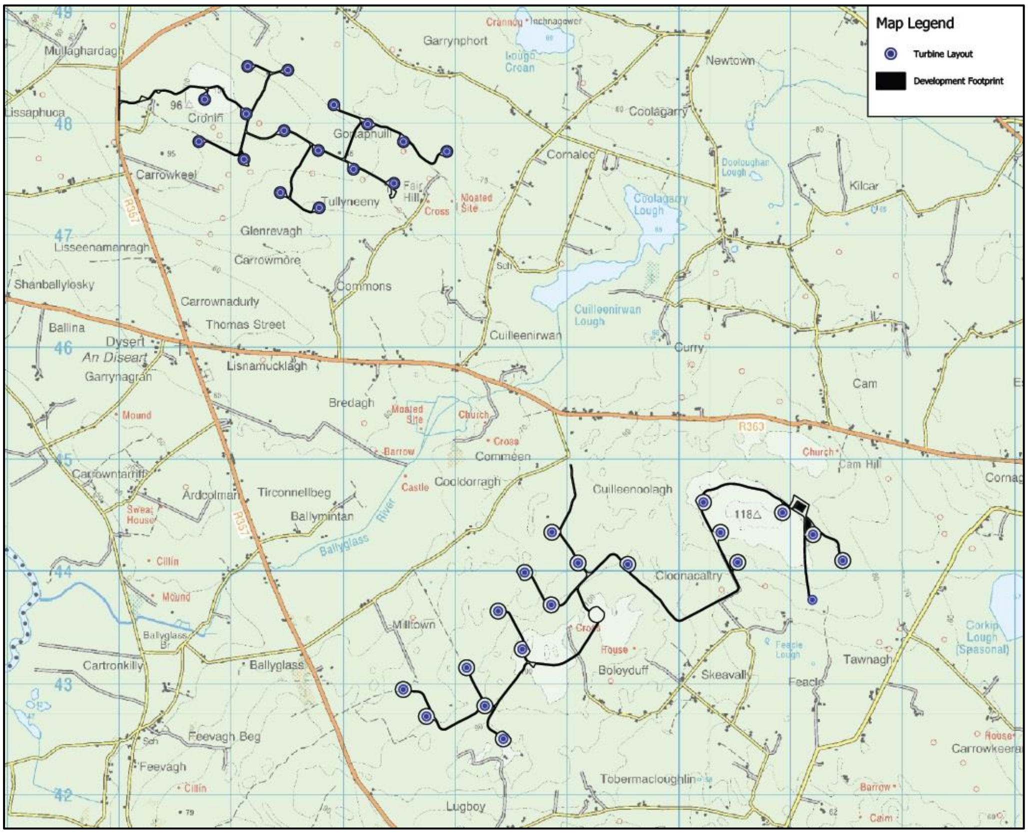


Figure 3-2 35 No. Turbine Site (Planning Ref. Pl.20.244346 and Pl.20.244347)

3.4.2.2.2 *Initial Site Layout*

During the initial site layout design, there were a number of reviews to the proposed turbine locations for the development. The initial turbine layout was based on a preliminary constraint mapping exercise and identification of a viable area for turbine placement (see Figure 3-3 below). A significant viable area for a 21 no. turbine layout was identified within the overall study area during the constraints mapping process. It was determined that it would be more environmental sensitive and efficient to allow for fewer turbines and a larger turbine model within this area.

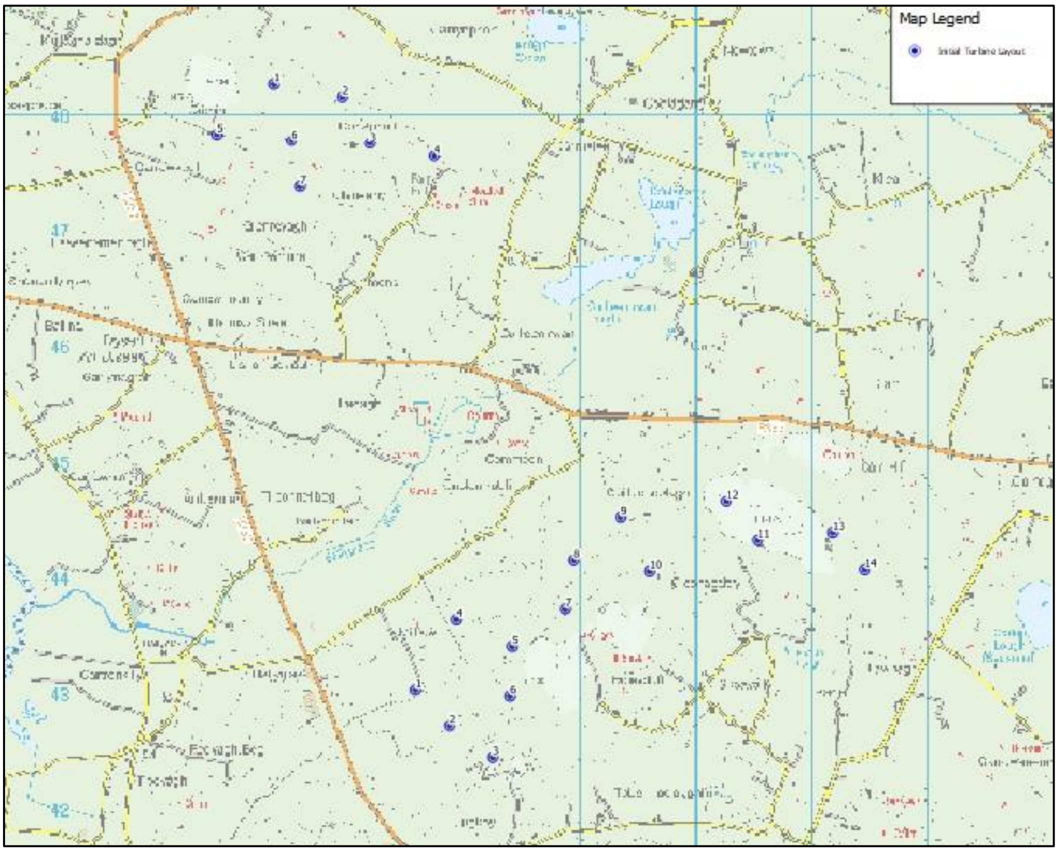


Figure 3-3 Initial site layout

3.4.2.2.3 *Second Site Layout*

Taking into account further constraints in the area and based on feedback from the design team and the emerging advances in turbine technology, a number of turbines were micro-sited from the initial 21 no. turbine layout. Additionally, the second site layout also included for a preliminary roads design and onsite electrical substation location (see Figure 3-4 below).

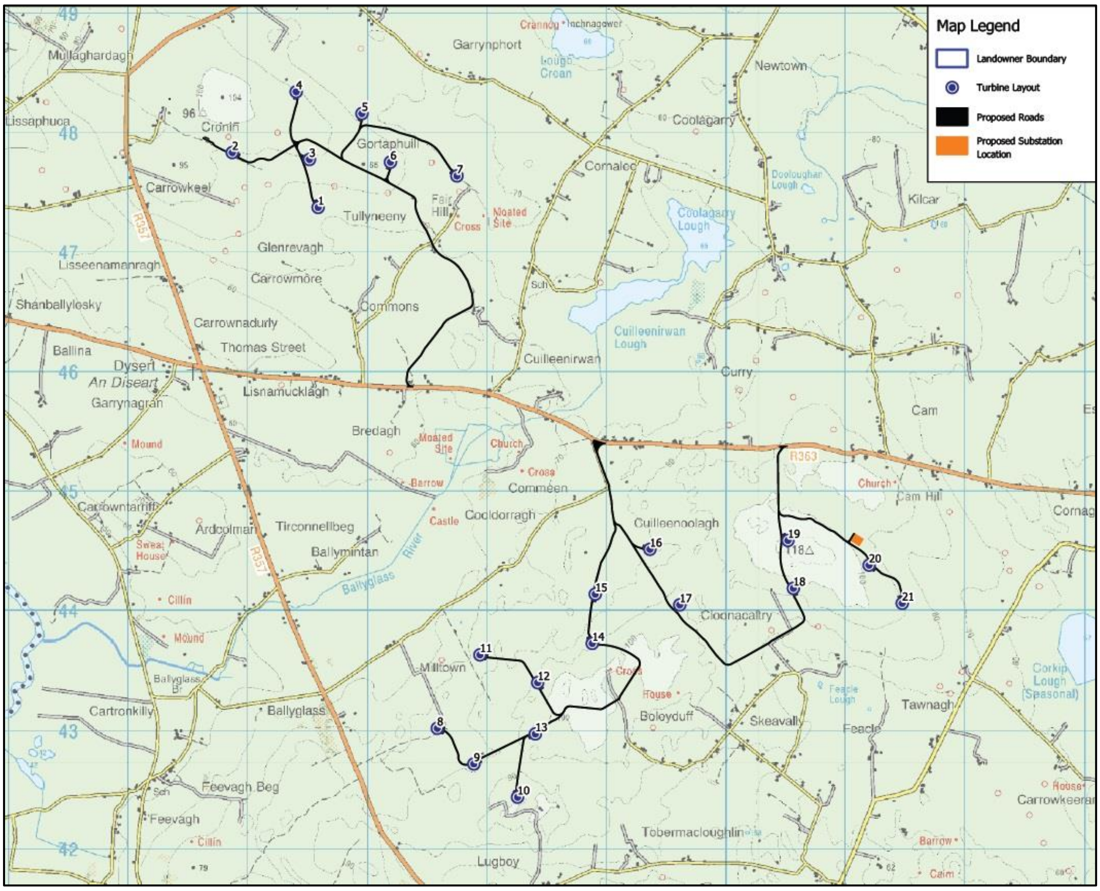


Figure 3-4 Second site layout

3.4.2.2.4 Telecommunications and Ecological Constraints

As part of the project design all telecommunications operators within proximity of the Proposed Development were consulted with to ensure that there would be no impacts on these networks. Detailed consultation responses for all telecommunications and aviation authorities can be found in Chapter 14: Material Assets of this EIAR.

On the 15th of July 2020 Ripplecom responded to initial consultation request, identifying two transmission links within the study area provided which may be impacted by the Proposed Development. Following further consultation, a preliminary turbine layout and dimensions were provided to Ripplecom to help calculate the Fresnel zone (i.e. the area around the visual line-of-sight that radio waves spread out into after they leave the antenna), to be applied to their telecommunications links. A 40m clearance from the blade tip was recommended to help avoid impacts on this link. As the turbine dimensions include a blade length of 81m, the total buffer for avoidance of the link is 121m.

The proposed Wind Farm layout was revised to ensure that this telecoms link and associated buffer was avoided. A follow up email was sent to Ripplecom on the 21st of August 2020 to confirm that the project design team had relocated turbines in the area to avoid this link and associated buffer. The revised layout for the Proposed Development to avoid telecommunications constraints can be seen on Figure 3-5 below.

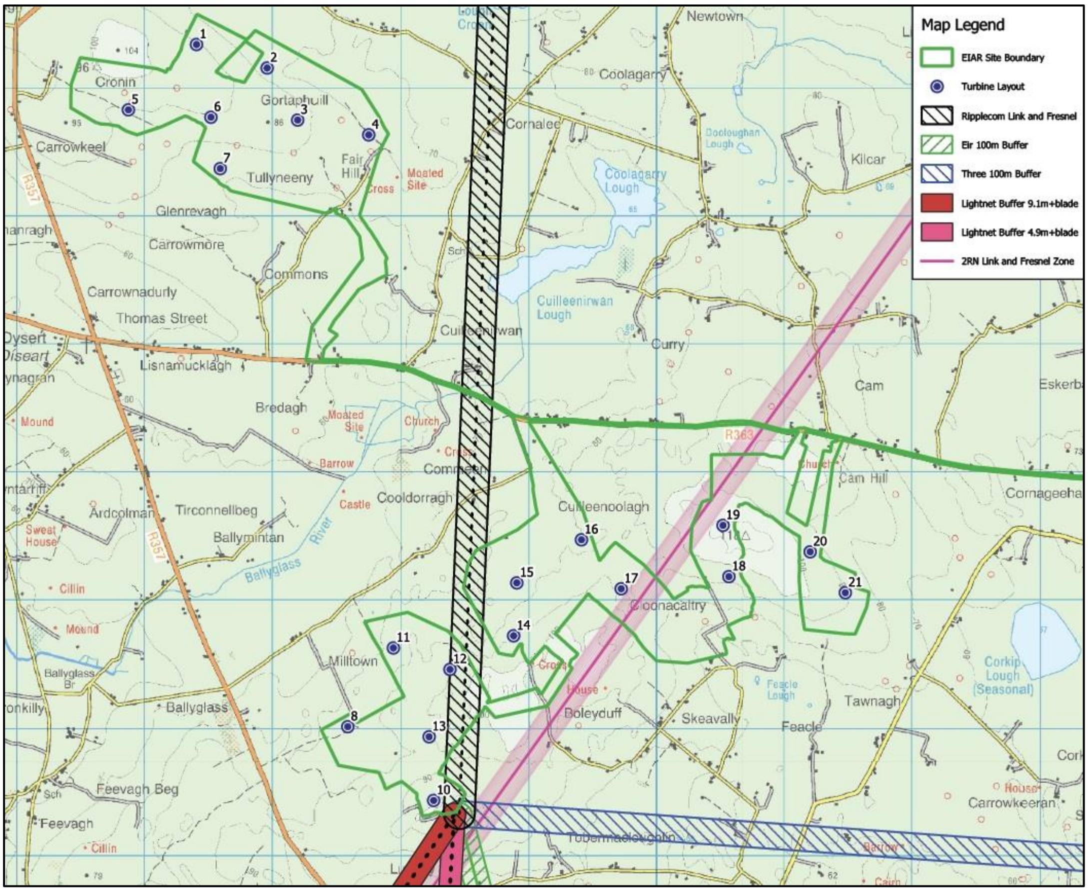


Figure 3-5 Third Site Layout (Telecoms Constraints)

Following an ecological site visit and preliminary habitat mapping in August 2020, areas of Annex I Calcareous Grassland habitat were identified, particularly in the south of the site. Taking into account this more detailed constraints mapping, it was determined that a reduced number of turbines would be more suitable in this area to minimise the placement of turbines and associated infrastructure within areas of Annex I habitat. The reduced site layout provided for a revised 20 no. turbines to minimise Annex I habitat loss (see Figure 3-6 below).

Two badger setts were recorded within the EIAR Site Boundary as part of the extensive ecological surveys undertaken. One of the setts is located in close proximity to a proposed site access road leading to T4. Therefore, following the deployment of a camera trap at the location and subsequent evidence of badger usage of the sett, the proposed site access road was moved further south of the location during the iterative design process to avoid any potential for unnecessary destruction/disturbance to the feature.

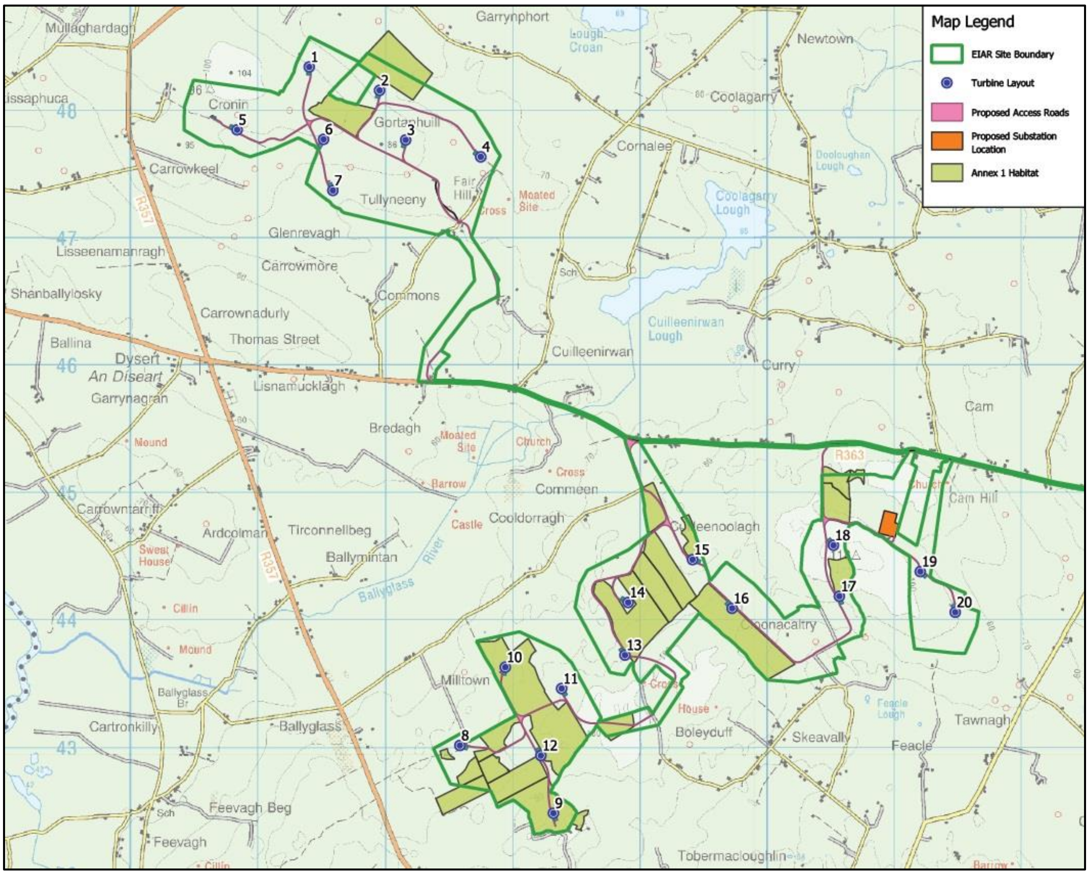


Figure 3-6 Fourth Site Layout (Revised 20 Turbine Layout Accounting for Annex I Habitat and Telecoms)

3.4.2.2.5 Archaeological, Geological and Hydrological Constraints

On completion of a site visit and ground truthing of all archaeological constraints as shown in Figure 3-1, appropriate set back distances and buffers were applied to all recorded monuments and any newly recorded monuments within the site. To ensure a reduced impact on all archaeological monuments of note, the turbine layout was revised to avoid the exclusion zone around same.

Furthermore, the proposed road network was realigned to utilise more of the existing road network on site, avoid watercourse buffers and reduce the amount of cut and fill required. A robust suite of Site Investigation (SI) works was also carried out to help determine the optimal location for the Proposed Development infrastructure taking into account ground conditions and local geological constraints. This revised layout iteration can be seen on Figure 3-7 below.

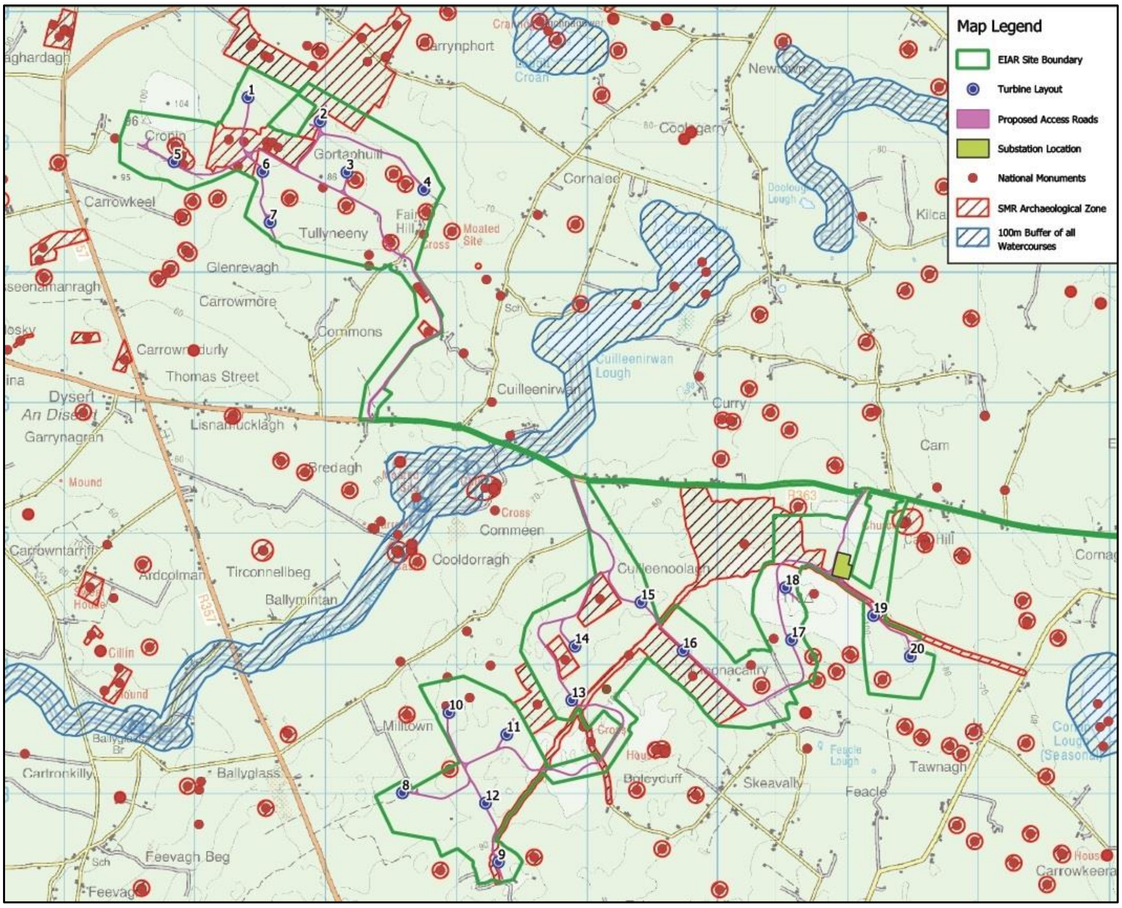


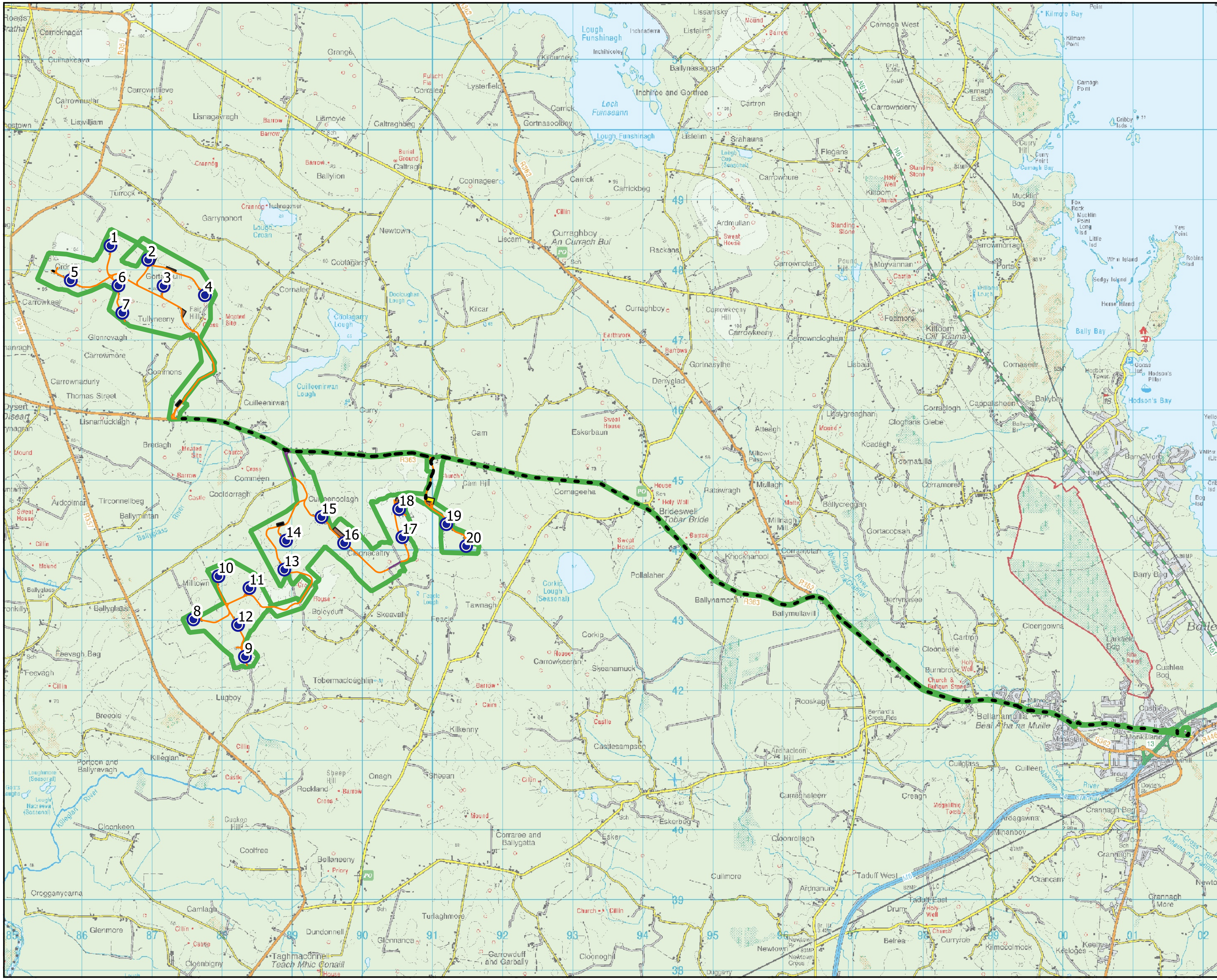
Figure 3-7 Fifth Site Layout (Revised 20 Turbine Layout Accounting for Archaeological, Geological and Hydrological Constraints)

3.4.2.2.6 Final Layout

During finalisation of the above layout, elements of the site design such as site roads, turbine hardstanding areas, drainage design, overburden storage areas, temporary construction compounds and internal cabling were all confirmed. The final proposed site layout can be seen on Figure 3-8 below. The chosen turbine layout, as seen in Figure 3-8 is considered optimal, making use of existing infrastructure and topography where possible, while also avoiding sensitive areas identified during constraints mapping and site visits.

The final proposed turbine layout takes account of all site constraints detailed above and the distances to be maintained between turbines and from houses, watercourses, roads, etc. In addition to the above identified constraints, the selection of turbine number and layout has also had regard to wind-take, noise and shadow flicker impacts.

The final chosen turbine layout is considered the optimal layout given it has the least potential for environmental effects. A comparison of the potential environmental effects of the previous alternative layouts versus the final proposed layout is presented in Table 3-4 below.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Proposed Hardstands
- Proposed Access Roads
- Proposed Upgrades to Existing Access Roads
- Proposed 110kV Substation Location
- Proposed Construction Compounds
- Proposed Met Mast Location
- Proposed Overburden Storage Areas
- Infrastructure Overburden Storage Areas
- Proposed Connector Cabling and Grid Connection

N

Drawing Title	
Proposed Layout	
Project Title	
Seven Hills Wind Farm, Co. Roscommon	
Drawn By: DN	Checked By: ÓM
Project No.: 190907	Drawing No.: Figure 3-8
Scale: 1:70500	Date: 01.06.2021

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Table 3-4 Comparison of environmental effects of alternatives when compared to final proposed layout

Environmental Consideration	Earlier Alternative Layouts
Population & Human Health (incl. Shadow Flicker)	› Earlier layouts comprising additional turbines had the potential to give rise to additional impacts on residential amenity, due to noise, dust or traffic impacts during the *construction* phase of the Proposed Development. › Earlier layouts comprising additional turbines had the potential to give rise to additional impacts on residential amenity, due to noise, shadow flicker or visual impact during the *operational* phase of the Proposed Development.
Biodiversity & Ornithology	› Larger development footprint would result in greater habitat loss. › Greater potential collision risk for birds due to the presence of more turbines.
Land, Soils & Geology	› Larger development footprint would result in greater volumes of soil and subsoil to be excavated and removed to dedicated onsite overburden storage areas.
Geotechnical	› Earlier layouts gave potential for additional impacts on underlying geology and larger areas of cut and fill
Water	› Neutral impact. No surface watercourses on or near the Proposed Development site. › Earlier layouts gave potential for additional impacts on groundwater quality.
Air & Climate	› Earlier layouts comprising additional turbines had the potential to make a greater contribution to renewable energy targets and greenhouse gas reductions
Noise & Vibration	› Earlier layouts comprising additional turbines had the potential to give rise to additional impacts on residential amenity, due to noise. › Turbines were moved in order to increase their separation distance from houses.
Landscape & Visual	› Earlier layouts comprising additional turbines had the potential to give rise to additional landscape and visual impacts.
Cultural Heritage & Archaeology	› Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	› Turbines were re-located so as to avoid existing telecommunications links within the area.

3.4.2.3 Location of Ancillary Infrastructure

The ancillary structures required for the Proposed Development include roads, temporary construction compounds, meteorological mast, onsite electrical substation and associated cabling and dedicated overburden storage areas.

3.4.2.3.1 *Road Layout*

Access tracks are required onsite in order to enable transport of infrastructure and construction materials within the Proposed Development. Such tracks must be of a gradient and width sufficient to allow safe movement of equipment and vehicles. As the Proposed Development is currently used for farming practices, the applicant is able to avail of the existing access tracks, which will require upgrade, where available, rather than constructing new roads as an alternative, helping to minimise the potential for impacts.

As the overall site layout was finalised, the most suitable routes between each component of the Proposed 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 and where new roads are to be constructed, in order to ensure suitable access to and linkages between the various project elements, and efficient movement around the site (see Figure 3-8).

An alternative option to making maximum use of the existing road network and access tracks within the site would be to construct a new road network, having no regard to existing roads or tracks. This approach was deemed less desirable, as it would require unnecessary disturbance to the site and create the potential for additional environmental effects to occur in relation to land, soils and geology (increased excavation and aggregate requirements), hydrology (impact on surface water) and biodiversity (increased habitat loss).

A comparison of the potential environmental effects of constructing an entirely new road network when compared against maximising the use of the existing road network is presented in Table 3-5 below.

Table 3-5 Comparison of environmental effects when compared against the chosen option (maximising use of the existing road network)

Environmental Consideration	New Road Network
Population & Human Health (incl. Shadow Flicker)	Potential for increased impacts on residential amenity due to increased disturbance during the construction stage.
Biodiversity & Ornithology	Larger development footprint would result in greater habitat loss.
Land, Soils & Geology	Larger development footprint would result in greater volumes of soil and sub-soil to be excavated and stored. Larger volume of imported stone required for road construction.
Geotechnical	Larger development footprint and increased potential for slope stability risk
Water	Neutral Impact as no watercourse crossings on site. Larger development footprint and increased potential for impact on groundwater

Environmental Consideration	New Road Network
Air & Climate	Potential for greater dust emissions due to the requirement of an increased volume of stone. Potential for greater vehicular emissions due to increased volume of construction traffic.
Noise & Vibration	Potential for increased noise impacts on nearby sensitive receptors during the construction of the new roads.
Landscape & Visual	Potential for greater visual and landscape impacts due to the construction of new roads.
Cultural Heritage & Archaeology	Larger development footprint would increase the potential for impacts on unrecorded, subsurface archaeology.
Material Assets	Potential for greater traffic volumes during construction phase due to larger development footprint and requirement for more construction materials.

3.4.2.3.2 *Temporary Construction Compounds*

Two temporary construction compounds are proposed which will consist of temporary site offices, staff facilities and car-parking areas for staff and visitors. Temporary construction compound No. 1 is located in the northern section of the site, approximately 150m to the north of the northern site entrance. Temporary construction compound No. 2 is located approximately 200 meters north of Turbine 14. Both temporary construction compounds measure approximately 100 metres by 40 metres, with a footprint of 4,000 m^2 in area each, or a combined footprint of 8,000 m^2 for both compounds. The location of both proposed temporary construction compounds are shown on Figure 3-8.

The proposed construction compounds are located strategically within the site to facilitate the construction of the various infrastructure components. The alternative option of using a single larger construction compound and locating it within one of the clusters in the site, rather than the two compounds proposed, was not considered to be a viable alternative given the increased traffic movements and potential environmental impacts that would be experienced from transporting materials across public roads to get between the two clusters of the site.

A comparison of the potential environmental effects of constructing one larger compound when compared against the use of two compounds is presented in Table 3-6 below.

Table 3-6 Comparison of environmental effects when compared against the chosen option (multiple construction compounds)

Environmental Consideration	Single Larger Construction Compound
Population & Human Health (incl. Shadow Flicker)	Potential for increased impact on residential amenity due to increased vehicular and dust emissions from increased traffic movements.
Biodiversity & Ornithology	Neutral
Land, Soils & Geology	Neutral

Environmental Consideration	Single Larger Construction Compound
Geotechnical	Neutral
Water	Neutral
Air & Climate	Potential for increased vehicular and dust emissions from increased traffic movements
Noise & Vibration	Potential during construction phase for increased noise impacts on nearby sensitive receptors due to longer distance of traffic movements within the site.
Landscape & Visual	Neutral
Cultural Heritage & Archaeology	Neutral
Material Assets	Less efficient construction practices due to longer movements of construction vehicles, plant and materials within the site.

3.4.2.3.3 Deliveries of Materials from Nearby Quarries

In order to facilitate the construction of the Proposed Development, materials will need to be imported from nearby quarries. The quarries that could potentially provide stone and concrete for the Proposed Development are as follows;

1. *Roadstone, Cam – Stone,*
2. *Manninon Quarries, Bealnamulla – Stone,*
3. *Kildea Concrete, Bealnamulla – Concrete,*
4. *Spollen Concrete, Glasson – Concrete,*
5. *Ward Bros Quarry, Athleague – Stone,*
6. *Whelan's Limestone Quarries Ltd., Leccarow.*

The locations of these quarries and RMC batching plants together with the routes to the Proposed Development site are shown in Figure 4-8 of Chapter 4. Deliveries of stone and ready-mix concrete for use in construction of the Grid Connection, are discussed in further detail in Chapter 14 of this EIAR.

Site investigation works were carried out at the site to determine if it would be feasible to provide onsite borrow pits as an alternative to sourcing materials from nearby quarries. The use of onsite borrow pits would eliminate the need to transport large volumes of construction material along the local public road network to the site. However, when considering the site characteristics, including topography, ground conditions, accessibility, habitat and surface and ground water features, it was determined that onsite borrow pits would not be feasible as they would create a larger local impact than the minor traffic generation associated with deliveries of materials to the site.

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

Table 3-7 Comparison of environmental effects when compared against the chosen option (Deliveries of Materials from Nearby Quarries)

Environmental Consideration	Obtaining all stone from onsite borrow pits
Population & Human Health (incl. Shadow Flicker)	Less potential for impact on residential amenity when compared to quarries, due to vehicular and dust emissions from additional traffic associated with movement of material on and off-site. Potential for increased impact on residential amenity due to increased noise and dust emissions associated with excavation of material at onsite borrow pits. Combination of effects resulting in neutral impact overall.
Biodiversity & Ornithology	Larger development footprint which would result in larger amounts of habitat loss and disturbance and displacement of local wildlife due to onsite excavations.
Land, Soils & Geology	Potential for increased impact on lands, soils and geology due to excavation of material at onsite borrow pits.
Geotechnical	Excavated borrow pits could be later reinstated with excess material or overburden. This would result in no requirement for dedicated onsite overburden storage areas and would potentially lead to greater geotechnical stability.
Water	A drainage plan for onsite borrow pits would be required to be incorporated into project drainage design.
Air & Climate	Potential for less vehicular and dust emissions compared to delivery of materials to site which would result in additional traffic associated with movement of material on and off-site. Potential for more dust emission due to onsite excavation of borrow pits. Combination of effects resulting in neutral impact overall.
Noise & Vibration	Potential for increased noise and vibration impacts on nearby sensitive receptors due to excavation of material from onsite borrow pits.
Landscape & Visual	Neutral (as onsite borrow pits would be reinstated following use)
Cultural Heritage & Archaeology	Larger development footprint, therefore increasing potential for impacts on sub-surface archaeology
Material Assets	Less potential for impact on public road network compared to delivery of materials to site which would cause additional traffic.

3.4.2.3.4 Electricity Substation

The preferred connection to the national grid for the Proposed Development is to the existing 110kV substation in Monksland, as described in Section 3.6 below. As this was the most suitable grid connection option, the location of the proposed onsite electrical substation was largely considered with this grid connection route in mind. The proposed onsite electrical substation is located towards the easternmost lands of the EIAR Site Boundary, as seen on Figure 3-8 above, in order to minimise the total length of the connection required through the public road network. Site investigation works were carried out in the general area of the proposed onsite electrical substation to achieve the most optimal location. The proposed onsite electrical substation is located in an area of agricultural grassland, which is less environmentally and ecologically sensitive than other possible locations for the substation.

It should also be noted that while the operational lifespan of the proposed turbines is expected to be 30 years (following which they may be replaced or decommissioned) the onsite electrical substation and associated infrastructure will become an ESB asset and will be a permanent feature of the proposal as it will be required to continue to form part of the electrical infrastructure of the area in the event of the remainder of the site being decommissioned.

3.5 Alternative Construction Methods

The construction methods for any wind farm are not unique in the context of ground preparation, foundation installation and turbine erection. When considering the construction methodology for the Proposed Development; consideration was given to the Site Investigative surveys undertaken on site and the most appropriate means of constructing the onsite infrastructure without allowing for significant environmental impacts.

Foundations for wind turbines will be of the ground bearing gravity type. Numerous intrusive site investigations were undertaken across the Northern and Southern Clusters, to provide detail and clarity on the nature and extent of subsoils and bedrock as a means of characterising the site and providing evidence for potential karstification of the limestone bedrock. This assisted in providing additional information on the most suitable location for turbines and associated infrastructure. The site specific Site Investigation data has informed the likely construction methods that will be employed for the groundwork and foundation installations as well as the road and handstand designs. The construction methods that will be employed are not unique potential sources of contamination and so the chosen options are considered neutral.

3.6 Alternative Grid Connections

The output of the Proposed Development is such that it requires a connection to a 110 kV substation. A high-level review of grid connection options was undertaken by AECOM, which examined the viability of the grid connection with respect to technical and economic aspects. Further consideration was then given to the route options by the project team with regard to environmental aspects.

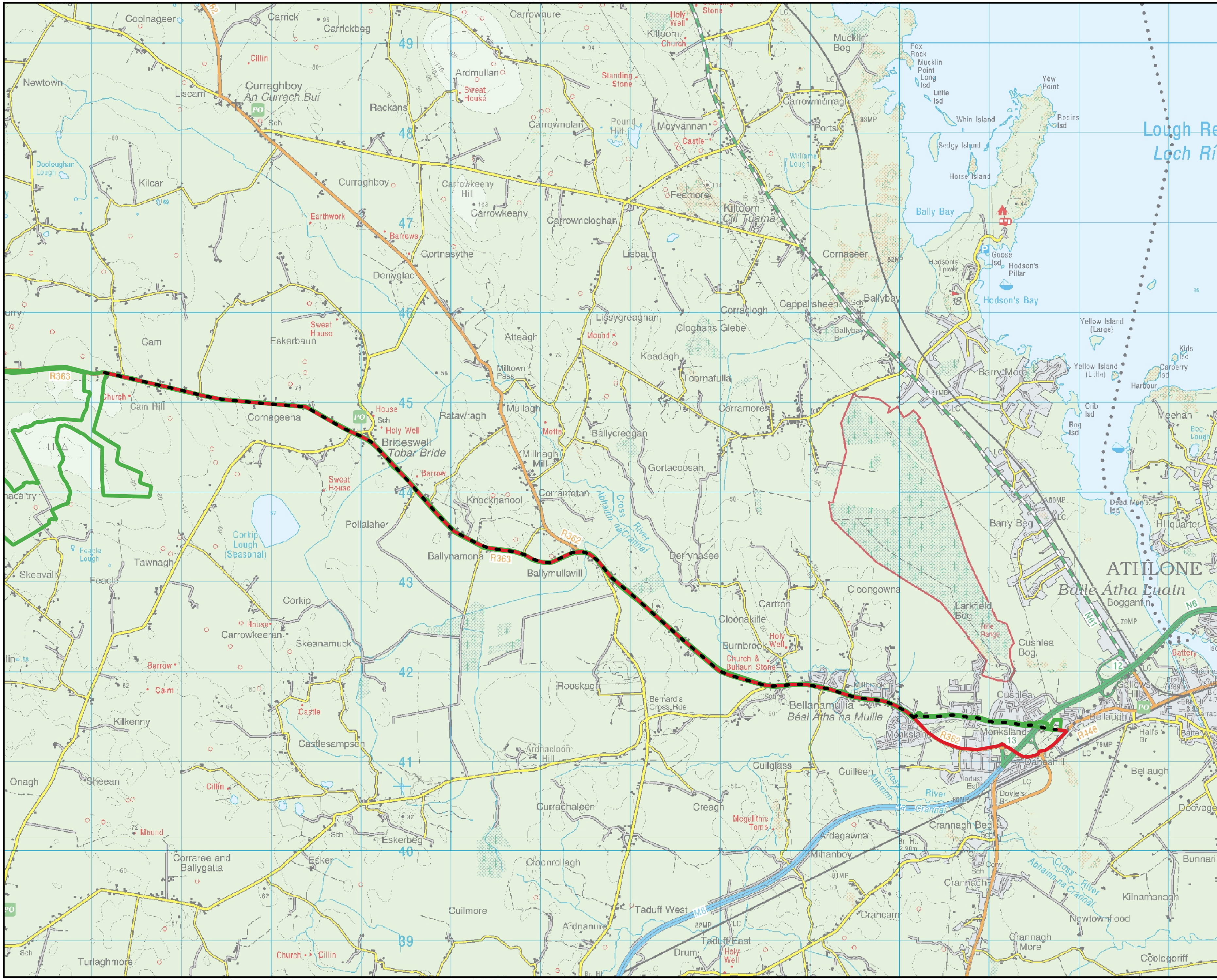
The closest suitable 110kV substation with capacity for the Proposed Development to connect into is the existing Athlone 110kV substation at Monksland, approximately 11.3km east of the Proposed Development. Site Investigation works, including trial pits were undertaken along the R363 and R362 Regional Roads to determine existing services within the road carriageway and the suitability of undergrounding the grid connection within the public road.

Two potential grid connection routes into Monksland were identified and considered within the high-level review as set out below. The route options are shown on Figure 3-9.

Grid Route Option 1 is a dedicated 110 kV connection to the existing Athlone 110 kV Substation and is considered suitable for a wind farm with capacity such as that intended at the Proposed Development. This connection method entails a 110kv underground cable grid connection through the public road network, approximately 12km in length, to the existing substation in Monksland. The route leaves the proposed Wind Farm from the onsite electrical substation, travelling east through the R363 and R362 Regional Roads, before exiting the roundabout in Monksland onto the L2047 Local Access Road, and continuing along this road for approximately 1.6km before connection into Monksland substation.

Grid Route Option 2 follows a largely similar connection route. However, instead of exiting the roundabout at the L2047 Local Access Road, Option 2 continues along the R362 Regional Road past the flyover bridge over the M6 Motorway. The route then exits the roundabout north onto the R446 Regional Road, continuing north for approximately 350m before turning west onto the L2047 Local Access Road. This connection follows the L2047 for less than 100m before connecting into the existing substation in Monksland.

Both routes were reviewed and discussed at pre-planning meetings with Roscommon County Council (RCC). Grid Route Option 1 was considered the most viable option for connecting the Proposed Development to the national grid. This connection method avoided an area that RCC have designated as an area for commercial development and was therefore considered the most suitable route. Furthermore, the area surrounding Grid Route Option 2 was highlighted as having the potential for geotechnical issues. Further assessment of the potential environmental effects of the alternative grid connection options compared against the chosen option of the onsite connection are presented in Table 3-8 below.



Map Legend

EIAR Site Boundary

Grid Route Option 1

Grid Route Option 2

N

Drawing Title
Proposed Grid Route Options

Project Title
Seven Hills Wind Farm, Co. Roscommon

Drawn By	Checked By
DN	ÓM
Project No. 190907	Drawing No. Figure 3-9
Scale 1:55000	Date 31.05.2022

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Table 3-8 Comparison of environmental effects when compared against the chosen option (Option 1)

Environmental Consideration	Grid Connection Option 2
Population & Human Health (incl. Shadow Flicker)	Potential for increased disturbance to road users and occupants of dwellings located along roads, due to works associated with laying underground cabling in busier sections of road
Biodiversity & Ornithology	Neutral
Land, Soils & Geology	Neutral
Geotechnical	Neutral
Water	Neutral
Air & Climate	Potential for increased vehicular and dust emissions associated with grid connection works which may cause traffic build up.
Noise & Vibration	Potential for decreased noise and vibration nuisances during construction phase on sensitive receptors (residential dwellings), when compared to the more urban /residential area of Option 1.
Landscape & Visual	Neutral
Cultural Heritage & Archaeology	Neutral
Material Assets	Potential for greater traffic volumes during construction phase due to grid connection works on busier public roads.

3.7 Alternative Transport Route and Site Access

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

3.7.1 Port of Entry

The alternatives considered for the port of entry of wind turbines into Ireland for the Proposed Development include the Port of Galway, Dublin Port, Port of Waterford or Foynes/Shannon/Limerick Port. Dublin Port is the county's principal seaport catering for approximately two-thirds of Ireland's port traffic. The Port of Galway also offers a roll-on roll-off procedure to facilitate import of wind turbines. Both ports and indeed others in the State, including Cork and Shannon-Foynes), offer potential for the importing of turbine components and therefore are equally viable alternatives. While the selection of a precise port of entry can only be determined following appointment of the chosen turbine manufacturer, for the purposes of the assessment, delivery from the Port of Galway is considered in this EIAR as detailed in Chapter 4, Section 4.4.

3.7.2 Site Access and Turbine Delivery Route

From the selected Port of Entry, the turbines will be transported along the M6 Motorway before exiting northwest at Monksland on to the R362 Regional Road. The route then travels northwest on the R362 Regional Road for approximately 5.5km, before merging left on to the R363 Regional Road. The delivery route continues west along the R363 for approximately 6km before arriving at the first proposed primary access road, turning south to the southern section of the Proposed Development, while the second access road turning south is a further 2km west of the first junction. The access road junction to the northern part of the Proposed Development is located approximately 2km further west along the R363 towards Dysart village, before turning north at proposed access junction. This route makes optimum use of the National Road network.

Three site entrances are proposed for the construction stage of the Proposed Development in order to transport turbine components, construction materials and equipment to the site. The locations of the access junctions are shown in Figure 4-22 in Chapter 4 of this EIAR and comprise the following:

- Access A on the R363 Regional Road into Northern Cluster of turbines (T1 to T7).
- Access B on the L7535 Local Road at the junction with R363, into the southwest cluster of turbines (T8 to T18), and
- Access C on the R363 Regional Road, into the southeast turbines (T19 and T20) and proposed substation

Access B makes us of an existing junction of the regional road as well as the local road as a means of accessing the Proposed Development site. However, this access and road is not off sufficient width to allow for turbine delivery or construction machinery to the site and therefore will be widened as part of the Proposed Development

An alternative option considered to the above was to use two access junctions only (one at each cluster). However, in order to avoid concentrating all traffic movements to and from the larger southern cluster of turbines at one access location, it was considered more appropriate to make use of two access locations. Following engagement with near neighbours, the three proposed site entrances and access roads to the Wind Farm site were selected, so as to minimise disruption.

A comparison of the potential environmental effects of the alternative options when compared against the chosen access locations is presented in Table 3-9 below. A complete Traffic and Transportation Assessment (TTA) of the proposed delivery route and access junctions has been carried out by Simon Carleton of Galetech Energy Services (GES). The results of the TTA are presented in Section 14.1 of this EIAR.

Table 3-9 Comparison of environmental effects when compared against the chosen option (use of three access junctions)

Environmental Consideration	Use of one access location to the Southern Cluster (rather than two in Southern Cluster)
Population & Human Health (incl. Shadow Flicker)	Potential for increased disturbance to residents living close to the site access location, due to additional traffic movements to and from the site
Biodiversity & Ornithology	Neutral
Land, Soils & Geology	Neutral
Geotechnical	Neutral
Water	Neutral

Environmental Consideration	Use of one access location to the Southern Cluster (rather than two in Southern Cluster)
Air & Climate	Neutral
Noise & Vibration	Potential for increased noise and associated disturbance to residents living close to the site access location, due to additional traffic movements to and from the site
Landscape & Visual	Neutral
Cultural Heritage & Archaeology	Neutral
Material Assets	Potential for increased disturbance to road network users, due to additional traffic movements to and from one main access location

3.8 Alternative Mitigation Measures

Mitigation by avoidance has been a key aspect of the proposed project's evolution through the selection and design process. Avoidance of the most ecologically sensitive areas of the site limits the potential for environmental effects. As noted above, the site layout aims to avoid environmentally sensitive areas. Where loss of Annex 1 Habitat occurs within the site, this has been mitigated by proposing enhancement lands as described in Chapter 6 of this EIAR. The alternative to this approach is to encroach on the environmentally sensitive areas of the site and accept the potential adverse environmental effects 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 environmental receptors. The alternative is to either not propose these measures or propose measures which are not best practice and /or effective and neither of these options is acceptable or sustainable.

3.9 Conclusion

A description of the reasonable alternatives in terms of project design, technology, location, size and scale, which are relevant to the Proposed Development and its specific characteristics, and an indication of the main reasons for selecting the chosen option with regard to each, including a comparison of the environmental effects, has been provided in the preceding sections. The consideration and assessment of alternatives has been carried out throughout the project design so as to avoid adverse environmental impacts.