3. CONSIDERATION OF REASONABLE ALTERNATIVES

3.1 INTRODUCTION

This chapter of the EIAR contains a description of the reasonable alternatives that were studied which are relevant to the proposed project and its specific characteristics. It provides an indication of the main reasons for the option chosen, taking into account the effects of the proposed project on the environment.

Environmental Impact Assessment (EIA) Directive 2011/92/EU, as amended by Directive 2014/52/EU (hereafter referred to as the 'amended EIA Directive'). Article 5 of the amended EIA Directive, relating to the preparation of an EIAR by the developer, states the following is to be included regarding alternatives:

"…a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment" (Article 5(1)(d)).

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

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

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"[1].

In addition, as noted by the EPA in the Guidelines on the Information to be Contained in EIARs (May 2022) *"Analysis of high-level or sectoral strategic alternatives cannot reasonably be expected within a project level EIAR"* and *"that the amended Directive refers to 'reasonable alternatives… which are relevant to the proposed project and its specific characteristics'.*[2]*"*

The EPA EIAR Guidelines (2022) also stipulates in Section 3.4 (consideration of alternatives) that *'The presentation and consideration of the various alternatives investigated by the developer is an important requirement of the EIA process'.*

In the same section the EPA EIAR Guidelines (2022) discuss the different types of alternatives that may be considered, including:

- Alternative locations;
- Alternative designs; and

[1] https://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf.
[2]https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf.

- Alternative processes.

This chapter provides information on the consideration of alternatives, including 'do nothing' (see Section 3.4.1), alternative site locations (see Section 3.4.2), alternative layout and design, (see Section 3.4.4), and alternative processes (see Section 3.5), amongst other alternative considerations discussed below.

3.2 STATEMENT OF AUTHORITY

This chapter was prepared Allison Murphy who is an Associate Director in TOBIN. Allison has twenty years' postgraduate experience in environmental consultancy. Allison is a Chartered Environmentalist and holds an MSc in Environmental Resource Management. Allison has considerable experience in project managing renewable energy developments and carrying out associated impact assessments.

This chapter was reviewed by Orla Fitzpatrick, Technical Director in TOBIN. Orla has twenty years' experience working in the delivery of EIA projects in environmental consultancy. She holds a BSc in Geophysics and MSc in Environmental Consultancy and has considerable experience as technical approver of environmental deliverables for major infrastructure projects.

3.3 METHODS

3.3.1 Standards and Guidance Documents

The following documents and guidance were adhered to in the preparation of this chapter:

- Guidelines on the Information to be contained in EIARs (EPA, 2022);
- Environmental Impact Assessment of Projects - Guidance on the preparation of the EIAR (European Union, 2017);
- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment; and
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018).

Consideration was also given to the following as part of the literature review:

- Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2012).

3.4 CONSIDERATION OF ALTERNATIVES

In accordance with Directive 2011/92/EU, as amended by Directive 2014/52/EU, and taking into account the above standards and guidance documents listed, including the EPA EIAR Guidelines (2022) this chapter addresses alternatives under the following headings:

- 'Do Nothing' Option, i.e. without the proposed project proceeding;
- Site Selection;
- Alternative Layouts/ Design;
- Alternative Technology; and
- Alternative Timelines and Construction Methodology;

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

3.4.1 'Do -Nothing' Option

The "Do-Nothing" scenario is to not develop the proposed project and to leave the existing environment as it is, with no changes made to the current land-use practices.

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

The 2009 EU Renewable Energy Directive (2009/28/ EC) set Ireland a legally binding target to meet 16% of our energy requirements from renewable sources by 2020. In 2018, the Directive was recast (2018/2001/EU) to move the legal framework to 2030 targets, setting a new binding target of at least 32%. At that time Ireland was committed to meeting 40% of electricity demand from renewable sources, with 10% for transport and 12% for heat. It is now established that Ireland did not meet the 2020 renewable energy targets.

The EU's third Renewable Energy Directive (RED III) (Directive 2023/2413) now has a target to increase the share of renewable energy to a binding minimum of 42.5% of total energy consumption by 2030. There is also an additional indicative (non-binding) target to reach 45% by the same year. This directive is part of the EU's "Fit for 55" package to reduce greenhouse gas emissions and strengthen energy security. The European Commission has initiated legal action against Ireland for failing to fully transpose the directive to date.

Under the 'Do-Nothing scenario,' there will be no opportunity to provide additional renewable energy into the electricity grid for this location.

The Climate Action Plan 2025 (CAP25), published on the 15th of April 2025, marks the fourth annual update to Ireland's Climate Action Plan. Building on CAP23 and CAP24, CAP25 aims to expedite the deployment of onshore wind, targeting 9 GW by 2030. The plan emphasizes the necessity for rapid and substantial reductions in greenhouse gas emissions to meet the 2015 Paris Agreement and the UN's Sustainable Development Goals. Additionally, it highlights the importance of the revised National Planning Framework (NPF), which supports the development of electricity grid infrastructure by establishing regional renewable electricity capacity targets for 2030. CAP25 sets a target of increasing Ireland's share of renewable electricity to 80% by 2030.

Under the "Do-Nothing" scenario, the proposed project would not go ahead, the development of wind turbines would not be pursued, and all lands associated with the proposed project would remain in their current uses (primarily forestry and agriculture). Several landowners would lose the ability to diversify their land use and add to their farm income. The prospect of creating sustainable energy would be lost at this site. The contribution of the project to renewable energy and the reduction of greenhouse gas (GHG) targets would be lost, as the nation's overall ability to meet these would be reduced.

The proposed wind farm will abate Ireland's greenhouse gas emissions by approximately 52.6 Mt CO_2e for every year of operation, see EIAR Chapter 14 (Air Quality & Climate). In a "Do-Nothing" scenario these savings would not occur.

Importation and use of fossil fuels would continue, and Ireland's energy security would remain vulnerable. According to EirGrid's All-Island Generation Capacity Statement 2021 – 2030, the growth in energy demand for the next ten years will be between 18% (low demand scenario) and 43% (high demand scenario)[3].

In addition, the proposed project will provide employment both in the local area and to the wider economy through the construction and operational phases as described in EIAR Chapter 5 (Population and Human Health). Under the 'Do-Nothing' scenario, the socio-economic benefits associated with the proposed project will be lost.

In the scenario where the proposed project does not proceed, 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 would be lost.

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

Table 3-1: Environmental Impacts of the Do-Nothing Alternative relative to the Chosen Option

Environmental Consideration	Do Nothing Alternative
Human Health and Population	No increase in employment as a result of the proposed project. No long-term investment in sustainability in the locality. No potential for construction/operation phase effects. No community benefit fund. No opportunity for private project landowners to diversify their land use and add to their farm income.
Biodiversity	Forestry would continue to be clear-felled / managed as part of the ongoing forestry growth cycle. Agriculture would continue to be practiced as it currently is. No potential for construction/operation/decommissioning phase impacts associated with the proposed project. No ecological enhancement works would occur.
Ornithology	No potential for construction/operation phase effects to bird populations.
Land, Soils and Geology	Forestry works will be carried out as required. Some lands would continue to be used for agriculture. No potential for construction phase effects.
Hydrology and Hydrogeology	Forestry works will be carried out as required. Some lands would continue to be used for agriculture. No potential for construction phase impacts.
Shadow Flicker	No potential for shadow flicker.
Material Assets	No potential for effects on telecommunication links and aviation activity. The availability of the airspace within and around the proposed wind farm site would have no restrictions for local air traffic, however there is no attraction for aircraft in the immediate area around the proposed wind farm.
Air Quality and Climate	Missed opportunity to contribute to the reduction of carbon and greenhouse gas emissions. No potential for construction phase effect such as dust emissions.
Noise and Vibration	No potential for additional noise at nearby sensitive receptors.
Cultural Heritage	No potential effects on archaeology or local cultural heritage.
Landscape and Visual Impact	Existing landscape and visual amenity in the area will remain unchanged, though any cumulatively considered projects will continue to operate or may continue to be built.
Traffic	No potential increased traffic volumes on local roads. No works required at existing or new entrances for the proposed wind farm or along the turbine delivery route or for grid connection.

3.4.2 Site Selection

ART Generation and FuturEnergy Ireland (FEI), joint developers for this proposed project under Manogate Ltd, separately examined potential land for candidate sites for wind energy development.

In 2014, FEI's (under Coillte at the time) Renewable Energy Development Team undertook a detailed screening process of Coillte managed land through Geographical Information System (GIS) software, using a number of criteria and stages to assess the potential of a large number of possible sites (c. 441,000 hectares (ha)), suitable to accommodate wind energy development. The GIS database drew upon a wide array of key spatial datasets such as forestry data, ordnance

survey land data, house location data, transport, existing wind energy and grid infrastructure data, and environmental data such as ecological designations, planning policy, landuse zoning, landscape designations and wind energy strategy designations available at the time.

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

Phase 1 – Initial Screening

At this early stage, lands were discounted that were not available for development under a number of criteria, as follows:

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

Lands where the average wind speed at 100 m above ground level is less than 6.5 m/s and, therefore, potentially not suitable for a commercially viable wind energy development were also discounted at this stage. In addition, sites with a contiguous area of less than 300 ha were discounted.

Phase 2 – Grid Constraints

The electricity transmission system is the backbone of the nation's power system, efficiently delivering large amounts of power from where it is generated to where it is needed. As part of the site selection process, the potential for grid connection was considered, including such aspects as distance to potential connection nodes and grid capacity at the nodes to accommodate the connection.

Phase 3 – Screening

A screening process was conducted across the country in 2014 and again in 2017 which identified a number of suitable sites, which were then taken forward for detailed assessment. As these sites have all been brought forward to planning (or are in that process), and are subject to EIA, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts, are provided in the EIAR accompanying the applications for same.

Sites that emerged from the 2014 site selection process outlined above for which planning applications have been submitted are as follows:

- Croagh, County Leitrim;
- Carrownagowan, County Clare;
- Glenard, County Donegal;

- Bottlehill (Coom), County Cork; and
- Castlebanny, County Kilkenny.

In 2017, Coillte once again examined the lands under its stewardship for candidate sites for wind energy development using the same site selection process as described above, but this time, reducing the required contiguous site area from 300 ha to 50 ha.

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

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

Similar to the sites which emerged in 2014; these sites which emerged in 2017 are projects in their own right which are/will be subject to EIA.

As such, a description of the reasonable alternatives studied which are relevant to each project and its specific characteristics, together with an indication of the main reasons for selecting the chosen option with regards to their environmental impacts, is/will be provided in the EIAR accompanying the applications for same.

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

This site for the proposed Ballyfasy Wind Farm project was considered by FEI and identified as being suitable for wind energy however it was not brought forward under the 2014 or 2017 screening processes due to the size of land availability at that time; it was not deemed to be commercially viable. This changed due to a number of factors in the interim which improved the financial viability of the project, such as advancements in turbine technology and the associated increase in energy production, and an increase in scale through the addition of adjoining private lands gained by entering a joint venture with Art Generation.

In our continuous review of the portfolio, other sites which have also emerged are as follows:

- Cummeennabuddoge Wind Farm, Co. Kerry; and
- Knockshanvo Wind Farm, Co. Clare.

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

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

ART Generation is an Irish renewable development company founded in 2002. The company has developed a substantial portfolio in excess of 20 onshore wind farms in Ireland and operates a number of wind farms. ART Generation had identified that the southeast region of Ireland had available grid capacity and subsequently a number of alternative sites were studied in Counties Kilkenny and Tipperary. The assessment carried out was a two-stage process. The first stage comprised the identification of a number of candidate sites while the second phase comprised a site-specific assessment.

The site assessments were carried out by a consultant team with inputs from competent experts on ecology, landscape and visual considerations, archaeology as well as technical and engineering considerations. The following sites were studied in detail:

Kilnagranagh, Cloneen, Fethard, County Tipperary

The site located within the townland of Kilnagranagh is designated as 'Open to Consideration for new Energy Development' in the Tipperary County Development Plan 2022 – 2028. The site had potential for an output of approximately 30 MW and had a number of positive attributes as a potential wind farm location. Good setback distances were achievable from dwellings and the site consisted of a highly modified habitat of low conservation value.

Challenges encountered with the site included;

- Visual impact on the nearby receptors;
- Limited access to the site; and
- Technical engineering difficulties with the grid connection point to the national electrical grid.

The Devilsbit, Co. Tipperary

The site is situated in an upland area in North Tipperary. The site is located adjacent to an existing windfarm and had the potential for approximately 20 MW. Good setback distances were achievable from dwellings and the site consisted of a highly modified habitat of low conservation value. Challenges encountered with the site included:

- The site is designated as 'Unsuitable for New Wind Energy Development' in The Tipperary Renewable Energy Strategy; and
- The site has a high landscape sensitivity. The Landscape Character Assessment of Tipperary sets out classified landscape character areas, based on a qualitative assessment of their landscape value, into 6 classes of sensitivity to development: ranging from "Robust" to "Vulnerable" The site is located in an area designated as "Vulnerable" in The Tipperary Renewable Energy Strategy.

Firoda Upper and Skehana, Castlecomer Co. Kilkenny

The site is situated in a rural setting with relatively low housing density, and the land use is predominantly coniferous forestry. The site has the potential for approximately 40 MW. Challenges encountered with the site included:

- Proximity to dwellings (difficulty in achieving setback distances from dwellings);
- Technical engineering difficulties with the grid connection point to the national electrical grid; and
- Limited access to the site.

Coan East, Castlecomer Co. Kilkenny

The site has two pockets designated as 'Preferred' in the Kilkenny County Development Plan 2014-2020 and 'Acceptable in Principle' in the Kilkenny County Development Plan 2021-2027 (although currently there is no wind strategy for Kilkenny and projects are being assessed project by project basis). The site is situated in a rural setting and housing density in the vicinity of the site is relatively low. This site had the potential for approximately 30 MW. However, the site has not been progressed due to mainly the difficulty in achieving setback distances from dwellings.

Ballyfasy, Co Kilkenny

Following the studies of alternative sites, the subject site was considered the most suitable having regard to the below environmental considerations.

- Planning policy considerations; the site is location in an area designated in the Kilkenny City and County Development Plan 2021 – 2027 as 'Open of Consideration' to wind energy.
- Setback distance to dwellings; the lands available will enable a turbine set back of 4 times the tallest tip height to be achieved, in compliance with the 2019 Wind Energy Guidelines.
- Road access; there are several local roads surrounding the site providing access opportunities as well as the regional road R704 to the north which connects to the M9 motorway.
- Proximity to the national grid; two feasible grid connection options are available.

3.4.3 Combined Site Selection

Following the separate site selection processes undertaken by FEI and ART Generation both parties agreed to share resources to develop the proposed project site together. The separate identification of the proposed project site reinforces the suitability of the site location for a wind energy development.

3.4.3.1 Selection of Candidate Site

Following the initial selection of the proposed wind farm site, further detailed assessments were undertaken to confirm the suitability of the site. The proposed wind farm site was examined under the following headings:

- Wind resource / speed in the area;
- Proximity to the national grid;
- Planning policy, designations;
- Environmental designations (avoidance of Natura 2000 sites and other nationally designated sites);
- Accessibility, and road network;
- Availability of lands;
- Distance from settlements and residential properties;
- Landscape and Visual Impact; and
- Telecommunication, Archaeological, Geotechnical and Hydrological constraints.

The site selection process had noted the areas identified in the current Kilkenny City and County Development Plan 2021-2027 (CDP) as Open for Consideration of wind farm developments.

As discussed in detail in Chapter 4 (Planning, Policy and Development Context) of this EIAR it is important to note that a Ministerial Direction was issued on 15th October 2021, with respect to the CDP which states that:

> *"In accordance with Section 31(4) of the Planning and Development Act 2000, those parts of the Kilkenny City and County Development Plan 2021 – 2027 Plan referred to in the notice shall be taken not to have come into effect, been made or amended; namely;*
>
> *Chapter 11, Renewable Energy:*
>
> - *Section11.4 Kilkenny Targets;*
> - *Section 11.5.1 Current status and targets; and*
> - *Figure 11.4 Wind Strategy areas. "*

The reason for the Draft Direction are as follows:

> I. *The Development Plan as made is inconsistent with Ministerial Guidelines issued under Section 28 of the Act, specifically item 2 of the Specific Planning Policy Requirement contained in the Interim Guidelines for Planning Authorities on Statutory Plans, Renewable Energy and Climate Change (July 2017), which sets out the requirement for the Planning Authority to comply with the aforementioned Specific Planning Policy Requirement under section 28(1C). In particular, the Development Plan fails to identify renewable energy targets (in megawatts) which Kilkenny can contribute in delivering its share of overall Government targets on renewable energy and climate change mitigation over the plan period.*
>
> II. *The Development Plan contains conflicting objectives on renewable energy sustainable development and climate action such that the adopted Plan, without providing sufficient compensatory measures, significantly reduced the extent of the areas indicated as 'acceptable in principle' that were identified in the draft Development Plan as being necessary to achieve the target of 201MW required to ensure that 100% of electricity demand for Kilkenny is met from renewable sources by 2030 and to ensure consistency with the climate action plan.*
>
> III. *The Development Plan has therefore not been made in a manner consistent with the recommendations of the Office of the Planning Regulator under Section 31 AM and fails to set out an overall strategy for the proper planning and sustainable development of the area.*

Following the Minister's notice a public consultation period was held from 29th October 2021 to the 12th November 2021. Taking in to account the ministerial direction and the public consultation, a report was prepared by the Chief Executive of Kilkenny County Council setting out a response. This was sent to the Minister, and it is now the responsibility of the Minister to decide on whether to make a Direction. There is no timeline set out in planning legislation for this decision.

The effect of the Minister's notice of 15th of October 2021 is to suspend those parts of the CDP to which the notice related. The notice related, in part, to Chapter 11 Renewable Energy, so this means that there are no specific local planning policies pertaining to renewable energy. The remainder of the CDP continues to apply. It contains a number of policies that are relevant to the proposed development and the application must be decided on the basis of these policies and applicable regional, national and international policy and regulations.

Having considered the site and wider environ landscapes, proximity to designated sites, land availability, distance from residential properties and grid connection feasibility, the proposed wind farm site was further investigated. The available wind resource, availability of lands and

the proximity of the subject site to infrastructure for connection to the national grid was a key driver on the final selection of the site. The site proposed for the proposed project emerged as an optimal location for a wind energy development. A summary of its findings is provided in Table 3-2.

Table 3-2: Summary of the key findings with respect to the site chosen for the proposed wind farm site

Criterion	Proposed wind farm site
Grid Access/Capacity	The proposed wind farm site was determined to be well-placed in terms of proximity to existing grid infrastructure and in terms of available grid capacity at the relevant nodes. The proposed project will include an onsite 110 kV Air Insulated Switchgear (AIS) substation. Two grid connection options are feasible for this project at this location.
County Development Plans and Zoning	The proposed project is in an area previously deemed as Open for Consideration of wind farm development. As there is currently no Wind Strategy for Kilkenny, each project is being assessed on a project by project basis.
Proximity to Houses	In general, the proposed wind farm site is surrounded by a mixture of forestry and agricultural land. Given the extent of the land, it was considered that the setback distance requirements of 500 m (as stated in the current Wind Energy Guidelines 2006), could easily be met at this location. The nearest residential dwellings are 720 m, at least 4 x tallest tip height from the proposed turbine locations which is also in compliance with the Draft Revised Wind Energy Development Guidelines 2019.
Wind Resource Assessment	The Wind Atlas mean wind speed was determined for the proposed wind farm site and was considered to be suitable in the context of operational efficiency and the nature of modern-day turbine technology. The 2013 SEAI Wind Speed Atlas identifies the proposed wind farm site as having a wind speed of between 8.1 m/s and 8.4 m/s at 100 m above ground level, identifying the site as a candidate for wind energy. An onsite met mast (PI Ref 2360360) which has been erected on site since July 2022 has also confirmed that a sufficient wind resource is present.
Ecological Sensitivity	There are no NHAs or pNHAs in or immediately adjacent to the proposed wind farm site. Furthermore, there are no sites designated under the EU Habitats Directive (SACs) and EU Birds Directive (SPAs) located within the footprint of the proposed project. However, proposed Grid Connection Option (GCO) One is positioned within the public road immediately adjacent to the River Barrow and River Nore SAC boundary. The Arrigle River and the Smartcastle Stream both cross the proposed wind farm site. These are hydrologically connected to the River Barrow and River Nore SAC and the Lower River Suir SAC. There is a project commitment that no instream works will be undertaken on watercourses. Within the wind farm site, clear span bridges will be included where required in the project layout design for crossing watercourses. Should watercourses require crossing for the grid connection, it will be done using horizontal directional drilling (HDD) ensuring no instream works are required.
Archaeological Sensitivity	There are no known recorded monuments or buildings within the proposed wind farm site. GCO One will pass close to three recorded monuments, but the cable works will be contained within the public road footprint.
Landscape Capacity/ Cumulative Impact	The landscape of the site and wider area is predominantly productive and exhibits a high degree of modification, characterised by a range of anthropogenic features, including existing wind energy infrastructure, electrical transmission lines, and major transport corridors. These elements contribute to a landscape character that is functional and utilitarian, with limited naturalistic or scenic qualities. For most commercial wind energy developments, the greatest potential for landscape impacts arises from the change in character of the immediate area due to the introduction of tall structures with moving components. Wind turbines are a

	familiar feature of the local landscape. There are three commissioned wind farms to the west and north east of the site namely; Ballymartin Wind Farm, Smithstown Wind Farm and Rahora Wind Farm, respectively. The consented Castlebanny Wind Farm is located to the north. In addition, the Great Island to Kilkenny 110 kV line crosses over the east of the site. Chapter 13 (Landscape and Visual Impact), finds that the proposed project, whether considered in isolation or cumulatively with nearby existing wind energy developments, will give rise to visual effects that are classified as Not Significant.
Land Use	The land use/activities on the site are primarily commercial forestry and agriculture. The topography of the proposed wind farm site varies from around 140 mOD to 220 mOD. The highest points are found in the north-east areas, while the southwest corner has the lowest elevation. Areas of forestry will be clear-felled at some point in the future as part of the ongoing forestry growth cycle, while agricultural areas are subject to intensive management. Based on the above, the land use at the site was found to be compatible with wind farm installation.
Flood Plain Analysis	There is no record of pluvial flooding or surface water ponding at the proposed wind farm site that would prohibit the development of the proposed project. Surface water arising at developed areas of the site will be managed by a dedicated stormwater drainage system designed in accordance with Sustainable Drainage Systems (SuDS) principles, limiting discharge from the site to greenfield runoff rates.
Supporting transport Infrastructure	The transport infrastructure in the surrounding area is deemed to be sufficient to accommodate the proposed project. Five site permanent entrances will be used to access the site from local roads L7499, L3417 and L3424. Four of these are existing entrances which will require modifications, and one is a new entrance. These separate entrances will allow traffic to reach different parts of the site. This will also reduce the number of construction vehicles gaining access at one particular location. GCO One will involve cable laying works on the L7499, L3417, R704, and L3418 roads. These local roads surrounding the project can be accessed via the R704 regional road, which itself has direct access to the M9 Motorway (M9 Junction 11 is less than 5 km along the R704 road). Internal wind farm site access roads will be constructed as part of the initial phase of the construction of the wind farm including modifications to existing internal forestry and agricultural roads.

3.4.4 Alternative Layouts/ Designs

During the development of the EIAR, environmental surveys of the proposed wind farm site, Grid Connection Options (GCO) and work areas along the proposed Turbine Delivery Route (TDR) were carried out to establish the baseline environment. All site constraints were identified and updated as further detailed assessment was undertaken. The locations of county roads, streams, residential dwellings, landowner boundaries, ecologically sensitive areas and archaeological sites were noted in detail. Separation distances to identified constraints were determined using GIS (see Figure 3-1 Constraints Map). The scoping and consultation exercises (statutory and non-statutory bodies and the public) also fed into the site layout/design.

The site layout design stage considered the size, number and positioning of turbines and layout of associated site infrastructure e.g. internal access roads, borrow pits, temporary construction compounds/deposition areas, and onsite substation. Alternatives considered for each of these elements are documented in the following sections. An iterative process requiring input from the design team, environmental specialists, internal and external stakeholders was followed.

Where possible, potential environmental effects were reduced or eliminated through changes to the design, and embedded mitigation included. The constraints identified during this process are presented in Figure 3-1.

Constraints and environmental sensitivities were first identified, and buffers applied in order to determine a viable area within the site to accommodate development. The constraints identified and resulting design solutions are listed in Table 3-3.

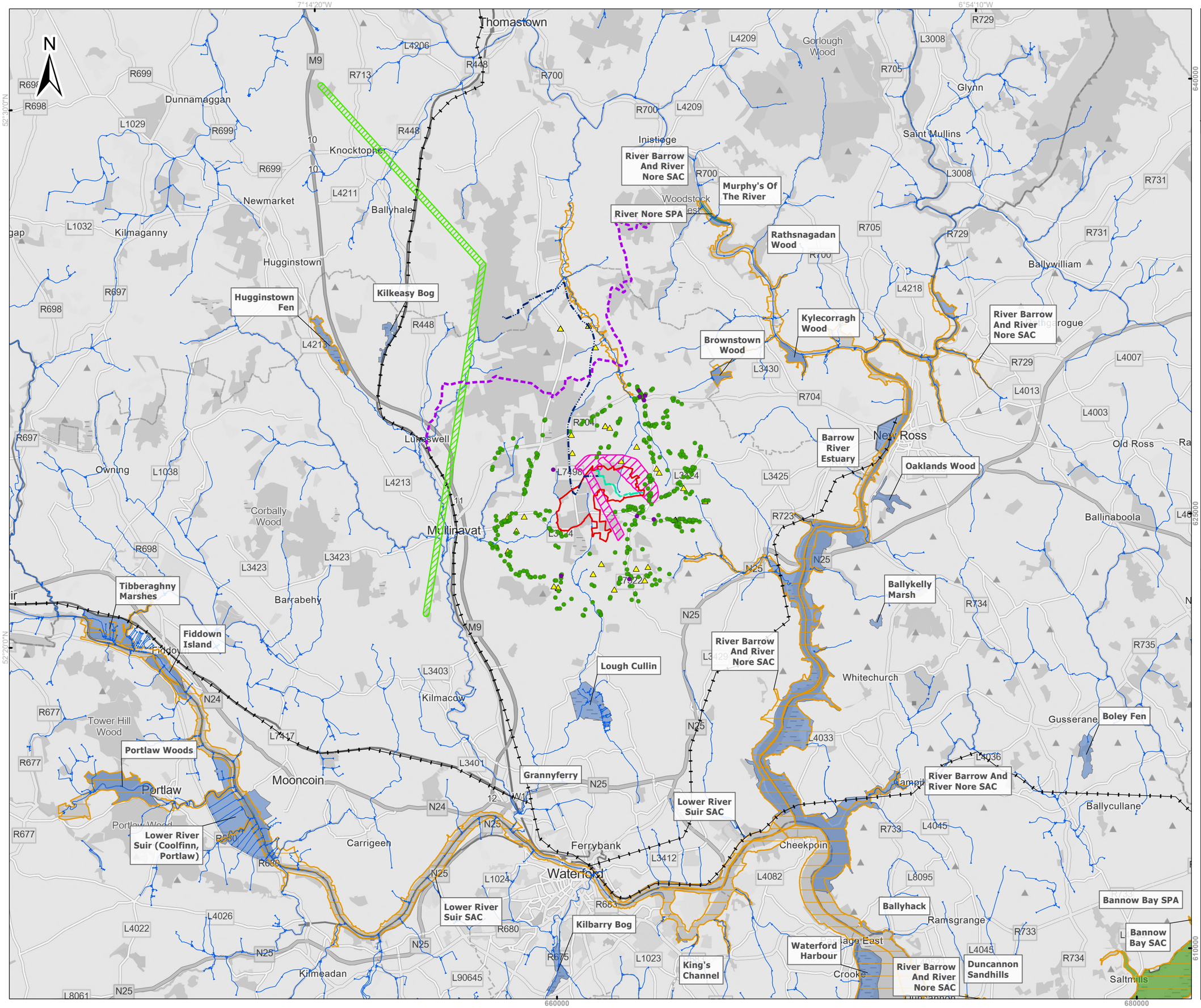
Table 3-3: Environmental Considerations

Environmental Consideration	Required set back / constraint	Design Solutions
Residential Amenity	The existing 2006 Wind Energy Development Guidelines (WEDGs) and the 2019 Draft Revised WEDGs indicate that a 500 m or a 4 times tip height setback distance (whichever is greatest) is sufficient.	In order to minimise potential effects on residential amenity, a decision was made early in the design process to maintain a minimum set-back of 720 m (4 x the highest potential tip height of 180 m). The proposed layout has achieved a high level of separation between dwellings and turbines by providing a minimum separation distance of 720 m. The closest dwelling is located approximately 720 m away from proposed turbine T6, which is more than 4 x times the maximum tip height in the proposed turbine range (in this case 4 x 180 m), in line with the setback requirements in the 2006 and Draft 2019 WEDGs.
Flora and Fauna	Mitigation by avoidance measures to avoid significant potential impacts on species and habitats. A 50 m buffer set from the main infrastructure (turbines, substation, borrow pits, compounds) and the Arrigle River and the Smartcastle Stream on site and from watercourses crossing along the GCOs.	The project avoids European Sites and Nationally designated sites. The presence of sensitive flora and fauna is limited across much of the site, with majority of the wind farm site occupied by conifer plantation and improved agricultural lands. Clear span bridges will be developed on site to avoid in-stream works. Where watercourses are to be crossed by the grid connection, horizontal directional drilling will be undertaken to avoid instream works. A 50 m buffer between watercourses and the main infrastructure will be achieved.
Ornithology	Avoidance of nesting area, foraging sites and migratory routes.	Following multi-year baseline birds studies, no additional design solutions were required specifically for birds. As detailed in Chapter 7 (Ornithology) no species specific mitigations are required. Standard bird protections will be included in mitigations including having an ecological clerk of works on site, pre construction surveys, planned timing of works to

Environmental Consideration	Required set back / constraint	Design Solutions
		avoid disturbance to nesting birds and for vegetation removal.
Soils and Geology	No notable constraint.	The proposed site is not a sensitive site in terms of soils and geological environment, due to commercial forestry and the site's low geological value. Standard good practice construction design solutions will be in place on site to protect soils and geology e.g. silt curtains and designated fuel filling locations within the construction compounds.
Hydrology	Avoid impact on existing drainage regime.	In identifying and avoiding direct impacts on drainage features the proposed development has implemented 'avoidance of impact' measures. Examples include clear span bridges for watercourse crossings and replicating drainage width, side slopes and substrate for any forestry drains which need to be rerouted.
Water Quality	Minimum setback from rivers and streams and appropriate mitigation designed to avoid siltation during construction.	There will be five watercourse crossings required for site access roads on the wind farm site. Clear span bridges will be constructed to avoid in-stream works. A 50 m setback from main infrastructure (turbines, substation, borrow pits, compounds) to watercourses will be maintained. Before any ground works are undertaken, silt fencing will be placed upslope of the watercourses on site. Where watercourses are to be crossed by the grid connection, horizontal directional drilling will be undertaken to avoid instream works.
Noise and Vibration	The 2006 WEDGs states that 'a lower fixed limit of 45dB(A) or a maximum increase of 5dB(A) above background noise at nearby noise sensitive locations is considered appropriate to provide protection to wind energy development neighbours.' Similarly, these guidelines indicate "*A fixed limit of 43dB(A) will protect sleep inside properties during the night.*"	The proposed layout has achieved a high level of separation between dwellings and turbines by providing a minimum separation distance of 720 m. The closest sensitive dwelling is 720 m away from proposed turbine T6, which is 4x times the maximum tip height in the proposed turbine range (in this case 4 x 180 m), in line with the setback requirements in the 2006 and Draft 2019 WEDGs. This high level of separation will reduce the likelihood of noise disturbance at residential receptors.

Environmental Consideration	Required set back / constraint	Design Solutions
		The appropriate noise criteria will be adhered to by the proposed wind farm while in operation, as described in Chapter 12 (Noise & Vibration).
Shadow Flicker[4]	Near Zero shadow flicker.	The proposed project has committed to near zero shadow flicker as described in Chapter 10 (Shadow Flicker). This is compliant with the 2006 WEDGs and is in line with both the emerging best practice and 2019 WEDGs.
Cultural Heritage	Recorded archaeological monuments or architectural sites have been avoided and therefore there will be no direct impact.	The final layout has been designed to ensure that there is no direct impact on recorded archaeological monuments or architectural sites.
Material Assets	No significant impacts to any telecommunications networks or aviation in the area.	There is a project commitment to ensure there is no significant impact on telecommunications and aviation related activities.

[4] Near Zero is a term used in the EIAR as it will take 1-2 minutes for the turbine to shut down once a shadow moves over a property. See Chapter 10 (Shadow Flicker) for more details.



Legend

- Wind Farm Study Area

Grid Connection Options

- Option 1
- Option 2
- WFD - River Water Bodies
- Rail Network
- Archaeology
- EIR Transmission Links 100m Buffer
- ESB Microwave Links Buffer
- South Leinster Way
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- proposed Natural Heritage Area (pNHA)

Receptors

- Sensitive
- Non-Sensitive

0 2.5 5
Kilometers

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
A	21/10/2025	First issue	S.P	A.M

Client: Manogate Ltd.

Project: Ballyfasy Wind Farm

Title: Figure 3-1: Constraints Map

Scale @ A3: 1:120,000

Prepared by:	Checked by:	Date:
S.Pezzetta	A.Murphy	October 2025

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Map Ref: 11474-003-ENV.C-BUFFs-TOB-A

Draft: A

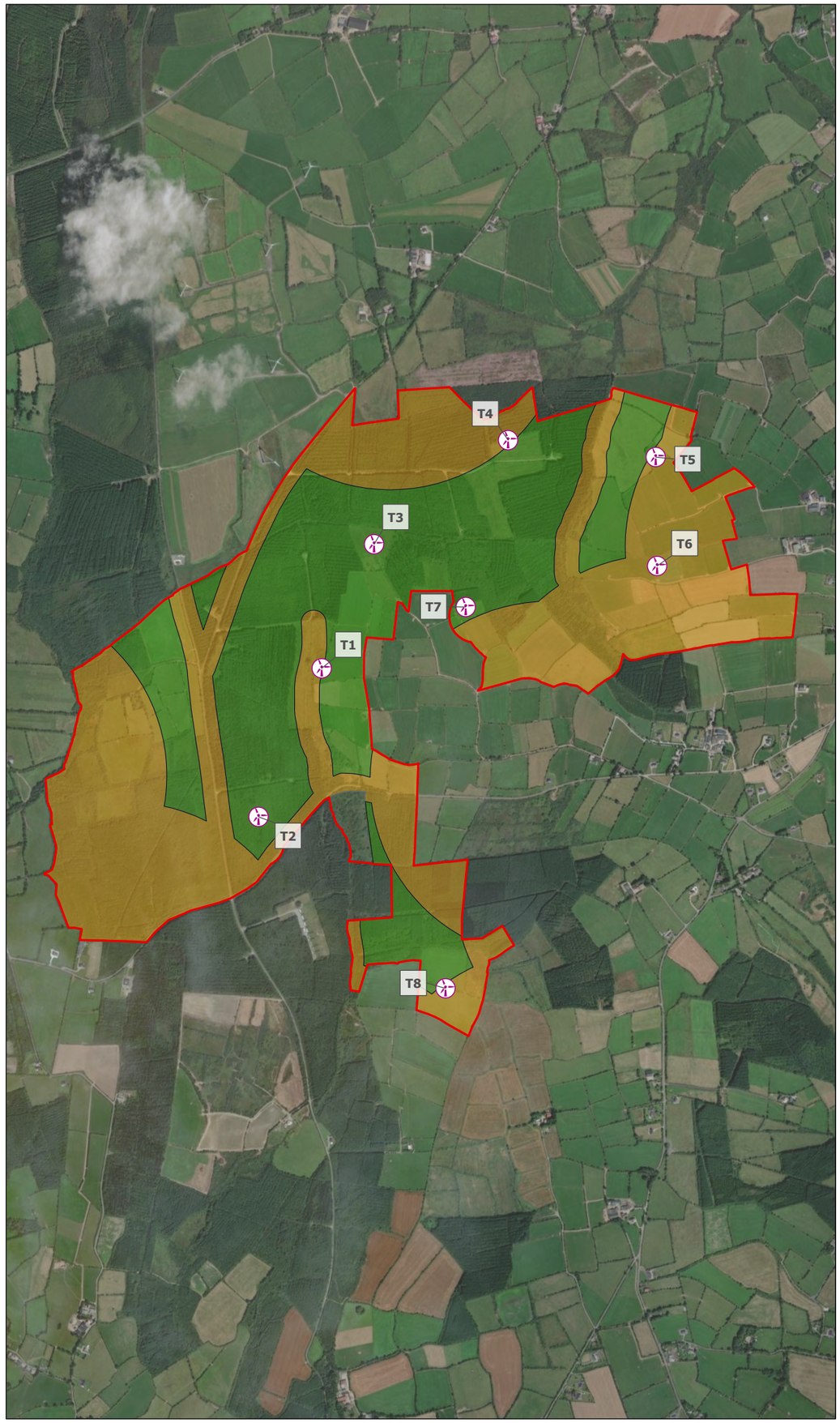
Within the viable buildable area which emerged from the above constraint analysis, three main alternative design options (to the current proposed option) were investigated throughout progressive stages of the design. These alternative designs / layouts are illustrated in Figure 3-2 and Figure 3-3.

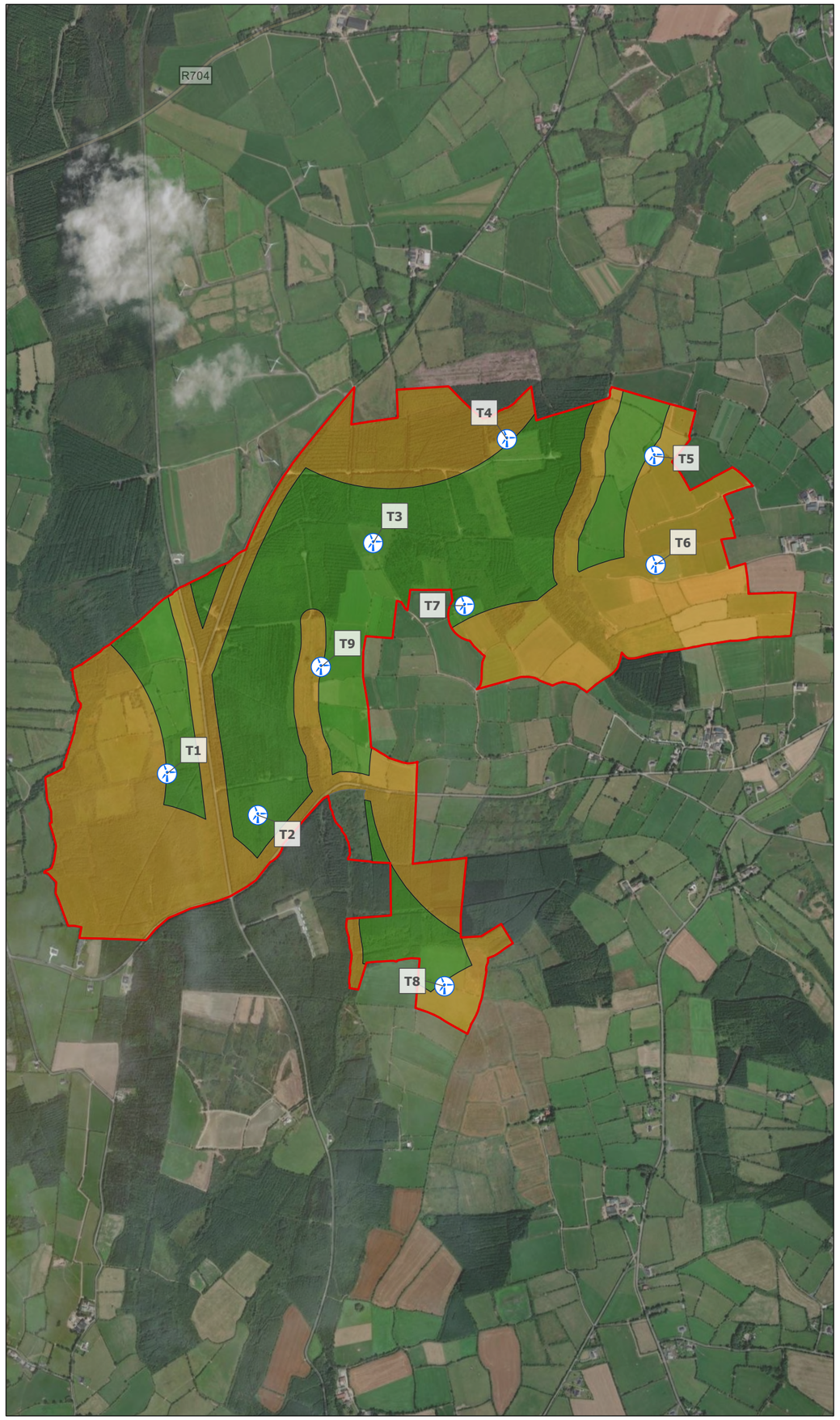
The location of individual turbines is influenced by a range of design constraints. As information regarding the proposed wind farm site was compiled and assessed, the number and location of turbines were revised and amended to take account of the existing constraints and opportunities. These constraints (and their associated buffer zones) and opportunities included archaeological assets, residential receptors, neighbouring developments, available lands, ecological receptors, topography etc.

The proposed wind turbine layout has been optimised using appropriate wind farm design software to optimise the energy yield from the proposed wind farm site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance. Development of the final proposed wind farm layout has resulted from information contained in these assessments, carried out during preparation of this EIAR, and received during the scoping and consultation exercises described in Chapter 1 (Introduction).

As previously mentioned, the project also took into account the necessary compliance with relevant guidelines, specifically the current WEDGes (2006), IWEA Guidelines (2012), EPA EIAR Guidelines (2022), and the Draft Revised WEDGes (DoEHLG, 2019), particularly regarding setback distances to dwellings

Initial studies identified a significant viable area within the proposed wind farm site in which potential turbine layouts were developed. The turbine layouts were then refined a number of times following consideration of environmental constraints, feedback from the project team as a result of information obtained from site investigations, and from engagement with the relevant consultees. A project design was drafted which would maximise the wind energy potential of the proposed wind farm site.





Legend

- Wind Farm Study Area
- Turbine Layout 1
- Buildable Area
- Non-Buildable Area
- Turbine Layout 2

0 500 1,000
Meters

Spatial Reference
Datum: IRENET95
EPSG: 2157

Rev	Date	Description	By	Chkd.
A	21/10/2025	First issue	S.P	A.M

Client:
Manogate Ltd.

Project:
Ballyfasy Wind Farm

Title:
Figure 3-2:
Site Layout Design History Map - Turbine Locations

Scale @ A3:

Prepared by:	Checked by:	Date:
S.Pezzetta	A.Murphy	October 2025

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Map Ref:
11474-004.a-DIs-P.App.BO-TOB-A

Draft:
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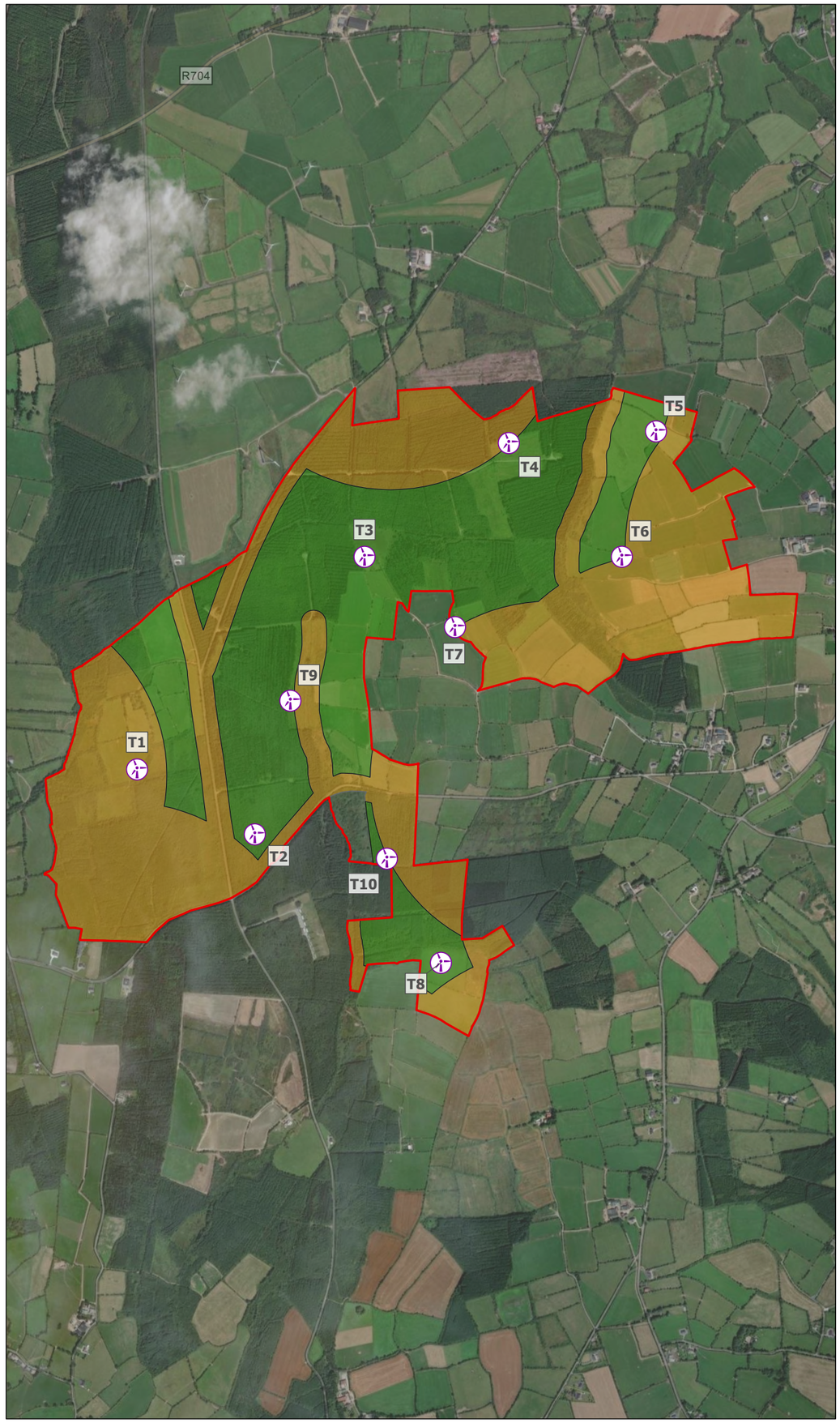

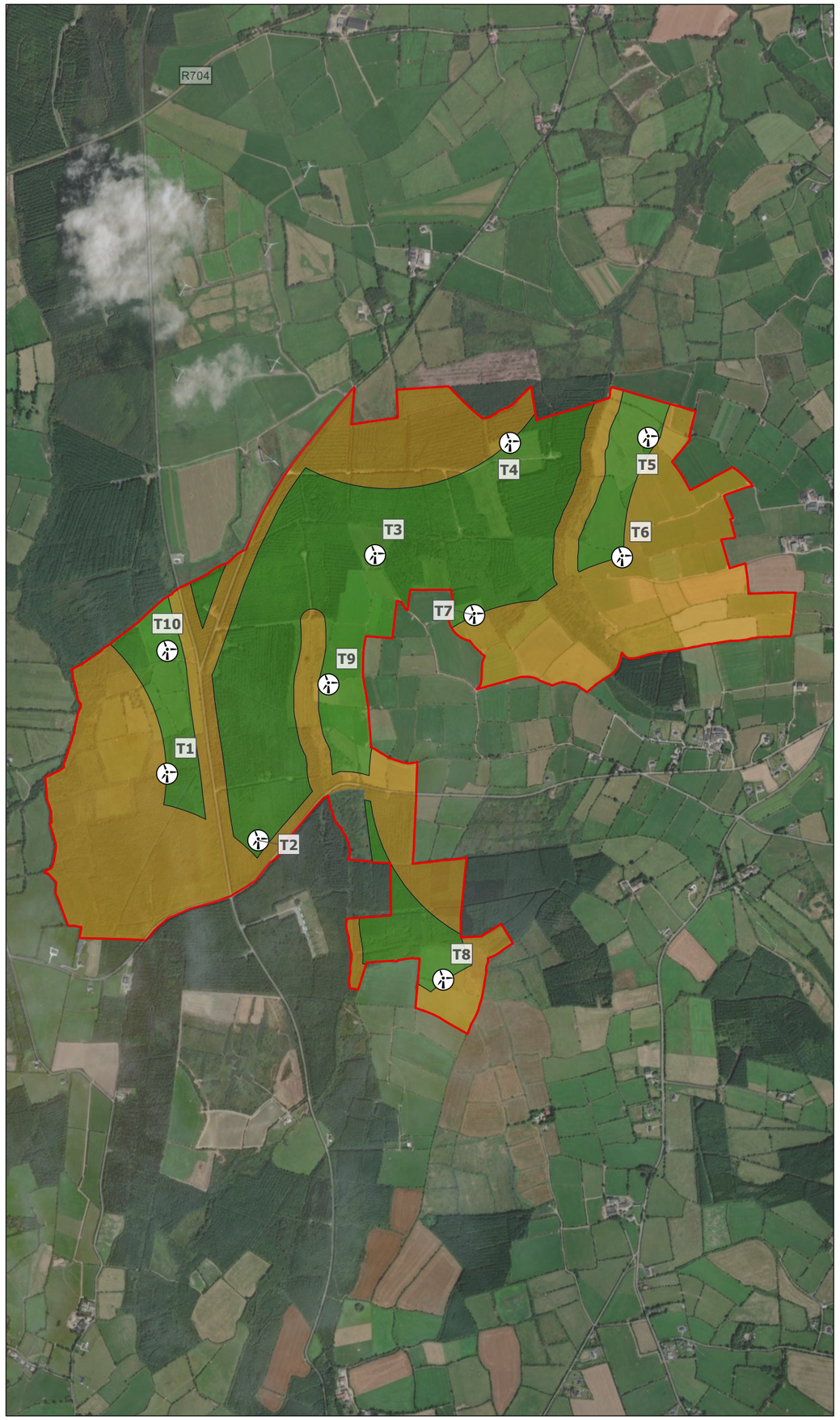

Legend

- Wind Farm Study Area
- Turbine Layout 3
- Buildable Area
- Non-Buildable Area
- Current Layout - Layout 4

0 500 1,000
Meters

Spatial Reference
Datum: IRENET95
EPSG: 2157

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A	20/10/2025	First issue	S.P	A.M

Client:
Manogate Ltd.

Project:
Ballyfasy Wind Farm

Title:
Figure 3-3:
Site Layout Design History Map - Turbine Locations

Scale @ A3:

Prepared by:	Checked by:	Date:
S.Pezzetta	A.Murphy	October 2025

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Map Ref:
11474-004.b-DIs-P.App.BO-TOB-A

Draft:
A

Layout One

Layout One as shown on Figure 3-2, initially considered eight turbines within the wind farm study area.

- Seven turbines were to be located in lands north of the L3424 local road and one turbine to be located to the south of the L3424 local road.
- Turbine tip heights of 170 m - 180 m and rotor diameter of approximately 149 m – 163 m.
- The closest residential dwelling to a turbine was approximately 596 m at T6.

Layout Two

An alternative Layout Two, as shown on Figure 3-2, was later developed as more viable land became available to the proposed project in the west.

- Nine turbines were included in the design which included a new turbine to the west of the L3417 local road.
- Turbine tip heights of 170 m -180 m and a rotor diameter of approximately 149 m – 163 m.
- The closest residential dwelling to a turbine was approximately 596 m at T6.

In trying to maximise the available land area and make the most of the wind resource on the proposed wind farm site, alternative Layout Three was proposed following a review of Layout One and Layout Two.

Layout Three

Layout Three considered 10 no. turbines as shown on Figure 3-3.

- Ten turbines were included in the design which included for two turbines south of the L3424 local road.
- Turbine tip heights of 170 m – 180 m and a rotor diameter of approximately 149 m – 163 m.
- The closest residential dwelling to a turbine was approximately 600 m at T1.

This layout was reviewed by the project design team following initial site visits and surveys of the proposed wind farm site. After this design review exercise, a decision was made to remove the second proposed turbine south of the L3424 local road (labelled as T10 on Figure 3-2) as it would be visually intrusive and disruptive to those partaking in activities at the Bishop's Mountain Shooting Ground which is located to the west.

Following a design review of main Layouts One, Two and Three, and consideration of environmental and design constraints on site including distance to residential receptors, the proposed layout, Layout Four was developed.

Layout Four

Layout Four consists of 10 no. turbines as shown on Figure 3-3.

- Ten turbines are included in the design which includes two to the west of the L3417 local road, one to the south of the L3424 local road and seven in lands north of the L3424 local road.
- Turbine tip heights of 170 m - 180 m and a rotor diameter of approximately 149 m –163 m.
- This layout includes a minimum distance to all residential dwellings of 720 m.

Layout Four maximises the available land area to the proposed project, whilst staying out of key environmentally constrained areas, achieving a 720 m buffer from all residential properties and achieving the required separation distances needed between proposed turbines and those existing turbines adjacent to the site.

Proposed Layout Four makes the most efficient use of wind resource on site and is proposed for planning permission.

Table 3-4: Layout design changes

	Layout One	Layout Two	Layout Three	Layout Four - Current Design Proposal
Closest distance to residential receptor	596 m	596 m	600 m	720 m
No. of Turbines	8	9	10	10
Turbine Height	170m - 180 m	170m - 180 m	170m - 180 m	170m - 180 m
Potential Output	Between 45.6 - 57.6 MW	Between 51.3 - 64.8 MW	Between 57 - 72 MW	Between 57 - 72 MW

The adjustments through each layout iteration resulted in placement changes to the turbines within the proposed wind farm site to ensure sufficient distances were maintained from sensitive receptors and constraints. Adjustments were also required to alternative layouts to ensure the project maintained the required separation distances between the proposed project turbines and turbines at the neighbouring wind farms while maximising energy production and minimising wake effects.

Table 3-5: Table of potential environmental impacts relative to current design proposal

	Layout One (8 turbines)	Layout Two (9 turbines)	Layout Three (10 turbines)	Proposed Design - Layout Four (10 turbines)
Human Health and Population	Potential for increased impact on sensitive receptors due to proximity to some turbines. The closest residential dwelling to a turbine was approximately 596 m at T6.	Potential for increased impact on sensitive receptors due to proximity to some turbines. The closest residential dwelling to a turbine was approximately 596 m at T6.	Potential for increased impact on sensitive receptors due to proximity to some turbines. The closest residential dwelling to a turbine was approximately 600 m at T1.	All turbines are located a minimum of 720m from residential properties in compliance with the setback requirements in the 2006 and Draft 2019 WEDGs.
Biodiversity & Ornithology	More clustered approach which limits the positioning of turbines. Areas of locally important habitats potentially impacted. Difficult to achieve required separation distances from watercourses.	More clustered approach which limits the positioning of turbines. Areas of locally important habitats potentially impacted. Difficult to achieve required separation distances from watercourses.	This larger infrastructure footprint in comparison to Layouts One and Two would result in the greater loss of habitat. Areas of locally important habitats potentially impacted. Difficult to achieve required separation distances from watercourses.	The largest infrastructure footprint would result in the greatest loss of habitat. This layout enables areas of locally important habitats to be avoided. 50 m buffers between infrastructure and watercourses are achieved.
Land, Soils and Geology	More clustered approach which limits the positioning of turbines. Clustered impact from excavations and disturbance on site.	A similar clustered approach which limits the positioning of turbines. Clustered impact from excavations and disturbance on site.	The larger number of turbines will give rise to more areas requiring excavation and further disturbance of soil onsite, in addition to requiring more crushed stone for construction.	The larger number of turbines will give rise to more areas requiring excavation and further disturbance of soil onsite, in addition to requiring more crushed stone for construction. Two borrow pits are present onsite providing a source of rock.
Hydrology and Hydrogeology	More clustered approach which limits the positioning of turbines. Difficult to achieve required separation distances from watercourses.	More clustered approach which limits the positioning of turbines. Difficult to achieve required separation distances from watercourses.	The larger number of turbines will give rise to more areas requiring excavation and further disturbance of soil onsite. Difficult to achieve required separation distances from watercourses.	The larger number of turbines will give rise to more areas requiring excavation and further disturbance of soil onsite. 50 m buffers between infrastructure and watercourses is achieved.
Shadow Flicker	Neutral - No significant difference in impact	Neutral - No significant difference in impact as the	Neutral - No significant difference in impact as the	Neutral - No significant difference in impact as the

	as the project has committed to achieving near zero shadow flicker at sensitive receptors.	project has committed to achieving near zero shadow flicker at sensitive receptors.	project has committed to achieving near zero shadow flicker at sensitive receptors.	project has committed to achieving near zero shadow flicker at sensitive receptors.
Telecommunications & Aviation	Neutral- mitigations will be needed to avoid impact to telecommunication links.	Neutral- mitigations will be needed to avoid impact to telecommunication links.	Neutral- mitigations will be needed to avoid impact to telecommunication links.	Neutral- mitigations will be needed to avoid impact to telecommunication links.
Air and Climate	This layout has the smallest potential for contributing to carbon reduction targets overall during the lifetime of the proposed project.	This layout has a smaller potential for contributing to carbon reduction targets overall during the lifetime of the proposed project in comparison to the proposed option.	Due to the increased number of turbines with this layout there is potential for greater contribution to carbon reduction targets overall during the lifetime of the proposed project.	Due to the increased number of turbines with this layout there is potential for greater contribution to carbon reduction targets overall during the lifetime of the proposed project.
Landscape & Visual Impact	Turbines can generally be well accommodated within this locally elevated landscape, which is characterised by existing wind energy development and typical working land uses, such as extensive areas of conifer forestry and a patchwork of pastoral farmland. Overall, the proposed project will generate residual visual effects that are deemed Not Significant at the nearest surrounding visual receptors.	Turbines can generally be well accommodated within this locally elevated landscape, which is characterised by existing wind energy development and typical working land uses, such as extensive areas of conifer forestry and a patchwork of pastoral farmland. Overall, the proposed project will generate residual visual effects that are deemed Not Significant at the nearest surrounding visual receptors.	Turbines can generally be well accommodated within this locally elevated landscape, which is characterised by existing wind energy development and typical working land uses, such as extensive areas of conifer forestry and a patchwork of pastoral farmland. Overall, the proposed project will generate residual visual effects that are deemed Not Significant at the nearest surrounding visual receptors.	Turbines can generally be well accommodated within this locally elevated landscape, which is characterised by existing wind energy development and typical working land uses, such as extensive areas of conifer forestry and a patchwork of pastoral farmland. Overall, the proposed project will generate residual visual effects that are deemed Not Significant at the nearest surrounding visual receptors.
Noise and Vibration	Neutral – noise levels at all receptors will be within the recommended limits.	Neutral – noise levels at all receptors will be within the recommended limits.	Neutral – noise levels at all receptors will be within the recommended limits.	Neutral – noise levels at all receptors will be within the recommended limits.
Cultural Heritage	Potential for negative impacts on unknown sites of archaeological potential although all known sites of	Potential for negative impacts on unknown sites of archaeological potential although all	Potential for negative impacts on unknown sites of archaeological potential although all	Potential for negative impacts on unknown sites of archaeological potential although all

	interest are avoided.	known sites of interest are avoided.	known sites of interest are avoided.	known sites of interest are avoided.
Traffic	Potential for traffic impacts during construction phase due to deliveries to site.	A greater number of turbines will require more deliveries to site, slightly increasing potential for traffic impacts.	The greatest number of turbines will require the most deliveries to site, slightly increasing potential for traffic impacts.	The greatest number of turbines will require the most deliveries to site, slightly increasing potential for traffic impacts. The inclusion of five no. entrances enables traffic to be spaced around the local area and not clustered on local roads or onsite roads.

3.4.4.1 Port of entry

The port of entry chosen for turbine delivery to the proposed wind farm site is Belview Port (Port of Waterford), which, in comparison to other alternative ports, minimises the travel distance and therefore the associated traffic and air quality impacts arising from the delivery vehicles. This port has also been successfully used for the delivery of wind turbines for other Irish wind farm projects.

However, given the location of the proposed wind farm site near the M9 national road network in the south of the country, the ports in Dublin, Cork and Foynes are feasible alternatives. These were studied as part of this EIAR. The selection of any of these ports is less favourable due to some challenging pinch points on each and the longer delivery route to the proposed wind farm site.

It was found that the use of Dublin Port would likely require significant works at the M50/M7 interchange, and due to the impacts this would have on existing traffic flows at such a busy location, this was viewed as the least preferred option. The use of either the Port of Cork or Foynes Port were also considered, using the connecting N24 between the M8 and M9. Both these options would result in vehicles having to pass through several towns, along with the associated potential traffic impacts as a result of any required improvements to the national road network. All of these alternative options (Dublin Port, Port of Cork and Foynes Port) would involve a longer transport route along busy road networks with more enabling works required, and therefore resulting in increased traffic impacts compared to the current proposed option. Delivery via Belview Port allows for the shortest and more direct route to the proposed wind farm site, with the lowest number of pinch points. It therefore has the lowest potential impact.

Table 3-6: Table of potential environmental impacts relative to proposed port of entry (with associated delivery route)

Environmental Considerations	Alternative One – Route from Dublin harbour	Alternative Two – Route from Cork harbour	Alternative Three – Route from Foynes harbour	Preferred Option Four – Route from Belview Port
Human Health and Population	Significantly longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads around Dublin and at motorway interchanges) to get to site, resulting in a greater impact to road users and residents along the route. The route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	Longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads near Cork City and at motorway interchanges) to get to site, resulting in a greater impact to road users and residents along the route. The route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads near Foynes and at motorway interchanges) to get to site, resulting in a greater impact to road users and residents along the route. The route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Two, would be anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	This route has 13 pinch points across approximately 29 km from Belview Port, nine of which would be required by all delivery route options as they come off the M9 onto the R704 and local roads. This option has the least impact from accommodation works in comparison to Alternatives One, Two and Three on Human Beings.
Biodiversity	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to biodiversity along the route than the proposed option. The route also requires the same accommodation works as the proposed option between the M9 and the proposed wind	This is a longer route which would require more enabling works at pinch points, resulting in a greater potential impact to biodiversity along the route than the proposed option. The route also requires the same accommodation works as the proposed option	This is a longer route which would require more enabling works at pinch points, resulting in a greater potential impact to biodiversity along the route than the proposed option. The route also requires the same accommodation works as the proposed option	As noted above, this route has four pinch points between Belview Port and the M9 Junction at which all options would then need to exit at. At the four pinch points, grounds works at roundabouts which have previously been used before for large deliveries and temporarily removing

	farm site. This option would be anticipated to have the greatest impact of any option.	between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	between the M9 and the proposed wind farm site. This option, along with Alternative Two, would be anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	signs are the main accommodation works. This option will have the least impact on biodiversity given it's close proximity to the site and the existing road infrastructure which has been worked before for large port deliveries.
Land, Soils and Geology	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to land, soils and geology (mostly through soil disturbance) along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to land, soils and geology (mostly through soil disturbance) along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to land, soils and geology (mostly through soil disturbance) along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	As noted above, this route has four pinch points between Belview Port and the M9 Junction at which all options would need to exit at. At the four pinch points, grounds works at roundabouts which have been used before for large deliveries and temporarily removing signs are the main accommodation works. This option will have the least impact on land, soils and geology in comparison to Alternatives One, Two and Three.
Hydrology and Hydrogeology	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to surface and ground water quality along the route than the proposed option (in general through greater landtake and soil disturbance).	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to surface and ground water quality along the route than the proposed option (in general through greater landtake and soil disturbance).	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to surface and ground water quality along the route than the proposed option (in general through greater landtake and soil disturbance).	Due to the proximity to site, this option will have fewer potential impacts on hydrology and hydrogeology both from works and from the haulage.

	This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	The route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	
Climate and Air Quality	Significantly longer haul route leading to greater potential for emissions both from works and from the longer haulage. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	Longer haul route leading to greater potential for emissions both from works and from the longer haulage. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Longer haul route leading to greater potential for emissions both from works and from the longer haulage. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Due to the proximity to site, this option will have less emissions both from works and from the haulage.
Landscape & Visual	The additional accommodation works required along the longer route may have a greater potential visual impact, however this would be temporary and very localised in nature, so would not be significant. This option would be anticipated to have the greatest impact of any option.	The additional accommodation works required along the longer route may have a greater potential visual impact, however this would be temporary and very localised in nature, so would not be significant. This option, along with Alternative Three, is anticipated to have a slightly	The additional accommodation works required along the longer route may have a greater potential visual impact, however this would be temporary and very localised in nature, so would not be significant. This option, along with Alternative Three, is anticipated to have a slightly	Given the proximity to site fewer accommodation works required along this route would be anticipated. These may have a potential visual impact, however this would be temporary and very localised in nature, so would not be significant.

		less impact than Alternative One, but greater than the proposed option.	less impact than Alternative One, but greater than the proposed option.	
Noise and Vibration	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact from a noise and vibration perspective along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact from a noise and vibration perspective along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact from a noise and vibration perspective along the route than the proposed option. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Due to the proximity to site, this option will have less noise and vibration impacts both from works and from the haulage.
Cultural Heritage	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to archaeology and cultural heritage along the route than the proposed option (due to greater landtake). This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to archaeology and cultural heritage along the route than the proposed option (due to greater landtake). This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative	Longer route which would require more enabling works at pinch points, resulting in a greater potential impact to archaeology and cultural heritage along the route than the proposed option (due to greater landtake). This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative	As noted above, this route has four pinch points between Belview Port and the M9 Junction. From this point, all options would follow the same route. There are no predicted cultural heritage impacts at these four locations.

	the greatest impact of any option.	Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	
Traffic and Transportation	Significantly longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads around Dublin and at motorway interchanges) to get to site, resulting in a greater potential impact to road users along the route. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option would be anticipated to have the greatest impact of any option.	Longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads near Cork City and at motorway interchanges) to get to site, resulting in a greater potential impact to road users along the route. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Longer route which would require more enabling works (widening of the road, removal/ movement of street furniture, etc. at pinch points on very busy roads near Foynes and at motorway interchanges) to get to site, resulting in a greater potential impact to road users along the route. This route also requires the same accommodation works as the proposed option between the M9 and the proposed wind farm site. This option, along with Alternative Three, is anticipated to have a slightly less impact than Alternative One, but greater than the proposed option.	Due to the proximity to site and availability of national and regional roads for access, this option will have less traffic impacts both from works and from the haulage.

3.4.4.2 Turbine Delivery Route (TDR)

The proposed TDR runs from Belview Port and heads north from the port on the N29 road to the N25 road where it turns westwards. The route then continues generally westwards on the N25 road, along the N9 to the junction with the M9 motorway, where it makes a northerly turn in the direction of Mullinavat. The route continues on the M9 for approximately 10.5 km before exiting at Junction 11 and travelling eastwards on the R704 regional road. The route continues on the R704 regional road for approximately 5 km before turning right (south) at Three Friars Cross. The route continues southwards on the L3417 local road for the final approach towards the proposed wind farm site entrances.

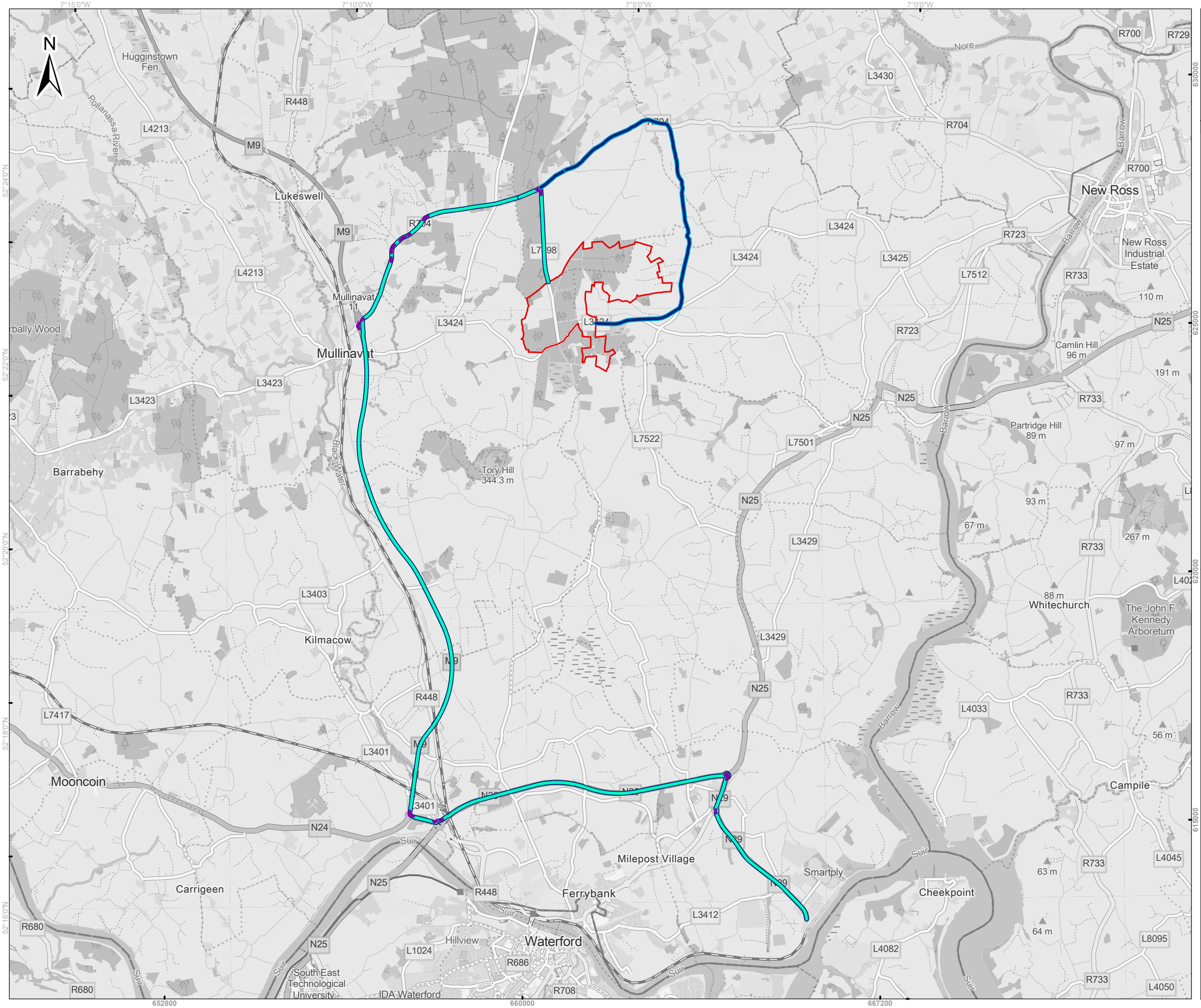
Three temporary road crossings using third party lands are also proposed to enable the turbine deliveries to access to the relevant turbine site location, removing the vehicles from parts of the public road network and avoiding tight road bends. The TDR is discussed

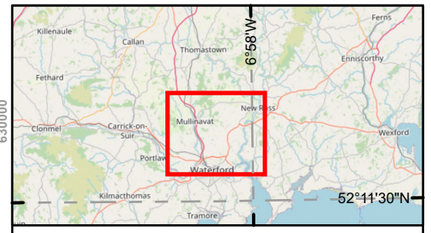
further in Chapter 2 (Description of the Proposed Project), Appendix 2-2 and Chapter 16 (Traffic and Transportation) of this EIAR. This route is also presented on Figure 3-4.

Given the proximity to the proposed project and the relatively straight-forward access between the site, the R704 road, the M9 motorway, and subsequent access from the National Road network to Belview Port (via the N25 and N29), it was determined that any delivery route for oversized loads should use the M9 to minimise the potential for impacts on smaller roads.

An alternative option was considered for the TDR when site access was being considered. This alternative route involved staying on the R704 regional road at Three Friars Cross and travelling approximately 7 km towards the village of Listerlin. From here the route would travel southwards along the L3420 local road for approximately 3.5 km (along the east of the proposed wind farm site) and then travel westwards along the L3424 local road for approximately 2.5 km before making its approach northwards towards the main site entrances on the L3417 and L7499 local roads.

This TDR was not progressed as it would have brought project vehicles into the village of Listerin and pass more residential properties etc. causing a greater environmental impact as discussed in Table 3-7. An alternative site entrance which was initially considered along the east of the proposed wind farm site (see Section 3.4.4.3), off the L3420 local road, is also not progressing so there is no need for project vehicles to be travelling in this area.





Legend

- Wind Farm Study Area
- TDR Works Areas
- Turbine Delivery Route
- Alternative Turbine Delivery Route

0 1 2
Kilometers

Spatial Reference
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Figure 3-4:
Alternative Turbine Delivery Route

Scale @ A3: 1:70,000

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Map Ref: 11474-038-TDR..Opt-P.App.BO-TOB-A

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Table 3-7: Table of potential environmental impacts relative to proposed TDR

Environmental Considerations	Alternative TDR – From Three Friars Cross using the R704, L3420, L3424, L3417, L7499 roads	Proposed TDR - From Three Friars Cross using the L3417, L7499 and L3424, roads
Human Health and Population	Significantly longer route which would require more accommodation works to get to site, resulting in a greater impact to residents along the route. It would also bring increased traffic into the village of Listerlin and along local roads. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km. This avoids the village of Listerlin and reduces the amount of accommodation works needed along local roads. It also reduces the number of residential properties the TDR passes.
Biodiversity	Significantly longer route which would require more accommodation works at pinch points, resulting in a greater potential impact to biodiversity along the route than the proposed option. This route also crosses three additional watercourses. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing the likely biodiversity impacts from accommodation works along a longer route.
Land, Soils and Geology	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to land soils and geology (mostly through soil disturbance) along the route than the proposed option. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing the likely land, soils and geology impacts from accommodation works along a longer route.
Hydrology and Hydrogeology	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to surface and ground water quality along the route than the proposed option. This route also crosses three additional watercourses. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing the likely hydrology and hydrogeology impacts from accommodation works along a longer route.
Climate and Air Quality	Significantly longer route leading to greater potential for emissions both from enabling works and from the longer haulage. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing vehicle emissions along a longer route.
Landscape & Visual	The additional accommodation works required along the longer route may have a greater potential visual impact, however this would be temporary and very localised in nature, so would not be significant. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing the likely visual impacts from accommodation works along a longer route and from passing vehicles at more residential properties.
Noise and Vibration	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact from a noise and vibration perspective along the route than the proposed option. This option also brings traffic pass more residential properties and into the village of Listerlin.	Shorter TDR route by approximately 9 km reducing the noise and vibration impacts from accommodation works and traffic passing along a longer route.

	This option would be anticipated to have a greater impact than the chosen TDR.	
Cultural Heritage	Significantly longer route which would require more enabling works at pinch points, resulting in a greater potential impact to archaeology and cultural heritage along the route than the proposed option. This option would be anticipated to have a greater impact than the chosen TDR.	Shorter TDR route by approximately 9 km reducing the likely archaeology impacts from accommodation works along a longer route.
Traffic and Transportation	Significantly longer route which would require more enabling works to get to site, resulting in a greater potential impact to road users along the route. This option also brings traffic into the village of Listerlin. This option would be anticipated to have a greater impact than the chosen TDR. .	Shorter TDR route by approximately 9 km reducing the traffic impacts from accommodation works along a longer route. This option will have a reduced impact on traffic in Listerlin village and passing residential properties.

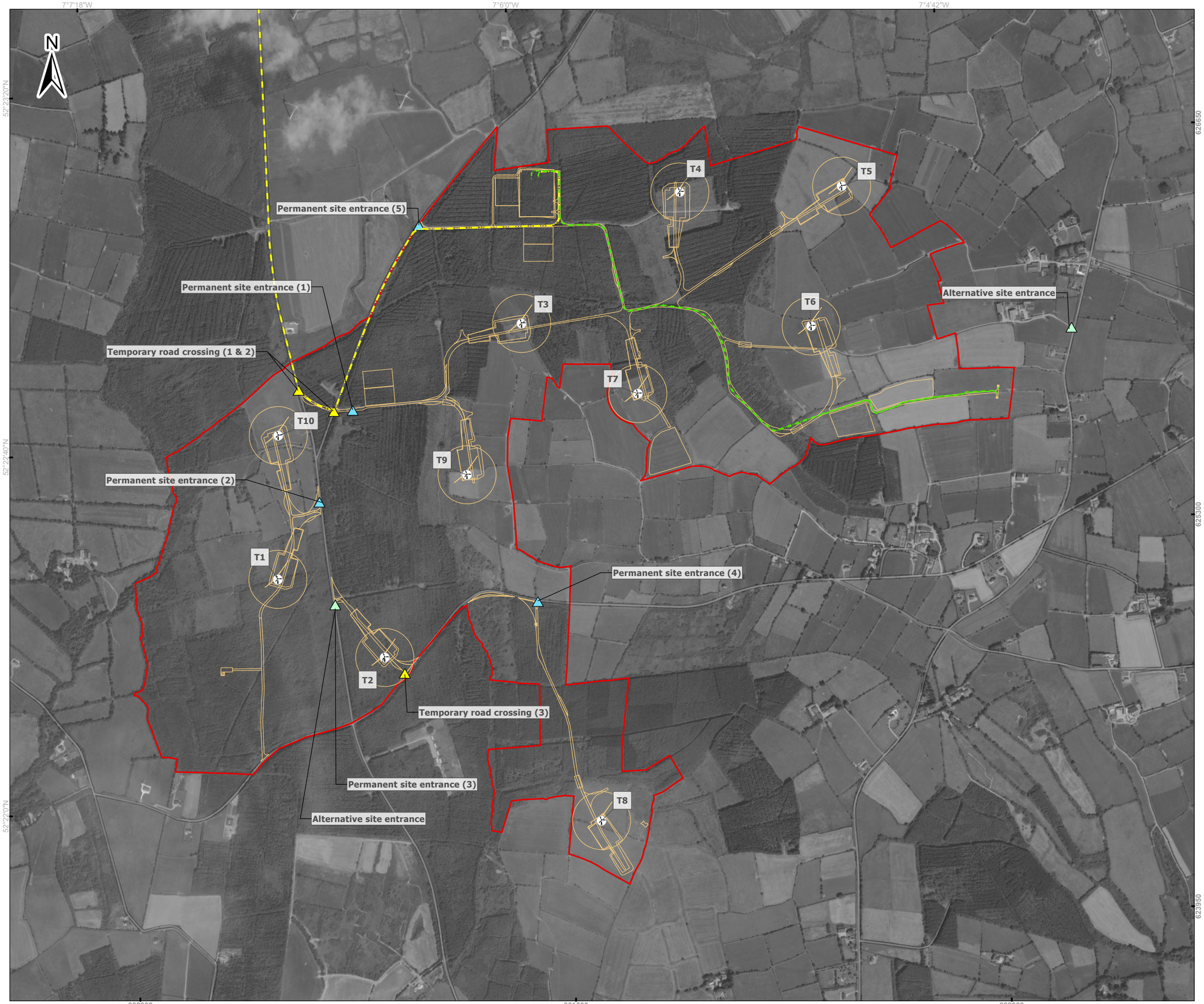
The current proposal minimises such impacts and involves the shortest route possible, taking advantage of the site proximity to the M9 motorway and R704 regional road.

3.4.4.3 Site Entrances

Five permanent site entrances are proposed to support the proposed wind farm site development (see Figure 3-5).

- Site Entrance One is an existing site entrance off the L7499 local road. This will be the main site entrance to access turbine numbers T3, T4, T5, T6, and T9.
- Site Entrance Two is a new entrance off the L3417 local road and will be used to access T1 and T10.
- Site Entrance Three is an existing entrance off the L3417 local road and will be used to access T2.
- Site Entrance Four is an existing entrance off the L3424 local road and will be used to access T8.
- Site Entrance Five is an existing entrance accessed off the L7499 road and will be used for access to the on-site substation.

All proposed entrances will be upgraded to ensure the required swept path for vehicles is achievable and sightline visibility (see Chapter 16 (Traffic & Transportation)). The internal access roads will have a minimum running width of 5 m. The proposed internal roadways incorporate passing bays to allow traffic to pass easily while traveling around the proposed wind farm site, see further detailed in Chapter 2 (Description of the Proposed Project).



Legend

- Wind Farm Study Area
- Site Layout

Grid Connection Options

- Option 1
- Option 2

Site Entrances

- Construction & Operational Phase
- Construction Phase
- Alternative Site Entrance

0 250 500
Meters

Spatial Reference
Datum: IRENET95
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Figure 3-5:
Proposed site entrances design and alternatives considered

Scale @ A3: 1:12,000

Prepared by:	Checked by:	Date:
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Map Ref: 11474-040-A..S.ENTR-P.App.BO-TOB-A

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In terms of alternative design, originally (i.e. at the time of compiling Layout 1) three sites entrances were proposed for the wind farm site. An alternative entrance was proposed off the L3417 local road to the west of the site enabling access to all turbines except T8 in the south. This would have been the main site entrance and is in the same proximity as proposed permanent Site Entrance 3 (see Figure 3-5). However, following a layout design review, having the main site entrance here was not feasible due to the non-availability of lands for connecting the site infrastructure (e.g. internal roads) to each turbine and the environmental impacts and technical constraints this option had (see Table 3-8). As shown on Figure 3-4, the main site entrance is now further north (i.e. labelled permanent Site Entrance 1) and uses an existing site entrance off the L7499 local road.

The second entrance included within the initial alternative design was off the L3424 local road to access T8 in the south. This existing site entrance is proceeding within the proposed site layout (see Figure 3-5, labelled permanent Site Entrance 4).

An alternative site access entrance was also considered off the L3420 local road, allowing vehicles to enter/exit the proposed wind farm site in the east (see Figure 3-5). However, as the proposed wind farm site design progressed, this entrance was deemed not necessary to the working flow of the site. This alterative entrance would bring vehicles along a farm track requiring significant upgrade works, pass residential properties and a working farm yard, and onto the L3420 local road. The environmental impacts and technical challenges from including this alternative this entrance, were deemed unnecessary and it was removed from the proposed wind farm site layout.

As noted above, as the wind farm site layout design developed, alternative site entrances were considered. Following a design review by the project team (including a review of available lands, environmental and technical constraints), and in consideration of local traffic impacts and health and safety on site, particularly during the construction phase, using the proposed five entrances (see Figure 3-5) to meet the needs of the proposed site layout was deemed to be the best option.

As shown on Figure 3-5, Site Entrance One will allow the main parcel of land comprising of six turbines to be accessed/ exited. Site Entrances Two, Three and Four are required to enter the land parcels outside the main land parcel. Site Entrance Five will provide direct access to the substation site, helping to separate substation and wind farm development works. It will also reduce the number of vehicles entering/ exiting at Site Entrance One during the construction phase.

Table 3-8: Table of potential environmental effects from alternative site entrance designs

Environmental Considerations	Alternative site entrance on L3417 road	Alternative site entrance on L3420 road
Human Health and Population	This alternative entrance would have been the only wind farm entrance along the L3417 road. This would have led to possible traffic congestion issues on the L3417 road, additional accommodation works and overall disturbance to the local population using this road.	The alternative entrance to the east of the wind farm would have brought project vehicles directly past residential properties, a working farm and onto the L3420 local road which has several residential properties along it. This alternative design would have brought unnecessary environmental impacts to residents (e.g. noise, traffic).
Biodiversity	This alternative site entrance would have required more tree felling on adjacent lands to access and connect this location to the main site. It would also have required another watercourse crossing.	This alternative access would have involved the upgrading of a farm access track including widening and therefore more disturbance to habitats and overall biodiversity in this area.
Land, Soils and Geology	This alternative site entrance would have involved more soil disturbance to construct the internal road and increased tree felling to try and link the site.	This alternative access would have involved the upgrading of a farm access track and therefore more disturbance of soils.
Hydrology and Hydrogeology	This alternative site entrance would have required the construction of an internal road to connect the site. This would have required more ground disturbance to construct the road and tree felling, potentially leading to more siltation in surface waters. It would also have required another watercourse crossing.	This alternative access would have involved the upgrading of a farm access track and potentially leading to more siltation in surface waters.
Climate and Air Quality	Potential air quality impacts will be limited to along the routes travelling to/from the site entrances.	Potential air quality impacts will be limited to along the routes travelling to/from the site entrances.
Landscape & Visual	Neutral – the same number of vehicles will be present within the local area.	Neutral – the same number of vehicles will be present within the local area.
Noise and Vibration	Potential noise impacts will be limited to along the routes travelling to/from the three site entrances.	Potential noise impacts along the L3420 road travelling to/from the other site entrances. The proposed design avoids this road.
Cultural Heritage	Neutral. All known archaeology is avoided in project designs.	Neutral. All known archaeology is avoided in project designs.
Traffic and Transportation	This alternative site entrance which would have been the only one along this side of the wind farm site would potentially led to congestion on the public road network, particularly the L3417 local road during the construction phase.	This alternative entrance would have also brought project vehicles onto the L3420 local road which the proposed design avoids.

3.4.4.4 National Grid Connection Options

For this project it was necessary to consider the potential for grid connection, including such aspects as distance to potential connection nodes and grid capacity at the nodes to accommodate the connection. Based on the scale of the proposed project, a 110 kV connection is required to accommodate the likely output from the project.

The consented Castlebanny Wind Farm 110 kV substation (An Coimisiún Pleanála reference; 309306-21) is the most proximal 110 kV substation option, and has capacity for connecting to the national grid. The Castlebanny Wind Farm 110 kV substation is due to connect into the existing Great Island to Kilkenny 110 kV line.

For the proposed project, five potential grid connection options were considered. Two grid connection options are being brought forward as part of this planning application (options One and Two discussed below) but only one GCO will be constructed.

GCO One

- GCO One, will connect the onsite Ballyfasy Wind Farm 110 kV substation with the Castlebanny Wind Farm 110 kV substation located 12 km away via a combination of third party lands and public roads (local roads L7499, L3417, R704 and L3418, see Figure 3-6).

GCO Two

- GCO Two requires the installation of a loop-in connection to the existing 110 kV Great Island-Kilkenny overhead line which crosses approximately 2.3 km to the east of the proposed onsite substation (see Figure 3-6). This route is via proposed internal access roads on site and does not require use of public roads.

Both of the above grid connection options are being carried forward in the project planning application.

GCO Three

As a third alternative, consideration was given to potentially connecting the Ballyfasy Wind Farm 110 kV substation to either of the existing Waterford (Grace Dieu) to Great Island 110 kV overhead lines (see Figure 3-6).

- These existing lines are located approximately 12 km south of the proposed wind farm site.
- Several potential loop in locations were investigated within the general area where these lines cross in terms of technical and environmental constraints and for the potential construction of a new 110 kV substation.
- Following desk-based studies, site surveys and landowner discussions, no viable connection options were identified to connect the project with either of these overhead lines.

GCO Four

Alternative GCO Four connects the proposed Ballyfasy Wind Farm substation to the consented Castlebanny Wind Farm substation via the Castlebanny Wind Farm site entrance road and internal wind farm roads (see Figure 3-6).

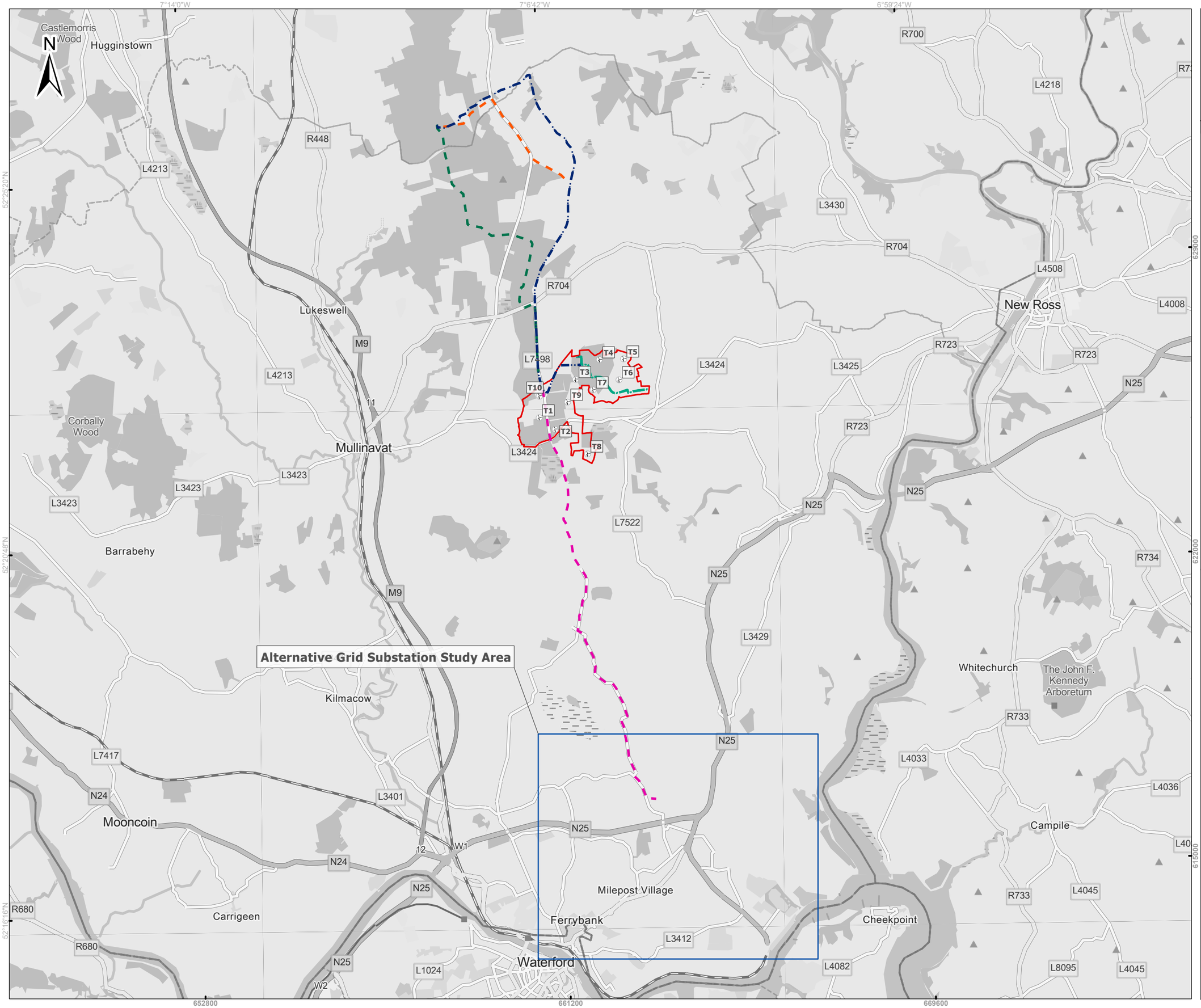
- This option would have reduced the public road footprint required for grid cables on GCO One by approximately 5.8 km. However, when considered, this route was deemed to have several technical challenges and potential for increased environmental impacts as described below.
- The consented Castlebanny Wind Farm cables are to be positioned within the middle of the internal access roads which is a stated preference of Coillte Land Solutions within the site's design. This limits the potential space available for the installation of the Ballyfasy Wind Farm cables. EirGrid also prefer cables to be placed within a road. Therefore, new internal access roads/an expanded road footprint would be required within the Castlebanny Wind Farm project area to accommodate the proposed Ballyfasy Wind Farm grid connection. This new land take to enable the Ballyfasy Wind Farm grid cables would involve additional tree felling, potentially impacting Coillte forestry operations or leading to future wind throw damage for remaining forestry, ecological habitat disturbance/removal (e.g. passing through broadleaved woodland, conifer/ wet heath habitats etc.), soil disturbance, increase risk of water siltation etc.
- The Castlebanny Wind Farm includes 21 turbines which develops technical complexities as these cables approach the onsite substation site. Again, this presents technical limitations to including Ballyfasy Wind Farm cables on site.
- Entering the site via the Castlebanny Wind Farm site entrance would also increase traffic and general disturbance in this working area for both the Castlebanny Wind Farm project works but also local traffic on the regional R704 road.
- There is also potential health and safety risks to workers onsite through increased staff and machinery from both working projects being developed and operated on site concurrently.

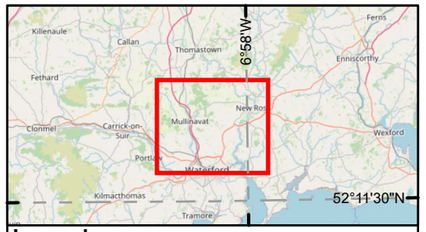
GCO Five

Alternative GCO Five would connect the proposed project using the L7499, L3417 road, R704 road, L3418 road, L7490 road and L8272 road (see Figure 3-6).

- Following consideration this option was not progressed as it would bring construction works immediately adjacent to a greater number of residential properties than the chosen two options.
- Cable laying works and road closures would also be required on five roads within the local area.
- This connection option utilises the public road directly opposite of St Moling's Well, which is an archaeological recorded ritual site - holy well, and is visited by the public. Construction works would inevitably interfere with anyone wishing to visit the site. The road is also narrow in this area and considered a pinch point for the required works.

The grid connection options considered for the proposed project are presented in Figure 3-6.





Legend

- Wind Farm Study Area

Grid Connection Options

- Option 1
- Option 2

Alternative Grid Connection Options

- Option 3
- Option 4
- Option 5

0 1.5 3
Kilometers

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Figure 3-6:
Alternative Grid Connection Options

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Table 3-9: Potential environmental effects of alternative grid connection options in relation to GCO One and Two

Environmental Considerations	Alternative GCO Three	Alternative GCO Four	Alternative GCO Five
Human Health and Population	There are more residential properties along this route in comparison to GCO One and Two. Greater disturbance effects on local residents living opposite cables works and using the local roads over a distance of approximately 12 km. A new 110 kV substation would also be required bringing this infrastructure type closer to residents.	Increased risk of collision from increased number of staff and machinery working on site and at road entrance for two projects being constructed/ operated concurrently. Increased local disturbance particularly on R704 road as a longer stretch of this road is needed to lay cables than in GCO One GCO Two works are within the wind farm site and in public roads.	There are more residential properties along this route in comparison to GCO One. Greater disturbance effects on local residents living opposite cables works. Air, noise, traffic effects would be greater along this route including for people visiting St Moling's Well. GCO Two works are within the wind farm site and therefore not passing residential properties.
Biodiversity	Similar potential impacts in comparison to GCO One and more than GCO Two due to the level of works required over approximately 12 km. Greater impact than GCO One and Two due to required land take required for a new 110 kV substation.	Greater potential ecological impacts in comparison to GCO One and Two as additional lands (including broadleaved woodland, conifer/ wet heath habitats) would be required for cables and habitats disturbed / removed.	Neutral in comparison with GCO One and GCO Two.
Land, Soils and Geology	Greater potential disturbance impacts in comparison to GCO One and Two due to the level of works required for approximately 12 km and land take required for developing a new 110 kV substation.	Greater potential impacts as there would not be available space for the cables within the internal site roads. Therefore, more land take would be required and soils disturbed.	Neutral in comparison with GCO One and GCO Two.
Hydrology and Hydrogeology	Greater potential disturbance impacts in comparison to GCO One and Two due to the level of works within several public roads for approximately 12 km and land take required for developing a new 110 kV substation.	This option crosses two streams in comparison to GCO One which has four additional crossings along the R3418 road. No instream works are planned for the project. Neutral in comparison with GCO Two.	Neutral in comparison with GCO One and GCO Two.

Visual Impact	Greater visual impact in comparison to GCOs One and Two as a new standalone 110 kV substation would be required.	A decrease in visual effect in comparison to GCO One as the works would not directly pass any residential properties. Neutral in comparison with GCO Two.	Neutral in comparison with GCO One and GCO Two.
Noise and Vibration	Numerous residential properties border these roads. A new 110 kV substation would also be required bringing this infrastructure closer to residents causing greater impacts in comparison to GCOs One and Two.	A decrease in visual effect in comparison to GCO One as the works would not directly pass any residential properties. Neutral in comparison with GCO Two.	This route passes more residential properties along public roads in comparison to GCO One therefore more noise disturbance is likely. GCO Two works are within the wind farm site and therefore not passing residential properties.
Cultural Heritage	This route would pass numerous archaeological features and therefore have a potential greater impact. A new site is required for new 110 kV substation and potentially would impact or be closer to archaeological features.	Neutral in comparison with GCO One and GCO Two.	This route passes St Moling's Well, a recorded holy well. Disturbance effects would be likely to people visiting this recorded site. GCO One and Two do not pass St Moling's Well.
Traffic	Similar potential impacts to GCO One due to the level of works within several local roads for approximately 12 km and less than GCO Two which is within the wind farm site. A new site is required by this option for a new 110 kV substation which would increase traffic levels in this area. GCO One and Two do not need an additional substation site.	This GCO would cause greater traffic effects in comparison to GCO One & Two on the R704 road as the cables are constructed within the road from Three Friars Cross to the proposed Castlebanny Wind Farm site entrance.	This route passes more residential properties than GCO One therefore more local traffic disturbance is likely. It involves cable laying works and road closures to five roads within the local area. GCO Two works are within the wind farm site and therefore not passing residential properties or using public roads.

3.4.4.5 Site Substation

Two onsite substation locations were considered for the proposed project as shown on Figure 3-7.

Substation Option One

Substation Option One involved the substation being placed within several agricultural fields. In this location, land availability for the required 110 kV substation footprint to meet EirGrid

specifications and the required set back distances from wind turbines, determined this location to be non-feasible. This location also limited the ability to avoid local ecological habitats of high to low ecological value (e.g. hedgerows, heath).

The availability of lands on the wind farm site to suit EirGrid's specifications and the required set back from turbines was limited. However, a second location option was identified and is the proposed onsite 110 kV substation site.

Substation Option Two

Substation Option Two, which is the chosen substation location, is within Coillte forestry to the north. This location provides the required footprint space needed for the 110 kV substation.

- It also achieves the required set back distances required from the onsite turbines and neighbouring wind turbines at Ballymartin Wind Farm and Smithstown Wind Farm.
- This location is also adjacent to an existing access road and site entrance.
- This site entrance will be used to keep substation construction works and traffic separate from the wind farm construction works.
- This area is currently commercial forestry which is due to be felled in the future.
- It positions the substation in an area of low ecological value. The surrounding forestry will also provide some visual screening.

7°7'0"W
7°6'0"W
7°5'0"W
52°23'0"N
52°22'0"N
626100
625000
660000
661500
663000
N
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10

Legend

- Wind Farm Study Area
- Turbine locations
- Proposed Substation
- Alternative Substation Location

0 250 500
Meters

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Figure 3-7:
Substation options

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Draft: A

3.4.4.6 Site Access Roads

The location of the proposed internal site access roads was determined by the location of wind turbines, the onsite substation and the ability for turbine delivery. As layout designs changed, so did the positioning of site access roads. Site access roads were also designed with consideration of onsite environmental constraints such as watercourses and associated buffer zones and local topography. In the five locations where watercourse crossings are needed, clear span bridges will be constructed with linkage to the internal site access roads. No in-stream works will be required to accommodate internal site access roads.

3.5 ALTERNATIVE PROCESSES

3.5.1 Alternative Technology

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

While solar energy could in theory be implemented at the proposed wind farm site as a reasonable alternative to wind energy, it would have been restricted in certain parts of the proposed wind farm site as some site areas have unsuitable steeper slopes. Solar farms also tend to need a more continuous expanse of land for their panels, which is limited on site, whereas wind turbines can be spread out. The environmental and financial impacts would also be more extensive in terms of the area of forestry required to be felled and replanted elsewhere to accommodate a solar farm. There are also likely to be increased effects on land use, geology, and hydrology as well as biodiversity, as a result of increased felling works. The capacity factor[5] of solar energy is significantly lower than that of onshore wind energy, requiring approximately 3 times the capacity of the proposed wind farm development to produce the same amount of energy. For these reasons, solar was ruled out as an option at the proposed wind farm site.

3.5.2 Alternative Timelines and Construction Methodology

Throughout the design and assessment process, alternatives of other aspects of the proposed project were considered. A summary of this process is provided here.

The construction methods for the proposed project are dependent on a number of factors specific to the site and design, and have been considered in relation to ground conditions, foundation installation and turbine erection. Site-specific information gathered through intrusive site investigation and environmental surveys was taken into consideration when reviewing alternative methodologies for construction. Alternative stream crossing methodologies for the grid connection were considered at the outset, such as trenching with over-pumping, but this was quickly considered to be too risky for water quality in the area and was thus ruled out. Within the proposed wind farm site, five clear span bridges will be developed to cross watercourses preventing in-stream works. Where watercourses are to be crossed for grid connection, horizontal directional drilling will take place to negate the need for in-stream works.

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

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

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

3.6 CONCLUSIONS

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

As discussed above the siting and design of the proposed project has evolved through the consideration of alternatives and allowing for stakeholder input into the process, see Chapter 1 (Introduction) of this EIAR. This included initial consideration of the need for renewable energy, the site selection process, the consideration of alternative layouts, scales, and design processes.

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

When weighed against all of the alternatives and constraints/facilitators outlined in this chapter, the proposed wind farm site has been found to be a highly suitable location for a wind farm with regard to a number of criteria including:

- wind speed;
- grid access;
- environmental effects;
- distance from dwellings;
- topography;
- site geology; and
- landscape character.

3.7 REFERENCES

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