STATKRAFT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED DERNACART WIND FARM, COUNTY LAOIS

VOLUME 2 – MAIN EIAR

CHAPTER 2 - NEED AND ALTERNATIVES

DECEMBER 2019

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FEHILY TIMONEY
30 YEARS

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2 NEED AND ALTERNATIVES

2.1 Introduction

This chapter sets out the need for the development with respect to climate change, national policy and national renewable energy targets. Following the establishment of the need for the development, the reasonable alternatives for the project are considered. This includes the site selection process and details the alternatives considered for the design and site layout which were examined during the development of the project. Alternative processes, including alternative renewable energy technologies were also considered.

2.2 The Need for the Project

Ireland is dependent on reliable and secure supplies of electricity. The generation of electricity accounts for about one-third of all energy use each year in Ireland. The proposed development of the Dernacart Wind Farm is necessary not only to produce electricity for the national grid, but also due to its contribution to transitioning Ireland to a low carbon economy. The proposed development will play a critical role in providing renewable electricity, accounting for up to 1.35% of the current installed wind energy capacity[i] in the Republic of Ireland.

At a strategic level the need for the proposed wind farm development is supported by International, European, and National environmental and energy commitments and policies. In Chapter 3 of this EIAR, a detailed analysis of these commitments and policies is outlined.

It is now established that Ireland will not be able to meet the binding 2020 targets to reduce greenhouse gas emissions by 20% from 2005 level and produce 16% of total energy from renewable sources. These targets were set by EU leaders in 2007 and enacted in legislation in 2009. Ireland will be subject to additional costs in the form of having to buy carbon credits through the EU Emissions Trading System (ETS) until these targets can be achieved[ii]. The Irish Government published the Climate Action Plan in June 2019[iii] (see Chapter 2.2.1 below) which sets ambitious policy actions to ensure the 2030 targets can be achieved. This is in the context of substantial and continuing failure by Ireland in meeting climate targets to date. According to a report[iv] by Climate Action Network Europe (CAN), Ireland is:

> *"Way off track with its greenhouse gas emission reductions in sectors such as transport, buildings, waste and agriculture (non-ETS) both for 2020 and 2030"*

The Climate Action Plan recognises that Ireland must make a significant increase in the levels of renewable energy in the country. The Climate Action Plan states that:

> *"We should be radically reducing our reliance on carbon; Ireland's greenhouse gas emissions have been rising rapidly. We are currently 85% dependent on fossil fuels. We have a short window of opportunity to reverse this trend and secure a better, healthier, more resilient future for the country…This plan identifies how Ireland will achieve its 2030 targets for carbon emissions and puts us on a trajectory to achieve net zero carbon emissions by 2050."*[v]

2.2.1 Climate Change

The Minister for Communications, Climate Action and Environment Richard Bruton TD remarked in January 2019 that:

> *"We need to step up our response to climate disruption. The window for opportunity is closing. The decisions we take now will define the next century."*[vi]

Ireland has enacted the Climate Action and Low Carbon Development Act 2015[vii] and more recently, the Climate Action Plan**Error! Bookmark not defined.** (CAP) of June 2019 was published. The CAP brings in radical actions to cut emissions and make Ireland a zero-carbon economy by 2050.

It is estimated that the capacity of ca. 40MW of electricity from the proposed Dernacart Wind Farm will result in the net displacement of approximately 55,188 tonnes of CO_2per annum.

This is in line with the targets of the CAP which:

> *"identifies how Ireland will achieve its 2030 targets for carbon emissions, and puts us on a trajectory to achieve net zero carbon emissions by 2050"*[viii]

2.2.2 EU Renewable Energy Targets

Fossil fuels still dominate Ireland's electricity production. Greenhouse gases and other emissions from fossil fuels give rise to acid rain and air pollution. The Dernacart Wind Farm will be a source of renewable energy that is utilised locally with minimal impact on the environment. It is necessary to meet the challenges of future climate change.

The Department of Communication, Climate Action and Environment website sets out that:

> *"climate disruption is already having diverse and wide ranging impacts on Ireland's environment, society, economic and natural resources. The Climate Action Plan clearly identifies the nature and scale of the challenge."*

The Dernacart Wind Farm will assist in reducing the risk of climate breakdown and will support and maintain onshore wind energy capacity in Ireland. The Climate Action Plan seeks the installation of a total of 8.2 GW of onshore wind energy capacity by 2030, and the Dernacart Wind Farm development can contribute approximately 0.6% of this 2030 target.

The European Commission's Climate and Energy Framework 2030[ix] seeks to drive continued progress towards a low-carbon economy and build a competitive and secure energy system that ensures affordable energy for all consumers and increase the security of the EU's energy supply. It proposes to achieve a 40% reduction in greenhouse gas (GHG) by 2030 relative to 1990 across the EU, and a binding EU-wide target for renewable energy of at least 27% by 2030. Under this, Ireland is required to reduce its greenhouse gas emissions by 30%, relative to 2005, a further increase from the 2020 target of 20%. In addition, Ireland is currently projected by the SEAI to be 3% short of the required renewable energy target of 16% by 2020. Ireland will be subject to additional costs as a result of this shortfall.

The 2050 "*Low-Carbon Economy Roadmap*"[x] suggests that by 2050, the EU as a whole should cut greenhouse gas emissions to 80% below 1990 levels, which would require 40% emissions cuts by 2030 and 60% by 2040. This is in line with EU leaders' commitment to reducing emissions by 80-95% by 2050, and Ireland as a member state is likely to adopt radical emission cuts to meet these targets.

In June 2018, a political agreement was reached between negotiators for the European Commission, the European Parliament and the Council on increasing renewable energy use in the European Union. The new regulatory framework includes a binding renewable energy target for the EU for 2030 of 32%, with an upwards revision clause by 2023. The agreement is aimed at ensuring the EU, as a whole, meets the Paris Agreement Goals, a legally binding global climate deal made in 2015 by 195 countries to limit global warming.

Substantial new development will be required in Ireland to increase renewable energy production from 30% to 70%, as set out in the Climate Action Plan 2019**Error! Bookmark not defined.**. Most of this increase is likely to come from wind power. Moving from 2020 targets to 2030 and 2050 targets, wind energy development is required to increase substantially. This demonstrates the importance of and need for the proposed Dernacart Wind Farm development.

2.2.3 Energy Security

Ireland is one of the most energy import-dependent countries in the European Union, importing 66% of its fuel in 2017 at an estimated cost of €4 billion[xi]. Ireland's import dependency prior to 2016 varied between 85% and 90% and decreased to 69% when the Corrib Gas started production.

While lower levels of oil import are being achieved as a result of the growing wind energy sector, Ireland remains vulnerable to future energy crises and price fluctuations given its location on the periphery of Europe.

The international fossil fuel market is growing increasingly expensive and is increasingly affected by international politics which can add to price fluctuations. Volatility may increase as carbon prices escalate in the future. The cost of carbon credits is included in all electricity trade, and the price of electricity generated by coal is particularly vulnerable due to the high carbon emissions per unit of electricity generated. Coal still generates 25% of Ireland's electricity, but the recent programme for government called for a review of options to replace coal with low carbon alternatives within a decade[xii].

The Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030[xiii] sets out a framework to guide policy and actions that the government intends to take in the energy sector. The paper notes that "There will be a substantial increase in the cost of carbon in the short and medium term, through the EU Emissions Trading Scheme". The proposed Dernacart Wind Farm aims to reduce dependence on imported fossil fuels and add to financial autonomy and energy stability in Ireland.

2.2.4 Competitiveness of Wind Energy and Economic Benefits of the Dernacart Wind Farm

In addition to helping Ireland avoid significant fines and reducing Ireland's environmentally damaging emissions, the Dernacart Wind Farm will also contribute positively to the national and regional economy.

SEAI[xiv] reported that in 2017 wind energy:

- Generated 25% of all electricity;
- Displaced 1.1Mtoe of fossil fuel consumption; and
- Avoided 2.7 million tonnes of CO_2 emissions.

Additionally, a report published by Baringa[xv] in January 2019 states that:

> *"Our analysis indicates that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 will result in a total net cost to consumers, over 20 years, of €0.1bn (€63 million to be exact), which equates to a cost of less than €1 per person per year."*

Notwithstanding the above financial costs and benefits the Baringa report outlines that wind generation in Ireland avoids:

- "33 million tonnes of power sector CO2 emissions. The total carbon emissions from electricity generation in 2017 was 11.7 Mt, so a saving of 33 Mt is equivalent to almost 3 years of total carbon emissions in the electricity sector today.
- 137 TWh of fossil fuel consumption at a saving of €2.7bn. In comparison, Ireland consumed 44 TWh (3814 ktoe) of fossil fuels for electricity generation in 2017, so a saving of 137 TWh is equivalent to 3 years of current fossil fuel consumption for electricity generation."

2.3 ALTERNATIVES CONSIDERED

The alternatives considered throughout the development process are discussed below. These include the site selection process, the design and layout of the development and the alternative technologies considered. This section has particular regard to the environmental considerations which influence the selection of alternatives and details the evolution of the development through alternatives considered.

2.3.1 Alternative Processes

At the outset of the project, the developers considered a range of technologies for the production and supply of renewable energy to the Irish national electricity grid. The following section outlines the alternative technologies and respective considerations in relation to the chosen alternative for the project, onshore wind.

Bio-Energy

Bio-energy presents an alternative to wind in assisting Ireland to meet its renewable energy targets. Bioenergy refers to the production of renewable energy from a variety of materials of a biodegradable nature and is generally considered under the headings of solid biomass, biogas and biofuels. Forestry has the largest potential to expand at current market prices for bio-energy production in Irelandxvi and is therefore considered in this section.

A report entitled *Unlocking Ireland's Biomass Potential – Converting Moneypoint Coal Fired Power Station to Sustainable Biomass* (March 2016)[xvii] suggested converting the Moneypoint generation station from coal to biomass can solve Ireland's renewable energy issues. The report, prepared by UK consultants BW Energy for the Rethink Pylons campaign group, argues that this one action would enable Ireland to meet its 2020 renewable energy targets at a single stroke. The report also claims it would allow Ireland to abandon plans for investment in wind energy, transmission infrastructure and other renewable energy technologies. However, the reality is not that simple:

The idea of one simple action to solve our renewable energy problems, meet our targets and avoid the need for new infrastructure appears attractive, however, the conversion of Moneypoint to biomass has been considered a number of times over the years, including trials of small amounts of biomass in the station. The technical and economic challenges have proven far greater than set out in the 2016 report. The existing Moneypoint plant cannot use biomass as a fuel. To allow for combustion of biomass, a full redesign and rebuild of much of the station would be required. This process is expensive, hundreds of millions more expensive than is being suggested. To get a sense of what that cost might do to electricity prices, we can look to the UK, where a conversion of a coal plant (Drax Power Station) to biomass required significant financial support to make it viable. Each unit of energy from the UK plant is guaranteed a price of the equivalent of 13 cents, almost double the 7-cent price offered to wind energy in Ireland under the REFIT 2 scheme for renewable energy.

Furthermore, in terms of efficiency biomass is better used to generate heat because it is possible to get twice the energy from the same amount of biomass than by turning it into electricity. Ireland has a target for renewable heat as well as a target for renewable electricity as set out in the National Renewable Energy Action Plan[xviii]. If potential heat resources were to be diverted into electricity it would stifle the achievement of our national targets for 2020 and beyond.

Moneypoint, if converted, would consume an unsustainable amount of biomass resource requiring over 300,000 hectares of land - the equivalent of covering Counties Wexford and Carlow with willow. Assuming this is unlikely, very large amounts of biomass would have to be imported (with significant associated greenhouse gas emissions from transport) from different parts of the world to fuel the station, at a significant cost.

In their 2014 Press Release '*Biomass is a Big Part of the Solution, but not the Whole Solution*', SEAI advised that the cheapest way for Ireland to generate clean electricity would be by utilising wind energy. It was already one of the biggest single contributors to greenhouse gas reduction in Ireland and had at that point saved the nation close to one billion Euro in avoided imports of fossil fuel. "*We should keep exploiting wind in the right way and add the benefits of exploiting biomass in the right way on top of that*"[xix].

Offshore Wind

Another form of renewable energy development considered was offshore wind energy. The Climate Action Plan indicates a planned introduction of offshore wind to the system commencing in 2023 with a projected installed capacity of 3.5 GW by 2030.

Offshore wind is currently more expensive than onshore wind. The UK has a support scheme for offshore wind, which ensures a tariff of 40-50% higher than the tariff paid for onshore wind. In an Irish context, this indicates that subsidies for offshore wind would require a significantly higher input than that currently provided for onshore wind in order to make it economically viable.

Solar Energy

There has been a recent surge of interest in solar energy in Ireland due to rapid improvements in solar technology and cost competitiveness. A report undertaken by KPMG entitled *A Brighter Future – Potential Benefits of Solar PV in Ireland* (November 2015)[xx], detailed the potential impacts of solar energy on the Irish electricity network and market, and how it will interact with other technologies, principally onshore wind.

The report notes that while solar PV would diversify Ireland's renewable energy portfolio, its output is unlikely to be correlated with that of wind.

The KPMG report notes that:

> *"Ireland's progress to date towards meeting its targets has principally been through the deployment of onshore wind energy. Onshore wind will continue to be the principal means of meeting Ireland's 2020 targets, with a total of 3.2-3.7GW projected to be commissioned by 2020".*

Tidal and Wave Energy

Tidal energy involves the harnessing and converting of kinetic or moving energy present in the inflow or outflow of tidal waters into electricity. There are two types of tidal harvesting technology namely, tidal barrage and tidal stream turbines. Tidal barrage technology is a firmly established technology however tidal stream is still in its infancy.

In 2005 the SEAI undertook a review of the tidal resource in Ireland entitled *Tidal & Current Energy Resources in Ireland*[xxi]. This report identified a number of areas around Ireland's coastline suitable for commercial tidal deployment, primarily the East coast, and Shannon estuary. In 2014 the Offshore Renewable Energy Development Plan, designated the following areas as suitable for tidal development:

- South East coast
- Shannon Estuary
- North West coast

SEAI is now working to develop more specific resource assessments for these areas.

There are many similarities between wind and tidal current generating systems both in terms of devices and the nature of the driving force. However, the 2005 report noted that tidal systems are in their infancy and there have been only a small number of prototype scale demonstrations of plant with an installed capacity of over 100kW. It is expected to take several years before items of equipment are produced for purchase and installation.

It should be noted however that the world's first commercial scale tidal power generating device was commissioned in July 2008 in Strangford Lough, Northern Ireland. A UK company have designed and developed a tidal stream device known as SeaGen. The project, comprising of two 600KW turbines, required a total investment of £12m. The project reached an important milestone in September 2012 by producing up to 5GWh of power since its commissioning. This is equal to the power required by 1,500 households annually. The milestone indicates the completion of the demonstration phase of the project.[xxii]

An early study of the European wave energy resource was performed which indicated that the average wave power in Europe is highest near the west of Ireland with an average wave power of 76kW occurring at the Irish coast.

A more detailed assessment of Ireland capacity to generate wave energy was undertaken by SEAI in 2005, the study indicated that a theoretical wave energy resource of up to 525TWh exists within the total limit of Irish waters. For comparison, in 2006 the Total Electricity Requirement for the Republic of Ireland (ROI) was 27.8TWh of electricity.

To date, tidal and wave energy technology is not at a viable commercial standard to provide clean energy at a large scale in comparison to the well-developed wind energy technology which is tried and tested throughout Ireland and Europe.

2.3.2 Do-Nothing Alternative

In accordance with the EU Directive on the Promotion of the Use of Renewable Energy (2009/28/EC), enacted in Ireland (S.I. No. 147/2011 - European Communities (Renewable Energy) Regulations 2011), Ireland has committed to ensuring that 16% of the total energy consumed in heating, electricity and transport is generated from renewable resources by 2020 to reduce the nation's CO_2 emissions and to promote the use of indigenous sources of energy. Under the 'Do-Nothing scenario', there will be no opportunity to provide additional renewable energy into the electricity grid.

The 2019 Climate Action Plan**Error! Bookmark not defined.** sets out targets for 2030:

- Reduce CO_2 equivalent emissions from the electricity sector by 50–55% relative to 2030 NDP projections;
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation;
- Increase electricity generated from renewable sources to 70%, indicatively comprised of:
    - at least 3.5 GW of offshore renewable energy;
    - up to 1.5 GW of grid-scale solar energy; and
    - up to 8.2 GW total of increased **onshore** wind capacity.

Further to this the European Commission in 2016 published its 2030 CO_2 emissions targets breakdown for each Member State. Ireland[xxiii] will have to reduce its emissions by 30% relative to its 2005 emissions. Ireland will have 4% one-off flexibility from emissions trading, at the highest end of the ranking. Harvesting renewable, indigenous resources such as wind will help diversify the Irish electricity generation portfolio and reduce future dependency on imported fuel resources.

Under the "Do-Nothing" scenario, the Dernacart Wind Farm project would not go ahead, the development of wind turbines would not be pursued, and the site would remain in use for forestry and agriculture. The prospect of creating sustainable energy through County Laois's wind energy resource would be lost at this site. The nation's ability to produce sustainable energy and reduce greenhouse gas emissions to meet EU targets and targets set out in the National Climate Action Plan (2019) would be reduced.

The proposed development is estimated to offset 55,188 tonnes of CO_2 emissions per year, which would otherwise be released to the atmosphere through the burning of fossil fuels in the "Do-Nothing" scenario. Importation and use of fossil fuels would continue and Ireland's energy security would remain vulnerable. According to EirGrid Group's All-island Generation Capacity Statement 2018 – 2027[xxiv], the growth in energy demand for the next ten years will be between 15% and 47%. A 'Do-Nothing' scenario would contribute to strain existing energy infrastructure and may impact on potential economic growth if energy demand cannot be met.

Under the 'Do-Nothing' scenario, the socio-economic benefits associated with the proposed development will be lost. These benefits include up to 128 no. jobs during the construction phase of the project, and up to 20 long term jobs once operational. Furthermore, the local community will not benefit economically from the associated community benefit fund, which could be used to improve physical and social infrastructure in the area.

In the 'Do-Nothing' scenario the potential environmental impacts of the proposed development as set out throughout this EIAR will not occur and mitigation measures will not be implemented.

2.3.3 Site Selection – Macro Level

The site selection process for the proposed development began at a macro level. This process firstly took account of relevant international, national and regional policies, as well as the principal environmental, planning and technical criteria that determine the feasibility and suitability of the existing environment to absorb wind energy developments.

The primary macro level considerations in the identification of a broad area for wind energy development included the following:

- Identification of environmental designations on a National Scale;
- Identification of areas of built Wind Farms in Ireland;
- Identification of Grid Capacity and Electricity Infrastructure; and
- Relevant National and Regional Policies.

An assessment of environmental designations (SACs, SPAs, NHAs, pNHAs) identified the west and the eastern seaboard of the country as having dense levels of European and National environmental designations. Areas in the south, east and midlands have a lower density of designations, allowing for greater scope for development in these areas. See Figure 2.1 which illustrates the distribution of designated sites throughout the country.

Areas throughout the country where wind energy developments already exist were examined to determine and locate areas with capacity for future wind energy development, as well as areas with cumulative capacity to absorb further wind energy development. Figure 2.2 shows the locations of existing wind energy projects as of 2019 on the island of Ireland. The figure shows dense areas of wind energy development which were further examined for cumulative capacity. Areas in the south, midlands and east with less dense wind energy development were further examined for viability.

EirGrid's All-Island Ten-Year Transmission Forecast Statement 2017[1] states that the electricity transmission system is the backbone of the power system, efficiently delivering large amounts of power from where it is generated to where it is needed. An assessment of Grid Capacity across the Country identifies the existing infrastructure throughout the country. Figure 2.3 below shows the transmission system which is more extensive at towns and cities with strategic cross-country connections in between. The site selection process for the Dernacart Wind Farm considered infrastructure location as an important factor due to the requirement of returning the electricity to the national grid in a sustainable and efficient manner.

[1] http://www.eirgridgroup.com/site-files/library/EirGrid/TYTFS-2017-Final.pdf

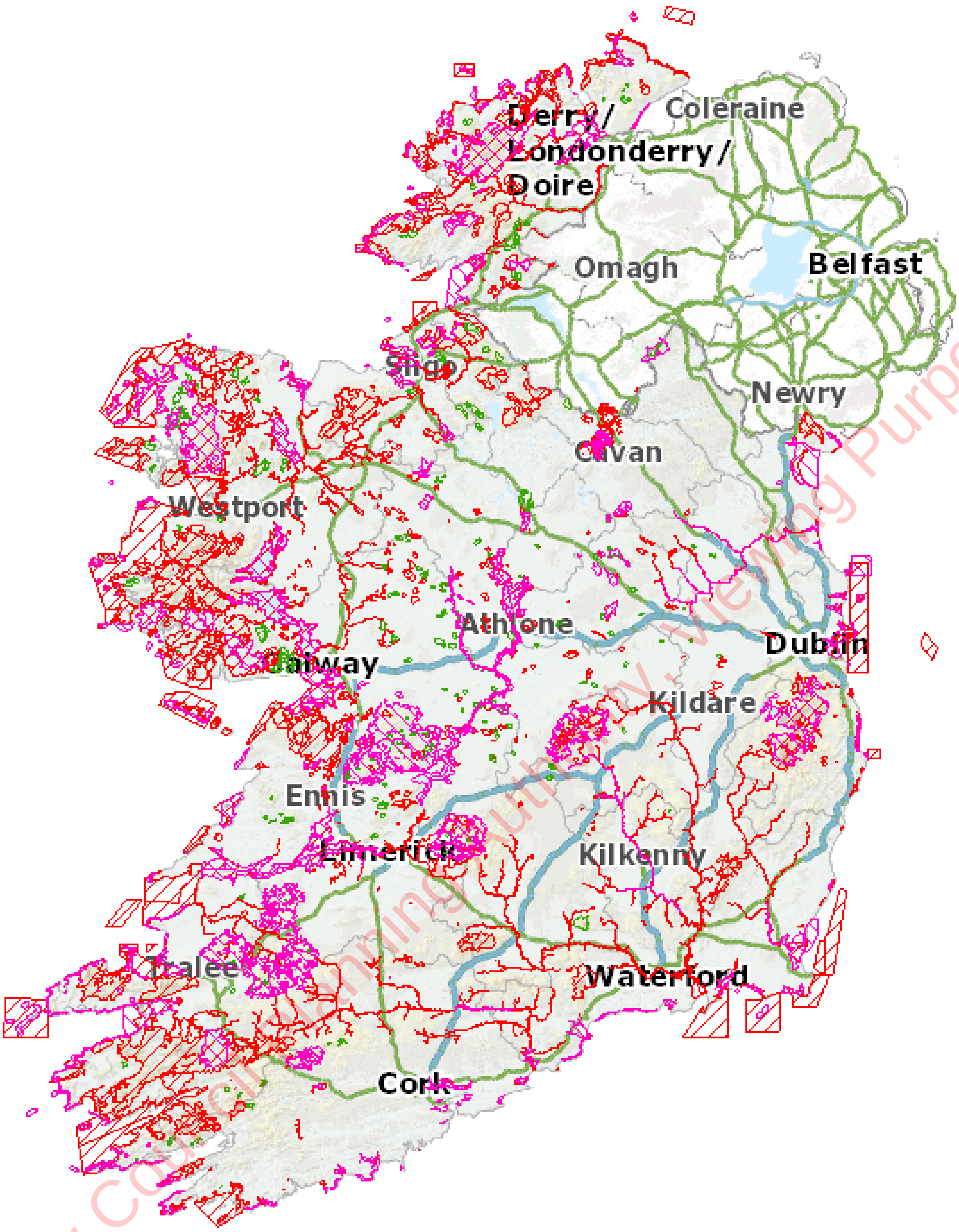
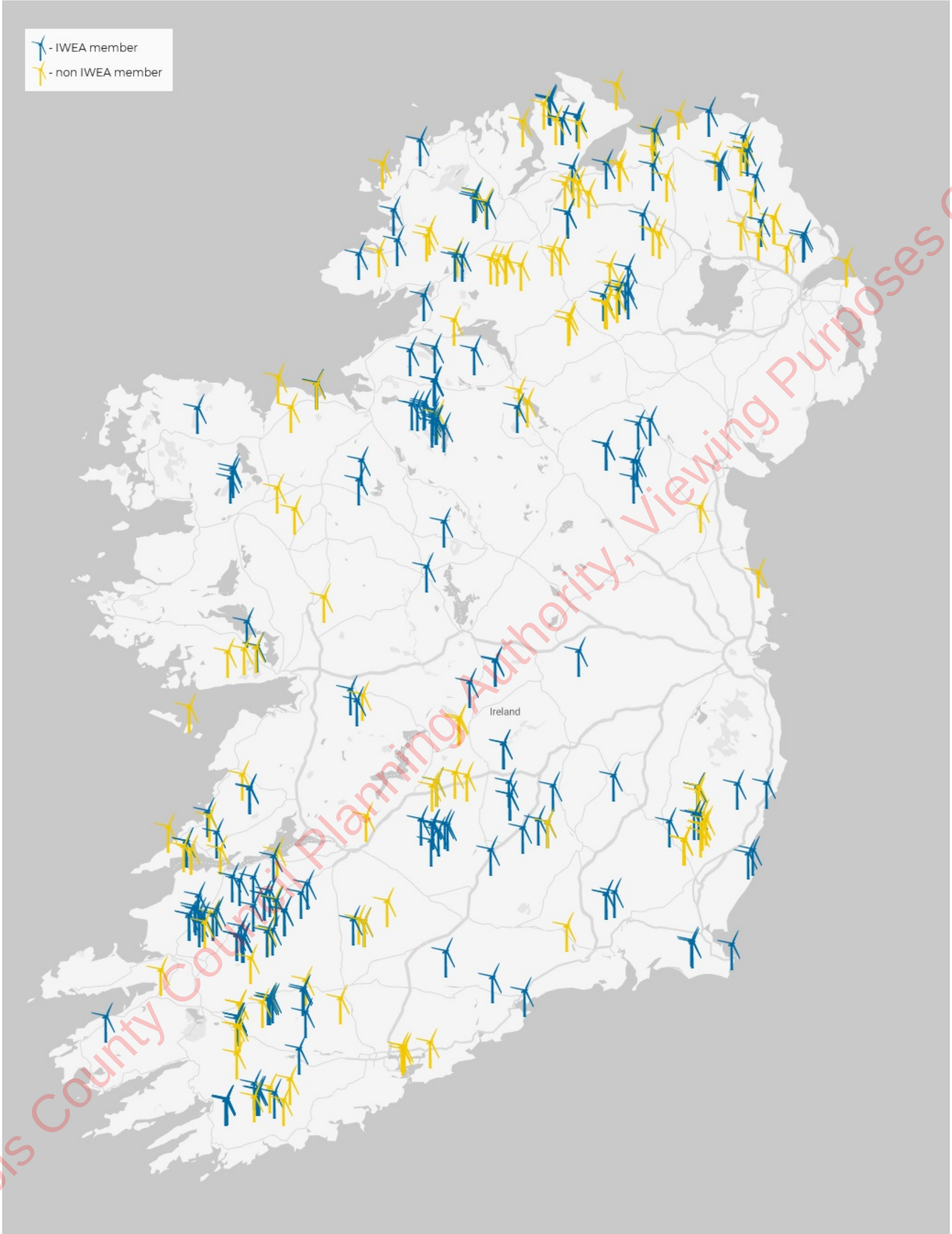
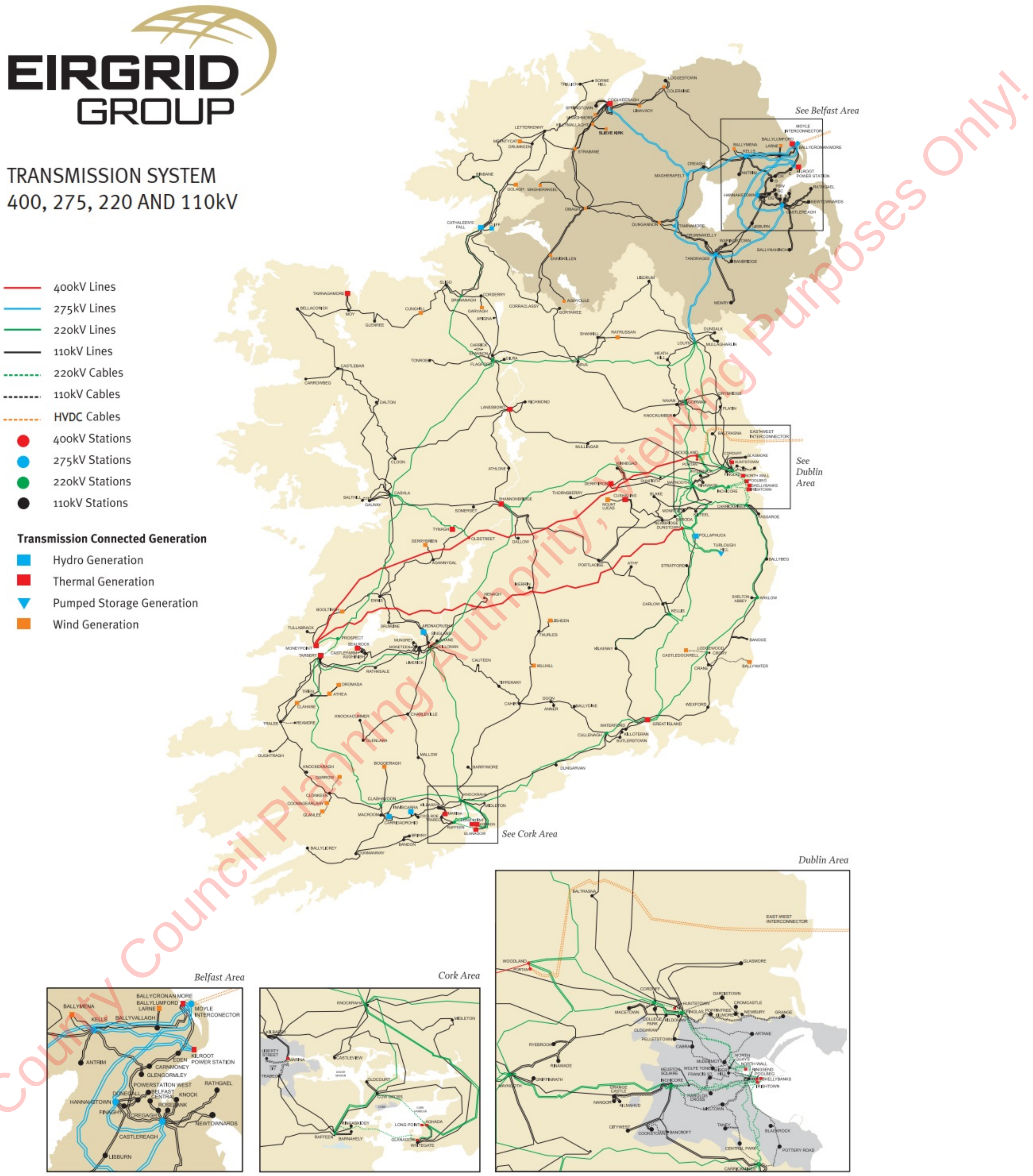


Figure 2-1: Designated Sites (www.npws.ie)



Source: https://www.iwea.com/about-wind/interactve-map
Date: 30/10/2019

Figure 2-2 Existing Wind Energy Development in Ireland



Source: Annual Renewable Energy Constraint and Curtailment Report 2015 (Eirgrid & Soni 2016)

Figure 2-3: National Transmission System

Relevant policy was considered at a national and regional level in order to determine appropriate locations for wind energy development throughout the country. At a national level Project Ireland 2040: The National Planning Framework[xxv] (NPF) is the foremost forward planning document within the Republic of Ireland and guides development accordingly.

The NPF sets out the key goals and objectives for the State, and central to this framework is the theme of Realising Our Sustainable Future. In particular, Section 9.2: Resource Efficiency and Transition to a Low Carbon Economy notes that:

> ***"Our transition to a low carbon energy future requires:***
> - *A shift from predominantly fossil fuels to predominantly renewable energy sources;*
> - *Increasing efficiency and upgrades to appliances, buildings and systems;*
> - *Decisions around development and deployment of new technologies relating to areas such as wind, smart grids, electric vehicles, buildings, ocean energy and bio energy; and*
> - *Legal and regulatory frameworks to meet demands and challenges in transitioning to a low carbon economy."*

With respect to the locating of renewable energy projects, the NPF states that:

> *"Rural areas have significantly contributed to the energy needs of the country and will continue to do so, having a strong role to play in securing a sustainable renewable energy supply."*
>
> *"In meeting the challenge of transitioning to a low carbon economy, the location of future national renewable energy generation will, for the most part, need to be accommodated on large tracts of land that are located in a rural setting, while also continuing to protect the integrity of the environment and respecting the needs of people who live in rural areas."*

Key future planning and development and place-making policy priorities for the Eastern and Midlands Region as set out in the NPF include:

> *"Harnessing the potential of the region in renewable energy terms across the technological spectrum from wind and solar to biomass and wave energy, focusing in particular on the extensive tracts of publicly owned peat extraction areas in order to enable a managed transition of the local economies of such areas in gaining the economic benefits of greener energy."*

Furthermore, the Eastern and Midland Spatial & Economic Strategy[xxvi] (2019) encourages the development of renewable energy projects within the region stating:

> *"To meet our energy targets, we need to better leverage natural resources to increase our share of renewable energy. There is an established tradition of energy production in the Midland counties by state agencies, however national environmental policies are dictating the wind down of traditional fossil fuel powered stations, such as peat fired power plants in these counties."*

In summary, the site selection process at macro level broadly considered the locating of renewable energy projects throughout the country. Environmental designations, the locations of existing wind energy development, electricity infrastructure capacity and broad policy context were considered. The process led to a focused search for areas considered to have capacity for wind energy projects and a search for appropriate and available lands within these areas. A micro level search was then conducted to locate suitable alternative sites.

2.3.4 Site Selection – Micro Level

The micro level search criteria reflects the broad range of issues which can arise in wind farm development and allows for direct comparison across the study area to determine the relative suitability of potential wind energy development sites.

A range of sites for wind energy development were considered by the applicant. Each site was subject to consideration on a series of criteria in order to determine their wind energy feasibility. The micro level search process is described below.

The micro level search criteria included the following:

- County Development Plan Policies and Designations;
- Natura 2000 sites;
- Population Density;
- Access to major transport routes;
- Proximity to the National Electricity Grid;
- Wind Speeds;
- Land availability.

Environmental Considerations at this stage included:

- Avoidance of environmental sensitivities;
- Access to environmental capacity; and
- Level of environmental capacity.

2.3.4.1 County Development Plan Policies and Designations

The assessment of site alternatives was undertaken in the context of The Environmental Protection Agency document 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (Draft, EPA, 2017). These Guidelines state that it is important to acknowledge the existence of difficulties and limitations when considering alternatives.

The Draft Guidelines state:

> "Alternatives may be identified at many levels and stages during the evolution of a project, from project concepts and site locations, through site layouts, technologies or operational plans and on to mitigation and monitoring measures. The alternatives that are typically available for consideration at the earlier stages in the evolution of a project generally represent the greatest potential for avoidance of adverse effects."

Section 3.4 of the Draft Guidelines is concerned with the Consideration of Alternatives, which states that:

> "**Higher level alternatives may already have been addressed during the strategic environmental assessment of strategies or plans**. Assessment at that level is likely to have taken account of environmental considerations associated, for example, with the cumulative impact of the area zoned for industry on a sensitive landscape. Note also that plan-level/higher-level assessments may have set out project level objectives or other mitigation that the project and its EIAR should be cognisant of. Thus, these prior assessments of strategic alternatives may be taken into account and referred to in the EIAR."

Development Plans and Regional Plans provide a strategic framework and policy context for all planning decisions. The Planning and Development Act 2000 (as amended) reinforces the role of the Development Plan as the primary strategic statement on land-use planning at city, town and county levels, and provides a clear defined context for the formulation and content of planning applications.

Key policies of the Laois County Development Plan 2017-2023[xxvii] were identified including the following:

- Wind Energy Development Zoning;
- Landscape Character Assessments;
- Sensitive Landscape Designations; and
- Cultural Heritage Sites.

As set out in section 3.5.3 of this EIAR, the County Development Plan supports the development of renewable energy projects in appropriate areas. In light of amendments to the County Development Plan issued in a Direction by the Minister of State, the subject site is located within an area open to consideration for wind energy development. The policy states the following:

> *"Wind energy applications in these areas will be evaluated on a case by case basis subject to viable wind speeds, environmental resources and constraints and cumulative impacts"*

The subject site is located in a 'Lowland Agricultural Area' as identified in the Landscape Character Assessment for the County and is described as generally flat and open landscape with long range views towards upland areas. The subject site is located adjacent to a peatland area and in proximity to 2 no. river corridors. There are no further landscape or scenic designations associated with the site.

A study of cultural heritage designations identified no major constraints with respect to architectural heritage and protected monuments. The subject site has no archaeological sites included on the Record of Monuments and Places. 4 no. sites are located in proximity including 3 no. enclosures and a metal work site. It is unlikely that these designations will be impacted by a wind energy development. With respect to County Development Plan designations, the subject site was considered feasible for wind energy development.

2.3.4.2 Natura 2000 Sites

It is preferable that wind energy development is not located in an area designated as a Special Area of Conservation (SAC), Special Protected Area (SPA) or Natural Heritage Area (NHA). The subject site is not located within an environmentally designated area however, it is located in proximity to and is hydrologically connected with the River Barrow and River Nore SAC. With respect to the conservation objectives for this Natura 2000 site, it was considered that a wind energy project could be developed at the subject site without causing negative impacts to the designated site.

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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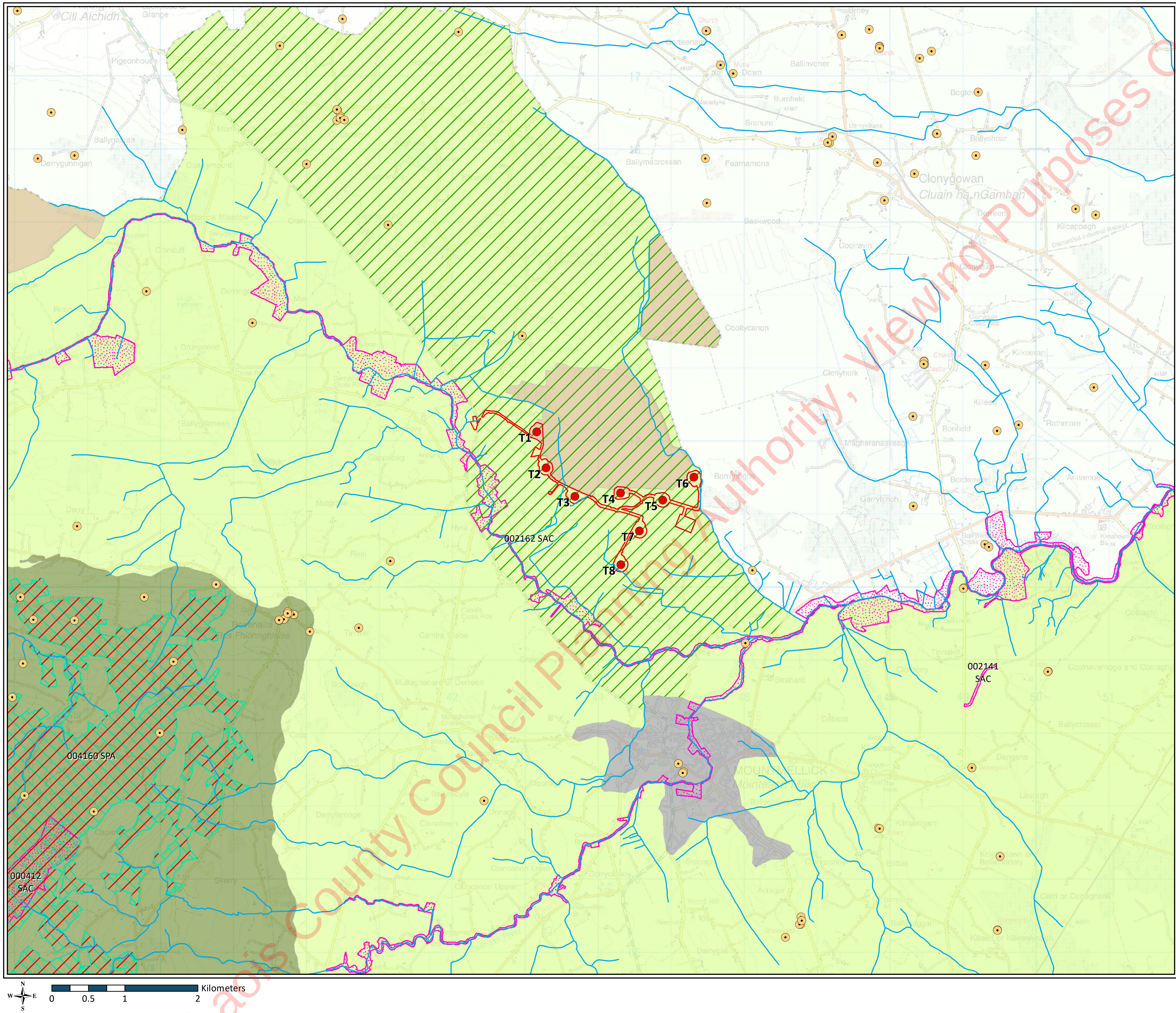

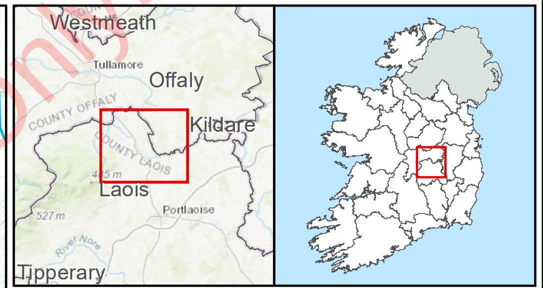

Record of Monuments and Places (RMP)
Proposed Turbines
Rivers
Proposed Planning Boundary
Special Protection Area (SPA)
Special Area of Conservation (SAC)

Wind Policy Areas

Areas Open for Consideration
Areas not for Consideration

Landscape Policy Areas

Lowland Agricultural Areas
Mountain Areas
Peatland Areas
Urban Fringe Areas

TITLE:	CDP Designations and Location of Natura 2000 Sites
PROJECT:	Dernacart Wind Farm
FIGURE NO:	2.4
CLIENT:	Statkraft
SCALE: 1:50000	**REVISION:** 0
DATE: 29/01/2020	**PAGE SIZE:** A3

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2.3.4.3 Population Density

Areas with low housing density are preferable for wind energy development so as to minimise potential residential amenity disturbance, which may be caused by construction activities, visual impacts, shadow flicker and noise. As discussed in Section 6.3 of this EIAR, the population in the area of the subject site was found to be far below the state average and below the Laois County average, as detailed in Table 2.1 below. Population density of the site and locality is illustrated in Figure 2.5.

Table 2-1: Population Density

Area	Population Density (Persons per square kilometre) 2016
State	70
Laois County	49
Study area	14.3

2.3.4.4 Other Considerations

Wind speed was assessed at the site in order to determine if wind energy development would be feasible. Available wind speed is a key factor in determining the economic viability of potential wind energy locations. The 2013 SEAI Wind Speed Atlas identifies the site as having a wind speed of between 7.25 – 7.5 m/s to 7.5 - 7.75 m/s at 75m above ground level. In order to achieve greater wind speed at the site, alternative designs of the project were considered and are further detailed in this chapter. Figure 2.6 illustrates on-site wind speeds.

The site is in proximity to the N80 national primary route which connects to the M7 motorway to the south of the site at Portlaoise and to the M6 to the north. Local roads leading from these primary routes to the site are of good quality and capacity and will require little upgrade to facilitate construction traffic and turbine deliveries. The site was also assessed with respect to capacity for access to the national electricity grid. The EirGrid future proposed Bracklone substation was identified as a potential connection location, approximately 10km east of the proposed development. Alternative routes to this substation were considered further at the design stage.

The broad criteria required for viable wind energy development, as detailed above, were applied to a number of candidate sites throughout the country. This resulted in a short list of viable alternatives. Due to the subject site's high score on viability, combined with a lack of environmental sensitivities at a macro and micro level, and availability of appropriate land, the developer chose the site at Dernacart to advance a proposal for a wind energy development.

Path: R:\Map Production\2018\P1892\Workspace\EIAR\Chapter 2 - Need and Alternatives\P1892_Fig2-5_PopulationDensityOfEDWithinTheStudyArea_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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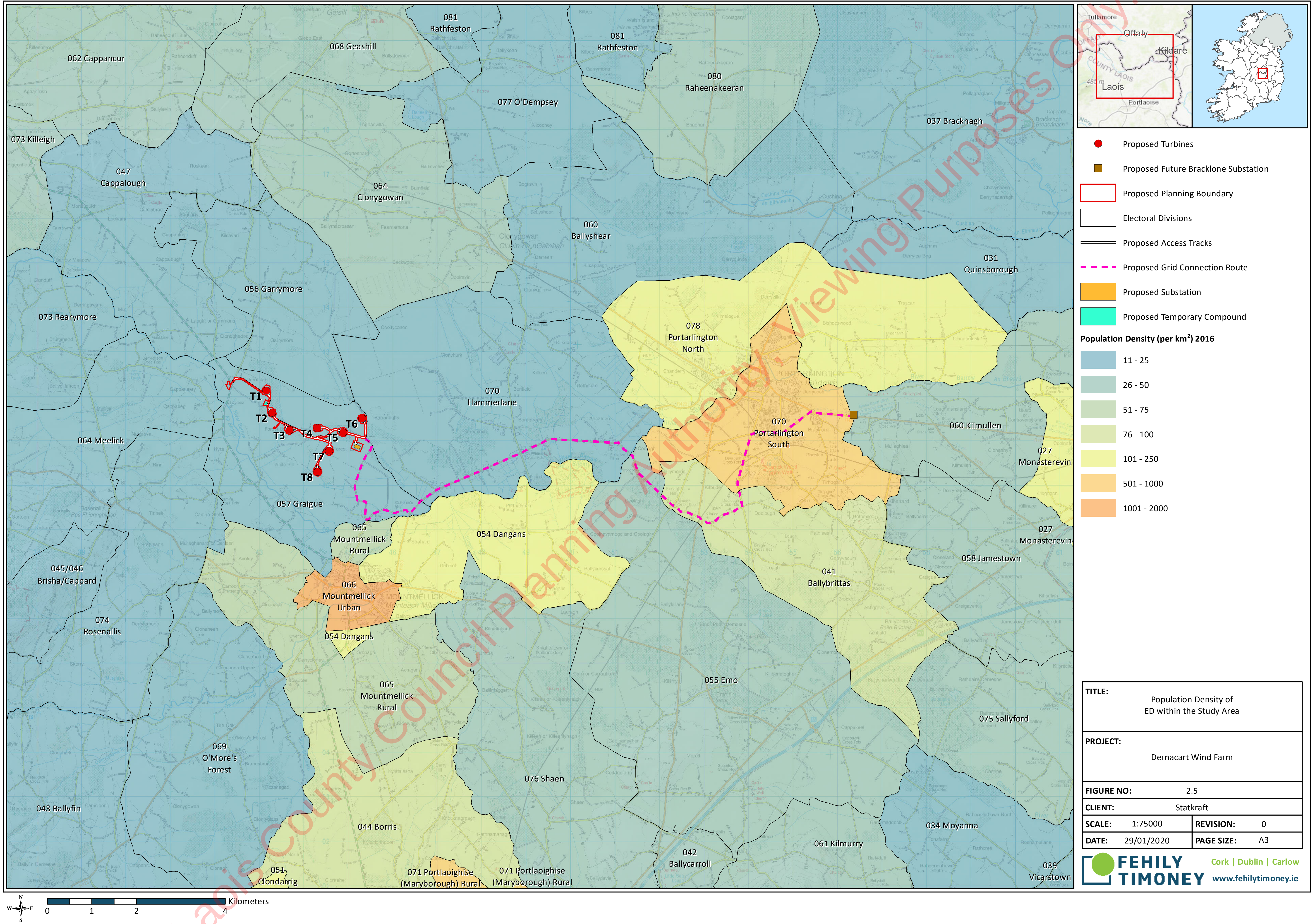

TITLE:	Population Density of ED within the Study Area
PROJECT:	Dernacart Wind Farm
FIGURE NO:	2.5
CLIENT:	Statkraft
SCALE:	1:75000
REVISION:	0
DATE:	29/01/2020
PAGE SIZE:	A3

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2.3.5 Layout, Design, Alternatives and Constraints

2.3.5.1 Project Layout Alternatives

Alternative project layouts were developed in order to avoid environmental sensitivities, minimise potential environmental impacts both on and off site and to maximise the wind potential on site. The design has been carried out in accordance with industry guidelines and best practice, namely the Department of Environment, Heritage and Local Government (DoEHLG) Wind Energy Development Guidelines (2006), the Review of the Wind Energy Development Guidelines (2017) 'Preferred Draft Approach' and the Irish Wind Energy Association Best Practice Guidelines (2012). The site layout and design were developed through an iterative process which took account of such criteria as:

- Setback from houses;
- Setback from village and town cores;
- Setback from designated sites;
- Setback from other constraints such as watercourses and power lines;
- Suitable wind speeds;
- Landscape and visual sensitivity;
- Ecology;
- Ornithology;
- Soils and Geology;
- Hydrology;
- Noise; and
- Cultural Heritage.

Constraints and environmental sensitivities were first identified, and buffers applied in order to determine appropriate areas within the site to accommodate development. The environmental sensitivities of the site included an analysis of the criteria listed above. The constraints identified and resulting design solutions are listed in table 2.2.

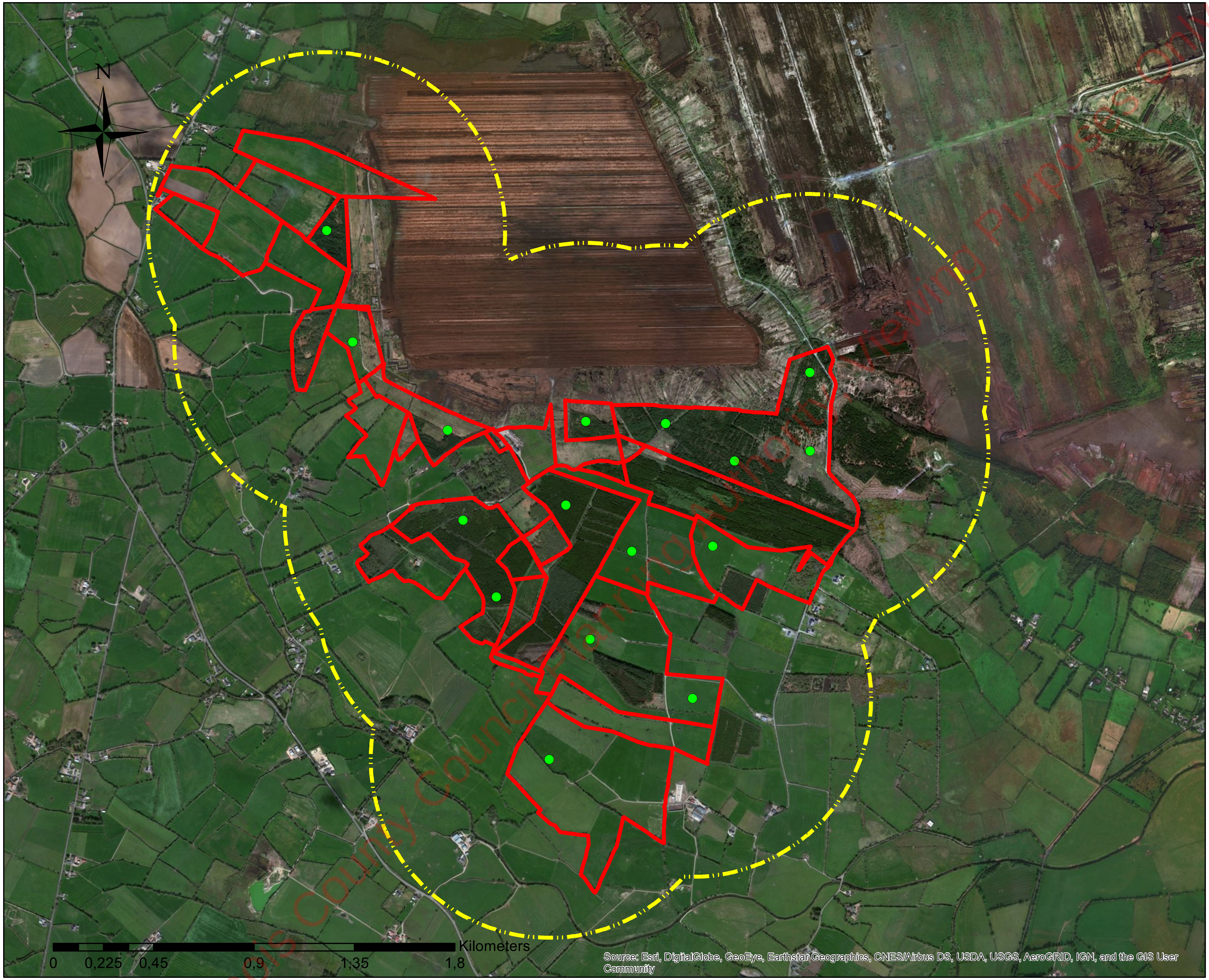
Table 2-2: Environmental Considerations

Environmental Consideration	Required Setback/Constraint
Residential Amenity	A minimum 500m setback from all inhabited dwellings was originally sought, in line with the Wind Energy Development Guidelines, but was subsequently increased to a minimum of 740m as a result of public consultation where local residents requested a greater setback distance from turbines.
Flora and Fauna	Avoidance of designated sites and mitigation designed to avoid potential impacts on species and habitats.
Ornithology	Avoidance of designated sites and migratory routes.
Soils and Geology	Avoid where possible areas of deep peat.
Hydrology	Minimum 50m setback of infrastructure from rivers and streams.
Water Quality	Minimum 50m setback from significant rivers and streams and appropriate mitigation designed to avoid siltation during construction.
Noise & Vibration	The Wind Energy Development Guidelines (Section 5.6) state in general, noise is unlikely to be a significant problem where the distance from the nearest turbine to any noise sensitive property is more than 500 metres. A 740m minimum setback from nearby dwellings has been achieved. Furthermore, the following noise limits will be applied in line with the preferred draft approach to the Wind Energy Development Guidelines: a relative rated noise limit of 5dB(A) above existing background noise within

Environmental Consideration	Required Setback/Constraint
	the range of 35 to 43dB(A) for both day and night, with 43dB(A) being the maximum noise limit permitted.
Shadow Flicker	Zero shadow flicker on residential receptors has been committed to following requests from the public during consultation.
Cultural Heritage	Avoid direct impact on designated sites of cultural heritage and archaeologically significant sites.
Material Assets	Offsets to wayleaves were not required as no wayleaves fall within the boundary of the site. Commercial forestry impacted by the proposed development will be replanted at an alternative site.

2.3.5.2 Alternative Designs and Scales

Over 10no. alternative design options were considered during the project design stage. Initially, a layout of the maximum number of turbines was considered. This consisted of 16no. turbines at the subject site – refer to Figure 2.7.



Legend

- Proposed 16 Turbine Layout
- 800m Buffer
- Lands

TITLE OF FIGURE:

Baybridge 16 Turbine Layout

Figure 1 Rev A

DATE: 31/05/2019

SCALE: 1:16 000 @ A3

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Turbines were initially set to be 169m high and would have a setback distance of 500m from houses as set out in the Wind Energy Development Guidelines (2006). The initial power output of this design iteration was expected to be 45MW or approximately 2.8MW output per turbine. This layout was established as a baseline design for public consultation and environmental assessment purposes.

Furthermore, as part of the design process a number of different turbine heights were considered. The relationship between the height and density or number of turbines required to achieve a particular output is a key design consideration. Several case studies and land surveys have highlighted that when given an option people tend to prefer a scenario of fewer larger turbines. One such study[xxviii] commissioned by Bord Fáilte (now Fáilte Ireland) in 2008 found that:

> *"In terms of the size and composition of wind farms, tourists tended to prefer farms containing fewer turbines. If both produced the same amount of electricity, tourists also preferred wind farms containing a small group of large turbines (55%) to a large group of smaller turbines (18%)."*

There is a balance to be struck between the visual and spatial dominance of turbines and the clutter and the frequency of turbines within a view as both of these effects contribute towards the magnitude of visual impact. This is illustrated in Figure 2.8, which compares a similar energy yield across three turbine heights within the same view. This is intended only as an illustrative diagram to show the balancing relationship between turbine height and density.

On the basis of these factors and through design stage analysis, it is considered that the slightly increased sense of visual dominance imparted is preferable to the reduced level of permeability and increased visual clutter associated with a greater number of shorter turbines required to achieve the same output. In this regard, alternative turbine outputs were considered correlating to alternative turbine heights.

In deciding to propose fewer taller turbines, a turbine model with an output of approximately 5MW was chosen as the likely option with an alternative tip height of up to 185m, increasing the proposed tip height by 16m, and reducing the overall number of turbines from 16 to 8. The increased height and diameter are expected to reach greater wind speeds and have an increased wind capture and therefore produce more energy. The expected output of these taller turbines would produce similar levels of energy production to the original layout, while greatly reducing the number of turbines. In addition, it is expected that new and more efficient turbine designs will come onto the market prior to the construction of the wind farm that will fit the proposed turbine envelope of up to 185m tip. As a result of this chosen alternative, construction traffic would be greatly reduced resulting in less impact on local roads.

The public consultation process assisted in the consideration of alternative project design as local knowledge and stakeholders' concerns were incorporated along with further site investigation data and initial environmental impact assessment. Main concerns brought to light by this process included:

- Wind farm should be best in class
- Lower noise levels at neighbouring houses
- Increased setback from dwellings

In line with local concerns, the alternative design of fewer taller turbines with increased hub height and blade diameters was achieved and resulted in halving the original number of proposed turbines to 8. Through this alternative design, a minimum setback distance of 740m to dwellings was achieved.

Grid Connection

A number of alternative grid connection points were considered for the proposed development, however, the future proposed Bracklone Eirgrid substation at Portarlington, was determined by Eirgrid at consultation to be the optimum point with capacity for returning electricity to the national grid in the future and was therefore selected as the grid entry substation location.

Alternative routes to the proposed substation were considered. For the most part the proposed grid connection runs along the R423 regional route. The cable route then splits off the R423 to a local road in order to avoid potential impact on Portarlington Town Centre. Two alternative routes (Options A and B) to bypass the town were considered and are illustrated in figure 2.9.

Option A was chosen as the optimum option due to the road's capacity to accommodate an underground cable. The alternative design/route labelled 'Option B' was considered. When assessed, the route was found to be a greater length than Option A, and road conditions were found to be of lower quality. The assessment concluded that Option A would cause less environmental impact as a result of the installation of an underground cable and it was therefore chosen as the proposed route.

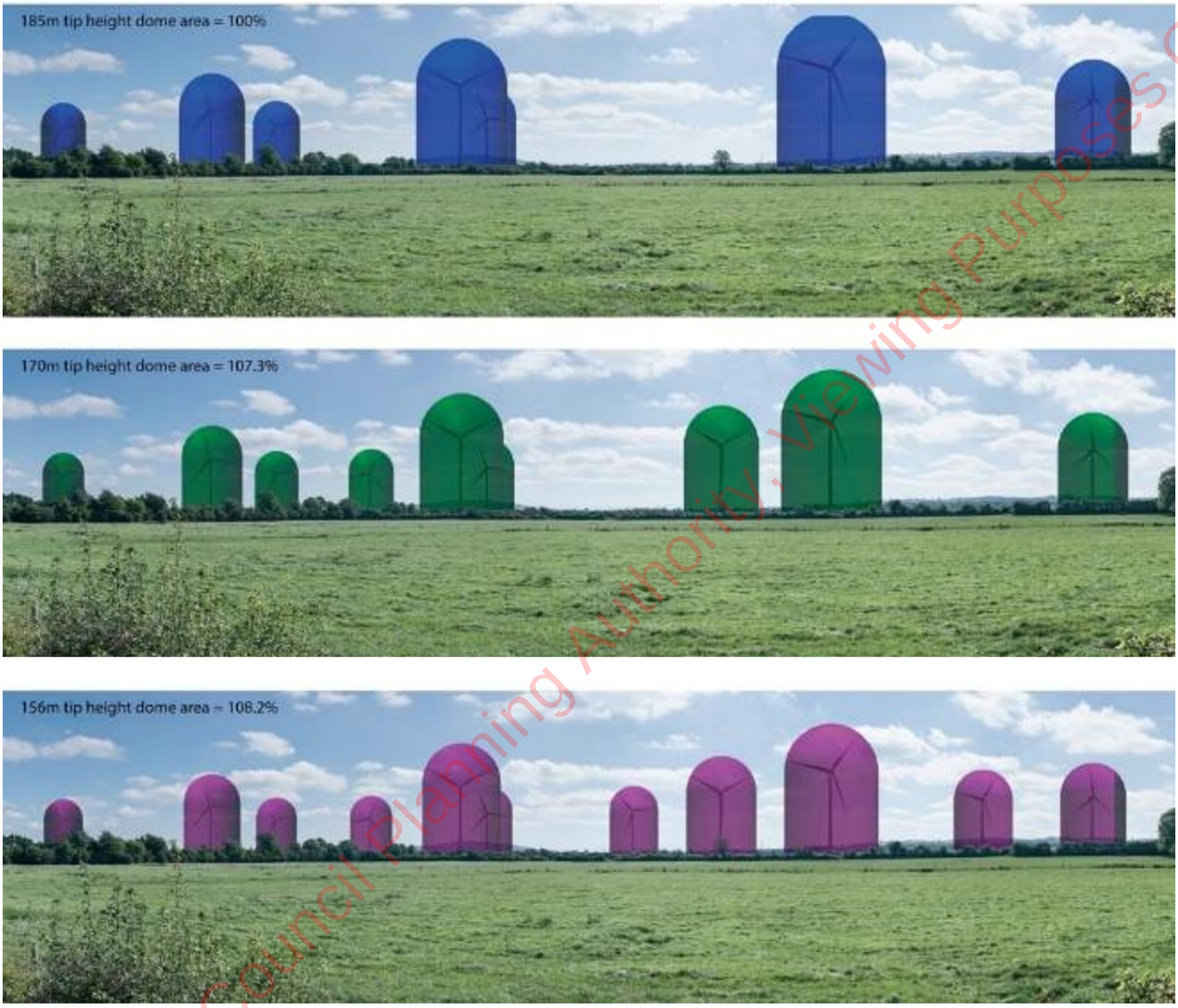
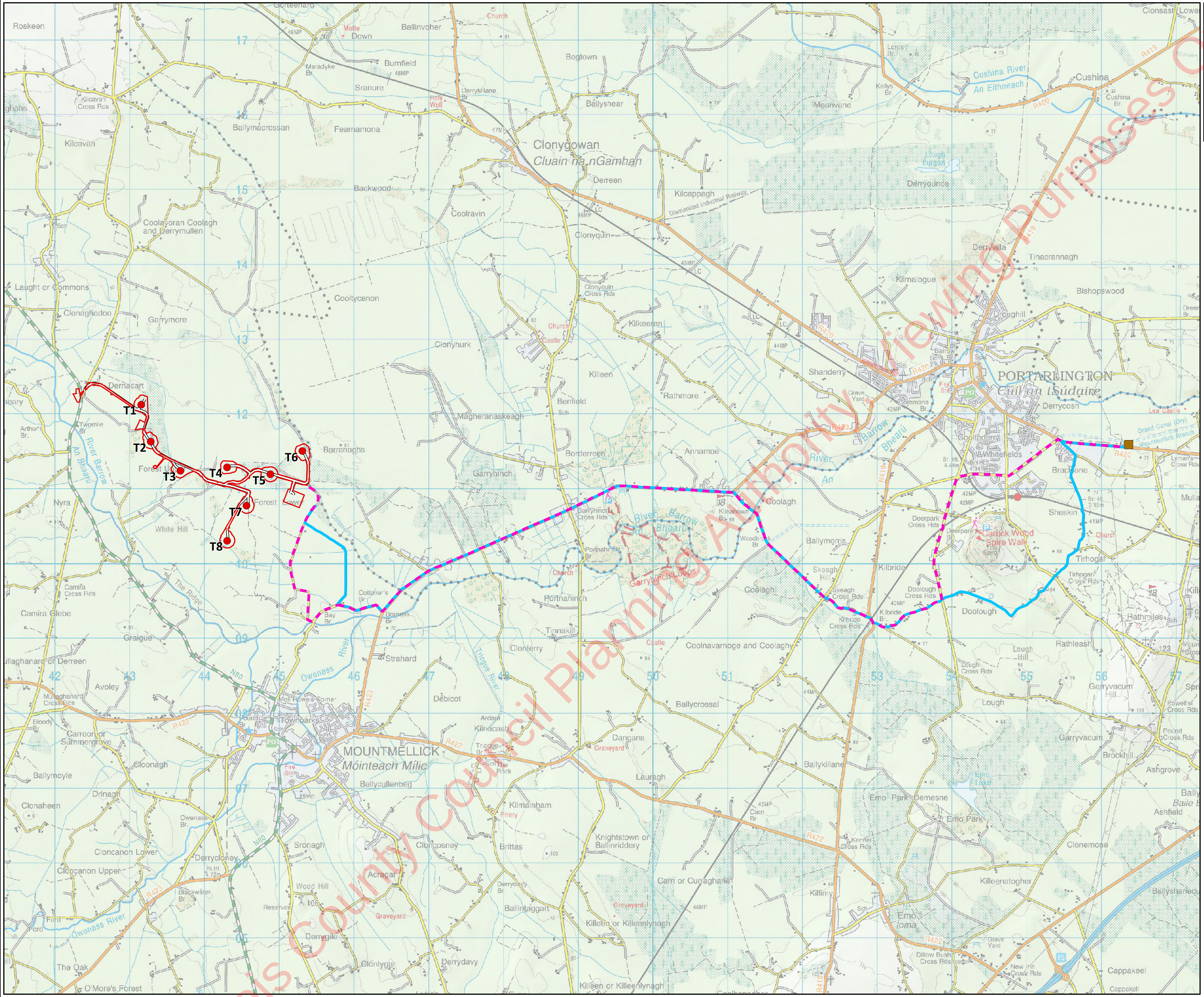
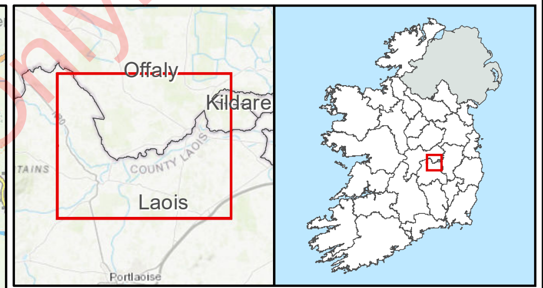


Figure 2-8: Turbine height versus density relationship (same power output within survey)





Proposed Turbines
Proposed Future Bracklone Substation
Proposed Planning Boundary
Proposed Grid Connection Route
Alternative Grid Connection Route
Proposed Access Tracks

Kilometers
0 1 2 4

TITLE: Alternative Grid Connection Routes Considered	
PROJECT: Dernacart Wind Farm	
FIGURE NO: 2.9	
CLIENT: Statkraft	
SCALE: 1:50000	REVISION: 0
DATE: 29/01/2020	PAGE SIZE: A3

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Conclusion of Alternatives Considered

As discussed above the siting and design of the proposed wind farm development have evolved through the consideration of alternatives and allowing for stakeholder input into the process.. This included initial consideration of the need for renewable energy, the consideration of different processes to produce renewable energy, the site selection process at macro and micro level, and alternative layouts, scales and design processes.

Reasonable alternatives were considered with specific regard to the characteristics of the project. Comparisons of environmental effects were noted where relevant. The alternatives chosen focused on mitigation by design in order to avoid potential impacts on the environment. Table 2.3 summarises the alternatives considered throughout the project development process.

Table 2-3: Extract from the Draft Guidelines on Information to be Contained in EIARs 2017, EPA (Figure 3.4 - Consideration of Alternatives in an EIAR)

Topic	Environmental Consideration	Actions
Is this the Right Site or Route?	Environmental Considerations at this stage would include: • Avoidance of environmental sensitivities; • Access to environmental capacity; • Level of environmental capacity.	At a macro level, areas throughout the country were investigated for environmental capacity through the identification of designated or sensitive sites, existing wind energy projects, grid capacity and electricity infrastructure, and relevant national and regional policy. Following the establishment of appropriate candidate areas for onshore wind energy development, micro level criteria were examined. These aimed to identify a site with pro-wind county level policy, avoidance of Natura 2000 sites, low population density, access capacity, electricity infrastructure capacity and proximity, and viable wind speeds. Due to the subject site's viability with regard to the above criteria, in combination with land availability, the applicant chose the subject site at Dernacart to advance a proposal for a wind energy development.
Is this the Right Site Layout?	Environmental Considerations at this stage would include: • Proximity to site sensitivities; • Potential to affect offsite environmental assets.	Industry guidelines and best practice were employed to produce an appropriate layout to maximise wind potential on the site. Following this, a range of constraints and criteria were considered, and alternatives examined to produce an appropriate layout for the Dernacart Wind Farm. This was an iterative process, producing many alternative layouts as constraints were discovered throughout the project development process. This process involved site investigation, environmental impact assessment and public consultation.
Is this the Right Project Design?	Environmental Considerations at this stage would include: • Likely effects during construction; • Likely effects onsite features; • Likely effects on neighbours.	The project design was an iterative process which produced a range of alternative designs. Initially the maximum number of turbines were considered and then refined following constraints analysis and input from public consultation. The size and height of turbines were considered throughout the design process. The applicant chose to propose fewer large-scale turbines as an alternative to a greater number of small-scale turbines as an approach to produce greater visual permeability and reducing clutter.

Topic	Environmental Consideration	Actions
		This resulted in achieving a minimum setback of 740m from dwellings, reducing noise and visual impact on local residents. The applicant also committed to zero shadow flicker as part of the design alternatives, to mitigate against potential disturbance. Alternative grid connection routes were considered and a less visually intrusive option was considered for the proposal.
Is this the Right Process Design?	Environmental Considerations at this stage would include: • Likely emissions to air and water • Likely generations of waste; • Likely effects on traffic.	The process design was influenced by the need for producing electricity in Ireland and by the need for renewable energy sources as alternatives to fossil fuels. Alternative renewable technologies were compared at the outset of the project, and the technical and economic feasibility of a number of technologies were considered. It was concluded that in this case, onshore wind is the most viable and economical alternative, providing renewable energy in accordance with national policy objectives, and contributing to an overall positive impact on the environment. Mitigation measures as set out throughout this EIAR are the result of choosing the alternative layouts, designs and processes which would have the least likely impact on the environment, assuring that development goes ahead in a sustainable manner. As an environmental comparison, a 'Do-Nothing' scenario was considered which would result in continued energy security vulnerability, a lack of off-set of CO_2 emissions and a lack of socio-economic benefits to the local area.

2.4 Conclusion

This chapter of the EIAR has described the need for the development and the reasonable alternatives considered throughout the development process for the proposed Dernacart Wind Farm. The need for the development is established in Section 2.2 and is centred on providing renewable electricity to the Irish national grid, in line with European and national policy objectives, the need to meet current and future EU Renewable Energy targets, including the latest targets set out in the national Climate Action Plan (2019), and the need to circumvent climate change.

The reasonable alternatives considered throughout the development of the Dernacart Wind Farm project are detailed in Section 2.3. The site selection process is detailed at a macro and micro level, describing how the subject site was selected over less viable alternatives. The evolution of the layout, design and scale of the project is detailed with respect to site investigation, public consultation and constraints analysis. The establishment of design iterations is detailed and reasons for decisions are set out for the final 8 no. turbine layout as proposed.

Alternative processes were considered including alternative renewable energy technologies and a 'Do-Nothing' scenario as a baseline comparison to potential environmental impacts as set out throughout this EIAR.

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