White Hill Wind Farm

Environmental Impact Assessment Report

Annex 1.1: Environmental Impact Assessment Scoping Report

White Hill Wind Limited

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DOCUMENT CONTROL

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1.0 Introduction

White Hill Wind Limited intends to apply for planning permission to construct and operate a wind energy development, to be known as the White Hill Wind Farm, located in west County Carlow and east County Kilkenny; c. 13km southwest of Carlow, c. 14km northeast of Kilkenny City and c. 4km west of Oldleighlin. The location of the proposed wind farm is illustrated at **Figure 1** below.

The currently proposed development[1] generally consists of a wind farm and ancillary infrastructure including 7 no. wind turbines; associated foundations and crane hardstandings; access tracks and site entrances; underground electricity lines; an on-site electrical substation and energy storage facility; 2 no. borrow pits; 3 no. spoil deposition areas; upgrade works to the turbine component haul route; and a c. 15km underground electricity line connection to the Kilkenny 110kV electricity substation, in the townland of Scart, outside Kilkenny City.

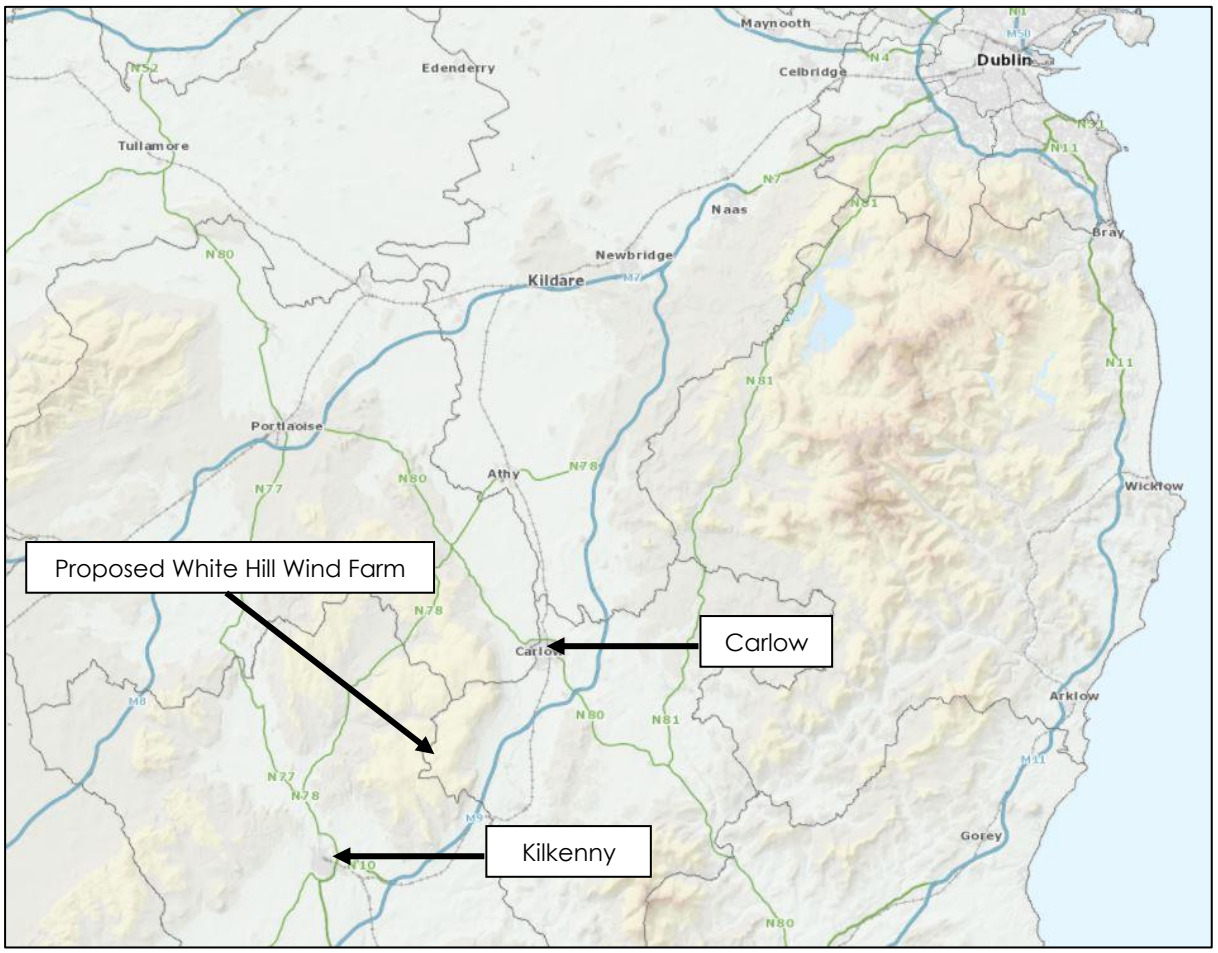


Figure 1: Site Location

1.1 White Hill Wind Limited

White Hill Wind Limited (WHWL) is a renewable energy development company with substantial experience in the renewable industry; the company principals owning and operating a number of permitted and operational wind farms both within Ireland and internationally.

[1] As the proposed development is subject to continuous review and re-design, specific details of the proposed development should only be obtained from the planning application documentation.

1.1.1 The Agent

Galetech Energy Services (GES) has been commissioned by WHWL to coordinate the preparation of an Environmental Impact Assessment Report (EIAR) including the scoping process. GES is an Irish multi-disciplinary renewable energy consultancy that specialises in the project management of planning, environmental and technical engineering services of wind energy developments from project feasibility through to delivery and operation. GES combines the expertise of leading experts in wind farm design, planning and environmental assessment and has extensive experience in managing and coordinating EIAR projects for wind energy and associated electricity grid and substation developments.

1.2 Purpose of this Report

The purpose of the Environmental Impact Assessment (EIA) scoping process is to identify key environmental elements which are likely to be important during the EIA process and to eliminate those which are not from further assessment. The scoping process identifies sources or causes of potential environmental effects, the pathways by which the effects can happen, and the sensitive receptors which are likely to be affected. It defines the appropriate level of detail for the information to be provided in the Environmental Impact Assessment Report (EIAR). In essence, the primary focus of scoping is to define the most appropriate assessment of likely significant effects related to the proposed development.

The aims of this document are to:-

- set out the overall approach to the preparation of the EIAR;
- describe the proposed content and structure of the EIAR;
- summarise key baseline information;
- describe the proposed assessment methodology;
- identify potential effects at all stages of the proposed development; and
- identify topics/factors which do not require further assessment and can be scoped out.

2.0 Environmental Impact Assessment

2.1 What is EIA?

EIA is a process required by the European Union (EU) Environmental Impact Assessment Directive 2011/92/EU, as amended by 2014/52/EU, and transposed into Irish law by way of Part X of the Planning & Development Act 2000 (as amended).

EIA is carried out by the relevant competent authority to ensure that projects, where the likelihood of significant effects on the environment cannot be excluded, are subject to a comprehensive and independent examination, analysis and evaluation of their likely significant effects on the environment; including the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects; of both their construction and operational phases, prior to being granted planning permission.

2.2 EIA Screening

In accordance with the provisions of the Planning & Development Act 2000 (as amended), EIA is mandatory when certain classes of projects exceed specific sizes and thresholds. Planning applications for such projects must be accompanied by an EIAR. Schedule 5 of the Planning and Development Regulations 2001 (as amended) provides that the following class of development proposal shall be subject to EIA:-

"Installations for the harnessing of wind power for energy production (wind farms) with more than 5 turbines or having a total output greater than 5 megawatts"

The proposed development consists of 7 no. wind turbines, and ancillary infrastructure, and is therefore of a scale which exceeds the mandatory threshold for EIA and, consequently, an EIAR will be prepared and submitted with the planning application.

2.3 What is an EIAR?

An EIAR is a written statement prepared by the developer (in this case, WHWL) of the likely significant effects, if any, which the proposed development, if carried out, will have on the environment. The EIAR consists of a systematic analysis of the proposed development, including its construction, operational and decommissioning phases, in relation to the existing environment. It is an iterative process carried out throughout the full lifecycle of the project design and consenting process so as to allow for preventative and ameliorative action, as necessary, at a point in time when changes can still be made to the project that anticipate, avoid and mitigate any likely significant effects foreseen.

The EIAR is the principal document that informs the EIA process and provides integral information which a consenting authority can use; amongst other considerations, including, where appropriate, its own supplementary assessments; in independently undertaking EIA and informing its decision to grant (including subject to conditions and/or modifications) or to refuse planning permission, and/or to seek further information from WHWL.

The EIAR can also be used by third parties, including members of the public concerned, as part of the public participation process, to evaluate the proposed development and its likely significant environmental effects, and to inform any submissions made to the planning application process.

The EIAR will be prepared in accordance with the provisions contained within Schedule 6 of the Planning and Development Regulations 2001, as amended, which sets out the information to be contained in an EIAR. In addition, the EIAR will take account of the contents of Directive 2014/52/EU (the 2014 EIA Directive), which was adopted in the EU on 16th April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. The 2014 EIA Directive was transposed into Irish planning law from the 1 September 2018 via the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

2.4 Purpose of the EIAR

The purpose of the EIAR is to inform decision making processes. The EIAR provides for a system of sharing information about the environment, within which a proposed development sits, and enables effects to be foreseen and prevented during the design and consent stages. The purpose of the EIAR is to:-

- Anticipate, avoid and reduce significant effects;
- Assess and mitigate effects;
- Maintain objectivity;
- Ensure clarity and quality;
- Provide relevant information to decision makers; and
- Facilitate better consultation.

It is a statutory requirement that the EIAR pays particular regard to the:-

- Key alternatives;
- Proposed project;
- Receiving environment;
- Likely significant effects;
- Mitigation and monitoring measures; and
- Residual effects.

A non-technical summary must also be provided.

2.5 EIAR Methodology

The EPA has published a set of revised '*Guidelines on the Information to be contained within an EIAR*' and these guidelines have been updated to reflect the 2014 EIA Directive and the provisions contained therein. The guidelines have been published in draft form (August 2017) and provide an update on the previous guidelines which were initially published in 2002. The guidelines are a statutory document and provide guidance on the role of the EIAR in the EIA process, the key activities involved in the EIAR process, and guidance on the presentation of the information contained in the EIAR.

The EIAR team will have regard to these guidelines in the preparation of the EIAR documents; additionally the team will also have regard to best practice guidance for each individual environmental topic covered by the EIAR.

The EPA guidelines include a 7 no. stage approach (sequence) in the production of the EIAR. This includes:-

- Screening;
- Scoping;
- Consideration of Alternatives;
- Project Description;
- Baseline Description;
- Assessment of Likely Significant Impacts; and
- Mitigation/Monitoring.

The guidelines outline that adherence to this sequence ensures an objective and systematic approach is achieved. Using this sequence, the environment is described using a number of specific headings and this provides for a separate section for each topic. The description of the existing environment, the likely significant effects (positive, negative, & cumulative), mitigation and monitoring measures, and residual impacts are then grouped together in each section, covering each topic. This format allows for ease of investigation into each topic and for specialist studies/input to be integrated seamlessly.

2.6 Content and Structure of the EIAR

In order to be relevant, complete and legally compliant, the content of this EIAR includes all of the information required by the EIA Directive and national legislation, as appropriate and necessary to the specific characteristics of the proposed development, and includes:-

(a) A description of the project comprising information on the site, design, size and other relevant features of the project;
(b) A description of the likely significant effects of the project on the environment;

(c) A description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
(d) A description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;
(e) A non-technical summary of the information referred to in points (a) to (d); and
(f) Any additional information specified in Annex IV of the EIA Directive relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

In order to provide for a consistent approach and to communicate clear, concise, unambiguous information, each chapter of the EIAR will be systematically organised so as to follow a similar basic structure, as follows:-

- The existing environment: A description of the context, character, significance and sensitivity of the receiving (baseline) environment using standard descriptive methods, in order to predict the likely significant effects of the proposed development;
- The likely significant effects of the proposed development: The aspects of the construction, existence and operation of the proposed development that are likely to affect the existing environment including, as appropriate, predicted, potential, residual, 'do nothing' and 'worst case' effects. The likely significance of any effects is determined with reference to magnitude, intensity, integrity, duration and probability; and
- The measures to mitigate and monitor adverse effects: The range of methods which are proposed for mitigation by avoidance, reduction and remedy of any likely significant effects (including unplanned events) together with ongoing monitoring of the efficacy of mitigation measures.

This structure, which clearly separates data (descriptions of the receiving environment and of the project) from impact predictions (likely significant effects and mitigation measures), is designed to ensure that replicable impact assessments, based on rigorous scientific information and verifiable evidence, is carried out using recognised methods that are presented and documented in a fully legible, transparent and objective manner.

This methodological structure is designed to reduce any possible subjective information and bias in order to facilitate An Bord Pleanála in their independent EIA of the proposed development.

2.7 Format of the EIAR

The format of the EIAR is set out below:-

- Introduction;
- Assessment of Project Alternatives;
- Description of the Proposed Development;
- Population and Human Health;
- Biodiversity;
- Land & Soil;
- Water;
- Air Quality & Climate;
- Landscape;
- Cultural Heritage;

- Noise & Vibration;
- Shadow Flicker;
- Material Assets; and
- Interaction of the Foregoing.

Each chapter of the EIAR will be structured using the following general format:-

- Introduction;
- Methodology;
- Description of the Existing Environment;
- Description of Likely Significant Effects;
- Mitigation & Monitoring Measures;
- Residual Effects; and
- Summary.

2.7.1 Introduction

This section will introduce the environmental topic to be assessed and the elements to be examined within the assessment.

2.7.2 Methodology

Specific topic related methodologies will be outlined in this section. This will include the methodology used in describing the existing environment and undertaking the impact assessment. It is important that the methodology is documented so that the reader understands how the assessment was undertaken.

2.7.3 Description of the Existing Environment

An accurate description of the existing environment is necessary to predict the likely significant effects of a new development. Existing baseline data will be used as a valuable reference for the assessment of actual effects from a development once it is in operation. To describe the existing environment, desktop reviews of existing data sources will be undertaken for each specialist area relying on published reference reports and datasets to ensure the objectivity of the assessment. Desktop studies will also supplemented by specialised field walkovers or studies in order to verify the accuracy of the desktop study or to gather additional environmental information for incorporation into the EIAR.

The existing environment will be evaluated to highlight the character of the existing environment that is distinctive and what the significance of this is. The significance and sensitivity of a specific environment will be derived from legislation, national policies, local plans and policies, guidelines or professional judgements.

2.7.4 Description of the Likely Effects

In this section, assessments will be made as to how the receiving environment will interact with the proposed development. The full extent of the proposed development's effects prior to the implementation of proposed mitigation measures are introduced will be described. Effects from the construction, operation and decommissioning phases of the proposed development will be discussed; while interactions with other environmental topics and cumulative effects with other developments will also be assessed.

The evaluation of the significance of the effect will be undertaken. Where possible, pre-existing standardised criteria for the significance of effects will be used in accordance with the guidelines set out in the Environmental Protection Agency (EPA) *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (Draft; August 2017). Additional assessment criteria can include

Irish legislation, international standards, European Commission and EPA guidelines or good practice guidelines. Where appropriate criteria do not exist, the assessment methodology section will set out the criteria used to evaluate the significance.

2.7.5 Mitigation & Monitoring Measures

If significant effects are assessed as likely to arise, mitigation measures will be devised to minimise effects on the environment. Mitigation measures by avoidance, by reduction and by remedy may be implemented.

Proposals to undertake pre- or post-construction monitoring, or monitoring during construction activities, may also be proposed to obtain current information on the proposed development site to inform construction methods, to ensure that activities are been completed in accordance with best practice guidelines and/or to ensure the efficacy of the proposed mitigation measures. These measures, and a clear justification for their implementation, will be described in this section.

2.7.6 Residual Effects

This section will describe those environmental effects which will remain following the implementation of mitigation and monitoring measures. These effects will be described in detail and an assessment of their significance undertaken.

2.7.7 Summary

A summary of the assessment undertaken will be provided in this section along with an overall assessment of the significance of the likely effects.

2.8 Contributors to the EIAR

The EIA Directive requires that an EIAR must be prepared by a team of competent, qualified experts with an appropriate combination of experience, expertise and knowledge related to the significance, complexity and range of effects that an EIAR needs to assess. Such competence includes an understanding of the legal context of the decision-making process and a variety of technical experts to address different environmental topics, and their interactions, in order to ensure that the information included in the EIAR is complete to a high level of objective quality. The preparation of an EIAR is also critically dependent on the technical expertise, experience, independence and objectivity of environmental specialists. They characterise the existing environment, evaluate its sensitivity and likely significant effects of the proposed development.

The preparation of this Scoping Report has been managed by GES with recognised experts carrying out specialist scoping assessments within their individual field. GES will also coordinate the preparation of the EIAR and, in addition to the appointed specialist experts, will prepare a number of specific chapters, as follows:-

- Population & Human Health: GES
- Biodiversity: Ecology Ireland;
- Land & Soil: Hydro Environmental Services;
- Water: Hydro Environmental Services;
- Air Quality & Climate: AWN Consulting;
- Landscape: Macro Works;
- Cultural Heritage: Dermot Nelis Archaeology;
- Noise & Vibration: AWN Consulting;
- Shadow Flicker: GES;
- Material Assets: GES; and
- Interaction of the Foregoing: GES.

3.0 Consultation

Consultation, to date, has predominately comprised engagement with organisations and authorities, key service providers (e.g. telecommunications) and other stakeholders to whom the proposed development may be of interest or may be affected by the proposed development; and consultation with the local community and general public.

3.1 Stakeholder Consultation

A wide range of statutory and non-statutory organisations were contacted in writing at an early stage in the scoping process to gather their views on the EIAR scope and the likely significant environmental effects of the proposed development. The process involved furnishing each organisation with a 'Preliminary Scoping Report' accompanied by a set of maps and drawings, and requesting written feedback. All responses received will be fully assessed and taken into consideration in the scope of the EIAR and, where necessary, the layout and design of the project will be revised in accordance with specific recommendations.

The following stakeholders were consulted with:-

- Airspeed Telecom;
- An Garda Síochana;
- An Taisce;
- Ajisko Limited;
- Bat Conservation Ireland;
- Birdwatch Ireland;
- Bord Gáis Energy
- Broadcasting Authority of Ireland;
- BT Communications Ireland;
- Carlow County Council;
- Commission for Communications Regulations;
- Commission for Regulation of Utilities;
- Department of Agriculture, Food and the Marine;
- Department of Defence;
- Department of Environment, Climate and Communications;
- Department of Housing, Local Government & Heritage;
- Department of Tourism, Culture, Arts, Gaeltacht, Sport & Media;
- Department of Transport;
- Eir Mobile;
- EirGrid plc;
- Enet Telecommunications Networks Limited;
- Environmental Protection Agency;
- ESB Networks;
- Fáilte Ireland;
- Gas Networks Ireland;
- Geological Survey of Ireland;
- Health & Safety Authority;
- Health Service Executive – Environmental Health Department;
- Iarnród Éireann;
- Imagine Group;
- Inland Fisheries Ireland;
- Irish Aviation Authority;
- Irish Peatland Conservation Council;
- Irish Raptor Study Group;

- Irish Water;
- Irish Wildlife Trust;
- JFK Communications Limited;
- Kildare FM Radio Limited;
- Kilkenny County Council;
- Mosaic Net;
- National Ambulance Service;
- National Federation of Group Water Schemes;
- National Parks & Wildlife Service;
- National Trails Office (Sport Ireland Outdoors);
- Office of Public Works;
- Open Eir;
- Ripplecom;
- Radio Services & Building Limited;
- 2rn (RTE Transmission Network Limited);
- Southern Regional Assembly;
- Sustainable Energy Authority of Ireland;
- Tetra Ireland Communications Limited;
- The Arts Council;
- The Heritage Council;
- Three (3) Ireland;
- Towercom;
- Transport Infrastructure Ireland;
- Údarás na Gaeltachta;
- Virgin Media Ireland;
- Viatel Ireland Limited;
- Vodafone Ireland Limited; and
- Waterways Ireland.

3.2 Community Consultation

Due to the restrictions imposed by Government in response to the COVID-19 pandemic, WHWL has placed significant focus on remote consultation to ensure that local residents are fully aware of the proposed development, are aware of the layout and design of the proposed development, and that the local community has a suitable means of engagement with the project team.

Remote engagement has been predominately facilitated through the distribution of information leaflets to all residences within 2km of a proposed wind turbine offering information on the project and advising residents of the means of contacting the Community Liaison Officer (CLO). The CLO is contactable by email, phone, and via feedback forms (distributed with information leaflets).

A project website has been set up to inform the public of the project (www.whitehillwindfarm.ie). The website is being used to notify the public of any changes in the design and layout of the proposed development arising as a consequence of the scoping exercise; while also being used to advise of upcoming public consultation events (clinics, workshops, etc.) to be arranged following the lifting of COVID-19 restrictions.

In addition, and following the easing of certain public health restrictions in June 2021, WHWL has carried out 'door-to-door' consultation and it is understood that all dwellings within 2km have been visited.

4.0 Description of the Proposed Development

The proposed development consists of the construction and operation of a wind farm, comprising infrastructure including 7 no. wind turbines, crane hardstandings, access tracks, site entrances, meteorological mast, internal wind farm underground cabling, borrow pits and spoil deposition areas.

The project will also include a range of off-site or secondary developments including the wind farm's connection to the national electricity grid, turbine component haul route, construction material haul routes and the importation of materials. A set of location and layout drawings is provided at **Annex 1**.

3.1 Wind Turbines

The proposed turbines will each consist of a three-bladed rotor attached to a nacelle (hub) which contains the mechanical drive train and electrical generation mechanisms. The blades will be constructed of glass reinforced plastic and lightning protection conduits are integral to their constriction. The nacelle is supported on a steel tower of tubular construction. The colour of the proposed turbines and blades will be white, off-white or light grey in accordance with the *Wind Energy Development Guidelines for Planning Authorities 2006* and as determined by the Planning Authority. The turbine has a cut-in wind speed of 3 m/s and a cut-out speed of 25 m/s. At the cut-out speed the turbines will automatically shut down.

Given the available wind resource at the proposed development site, a wind turbine with an overall height of up to 185 metres is presently considered to be the most suitable turbine size for the subject site. It is important to stress, however, that the exact model and manufacturer of the turbine has not yet been chosen and remains under consideration. A number of turbine models with various hub height/rotor diameter combinations could be suitable for the subject site.

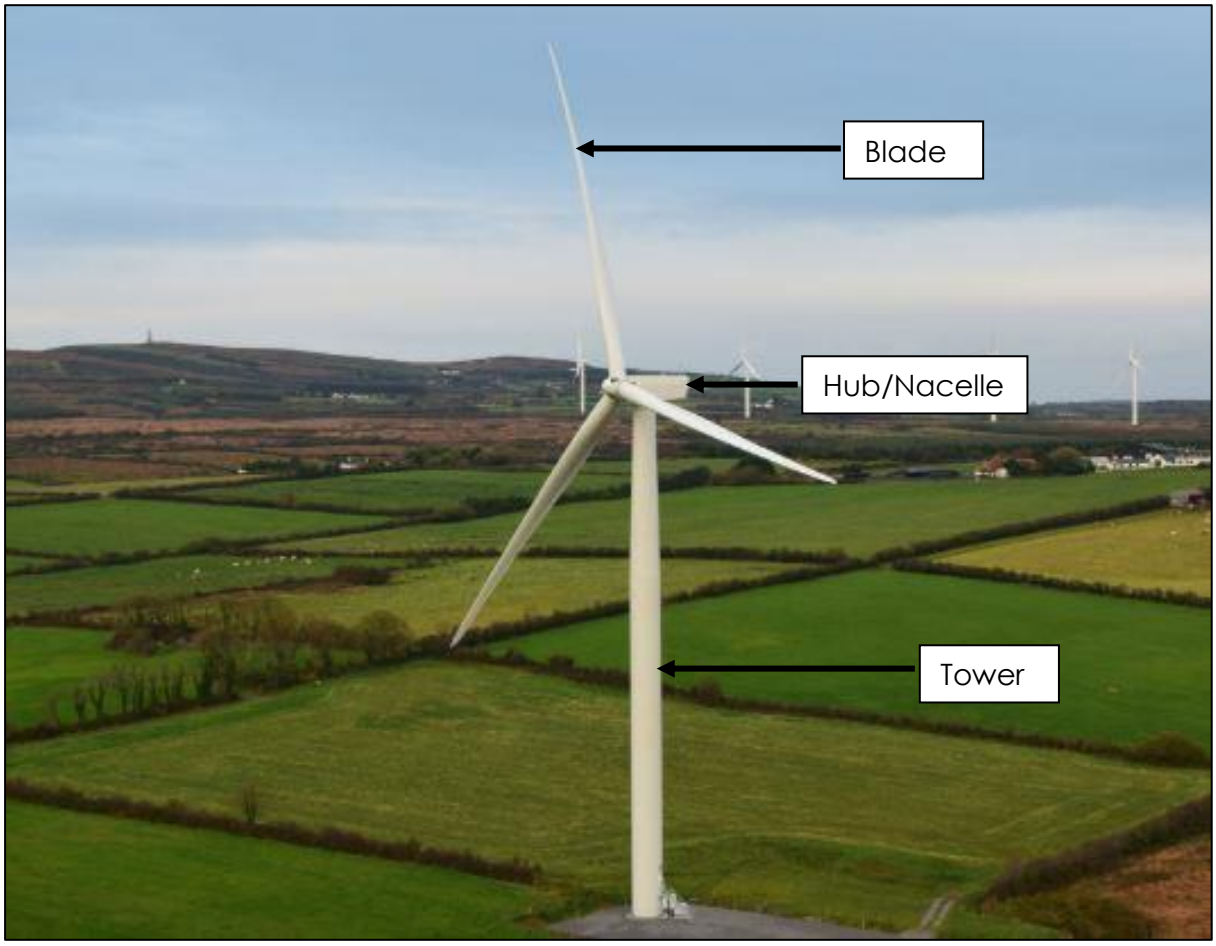


Figure 5: Typical Wind Turbine

3.2 Turbine Foundations

Each turbine tower will be bolted down to a steel ring foundation which can comprise either a reinforced concrete raft foundation or a piled foundation. The type of foundation used for each turbine will depend upon the specific ground conditions at each location; however, given the ground conditions at the proposed development site, piled foundations are unlikely to be required. This shall, however, be established through detailed technical design and post-consent geotechnical investigations, as is normal best-practice in all construction projects.

The typical foundation depth for each turbine will be c. 3 metres, including granular fill area. This depth may immaterially vary depending on the depth to a stable formation at each turbine location. Each turbine base will have an approximate radius of 24m. Rock (if present), topsoil, subsoil and vegetation removed during construction of turbine foundation bases will be appropriately stockpiled and, in so far as is practicable, reused onsite in the formation of access tracks and site reinstatement, or removed from site to an appropriate licensed facility where excess material arises.

3.3 Hardstandings

Hardstanding areas shall be established adjacent to each turbine to facilitate crane operations for erection and occasionally for maintenance and decommissioning. Each hardstanding area shall typically be 50m x 30m for the construction phase and will consist of levelled and compacted (unsealed) hardcore. However, the precise size, arrangement and position of the hardstanding area will be determined by the

chosen turbine supplier and, as such, cannot be confirmed until a turbine model has been chosen.

Temporary set-down areas will be located adjacent to each hardstanding area during the construction phase to accommodate turbine components following delivery to site. Following the erection of turbines, these set-down areas will be reinstated to their pre-construction condition.

3.4 On-Site Access Tracks

A total of c. 7km of on-site access tracks will be required for construction purposes and for site access during the operational phase. The access tracks proposed shall be similar to normal agricultural tracks but with a slightly wider typical running width of approximately 5-metres.

A number of site entrances will also be constructed to facilitate ease of access through the site. These entrances will be appropriately designed to ensure all visibility splays (sightlines) are provided for. In conjunction with the construction of 2 no. site entrances, it is proposed to re-align a short (c. 170m) section of the L7122 local road in County Carlow. The scope of these works will be agreed in full with Carlow County Council as part of ongoing consultation.

3.5 Internal Wind Farm Cabling

Electrical cabling will be required to connect each turbine to the electrical substation. The cables will be located underground, installed of trenches of 1m in depth, and will generally follow the alignment of on-site access tracks.

3.6 Electrical Substation

The electrical substation (switchroom & compound) will contain connection points and associated equipment such as incoming and outgoing circuit breakers, earth fault, protection devices, the grid transformer, metering equipment, computer and server. For safety and security reasons, the substation would be enclosed by a steel palisade fence of up to 3m in height and screened with landscaping.

The proposed substation will extend to an area of c. 1,050m^2. The switchroom will comprise a single storey building, constructed of blockwork and finished in sand and cement render, slate roof covering and steel doors. The substation will also be accompanied by a dedicated site entrance (from the L7117) and a short access track. Additionally, WHWL proposes to construct an energy storage system adjacent to the substation.

3.7 Meteorological Mast

A permanent meteorological mast will remain on-site during the operational phase of the development (permanent as per the life span of the wind farm). The proposed permanent mast will be c.100m in height and will consist of a steel lattice structure to which various measurement instruments will be attached. Some ground works, including the construction of concrete foundations and hardstanding area, will be required to erect the mast.

3.8 Turbine Component Haul Route

It is envisaged that the turbines will be transported from the Port of Waterford using the N29, N25, N9, M9, N78, L1834, L1835 (Kilkenny), and L3037 (Carlow). Temporary works; including the removal of street furniture (street lighting, signage, etc) and verge/roundabout island hardcoring; will be required at various locations along the route; however, substantial and permanent works are not currently assessed as

being necessary.

At the junction of the N78 and L1834, it is proposed to construct a temporary access track, to the south-east of the existing junction, to accommodate the delivery of abnormal-sized loads. The current junction is not capable of accommodating such loads and the construction of a temporary access track, which will be fully re-instated immediately following the delivery of turbine components, will facilitate same. WHWL will engage with the relevant stakeholders, as part of the project design process, as part of ongoing consultation.

3.8 Grid Connection

The point of connection of the project to the national grid will ultimately be decided by ESB Networks and/or EirGrid and is beyond the control of WHWL. As such, it is not currently possible to definitively state the nature or routing of the grid connection infrastructure. However, on the basis of detailed analysis by WHWL including an assessment of the existing grid network and grid capacity in County Carlow and County Kilkenny, it is predicted that the electricity generated will be exported to the existing Kilkenny 110kV electricity substation. It is also likely that the grid connection infrastructure will comprise underground electricity lines; located predominately within the carriageway of the public road network. An indicative grid connection route is illustrated at **Annex 1**.

4.0 Scope of the EIAR

The EIAR will provide an assessment of effects during the construction, operation and decommissioning of the proposed development for each the environmental topics described in this section. The EPA *Advice Notes for Preparing Environmental Impact Statements* (Draft; September 2015) set out, at Project Type 33, considerations in the preparation of an EIAR (formerly termed an 'Environmental Impact Statement' (EIS). The EIAR for the proposed development will have regard to the guidance set out in respect of this project type.

This section provides a brief overview of the level of scoping which has taken place to date, as well as the potential effects which have been identified and the proposed methodology for further assessment in the EIAR.

4.1 Project Alternatives

Prior to the selection of the development under consideration, WHWL undertook an extensive iterative process to assess a range of alternatives at both the macro-level and micro-level. The assessment of alternatives ranged from alternative site locations, site layouts and designs, technologies, grid connection options and haul route options. This process has so far determined that the development as proposed represents the most environmentally sensitive project having regard to all reasonable available alternatives.

However, the proposed development in its current layout and design remains subject to further revision in line with continued project scoping and ongoing statutory and non-statutory consultation,

4.2 Population & Human Health

As part the scoping process, a desk based review of existing conditions in the area has been undertaken. It is anticipated that, during the construction phase, effects on community, recreation and tourism receptors will primarily be associated with traffic, noise, air quality and water impacts. Once the proposed development becomes operational, effects will be primarily associated with visual impact and

noise impact.

In terms of human health, it is noted that impacts here will be closely linked with other environmental aspects associated with the proposed development which are relevant to human health, namely soils, water, air quality, noise, shadow flicker, and radiation (electrical infrastructure). Other effects may include employment effects and impacts on the local economy.

The potential effects identified above along with potential cumulative effects with other developments will be considered within the 'Population and Human Health' chapter of the EIAR. Effects which are not considered 'likely' or 'significant' have been scoped out from further assessment and include:-

- Safety issues connected with the operation of wind turbines;
- Health effects and wind turbine syndrome; and
- Effects of wind farms on property values as being a matter that is not relevant to the proper planning and sustainable development of the area.

The following sections set out the proposed approach to the preparation of the Population & Human Health chapter of the EIAR.

4.2.1 Methodology

The spatial focus of the study will be undertaken at two levels. Firstly, effects on specific community, recreation and tourism receptors will be assessed at a local level which will be defined as 5km from the boundary of the proposed development. This will be referred to as the 'Local Study Area'.

Economic effects will be considered with regard to a wider study area that takes account of a likely 'catchment' for provision of domestically sourced goods and services relating to the construction and operation of the wind farm. This part of the study will also take into consideration the likely benefits arising from part community ownership of the wind farm. This study area will comprise the counties of Carlow and Kilkenny and will be referred to as the 'Wider Study Area'. Given the scale of the proposed development, it is not intended to measure effects at a national or international level.

4.2.2 Description of the Existing Environment

A desk-based review of existing conditions in the area will be undertaken, including the following themes:-

- population demographics;
- labour market;
- economic diversity and investment including local business supply chain;
- education and skills;
- community receptors;
- visitor attractions (e.g. cultural heritage, fishing lakes, views);
- accommodation and other businesses/services serving the tourism economy;
- recreational assets (e.g. walking, cycling, views, equine use); and
- land use.

Data on sensitive receptors will be gathered within the Local Study Area and this will focus on community receptors, recreational assets and visitor assets. Baseline data on population demographics and employment will be gathered within the Wider Study Area. The sensitivity of each receptor or receptor group will be based on its importance or scale and the ability of the baseline to absorb or be influenced by the identified effects.

Key literature sources, in evaluating the baseline environment, will include:-

- Central Statistics Office (CSO);
- The county development plans of Carlow and Kilkenny (including draft county plans) where applicable;
- Pobal Profiling GIS Data;
- Fáilte Ireland;
- *County Carlow - Tourism Strategy and Action Plan 2020-2025*;
- *Kilkenny County Council Tourism Statement of Strategy and Work Programme 2017-2022*;
- *County Carlow Local Economic & Community Plan 2016-2021*; and
- *Kilkenny Local Economic & Community Plan 2016-2021*.

4.2.3 Description of the Likely Effects

The assessment will be primarily focussed on assessing the likely effects arising from the construction and operational phases. Decommissioning phase effects are considered, based on experience, to be similar to construction phase effects but of a reduced magnitude. Effects on the local economy (employment opportunities and economic output), local population, recreation and tourism assets and land use will each be assessed.

4.2.3.1 Receptor Sensitivity

There are no published standards that define receptor sensitivity relating to Population and Human Health assessments. As a general rule the sensitivity of each receptor or receptor group will be based on its importance or scale and the ability of the baseline to absorb or be influenced by the identified effects. In assigning receptor sensitivity, consideration will be given to the following:-

- importance of the receptor e.g. local, regional, national, international;
- availability of comparable alternatives;
- ease at which the resource could be replaced;
- capacity of the resource to recover or adapt to identified impacts over a period of time; and
- level of usage and nature of users (e.g. sensitive groups such as people with disabilities).

Based upon professional judgement, it is proposed that four levels of sensitivity are used: High; Medium, Low and Negligible.

4.2.3.2 Magnitude Criteria

The magnitude of effect will be evaluated based on the change that occurs to the baseline conditions relating to supply chains, local labour market, tourism and visitor economy, land use, and tourism and recreation assets. It is proposed that four degrees of magnitude are used: high; medium; low and negligible.

4.2.3.3 Significance of Effect

The level of effect will be assessed by combining the magnitude of the effect and the sensitivity of the receptor. It is proposed that four levels of effect are used: negligible, minor, moderate or major. Where an effect is classified as Major, this is considered to represent a 'significant effect' in EIA terms. Where an effect is classified as Moderate, this may be considered to represent a 'significant effect' but should always be subject to professional judgement and interpretation, particularly where the sensitivity or magnitude levels are not clear or are borderline between categories or the effect is intermittent.

4.2.4 Mitigation & Monitoring Measures

Mitigation measures, additional to those incorporated into the project design, will be considered in order to mitigate any significant adverse effects that are identified.

4.2.5 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has requested that the effects on electromagnetic fields and, as stated above, the effects of radiation from electrical infrastructure will be assessed. Fáilte Ireland has provided recommendations regarding the assessment of effects on tourism.

No other comments regarding the assessment of Population & Human Health effects have been received.

4.3 Biodiversity

A detailed Biodiversity Scoping Report has been prepared by Ecology Ireland and is enclosed at **Annex 2**. The report has identified the effects which may occur as a result of the construction, operation and decommissioning of the proposed development and describes the proposed approach in the preparation of the Biodiversity chapter of the EIAR.

4.3.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has requested that the following matters are addressed:-

- Proximity of the proposed development to the River Barrow & River Nore Special Area of Conservation (SAC) and the connectivity provided to this designated site by watercourses within the proposed development site;
- Assessments should be supported by appropriate field studies;
- The extent of clearfell shall be clearly described;
- Details to be provided regarding protection of retained ecological features (e.g. hedgerows, trees, etc.); and
- Invasive species.

No other comments regarding the assessment of Biodiversity effects have been received.

4.4 Land & Soil

A Land, Soil and Water Scoping Report has been prepared by Hydro Environmental Services and is enclosed at **Annex 3**. Given the highly inter-related nature of the geological, hydrogeological and hydrological environments, a consolidated scoping assessment has been carried out. The report describes the characteristics of the existing environment (based on a desktop survey), identifies environmental effects which may arise as a result of the construction, operation and decommissioning of the proposed development, and describes the methodologies to be followed in the preparation of the Land & Soil chapter of the EIAR.

4.4.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has

requested that Geological Survey Ireland and Environmental Protection Agency mapping databases are consulted to ensure the assessment of effects is conducted on the existing baseline environment.

Geological Survey Ireland has recommended that a suite of mapping databases and datasets available through its website are consulted to fully inform the proposed assessment; including in relation to geoheritage sites, geological composition mapping, geotechnical databases, geohazards, presence of natural resources, geochemistry and geophysical data.

No other comments regarding the assessment of Land & Soil effects have been received.

4.5 Water

A Land, Soil and Water Scoping Report has been prepared by Hydro Environmental Services and is enclosed at **Annex 3**. Given the highly inter-related nature of the geological, hydrogeological and hydrological environments, a consolidated scoping assessment has been carried out. The report describes the characteristics of the existing environment (based on a desktop survey), identifies environmental effects which may arise as a result of the construction, operation and decommissioning of the proposed development, and describes the methodologies to be followed in the preparation of the Water chapter of the EIAR.

4.5.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has recommended that:-

- Geological Survey Ireland and Environmental Protection Agency mapping databases are consulted to ensure the assessment of effects is conducted on the existing baseline environment;
- A detailed survey of all existing and proposed on-site drainage should be undertaken and proposals provided regarding the proposed drainage of the site and the maintenance of the existing drainage regime; and
- The effects of the proposed development on water supplies should be assessed.

Geological Survey Ireland has recommended that:-

- Data available on the Groundwater and Geothermal database is consulted, particularly in relation to groundwater distribution and the maintenance of safe and secure drinking water supplies;
- Detailed assessment should be undertaken of possible effects on underlying aquifers; particularly due to the presence of the Paulstown Public Water Supply and Castlewarren Group Water Scheme in relative proximity to the proposed development site;
- The assessment will need to consider the effects on groundwater to prevent the ingress of runoff to the aquifer while appropriate design should be incorporated to ensure surface water quality is not diminished; and
- The effects of potential contamination of groundwater should be fully assessed.

A pro-forma response has been provided by Irish Water regarding an assessment of effects on water supplies, treatment of effluent and the protection of water quality.

The National Federation of Group Water Schemes has advised/recommended that:-

- The proposed development is in close proximity to the drinking water catchment of the Castlewarren Group Water Scheme;
- The Group Water Scheme is supplied by six different sources, five boreholes and one spring source, located across four separate sites north of the village of Castlewarren;
- Any proposed development must take the location of these sources into account, ensuring any impacts as a result of the proposed development are duly considered and documented and necessary steps taken to protect this vital community resource; and
- Consideration must be given to the presence of group water scheme infrastructure in the local area and whether the proposed development is likely to affect the supply of water.

4.6 Air & Climate

An Air Quality and Climate scoping report has been prepared by AWN Consulting and is enclosed at **Annex 4**. The report describes the scope of work and methods to be applied in the identification and assessment of air quality effects associated with the proposed development.

4.6.1 Stakeholder Engagement

No specific comments regarding the assessment of Air Quality & Climate effects have been received. It is, however, noted that the Planning Authority (Carlow County Council) has requested that suitably scaled mapping is provided indicating the location of existing and proposed dust monitoring stations. The EIAR will assess the likelihood of significant levels of dust being generated during the construction, operation or decommissioning of the proposed development and whether the installation of dust monitoring stations is required.

4.7 Landscape

A Landscape scoping report has been prepared by Macro Works and is provided at **Annex 5**. The report provides an initial evaluation of the baseline environment and discusses landscape and visual effects which are likely to arise and describes the findings of the scoping process to date.

4.7.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has stated:-

- The assessment should take account of the Landscape Character Assessment contained within the Carlow County Development Plan 2015-2021;
- The proposed development site is located within the Killeshin Hills landscape character area and is identified as an uplands area with a high level of visibility and a landscape sensitivity rating of 5 (increasing sensitivity ranking from 1-5);
- The Killeshin Hills is rural landscape with a moderate landscape sensitivity and moderate potential to absorb development;
- There are a number of designated scenic views and routes in the wider vicinity of the propsoed development site;
- The Killeshin Hills provide vistas, to the east, over the county and a comprehensive assessment of effects will be required;
- The proximity of the proposed wind turbines to nearby scenic routes could negatively affect their scenic value;

- Cumulative effects with other wind energy developments should be assessed and other developments should be included within photomontages;
- Landscaping and replanting proposals should be considered and assessed;
- Views from local residences should be considered; and
- Photomontages should be prepared to accurately represent how a member of the public would view the proposed development from any location.

No other comments regarding the assessment of Landscape effects have been received.

4.8 Cultural Heritage

A Cultural Heritage scoping report has been prepared by Dermot Nelis Archaeology and is enclosed at **Annex 6**. The scoping report has been prepared to provide an initial evaluation of the baseline environment and to identify effects which the proposed development may have on the archaeological, architectural and cultural heritage resource of the surrounding area.

4.8.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has advised that the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media be consulted to determine whether an Archaeological Impact Assessment is required. The Department has been consulted with but a response has not been received.

No other comments regarding the assessment of Cultural Heritage effects have been received.

4.9 Noise & Vibration

A Noise & Vibration scoping report has been prepared by AWN Consulting and is enclosed at **Annex 7**. The scoping report has been prepared to identify the potential for noise and vibration effects at sensitive receptors surrounding the proposed development. The scoping report also describes the principal objectives, and the proposed methodologies, of the assessment.

4.9.1 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has requested that:-

- Suitably scaled mapping is provided indicating the location of existing and proposed noise monitoring stations; and
- The assessment should assess noise generated from construction activities and the operation of the proposed wind turbine.

No other comments regarding the assessment of Noise & Vibration effects have been received.

4.10 Shadow Flicker

4.10.1 Methodology

In order to determine the potential level of shadow flicker at the scoping stage, an assessment of the local environment has been carried out to identify potential

receptors. All existing (occupied and unoccupied) dwellings and permitted dwellings (not yet constructed) within 1.8km of a proposed wind turbine, have been identified. The proposed development is located in an area which has a dispersed rural settlement pattern and, consequently, the number of dwellings identified is relatively low.

The EIAR will assess the effects on human health from shadow flicker, i.e. the moving shadows cast by the turbine blades in times of direct sunlight and the resultant effect that can have on nearby properties. The EIAR will comprise a detailed assessment of the likelihood of shadow flicker affecting local receptors during the operation of the proposed development. The assessment will be based on detailed shadow flicker prediction modelling for each dwelling within 1.8km of a proposed wind turbine. An assessment will be made to establish if the proposed development will comply with shadow flicker limits prescribed within the Wind Energy Development Guidelines for Planning Authorities (2006) or any superseding guidelines. Proven and recognised technological mitigation will be introduced where necessary and appropriate.

4.10.2 Description of the Existing Environment

A total of 225 no. properties (dwellings) have been identified as being located within 1.8km of a proposed wind turbine; however, further assessment and ground-truthing will be undertaken to confirm the status of a number of the identified properties. WHWL will monitor future planning applications to ensure that a comprehensive assessment is undertaken and that the potential shadow flicker effects are fully assessed for all existing and permitted dwellings.

4.10.3 Description of the Potential Effects

In times of direct sunshine, wind turbine blades may occasionally cast moving shadows on residences in close proximity to the proposed turbines. At certain times of the year, the moving shadows of the turbines blades can periodically reduce light to a room causing the light to appear to flicker. Shadow flicker would not generally have any effect on health or safety, but could on limited occasions present a nuisance effect.

4.10.4 Mitigation & Monitoring Measures

Shadow flicker is an issue which has been considered at the early stages of scoping and has been used to inform the design and layout of the proposed development. A full shadow flicker projection will be provided within the EIAR which will determine the need for any further mitigation; while detailed mitigation measures and a preliminary Shadow Flicker Monitoring Programme will also be provided.

Technical solutions are available, and widely implemented, on wind farm developments to ensure that instances of shadow flicker do not result in significant effects. These mitigation measures effectively limit the operation of turbines during the infrequent periods when shadow flicker is predicted to occur. In summary, if a particular turbine is creating shadow flicker effects at a particular dwelling then that turbine may be temporarily shut down. This is usually addressed by turning off the turbines a predetermined times when shadow flicker is predicted to occur, if the sun is shining.

4.10.5 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. No comments regarding the assessment of Shadow

Flicker effects have been received.

4.11 Material Assets

4.11.1 Transport & Access

4.11.1.1 Methodology

A desktop review of the road network in the vicinity of the proposed development site has been conducted at the scoping stage together with a desktop review of proposed site entrance locations and the proposed grid connection route. A route access survey has been carried out by a specialist transport consultant between the anticipated port of entry and proposed main site entrance. This survey has identified locations which will require off-site permanent and temporary upgrades to facilitate the safe delivery of turbine components to the proposed development site. Swept path analyses have also been conducted for all internal tracks to ensure that they are adequate to allow delivery of turbine components while also minimising the required land take where feasible.

A transport and access impact assessment will be conducted in accordance with the Transport Infrastructure Ireland (TII) *Traffic and Transport Assessment (TTA) Guidelines*, May 2014. The methodology for the transport & access assessment will include a comprehensive assessment of the road networks ability to accommodate construction phase traffic, the suitability of the grid connection route for the accommodation of electrical infrastructure, a review of predicted traffic volumes and effects likely to be generated during the construction and operation of the proposed development, by the construction workforce, and by the transport of materials and equipment; while future traffic volumes associated with maintenance-related activities will be predicted. The potential disruption to the road network and local traffic movements during the construction phase and the availability of alternative routes (particularly in relation to the proposed grid connection route) will be assessed, where required. Recommendations will be made to mitigate any potential traffic effects on the road network.

4.11.1.2 Description of the Existing Environment

The road network in the vicinity of the proposed development generally comprises locally-classified roads; however, the anticipated turbine component haul route will also utilise motorways, national and regional roads; while the grid connection route will also follow, for a short distance, a regional road. Road widths and carriageway surface-conditions are of a condition typical for their classification and are considered, initially, to be generally capable of accommodating construction traffic associated with the development of a wind farm.

It is noted, however, that the route access survey has identified locations along the anticipated haul route where both temporary and permanent upgrade works will be required; each of which will be fully assessed in the EIAR.

Based on anecdotal evidence and experience, the road network in the vicinity of the proposed development is unlikely to carry significant volumes of traffic; however, it is anticipated that these routes will be of local importance to residents, landowners and business owners.

4.11.1.3 Description of the Likely Effects

The following effects have been identified as having the potential to arise as a consequence of the construction of the proposed development:-

- Increased traffic flows (construction phase);

- Changes to traffic/vehicular composition;
- Temporary traffic disruption/delays;
- Reduced road safety due to construction activities; and
- Degradation of road structures/surfaces.

Operational stage effects on traffic are likely to be much less than that associated with the construction stage; however, the level of impact will be examined in line with the operational life span of the proposed development.

4.11.1.4 Mitigation & Monitoring Measures

A comprehensive suite of mitigation measures will be set out, as required, to reduce the likely effects of the proposed development on transport and access. The majority of such measures are likely to be techniques which will be inherent and intrinsic to the completion of works in accordance with accepted best practice construction methodologies (e.g. appropriate traffic management measures); however, specific measures are also likely to be proposed to minimise traffic disruption and maintain traffic flows, ensure public safety is not adversely affected and to maintain the structural integrity of roads and associated structures.

4.11.1.5 Stakeholder Engagement

As described at **Section 3.1** above, a range of stakeholders have been consulted with and invited to provide comment on the proposed development and the scope of environmental assessments. The Planning Authority (Carlow County Council) has advised that the following matters be taken into consideration:-

- A construction phase traffic impact assessment shall be provided;
- Details of traffic types and volumes should be provided;
- Details of turbine delivery haul routes shall be provided. It is recommended that turbine delivery routes should seek to predominately utilise main roads and minimise the use of county and local roads;
- Consideration should be given to the avoidance of use of HGVs negotiating built up areas and, where required, the effects of this should be fully assessed;
- Full details of proposed site entrances should be provided;
- All road surfaces and structures along access routes should be evaluated to confirm structural capacity; and
- Where road/structure upgrades are required, specific proposals should be provided.

Transport Infrastructure Ireland (TII) has also offered recommendations regarding the scope of the EIAR which are generally reflective of the matters raised by the Planning Authority including, in addition:-

- Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes;
- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development;
- Visual impacts from existing national roads should be assessed;
- In preparing the EIAR, regard should be had to TII Publications (*DMRB* and *Manual of Contract Documents for Road Works*);
- In preparing the EIAR, regard should be had to TII's *Environmental Assessment and Construction Guidelines*, including the *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes*

(National Roads Authority, 2006);
- The EIAR should consider the *Environmental Noise Regulations 2006* (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority;
- TII Publications should be consulted to determine whether a Road Safety Audit is required;
- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network;
- In relation to haul route identification, it is indicated that turbine components will be transported from the Port of Waterford using the N29, N25, N9, M9, N78, national roads, before reverting to the local road network and that temporary works may be required along the route. It is also outlined that it is proposed to construct a temporary access at the junction of the N78 and L1834, to accommodate the delivery of abnormal-sized loads as the current junction is not capable of accommodating such loads. It is stated that the construction of the temporary access will be fully reinstated immediately following the delivery of turbine components. As noted above, designers should consult TII Publications to determine whether a Road Safety Audit is required for any of the temporary works proposed. Any recommendations should be incorporated into designs;
- TII recommends that the EIAR should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal 'weight' loads are proposed, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route through all the relevant County Council administrative areas should be checked to confirm their capacity to accommodate any abnormal 'weight' load proposed;
- The national road network is managed by a combination of PPP Concessions, Motorway Maintenance and Renewal Contracts (MMaRC) and local road authorities in association with TII. The Applicant should also consult with all PPP Companies, MMaRC Contractors and road authorities over which the haul route traverses to ascertain any operational requirements such as delivery timetabling, etc. and to ensure that the strategic function of the national road network is safeguarded.
- Any damage caused to the pavement on the existing national road at the temporary access due to the turning movement of abnormal 'length' loads (e.g. tearing of the surface course, etc.) shall be rectified in accordance with TII Pavement Standards and details in this regard shall be agreed with the Road Authority prior to the commencement of any development on site;
- It is noted that the grid connection routing does not propose utilising sections of national roads, however, an underground crossing point of the N10 in the vicinity of the Scart substation, Kilkenny, is proposed. Other consents or licences may be required from the road authority for any trenching or cabling proposals crossing the national road.

No other comments regarding the assessment of Transport & Access have been received.

4.11.2 Telecommunications

4.11.2.1 Methodology

The scoping process was commenced at an early stage of project design to identify

the presence of telecommunication links in the area and, if present, their specific route. Consultation with a number of key service providers was undertaken and all feedback and recommendations have been incorporated into the project design.

The scoping methodology, which is ongoing and will continue throughout the EIAR preparation process, will include:-

- Consultation with service providers, regulatory authorities and emergency services;
- Analyses of the effects of the proposed development on telecommunications operators' point-to-point microwave radio links and apply appropriate buffer distances around links and masts where required;
- Further specialist investigations will be carried out where significant effects are likely to occur;
- Where necessary, mitigation measures to be agreed with operators including:-
  - Turbine relocation;
  - Telecommunications link relocation;
  - Underground fibre optic cables to replace microwave link;
  - Submission of final detailed layout to telecoms operators; and
  - Agree any layout alterations following final detailed assessment by telecoms operators, or agree suitable mitigation measures if necessary.

4.11.2.2 Description of the Existing Environment

While the proposed development site is not assessed to be a particularly important location for telecommunications links or infrastructure, 3 no. links were identified as being traversing the subject site and having the potential to be affected.

4.11.2.3 Description of the Likely Effects

The proposed development was identified as having the potential to affect the Vodafone Ireland network due to interference with an existing microwave link.

During initial consultation, Vodafone Ireland identified that one of its network links passed, in a north-south orientation, almost directly through the location of proposed Turbine B (Turbine 2) and was at risk from the proposed development. Secondly, Enet indicated that its network was likely to be affected due to the siting of the proposed wind turbines.

Consultation with Radio Services & Building Limited indicated that the preliminary layout of the proposed development would affect radio links and potentially cause a broadcasting and telemetry system failure.

Finally, while the proposed wind farm will not have any impact on 2rn's fixed linking but there is a risk to interference to digital terrestrial television viewers receiving broadcast coverage from Mount Leinster.

4.11.2.4 Mitigation & Monitoring Measures

A wide range of technological measures are available to avoid any disruption to telecommunication links and services. Such measures will be fully examined within the EIAR and will be proposed for implementation where necessary.

We understand that following extensive consultation, and through the re-siting of a number of turbines and implementation of technical solutions, both Vodafone and Enet have confirmed that the proposed development is unlikely to affect their network.

It is further understood that following consultation with Radio Services & Building

Limited, a technical solution is achievable which will avoid any effect on this service provider.

Finally, it is noted that 2rn have recommended that a protocol between be entered into to ensure that appropriate remediation of any interference experienced by residents.

5.0 Cumulative Assessment

The assessment of cumulative effects arising from the proposed development will take 2 no. forms, as follows:-

- The cumulative effects of the proposed wind farm, grid connection infrastructure and haul route upgrade works will be assessed to evaluate the effects of the project as a whole; and
- The cumulative effects of the entire proposed development with other existing, permitted or proposed developments (for which there is publicly available information).

The cumulative assessment will be undertaken under each individual chapter heading. Where potentially significant cumulative effects are identified, mitigation and monitoring measures will be proposed to minimise this effect.

The interactions between effects on different environmental factors will also be addressed, as relevant, throughout the EIAR by ensuring that effects are cross-referenced between topics, thus reducing the need to duplicate coverage of such topics. Close co-ordination and management within the EIA Project Team, and careful read-across editing, will ensure that assessors are vigilant for complex interactions (direct, indirect, secondary and cumulative) and, where they are likely to arise, they are adequately identified and assessed. This includes interactions between effects, and possible cumulative effects, arising from the mitigation measures proposed that could magnify effects through the interaction or accumulation of effects.

6.0 Appropriate Assessment

As a separate, but interrelated, process, screening for the likelihood of any significant effects on European nature conservation sites (Natura 2000) designated under the EU Habitats Directive (92/43/EEC) and Birds Directive (2009/147/EC) will be undertaken through the preparation of what is known as an Appropriate Assessment (AA) Screening Report (Stage 1). This is formally a separate assessment process, with discrete reporting requirements, but is obviously highly interrelated with EIA.

Article 6(3) of the Habitats Directive provides for a two-stage assessment process, which is implemented into Irish law (with some additional requirements) by the provisions of sections 177U and 177V of the Planning & Development Act 2000 (as amended). Screening for AA in accordance with section 177U is the first stage of the AA process in which the possibility of there being a significant effect on a European site is considered. Plans or projects that have no appreciable effect on a European site are thereby excluded, or 'screened out', at this stage of the process.

The first step in the screening process is to develop a list of European-designated sites which may be affected by the construction, operation or decommissioning of the proposed development. Each relevant European site is evaluated to examine whether or not the proposed development is likely to have a significant effect on the European site.

The proposed development site is not located within any European site designated for nature conservation nor are there any direct interactions with designated sites. However, the proposed development site is located c. 2.7 upstream of the River Barrow and River Nore SAC and there is clear landscape (hydrological) connectivity between the respective sites via the Coolcullen River [Knocknabranagh and Knockbaun stream]. An Appropriate Assessment Screening Report, prepared by Ecology Ireland, found that that it could not be confirmed, in the absence of avoidance or reduction (mitigation/protective) measures, that designated conservation sites would not be adversely affected by indirect effects arising from the construction, operation and decommissioning of the proposed development, either individually or in combination with other plans and projects, having regard to their conservation objectives.

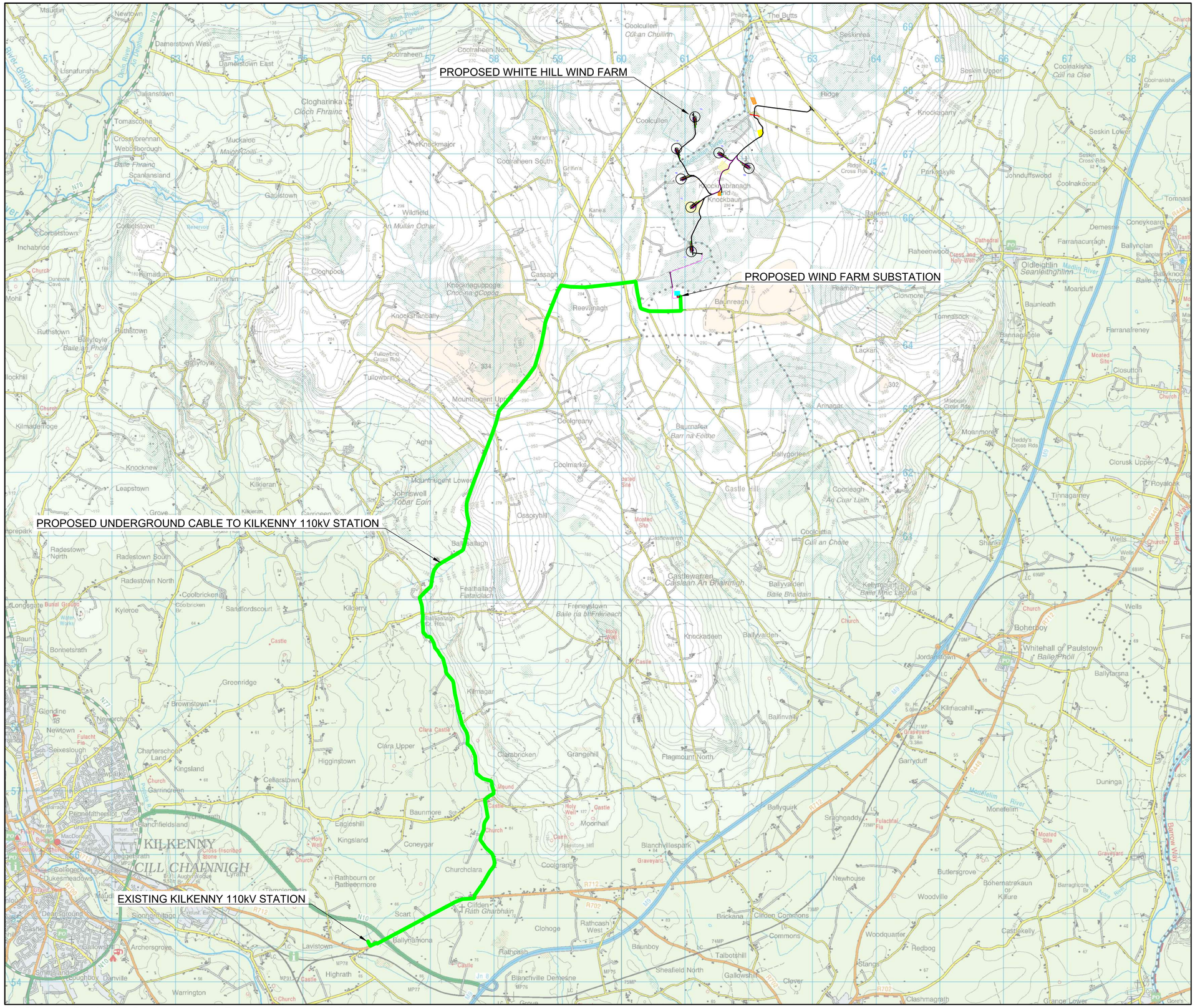
As a result, and in accordance with the precautionary principle, it was concluded that the proposed development should proceed to be subject to a Stage 2 AA and that a NIS should be prepared and submitted with the planning application alongside this EIAR. In the NIS, the effect of the proposed development on the integrity of the European site(s), and its conservation objectives, will be assessed. Likely effects on species or habitats will be evaluated with respect to the scale, extent and nature; to make an overall assessment of the significance of the effect.

In the NIS, mitigation measures can be proposed to minimise effects on European sites to reduce the significance of any effects. Mitigation measures will follow the 'Avoidance – Reduction – Remedy' hierarchy. The mitigation measures will be described in detail, including in relation to their practical implementation, efficacy, timing and monitoring.

The NIS is presented and submitted as a separate standalone document. The NIS will include both the Stage 1 AA Screening Report and the Stage 2 Appropriate Assessment.

The Biodiversity chapter of the EIAR (**Chapter 5**) will not repeat the detailed assessment included in the NIS but will cross reference the findings of the separate assessment, as necessary. This is in accordance with the EPA *Guidelines on the Information to be contained within an EIAR* (Draft; August 2017) which states "*a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement*" but should "*incorporate their key findings as available and appropriate*".

Annex 1 –
Maps and Drawings



OSI © Licence: EN 0062821. Prepared Using Irish Transverse Mercator. OS Sheet Name(s): 2414, 2416, 2614 & 2616

Legend:

- Proposed Internal Wind Farm Cable Route
- Proposed Wind Farm Substation
- Proposed Underground 110kV Connection Between Wind Farm Substation & Existing Kilkenny Station
- Proposed Turbine & Hardstand Locations
- Proposed Wind Farm Access Tracks
- Proposed Realignment of Local Road
- Proposed Soil Deposition Areas
- Proposed Burrow Pit & Soil Deposition Areas
- Proposed Met Mast Location
- Possible Battery Storage Area

N

Date:	Rev:	Description:	Drawn By:

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Client: Carlow Wind Ltd.

Job Title: White Hill Wind Farm

Drawing Title: Figure 1 - Overall Site Location

Drawing No.	Revision No.
BRK001_SCO_LOC-0.01	Rev00
Scale:	**Date:**
(A1) 1:30,000	21/04/2021

Drawn By:	Checked By:	Confirmed By:
J.B.	S.C.	S.C.

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- Proposed Met Mast Location
- Possible Battery Storage Area
- Proposed Site Compound

N

Date:	Rev:	Description:	Drawn By:

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Client: Carlow Wind Ltd.

Job Title: White Hill Wind Farm

Drawing Title: Figure 2 - Site Layout

Drawing No.	Revision No.
BRK001_SCO_LAY-0.01	Rev00
Scale:	**Date:**
(A1) 1:7,500	21/04/2021

Drawn By:	Checked By:	Confirmed By:
J.B.	S.C.	S.C.

Annex 2 –
Biodiversity Scoping Report

White Hill Wind Farm, County Carlow/ County Kilkenny

Scoping Report 2021

November 2021

White Hill Wind Farm

County Carlow/ County Kilkenny

Scoping Report 2021

Revision	Description	Prepared by	Checked by	Date
1	For Issue	Claire Deasy	Gavin Fennessy	11/11/2021

Client: Carlow Wind Ltd

Keywords: Scoping, Constraints, White Hill, Wind Farm

Contents

1 Introduction

1.1 Background

Ecology Ireland Wildlife Consultants Ltd has been commissioned by Carlow Wind Ltd to carry out a desktop Scoping Assessment for the proposed White Hill Wind Farm and its grid connection.

The White Hill Wind Farm site is located in west County Carlow and east County Kilkenny, ~3km west of Oldleighlin, 14km southwest of Carlow and 13km northeast of Kilkenny.

The purpose of this scoping assessment is to identify potential ecological receptors in the local environments that could be affected by the proposed development. A brief overview of the potential receptors is described along with their importance / sensitivity, likelihood of impact and if mitigation is likely to be required.

The main objectives of the scoping assessment are:

- To complete a desk study review of available information relating to the baseline ecological receptors in the area of the proposed development;

- To identify any ecological constraints that may affect the proposed wind farm layout or overall feasibility and if mitigation is likely to be required.

This document is based on desk study assessment and the survey work completed to date. While ecological survey work is ongoing, having commenced in 2019, all surveys for the proposed development have yet to be completed and the findings of this report is subject to confirmation from future survey work yet to be undertaken at the proposed development site. The survey work to date includes vantage point (VP) bird surveys to document the birds within the site and passing over it. Vantage point surveys have been carried out over two winter seasons (2019/20 and 2020/21) and one full breeding season VP survey (2020). A second breeding season vantage point survey is currently underway in 2021 and bat and habitat surveys have also commenced or will shortly commence.

1.2 Development description

The proposed development consists of 7 no. turbines, turbine foundations, turbine hardstandings, internal site access tracks, internal underground cabling, electrical substation and energy storage facility, site entrances, borrow pits and spoil deposition areas and all associated site development, access and reinstatement works. The project also includes approximately 15km of underground electricity line (UGL), to be located predominately within the carriageway of the public road network from the proposed wind farm substation to the existing 110kV substation at Scart, Kilkenny. The location of the proposed wind farm and UGL are shown below Figure 1.

1.3 Site Description

The habitats within the proposed White Hill Wind Farm development study area ('Study Area') are comprised primarily of commercial coniferous forestry plantation of varying age classes, agricultural grassland/pasture and small areas of wet grassland and semi natural woodland. The Knockbrannagh and Knockbaun stream runs through the centre of the Study Area which is a tributary of the River

Dinin which in turn flows into the River Nore north east of Kilkenny city. Current land use within the site and in the wider area is primarily for agriculture (cattle farming) and commercial forestry.

The topography of the wind farm site area is hilly with the overall site elevation ranging between approximately 230 and 290m OD (Ordnance Datum). The greatest elevations occur in the east and south of the site with the land sloping generally towards the north and west. The elevation of the proposed wind farm substation, located in the southwest of the site, is approximately 280m OD.

The UGL runs in a southerly direction for approximately 15km between the proposed White Hill Wind Farm substation to the existing substation at Scart, Co. Kilkenny. The grid connection comprises UGL to be located predominately within the carriageway of the public road network. The ground elevation along the grid connection decreases to ~65m OD at the Scart substation.

The proposed turbine delivery route is predominately located within motorway, national and regional roads.

Figure 1. Site Location Map

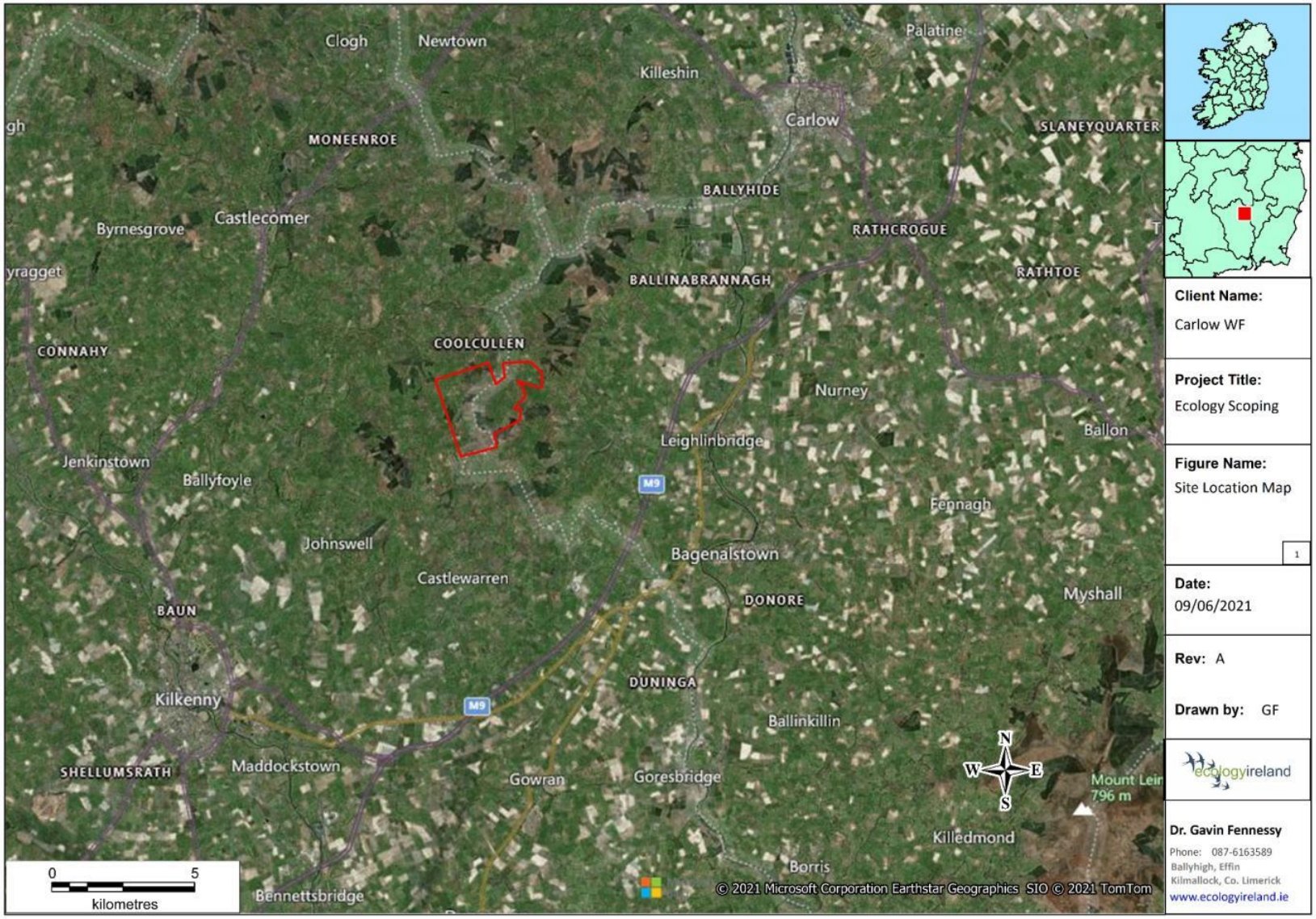
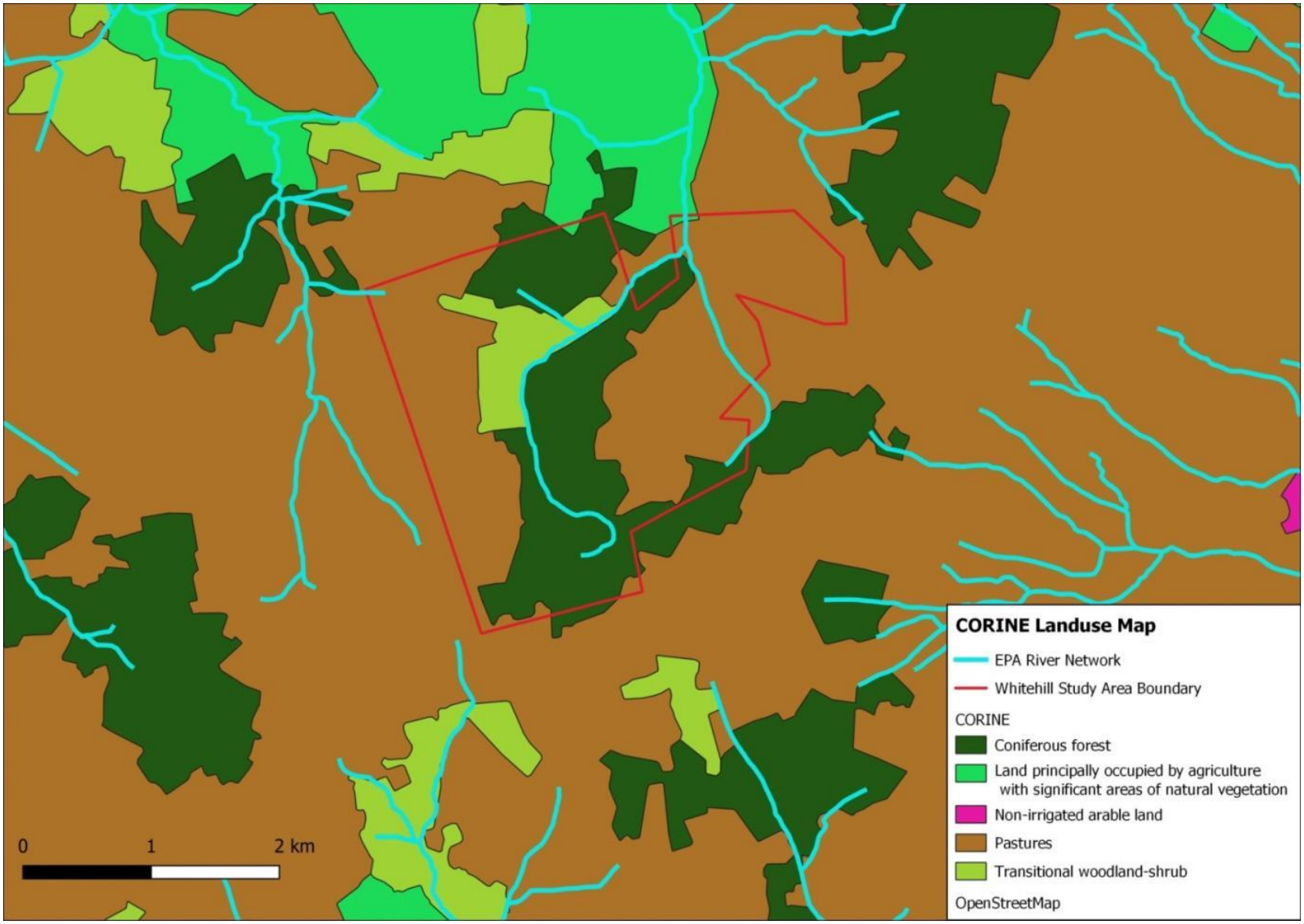


Figure 2. CORINE Landuse/Habitat of White Hill Wind Farm



1.4 Designated Sites

The Study Area is not located within or adjacent to an EU Designated Site or National Designated Site (See Figure 3). The closest EU designated site is River Barrow and River Nore Special Area Conservation (SAC) (Site code 002162) located 1.2km to the northwest of the Study Area. The River Barrow and River Nore SAC is downstream of the wind farm site and is hydrologically connected with the site via the Knocknabranagh and Knockbaun stream. In addition, all of the surface waterbodies draining the UGL drain into the River Barrow and River Nore SAC.

The following key qualifying aquatic species and habitats of the River Barrow and River Nore SAC are potentially likely to be at risk from deterioration in water quality:

- Annex I Habitat- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260];
- Annex I Habitat- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029];
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092];
- *Petromyzon marinus* (Sea Lamprey) [1095];
- *Lampetra planeri* (Brook Lamprey) [1096];
- *Lampetra fluviatilis* (River Lamprey) [1099];
- *Alosa fallax fallax* (Twaite Shad) [1103];
- *Salmo salar* (Salmon) [1106];
- *Lutra lutra* (Otter) [1355];
- *Trichomanes speciosum* (Killarney Fern) [1421];

According to the NBDC database there are no historical records for the Annex II protected Freshwater Pearl Mussel in the immediate vicinity of the proposed development site, the closest record lies c. 12km to the west downstream of the development site. The River Barrow and River Nore SAC is, therefore, considered to be Very Sensitive to the effects of water quality deterioration.

Potential impacts and likely significant effects on the **River Barrow and River Nore SAC** could include the following:

- Temporary significant pollution risk (negative impact) to protected habitats and species. This risk is related to the potential for the release of construction related pollutants. Any impact could result in adverse effects to qualifying Annex I habitats and species.
- Ongoing risk of pollution and disturbance during operation of the White Hill Wind Farm due to pollutants that enter watercourses from maintenance works or that are contained in road surface water run-off.
- Due to the hydrological connectivity, the introduction of invasive species via this waterway may also have a potential indirect impact on the Annex I habitats and species within this SAC.

The closest EU Birds Directive Special Protected Area (SPA), the River Nore SPA (Site Code 004233) is located 12km to the west. The proposed development is hydrologically connected to the River Nore SPA. The River Nore SPA is of high ornithological importance as it supports a nationally important

population of Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive. The next closest SPA's are the Slieve Bloom Mountains SPA and Wicklow Mountains SPA located 39km and 45km respectively to the northwest and north east. Slieve Bloom Mountains SPA is of special conservation interest for the Annex I species, the Hen Harrier. The Wicklow Mountains SPA is of special conservation interest for the Annex I species Merlin and Peregrine Falcon. There is no hydrological on habitat connection between these SPA's and the proposed development site. Potential indirect ex situ impacts on these SPA's would need to be considered due to possible use of the proposed development site by birds from these SPA's e.g. juvenile hen harriers are known to roam widely and can occur in the east of the country during the winter months.

Located over 66km to the west of the Study Area is the Slievefelim to Silvermines Mountains SPA. There is no habitat or hydrological connection to this SPA and features of interest (species) for which this site has been designated include Hen Harrier which are an Annex 1 species of special conservation interest for the EU Birds Directive.

The avoidance of potential significant impacts (direct and indirect) on European Designated Sites (Special Areas of Conservation (SAC) and Special Protection Areas (SPA) and nationally designated (NHA'S, pNHA's) sites are key considerations informing the constraints assessment of the Study Area.

Potential impacts and likely significant effects on the **River Nore SPA** could include the following:

- Due to hydrological connectivity, temporary significant pollution risk (negative impact) to the riparian habitats and invertebrates and small fish (Stickleback, Minnow, and Chub) on which the SPA qualifying interest (Kingfisher) depends on.
- Introduction of invasive species via this waterway may also have a potential indirect impact on the riparian habitats and indirectly impact the Kingfisher which depend on the riparian habitats.

A number of national designated sites are located within 15km of the Study Area these include;

- Mothel Church, Coolcullen
- Coan Bogs NHA
- Whitehall Quarries pNHA
- Ballymoon Esker pNHA
- Esker Pits pNHA
- Ardloo Fen pNHA
- Cloghristick Woods pNHA

The closest nationally designated sites are Mothel Church, Coolcullen pNHA (2km to the north west), Whitehall Quarries pNHA and Coan Bogs NHA (located c. 4km to the south east and north west respectively). All other designated sites are located greater than 5km from the proposed development site.

Figure 3. White Hill Study Area and EU and National designated sites within 15km of the study area boundary.

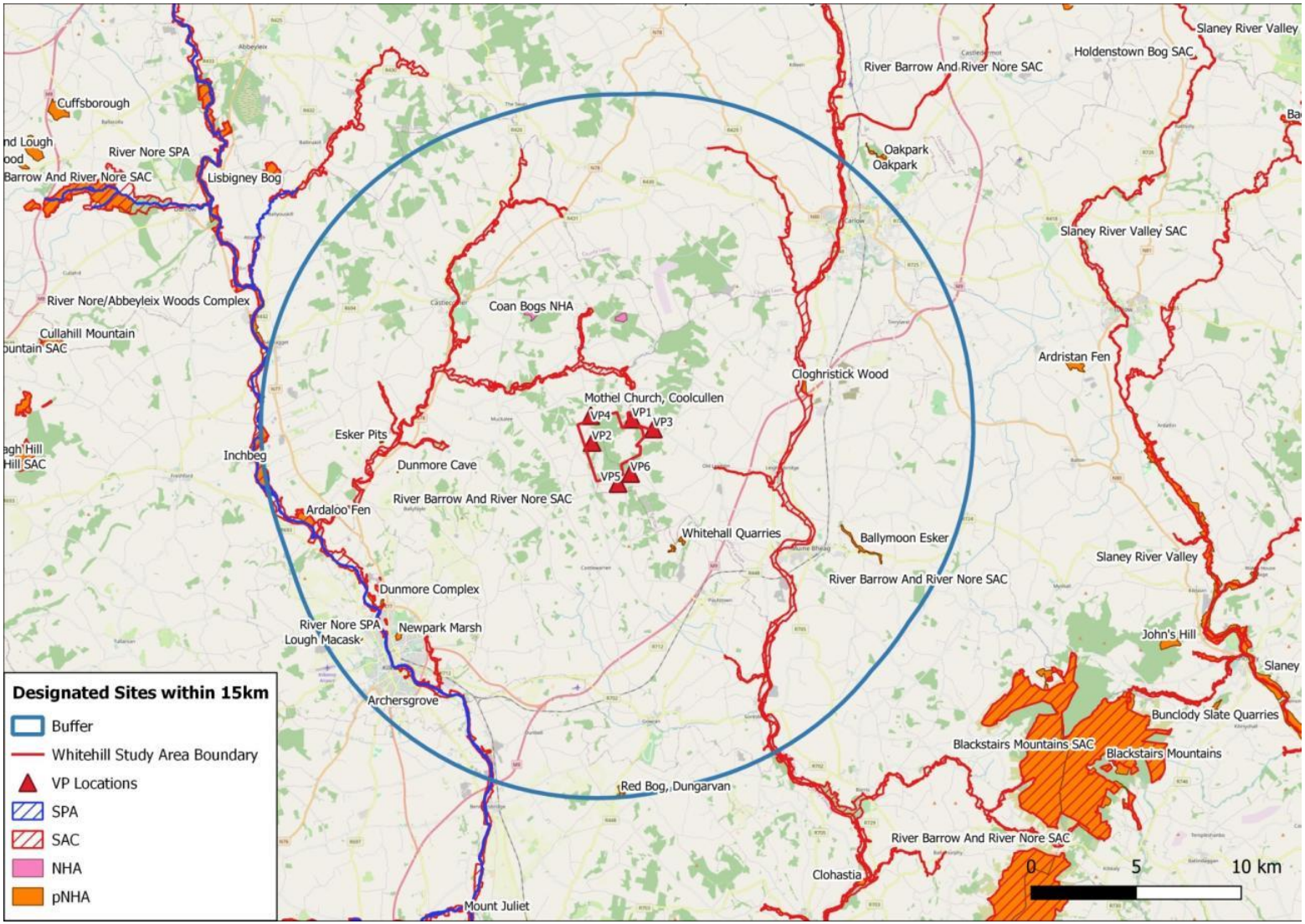


Table 1. EU designated sites hydrologically connected to the White Hill Wind Farm Site.

Designated Site	Site Code	Distance (km)	Qualifying Interests	Source-Pathway-Receptor Links
River Barrow & River Nore SAC	**002162**	1.2	River Barrow and River Nore SAC consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Its conservation objectives relate to maintaining the favorable conservation condition of the following qualifying interests (NPWS, 2011); • Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Reefs [1170] • Salicornia and other annuals colonising mud and sand [1310] • Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] • European dry heaths [4030] • Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] • Petrifying springs with tufa formation (Cratoneurion) [7220] • Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Yes - hydrological connectivity via Knockbrannagh and Knockbaun stream which flows into the Dinin River which in turn flows into the River Nore.

Designated Site	Site Code	Distance (km)	Qualifying Interests	Source-Pathway-Receptor Links
			• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] • Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016] • *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] • *Austropotamobius pallipes* (White-clawed Crayfish) [1092] • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Lampetra fluviatilis* (River Lamprey) [1099] • *Alosa fallax fallax* (Twaite Shad) [1103] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355] • *Trichomanes speciosum* (Killarney Fern) [1421] • *Margaritifera durrovensis* (Nore Pearl Mussel) [1990] The status of the freshwater pearl mussel (*Margaritifera margaritifera*) as a qualifying Annex II species for the River Barrow and River Nore SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species. Please note that the Nore freshwater pearl mussel (*Margaritifera durrovensis*) remains a qualifying species for this SAC. This document contains a conservation objective for the latter species.	
River Nore SPA	**004233**	12	The River Nore SPA is a long, linear site. The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the Annex I bird species; • Kingfisher *Alcedo atthis*. Its conservation objectives relate to maintaining the favourable conservation condition of the qualifying interest (NPWS, 2011) the Kingfisher *Alcedo atthis*.	Yes - hydrological connectivity via Knocknabrannagh and Knockbaun stream which flows into the Dinin River which in turn flows into the River Nore.

2 Methodology

In order to examine potential impacts on flora and fauna, a series of detailed ecological surveys have been commissioned by Carlow Wind Ltd from 2019 to2021. Ecology Ireland Wildlife Consultants Ltd. are currently carrying out the terrestrial and aquatic ecology surveys. As well as the field surveys described below, consultations and a desktop review of relevant data available for the study area is also being undertaken.

The following ecological surveys have been completed or are ongoing at the site:

- Bird Surveys (Winter 2019/20 & 2020/21 and Summer 2020 & 2021)
- Habitat and Botanical Survey (Summer 2021)
- Aquatic Ecology Survey (Sumer 2021)
- Other Fauna Survey (Amphibians, Invertebrates)- Summer 2021
- Mammal camera survey (Summer 2021)
- Mammal walkover surveys (Summer 2021)
- Active bat detector survey (Summer/Autumn 2021)
- Passive bat detector survey (Summer 2021)
- Grid Route Survey- Bats & Mammals (Summer 2021)
- Grid Route Survey- Habitats & Botanical (Summer 2021)
- Turbine Delivery Route – POI baseline ecological assessment (Summer 2021).
- Check of Replant lands (Summer 2021)

2.1 Guidance

The ecological assessment and scoping has been undertaken with due consideration to the following guidelines:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial,
- Freshwater and Coastal (CIEEM, 2018);
- SNH (2019) 'Bats and onshore wind turbines: survey, Assessment and mitigation';
- Draft Revised guidelines on the information to be contained in Environmental Impact
- Statements (EPA, 2017);
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).
- Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009).
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA,2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).
- Smith *et al*. (2011). Best Practice Guidance for Habitat Survey and Mapping in Ireland.

2.2 Desktop Study

The desk study to be undertaken for this assessment includes a thorough review of available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA (Envision), Water Framework Directive (WFD), Geological Survey of Ireland (GSI) & Inland Fisheries Ireland (IFI).
- Review of the Bat Conservation Ireland (BCI) Private Database.
- Review of the publicly available National Biodiversity Data Centre (NBDC) webmapper.
- Data on potential occurrence of protected bryophytes – as per NPWS online map viewer; Flora Protection Order Map Viewer – Bryophytes.
- Inland Fisheries Ireland (IFI) Reports.
- Records from the National Parks and Wildlife Services ('NPWS') WS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed Development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files

2.3 Habitats & Botanical

The habitat and flora survey will involve undertaking a desktop review and a baseline field assessment of the habitats and flora within the Study Area including the grid connection route, turbine delivery route and replant lands. As part of the desktop study a review of botanical data available for the study site will be carried out to identify botanical species of conservation interest (e.g. rare, legally protected) and invasive species previously recorded within the relevant national grid squares that overlap the study site. The habitat and flora field assessment will be carried out in accordance with best practice guidance (Smith *et al*. 2011). This will involve a walkover of the Study Area where the dominant habitats present will be mapped and classified according to Fossitt (2000) and where botanical species will be identified and recorded according to dominant habitat type. The extents of habitats will be recorded on a field map along with notes of the botanical species present and their relative abundance described using the DAFOR scale. In addition, observations of interest (e.g. invasive plant species, rare plants etc.) will be recorded using GPS.

Evaluation of the habitats present in terms of their biodiversity value is assessed using criteria amended after NRA 2009 and Nairn & Fossitt 2004. The correspondence of any habitats within the study area to those listed on Annex I of the EU Habitats Directive 92/43/EC will be evaluated with reference to the European Commission (2013) and the NPWS (2013). The conservation status of habitats and flora will also be considered in respect of the following: Irish Red List for Vascular Plants (Wyse Jackson *et al*. 2016); Irish Red List for Bryophytes (Lockhart *et al*. 2012), Flora Protection Order (1999 as amended 2015); the EU Habitats Directive (92/43/EEC).

2.4 Birds

Bird surveys are currently being completed to establish baseline data from which any future changes can be assessed and to identify the presence of any species of conservation concern. The site is being surveyed using methodology outlined in Percival (2003) and SNH (2017) Guidelines for Surveying On-shore Wind Farms. Site visits include standard line transects, walkover surveys (e.g. Brown & Shepherd, 1993) and vantage point surveying techniques, taking account of the proposed site layout and a buffer zone of at least 500m. All bird species heard, or seen, within and surrounding the site

were recorded using the standard British Trust for Ornithology bird registrations with evidence of breeding following Bibby *et al*. 2000. All bird observations are being recorded, however, particular attention is being paid to target species; Red- and Amber- listed species, Annex I species, and species that are considered vulnerable to wind farm developments. Bird surveys will also include a general assessment of bird usage along the grid connection route and at any replant lands and at POIs on the Turbine Delivery Route (TDR).

In accordance with best practice, two full years of vantage point surveys are required. These surveys will be completed in accordance with published best practice guidance e.g. SNH, 2017. The full survey effort requirements of 72 hours per VP per year (as recommended by SNH, 2017) will be adhered to, within the time frame of this study, and the surveys will be undertaken by experienced field ornithologists. Vantage point surveys commenced at six vantage points in November 2019 and continue to be conducted on a monthly with completion of surveys due in August 2021.

For assessment of sites for wind farm development, emphasis is placed on the following groups of birds or species which are considered potentially sensitive to collision and/or disturbance:

- Waders, such as Lapwing, Golden Plover, Curlew and Snipe
- Other waterbirds, including ducks and gull species
- Hen Harrier, Merlin and other birds of prey
- Red Grouse
- Any other Annex 1 species of EU Birds Directive
- Any other Red- or Amber-listed species as given in Gilbert et al., 2019.

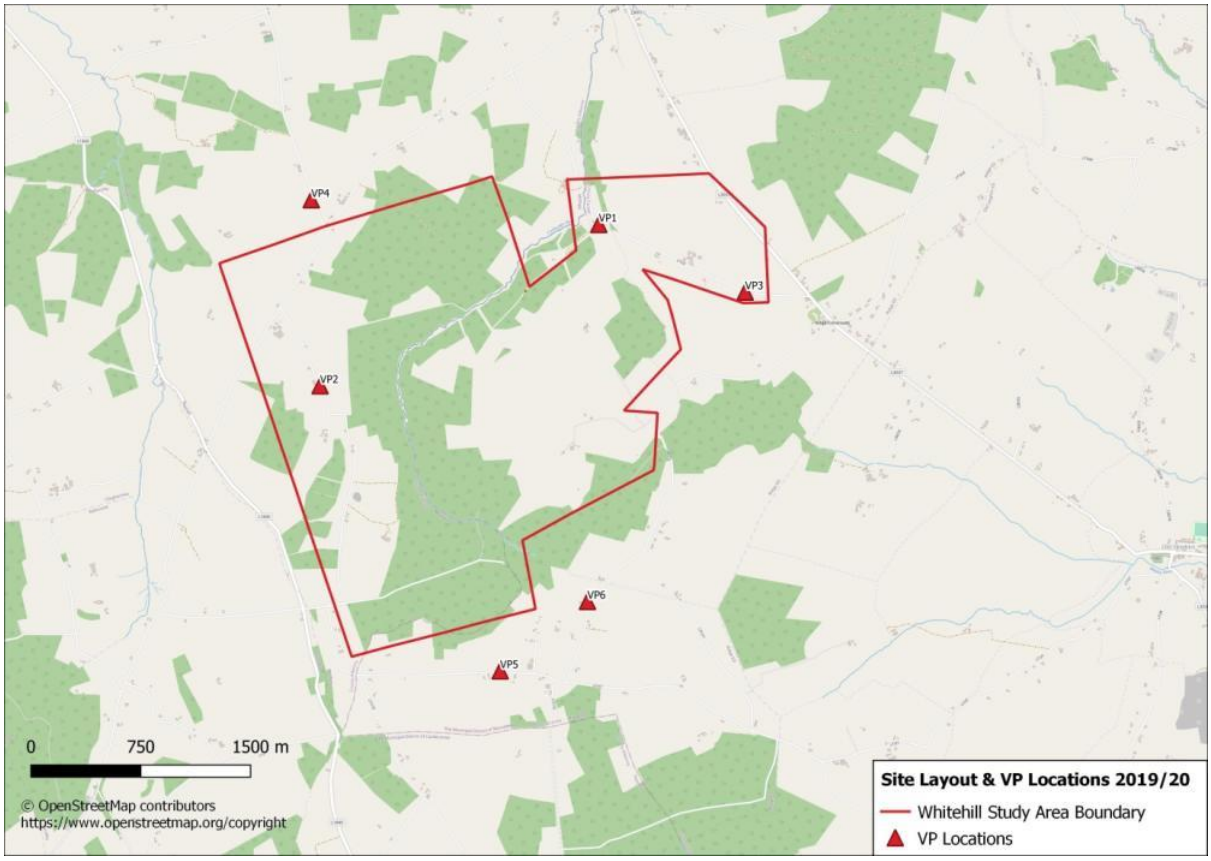


Figure 4 White Hill Wind Farm Study Area and Vantage Point (VP) Locations with areas shaded in green denoting forestry cover.

2.5 Aquatic Ecology

Aquatic Surveys for the proposed development are due to commence this summer (2021). Freshwater Pearl Mussel (FWPM) *Margaritifera margaritifera* habitat suitability survey is included in the survey scope as FWPM are a conservation interest of the River Barrow and River Nore SAC downstream of the site. If it is found that suitable habitat for FWPM exists within the site or downstream of the site then a dedicated FWPM survey may be required.

All watercourses within or adjoining the development site will be considered as part of the current baseline assessment. The baseline surveys will focus on the ecological evaluation of aquatic habitats in relation to fisheries habitat, amphibians, macro-invertebrates, (physiochemical) water quality, macrophytes (aquatic plants), aquatic invasive species and other aquatic species of conservation value which may occur within the watercourses in the footprint of the development site. Additionally, a desktop review will be undertaken to collate available ecological datasets pertaining to the natural environment of the aquatic survey sites and wider study area (e.g. NBDC & NPWS data).

The ecological significance of each aquatic survey site will be evaluated according to the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

2.6 Mammals

A desktop review of data available on mammal occurrence in proximity to the study site was undertaken by consulting online databases. A mammal survey of the study area has yet to be completed but will be undertaken in Summer/Autumn 2021. This will involve walkovers of the proposed development area, identifying mammal species or signs of mammal activity seen (e.g. droppings, tracks, burrows etc.), and recording observations using field notes and/or hand held GPS units. Techniques used to identify mammal activity followed recognised guidelines (e.g. Clark 1988, Bang & Dahlstrom 2004 and JNCC 2004). All casual observations of mammals, sightings, tracks or signs will be noted during the course of other walkover surveys will also be recorded.

In addition, digital trail cameras (Camera-traps) which take photographs and/or video when triggered by heat or motion, will also be deployed to record mammal activity across the study area. Any sightings or signs of mammals along the grid route will also be recorded. Similarly, any casual sightings of mammals observed along the turbine delivery route or wider hinterland will be recorded.

The conservation status of mammal species will be considered. The conservation status of mammals within Ireland and Europe is indicated by inclusion in one or more of the following: Irish Wildlife Acts (1976 - 2012); Red List of Terrestrial Mammals (Marnell *et al.* 2009); EU Habitats Directive. The evaluation of the site for mammals follows the criteria presented in Nairn & Fossitt.

2.7 Bats

A desktop study of available information on the bat potential of the local area was carried out, with particular attention given to the model of Bat Landscapes as available on the NBDC website. This model is based on the relative importance of landscape and habitat associations for bat species across Ireland (see Lundy *et al.* 2011). It suggests that the proposed development area has generally low suitability for bats, with most potential for Common Pipistrelle *Pipistrellus pipistrellus* and Brown long-eared bat *Plecotus auritus*. A daytime assessment of the bat potential of the habitats present in the area for roosting/foraging will be undertaken, where old ruined structures and habitats of potential value to bats will be checked for evidence of the presence of bats. The presence and pattern usage of the site and along the grid route will be assessed using both passive and active survey techniques. Time expansion bat detectors will be used to record bat vocalisations with these calls analysed and species identified using specialist software. In active surveys, ecologists will walk and drive transects on several nights to record the presence and distribution of any bats active in the area. According to the Scottish Natural Heritage (SNH 2019) methodology, passive bat detectors will be deployed at each of the selected turbine locations for a minimum of 10 consecutive nights in spring, summer and autumn. The deployments at the turbine locations will be of passive detectors that are left in situ to record all activity between sunset and dawn. This multi-season deployment records a huge amount of data which is analysed to record the pattern of activity at each proposed turbine location as well as the relative occurrence of each of the particular bat species present.

Bat surveys commenced at the proposed development site in April 2021 with the deployment of passive bat detectors. Two further monitoring periods (summer and autumn 2021) are due to follow. Active surveys for bats have been scheduled for July 2021.

2.8 Other taxa

A desktop study was conducted to review available records for other taxa such as invertebrates (butterflies, damselflies, dragonflies, moths, beetles etc.), amphibians and reptiles. NBDC records for the grid squares which overlap the proposed development site were reviewed and have been used to inform the scoping report.

Other taxa (e.g. Lepidoptera, Odonata, Amphibians and reptiles) encountered during the ecological field surveys will be casually recorded for inclusion in this assessment. The conservation status of other taxa is assessed by examining their inclusion in one or more of the following: Irish Wildlife Acts (1976 – 2012); Irish Red List for Butterfly (Regan *et al*. 2010); Irish Red List for Damselflies & Dragonflies (Nelson *et al*. 2011); Irish Red List for Amphibians, Reptiles & Freshwater Fish (King *et al*. 2011); Regional Red List of Irish Bees (Fitzpatrick *et al*. 2006); and the EU Habitats Directive.

3 Existing Environment & Key Constraints

3.1 Habitats & Botanical

Habitat and botanical surveys have yet to commence at the proposed development site; however a desk top study has been carried out for the site to identify habitats and botanical species of conservation interest (e.g. rare, legally protected) and invasive species previously recorded within the relevant national grid squares that overlap the study site

A desktop review was undertaken to collate and review available information, datasets and documentation sources pertaining to the flora and habitats of the Study Area. Records and information available from the following sources were reviewed;

- National Biodiversity Data Centre (NBDC)[1],
- Botanical Society of Britain and Ireland (BSBI) dataset and distribution maps[2];
- NPWS Flora Protection Order (FPO) Bryophytes database;
- NPWS Article 17 Metadata and GIS Database Files
- Environmental Protection Agency (EPA) Rivers and Lakes dataset;
- Ancient and Long-established Woodland Inventory 2010 dataset;
- National Forestry Inventory and Planning System (FIPS, 1998);
- CORINE Landcover mapping layer (2012);
- OSI mapping - Discovery series at 1:50,000 scale; 6inch and 25inch historical mapping as available on Geohive OSI Mapviewer;
- Aerial Imagery- Google Earth, Bing.
- Geological Survey Ireland Mapviewer
- Teagasc/EPA Soil Information System (SIS) Mapviewer

According to the GSI and EPA Mapviewers, the underlying bedrock is that of Westphalian shales and sandstones consisting of the Coolbaun Formation and the Swan Sandstone Member. The Coolbaun

[1] NBDC database accessed 24/01/2021 & 02/02/2021

[2] BSBI data accessed 03/02/2021

Formation is described by the GSI as consisting of shales and sandstone with thin coals while the Swan Sandstone member is composed of laminated dark-grey siliceous sandstone. The northern section of the UGL is also underlain by Westphalian shales and sandstones of the Coolbaun Formation. Further to the southwest, the UGL is underlain by Namurian Sandstone of the Bregaun Flagstone Formation consisting of thick flaggy sandstone and siltstone. Namurian Shales of the Killeshin Siltstone Formation and the Luggacurren Shale Formation are located further south. The southern half of the UGL is mapped to be underlain by Dinantian Pure Bedded Limestones of the Ballyadams Formation and the Clongrenan Formation.

3.1.1 Habitats

From a review of datasets, aerial and OSI mapping, the following habitats are considered as potentially occurring at the proposed development site, classified in accordance with Fossitt (2000);

- Conifer Plantation (WD4)
- Improved agricultural grassland (GA1)
- Scrub (WS1)
- Mixed broadleaved woodland (WD1)
- Treelines (WL2)
- Hedgerows (WL1)
- Recently felled woodland (WS5)
- Wet grassland (GS4)
- Eroding upland rivers (FW1)
- Drainage ditches (FW4)
- Dry meadows and grassy verges (GS2)
- Dry calcareous and neutral grassland (GS1)

Field surveys will be needed to confirm the habitat types within the proposed development footprint. The habitats within the study area reflect a landscape that has been the subject of considerable anthropogenic influence having undergone reclamation, drainage and land improvement measures as well as widespread planting with commercial coniferous forestry. Linkages to Annex I habitats are therefore unlikely to be prevalent however field surveys will be needed to verify this. Some habitats with potential for linkages to Annex I habitats include;

- **Dry meadows and grassy verges (GS2)-** *Links with Annex I:* Corresponds to the annexed habitat, 'lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* (6510)'.
- **Wet grassland (GS4)-** *Links with Annex I:* Wet grassland may contain examples of the annexed habitat, '*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410)'.
- **Dry calcareous and neutral grassland (GS1)-** *Links with Annex I:* Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'. Grassland with scattered Juniper *(Juniperus communis)* could also be included in the Annex I category, '*Juniperus communis* formations on heaths or calcareous grasslands (5130)'. Grasslands of old mine workings can correspond to the annexed habitat, '*Calaminarian* grasslands of the *Violetalia calaminariae* (6130)' if they are judged to be of interest. There are no naturally-occurring grasslands of this latter type in Ireland.

- **Eroding upland rivers (FW1)-** Links with Annex I- Floating River Vegetation, or "3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation"

A review was undertaken of NPWS Article 17 data sets and other available datasets and reports to establish if there were existing records for any EU Annex I protected habitats or other ecologically sensitive habitats present within the proposed development site. The following datasets were consulted;

- Article 17 datasets for Annex I habitats;
- Ancient and Long established Woodland dataset- (Perrin *et al*., 2010)
- National Survey of Native Woodlands- (Perrin *et al*., 2008)
- Irish Semi-Natural Grassland Survey 2007-2012 (O'Neil *et al*., 2013)

The National Survey of native woodland 2003-2008 dataset (Perrin *et al.,* 2008) did not record any native woodland within or adjacent to the Study Area. A review of the Ancient and Long-established Woodland Inventory (Perrin *et al*., 2010) found that there are no ancient or long established woodlands on or adjacent to the proposed development site. According to the Ancient and Long-established Woodland Inventory (2010) ancient woodland is defined as woodland stands which have been continuously wooded since 1660 and Long established woodland is defined as having been continuously wooded since 1830. The National Semi-natural grassland Survey dataset does not hold records for any semi-natural grassland habitats within or adjacent to the proposed development site. the aerial imagery).

3.1.2 Flora

A review was carried out of historical botanical records for the grid squares that overlap the proposed development site. One red listed "near threatened" species (Wyse-Jackson *et al*., 2016) has historically been recorded within the 2km grid squares (S55T) that overlap the study site; *Veronica agrestis or* Green speedwell. This plant is found on bare, disturbed ground and has been classified as near threatened due to a decline in its areas of occupancy.

Table 2 Rare or protected plant species that have previously been recorded from the 2km grid square S55T (after NBDC & BSBI databases).

Common Name	Scientific Name	Flora Protection Order 2015	Red Data Book Category (Wyse-Jackson *et al*., 2016)	Grid Square	Habitat
Green speedwell	*Veronica agrestis*	Not listed	Near threatened	2km Grid-S55T	Found on bare, disturbed ground

3.1.3 Invasive Plant Species

The NBDC[3] database and BSBI database for the grid squares overlapping the study site hold records for nine non-native invasive plant species (after NBDC & BSBI databses) See table 1.2. Four of these

[3] https://maps.biodiversityireland.ie/Map (accessed 02/02/2021 & 27/05/2021)

species are categorised as high Impact invasive species (Kelly *et al*., 2013; NBDC dataset) and four are listed in the Third Schedule Part I under Regulations 49 and 50 of the European Communities (Birds and natural Habitats) Regulations 2011. Regulation 49 of the 2011 Regulations prohibits the planting, allowing or causing dispersal, and spreading of any plant listed in the Third Schedule. The remaining species are medium risk or uncategorised and are not listed in the Third Schedule.

Table 3 Non-native invasive plant species which have been recorded from the 10km grid square S66 and 2km grid squares which overlap the wind farm and grid connection route (S66C, S66I, S66D, S56U, S56W, S56X, S55R, S56T, S56U) (after NBDC & BSBI databases).

Common Name	Scientific Name	Listed in Third Schedule Part I * (Y/N)	Risk Rating (Kelly *et al*., 2013) and/or NBDC Risk rating
Japanese Knotweed	*Fallopia japonica*	Y	High
Cherry Laurel	*Prunus laurocerasus*	N	High
Winter heliotrope	*Petasites fragrans*	N	N/A
Sycamore	*Acer pseudoplatanus*	N	Medium
Narrow-leaved Ragwort	*Senecio inaequidens*	N	Medium
Indian Balsam	*Impatiens glandulifera*	Y	High
Canadian waterweed	*Elodea canadensis*	Y	High
Water Fern	*Azolla filiculoides*	Y	Medium
Himalayan honeysuckle	*Leycesteria formosa*	N	Medium

3.1.4 Key Constraints

No key constraints have been identified on the ground to date as habitat and botanical surveys have yet to commence. Based on a desktop review, there are no historical records of Annex I protected habitats onsite or close to the proposed development. One botanical species classed as near threatened on the red list is located along the grid route. Botanical surveys will be carried out to identify areas where this plant occurs and mitigation by avoidance will be applied where possible. Key semi-natural habitats to avoid where possible and protect onsite include riparian habitats, hedgerows, treelines and areas of semi-natural grassland and woodland which support and enhance local biodiversity.

Non-native invasive plant species

Nine non-native invasive plant species (after NBDC & BSBI databases) have been historically recorded within the development footprint. Four of these species are categorised as high Impact invasive species (Kelly *et al*., 2013; NBDC dataset) are listed in the Third Schedule Part I under Regulations 49 and 50 of the European Communities (Birds and natural Habitats) Regulations 2011. Key areas where potential constraints may occur in relation to invasive plant species include at stream crossings for the wind farm and grid route where there is potential for invasive species to spread via watercourses. Field surveys will identify locations of invasive plant species at stream crossings and where possible these areas will be avoided via the design of the stream crossings and development footprint, where this is not possible mitigation measures will be provided to avoid the potential spread of these species.

3.1.5 Recommendations- Habitats & Botanical

Mitigation by avoidance should be applied at the earliest stage of development during the design phase. While there does not appear to be Annex I protected species within the study area based on a

desk review the design phase should take into account areas of local biodiversity value and where possible avoid these e.g. wet grassland, dry calcareous and neutral grasslands, areas of semi-natural woodland and scrub, hedgerows and riparian zones. These areas while not within designated sites do support the local biodiversity and provide a function as ecological stepping stones and corridors between areas of natural habitat and designated sites. They are also refuges for a range of flora and fauna species e.g. birds, bats and non-volant mammals, invertebrates.

The CEMP which will accompany any future planning application will include measures to ensure that the potential risks to terrestrial and aquatic habitats and species are comprehensively addressed. Standard mitigation measures will include commitments such as:

- No removal of habitats or movement of construction machinery will occur outside of the development works area/footprint during the construction phase, where the works area/footprint will be clearly marked for associated site staff.
- All of the works and mitigation measures will be monitored by a suitably qualified ecologist during the construction period, with findings reported to the competent authority.
- An outline Landscape and Biodiversity Management Plan will be developed and will be finalised under the advice of a suitably qualified/experienced Ecologist that may also include the provision of biodiversity habitats in addition to those proposed by the landscaping plan (e.g. pollinator friendly meadows and grassland, riparian zone planting along watercourses/water features) as well as monitoring/supervision of the management plan when implemented. Similarly, a series of biodiversity enhancement measures for terrestrial birds and mammals will be incorporated into the management plan. This would include the provision of roost and nest boxes for birds and bats.
- Existing hedgerows and trees to be retained at/near the site will be protected in line with current guidelines (*e.g*. NRA 2006).
- Vegetation clearance will be carried out outside of the bird breeding season (March 1st to August 31st) and tree removal will be under the supervision of a suitably qualified ecologist.

Recommendations- Non-native invasive plant species

Habitat and botanical surveys will identify the locations of invasive plant species within the wind farm site and along the grid connection and points of interest along the turbine delivery route. Mitigation by avoidance of these areas will be implemented where possible. Where construction works are required in areas where non-native invasive plant species occur, the EIAR will incorporate recommendations to avoid significant potential impacts from the spread of invasive plant species.

3.2 Aquatic Ecology

Aquatic ecology field survey work have yet to commence but are scheduled to take place over the summer of 2021. A key constraint identified at the scoping stage is the presence downstream of the EU Habitats Directive Annex II protected species the Freshwater Pearl Mussel. The proposed development is located in the **Lower Nore Freshwater Pearl Mussel sensitive area** categorised as "*Catchments with previous records of Margaritifera, but current status unknown*". According to the desktop study (after NBDC), the closest FWPM record is located c. 12km to the west in the River Nore. Other potential aquatic ecological receptors include the Annex I Kingfisher and Annex II Otter which are known to be present in the areas overlapping the proposed development site along with other aquatic species potentially located downstream of the site;

- White-clawed Crayfish;
- Sea Lamprey;
- Brook Lamprey;
- River Lamprey;
- Twaite Shad;
- Salmon;

The proposed wind farm site is located predominantly in the River Nore surface water catchment within Hydrometric Area 15. However, the southernmost section of the wind farm site, including the location of the proposed electricity substation, is located within the River Barrow surface water catchment within Hydrometric Area 14. On a more local scale, the majority of the wind farm site (including all of the proposed turbine locations) is located in the Dinin River surface water catchment (Dinin [South]_SC_010). The Knocknabranagh and Knockbaun stream (EPA Code: 15K25) drains the majority of the wind farm site and discharges into the Dinin River approximately 2km north of the site.

The small portion of the southern section of the wind farm site, including the proposed electricity substation, lies within the Barrow River surface water catchment (Barrow_SC_120). This area is drained by the Monefelim stream (EPA Code: 14M03), located less than 1km to the southwest of the proposed substation location. This watercourse flows to the southeast and discharges into the Barrow River approximately 12.5km from the site.

3.2.1 Recommendations- Aquatic Ecology

No key constraints on the ground have been identified to date as aquatic ecology surveys have yet to commence. A Freshwater Pearl Mussel *Margaritifera margaritifera* (FWPM) habitat suitability survey has been included in the field survey scope of works to be conducted this summer. FWPM are a qualifying interest of the River Barrow and River Nore SAC downstream of the site. If it is found that suitable habitat for FWPM exists within the site or downstream of the site then a dedicated FWPM survey may be required.

The design and implementation of a highly functional site drainage system with integrated silt management and flow attenuation management will also be key in mitigating any potential aquatic ecological impacts and crucial if FWPM are located in the close vicinity of the site.

Standard measures will be applied to mitigate potential impacts on the aquatic ecology. The creation of a buffer zone around watercourses is a key mitigation measure for a wind energy project in terms of aquatic ecology. The 20m buffer recommended by IFI is proposed to be increased by a factor of 2.5 to become a 50m buffer zone (apart from at watercourse crossings) within which works will be limited and will require the erection of appropriate measures such as silt fencing. The CEMP which will accompany any future planning application will include measures to ensure that the potential risks to aquatic habitats and species are comprehensively addressed. A Surface Water Management Plan will also be included in the CEMP which will be based on the detailed design and will include site specific silt, pollution and flow management measures.

3.3 Birds

Bird surveys have been carried out at the proposed development site since winter 2019/20 through the breeding season of 2020 and second winter of 2020/21. The 2021 breeding season survey is ongoing.

3.3.1 Desktop Study

A review of historical avifauna records from online available databases has been conducted for the Study Area. The variety of species recorded in the 10km grid square (S66, after NBDC database) that overlaps the Study Area reflects the range of habitats in the surrounding vicinity including riparian habitat, rough/rushy grassland, coniferous forestry, arable crop farming and improved agricultural grassland. Waterbirds (including wildfowl, waders and gulls) feature in the records due to the presence of significant rivers and their floodplains such as the Nore River and its tributaries (e.g. Dinin River) to the west and north and the River Barrow River to the east. The floodplains of these rivers, some of which are submerged during the winter months, provide attractive foraging wetland habitat for Gull species including the BoCCI Amber-listed Herring Gull (*Larus argentatus),* Black-headed Gull (*Larus* ridibundus) and Lesser Black-backed Gull (*Larus fuscus*). Waders such as Lapwing (*Vanellus vanellus*), Golden Plover (*Pluvialis apricaria*) and large waterbirds such as Whooper Swans (*Cygnus cygnus*) have also been recorded in the vicinity and are also likely to be attracted to these wetland habitats. Riparian habitat adjacent to these rivers supports species such as the Annex I Kingfisher, the Dipper (*Cinclus cinclus*) and Grey Wagtail (*Motacilla cinerea*). Other waterbirds of interest that appear in the records for this area include the BoCCI red listed Curlew (*Numenius arquata*), Wigeon (*Anas penelope*) and Snipe (*Gallinago gallinago*) and the BoCCI amber listed Great Cormorant (*Phalacrocorax carbo*), Common Coot (*Fulica atra*), and green listerd Little Grebe (*Tachybaptus ruficollis*).

A number of raptors occur in the area including the EU Birds Directive Annex I species; Hen Harrier (*Circus cyaneus*) (historically recorded only during the winter months) in addition to other raptor species such as Kestrel (*Falco tinnunculus*)(red listed), Sparrowhawk (*Accipiter nisus*), Buzzard (*Buteo buteo*), Long-eared Owl (*Asio otus*) and Barn Owl (*Tyto alba*) (red listed). The NBDC database also holds historical records of farmland bird species such as the BoCCI red listed Yellowhammer and the amber listed Tree Sparrow (*Passer montanus*) and Skylark (*Alauda arvensis*). Old records dating back to the 1970's and early 80's include the red listed Corncrake (*Crex crex*) and Grey Partridge (*Perdix perdix*) both of which are now very rare, largely confined to the north west (Donegal, Mayo) and Co. Offaly respectively.

Woodland species such as the BoCCI red listed Woodcock (*Scolopax rusticola*) the Eurasian Treecreeper (*Certhia familiaris*) and the Jay (*Garrulus glandarius*) have historically been recorded in this area reflecting the frequent woodland cover that exists in the area.

3.3.2 Results to date

Details of flight-lines for all target species have been recorded within, and in proximity to, the site from vantage point watches from November 2019 to May 2021. Breeding season 2021 vantage points surveys are currently ongoing with data yet to be analysed for winter 2020/21 and breeding season 2021. Casual or incidental sightings of all birds were also recorded during vantage point watches. The assemblage of bird species recorded reflects the woodland and farmland habitats within the area as well as the site's proximity to large rivers and their floodplains such as the Nore and the Dinin. The dominance of conifer plantation is reflected by the occurrence of species such as Goldcrest *Regulus*

regulus, Coal Tit *Periparus ater* and Siskin *Carduelis spinus*, Crossbill *Loxia curvirostra*, Goshawk *Accipiter gentilis* and Great-spotted Woodpecker *Dendrocopus major*. Siskin and Crossbill are considered conifer specialists. The BoCCI amber listed Great-spotted Woodpecker was recorded within the coniferous forestry plantation. This is a recent colonist to broadleaved woodlands in eastern counties of Ireland. There are estimated to be 50-100 pairs in Ireland, usually nesting in oak/broadleaved woodlands with some coniferous woods nearby. A further suite of species is characteristic of more open habitats such as pre-thicket plantation, marginal strips and scrub and included Stonechat *Saxicola torquata*, Meadow Pipit *Anthus pratensis* Whitethroat *Sylvia communis* and Linnet *Carduelis cannabina*.

There is no evidence to show that the Study Area is within a regularly used migration route by birds or a route used by wintering waterfowl between feeding and roost sites. For instance, during 11 months of monthly survey there were no flightlines of swans, geese or ducks over site. The amber Lesser black-backed Gull and herring gull were observed infrequently and as single birds. Golden Plover was the only regularly occurring wader species recorded, occurring only during the winter and spring months and therefore these observations are associated with the wintering population and are not breeding in the area. Raptor species that regularly used the site included Buzzard and Sparrowhawk which are widespread, a number of other rarer raptors were recorded such as the red listed Kestrel and the very occasionally recorded Hen Harrier and a possible recording of a Goshawk. The following section focuses on the target species and species of conservation interest recorded within the Study Area.

3.3.3 Birds of conservation concern

Table 4 shows a list of bird species of conservation interest recorded to date within the Study Area including EU Birds Directive Annex I species and species occurring on the red list (high conservation concern) and amber list (medium conservation concern) from the Birds of Conservation Concern in Ireland (BoCCI, 2019) (Gilbert *et al*., 2019).

Table 4 Birds of conservation interest recorded to date at the White Hill Study Area.

Common Name	Scientific Name	BoCCI (2019)	EU Birds Directive Annex I
Kestrel	*Falco tinnunculus*	Red	
Linnet	*Carduelis cannabina*	Amber	
Snipe	*Gallinago gallinago*	Red	
Starling	*Sturnus vulgaris*	Amber	
Swift	*Apus apus*	Red	
Curlew	*Numenius arquata*	Red	
Golden Plover	*Pluvialis apricaria*	Red	Annex I
Goldcrest	*Regulus regulus*	Amber	
Goshawk	*Accipiter gentilis*	Amber	
Grey Wagtail	*Motacilla cinerea*	Red	
Hen Harrier	*Circus cyaneus*	Amber	Annex I
Herring Gull	*Larus argentatus*	Amber	
House Martin	*Delichon urbicum*	Amber	
House Sparrow	*Passer domesticus*	Amber	
Lesser Black-backed Gull	*Larus fuscus*	Amber	

Meadow Pipit	*Anthus pratensis*	Red	
Goshawk	*Accipiter gentilis*	Amber	
Peregrine Falcon	*Falco peregrinus*	Amber	Annex I
Sand Martin	*Riparia riparia*	Amber	
Skylark	*Alauda arvensis*	Amber	
Sparrowhawk	*Accipiter nisus*	Amber	

Three EU Birds Directive Annex I species have been recorded within the Study Area;

- Hen Harrier;
- Golden Plover and;
- Peregrine Falcon.

Annex I bird species are those listed under the EU Birds Directive (Directive 2009/147/EC) as requiring special conservation measures in relation to their habitats. These species have been listed on account of inter alia: their risk of extinction; vulnerability to specific changes in their habitat; and/or due to their relatively small population size or restricted distribution. Curlew was also recorded infrequently within the Study Area, and while not listed as an Annex I species this is a species that is red listed under the Birds of Conservation Concern Ireland (BoCCI 2020-2026) (Gilbert et al., 2019) due to the decline in the resident Irish breeding population having dropped by 98% since the 1980's. The Curlew is also Ireland's only bird which is listed on the IUCN Red List, which has classed the species as near threatened on a global scale. The following sections describe the occurrence of these species within the Study Area during the Winter 2019/20 Season and the 2020 Breeding Season in further detail.

3.3.4 Hen Harrier

There were five sightings of a Hen Harrier during the winter season of 2019/20, four of which were recorded during vantage point watches on the same day during the December 2019 and the fifth a casual sighting recorded in January 2020 (Figure 5). The records consisted of a Ringtail Hen Harrier, the name Ringtail is given to both females and immature hen harriers which are similar in appearance; they are brown with a white rump and have a long, barred tail which gives them the name 'ringtail'. The Ringtail Hen Harrier was recorded for a total of two minutes of vantage point survey time within the Study Area and one minute outside of the Study Area. This hen harrier sighting amounts to 0.094% onsite and 0.046% offsite of total vantage point survey time. The Hen Harrier flight paths are illustrated in Figure 3.0 and the sightings were confined to the southern part of the site, close to the southern boundary. The Hen Harrier was hunting and flying over coniferous forestry, along coniferous forestry margins and over rough grassland. A casual record of a Ringtail Hen Harrier was also recorded in January 2020 within the Study Area south of VP2. The Ringtail was hunting and flushed a mixed flock of starling, field fare and redwing in a nearby field. No further sightings of hen harriers were recorded during the winter season. No hen harriers were observed during the entire 2020 breeding season. There was no evidence of breeding or roosting activity observed.

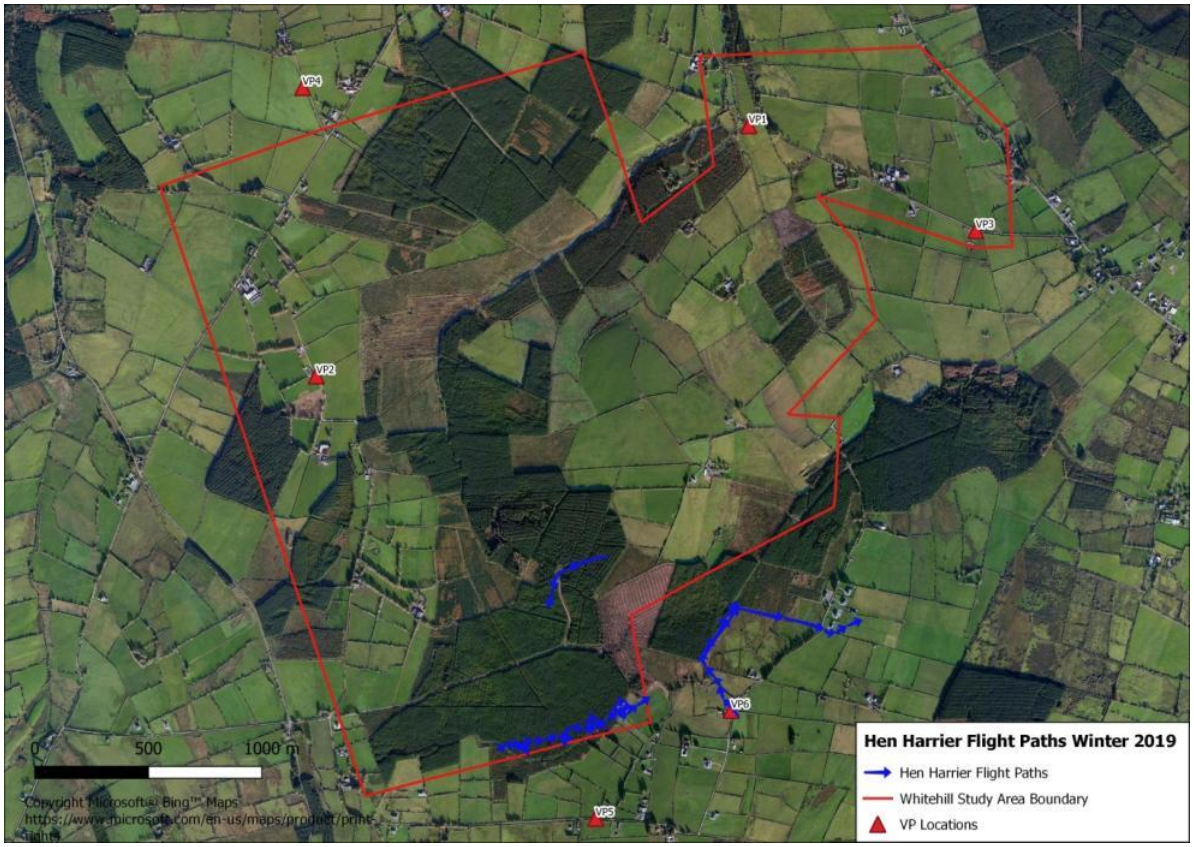


Figure 5 Hen Harrier Flight Paths recorded during the Winter Survey of 2019/20 at the White Hill Wind Farm.

3.3.5 Golden Plover

The most abundant species of conservation concern recorded during the 2019/20 vantage point survey work at within the Study Area was the Golden Plover. This is an Annex I species and is also red listed (BoCCI, 2020-2026), it is classified as being of high conservation concern for both its wintering and breeding populations. Numbers of Golden Plover in Ireland increase significantly during the winter period when overwintering visitors from Iceland, the Faroes and Greenland arrive to spend the winter in Ireland. The estimated national wintering population of golden plover in Ireland is 80,707 for the Republic of Ireland (ROI) (Lewis *et al.*, 2019). Golden Plover are a highly gregarious species; large flocks are known to gather in the winter on a range of habitats, primarily on grassland, cultivated lowlands and coastal mudflats. Their distribution is widespread in Ireland. Golden Plover are a rare breeder in Ireland with breeding confined to heather moors, blanket bogs and acidic grasslands, breeding distribution is limited to the uplands of northwest counties in Ireland.

Golden Plover were recorded during the Winter Survey in the months of November and December 2019 and early during the summer survey in April 2020. All observations of golden plover occurred during the winter months or periods of migration (November – April). A number of flocks ranging in size from 20 to 269 Golden Plovers were observed on the 23rd of April 2020 flying over the Study Area between 8:22am and 13:33pm. Golden Plover were not observed for any other month of the summer survey and the April observations were likely to be from a lingering wintering population.

Golden Plover were generally observed in flocks ranging in size from 18-300 birds flying at heights ranging from 20m-175m above ground level (AGL), a peak count of 500-700 Golden Plover was recorded in Winter 20/21 survey season. During the winter period, Golden Plover flocks were recorded

flying over the Study Area for a total of 30 minutes 33 seconds and were recorded outside of the Study Area for 17 minutes and 55 seconds. The total time spent onsite during the winter period amounts to 1.414% of the overall total winter survey time and the time observed offsite amounted to 0.829% of the total winter survey time. Golden Plover only appeared once during the summer survey in April 2020 for a total of 45 minutes and 9 seconds within the Study Area and 5 seconds outside of the Study Area. The total time spent onsite during the summer period amounted to 2.09% of the overall total summer survey time and the time observed outside of the Study Area amounted 0.004% of the total summer survey time. The Golden Plover flight paths are illustrated in Figure 6 and the sightings were generally recorded over the eastern, south-eastern and central parts of the site mainly over grassland habitat. The majority of the time was spent in the air circling and flying over the site, there were very few instances observed of Golden Plover landing and/or feeding within the Study Area. Golden Plover are not expected to breed within the Study Area but may potentially land and feed within the Study Area during the winter season and when migrating in Spring as suitable foraging habitat (variety of grassland types) exists within the Study Area.

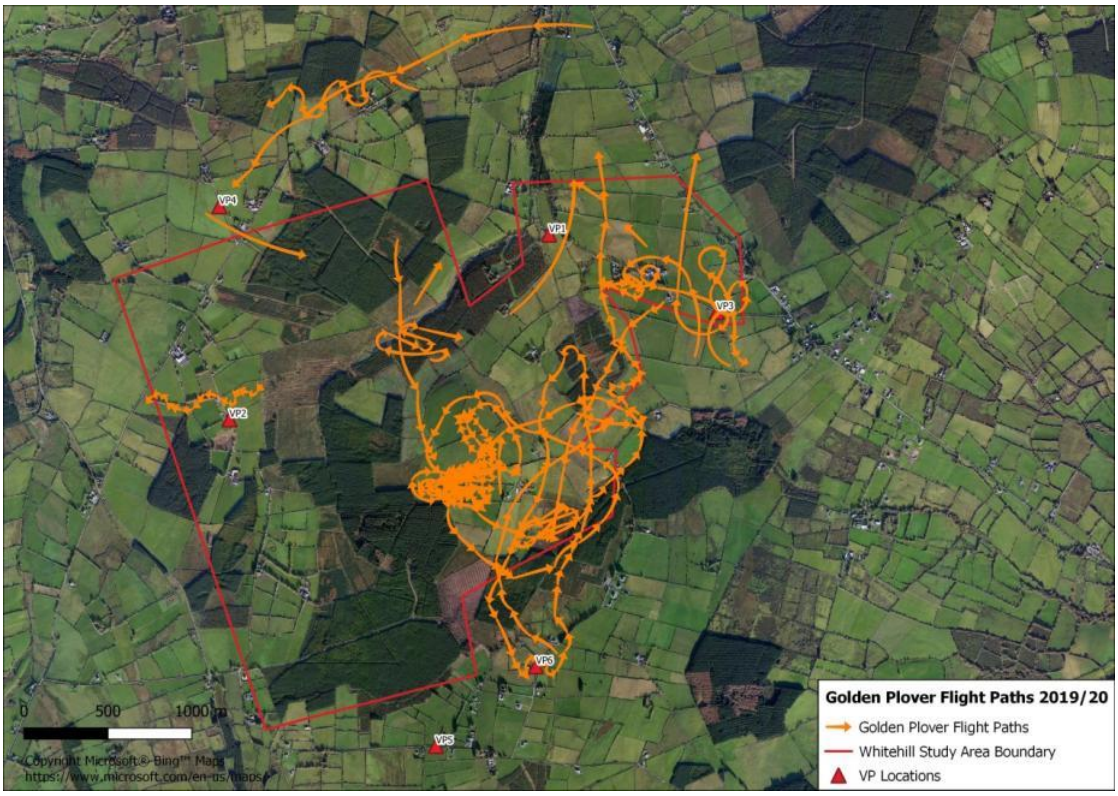


Figure 6 Golden Plover Flight Paths recorded during the Winter Survey of 2019/20 and Spring 2020 at the White Hill Wind Farm.

3.3.6 Peregrine Falcon

Peregrine Falcons are a bird of prey with a heavy powerfully built body which breed on coastal and inland cliffs and quarries. They are an Annex I bird species due to the widespread post-1960 decline in Peregrine numbers caused by food-chain contamination with persistent toxic chemical residues, mainly of agricultural organochlorines insecticides. The restrictions and later bans on the majority of persistent organochlorines over most of Europe were followed by the general recovery in Peregrine

numbers. In Ireland there are an estimated 400 pairs and numbers are thought to be making a slow recovery here.

Two Peregrine Falcon flight paths each of a single bird were observed during the entire winter and summer vantage point survey. These were recorded in the month of November 2019 and August 2020. The Peregrine Falcon flight paths are illustrated in Figure 5 one was within the Study area and one flight path just outside to the south east of VP6. While there are limited natural inland cliffs onsite or in the immediate vicinity where Peregrine Falcons could nest, the Study Area is located approximately 4km from a network of quarries named Whitehall Quarries where nesting Peregrine Falcon could occur however the core foraging range of Peregrine Falcons is generally 2km although a maximum recorded distance of 18km has been observed in Britain (SNH, 2016).

Other birds of conservation interest

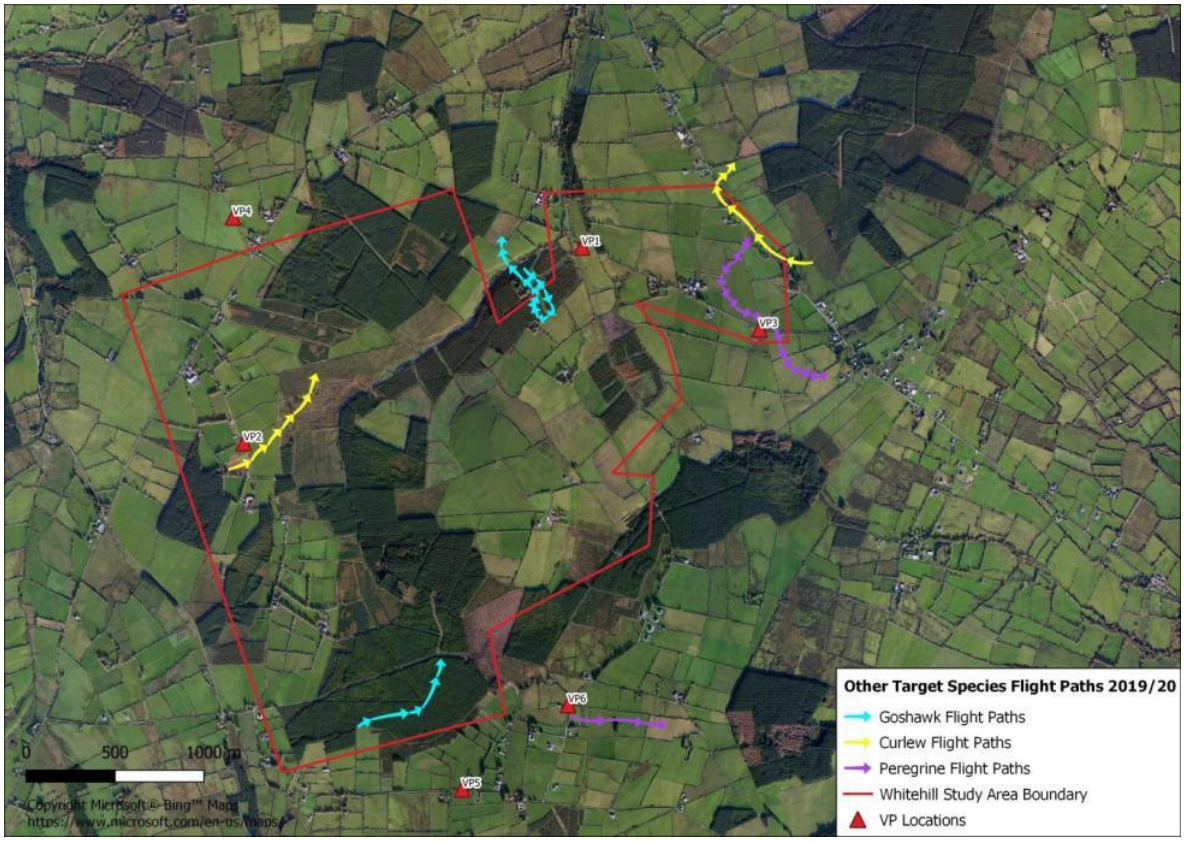


Figure 7 Peregrine Falcon, Curlew and Goshawk Flight Paths recorded during the vantage point surveys at the White Hill Wind Farm.

3.3.7 Northern Goshawk

The Goshawk is a relatively large raptor that is a scarce breeder in Ireland, they have been breeding in Northern Ireland since the early 1990s and a few pairs have been recorded in the Republic of Ireland in recent years. The goshawk requires large blocks of undisturbed forest where it builds a large stick nest. It is an agile hunter and preys on medium-sized mammals and birds, especially wood pigeons, squirrels, crows, rooks and rabbits. Goshawks are solitary outside the breeding season, but pair for life where they are resident and do not migrate. Courtship flights over their forest territories begin in late winter and early spring. These involve aerobatic swoops and dives while fanning out their white

under-tail feathers. The goshawk is Amber Listed in the Irish Birds of Conservation Concern (BoCCI 2020-2026) due to its rarity as a breeding species.

Two records of possible and probable sightings of Goshawk were recorded in the month of December 2019 between VP5 and VP2. It was recorded for 1 minute and 6 seconds within the Study Area in what appeared to be display flight behaviour and a further twenty seconds outside of the Study Area. Figure 7 illustrates the Goshawk Flight paths.

Curlew

The Curlew is Ireland's largest wader and most visible in winter where it can be found in large flocks on coastal mudflats and wetlands throughout Ireland. The Irish population consists of a small resident breeding population which increases in numbers annually by winter visitors from Scotland and Scandinavia. They winter in a wide range of wetland habitats (coastal and inland) and other good feeding areas including damp fields. The breeding population nest on the ground in rough pastures, meadows and heather. Curlews are red listed in Ireland and classified as being of high conservation concern due to resident Irish breeding population having dropped by 98% since the 1980's.

Two Curlew flight paths were recorded in the month of May and July near VP3 and VP2 respectively, each of single bird. In total Curlew spent a total of 60 seconds onsite over the entire vantage point summer survey period, both flights were recorded at a height of <15m AGL. The Curlew flight path are illustrated in Figure 7. No other Curlew sightings were recorded over the course of the remainder of the vantage point surveys.

3.3.8 Constraints & Recommendations

As per SNH Guidance, wind farms present three potential risks to birds (Drewitt & Langston 2006, 2008; Band *et al*. 2007):

(i) Death through Collision or interaction with turbine blades and other infrastructure.
(ii) Direct habitat loss through construction of wind farm infrastructure;
(iii) Displacement (sometimes called indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds;

For each of these three risks, the detailed knowledge of bird distribution and flight activity within and surrounding the site is utilised to predict the potential significant effects of the proposed wind farm development on birds.

3.3.8.1 Collision Risk

Birds which use the airspace around turbines are susceptible to collision with operating turbines. The swept area of the rotor blade is the area in which a collision is theoretically possible. Possible collision height (PCH) is therefore defined as the area of space occupied by the turbine rotors. Collision risk can be reduced by siting wind energy developments away from flight corridors between roosting and foraging areas and from migratory bottlenecks (Dirksen et al. 1998; Hötker *et al*. 2006). A seven turbine layout is currently under consideration for the proposed development and modern turbine technology consists of turbines with tip heights in excess of 175m. Considering these dimensions defined flight bands are considered when conducting VP surveys which reflect modern turbine

dimensions. Height bands 0-10m, 10-25m, 25-175m and 175m+ are now commonly used. All flight activity within the combined height band of 25-175m is considered to be within the Potential Collision Height (PCH) with regard to the turbine swept area, based on a worst-case scenario for collision risk modelling.

As mentioned previously, a number of target species of conservation interest were recorded within the Study Area - Golden Plover, Hen Harrier, Curlew and Peregrine Falcon. Three of these (Golden Plover, Hen Harrier, Peregrine Falcon) were recorded to be flying within the potential collision risk zone of 25-175m for some of the period under observation. However the overall risk is deemed to be low given the low number of sightings of Hen Harrier and Peregrine Falcon coupled with the fact that there have been no breeding, roosting, regular foraging or dedicated transit routes associated with these species within the Study Area to date. Golden Plover were recorded flying within the potential collision risk zone during VP surveys in large flocks of over 200 birds at times during the winter and spring period however collision risk for waders is generally deemed to be low, due to high flight manoeuvrability (McGuinness *et.al* 2015). A review of pan-European collision assessments revealed much lower Golden Plover collision records than other species, though this was not controlled for survey effort or corpse recovery rates (Hötker *et al*. 2006). Breeding habitat for the Golden Plover is not present within the Study Area however there is potential foraging habitat for winter migrants that are known to occur in the form of a variety of grasslands within the Study Area. Furthermore, based on the flight paths observed to date collision risk may be higher in the eastern half of the site where more observations were recorded however ongoing surveys in 2020/21 will inform this collision risk further.

Very few records of hen harrier were observed and of those that were recorded, the majority were at a flight heights below 22m. Peregrine falcon was recorded just twice within the Study Area, this species was merely passing through and is not associated with the site on a regular basis. No suitable nest sites are thought to be present apart from a series of quarries located >4km away. The core foraging range is 2km for the Peregrine Falcon (SNH, 2016) therefore there is unlikely to be any dedicated usage of the Study Area by foraging Peregrines apart from opportunistic feeding from passing birds.

Lesser Black-backed Gull was recorded passing over or within the Study Area on three occasions over the summer and winter survey period. These were single birds each time and are considered to be commuting between feeding fields and the Nore/Dinin River corridor. The flightlines of Lesser black-backed Gulls were at varying altitudes (30-80m AGL) within the potential collision risk zone therefore there is some risk of collision in poor visibility conditions but given the low number of birds involved and low frequency of occurrence the overall risk is deemed low based on 2019/20 survey results.

For birds of prey, Sparrowhawk, Kestrel and Buzzard are potentially prone to collision with turbines particularly during display/courtship periods of the breeding season. Cullen and Williams (2010)[4] recorded two Sparrowhawk collisions with turbines at a wind farm site in Co. Tipperary. These species occurred frequently within the Study Area and are expected to breed within or close to the Study Area

[4] Cullen, C. & Williams, H. (2010) Sparrowhawk mortality at a wind farm in Ireland. *Irish Birds* 9: 125-126.

given the habitats present. Flight heights recorded of these species within the Study Area were at times within the potential collision risk zone.

Overall, it is considered that there is some collision risk to Sparrowhawk, Buzzard and Kestrel as a result of the proposed project. As Buzzard and Sparrowhawk are relatively widespread species, the effect at the local population level is not deemed to be very significant however Kestrel are red listed (Gilbert et al., 2019). Further surveys in 2020/21 will inform the collision risk particularly if the raptor species are found to be breeding within the Study Area.

3.3.8.2 Habitat Loss

The construction of the project will require the removal of commercial forest and areas of improved and rough grassland. The loss of a relatively small amount of commercial forest is not expected to have an adverse impact on any of the bird species associated with the Study Area, as similar habitat, i.e. conifer plantation, will still comprise a large part of the remainder of the site. Further, it is noted that conifer plantation, is a very frequent habitat in the surrounding area. The creation of open areas around each of the turbine locations and along the wind farm roads can be considered beneficial for birds as within conifer plantation the most useful and productive areas for birds (and other fauna) are the edges and the marginal strips. The impact on birds by the 'opening' of conifer plantation as a result of the proposed development may lead to increased usage by birds such as the Annex I hen harrier which has occurred onsite infrequently.

3.3.8.3 Disturbance/Displacement & barrier Effects

Birds may be displaced from a wind farm into areas of less suitable foraging or breeding areas, which may negatively affect survival and reproductive output (Langston & Pullan, 2003; Madders & Whitfield, 2006). No breeding, roosting or regular foraging/transiting was recorded within the Study Area by target species such as the Hen Harrier, Peregrine Falcon or the Curlew during the 2019/20 survey season and therefore disturbance/displacement and/or barrier effects are not likely to impact these bird species significantly in this area. Golden Plover, an Annex I red listed species was recorded flying above the Study Area in large numbers during the winter period. While these birds were not recorded feeding onsite there is potentially suitable foraging habitat present within the Study Area and therefore a potential pathway for impact is present via disturbance from these foraging habitats. A review of 29 studies suggests Golden Plover will approach wind turbines to an average distance of 175 m in non-breeding season (Hötker *et al*. 2006), with turbine height positively correlated with displacement distance. Further, modelling of wind energy developments and potential Golden Plover habitat found a negative relationship between wind farms and predicted populations of this species (Pearce-Higgins *et al*. 2008). However, a paper by Douglas *et al*. (2011) revealed that the installation of wind farms had no observable effect on populations or distributions of breeding Golden Plover up to three years after the completion and operation of turbines. Conversely, disturbance effects observed by Hötker et al. (Hötker *et al.* 2006) were found in 72% of Golden Plover sites for non-breeding birds. Surveys are ongoing at the Study Area which will provide further data relating to overall site usage by Golden Plover.

3.3.9 Summary and Recommendations - Birds

Based on surveys conducted to date there is a broad assemblage of bird species present within or near the Study Area reflective of the range of habitats present. While dedicated breeding bird transect surveys have yet to be carried out there was limited evidence of target species and birds of

conservation interest such as Annex I Hen Harrier, Merlin or Peregrine Falcon breeding or regularly foraging onsite. Similarly there was no evidence of winter roosting of target species within the Study Area. There were no flightlines of swans, geese or ducks over site and apart from the presence of wintering Golden Plover and infrequent occurrence of individual birds such as, Lesser black backed gull and Herring gull. There is no evidence to show that the Study Area is within a regularly used migration route by birds or a route used by wintering waterfowl between feeding and roost sites. Ongoing survey work is required to further confirm site usage by target species in particular Golden Plover however and this in turn will further inform project design. Species specific surveys which may be required given the woodland habitat types present include a crepuscular (dusk) survey for species such as breeding woodcock, this is a red listed species and was identified as part of the desktop study as historically occurring in the general area. Other species which may occur include the red listed Barn Owl.

Regular usage of the site was apparent by more widespread species such as Buzzard, Kestrel and Sparrowhawk which are likely to nest on site or nearby and could potentially be prone to disturbance should nesting occur within proximity of a work area during the construction period. Mitigation measures can be employed to reduce this impact. Should a nest or breeding territory of these species be located, best practice would be to create a buffer zone of an appropriate distance around the nesting area where works would be restricted until nesting has been complete. To locate potential nests, a pre-construction survey is required for each species in the breeding season by a competent ornithologist. From the survey, and depending on local topography, a suitable restrictive distance can be recommended.

Further pre-planning survey work will also be required along any proposed grid routes, haul routes and within replant lands associated with the project to fully identify potential ornithological constraints. If necessary a habitat and species management plan may be required to ensure a biodiversity net gain is achieved when mitigation is taken into account.

3.4 Mammals (including bats)

Bat surveys commenced in April 2021 and mammal surveys will be carried out in the coming summer/autumn 2021 period. The following section describes the occurrence of mammals and bats based on a review of historical records for the area carried out as part of the desk based study. A relatively wide range of terrestrial mammals have previously been recorded in the 10km grid squares in which the proposed development site is located (S66, NBDC; Table 5).

Table 5 Terrestrial mammals previously recorded in 10km grid square S66 (NBDC)

Common Name	Scientific Name	Conservation Status*
American Mink	*Mustela vison*	Introduced species (non-native)
Badger	*Meles meles*	WA, lc
Eastern Grey Squirrel	*Sciurus carolinensis*	Introduced species (non-native)

Eurasian Red Squirrel	*Sciurus vulgaris*	WA, lc
European Rabbit	*Oryctolagus cuniculus*	Introduced species (non-native)
Irish Hare	*Lepus timidus hibernicus*	Annex V, WA, lc
Otter	*Lutra lutra*	Annex II/IV, WA, NT
Pine Marten	*Martes martes*	Annex V, WA, lc
Red Fox	*Vulpes vulpes*	lc

HTTPS://MAPS.BIODIVERSITYIRELAND.IE/MAP.

* Key: Annex status (EU Habitats Directive), WA (Protected under Wildlife Act 1976), lc – Least Concern, NT – Near Threatened (Marnell et al., 2019).

Based on a review of historical records for the area three species of bats have been recorded in the 10km grid squares in which the proposed site is located (S66, NBDC). These species and their conservation status are shown in Table 6 below.

A desktop study of available information on the bat potential of the local area was carried out prior to the field surveys, with particular attention given to the model of Bat Landscapes as available on the NBDC website. This model is based on the relative importance of landscape and habitat associations for bat species across Ireland (see Lundy *et al.* 2011 [24]). The overall bat suitability index value (25.82-29.22) according to 'Model of Bat Landscapes for Ireland' (Lundy et at. 2011) suggests the landscape in which the proposed site is located is of low to moderate suitability for bats in general. The Annex II (EU Habitats Directive) listed bat species, Lesser Horseshoe Bat, is assigned a score of zero as the proposed site is outside the known range for this species.

Table 6 – Historical records for Bat species previously recorded in 10km grid square S66 (NBDC)

Common Name	Scientific Name	Conservation Status*
Daubenton's Bat	*Myotis daubentonii*	Annex IV, WA
Common Pipistrelle	*Pipistrellus pipistrellus*	Annex IV, WA
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Annex IV, WA

HTTPS://MAPS.BIODIVERSITYIRELAND.IE/MAP.

* Key: Annex status (EU Habitats Directive), WA (Protected under Wildlife Act 1976), lc – Least Concern, NT – Near Threatened (Marnell et al., 2019).

3.4.1 Recommendations- Mammals (including bats)

Protected species requiring particular consideration in relation to the development of the wind farm and underground grid connection include:

- Otter - listed on Annex II of the E.U. Habitats Directive; and
- Bat species – Listed on Annex IV of the E.U. Habitats Directive.

Disturbance impacts potentially affecting otter during construction include direct impacts to breeding/resting sites (if present) and indirect impacts due to visual and noise disturbance. This could result in the loss of resting, foraging or breeding sites, and potentially a temporary decline in extent of the range of this species. Bat roosts (within bridges/mature trees) have the potential to be

impacted during river crossing construction works. Otter and bat breeding sites will require consideration in the vicinity of river crossings to minimise potential disturbance effects, in particular during construction.

Mammals including Pine Marten, Red Squirrel and Badger are dispersed throughout the study area and may require mitigation consideration for potential disturbance effects. As bat surveys have just commenced and mammal surveys have yet to commence, no key constraints have been identified to date. In relation to bats, standard mitigation measures outlined in SNH (2019) will likely be required including clearance of nearby trees. Given the location of a number of the proposed turbines in commercial forestry, a 50m buffer from the blade tip to the nearest woodland is likely to be recommended to avoid encouraging bat activity within the 'blade-swept' area, as recommended in SNH (2019). These areas will be maintained vegetation-free during the operational life of the development. A methodology for determining the clearance area at ground level is presented in SNH (2019). Bats are expected to be widespread throughout the Study Area, especially in the low-lying areas where hedgerows and woodland are frequent. Buildings, stone bridges and mature trees provide potential roosts for bats. Bat surveys will be required at suitable habitat along Route B to establish the locations of roosts, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation, will be made to National Parks and Wildlife Service. As part of the EIAR it is recommended that a Biodiversity Management Plan be prepared to optimise biodiversity throughout the lifetime of the wind farm.

3.5 Other taxa (Amphibians, Invertebrates etc)

NBDC records for the 2km grid squares which overlap the Study Area (S66C, S66D, S66I, S66H) hold records for a number of butterflies including the Meadow brown, Green veined white, Ringlet however none of these are Red listed and are classed as Least concern. While the wind farm site itself does not hold records for red listed butterflies the EU Habitats Directive protected Annex II Marsh Fritillary butterfly does occur in the wider 10km grid square (S56) that lies adjacent to the proposed wind farm and which overlaps the grid connection route.

Other invertebrates listed for this area that are red listed include the endangered Gooden's Nomad Bee, the near threatened Large red tailed bumble bee and the Hymenopteran species *Andrena praecox* classed as vulnerable.

In relation to amphibians the Common Frog *Rana temporaria* and Smooth Newt *Lissotriton vulgaris* both occur in grid square S66 which overlaps the wind farm Study Area and may be present in areas such as pools in the local quarries, in wet grassland and along the local watercourses.

Table 7 Terrestrial mammals previously recorded in 10km grid square S66 & S56 (NBDC)

Common Name	Scientific Name	10km grid square	Red List Protection Status
Marsh Fritillary	*Euphydryas aurinia*	S56	Near Threatened

Gooden's Nomad Bee	*Nomada goodeniana*	S66	Endangered
Andrena (Hymenoptera)	*Andrena praecox*	S66	Vulnerable
Large Red Tailed Bumble Bee	*Bombus lapidarius*	S66	Near threatened

3.5.1 Recommendations- Other taxa

While the habitats within and surrounding the Study Area are strongly influenced by human activities such as intensive agriculture and commercial afforestation there are also areas of semi-natural habitats including riparian habitats, semi-natural grassland, scrub and semi-natural woodland which in turn support invertebrates and amphibians. These play an important role in supporting a functioning and healthy local ecosystem by acting as pollinators to local plants and providing a food source for birds and mammals. Recommendations with regards to other taxa include for the provision of Invertebrate and amphibian field surveys to be conducted as part of the field studies to inform route selection and EIA. Furthermore at the design stage, it is recommended that the site layout avoids areas of semi-natural habitat such as hedgerows, semi-natural woodland and grasslands and scrub to reduce or avoid impact on invertebrates and amphibians is recommended. Hedgerows can often be refuges for invertebrates, flora and a wide range of fauna- where possible destruction of hedgerows should be avoided or minimised. During construction mitigation measures and monitoring should be implemented to avoid trafficking and unnecessary destruction of semi-natural habitats. During the operational stage establishment of areas of pollinator friendly planting schemes, adherence to the All Ireland Pollinator Plan Guidelines for Wind Farms is recommended. These guidelines can be incorporated into the landscaping design/habitat management plan to improve overall biodiversity in the area over the operational lifetime of the wind farm.

4 Summary & Conclusion

The conclusions of this scoping assessment are presented as follows:

- The wind farm site is located within a landscape which has undergone considerable human influence and improvement with the majority of habitats consisting of improved agricultural grasslands and commercially afforested lands.
- Semi-natural habitats within the Study Area include Wet grassland, Dry meadows and grassy verges, Dry calcareous and neutral grassland, Hedgerows, Treelines, Scrub, Riparian habitats and semi-natural woodlands.
- Due to the relative scarcity of this semi-natural habitat in the surrounding area in comparison to human influenced habitat it is recommended to avoid where possible through sensitive design of the layout these areas of semi natural habitat;
- Based on a review of the Annex I habitats database there does not appear to be records for Annex I habitat overlapping the Study Area however habitat and botanical surveys will confirm if this is the case. Some of the semi-natural habitats which occur within the Study Area have potential linkages with Annex I habitat and the conservation status of these semi-natural habitats will be evaluated as part of the habitat and botanical assessment.
- No Flora Protection Order (2015) plant species have been historically recorded within the Study Area however the red listed Green Speedwell does occur in the Study Area.
- Invasive Species- the Study Area holds records for several high Impact invasive species (Kelly *et al.*, 2013; NBDC dataset) and species listed under the Third Schedule Part I under Regulations 49 and 50 of the European Communities (Birds and natural Habitats) Regulations 2011. Dedicated surveys to fully assess the distribution of non-native invasive plant species within the proposed development footprint will be carried out as part of the botanical survey of the Study Area. On foot of the findings of the invasive species field surveys targeted mitigation measures may be required such as the implementation of a Invasive Species Management Plan during the construction phase.
- Three EU Birds Directive Annex I species have been recorded within the Study Area; Hen Harrier; Golden Plover and Peregrine Falcon.
- Hen harrier and Peregrine falcon occurrence has been very intermittent and are thought to be birds in transit or passing through. No dedicated usage of the site for foraging, breeding or wintering by these two species has been recorded. While other species have not been recorded to date in the surveys at White Hill, potential for their occurrence nonetheless also needs to be considered based on the habitat that exists in the area e.g. occurrence of barn owl in the area.
- Large flocks of Golden Plover were regularly recorded onsite during the winter season, maximum numbers recorded were 500-700 birds during one VP observation. The majority of the time was spent in the air circling and flying over the site, there were very few instances observed of Golden Plover landing and/or feeding within the Study Area. Breeding habitat for the Golden Plover is not present within the Study Area however there is potential foraging habitat for winter migrants that are known to occur in the form of a variety of grasslands

within the Study Area. Golden Plover are not expected to breed within the Study Area but may potentially land and feed within the Study Area during the winter season and when migrating. Golden Plover were recorded flying within the potential collision risk zone during VP surveys in large flocks of over 200 birds (peak count 500-700 birds). Furthermore, based on the flight paths observed to date collision risk may be higher in the eastern half of the site where more observations were recorded.

- Designated Sites: The site is not located within any designated site however it is hydrologically connected to two EU Designated sites- the River Barrow and River Nore SAC and the River Nore SPA. Sensitive ecological receptors that are qualifying interests of these designated sites include a range of aquatic species and habitats including the Annex II Freshwater Pearl Mussel, Annex I Kingfisher and Annex II Otter. Dedicated surveys and targeted mitigation measures may be required to avoid a significant adverse impact on these Natura 2000 sites and qualifying interests. Potential ex situ impacts on other designated sites e.g. Slieve Bloom Mountains SPA will also need to be considered.

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Annex 3 –
Land, Soil & Water Scoping Report

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WHITE HILL WIND FARM, COUNTY CARLOW/KILKENNY

Land, Soils and Water Scoping Assessment

FINAL REPORT

Prepared for:
CARLOW WIND LTD

Prepared by:
HYDRO-ENVIRONMENTAL SERVICES

REPORT NO.: P1547-0
REPORT DATE: 21st May 2021

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1. INTRODUCTION

1.1 OVERVIEW

Hydro-Environmental Services (HES) were commissioned by Carlow Wind Ltd to undertake a desktop Land, Soil and Water Scoping Assessment for the proposed White Hill Wind Farm and its grid connection options.

The White Hill Wind Farm site is located in west County Carlow and east County Kilkenny, ~3km west of Oldleighlin, ~14km southwest of Carlow and ~13km northeast of Kilkenny.

The purpose of this scoping assessment is to identify potential receptors in the local (and downstream) geological, hydrological and hydrogeological environments that could potentially be affected by the proposed development works. A brief overview of the potential receptors is described along with their importance / sensitivity, likelihood of impact and if mitigation is likely to be required.

The main objectives of the scoping assessment are:

- To complete a desk study review of available information relating to the baseline geological, hydrological and hydrogeological regime in the area of the proposed development;
- To identify any geological, hydrological and hydrogeological receptors/constraints that may affect the proposed wind farm layout or overall feasibility;
- To identify potential downstream receptors such as designated sites/habitats, geological heritage sites and drinking water supplies;
- To Identify receptors scoped in for further assessment in the EIAR; and,
- To determine likelihood of impact and if mitigation is likely to be required.

This document is based on desk study assessment. A site visit has not yet been undertaken to confirm the findings of this report on the ground.

1.2 DEVELOPMENT DESCRIPTION

It is understood that the proposed development will comprise the installation of 7 no. turbines, turbine foundations, turbine hardstandings, internal site access tracks, internal underground cabling, electrical substation and energy storage facility, site entrances, borrow pits (2 no.) and spoil deposition areas and all associated site development, access and reinstatement works.

The project also includes approximately 15km of underground electricity line (UGL), to be located predominately within the carriageway of the public road network from the proposed wind farm substation to the existing 110kV substation at Scart, Kilkenny. The location of the proposed wind farm site and UGL are shown below in **Figure A** and the wind farm site layout is shown as **Figure B**.

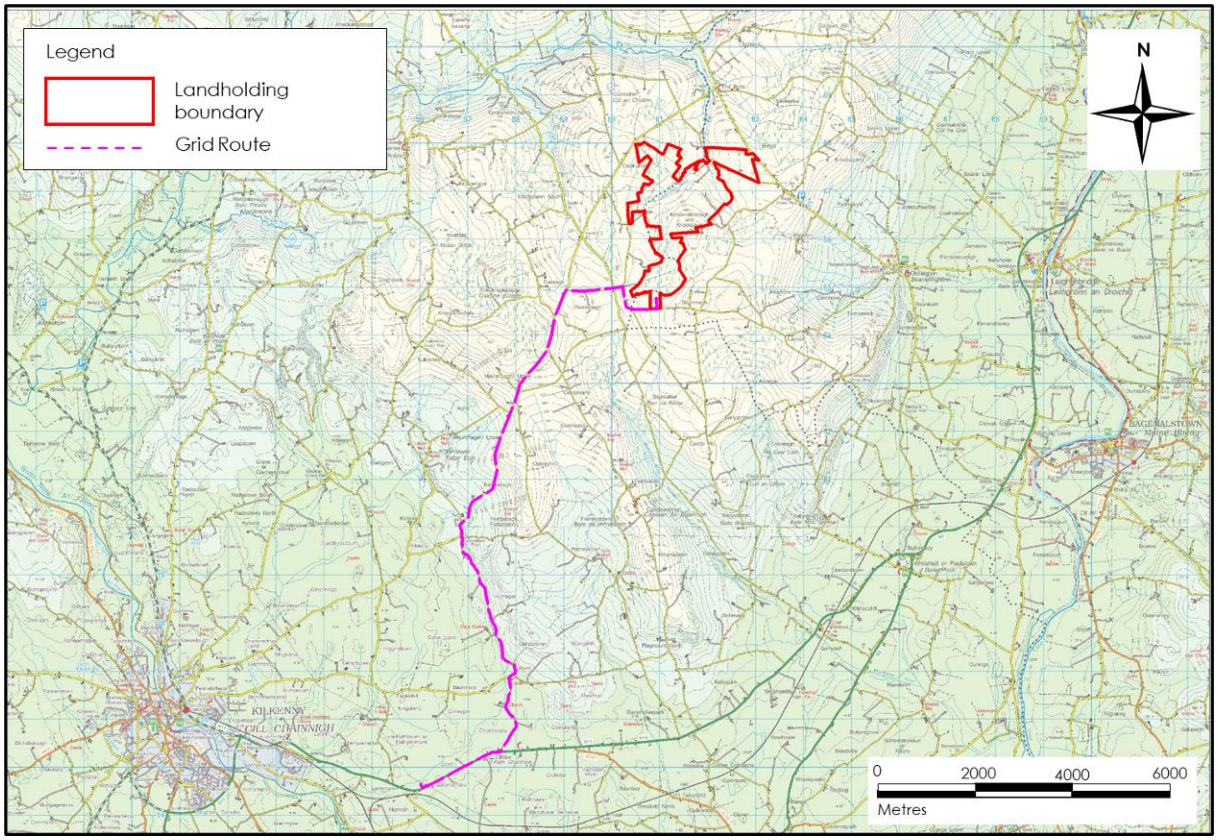


Figure A: Site Location Map

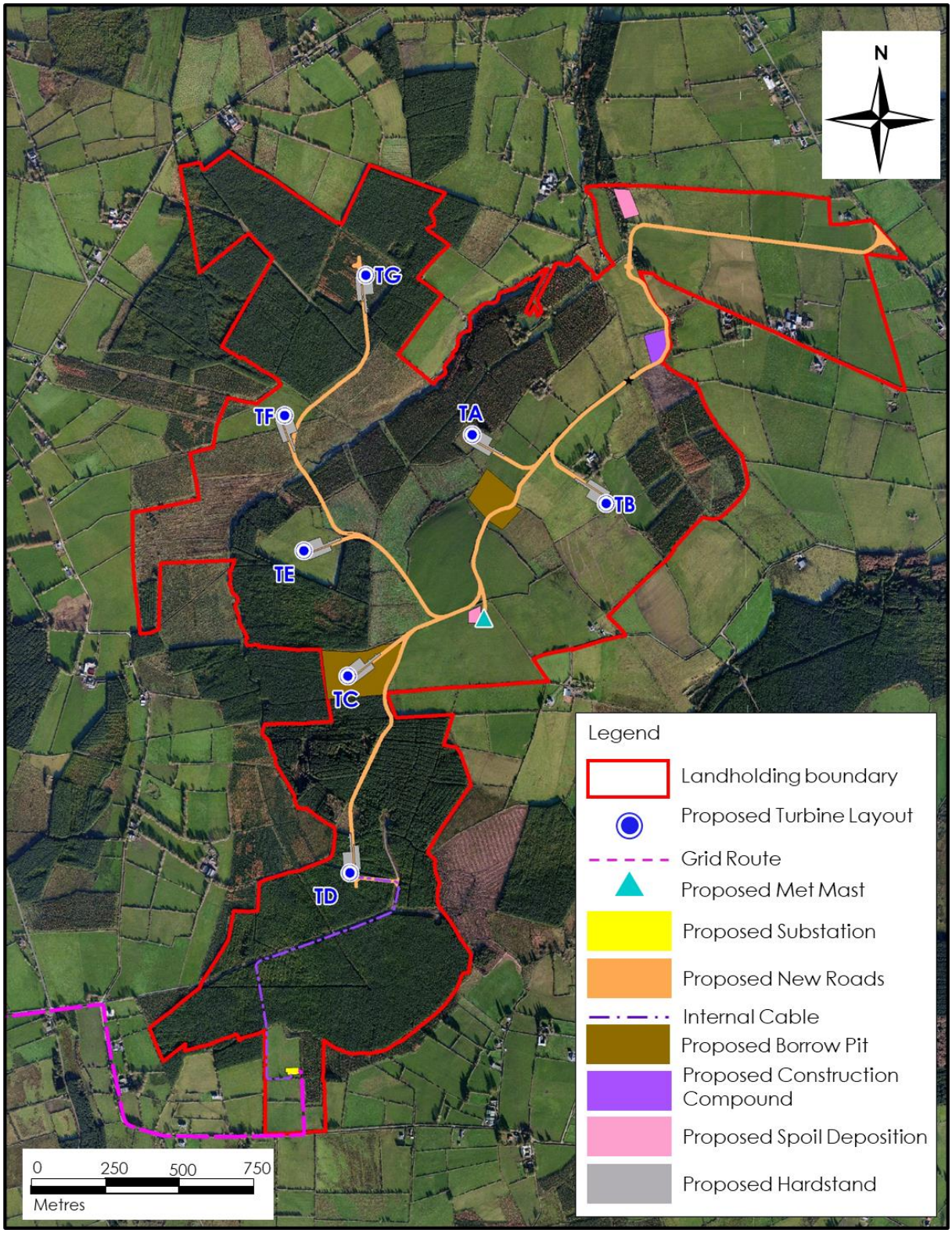


Figure B: Wind Farm Site Layout Map

1.3 GUIDANCE

The land/soils and water scoping assessments were carried out using the following guidance documents:

- Environmental Protection Agency (2017): Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Wind Farm Development Guidelines for Planning Authorities (2006);
- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh; and,
- COFORD (2004): Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads.

1.4 METHODOLOGY

1.4.1 Desk Study

A desk study of the proposed White Hill Wind Farm site, grid connection route options, and the surrounding area was completed using the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16 (Geology of Kildare - Wicklow); Geological Survey of Ireland (GSI, 1994);
- Geological Survey of Ireland – Groundwater Bodies Initial Characterisation Report - Draft (2004);
- OPW Indicative Flood Maps (www.flooding.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- Environmental Protection Agency – Catchments Map Viewer (www.catchments.ie);
- CFRAM Flood Risk Assessment (CFRA) maps (www.floodinfo.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

1.4.2 Receptor Importance/ Sensitivity Criteria

Using the National Roads Authority (2008) guidance, an estimation of the importance of the soils/geology, hydrological and hydrogeological environments within the study area are quantified, using the criteria set out in **Table A**, **Table B** and **Table C**.

Table A: Estimation of Importance of Soil and Geology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Very High	• Attribute has a high quality, significance or value on a regional or national scale. • Degree or extent of soil contamination is significant on a national or regional scale. • Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	• Geological feature rare on a regional or national scale (NHA/SAC). • Large existing quarry or pit. • Proven economically extractable mineral resource.
High	• Attribute has a high quality, significance or value on a local scale. • Degree or extent of soil contamination is significant on a local scale. • Volume of peat and/or soft organic soil underlying site is significant on a local scale.	• Contaminated soil on site with previous heavy industrial usage. • Large recent landfill site for mixed wastes. • Geological feature of high value on a local scale (County Geological Site). • Well drained and/or high fertility soils. • Moderately sized existing quarry or pit. • Marginally economic extractable mineral resource.
Medium	• Attribute has a medium quality, significance or value on a local scale. • Degree or extent of soil contamination is moderate on a local scale. • Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	• Contaminated soil on site with previous light industrial usage. • Small recent landfill site for mixed Wastes. • Moderately drained and/or moderate fertility soils. • Small existing quarry or pit. • Sub-economic extractable mineral resource.
Low	• Attribute has a low quality, significance or value on a local scale. • Degree or extent of soil contamination is minor on a local scale. • Volume of peat and/or soft organic soil underlying site is small on a local scale.	• Large historical and/or recent site for construction and demolition wastes. • Small historical and/or recent landfill site for construction and demolition wastes. • Poorly drained and/or low fertility soils. • Uneconomically extractable mineral resource.

Table B: Estimation of Importance of Hydrology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	• Attribute has a high quality or value on an international scale.	• River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid Waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	• Attribute has a high quality or value on a regional or national scale.	• River, wetland or surface water body ecosystem protected by national legislation – NHA status. • Regionally important potable water source supplying >2500 homes. • Quality Class A (Biotic Index Q4). • Flood plain protecting more than 50 residential or commercial properties from flooding. • Nationally important amenity site for wide range of leisure activities.
High	• Attribute quality or value on a local scale.	• Salmon fishery Locally important potable water source supplying >1000 homes. • Quality Class B (Biotic Index Q3-4). • Flood plain protecting between 5 and 50 residential or commercial properties from flooding. • Locally important amenity site for wide range of leisure activities.
Medium	• Attribute has a medium quality or value on a local scale.	• Coarse fishery. • Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). • Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	• Attribute has a low quality or value on a local scale.	• Locally important amenity site for small range of leisure activities. • Local potable water source supplying <50 homes. • Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1residential or commercial property from flooding. • Amenity site used by small numbers of local people.

Table C: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	• Attribute has a high quality or value on an international scale.	• Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	• Attribute has a high quality or value on a regional or national scale.	• Regionally Important Aquifer with multiple wellfields. • Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status. • Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	• Attribute quality or value on a local scale.	• Regionally Important Aquifer Groundwater • Provides large proportion of baseflow to local rivers. • Locally important potable water source supplying >1000 homes. • Outer source protection area for regionally. • important water source. • Inner source protection area for locally important water source.
Medium	• Attribute has a medium quality or value on a local scale.	• Locally Important Aquifer • Potable water source supplying >50 homes. • Outer source protection area for locally important water source.
Low	• Attribute has a low quality or value on a local scale.	• Poor Bedrock Aquifer Potable water source supplying <50 homes.

2. EXISTING ENVIRONMENT

2.1 SITE DESCRIPTION & TOPOGRAPHY

The proposed wind farm site, which is located within an area of approximately 460ha, is located in west County Carlow and east County Kilkenny. The site is ~3km west of Oldleighlin, ~14km southwest of Carlow and ~13km northeast of Kilkenny. Refer to **Figure A** above for location map.

Current land use within the wind farm site is predominately commercial forestry and agricultural pastures, with small pockets of transitional woodland scrub within the wider landscape. 4 no. of the proposed turbine locations are situated in grassland (TA, TB, TE and TF) with the remainder located in forested areas.

The topography of the wind farm site area is hilly with the overall site elevation ranging between approximately 230 and 290m OD (Ordnance Datum). The greatest elevations occur in the east and south of the site with the land sloping generally towards the north and west. The elevation of the proposed wind farm substation, located in the southwest of the site, is approximately 280m OD.

The UGL runs in a southerly direction for approximately 15km between the proposed White Hill Wind Farm substation to the existing ESB 110kv substation at Scart, Co. Kilkenny. The grid connection comprises UGL to be located predominately within the carriageway of the public road network. The ground elevation along the grid connection decreases to ~65m OD at the Scart substation.

The proposed turbine delivery route is predominately located within motorway, national and regional roads.

2.2 SUPERFICIAL GEOLOGY

Based on the GSI/Teagasc soils mapping (www.gsi.ie) the wind farm site is mainly overlain by deep poorly drained mineral soils (AminPD) and to a lesser extent shallow well drained mineral soils (AminSW) of acidic nature. Some acid poorly drained mineral soils (AminSP) are also found in the east and southwest of the site and are mapped in the area of the proposed wind farm substation. Pockets of blanket peat (BktPt) and poorly drained mineral soils with a peaty topsoil (AminPDPT) are also mapped within the wind farm site. None of the proposed wind farm infrastructure is located in areas mapped as blanket peat.

The soil types along the UGL are similar to the wind farm site, with alluvium mapped along many of the local rivers and streams along its route.

GSI subsoils mapping (www.gsi.ie) show that Till derived from Namurian sandstones and shales (TNSSs) is the dominant subsoil type in the area of the wind farm site. Other subsoils mapped with the site include Blanket Peat (BktPt) and Bedrock outcrop/subcrop (Rck). Bedrock outcrop is dominant along much of the proposed UGL, with the other subsoil types along the route similar to those mapped within the wind farm site. Towards the south of the UGL, there are pockets of Karstified bedrock outcrop or subcrop (KaRck), Gravels derived from Namurian sandstones and shales (GNSSs) and Alluvium (A). Meanwhile, Till derived from limestones (TLs) is mapped to the south and underlying the Scart substation.

Proposed turbine TG is the closest proposed infrastructure to mapped peat within the wind farm site. Review of the aerial photography shows that the tree coverage in the area of TG is very patchy which may indicate peaty/wet ground conditions. A detailed survey of ground conditions at this location will be completed.

Based on criteria shown in the **Table A** above, the local soils and subsoils have a Low to Medium Importance.

A local subsoil geology map is shown as **Figure C** below.

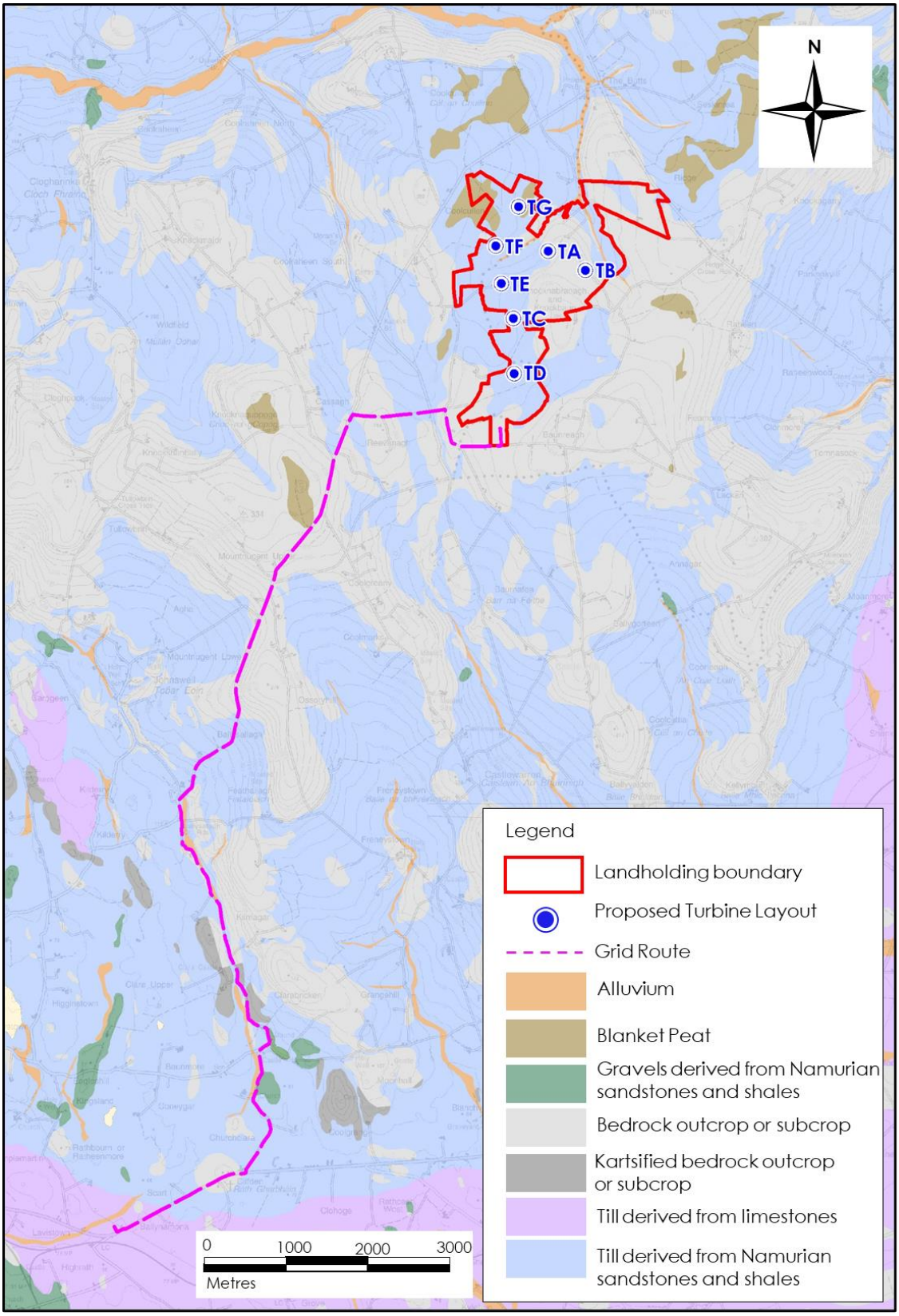


Figure C: Local Subsoils Maps

2.3 BEDROCK GEOLOGY

Based on the GSI bedrock mapping (www.gsi.ie), the wind farm site is underlain by Westphalian shales and sandstones consisting of the Coolbaun Formation and the Swan Sandstone Member. The Coolbaun Formation is described by the GSI as consisting of shales and sandstone with thin coals while the Swan Sandstone member is composed of laminated dark-grey siliceous sandstone.

The northern section of the UGL is also underlain by Westphalian shales and sandstones of the Coolbaun Formation. Further to the southwest, the UGL is underlain by Namurian Sandstone of the Bregaun Flagstone Formation consisting of thick flaggy sandstone and siltstone. Namurian Shales of the Killeshin Siltstone Formation and the Luggacurren Shale Formation are located further south. The GSI describe the Killeshin Siltstone Formation as muddy siltstones and silty mudstones while the Luggacurren Shale Formation consisting of mudstone and shale interbedded with chert and limestone.

The southern half of the UGL is mapped to be underlain by Dinantian Pure Bedded Limestones of the Ballyadams Formation and the Clongrenan Formation. The Ballyadams Formation is known to consist of crinoidal wackestone/packstone limestones while the Clongrenan Formation is described as cherty, muddy and calcarenitic limestones. Further south, the GSI map Dinantian Upper Impure Limestones of the Butlersgrove Formation, consisting of argillaceous limestones.

A bedrock geology map for the area is shown as **Figure D** below.

There are no mapped faults within the proposed wind farm site. However, there are several faults mapped along the proposed UGL. These are likely to have no consequence for the development due to the shallow nature of the UGL works.

According to the GSI, natural resource mapping, the area of the wind farm site has a 'very low to high' crushed aggregate potential and 'low to very low' potential for granular aggregate potential. The bedrock underlying the majority of the proposed UGL has similar aggregate potential as the wind farm site. However, to the south, the limestones of the Ballyadams Formation are mapped as having 'high to very high' crushed aggregate potential.

Based on criteria shown in the **Table A** above and the GSI aggregate potential the local bedrock underlying the wind farm site has a Low to Medium Importance. Meanwhile, the bedrock along the UGL has a Low to Very High Importance.

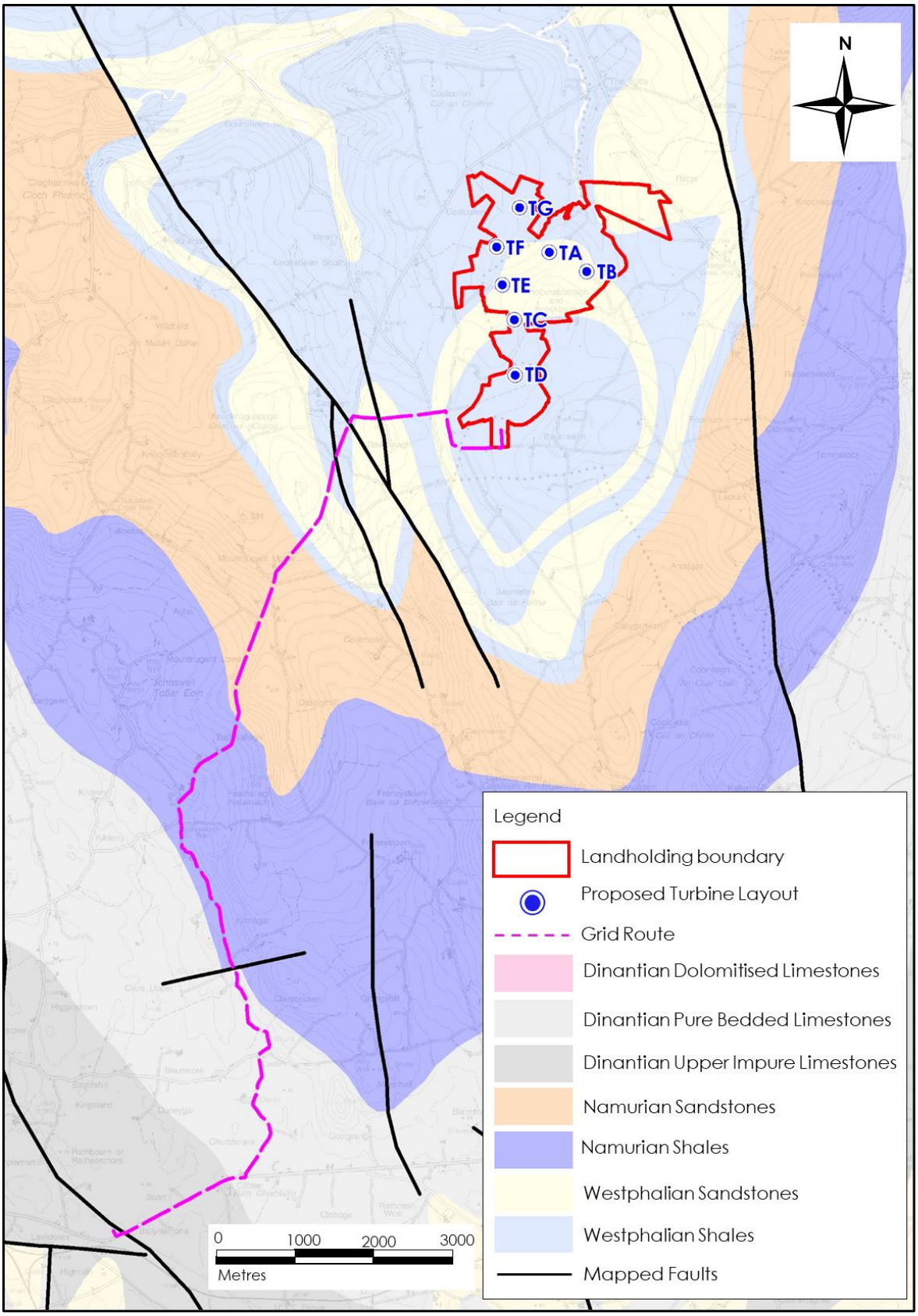


Figure D: Local Bedrock Geology Map

2.4 GEOLOGICAL HERITAGE SITES

No section of the wind farm site or the UGL is mapped within a geological heritage site.

The closest geological heritage site to the proposed wind farm is Bannagagole Quarry (Site Code CW004), a large and deep working quarry in the limestones of the Ballyadams Formation, which is located approximately 4km southeast of the site.

Another geological heritage site, Ballyfoyle Channels (Site Code: KK005), consisting of a series of deeply incised channels, is located approximately 7km to the southwest of the wind farm site.

Two geological heritage areas are located to the south of the UGL and the Scart substation. The Dunbell M9 cutting (Site Code: KK023), located less than 2km southeast of the final stretch of the UGL, is a road cutting along the M9 motorway with good exposures of the limestone rocks of the Butlersgrove Formation. Meanwhile, Bennettsbridge Quarry (Site Code: KK010) is located approximately 2.5km south of Scart substation.

Based on criteria shown in the **Table A** above, geological heritage sites have a High Importance.

2.5 HYDROLOGY & DRAINAGE

On a regional scale, the proposed wind farm site is located predominantly in the River Nore surface water catchment within Hydrometric Area 15. However, the southernmost section of the wind farm site, including the location of the proposed electricity substation, is located within the River Barrow surface water catchment within Hydrometric Area 14.

On a more local scale, the majority of the wind farm site (including all of the proposed turbine locations) is located in the Dinin River surface water catchment (Dinin[South]_SC_010). The Knocknabranagh and Knockbaun stream (EPA Code: 15K25) drains the majority of the wind farm site and discharges into the Dinin River approximately 2km north of the site.

The small portion of the southern section of the wind farm site, including the proposed electricity substation, lies within the Barrow River surface water catchment (Barrow_SC_120). This area is drained by the Monefelim stream (EPA Code: 14M03), located less than 1km to the southwest of the proposed substation location. This watercourse flows to the southeast and discharges into the Barrow River approximately 12.5km from the site.

4 no. watercourse crossings are likely to be required within the wind farm site; between TG and TF, TF and TE, TC and TD and on the site entrance road in the northeast of the site. All of these are located within the Dinin River surface water catchment. The watercourse crossing numbers are estimated using the EPA mapping and additional crossings may be identified during the site walkover.

On a regional scale, the vast majority of the UGL is located in the River Nore surface water catchment. The UGL begins with approximately 1km of underground cabling located within the Barrow River catchment, followed by approximately 2.2km in the Dinin River catchment before an additional 1.4km in the Barrow River. The remaining ~10km of underground cabling is located in the River Nore.

No major watercourse crossings will be required within the Barrow River catchment. However, the UGL comes to within 100m of the Monefelim stream and less than 400m from the Gowran stream (EPA Code: 14G03). Similarly, no watercourse crossings will be required

within the Dinin River catchment with the UGL located less than 100m from the Cassagh stream (EPA Code: 15C83).

Based on the EPA watercourse mapping, 3 no. watercourse crossings will be required within the Nore River catchment along the UGL. In the north of the catchment, the UGL is located less than 200m from the Sandsfordscourt Stream (EPA Code:15S24). Further south, a crossing will be required on the Kilderry Stream (EPA Code: 15K54) before the UGL runs parallel with the Lyrath River (EPA Code: 15L27).

A local hydrology map is shown as **Figure E** below.

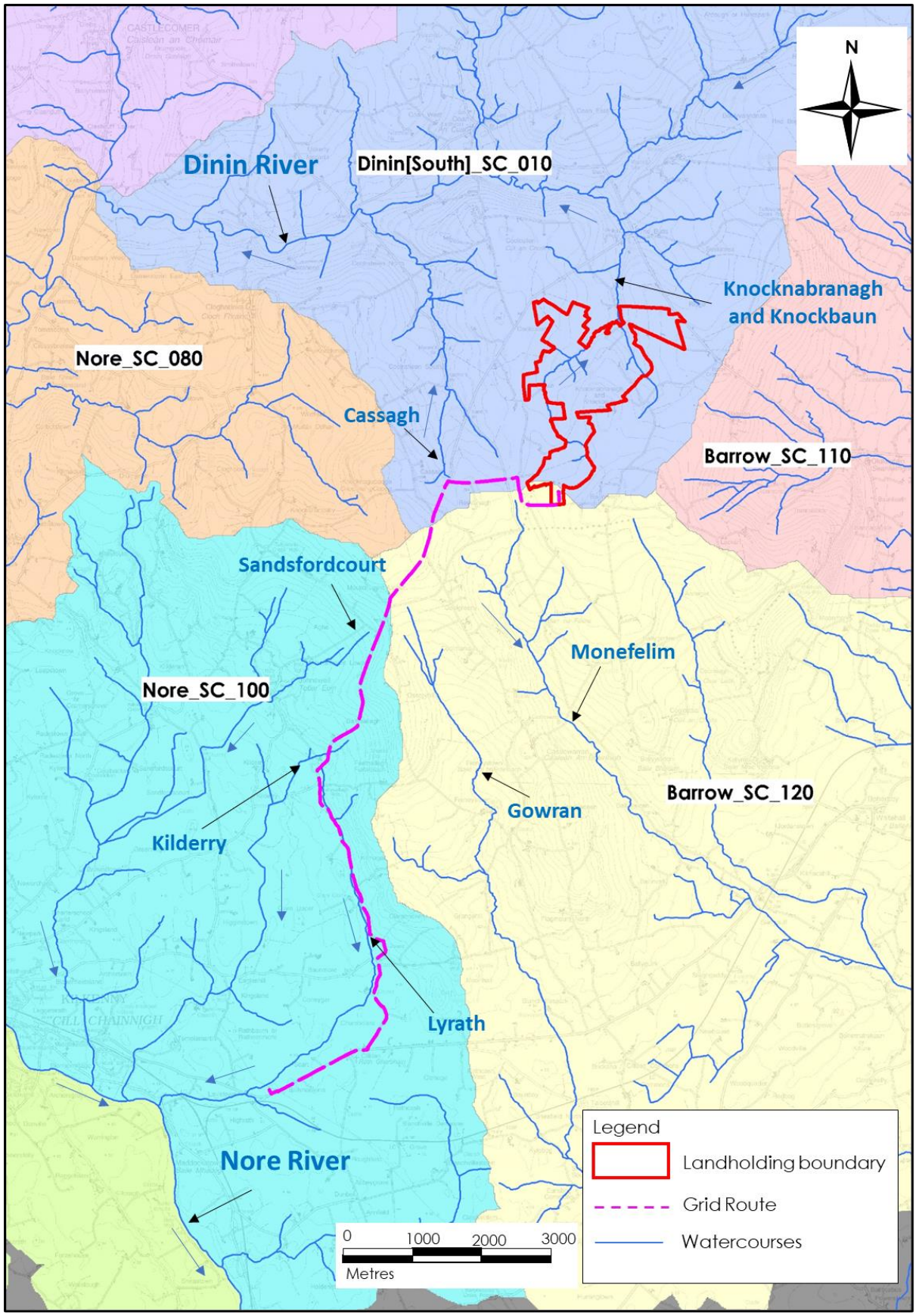


Figure E: Local Hydrology Map

2.6 WATERBODY QUALITY & STATUS

Biological Q-rating data for EPA monitoring points on nearby river water bodies are shown in **Table D** below. Most recent data available (2017-2019) show that the Q-rating ranges from 'Good' to 'High' in the vicinity of the proposed wind farm site and UGL.

Approximately 8km downstream of the wind farm site at Dysart Bridge, the Dinin River achieves a Q-rating of 4 i.e. 'Good Status'. Similarly, the Monefelim River achieves a Q-rating of 4 less than 4km south of the wind farm site. Other rivers downstream of the UGL, including the Gowran and the Nore achieved Q-rating of 4-5 and 4 respectively.

Table D: EPA Biological Q-rating data

Station Name	River Waterbody	Year	Q-Value Score	Status
Dysart Br.	Dinin_020	2019	Q4	Good
Castlewarren Br.	Monefelim_010	2017	Q4	Good
Br SW of Garryduff Crossroads	Monefelim_020	2017	Q4	Good
Br E of Freneystown	Gowran_010	2017	Q4-5	High
NE of Warrington d/s Kilkenny	Nore_180	2019	Q4	Good

River Water Body status information is available for view from www.catchments.ie. A summary of wind farm status of surface water bodies (SWBs) immediately downstream of the proposed development is shown in **Table E** below.

Within the area of the proposed wind farm, site river water body status information is available for the Dinin River and Monefelim Rivers. The Dinin (South)_020 SWB, which includes the streams which emerge from the proposed wind farm site (*i.e.* Knocknabranagh and Knockbaun streams), have been assigned an overall 'Good Status'. Within the Barrow River catchment, the Monefelim_010 achieved 'Good Status' immediately downstream of the site.

Along the UGL, the Dinin and Monefelim rivers achieved 'Good Status' as described above. The Gowran_010 SWB has been assigned 'Moderate Status', while in the Nore River Catchment the Brownstown (Pococke)_010, which includes the Sandsfordscourt stream, achieved 'Poor Status'. Further south the Kilderry_010 SWB and the Nore_190 SWB (including the Lyrath River) have not been assigned a status in the latest Water Framework Directive (WFD) round.

Table E: WFD Summary Information for Surface Water Bodies

Regional Catchment	Water Body	Overall WIND FARMD Status (2013-2018)	Development Infrastructure
Dinin	Dinin (South)_020	Good	WIND FARM Site and Grid Connection Route
Barrow	Monefelim_010	Good	WIND FARM Substation & Grid Connection Route
Barrow	Gowran_010	Moderate	Grid Connection Route
Nore	Brownstown (Pococke)_010	Poor	Grid Connection Route
Nore	Kilderry_010	Unassigned	Grid Connection Route
Nore	Nore_190	Unassigned	Grid Connection Route

Taking the view that all watercourses are required to have at least "Good Status" in terms of the WFD and by applying the criteria in **Table B** above, local and downstream watercourses have a High to Very High Importance.

2.7 FLOOD RISK

To identify those areas of the proposed development as being at risk of flooding, OPW's indicative river flood map (www.floodinfo.ie), Catchment Flood Risk Assessment and Management (CFRAM) Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie), and historical mapping (*i.e.* 6" and 25" base maps) were consulted.

There are no areas on the historical 6" or 25" mapping in the area of the WIND FARM site or grid connection options that are identified as an area that is "*Liable to Floods*". No recurring flood incidents were identified near the proposed wind farm site from OPW's Flood Hazard Mapping which is shown as on **Figure F** below. The closest mapped recurring flood event is within the Barrow River Catchment (Barrow_SC_110) in the townland of Lackan where a local road is periodically impassable.

Where complete the CFRAM Study OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the PFRAM maps. There is no CFRAM mapping available for the area of the wind farm site or UGL. The available CFRAM mapping is shown as **Figure G** below.

There is no PFRA mapping available for the proposed development site as it has been removed from public access and Kilkenny or Carlow County Council do not have the PFRA mapping up their online ArcGIS system. However, due to the site elevation and its sloping nature, significant surface water flooding is not likely at the wind farm site or along the UGL. It is recommended that a site-specific flood risk assessment is carried out for the wind farm site regardless. There is a requirement to locate the electricity substation in Flood Zone C (Low Risk).

In addition, the GSI Ground and Surface water flood maps do not map any potential flood zones within the wind farm site or along the proposed UGL. However, the GSI Maximum Historical Groundwater Flood Map shows a flooded area in the townland of Churchclara towards the south of the UGL, approximately 200m west of the UGL.

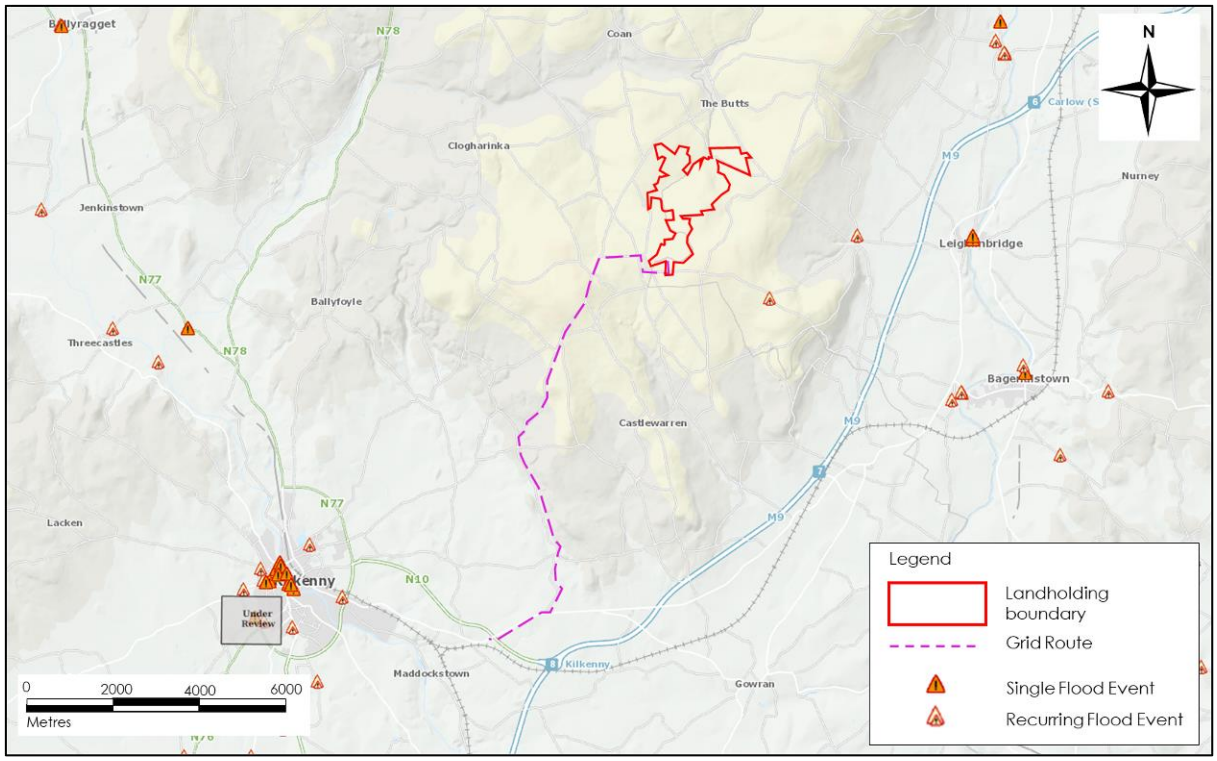


Figure F: OPW National Flood Hazard Mapping

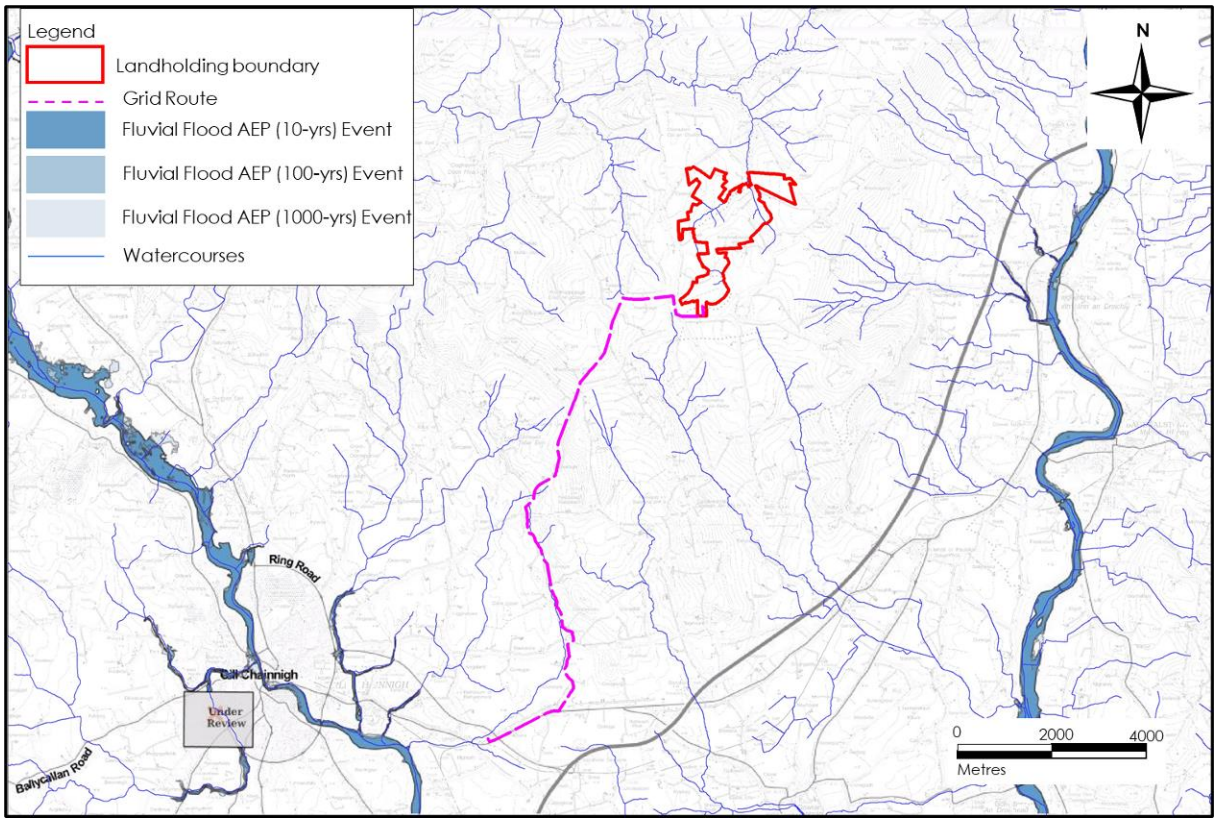


Figure G: OPW CFRAM Mapping

2.8 HYDROGEOLOGY

The Westphalian Shales and Sandstones which underlie the wind farm site and the northern section of the UGL are classified by the GSI (www.gsi.ie) as a Poor Aquifer - Bedrock which is Generally Unproductive (Pu) and Locally Important Aquifer – Bedrock which is Generally Moderately Productive (Lm).

Namurian Sandstones and Shales which underlie the central section of the grid connection route options are classified as a Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones (Pl). Further south the Dinantian Upper Impure Limestones and Dinantian Pure Bedded Limestones are classified as Regionally Important Aquifer – Karstified (diffuse) (Rkd) and Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (Ll).

In terms of local Groundwater Bodies (GWBs), the proposed wind farm site and the northern section of the UGL are located in the Castlecomer GWB (IE_SE_G_034). Sections of the UGL further south are mapped in the Shanragh GWB (IE_SE_G_124), the Ballingarry GWB (IE_SE_G_009) and the Kilkenny GWB (IE_SE_G_078) before terminating in the Clifden GWB (IE_SE_G_038).

Based on criteria shown in the **Table C** above, the Poor bedrock aquifer and Locally Important aquifer in the area of the wind farm site has a Low to Medium Importance. The Poor Aquifers in the northern section of the UGL have a Low Importance while the Regionally Important Aquifer at the southern end of the UGL has a High Importance.

A local bedrock aquifer map is shown as **Figure H** below.

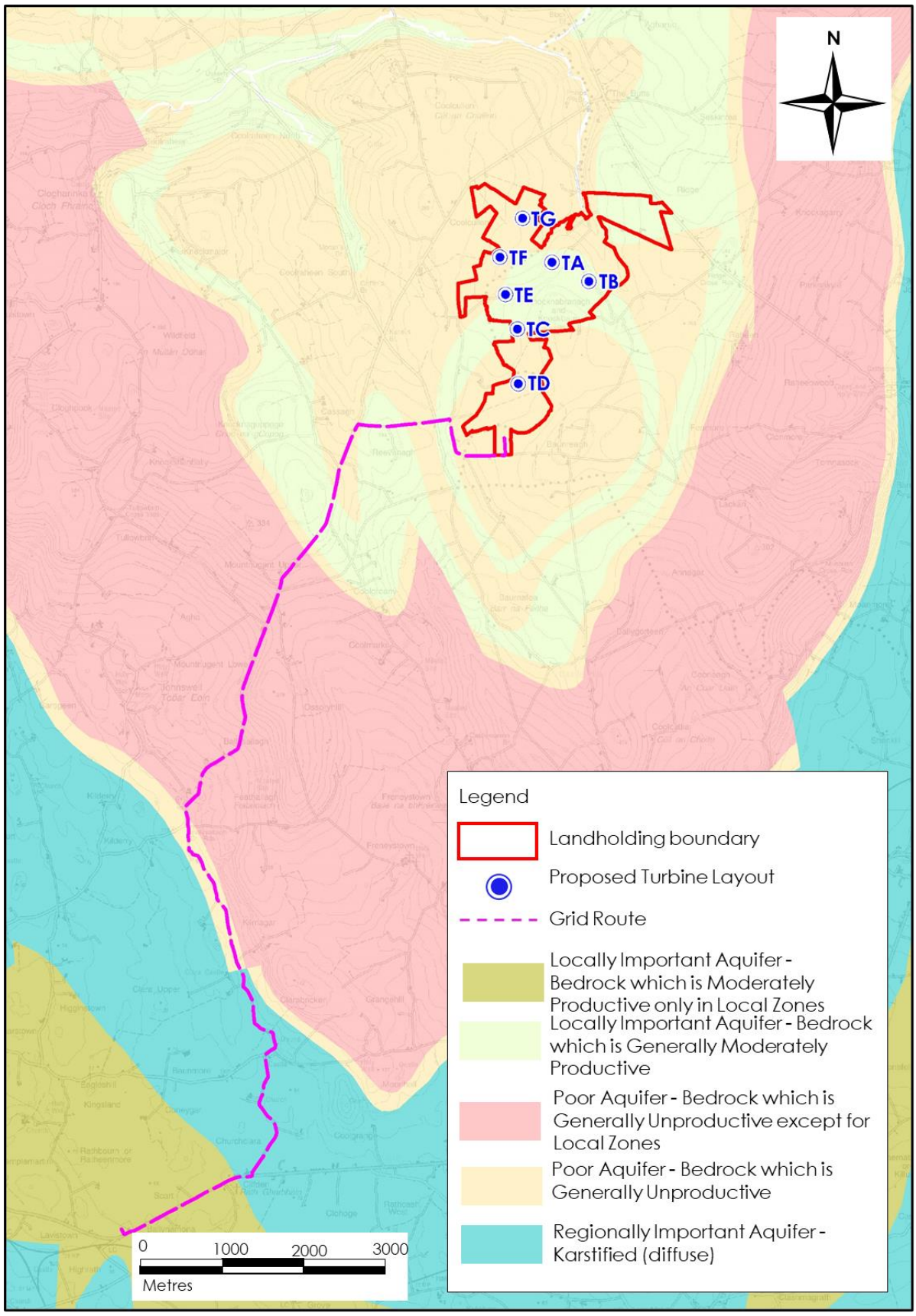


Figure H: Bedrock Aquifer Map

2.9 DESIGNATED SITES

Within the Republic of Ireland, designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), candidate Special Areas of Conservation (cSAC), Special Areas of Conservation (SAC) and Special Protection Areas (SPAs).

Local designated sites in the area and downstream of the proposed wind farm site and UGL are shown on **Figure I** below. The wind farm site or UGL are not located within any designated conservation site.

The proposed development is hydrologically connected to the River Barrow and River Nore SAC (Site Code: 002162). At its closest point this designated site is located approximately 1.5km to the north (as crow flies) and downstream of the wind farm site and is hydrologically connected with the site via the Knocknabranagh and Knockbaun stream. In addition, all of the surface waterbodies draining the UGL drain into the River Barrow and River Nore SAC and the River Nore SPA (Site Code: 004233).

The following key aquatic species and habitats of the River Barrow and River Nore SAC are potentially likely to be at risk from a deterioration in water quality:

- Water courses and vegetation;
- White-clawed Crayfish;
- Sea Lamprey;
- Brook Lamprey;
- River Lamprey;
- Twaite Shad;
- Salmon; and,
- Freshwater Pearl Mussel.

The River Barrow and River Nore SAC is, therefore, considered to be Very Sensitive to the effects of water quality deterioration.

There are a number of NHA and pNHA designated sites locally (*i.e.* Coan bogs NHA, Whitehall Quarries pNHA, Dunmore Complex pNHA, Newpark Marsh pNHA etc) but hydrological connectivity to these sites is likely to be limited due to the presence of intermediate rivers acting as hydraulic boundaries.

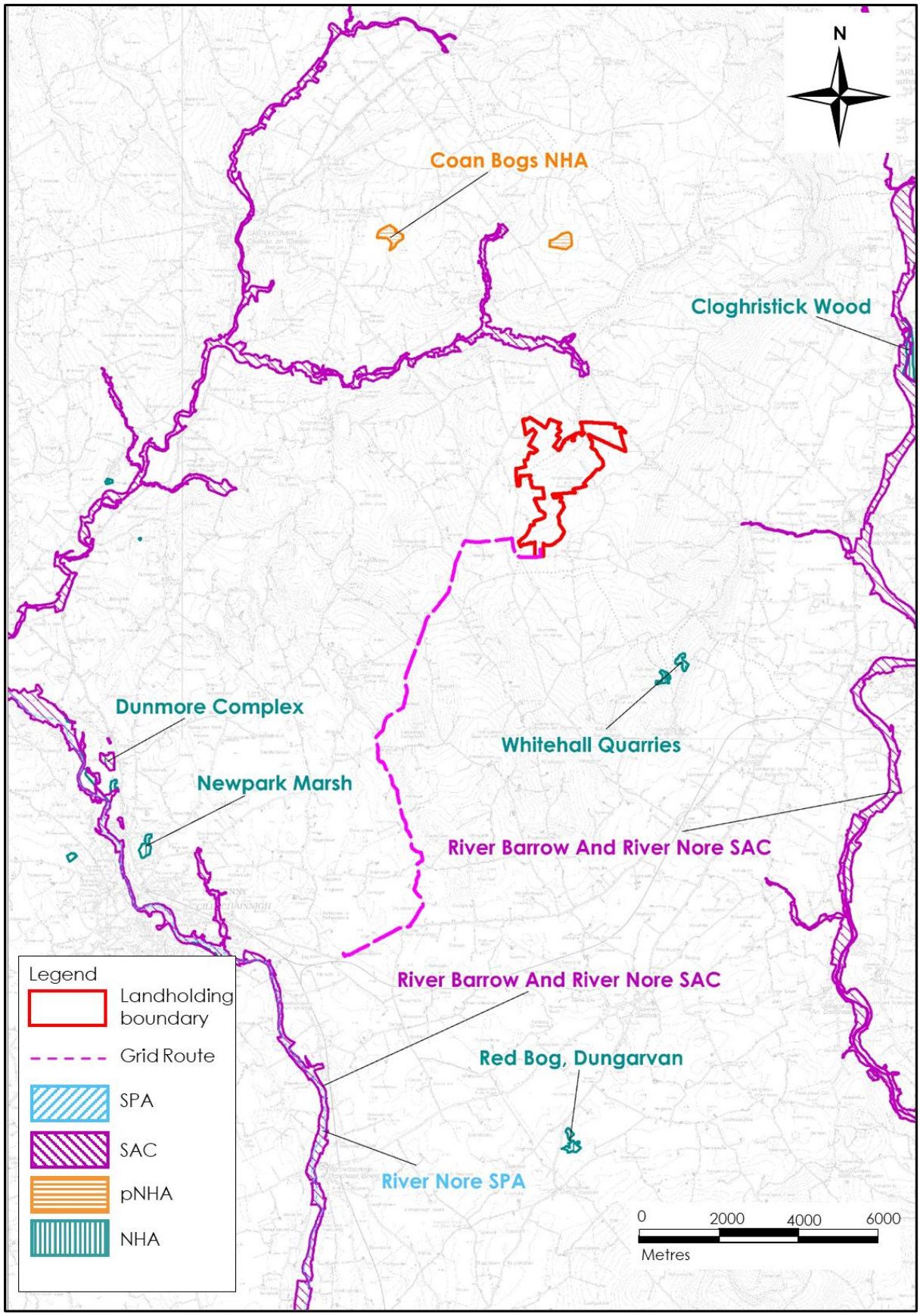


Figure I: Local Designated Site Map

2.10 DRINKING WATER SUPPLIES

According to the EPA Abstraction Register), there is a National Federation of Group Water Schemes (NFGWS) Group Scheme Source Protection Area lying immediately to the southwest and south of the wind farm site i.e. the Castlewarren Zone of Contribution (ZOC) Region. None of the proposed wind farm site infrastructure is located within the ZOC, however approximately 850m of the UGL is located inside the ZOC. Refer to **Figure 1** attached for the location of the groundwater source protection areas.

In addition, a GSI Public Supply Source Protection Area, the Paulstown Public Water Supply, is mapped to the southwest of the site. The outer protection zone for this water supply extends northwards to less than 500m from the wind farm site.

Further southwest, the Monefelim River is included in the inner protection zone for the Paulstown Public Water Supply. As shown in **Figure D**, the most southern end of the wind farm site is located in the Monefelim River catchment. The proposed electricity substation and sections of the UGL (~1.9km) are also located inside the surface water catchment to the Monefelim River. Based on the Paulstown PWS Source Protection Report (May 2002), the streams/rivers flowing off the Castlecomer Plateau indirectly recharge the limestone aquifer from which the spring source emerges. The proportion coming from the Monefelim River appears to be less important though:

> "*As the streams flow off the Castlecomer Plateau and onto the karstic aquifer, a proportion of streamflow will sink back down into groundwater before flowing to the springs. Most of this river recharge will occur from the Acore catchment to the north of the springs, rather than from the Monefelim catchment to the north west*".

Based on the GSI well database, groundwater is likely to be used locally as a private drinking water source, but the overall mapped well density is low in the area which may suggest that residents are connected to the public water mains. However, the GSI database is not exhaustive and other wells not in the database are likely to be present.

Based on criteria shown in **Table C** local wells have Low Importance and the public supply has a Medium Importance.

3. IDENTIFICATION OF POTENTIAL EFFECTS

3.1 POTENTAL EFFECTS AND CONSTRAINTS

A summary of receptors, likelihood of Impact and potential constraints is shown in **Table F** below.

Potential impacts on surface water and groundwater will mainly be water quality related. However due to the shallow nature of the works and the potential for site runoff, surface waters will be the main receptor in terms of water quality impacts.

No significant effects on surface water or groundwater flows levels or volumes are likely (*i.e.* quantity). Potential effects on the soils, subsoils and geology will be both quantity (excavations) and quality (spills and leaks).

The main mitigation requirements will be drainage/runoff control and mitigation and best practice use for oils/fuels and cement. Best practice wind farm drainage will have to be implemented.

The main potential site layout constraints identified by this desk based scoping assessment are on-site watercourses (a 50m buffer has been applied to all on-site watercourses).

All of the proposed turbine locations, the electricity substation and the majority of the access roads are located outside the 50m stream buffers. Turbine D and Turbine F are located closest to mapped watercourses.

Turbine G is mapped close to an area of blanket peat. Review of the aerial photography shows that the tree coverage in the area of Turbine G is very patchy which may indicate peaty/wet ground conditions.

Approximately 850m of the UGL is located inside the Castlewarren Zone of Contribution (ZOC). Also, the electricity substation and sections of the UGL (1.9km) are located within the Monefelim River catchment which forms part of the Paulstown Public Water Supply ZOC.

The potential for effects on both drinking water supplies is relatively low due to the localised and shallow nature of the UGL trench and substation works.

Downstream designated sites such as the River Barrow and River Nore SAC are sensitive receptors. The presence of Freshwater Pearl Mussel means surface water quality protection measures will have to be of a high standard.

In terms of the UGL, the infrastructure is predominately along the existing public road network and therefore the presence of watercourses, flood zones or peat is unlikely to affect the grid route design significantly. The watercourse crossings and the sections of grid route located within 50m of rivers and streams have the potential to impact the quality of surface waters. The main mitigation requirements will be drainage/runoff control during the construction phase and mitigation and best practice for oils/fuels and cement.

Potential geological and hydrological constraints mapping for the wind farm site and grid connection route is attached below as **Figure 1.**

Table F: Summary of Receptors, likelihood of Impact and Constraints

Potential Receptor	Likelihood of Potential Impact	Impacts Type	Mitigation Required	Layout Constraint
Mineral Soil/Subsoil	High	Quantity & Quality	Yes	Unlikely
Blanket Peat	High	Quantity, Quality & Ground Stability	Yes	Potentially
Bedrock	High	Quantity & Quality	Yes	Unlikely
Surface Water	High	Quality/Quantity	Yes	Yes
Flood Risk	Low	Quantity/Level	Yes	Likely
Groundwater	Low/Medium	Quality	Yes	Unlikely
River Nore and River Barrow SAC	Medium/High	Quality	Yes	Unlikely
River Nore SPA	Low/Medium	Quality	Yes	Unlikely
Castlewarren Group Scheme Supply/ Paulstown Public Water Supply	Low/Medium	Quantity & Quality	Yes	Yes
Local Private Wells	Low	Quantity & Quality	Yes	Unlikely

4. EIAR ASSESSMENT METHODOLOGY

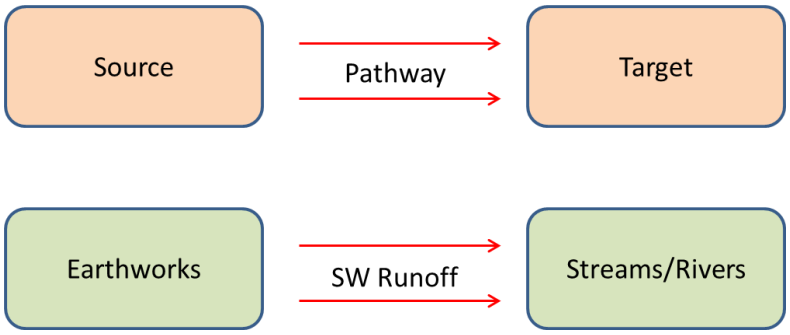
4.1 SITE SURVEYS AND INVESTIGATIONS

The following site surveys and investigations will be undertaken to address the Land/Soil and Water chapters of the EIAR:

- Intrusive site investigations will be undertaken by means of trial pitting, peat probes (if required) and gouge cores to investigate peat and mineral subsoil lithology along with depth to bedrock;
- Inspection and mapping of all relevant hydrological features, such as existing drainage ditches, streams and springs etc in terms of potential receptors, constraints and pathways;
- Complete field hydrochemistry measurements (electrical conductivity, pH and temperature) to determine the origin and nature of surface water and groundwater flows;
- Surface water samples will be undertaken to assess the contemporary baseline water quality of the primary surface waters originating from the proposed wind farm site and along the UGL; and,
- Assessment of downstream receptors such as public water supplies, private wells, surface water abstractions and designated sites using the Source-Pathway-Receptor model (see below).

4.2 IMPACT ASESSMENT PROCESS

The conventional source-pathway-target model (see below, top) will be applied to assess potential impacts on local and downstream environmental receptors (see below, bottom as an example) as a result of the proposed development.



Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process that will be applied, we have firstly presented below a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all project (wind farm and grid connection) construction and operation activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Step 1	**Identification and Description of Potential Impact Source** This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.	
Step 2	**Pathway / Mechanism:**	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of wind farm/grid connection developments, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	**Receptor:**	A receptor is a part of the natural environment which could potentially be impacted upon, *e.g.* human health, plant/animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	**Pre-mitigation Impact:**	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	**Proposed Mitigation Measures:**	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to wind farm/grid connection developments, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	**Post Mitigation Residual Impact:**	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	**Significance of Effects:**	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

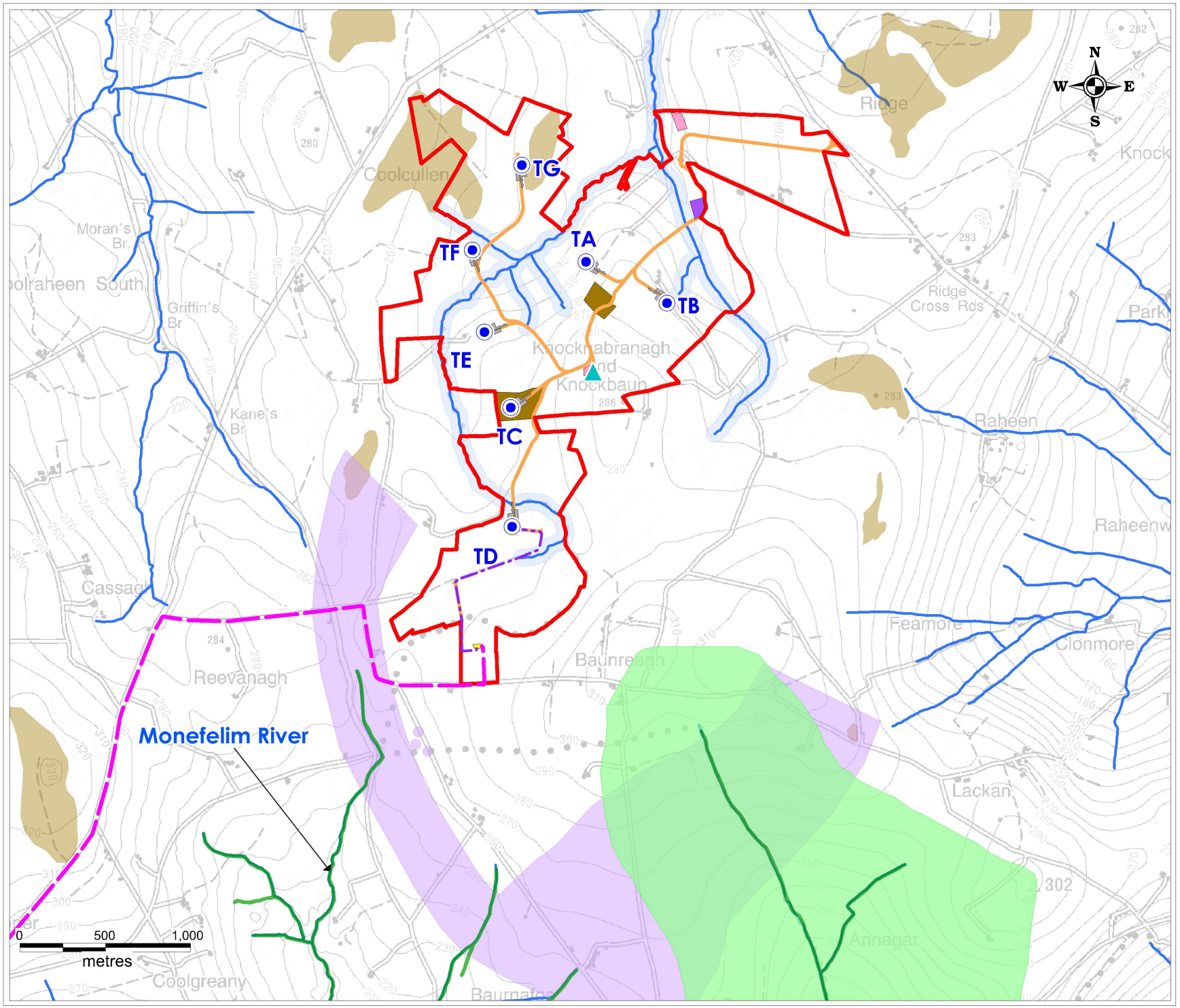
5. REPORT CONCLUSIONS

The conclusions of this scoping assessment are presented as follows:

- The wind farm site is located within hilly landscape with the proposed wind farm infrastructure been spread over mainly sloping agricultural and forested lands;
- The mapped geology in the area of the proposed wind farm site comprises mainly subsoils (sandstone, shale and limestone tills) over limestone. Pockets of blanket peat are mapped locally also;
- The proposed development drains to the Nore River via the Dinin River and to the Barrow River via the Monefelim River;
- The main potential site layout constraints identified by this desk based scoping assessment are on-site watercourses (a 50m buffer has been applied to all on-site watercourses);
- In terms of constraints imposed by stream buffer zones, the current proposed layout does not appear to be affected;
- For assessment purposes, a detailed flood risk assessment will be required;
- The main downstream receptors identified by this assessment include the River Nore and River Barrow SAC, the River Nore SPA, Freshwater Pearl Mussels and the Castlewarren Group Scheme source;
- The River Nore and River Barrow SAC will not constrain the layout of the proposed development, but increased mitigation will be required particularly during the construction phase; and,
- All receptors identified in this report remain scoped in for further assessment in the EIAR.

****

FIGURE



Legend

- Landholding Boundary
- Proposed Turbine Layout
- Proposed Met Mast
- Proposed Grid Route
- Internal Cable
- Prposed Substation
- Proposed Borrow Pit
- Proposed Construction Compound
- Proposed Hardstand
- Proposed New Roads
- Proposed Spoil Deposition
- Watercourses
- 50m Watercourse Buffer
- Mapped Peat
- Paulstown PWS (Outer Protection Area)
- Paulstown PWS (Inner Protection Area)
- Castlewarren ZOC

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Title: Hydro-Constraints Map

Client: Galetech Energy Services

Job: White Hill WF, Co. Carlow/Kilkenny

Project No: P1547-0

Figure No: Figure 1

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Annex 4 –
Air Quality & Climate Scoping Report

AIR QUALITY AND CLIMATE SCOPING REPORT
-
WHITE HILL WIND FARM

Technical Report Prepared For

Carlow Wind Limited

Technical Report Prepared By

Niamh Nolan BSocSci AMIEnvSoc

Our Reference

NN/21/12203AR01

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1 INTRODUCTION

The purpose of this section of the Environmental Scoping Report is to describe the scope of work and methods to be applied in the identification and assessment of air quality impacts associated with the proposed White Hill Wind Farm. A high-level overview of the baseline conditions is included, together with the proposed methodology and a scope of work likely to be required to undertake a detailed assessment of the impact of the proposed development on air quality as part of the Environmental Impact Assessment Report.

1.1 Policy and Plan Context – Air Quality

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set. The assessment of air quality will be conducted with consideration of the relevant legislation and guidance including:

- Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC);
- European Union Directive on air quality assessment and management (96/62/EC) and the associated "daughter Directives", which set the Limit Values;
- Air Quality Standards Regulations 2011 (S.I. 180 of 2011), which incorporates European Commission Directive 2008/50/EC which has set limit values for the pollutants sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10}), benzene and carbon monoxide (CO);
- Air Pollution Act 1987 (No. 6 of 1987);
- Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (2014);
- Local Authority air quality and planning guidance;
- UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality HA 207/07 Air Quality (UK Highways Agency 2019); and
- Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII 2011).

1.2 Policy and Plan Context – Climate

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements. In order to meet the commitments under the Paris Agreement, the EU enacted Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013 (the Regulation). Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In addition, the Climate Action Plan (CAP), published in June 2019 (Government of Ireland, 2019), outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP has set a built environment sector reduction target of 40-45% relative to 2030 pre-NDP (National

Development Plan) projections. The impact of the proposed development on climate will be assessed against compliance with these target values. The CAP specifically targets delivery of 70% renewable electricity by 2030.

Climate Change Adaptation Strategies were published in 2019 by both Kilkenny County Council (Kilkenny County Council and The Eastern & Midlands Climate Action Regional Office, 2019) and Carlow County Council (Carlow County Council, 2019) following the National Adaptation Framework outlines the measures of each county council to help in mitigating and adapting to climate change. One of the key measures to be included in these documents includes the increased use of renewable energy sources as opposed to traditional fossil fuels.

The assessment of climate will be conducted with consideration of the relevant legislation and guidance including:

- European Commission (EC) (2014) 2030 Climate and Energy Policy Framework;
- Climate Action and Low Carbon Development Act (No. 46 of 2015);
- DCCAE (2013) Climate Action and Low Carbon Development – National Policy Position Ireland;
- DCCAE (2017) National Mitigation Plan: July 2017;
- Government of Ireland (2019) Climate Action Plan;
- IAQM Guidance on the Assessment of Dust from Demolition and Construction (2014);
- Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII, 2011);
- Local Authority's climate and planning guidance; and
- UK Highways Agency (2019b) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

1.3 Study Area

The proposed White Hill Wind Farm will be sited in west County Carlow and east County Kilkenny, approx. 3km west of Oldleighlin, approx. 14km southwest of Carlow and approx. 13km northeast of Kilkenny.

The development will comprise 7 no. wind turbines with an overall tip height of up to 180m; turbine foundations; turbine hardstandings; internal site access tracks; internal wind farm underground cabling; site entrances; and all associated site development, access and reinstatement works. The project also includes approx. 15km of underground electricity line (UGL) to the existing electricity substation at Scart, Kilkenny. The land use in the immediate vicinity of the proposed White Hill Wind Farm is rural farmland with a low number of one off houses. There are areas of peatland in proximity to the proposed wind farm.

It is determined that the scheme will require assessment of the degree of sensitivity of the siting and design (i.e. sensitivity of surroundings) of proposed infrastructure associated with the proposed development. It is expected that there will be sensitive residential receptors located within 200m of the grid connection and construction traffic routes for the wind farm.

The construction phase study area is focused on potential impacts generally due to dust. These impacts usually occur within 350 metres of the dust generating activity as dust particles fall out of suspension in the air. Dust impacts during the construction phase due to material handling activities, including excavation and backfill, may typically emit dust. Deposition typically occurs in close proximity to each site and therefore the study area is

limited to a 350 m radius from any dust generating activities and up to 500 m along haul routes from the site exit.

The study area with respect to impacts to air quality due to emissions from vehicle and HGV movements is limited to sensitive receptors less than 200 m from road links which are affected by significant changes in traffic volume (i.e. above 5%). This study area is the same for designated areas of conservation (either Irish or European designation) with respect to ecology as the potential impact is highest within 200 m of the road links and when significant changes in AADT (>5%) occur.

Due to the nature of climatic effects, if significant emissions occur, they will have the potential to impact Ireland's commitments and targets under various EU Climate Agreements and other international agreements. Therefore, the study area can be classed as Ireland.

2 DESCRIPTION OF THE EXISTING ENVIRONMENT

2.1 Air Quality

A desktop review of available baseline air quality data within the study area will be undertaken.

Assessment Criteria for the impact of dust during the construction phase are set out in the TII guidelines (TII 2011) and the Institute of Air Quality Management (IAQM) guidelines (IAQM 2014). These are used to assess the impact of dust emissions from construction and demolition activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. It is important to note that the predicted impacts associated with the earthworks and construction phases of the proposed development are short term and temporary in nature.

The following data sources will be referred to during the air quality assessment:

- Environmental Protection Agency – National Ambient Air Quality Monitoring Data Archive;
- Environmental Protection Agency – Air Quality in Ireland 2019 Report and previous reports (1997 – 2019);
- National Parks and Wildlife Service Maps; and
- Environmental Protection Agency – Integrated Pollution Control Licences.

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality in Ireland 2019" (EPA 2020), details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA 2020). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air monitoring, the region of the proposed development is categorised as being rural Zone D (EPA 2020).

NO_2 monitoring was carried out at two rural Zone D locations in 2019, Emo and Kilkitt (EPA 2020b). The NO_2 annual average in 2019 for Emo was 4 µg/m^3 and for KilKitt was 5 µg/m^3. Hence, long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40 µg/m^3. The average results over the last five years at a range of rural Zone D locations suggest an average of no more than 8 µg/m^3 as a background concentration, with maximum rural concentrations of 5 µg/m^3. Based on the above information a conservative estimate of the background NO_2 concentration in the

region of the proposed wind farm is 5 µg/m^3.

Long-term PM_{10} monitoring was carried out at the Zone D locations of Castlebar, Kilkitt and Claremorris in 2019 (EPA 2020b). The long-term average of the 90th%ile of 24-hour concentration is 19 µg/m^3. The average annual mean concentration measured is 11.3 µg/m^3 (EPA 2020b). The average results over the last five years at a range of Zone D locations suggests an upper average of 13 µg/m^3 as a background concentration. Hence long-term average PM_{10} concentrations measured at this location were significantly lower than the annual average limit value of 40 µg/m^3.

The results of $PM_{2.5}$ monitoring at Claremorris (Zone D) in 2019 (EPA 2020b) indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.52. Based on this information, a conservative ratio of 0.6 was used to generate a rural background $PM_{2.5}$ concentration of 7.8 µg/m^3. Hence long-term average $PM_{2.5}$ concentrations measured at this location were significantly lower than the annual average limit value of 25 µg/m^3.

In summary, existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ based on extensive long-term data from the EPA are well below ambient air quality limit values in the vicinity of the proposed wind farm.

2.2 Climate

The UN Intergovernmental Panel on Climate Change (IPCC) was formed to provide policymakers with regular scientific assessments on climate change assessing peer reviewed research. The IPCC remit also includes formulating adaptation and mitigation options. The IPCC publishes an assessment report every 5–7 years. The latest report is Assessment Report 5 (AR5) with the next report due in 2022. The IPCC focuses on anthropogenic GHG emissions which are influenced by population size, economic activity, lifestyle, energy use, land use patterns, technology and climate policy. In the AR5 report an additional pathway was included, this is radiation.

The fifth assessment report (AR5) reported that warming of the climate system is unequivocal with atmospheric concentrations of carbon dioxide, methane, and nitrous oxide having increased to levels unprecedented in at least the last 800,000 years. Global surface temperature change for the end of the 21st century is projected to be likely to exceed 1.5°C relative to the period 1850 to 1900 in all but the lowest scenario considered and are higher for other modelled scenarios. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

Ireland has signed up to several Climate agreements including the "*2030 Climate and Energy Policy* Framework" which aims to reduce GHG emissions by 40% compared with 1990 levels by 2030.

A review of Irelands GHG Emissions, published by the EPA states that Ireland exceeded its 2017 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC3 and updated under the subsequent EU's Effort Sharing Decision (ESD) 2017/1471. Therefore, reduction measures are required. The annual emission allocation in Annex II of this document for Ireland in the year 2020 is 37,942,682 tonnes of CO_2eq.

The EPA Report *Ireland's Greenhouse Gas Emissions Projections 2018-2040* (EPA 2019b) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in

animal numbers. However, over the period 2013-2020 Ireland as a whole is projected to exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No 406/2009/EC) 2020 target of 37,942 kilo tonnes CO_2eq by approximately 10 Mt CO_2eq under the With Existing Measures scenario and 9 Mt CO_2eq under the With Additional Measures scenario.

2.3 Consultation

Consultation is important in order to ensure that a sufficiently robust environmental baseline is established for the proposed development and its surroundings. It helps to identify specific concerns and issues relating to air quality and climate early on in the process.

Consultation with all relevant authorities, organisations and stakeholders will continue throughout the assessment and design process.

3 DESCRIPTION OF POTENTIAL IMPACTS

3.1 Potential Construction Phase Impacts – Air Quality

During the construction phase there is potential for an impact on air quality from the following:

- Potential for construction dust emissions and nuisance dust. This will potentially be caused by activities such as excavation, soil movement, soil storage and backfilling, and would be exacerbated by winds and dry weather. Dust tends to be deposited within 350 metres of the generation site, and therefore sensitive receptors which fall within this distance of construction activities would be most at risk;
- There is the potential impact of traffic emissions on nearby sensitive receptors and this will be reviewed in accordance with the UK Highways Agency guidance LA 105 – Air Quality (2019) criteria; and
- Emissions from Heavy Goods Vehicles (HGVs) and on site construction plant and equipment which may give rise to emissions including; particulates (PM_{10} and $PM_{2.5}$) and nitrogen oxides (NO_x).

In order to minimise dust emissions during construction, a series of mitigation measures will be included in the EIAR and will be implemented during the construction phase of the project, such as speed restrictions on site and water misting. The contractor appointed to design and build the proposed development will be required to comply with these measures. The mitigation measures will ensure no significant impact on sensitive receptors.

3.2 Potential Construction Phase Impacts – Climate

GHG emissions from construction traffic and embodied energy from construction materials will increase Ireland's GHG emissions potentially causing climate change. The impact of this will be assessed in the EIAR. The embodied energy of the construction material is expected to be the dominant source of GHG emissions as a result of the development. Emissions with the potential to cause climate change will arise from embodied carbon dioxide in site materials, removal of existing material and backfill as well as kilometres travelled by vehicles delivering/removing this material to and from the construction site. These emissions will be quantified using the TII Carbon Assessment Tool (Version 2) (TII 2020) for construction sites and compared to Irelands greenhouse gas emissions. The potential construction traffic emissions will be reviewed in accordance with the UK Highways Agency guidance LA 114 – Climate (2019) criteria.

The proposed development has the potential to cause a loss of forestry and removal of peat during the construction phase, this may have a negative impact on the sequestration of GHG emissions.

3.3 Potential Operational Phase Impacts– Air Quality

Due to the size, nature and location of the proposed development, increased road traffic emissions resulting from the proposed development are expected to have an imperceptible impact on air quality. However, the potential impact of traffic emissions will be reviewed in accordance with the UK Highways Agency guidance LA 105 – Air Quality (2019) criteria. Baseline levels of pollutants in the area are quite low and due to the low numbers of vehicles associated with the proposed development these are unlikely to increase them above limit values.

The generation of electricity due to the installation of the wind farm will lead to a net savings in terms of NO_x emissions resulting in a potentially significant beneficial impact.

3.4 Potential Operational Phase Impacts– Climate

The potential operational traffic emissions will be reviewed in accordance with the UK Highways Agency guidance LA 114 – Climate (2019) criteria.

In the absence of specific sectoral carbon budgets, it is anticipated that any negative changes in net GHG emissions due to the proposed development will be significant. This viewpoint aligns with the Institute of Environmental Management and Assessment (IEMA) guidance note on Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA 2017) which advises that all carbon emissions contribute to climate change and in the absence of a defined threshold (e.g. national sector-specific targets and trajectories), any decrease in carbon emissions may be considered as significant. As a result, GHG emissions from the operational phase have the potential to be significantly beneficial.

The benefit in terms of offset greenhouse gas emissions is calculated from the average fossil fuel electricity mix which will be offset by use of wind energy. This helps to fulfil Kilkenny and Carlow County Council's Climate Change Adaptation Strategy's (Kilkenny County Council and The Eastern & Midlands Climate Action Regional Office, Carlow County Council, 2019) commitment to more renewable energy sources.

4 PROPOSED METHODOLOGY AND ASSESSMENT

It is proposed that an assessment of air quality will be carried out in accordance with the following guidance and established best practice, it will be tailored accordingly based on professional judgement and local circumstance:

- Environmental Protection Agency (EPA) Guidelines on the Information to be contained in the Environmental Impact Statement (EPA, 2002) and will follow all future revisions or finalised EIA guidelines as appropriate (draft revised EPA guidelines on EIAR were published in 2017);
- Best Practice Guidelines for the Irish Wind Energy Industry (2012);
- EPA Advice notes on current practice in the preparation of Environmental Impact Statements (EPA, 2003) and will follow all future revisions or finalised EIA advice notes as appropriate (draft revised EPA Advice Notes for Preparing Environmental Impact Statements were published in 2015);
- UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality HA 207/07 Air Quality (UK Highways Agency 2019);
- LA 114 Climate (UKHA 2019);
- Transport Infrastructure Ireland document entitled Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII, 2011)); and

- TII Carbon Assessment Tool (Version 2) (TII 2020).

In line with the above guidance, the assessment will cover potential impacts to air quality and climate, it will describe the existing conditions and the likely potential impacts associated with the construction and operation of the proposed White Hill Wind Farm. The impact assessment process will involve:

- Assigning the receptor sensitivity;
- Identifying and characterising the magnitude and significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts; and
- Assessing the significance of any residual effects after mitigation.

The air quality assessment carried out on the proposed White Hill Wind Farm will include the following elements:

- Review of standards and legislation;
- Identification of air quality issues relevant to the components of the proposed development;
- Review of background ambient air quality in the vicinity of the proposed development (relevant air quality baseline data will be obtained from the EPA);
- Assessment of potential impacts of plant and equipment processes on air quality; and
- Assessment of potential impacts of traffic on ambient air quality.

The assessment will take account of sensitive receptors relevant to the proposed development. Sensitive receptors include locations where people spend significant periods of time, such as domestic properties. Ecological receptors are habitats that might be sensitive to dust. Examples of these sensitive receptors include:

- Residential dwellings;
- Industrial or commercial uses sensitive to dust;
- Recreational areas and sports grounds;
- Schools and other educational establishments;
- Buildings of religious sensitivity;
- Designated ecological area of conservation (either Irish or European designation);
- Hospitals and nursing homes; and
- Offices or Shops.

A series of mitigation measures to minimise any foreseen impacts for the construction, operational and decommissioning phasea of the project will be proposed as required as part of the EIAR. Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure proposed mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, a dust management plan will be formulated by drawing on best practice guidance from Ireland, the UK and USA.

5 References

Carlow County Council (2019) Climate Change Adaptation Strategy 2019 – 2024

Environmental Protection Agency (EPA) (2002) Guidelines On Information To Be Contained in Environmental Impact Statements

EPA (2003) Advice Notes On Current Practice (In The Preparation Of Environmental Impact Statements)

European Council (2014) European Council (23rd and 24th October 2014) Conclusions on 2030 Climate and Energy Policy Framework, SN 79/14

EPA (2015) Advice Notes for Preparing Environmental Impact Statements (Draft) on the Information to be Contained in Environmental Impact Assessment Reports (Draft)

EPA (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft)

EPA (2020b) Air Quality Monitoring Report 2019 (& previous annual reports 1997-2019)

EPA (2020). Ireland's Greenhouse Gas Emissions Projections 2019 - 2040

EPA (2021) EPA Website: http://epa.ie/pubs/reports/air/

European Council (2014) European Council (23 and 24 October 2014) Conclusions on 2030 Climate and Energy Policy Framework, SN 79/14

Institute of Air Quality Management (IAQM) (2014) Guidance on the Assessment of Dust from Demolition and Construction

Kilkenny County Council and The Eastern & Midlands Climate Action Regional Office (2019) Climate Change Adaptation Strategy 2019 - 2024

Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes

TII (2020) TII Carbon Assessment Tool (Version 2)

UKHA (2019). Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 - Climate

UKHA (2019) UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality HA 207/07 Air Quality

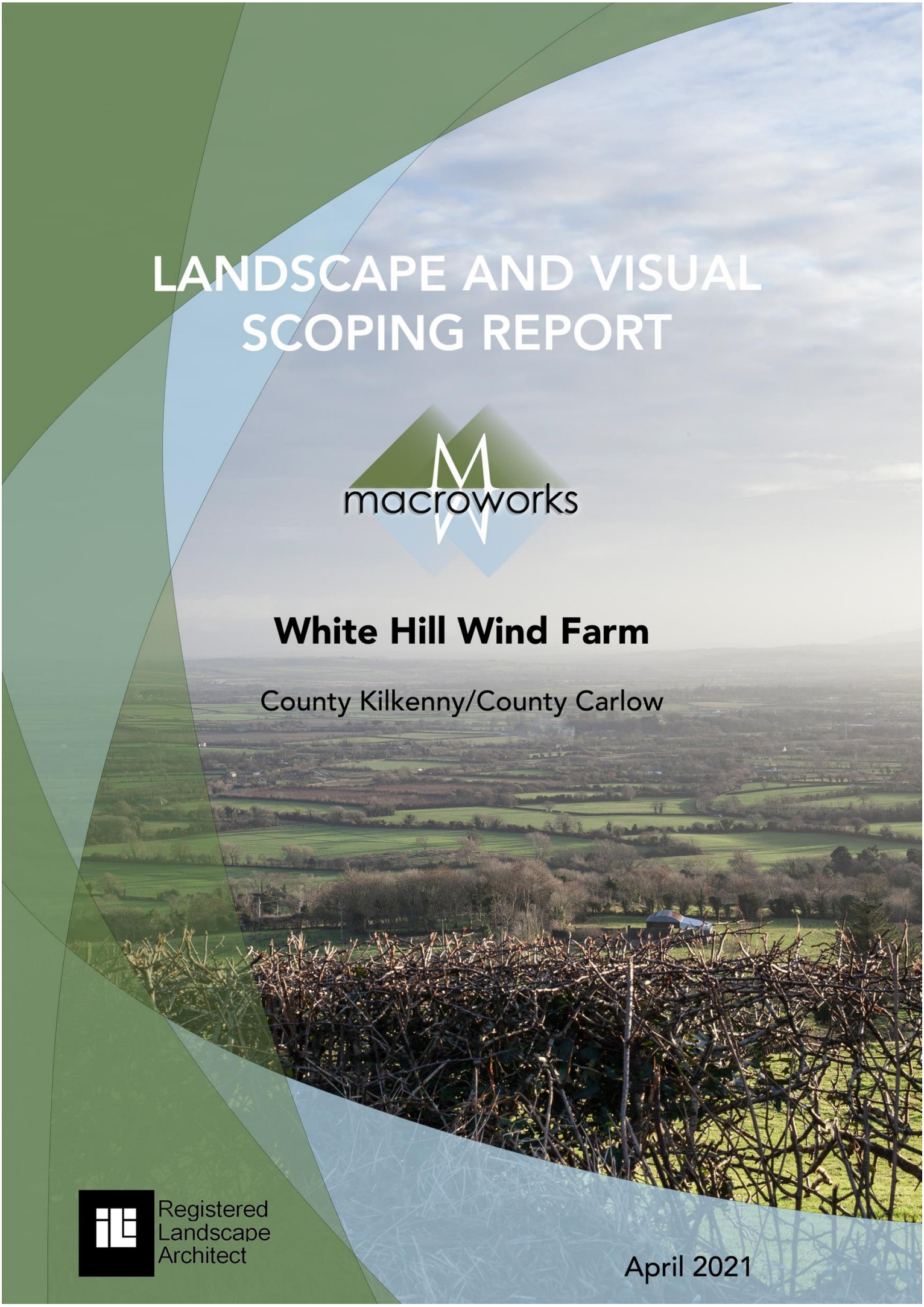
Annex 5 –
Landscape Scoping Report

LANDSCAPE AND VISUAL SCOPING REPORT

macroworks

White Hill Wind Farm

County Kilkenny/County Carlow



Registered Landscape Architect

April 2021

1 LANDSCAPE AND VISUAL SCOPING

1.1 INTRODUCTION

The purpose of this Scoping Report is to describe the scoping methodology and present outcomes of initial desk study and fieldwork stages and also to establish the scope of work and methods applied in the identification and assessment of landscape and visual impacts associated with the proposed White Hill Wind Farm. It will present key landscape and visual receptors and highlight potential effects that will be assessed. Another key element of the landscape and visual scoping report is the selection of the preliminary set of representative Viewshed Reference Points (VRPs), from which, it is intended to prepare photomontage simulations of the development and undertake the visual impact assessment.

The proposed White Hill Wind Farm is situated in an area of rolling hills and ridges on the Carlow-Kilkenny border that comprises of a mix of rolling farmlands and conifer forest plantations. It is situated some c. 13km northeast of Kilkenny City. A number of smaller village and town settlements are also located within the vicinity of the site and include Oldleighlin, Castlewarren, Muckalee and Coan.

1.2 POLICY PLAN AND CONTEXT

The European Landscape Convention promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. The Convention was adopted on the 20th October 2000 and came into force on the 1st March 2004. The Convention was ratified by Ireland in 2002. As one of the obligations under the convention, a draft National Landscape Strategy was issued for public consultation by the *Department of Arts*, *Heritage*, Regional, Rural and *Gaeltacht* Affairs, (formally the Department of Art, Heritage and the Gaeltacht in July 2014. Following consideration of submissions, The 'National Landscape Strategy for Ireland 2015-2025' was published in mid-2015 by the Department of Arts, Heritage and the Gaeltacht.

One of the key objectives of the National Landscape Strategy, and a requirement of the European Landscape Convention, is to prepare a National Landscape Character Assessment (LCA). However, this is not likely to be prepared prior to the submission of the planning application. On this basis, county level Landscape Character Assessments for County Kilkenny and County Carlow (both contained within the respective County Development Plans) will be a key consideration. In all cases, these Landscape Character Assessments have also been integral to the development of wind energy strategies / policy contained within the CDPs.

Wind Energy Development within the Republic of Ireland is undertaken in accordance with the Department of the Environment, Heritage and Local Government *Wind Energy Development Guidelines for Planning Authorities* (2006/2019 revision). Recommendations on the siting and design of wind energy developments are provided in Chapter 6 of the current / draft revised Guidelines based on six potential landscape character types. The proposed development is considered to be

most associated with the 'Hilly and Flat Farmland' landscape type. This guidance will be a key consideration of the landscape and visual assessment.

The Landscape and Visual Assessment of White Hill Wind Farm will be undertaken in strict accordance with the Landscape Institute and the Institute of Environmental Management and Assessment publication entitled '*Guidelines for Landscape and Visual Impact Assessment*' – Third Edition (2013). This is recognised as the principal best practice guidance for landscape and visual assessment of all forms of development in Ireland and the UK.

Regard will also be given to the overarching Environmental Impact Assessments guidelines and advice notes set out by the EPA:

- Environmental Protection Agency (EPA) *Guidelines on the Information to be contained in the Environmental Impact Assessment Reports* (EPA, Draft 2017)
- EPA *Advice Notes for preparing Environmental Impact Statements* (EPA, Draft 2015)

Other relevant LVIA and wind energy specific guidance that will be considered includes;

- Scottish Natural Heritage (SNH) *Siting and Designing Wind Farms in the Lan*dscape (version 3a – 2017)
- Scottish Natural Heritage (SNH) *Assessing the Cumulative Impact of Onshore Wind Energy Developments* (2012).
- Scottish Natural Heritage (SNH) *Visual representation of wind farms: Best Practice Guidelines* (version 2.2 - 2017).

The most relevant landscape and visual policies with regard to the proposed wind farm development are contained with the County Development Plan for County Kilkenny and County Carlow

Kilkenny County Development Plan 2014-2020

A landscape character assessment for County Kilkenny is incorporated in the current County Development Plan and divides the county into four landscape character types (LCTs). Areas of the main wind farm site that fall within county Kilkenny are located within the 'upland' LCT, whilst the southernmost section of the grid connection is located in the 'Transition Zone – LCT'. Landscape character types are sub-divided into a further 14 geographically specific Landscape Character Areas with the proposed wind farm site partially located within the 'LCA B – Castlecomer Plateau'. Whilst a large majority of the proposed development, including large sections of the grid connection, are also located within 'LCA B – Castlecomer Plateau', the southernmost extents of the grid connection falls within the 'LCA B1 – Castlecomer Southern Transition Zone'. The current county development plan also identifies areas of greater sensitivity within the county which area outlined on figure 8.3 of the current development plan. As identified on figure 8.3 of the current CDP, the proposed development site itself is located in 'areas of greater sensitivity' which relate to 'Altitude above 200m' and 'Transitional woodland scrub'. A number of 'principal ridgelines' are also located to the north, west and south of the site.

Note: *A draft of the Kilkenny City and County Development Plan 2021-2027 is currently available for review on the Kilkenny County Council website. This draft includes the same Landscape Character Assessment (prepared for County Kilkenny in 2003) that forms part of the current Kilkenny CDP 2014-2020. Consequently, there are no changes in relation to landscape character areas or landscape character types. One notable difference between the current CDP and the draft CDP occurs on figure 9.3 landscape sensitives (figure 8.3 in the current CDP), where the 'altitude above 200m' and 'principal ridgeline' categories are now removed. Furthermore, the gross area of 'transitional woodland scrub' that is shown to be contained within the site on the current CDP maps has reduced on the draft CDP.*

Carlow County Development Plan 2015-2021

A Landscape Character Assessment has been incorporated in the Carlow County Development Plan which separates the county into four principal landscape character areas. Areas of the proposed development site that are located within county Carlow are situated within the 'Killeshin Hills' landscape character area. Within the landscape character areas a number of generic landscape character types are identified, of which, the proposed development is located within 'Uplands'. It is important to note that the 'uplands' landscape character type is classified with a landscape sensitivity level '5 – most', the highest of five classifications. Nonetheless, this landscape character type has been classified with a 'moderate' capacity to absorb 'wind farming' land uses types.

Note: *The Carlow County Development Plan 2022-2028 is currently at Issues paper stage and landscape policies are not yet available for review.*

County Development Plan Scenic Designations

Scenic views and routes designations from both the Kilkenny and Carlow County Development Plans (and draft plans) will be considered as well as those from other Planning Authority jurisdictions (Kildare and Laois) within the study area. Those considered relevant in terms of viewing direction and potential visibility of the proposed development will be included as a representative viewpoint for the purposes of the visual impact assessments. A list of those designated scenic views that have been scoped out and the reasoning why will be included within the Viewshed Reference Point Selection Report.

1.3 STUDY AREA

The *Wind Energy Development Guidelines for Planning Authorities* published by the Department of the Environment, Heritage and Local Government (2006/2019 draft revised) specify different radii for examining the Zone of Theoretical Visibility of proposed wind farm projects ('ZTV'). The extent of this study area is influenced by turbine height as follows;

- 15km radius for blade tips up to 100m;
- 20km radius for blade tips greater than 100m; and
- 25km in order to incorporate features of national or international renown.

In the case of this proposed development, the blade tips will be over 100m high and, thus, the minimum ZTV radius required is 20km from the outermost turbines of the proposed development.

1.3.1 Consultation

It is recommended that consultation on the landscape and visual impact assessment will be undertaken with the Local Authorities – Kilkenny and Carlow County Councils, along with local residents.

1.4 SCOPING METHODOLOGY

Scoping for this LVIA will consist of a combination of 'desk study' and fieldwork in order to understand the nature of the receptors within the study area and the nature of likely impacts that are likely to occur as a result of the proposed development. The desk study element precedes fieldwork as the latter is used to scope-in or scope-out potentially affected receptors that are identified as part of the desk study.

Establishing the landscape baseline includes consideration of the geographic location and landscape context of the proposed development site as well as the essential landscape character and salient features of the wider Study Area and is discussed with respect to; landform and drainage and; vegetation and land use. The visual baseline is more population based, but still overlaps with elements of the landscape baseline. The visual baseline is discussed in relation to; centres of population and houses; transport routes and; public amenities and facilities.

1.4.1 Desk Study

The desktop study will comprise of the following:

- Review of a Zone of Theoretical Visibility (ZTV) map, which indicates areas from which the development is potentially visible in relation to terrain within the Study Area;
- Review of relevant County Development Plans, particularly with regard to sensitive landscape and scenic view/route designations;
- Online review of tourism, recreational and heritage features within the study area that may be potential visual receptors.
- Selection of potential Viewshed Reference Points (VRPs) from key visual receptors to be investigated during fieldwork for actual visibility and sensitivity;
- Production of wireframe images of the development at each potential viewpoint (illustrating the turbines in a bare-ground context) to aid fieldwork / viewpoint selection.

1.4.2 Fieldwork

Fieldwork was undertaken during Spring 2021 and comprised of the following:

- Examination of the salient landscape character of the site and its immediate surrounds as well as the wider study area.
- Investigation of potential viewpoint locations identified at the desk study stage and selection / rejection of each.
- Selection of other relevant viewpoints that may not have been apparent from the desk study (local monuments, walkways etc.).

- Capture high quality base photography from which to prepare photomontages of the proposal.
- Examine the route of the proposed grid connection.
- Preparation of a viewpoint selection report and associated map for consultation purposes (Planning Authorities) indicating the intended VP selection set to be used for the preparation of photomontages to support the visual impact assessment.

1.5 POTENTIAL IMPACTS

As described at Section 1.4, analysis of ZTV maps provides the basis for initial desk based VP selection, as these maps identify from where in the study area the development is potentially visible in a bare-ground scenario. Importantly, they also indicate areas where there is no potential for visible, which can then be confidently scoped-out of further investigation / assessment. Overall, there is potential for short range (0-5km), mid-range (5-15km) and long range (15km+) views of the development, but with the highest potential for significant landscape and visual impacts to occur for short range views, where these might coincide with highly sensitive receptors. Views of the proposed development from beyond 20km, though feasible, could only occur from elevated vantage points and in very clear viewing conditions. At such distances, any visual impacts from the proposed development are not considered to have potential for significant effects even at highly sensitive receptor locations.

Potential landscape and visual impacts could also occur in respect of ancillary development such as access roads, hard stands, and grid connection.

1.5.1 Analysis of ZTV maps

The ZTV maps show that there will be large areas of comprehensive visibility within the central study area (<5km from the site). Whilst large areas of the wider study area will afford no visibility of the proposed development, a number of notable blocks of comprehensive ZTV pattern exist throughout here and extend up to its full 20km study radius. In terms of large settlements, the central areas of Kilkenny City have the potential to afford views of up to 4 of the proposed turbines, whilst the southern suburban areas of the city have the potential to view up 6 of the proposed turbines. Only the south-eastern extents of Carlow town will afford theoretical visibility of the proposed development where views of up to 6 of the proposed turbines have the potential to be afforded.

Key receptors contained with the ZTV (i.e with potential visibility) within the central study area include the settlements of Oldleighlin and Coan, in addition to the numerous residential dwellings and farmsteads that are located within the vicinity of the site. Many of these are located in areas of comprehensive ZTV pattern and therefore have the potential to afford clear views of the proposed turbines. As a result, a strong emphasis will be placed on local community receptors in the LVIA.

1.5.2 Viewshed Reference Point (Viewpoint) Selection Report

Based on the ZTV map, analysis a preliminary viewpoint selection was generated. These viewpoints were investigated during fieldwork and resulted in the preparation Viewshed Reference Point

Selection Report which identified viewpoints that are intended to be used for the visual impact assessment and views that were investigated but will be scoped out. Below is a map of the refined selected viewpoints for assessment in the LVIA.

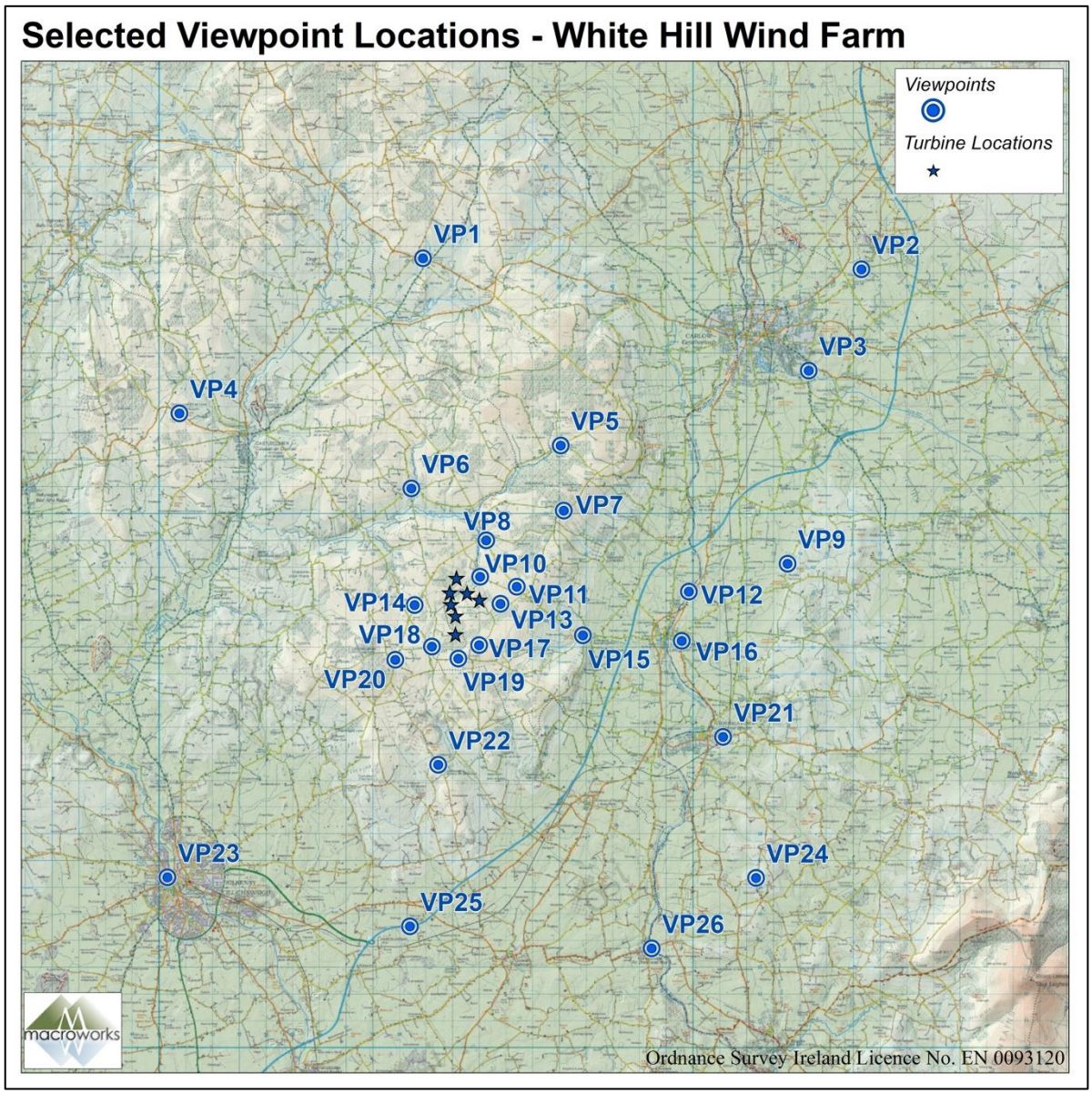


Figure 1: Selected Viewpoint Map

1.5.3 Potential Cumulative Impacts

The nearest existing wind energy development to the proposed development is that of Gortahile Wind Farm which is situated some c. 5km north of the site at its nearest point. Permission also exists for the Bilboa Wind Farm, a 5 turbine wind farm development situated c. 3km northeast of the site whilst planning permission for the 11 turbine Pinewoods Wind Farm also exists some 16km northwest of the proposed development.

1.6 EIAR ASSESSMENT METHODOLOGY

Production of the Landscape and Visual Impact Assessment (Landscape EIAR chapter) will involve desktop studies and fieldwork comprising professional evaluation by qualified and experienced Landscape Architects.

1.6.1 Assessment

In accordance with the *Guidelines for Landscape and Visual Impact Assessment* (2013), the method for estimating the significance of landscape impacts and visual impacts is very similar. This is summarised in the diagram below;

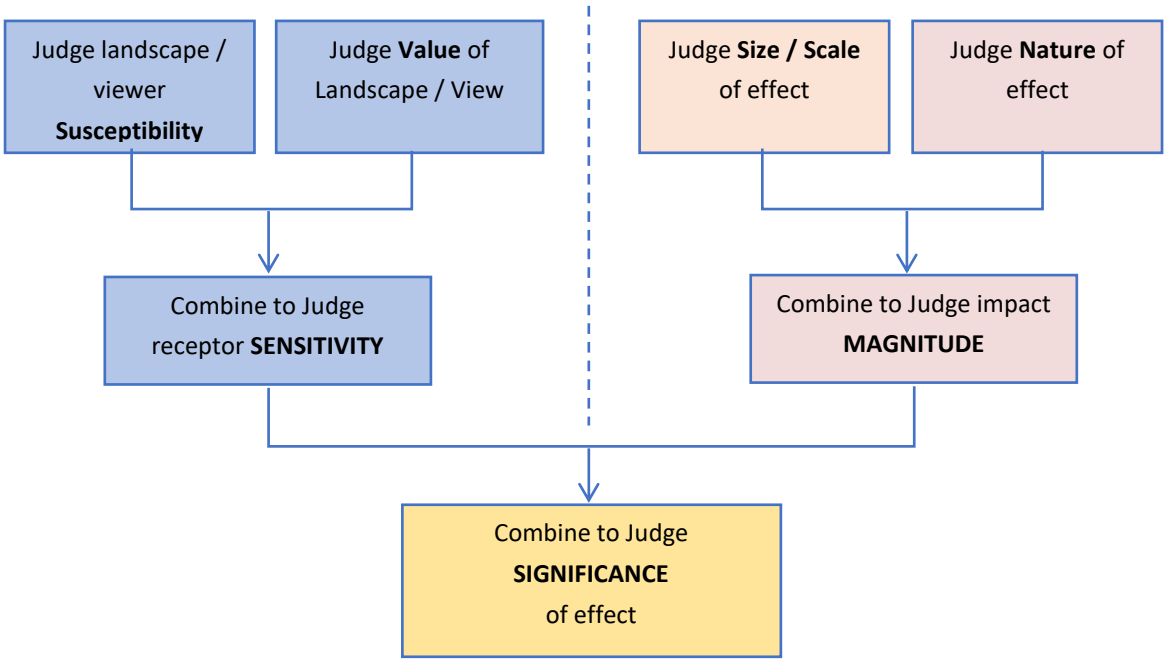


Figure 2: Method for assessing Landscape Impact Significance and Visual Impact Significance (based on GLVIA – 2013)

1.7 ASSESSMENT CRITERIA FOR LANDSCAPE IMPACTS

The sensitivity of the landscape to change is the degree to which a particular landscape receptor (Landscape Character Area (LCA) or feature) can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics. Landscape Value and Sensitivity is classified using the following criteria;

Sensitivity	Description
Very High	Areas where the landscape character exhibits a very low capacity for change in the form of development. Examples of which are high value landscapes, protected at an international or national level (World Heritage Site/National Park), where the principal management objectives are likely to be protection of the existing character.

High	Areas where the landscape character exhibits a low capacity for change in the form of development. Examples of which are high value landscapes, protected at a national or regional level (Area of Outstanding Natural Beauty), where the principal management objectives are likely to be considered conservation of the existing character.
Medium	Areas where the landscape character exhibits some capacity and scope for development. Examples of which are landscapes which have a designation of protection at a county level or at non-designated local level where there is evidence of local value and use.
Low	Areas where the landscape character exhibits a higher capacity for change from development. Typically this would include lower value, non-designated landscapes that may also have some elements or features of recognisable quality, where landscape management objectives include, enhancement, repair and restoration.
Negligible	Areas of landscape character that include derelict, mining, industrial land or are part of the urban fringe where there would be a reasonable capacity to embrace change or the capacity to include the development proposals. Management objectives in such areas could be focused on change, creation of landscape improvements and/or restoration to realise a higher landscape value.

Table 1: Landscape Value and Sensitivity

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced as a result of the proposed development. The magnitude takes into account whether there is a direct physical impact resulting from the loss of landscape components and/or a change that extends beyond the proposal site boundary that may have an effect on the landscape character of the area.

Magnitude of Impact	Description
Very High	Change that would be large in extent and scale with the loss of critically important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
High	Change that would be more limited in extent and scale with the loss of important landscape elements and features, that may also involve the introduction of new uncharacteristic elements or features that contribute to an overall change of the landscape in terms of character, value and quality.
Medium	Changes that are modest in extent and scale involving the loss of landscape characteristics or elements that may also involve the introduction of new uncharacteristic elements or features that would lead to changes in landscape character, and quality.
Low	Changes affecting small areas of landscape character and quality, together with the loss of some less characteristic landscape elements or the addition of new features or elements.
Negligible	Changes affecting small or very restricted areas of landscape character. This may include the limited loss of some elements or the addition of some new features or elements that are characteristic of the existing landscape or are hardly perceivable.

Table 2: Magnitude of Landscape Impacts

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. The significance of landscape impacts is arrived at using the following matrix:

	Sensitivity of Receptor				
Scale/ Magnitude	*Very High*	*High*	*Medium*	*Low*	*Negligible*
Very High	Profound	Profound-substantial	Substantial	Moderate	Slight
High	Profound-substantial	Substantial	Substantial - moderate	Moderate-slight	Slight-imperceptible
Medium	Substantial	Substantial - moderate	Moderate	Slight	Imperceptible
Low	Moderate	Moderate-slight	Slight	Slight-imperceptible	Imperceptible
Negligible	Slight	Slight-imperceptible	Imperceptible	Imperceptible	Imperceptible

Table 3: Landscape/Visual Impact Significance Matrix

**Orange shaded cells are considered to equate with 'significant' impacts in EIA terms.*

Note that potential beneficial landscape impacts are not accounted for in the tables and matrix above. This is on the basis that commercial scale wind energy projects are very unlikely to generate beneficial landscape impacts. In the rare instances that this might occur, perhaps by facilitating the rehabilitation of a degraded landscape, the benefits will be discussed in the assessment and the significance of impact would default to the lowest end of the range (Imperceptible).

1.8 ASSESSMENT CRITERIA FOR VISUAL IMPACTS

As with the landscape impact, the visual impact of the proposed development will be assessed as a function of receptor sensitivity versus magnitude. In this instance, the sensitivity of visual receptors, weighed against the magnitude of visual effects.

1.8.1 Visual Sensitivity

Unlike landscape sensitivity, visual sensitivity is population based. Visual sensitivity is a two-sided analysis of receptor susceptibility (people or groups of people) versus the value of the view on offer at a particular location.

1.8.2 Susceptibility of Receptors

In accordance with the *Guidelines for Landscape and Visual Assessment* (2013), visual receptors most susceptible to changes in views and visual amenity are:

- Residents at home;

- People, whether residents or visitors, who are engaged in outdoor recreation, including use of public rights of way, whose attention or interest is likely to be focussed on the landscape and on particular views;
- Visitors to heritage assets, or to other attractions, where views of the surroundings are an important contributor to the experience;
- Communities where views contribute to the landscape setting enjoyed by residents in the area; and
- Travellers on road, rail or other transport routes where such travel involves recognised scenic routes and awareness of views is likely to be heightened.

Visual receptors that are less susceptible to changes in views and visual amenity include:

- People engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views of the landscape; and
- People at their place of work whose attention may be focussed on their work or activity, not their surroundings, and where the setting is not important to the quality of working life.

1.8.3 Value of Views

To assess the amenity value of views, Macro Works use a range of criteria that might typically be related to high amenity value including but not limited to, scenic designations. These are set out below:

- **Recognised scenic value of the view** (County Development Plan designations, guidebooks, touring maps, postcards etc). These represent a consensus in terms of which scenic views and routes within an area are strongly valued by the population because in the case of County Development Plans, at least, a public consultation process is required;

- **Views from within highly sensitive landscape areas**. Again, highly sensitive landscape designations are usually part of a county's Landscape Character Assessment, which is then incorporated with the County Development Plan, and is therefore subject to the public consultation process. Viewers within such areas are likely to be highly attuned to the landscape around them;

- **Intensity of use, popularity**. Whilst not reflective of the amenity value of a view, this criterion relates to the number of viewers likely to experience a view on a regular basis and whether this is significant at county or regional scale;

- **Provision of elevated panoramic views**. This relates to the extent of the view on offer and the tendency for receptors to become more attuned to the surrounding landscape at locations that afford broad vistas.

- **Sense of remoteness and/or tranquillity**. Remote and tranquil viewing locations are more likely to heighten the amenity value of a view and have a lower intensity of development in comparison to dynamic viewing locations such as a busy street scene, for example;

- **Degree of perceived naturalness**. Where a view is valued for the sense of naturalness of the surrounding landscape, it is likely to be highly sensitive to visual intrusion by obvious human interventions;

- **Presence of striking or noteworthy features**. A view might be strongly valued because it contains a distinctive and memorable landscape feature such as a promontory headland, lough or castle;

- **Historical, cultural or spiritual value**. Such attributes may be evident or sensed at certain viewing locations that attract visitors for the purposes of contemplation or reflection heightening the sense of their surroundings;

- **Rarity or uniqueness of the view**. This might include the noteworthy representativeness of a certain landscape type and considers whether other similar views might be afforded in the local or the national context;

- **Integrity of the landscape character in view**. This criterion considers the condition and intactness of the landscape in view and whether the landscape pattern is a regular one of few strongly related components or an irregular one containing a variety of disparate components;

- **Sense of place**. This criterion considers whether there is special sense of wholeness and harmony at the viewing location; and

- **Sense of awe**. This criterion considers whether the view inspires an overwhelming sense of scale or the power of nature.

Those locations where highly susceptible receptors or receptor groups are present and which are deemed to satisfy many of the view value criteria above are likely to be judged to have a high visual sensitivity and vice versa.

1.8.4 Visual Impact Magnitude

The magnitude of visual effects is determined on the basis of two factors: the visual presence of the proposal and its effect on visual amenity.

Visual presence is a somewhat quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects beyond simply scale in

relation to distance. Some of these include the extent of the view as well as its complexity and the degree of existing contextual movement experienced, such as might be obtained where turbines are viewed as part of / beyond a busy street scene. The backdrop against which the development is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista and is often expressed as such i.e. minimal, sub-dominant, co-dominant, dominant and highly dominant.

For wind energy developments, a strong visual presence is not necessarily synonymous with adverse impact and this is reflected in *Wind Energy Development Guidelines for Planning Authorities* (2006/2019 revision) wherein it is advocated that a clear and comprehensive view of a wind farm might be preferable in many instances to a partial or cluttered view of turbine components that are not so prominent within a view. On the basis of these reasons, the visual amenity aspect of assessing impact magnitude is qualitative and considers such factors as the spatial arrangement of turbines both within the scheme and in relation to surrounding terrain and land cover. It also examines whether the development contributes positively to the existing qualities of the vista or results in distracting visual effects and disharmony.

It should be noted that as a result of this two-sided analysis, a high order visual presence can be moderated by a low level of effect on visual amenity and vice versa. Given that wind turbines do not represent significant bulk, visual impacts result almost entirely from visual 'intrusion' rather than visual 'obstruction' (the blocking of a view). The magnitude of visual impacts is classified in the following table:

Criteria	Description
Very High	The proposal intrudes into a large proportion or critical part of the available vista and is without question the most noticeable element. A high degree of visual disorder or disharmony is also generated, strongly reducing the visual amenity of the scene
High	The proposal intrudes into a significant proportion or important part of the available vista and is one of the most noticeable elements. A considerable degree of visual disorder or disharmony is also likely to be generated, appreciably reducing the visual amenity of the scene
Medium	The proposal represents a moderate intrusion into the available vista, is a readily noticeable element and/or it may generate a degree of visual disorder or disharmony, thereby reducing the visual amenity of the scene. Alternatively, it may represent a balance of higher and lower order estimates in relation to visual presence and visual amenity
Low	The proposal intrudes to a minor extent into the available vista and may not be noticed by a casual observer and/or the proposal would not have a marked effect on the visual amenity of the scene

Negligible	The proposal would be barely discernible within the available vista and/or it would not detract from, and may even enhance, the visual amenity of the scene

Table 4: Magnitude of Visual Impact

1.2.1 Visual Impact Significance

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. This relationship is expressed in the same significance matrix as for Landscape impacts provided at **Table 4** above.

1.9 CONCLUSION

Following the scoping stage desk study and field work, it is considered that the central study area is a working rural landscape that is predominantly contained in pastoral farmland and large commercial conifer forest plantations. The landform of the site and its surroundings is that of an elevated plateau of rolling hills and ridges where areas of open visibility are afforded across the surrounding lowland portions of the landscape. Nonetheless, whilst there is some sense of scenic amenity within the central study area, much of the landscape value here relates to the subsistence of the rural economy. In this regard, the landscape of the central study area is that of a robust rural setting that encompasses some sensitive elements including the settlements of both Coan and Oldleighlin.

Notwithstanding, the generally robust landscape character of the site and its immediate surroundings, there is potential for notable visual effects at local community receptors (local roads and residents) due to the perceived scale of the proposed turbines when viewed from short distances. Nonetheless, this is a broad elevated setting and it is considered that wind turbines can be well accommodated here.

There is a notable degree of scenic amenity present within the central and wider study area, much of which relates to views across the lowlands in the opposite direction to the proposed development. The most notable agglomeration of scenic designations occurs within areas of the study area that are located within County Carlow. Numerous designated scenic views and scenic routes occur in County Carlow in the eastern half of the study area, however, a large majority of these are oriented across the central plain or in the direction of the Blackstairs Mountains, all of which are located in the opposite direction to the proposed development. There is also potential for visual effects at a number of sensitive heritage and amenity receptors within the wider surrounds of the study area including the Barrow Way situated in the eastern half of the study area. A number of heritage features also occur within the wider surrounds of the study area, whilst several walking trails, cycling routes, and scenic drives are also located throughout the entire 20km study extents.

There is also potential for landscape and visual impacts in relation to the construction stage works of the proposed wind farm site, haul route, and grid connection. However, these effects are likely to be temporary/short-term. In relation to the turbine haul route and grid connection, any areas of the landscape disrupted by construction stage works will be reinstated post-construction, and

consequently, operational stage visual impacts for both the proposed haul route and grid connection have been scoped out.

There is 1 existing wind farm situated just over 5km north of the site, whilst a permitted wind farm is also located just over 3km northeast of the site. As a result, the cumulative impact of the proposed development will be an important consideration and it will be important to consider the visual relationship with both permitted and constructed developments to ensure they do not present as one large wind energy development or with any notable sense of scale conflict.

Visual impacts at receptors outside of the 20km radius study area are scoped-out of further assessment due to the very limited potential for visibility beyond this distance as well as the fact that if the proposed turbines are seen from beyond 20km (in the clearest of viewing conditions) they will present at a very small scale with a low degree of contrast against a backdrop of sky. Thus, there is not considered to be potential for significant visual impacts to occur. For similar reasons, cumulative impacts in relation to receptors or other wind farm developments beyond the 20km radius study area have also been scoped-out of further assessment. Visual effects at receptors that are not contained within the ZTV pattern will also be scoped-out on the basis that there will be no potential for views of the proposed development in such instances.

Annex 6 –
Cultural Heritage Scoping Report

dermot nelis archaeology

ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE SCOPING REPORT

WHITE HILL WIND FARM,

COUNTY CARLOW AND COUNTY KILKENNY

PREPARED BY

DERMOT NELIS ARCHAEOLOGY

FOR

CARLOW WIND LTD.

14th MAY 2021

CONTENTS

List of Figures

1 INTRODUCTION

1.1 General

This desk-based scoping report has been prepared on behalf of Carlow Wind Ltd. by Dermot Nelis Archaeology to assess and define any effects which the construction, operation and decommissioning of a seven no. turbine wind farm and associated infrastructure, including 1 no. grid connection route, 2 no. spoil deposition areas, 2 no. borrow pits/spoil deposition areas, a site compound, a possible battery storage area, a meteorological mast, a substation and a turbine delivery haul route may have on the archaeological, architectural and cultural heritage resource (Figure 1). The scoping report includes an identification of potential impacts or effects which may arise and outlines mitigation measures, based on current information, which may be used to avoid, reduce or offset any potential adverse impacts or effects.

1.2 Objectives of Scoping Report

The key objectives of this scoping report are to assess, as far as is reasonably possible from existing records and current information, any impacts the proposed development may have on the archaeological, architectural and cultural heritage resource. The following key issues are addressed:

- Direct and indirect impacts of the construction of the development on the archaeological, architectural and cultural heritage resource.

- Direct and indirect impacts of the operation of the development on the archaeological, architectural and cultural heritage resource.

- Cumulative impacts of the construction and operation of the development on the archaeological, architectural and cultural heritage resource with other existing, permitted or proposed developments or projects.

1.3 Project Team

Dermot Nelis BA ArchOxon AIFA MIAI

Dermot Nelis graduated from Queen's University Belfast, and after gaining extensive fieldwork experience undertook postgraduate studies at the University of Oxford in archaeological consultancy and project management.

Dermot has acted as Senior Archaeologist on several road schemes for various County

Councils, and Directed large-scale multi-period excavations associated with those developments. He has completed more than 180 Licensed fieldwork programmes and over 250 archaeological, architectural and cultural heritage desk-based reports and Environmental Impact Assessments.

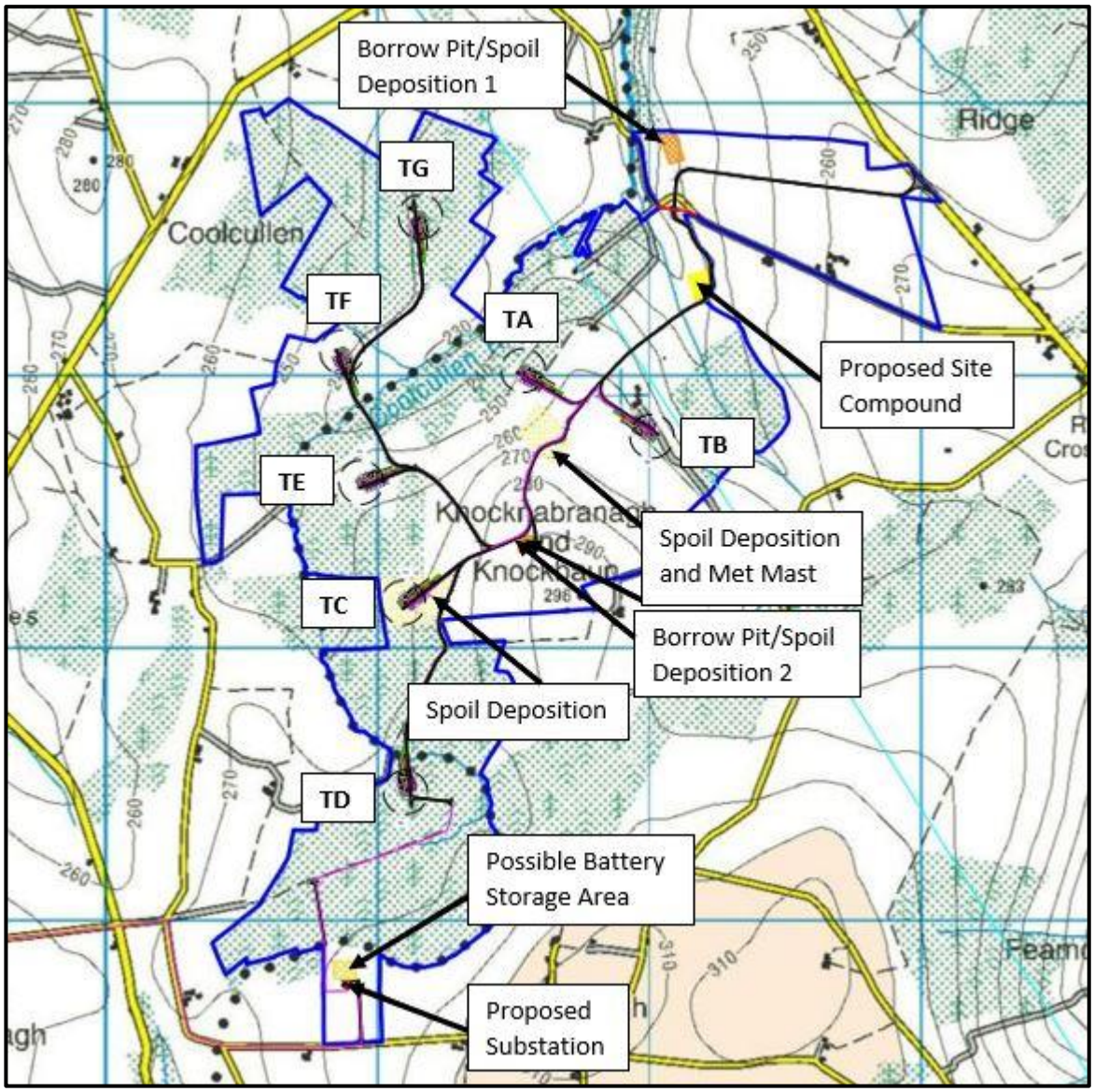


Figure 1: Site layout showing location of Turbines A - G and associated infrastructure

2 METHODOLOGY

2.1 Study Area

There is no professional standard for defining the extent of a study area when assessing the likelihood of effects on archaeological, architectural or cultural heritage remains. A 1km study area has been applied around the proposed wind farm to assess the presence of statutorily

protected archaeological remains (RMP sites). In addition, a 5km study area has been applied around the proposed wind farm to assess the presence of any World Heritage Sites, sites included in the Tentative List as consideration for nomination to the World Heritage List, National Monuments, sites with Preservation Orders or Temporary Preservation Orders, Protected Structures, Conservation Areas or Proposed Conservation Areas.

A 1km study area has been applied around the proposed wind farm to record the presence of any structures recorded on the National Inventory of Architectural Heritage (NIAH). An assessment has also been made of any historic gardens or designed landscapes as recorded on the NIAH that may exist within the proposed wind farm or the proposed grid connection route.

A 100m study area has been applied around the proposed grid connection route, while the three key areas located along the proposed turbine delivery haul route have also been assessed.

2.2 Data Sources

The following sources were examined and a list of sites and areas of archaeological, architectural and cultural heritage potential was compiled:

- Record of Monuments and Places of County Carlow and County Kilkenny;
- Cartographic and documentary sources relating to the study area;
- Aerial photographs of Ordnance Survey Ireland and Bing aerial photography;
- Carlow County Development Plan (2015 – 2021), Draft Carlow County Development Plan (2022 – 2028), Kilkenny County Development Plan (2014 – 2020) and the Draft Kilkenny City and County Development Plan (2021 – 2027); and
- National Inventory of Archaeological Heritage.

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Service. Back-up files of the Sites and Monuments Record (SMR) provide details of documentary sources and field inspections where these have taken place.

Cartographic sources are important in tracing land-use development within an area of land take, as well as providing important topographical information on sites and areas of archaeological potential. Cartographic analysis of relevant maps has been made to identify any topographical anomalies that may no longer remain within the landscape.

Documentary sources were consulted to gain background information on the historical and archaeological landscape of the development area.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its potential to contain previously unidentified archaeological remains.

Carlow County Development Plan (2015 – 2021), **Draft Carlow County Development Plan** (2022 – 2028), **Kilkenny County Development Plan** (2014 – 2020) and the **Draft Kilkenny City and County Development Plan** (2021 – 2027) contain Objectives and Policies on the preservation and management of archaeological, architectural and cultural heritage features.

National Inventory of Architectural Heritage is a section within the Department of Housing, Local Government and Heritage. The work of NIAH involves identifying, recording and evaluating on a non-statutory basis the architectural heritage of Ireland from 1700 to the present day.

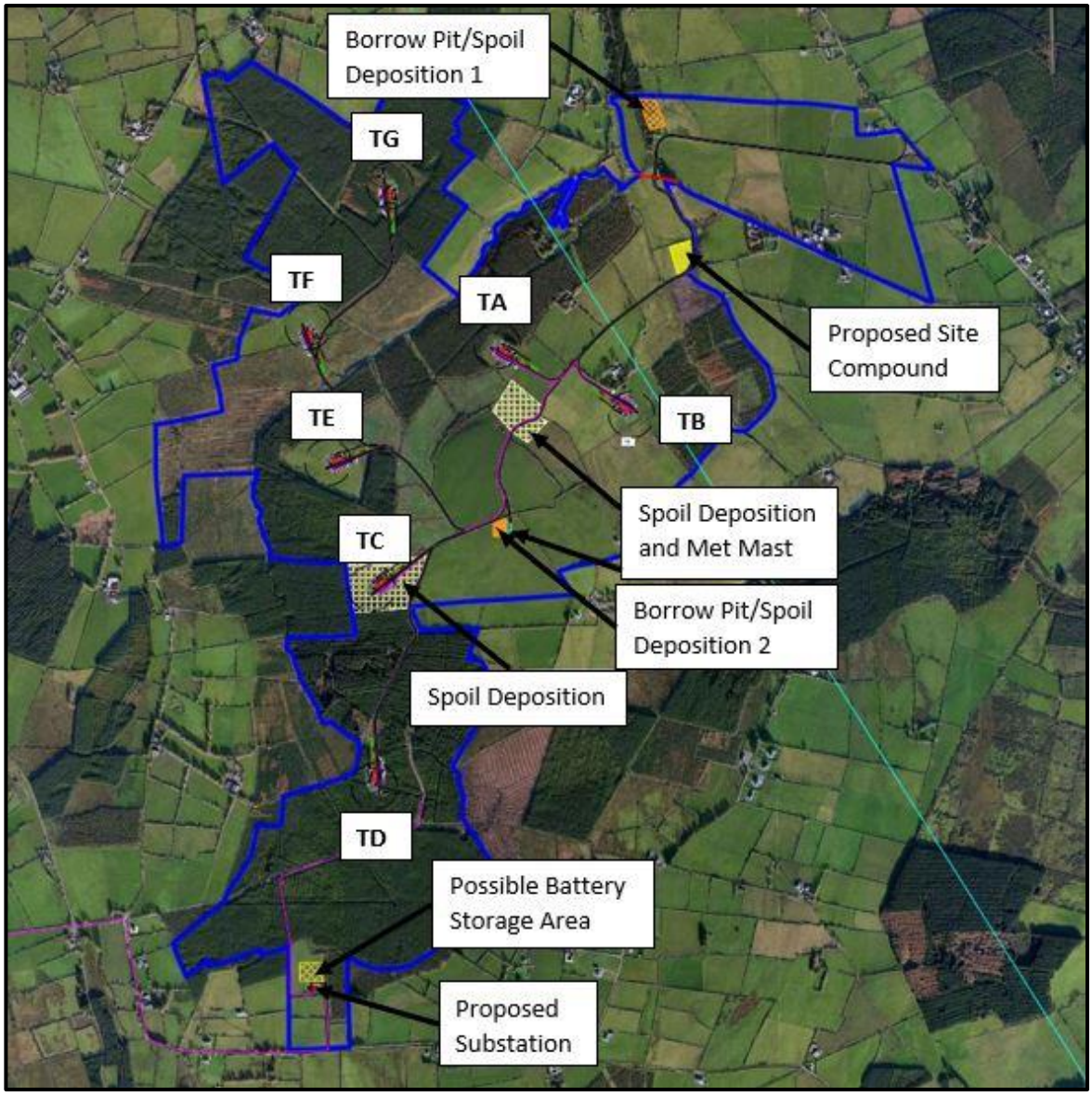


Figure 2: Aerial photograph showing location of Turbines A - G and associated infrastructure

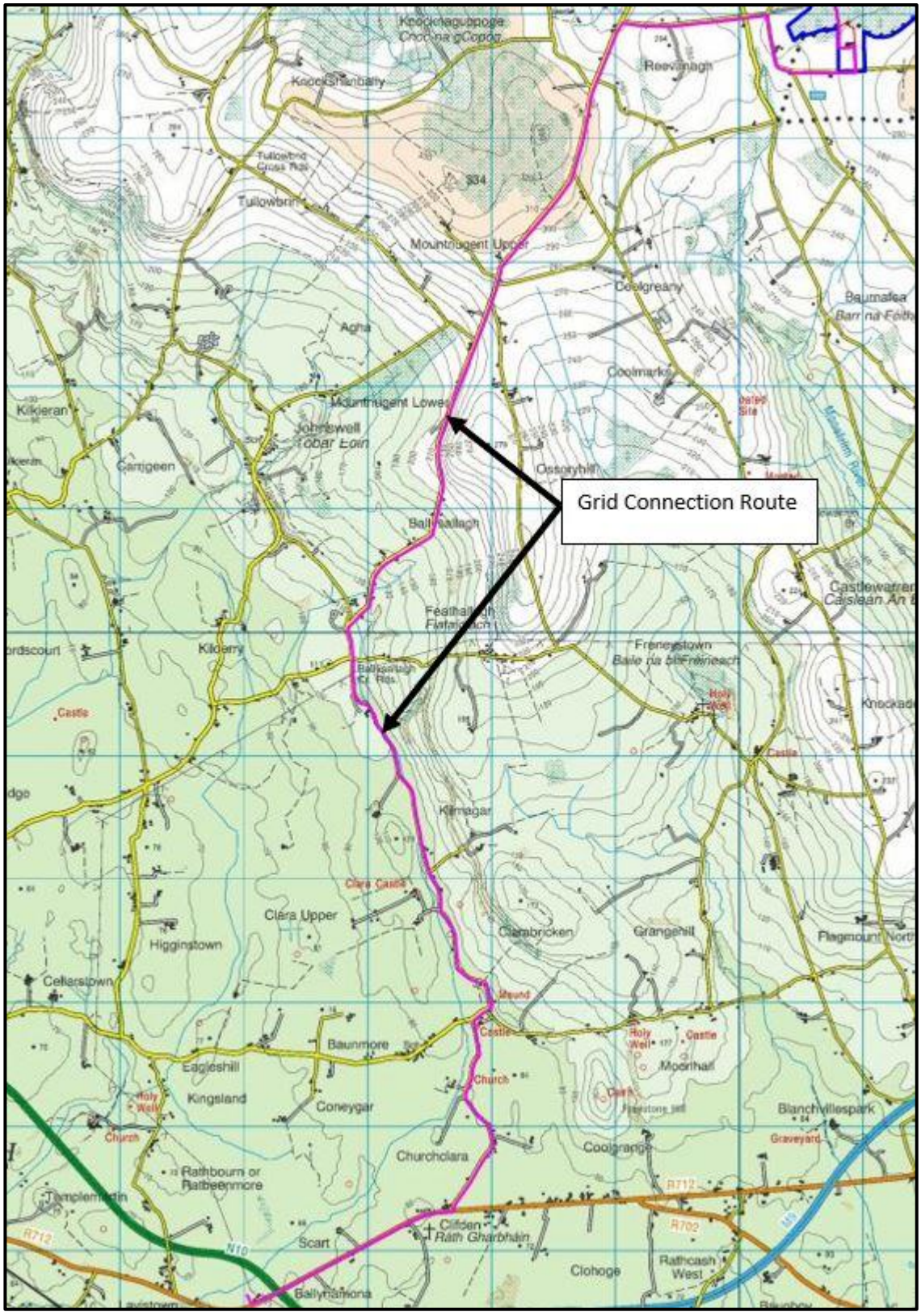


Figure 3: Line of grid connection route

3 BASELINE CONDITIONS

3.1 Site-Specific Archaeological Background

There are no Recorded Monuments within any areas of land take required for the proposed development.

There is one Recorded Monument within 1km of the proposed wind farm (Figure 4).

RMP CW011-006: enclosure

It is noted the barely discernible traces of a bank enclose a circular area measuring 16m in diameter (www.archaeology.ie). The site is recorded on the First Edition 1:10,560 Ordnance Survey map (1839), but is not shown on later edition cartographic sources.

Enclosures belong to a classification of monument whose precise nature is unclear. Often they may represent ringforts, which have either been damaged to a point where they cannot be positively recognised, or are smaller or more irregular in plan than the accepted range for a ringfort. An Early Medieval date is generally likely for this site type, though not a certainty.

There are no additional Recorded Monuments within 1km of the proposed wind farm.

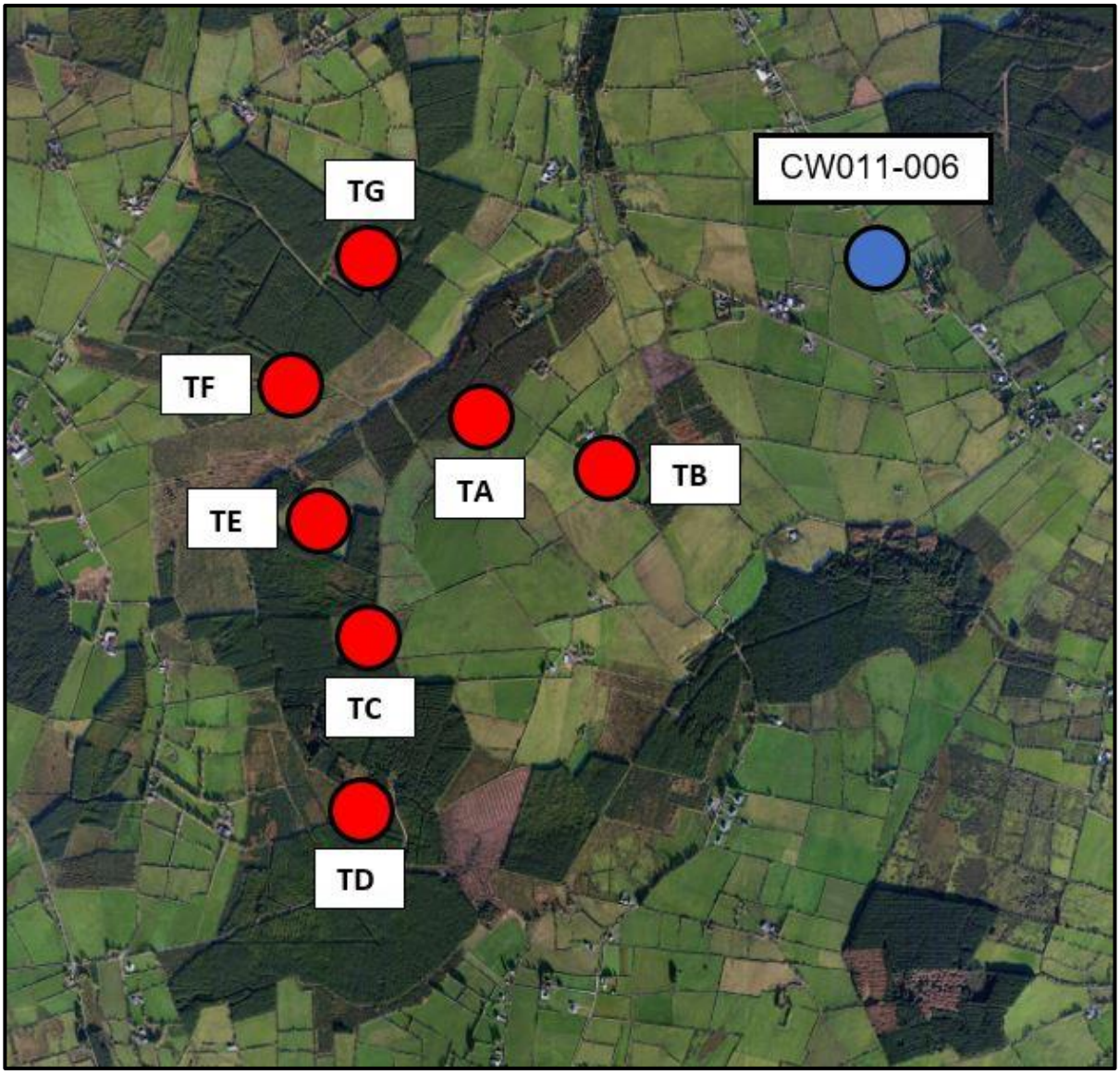


Figure 4: Recorded Monument within 1km of the proposed wind farm

There are 14 Recorded Monuments within 100m of the proposed grid connection route (Figure 5):

RMP KK015-055: Unclassified cairn

RMP KK015-080: 18th/19th century house

RMP KK020-005: Enclosure

RMP KK020-015: Castle- motte

RMP KK020-016: Castle-fortified house

RMP KK020-017001: Church

RMP KK020-017002: Graveyard

RMP KK020-017003: Ogham stone

RMP KK020-017004: Font

RMP KK020-017005: Graveslab

RMP KK020-017006: Holy well

RMP KK020-017008: Architectural fragment

RMP KK020-017009: Bullaun stone

RMP KK020-017010: Ogham stone

There are no additional Recorded Monuments within 100m of the proposed grid connection route.

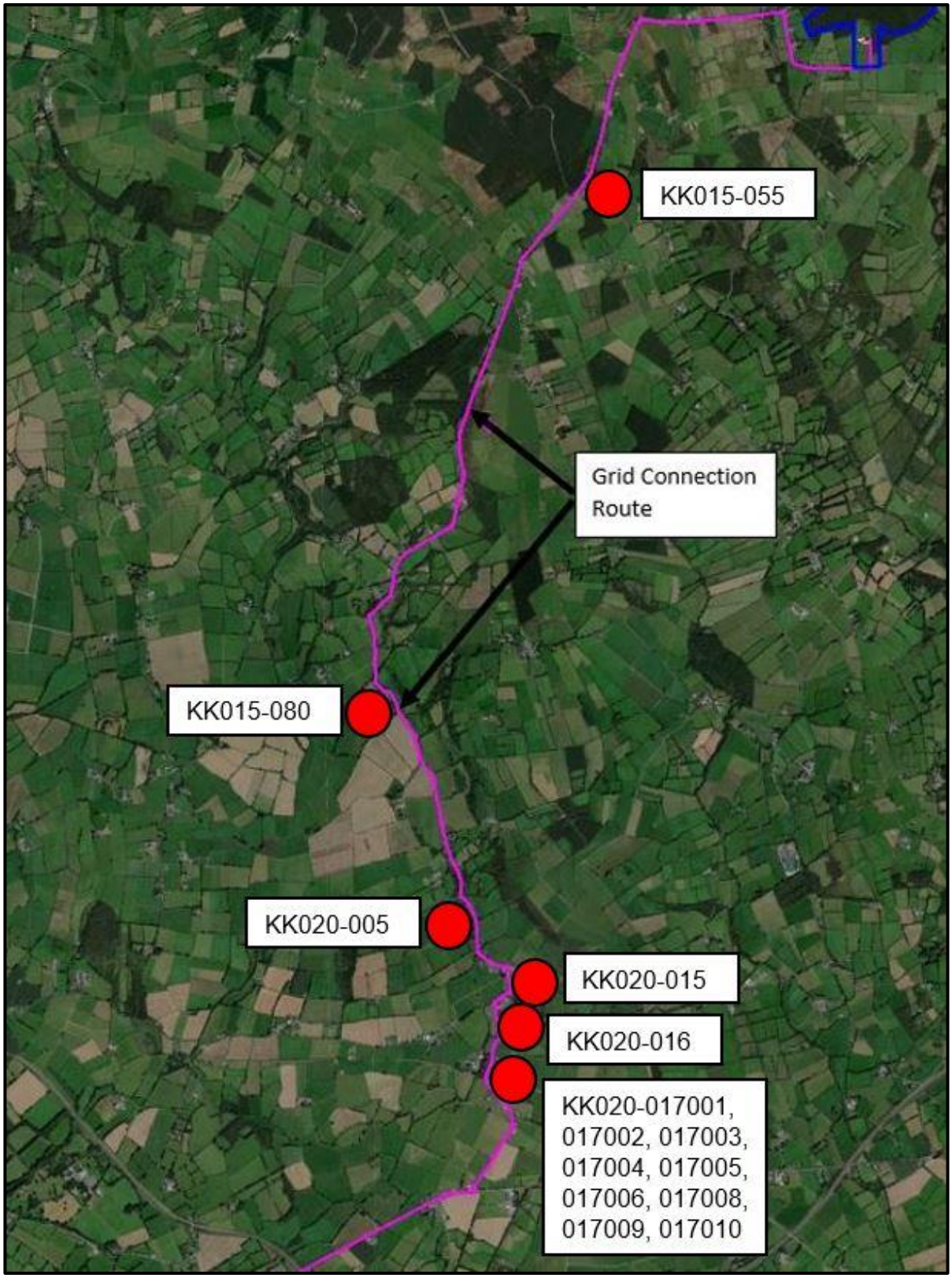


Figure 5: Recorded Monuments within 100m of the proposed grid connection route

3.2 Cartographic Analysis

Ordnance Survey Maps: First Edition 1:10,560 (1839, 1842)*; First Edition 1:2,500* (1899 –

1902, 1905 -1906); *Third Edition 1:10,560* (1902 – 1903, 1905 – 1906)

The proposed access tracks will cross four townland boundaries, one parish boundary, one barony boundary and a county boundary. Recent research suggests that:

> "*hoards and single finds of Bronze Age weapons, shields, horns, cauldrons and gold personal objects can all be shown to occur on boundaries*" (Kelly 2006, 28).

Three structures are recorded along the access track leading to Turbines A and B on the First Edition 1:10,560 map. One of these structures appears to be annotated as two small separate buildings on later edition Ordnance Survey maps, while the other two structures are not recorded on the later edition maps. Five small structures in three separate groupings are recorded on the First Edition map along the access track leading from Turbines A and B to Turbines C and E. These structures are not recorded on any of the later edition historic maps. The location of the met mast and Borrow Pit/Spoil Deposition Area 2 is recorded as undeveloped on the First Edition 1:10,560 map, while it is recorded as a "*Quarry (Disused)*" on later edition maps. The alignment of the access track leading from Turbine C to Turbine D is shown as a field boundary on the First Edition 1:10,560 map, while it is recorded as a track/road on later edition maps. A small structure is recorded immediately north of Turbine E and immediately west of the access track leading to Turbine F on the First Edition 1:10,560 map. This structure is not recorded on any of the later edition historic maps. A well is recorded immediately east of Turbine G on later edition maps, but it is not annotated on the First Edition 1:10,560 map.

There are no archaeological or additional architectural features recorded within the land take of the proposed turbines on historic cartographic sources.

The historic maps all record the presence of vernacular structures, Ordnance Survey bench marks, small quarries, *etc*. in the general vicinity of the proposed grid connection route.

3.3 Aerial Photographs

Aerial photographs held by Ordnance Survey Ireland (www.map.geohive.ie) and Bing aerial photography (www.bing.com/maps) were consulted to look for the presence of archaeological or architectural remains within the land take of the proposed development.

There was no evidence of any archaeological or architectural features recorded on aerial

photography within any areas of land take required for the proposed development.

3.4 County Development Plans

Carlow County Development Plan 2015 - 2021

3.4.1 Archaeological Heritage

It is the Policy (Heritage - Policy 3) of Carlow County Council (Carlow County Council 2015, 226) to:

> "*Protect and enhance archaeological sites, monuments, their setting, appreciation and amenity within the Plan area, including those that are listed in the Record of Monuments and Places (RMP) or newly discovered archaeological sites and/or sub-surface archaeological remains*".

It is also the Policy (Heritage - Policy 3) of Carlow County Council (*ibid*.) to:

> "*Require archaeological assessment, surveys, test excavation and/or monitoring for planning applications in areas of archaeological importance, if a development proposal is likely to impact upon in-situ archaeological monuments, their setting and archaeological deposits*".

The Carlow County Development Plan (2015) does not contain any designated lists or sites of archaeological importance or significance.

3.4.2 Architectural Heritage

Appendix 8 of the Carlow County Development Plan (2015) contains the Record of Protected Structures for the county.

There are no Protected Structures recorded in the Carlow County Development Plan within the proposed wind farm or within 1km of the proposed wind farm.

There are three Protected Structures recorded in the Carlow County Development Plan within 5km of the proposed wind farm.

There are no Protected Structures recorded in the Carlow County Development Plan within the proposed grid connection route or within 100m of the proposed grid connection route.

There are no Architectural Conservation Areas recorded in the Carlow County Development Plan (*ibid*., 229) within the proposed wind farm or within 5km of the proposed wind farm.

3.4.3 Cultural Heritage

The Carlow County Development Plan (2015) does not contain any designated lists or sites of cultural heritage importance or significance.

Following a review of the *Draft Carlow County Development Plan 2022 - 2028*, it is considered that there have been no substantive changes to objectives or policies relating to the protection of archaeological, architectural or cultural heritage sites.

Kilkenny County Development Plan 2014 - 2020

3.4.4 Archaeological Heritage

It is an Objective (8I) of Kilkenny County Council (Kilkenny County Council 2014, 117) to:

> "*Protect archaeological sites and monuments (including their setting), underwater archaeology, and archaeological objects, including those that are listed in the Record of Monuments and Places, and in the Urban Archaeological Survey of County Kilkenny or newly discovered sub-surface and underwater archaeological remains*".

There are no *Walled Towns* recorded in the Kilkenny County Development Plan (*ibid*., 116) within the proposed wind farm or within 5km of the proposed wind farm.

There are no features recorded in the *Industrial Archaeology Survey of County Kilkenny* (Kilkenny County Council 1990) within the proposed wind farm.

Conservation Plans have been prepared for significant archaeological and architectural sites in County Kilkenny (*ibid*., 117). There are no areas for which Conservation Plans have been prepared within the proposed wind farm or within 5km of the proposed wind farm

The Kilkenny County Development Plan (2014) does not contain any additional designated lists or sites of archaeological importance or significance.

3.4.5 Architectural Heritage

It is an Objective (8K) of Kilkenny County Council (*ibid*., 119) to:

> "*Ensure the protection of the architectural heritage of County Kilkenny by including all structures considered to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest in the Record of Protected Structures*".

Appendix I of the Kilkenny County Development Plan (2014) contains the Record of Protected Structures for the county.

There are no Protected Structures recorded in the Kilkenny County Development Plan within the proposed wind farm or within 1km of the proposed wind farm.

There are six Protected Structures recorded in the Kilkenny County Development Plan within 5km of the proposed wind farm.

There are no Protected Structures recorded in the Kilkenny County Development Plan within the proposed grid connection route or within 100m of the proposed grid connection route.

Black Bridge is recorded as a Protected Structure in the Kilkenny County Development Plan (2014) (RPS Ref. D84, Figure 6). The road carriageway/bridge deck is to be raised by 200mm to ensure that vertical alignments are suitable to accommodate turbine components. This structure is also recorded on the National Inventory of Architectural Heritage (Reg. No. 12401111).

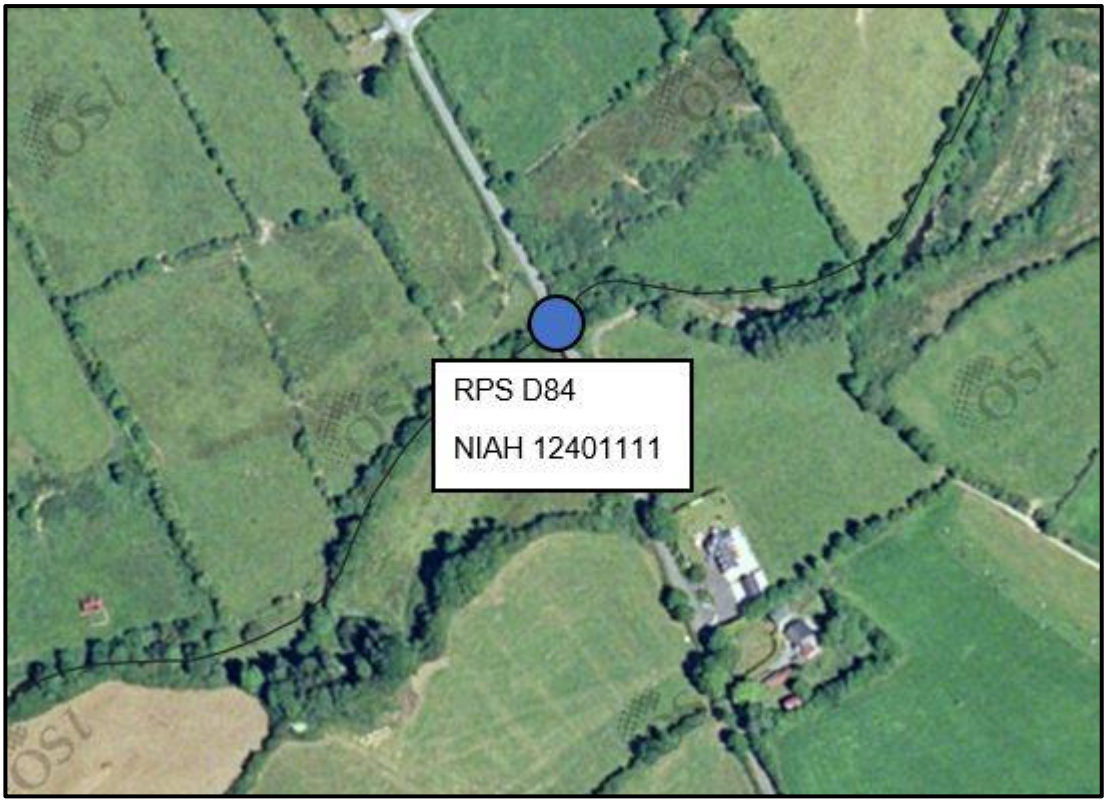


Figure 6: Protected Structure D84/NIAH Reg. No. 12401111 (Black Bridge)

There are no Architectural Conservation Areas or Proposed Architectural Conservation Areas recorded in the Kilkenny County Development Plan (*ibid*., 121) within the proposed wind farm or within 5km of the proposed wind farm.

3.4.6 Cultural Heritage

The Kilkenny County Development Plan (2014) does not contain any designated lists or sites of cultural heritage importance or significance.

Following a review of the *Draft Kilkenny City and County Development Plan 2021 - 2027*, it is considered that there have been no substantive changes to objectives or policies relating to the protection of archaeological, architectural or cultural heritage sites.

3.5 National Monuments

The Department of Housing, Local Government and Heritage maintains a database on a county basis of National Monuments in State Care. The term National Monument is defined in Section 2 of the National Monuments Act (1930) as:

"*a monument or the remains of a monument the preservation of which is a matter of*

national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto" (www.archaeology.ie).

There are no National Monuments in State Care within the proposed wind farm or within 5km of the proposed wind farm.

There are no National Monuments in State Care within the proposed grid connection route or within 100m of the proposed grid connection route.

There are no National Monuments in State Care within any areas requiring works for the proposed turbine delivery haul route.

The Department of Housing, Local Government and Heritage also maintains a database on a county basis of National Monuments with Preservation Orders or Temporary Preservation Orders.

There are no National Monuments with Preservation Orders or Temporary Preservation Orders within the proposed wind farm or within 5km of the proposed wind farm.

There are no National Monuments with Preservation Orders or Temporary Preservation Orders within the proposed grid connection route or within 100m of the proposed grid connection route.

There are no National Monuments with Preservation Orders or Temporary Preservation Orders within any areas requiring works for the proposed turbine delivery haul route.

There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within the proposed wind farm or within 5km of the proposed wind farm.

There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within the proposed grid connection route or within 100m of the proposed grid connection route.

There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within any areas requiring works for the proposed

turbine delivery haul route.

3.6 National Inventory of Architectural Heritage

Building Survey

The National Inventory of Architectural Heritage (NIAH) maintains a non-statutory register of buildings, structures *etc*. recorded on a county basis (www.archaeology.ie).

There are no structures recorded on the National Inventory of Architectural Heritage within the proposed wind farm or within 1km of the proposed wind farm.

There are no structures recorded on the National Inventory of Architectural Heritage within the proposed grid connection route or within 100m of the proposed grid connection route.

Black Bridge is recorded on the NIAH (Reg. No. 12401111, Figure 6). The road carriageway/bridge deck is to be raised by 200mm to ensure that vertical alignments are suitable to accommodate turbine components. This structure is also recorded as a Protected Structure in the Kilkenny County Development Plan (2014) (RPS Ref. D84).

Crettyard Bridge is recorded on the NIAH (Reg. No. 12400605, figure 7). It is proposed to lower the parapet wall for the duration of turbine component deliveries. The parapet wall will be fully reinstated post-construction.

Figure 7: NIAH Reg. No. 12400605 (Crettyard Bridge)

Garden Survey

There are no historic gardens or designed landscapes recorded on the National Inventory of Architectural Heritage within the proposed wind farm.

There are no historic gardens or designed landscapes recorded on the National Inventory of Architectural Heritage within the proposed grid connection route.

There are no historic gardens or designed landscapes recorded on the National Inventory of Architectural Heritage within any areas requiring works for the proposed turbine delivery haul route.

3.7 Conclusions

There are no Recorded Monuments within any areas of land take required for the proposed development. There is one Recorded Monument within 1km of the proposed wind farm. There

are 14 Recorded Monuments within 100m of the proposed grid connection route.

There are no National Monuments in State Care or National Monuments with Preservation Orders or Temporary Preservation Orders within the proposed wind farm or within 5km of the proposed wind farm. There are no National Monuments in State Care or National Monuments with Preservation Orders or Temporary Preservation Orders within the proposed grid connection route or within 100m of the proposed grid connection route. There are no National Monuments in State Care or National Monuments with Preservation Orders or Temporary Preservation Orders within any areas requiring works for the proposed turbine delivery haul route. There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within the proposed wind farm or within 5km of the proposed wind farm. There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within the proposed grid connection route or within 100m of the proposed grid connection route. There are no World Heritage Sites or sites included in the Tentative List as consideration for nomination to the World Heritage List within any areas requiring works for the proposed turbine delivery haul route. There are no Walled Towns recorded in the Kilkenny County Development Plan within the proposed wind farm or within 5km of the proposed wind farm. There are no features recorded in the Industrial Archaeology Survey of County Kilkenny within the proposed wind farm. There are no areas for which Conservation Plans have been prepared by Kilkenny County Council within the proposed wind farm or within 5km of the proposed wind farm.

There are no Protected Structures within the proposed wind farm or within 1km of the proposed wind farm. There are nine Protected Structures within 5km of the proposed wind farm. There are no Protected Structures within the proposed grid connection route or within 100m of the proposed grid connection route. Black Bridge is recorded as a Protected Structure in the Kilkenny County Development Plan. The road carriageway/bridge deck is to be raised by 200mm to ensure that vertical alignments are suitable to accommodate turbine components. This structure is also recorded on the National Inventory of Architectural Heritage. There are no Architectural Conservation Areas or Proposed Architectural Conservation Areas within the proposed wind farm or within 5km of the proposed wind farm.

There are no structures recorded on the National Inventory of Architectural Heritage within the proposed wind farm or within 1km of the proposed wind farm. There are no structures recorded on the National Inventory of Architectural Heritage within the proposed grid

connection route or within 100m of the proposed grid connection route. Crettyard Bridge is recorded on the National Inventory of Architectural Heritage. It is proposed to lower the parapet wall for the duration of turbine component deliveries. The parapet wall will be fully reinstated post-construction. There are no historic gardens or designed landscapes recorded on the National Inventory of Architectural Heritage within the proposed wind farm or within the proposed grid connection route.

There are no archaeological features recorded within the land take of the proposed turbines on historic cartographic sources. Several small structures are recorded on historic cartographic sources on the line of the proposed access tracks, but these features no longer appear to survive above-ground. The historic maps all record the presence of vernacular structures, Ordnance Survey bench marks, small quarries, *etc*. in the general vicinity of the proposed grid connection route. There was no evidence of any archaeological or architectural features recorded on aerial photography within any areas of land take required for the proposed development.

4 ASSESSMENT OF POTENTIAL CONSTRUCTION IMPACTS

4.1 Potential Construction Impacts

As a result of carrying out this desk-based scoping report, the following potential archaeological, architectural and cultural heritage impacts have been identified and thus require detailed assessment, where relevant:

- There are no Recorded Monuments or any additional statutorily protected archaeological features within any areas of land take required for the proposed development. As a result, there is likely to be no direct construction impact on any previously recorded protected archaeological remains.

- There is one Recorded Monument within 1km of the proposed wind farm. There are 14 Recorded Monuments within 100m of the proposed grid connection route.

- The proposed development could potentially have a permanent imperceptible direct construction impact on any previously unrecorded archaeological remains that may exist within the development area.

- It is considered at this stage that there is unlikely to be a visual or noise construction

impact on any archaeological, architectural or cultural heritage remains, however, further assessment is required.

- Black Bridge is recorded as a Protected Structure and is also recorded on the National Inventory of Architectural Heritage. The road carriageway/bridge deck is to be raised by 200mm to ensure that vertical alignments are suitable to accommodate turbine components and a further assessment is required.

- Crettyard Bridge is recorded on the National Inventory of Architectural Heritage. It is proposed to lower the parapet wall for the duration of turbine component deliveries. The parapet wall will be fully reinstated post-construction. Further assessment will be undertaken.

4.2 Potential Cumulative Construction Impacts

- It is considered at this stage there is unlikely to be cumulative construction impacts on any archaeological, architectural or cultural heritage remains.

5 ASSESSMENT OF POTENTIAL OPERATIONAL IMPACTS

5.1 Potential Operational Impacts

- It is considered the proposed wind farm may have an operational visual impact on a Recorded Monument located within the 1km study area and nine Protected Structures located within the 5km study area. Further assessment is required.

- It is considered that the proposed grid connection, due to its underground nature, does not have the potential to result in operational visual impacts on archaeological, architectural or cultural heritage remains.

5.2 Cumulative Operational Impacts

- It is not known at this stage if there will be any cumulative operational impacts on archaeological, architectural or cultural heritage remains between the proposed wind farm and any existing, permitted or proposed developments. Further assessment is required.

- It is considered that the proposed grid connection route will not have any cumulative operational impacts on archaeological, architectural or cultural heritage remains.

6 PROPOSED ASSESSMENT & MITIGATION MEASURES

- It is recommended that a detailed desktop analysis and appraisal of the existing cultural heritage environment be undertaken as part of the Environmental Impact Assessment Report (EIAR). This appraisal will allow for an evidence-based assessment of likely significant effects which may arise resulting from the construction, operation and decommissioning of the proposed development.

- A detailed site walkover will be necessary to further assess the presence and nature of heritage features and to ground-truth the findings of the desktop appraisal.

- It is recommended that detailed visual impact assessments be carried out to assess the extent of operational visual impacts the proposed wind farm may have on archaeological and architectural remains.

- It is likely that Licensed archaeological monitoring will be recommended for all excavation works associated with construction of the wind farm.

- It is likely that Licensed archaeological monitoring will be recommended for all excavation works associated with construction of the underground grid connection.

- It is recommended that consultation takes place with the relevant Local Authorities regarding the proposed works at Black Bridge and Crettyard Bridge. Mitigation in the form of Architectural Impact Assessments containing pre-development written, drawn and photographic records, carried out by a recognised historic building consultant, may be required at these locations.

- On the basis of the above scoping assessment it is assessed that no heritage elements can be “scoped out”, and thus a detailed impact assessment of the archaeological, architectural and cultural heritage resource must be provided within the EIAR.

7 MICROSITING

There are no Recorded Monuments or any additional statutorily protected archaeological, architectural or cultural heritage features within any areas of land take required for the proposed wind farm. As such, it is considered that micrositing would not have an impact on

the archaeological, architectural or cultural heritage resource.

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Carlow County Council. 2015. *Carlow County Development Plan* 2015 – 2021. Carlow.

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Internet Sources

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www.bing.com/maps	Bing aerial photography
www.carlow.ie	Carlow County Council
www.kilkennycoco.ie	Kilkenny County Council
www.map.geohive.ie	Ordnance Survey Ireland aerial photographs

Annex 7 –
Noise & Vibration Scoping Report

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WHITE HILL WIND FARM

SCOPING REPORT: NOISE AND VIBRATION

Technical Report Prepared For

Carlow Wind Limited

Technical Report Prepared By

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Our Reference

MS/21/12199NR01

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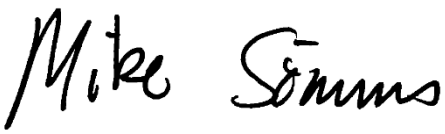
Signature		
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Date	17 May 2021	17 May 2021

EXECUTIVE SUMMARY

This document summarises the scope of the noise study for EIAR Chapter for White Hill Wind Farm under the following headings:

- The ***study area*** should be defined in line with the other chapters of the EIAR, which should at least contain the area within the 35dB L_{A90} contour of the proposed and existing/permitted wind farms, which AWN will provide once the layout is confirmed;
- the ***description of the existing environment*** will be obtained by the analysis of the measured noise levels and wind speeds, at locations to be proposed by AWN;
- The ***description of likely effects*** for the construction, operational and demolition phases will be evaluated against the current relevant guidelines for the construction and operational phases; and
- ***Cumulative environmental noise effects*** i.e. those including the presence of other wind farms will be assessed in detail as is required by the guidance.

CONTENTS

1.0 INTRODUCTION

The Noise and Vibration Chapter of the EIAR will assess the potential impacts of the proposed development to sensitive receptors in the surrounding environment. Information on the assessment of noise and vibration impacts on the environment during both the construction, operational and decommissioning phases will be assessed. The principal objectives of the Noise and Vibration assessment will be to specify appropriate limit values and mitigation measures to ensure that the impact on the environment is minimised.

2.0 STUDY AREA

The study area for the operational phase will cover at least the area where total turbine noise is predicted to exceed 35dB L_{A90} when all existing and proposed turbines are at their maximum output noise level at all identified Noise Sensitive Locations (NSLs) that are within this area. In order to provide an indicative extent of the study area in relation to noise, contours are presented in Appendix A, based on the following information:

- the turbine layout issued on 20 April 2021;
- a turbine hub height of 105 m;
- a sound power level of 105 dB(A);
- flat topography – i.e. no land contours have been added to the model.

The 35 dB(A) contour lies at a distance of up to 1.2 km in the current model, thus a house survey would need to include at least this area.

For the construction and decommissioning phases, all properties within 500m of the proposed construction activities, or the nearest NSL if greater than 500m, will be considered in the assessment.

Potential NSLs will include residential dwellings, commercial properties, derelict buildings, and proposed infrastructure (including houses submitted for planning permission). All properties will then be reviewed by ground-truthing and further desktop assessment (in the case of planning applications) to identify potential sensitive receptors in the vicinity of the development.

3.0 DESCRIPTION OF EXISTING ENVIRONMENT

Initial iterations of the noise model will be developed and expected noise levels predicted to the nearest NSLs. This initial exercise will be used to inform the selection of appropriate baseline noise monitoring locations in the vicinity of the site.

A background noise monitoring survey will be completed at several NSL's in the vicinity of the proposed development site. All measurements will be conducted in accordance with the IoA document *"A Good Practice Guide to the Application of ETSU-R-97 for The Assessment and Rating of Wind Turbine Noise"* (GPG*)* and the associated supplementary guidance notes.

The results of the background noise survey will be used to identify appropriate noise criteria for the various phases of the proposed development with reference to the appropriate guidance documents.

4.0 DESCRIPTION OF LIKELY EFFECTS

The baseline work will characterise the noise climate existing in the area and facilitate the quantification of potential noise impact which may arise from the proposed development. It is envisaged that the main noise impacts associated with the proposed development will be construction activity. The potential noise and vibration impacts will be considered for the following phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

4.1 Construction Phase

Construction (and decommissioning) noise levels associated with various elements of the proposed development will be predicted at the facades of the closest noise-sensitive locations in the vicinity of the development by developing detailed construction calculations. All predictions will be conducted in accordance with the guidance contained in ISO 9613:1996: *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO, 1996). Source noise levels will be obtained from BS 5228 2009 +A1 2014 *Code of practice for noise and vibration control on construction and open sites* (BSI, 2009). While it is noted that NSLs are generally well set back from construction activities, construction activities along the proposed grid connection route will take place in the immediate environs of a number of road-side dwellings and, therefore, a comprehensive assessment will be required. The likely noise levels at these dwellings, and the nearest dwellings to the proposed wind farm site (and haul route works), will be predicted using recognised noise prediction methodologies and the magnitude of effect will be quantified.

Vibration during construction will also be considered regarding the potential impact of residential amenity and structural damage to buildings. It is noted that the current proposed development layout generally provides for substantial separation distances between proposed infrastructure and NSLs; however, the proposed grid connection passes adjacent to a number of road-side dwellings and, therefore, a comprehensive assessment of likely vibration levels will be required.

4.2 Operational Phase

Noise levels at all the identified NSLs will be predicted using a proprietary noise modelling package. All predictions will be done in accordance with ISO 9613, using the recommended calculation settings outlined in the IOA GPG. The use of a computer-based noise model lends itself to ongoing evaluation of design changes and provides output that is detailed and extensive. Noise contour maps will be generated for the site noise models illustrating turbine noise levels in the study area.

The results obtained from the prediction calculations will be used to assess the likely noise impact of the operation of the proposed wind turbines. This will include appropriate downwind assessments at various NSLs. Where necessary and possible, noise control measures will be considered. Discussion of other issues will be included where appropriate (e.g. tonality, low frequency noise/Infrasound, amplitude modulation etc.).

The potential noise impact arising from operational-phase road traffic movements and other ancillary elements of the proposed development including the electricity substation and any other permanent sources of noise will be assessed and included in the assessment.

5.0 CUMULATIVE EFFECTS

An assessment of the potential cumulative noise effects with other existing, permitted and proposed developments; including other wind energy developments; will be undertaken if necessary. The existing Gortahile Wind Farm is located c. 6km northeast of the proposed development while the permitted (not yet constructed) Bilboa Wind Farm is located c. 3km northeast.

Due to the distance of the proposed development from other permitted wind farm developments, at the present time, it is not anticipated that cumulative noise impacts will be an issue for the proposed development. This will be confirmed prior to commencing the assessment.

APPENDIX A – WHITE HILL WIND FARM INDICATIVE 35dB NOISE CONTOUR