atmos CONSULTING

61253-01

Environmental Impact Assessment

Cummeennabuddoge Wind Farm

Technical Appendix 2-1: Scope of Works Report

Cummeennabuddoge Wind DAC

October 2022

Our ref: 61253-01-C3-V1

CBC House
24 Canning Street
Edinburgh
EH3 8EG

T: 0131 346 9100
E: edinburgh@atmosconsulting.com
www.atmosconsulting.com

25/08/2021

Dear Sir/Madam

Cummennabuddoge Wind Farm – Environmental Impact Assessment Proposed Scope of Work

Atmos Consulting Ltd ('Atmos'), acting as agent on behalf of Cummeennabuddoge Wind Designated Activity Company (DAC) (for and on behalf of Coillte CGA and SSE Renewables) ('the Applicant') has prepared a Scope of Works Report to inform a consultation process for the Environmental Impact Assessment Report (EIAR) to support a future planning application in relation to a proposed wind farm located on land at Clydaghroe and Cummeenabuddoge, Clonkeen, County Kerry (the 'Proposed Development').

This letter and enclosed report are being issued to you as part of the consultation process for the EIAR.

This document does not represent a formal Request for a Scoping Opinion, but an informal request for seeking your views to the scope of the various assessments.

We would be interested in receiving any comments or observations you may have on the proposed development relevant to your area of expertise.

Comments can be submitted by email to [redacted]@atmosconsulting.com by the 20th of October 2021. If you have no comments to make, I would be grateful if you would please acknowledge receipt of this letter.

Yours sincerely

Richard Newsham BSc (Hons)
Project Manager

T +44 [redacted]

E [redacted]@atmosconsulting.com

W www.atmosconsulting.com

Enc: Environmental Impact Assessment Proposed Scope of Work

atmos CONSULTING

61253-01 R2

Technical Report

Cummennabuddoge Wind Farm

Environmental Impact Assessment Proposed Scope of Work

Cummeennabuddoge Wind (DAC)

25 August 2021

Contents

Contents

Tables

Figures

Document Prepared For

Sandra Murphy
Coillte CGA

Document Prepared By

Richard Newsham
Project Manager
[redacted]@atmosconsulting.com

Document Approved By

Malcolm Sangster
Technical Director
[redacted]@atmosconsulting.com

Version	Date	Reason
1.1	25/06/2021	Draft issued to client for review
1.2	13/08/2021	Final
1.3	20/08/2021	Final following further comments
1.4	25/08/2021	Final Issued for Consultation

1 Introduction

1.1 Overview

Atmos Consulting Ltd (Atmos), on behalf of the Cummeennabuddoge Wind Designated Activity Company (DAC) (for and on behalf of Coillte CGA and SSE Renewables) (the Applicant) has prepared this Scope of Works Report to inform a consultation process for the Environmental Impact Assessment Report (EIAR) to support a future planning application in relation to a proposed wind farm located on land at Clydaghroe and Cummeenabuddoge, Clonkeen, County Kerry (the 'Proposed Development').

The Proposed Development consists of up to 19 wind turbines and associated infrastructure including electrical transformers, hardstandings, access roads, borrow pits, 110 kV grid connection and a 110kV air-insulated substation.

The majority of the Proposed Development is located within the planning authority area of Kerry County Council, with a proportion of the grid connection route within the planning authority area of Cork County Council.

The Proposed Development Site ('the Site') is shown on Figure 1.

This document does not represent a formal Request for a Scoping Opinion, but an informal request for seeking your views to the scope of the various assessments.

We would be interested in receiving any comments or observations you may have on the proposed development relevant to your area of expertise.

1.2 The Applicant

The shareholders of Cummeennabuddoge Wind DAC are Coillte CGA and SSE Renewables. Both companies have been involved in building and operating wind farm projects in Ireland over the past 10 years and are currently working in a co-development arrangement across a portfolio of projects that aim to reduce carbon emissions and contribute to national and international climate change targets.

1.3 EIA Screening

The Proposed Development exceeds the thresholds for completion of an Environmental Impact Assessment (EIA), as detailed in the Planning and Development Regulations 2001 (as amended), Schedule 5, Part 2, Class 3(j).

As such, it is not proposed to provide a report on the screening requirement for an EIA but to proceed on the basis of considering the potential effects of the wind farm development through the process of Environmental Impact Assessment. The Developer proposes to accompany the Planning Application for the wind farm with an EIAR.

The European Commission's, "Guidance on EIA Scoping" (EU 2001) notes the following in Part A of the guidance,

> *"EIA is a procedure required under the terms of European Union Directives 85/337/EEC and 97/11/EC on assessment of the effects of certain public and private projects on the environment. Article 2 of the Directive requires that;*

> *"Member States shall adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects."*

Article 8 then requires that;

> *"The results of consultations and information gathered pursuant to (the EIA procedure) must be taken into consideration in the development consent procedure".*

At this stage the Applicant is progressing with environmental surveys and scoping the extent of the assessments that would ultimately be presented as part of the EIAR.

1.4 Purpose of the Scope of Works Report

This Scope of Works Report is intended as a framework to facilitate statutory consultees to provide feedback into the EIA process.

This report includes the following:

- A description of the Proposed Development;
- A summary of the existing environment and identification of sensitive receptors in relation to the Site and the surrounding area;
- Identification of the issues the Applicant proposes to assess as part of the EIA and those proposed to be scoped out of the assessment;
- A description of the proposed methodologies for those assessments; and
- The proposed structure and content of the EIA Report;

This Scoping Report is set out in the following sections:

- Section 1: Introduction
- Section 2: Description of the Proposed Development;
- Section 3: Benefits of the Proposed Development;
- Section 4: Approach to the Environmental Impact Assessment;
- Section 5: Planning and energy policy; and

Section 6-14: Description of the potential environmental effects and discussion of the baseline situation and the approach to the impact assessment.

1.5 Introduction to the EIA Team

Atmos have been appointed by the Applicant to coordinate the EIA and prepare the EIAR for the proposed development. The relevant specialists included in the EIA Team are shown in Table 1.

Table 1: The EIA Team

Specialist	Responsibility
Atmos Consulting Limited	Overall responsibility for project management; EIA coordination; Ecology and Ornithology; Socio-economic Assessment; Population and Human Health; Shadow Flicker; Telecommunications & Aviation Assessment; and
Gavin and Doherty Geosolutions	Wind Farm Civil Design/Grid Connection; Electrical Design; Health and Safety; Reasonable Alternatives; Turbine Delivery Route Evaluation; Soils, Geology

Specialist	Responsibility
(GDG)	and Hydrogeology; Peat Stability & Management; Peat Stability Risk Assessment; Water quality
Fionna O Regan	Policy and Planning
SYSTRA	Traffic and Transport
Brindleys Associates	Landscape and Visual Impact Assessment
McCloys Consulting	Hydrology, Water Quality and Flood Risk
Hayes McKenzie	Noise
Rubicon Heritage Services	Cultural Heritage
The Forestry Company	Forestry
Chris Mee Group	Air Quality and Carbon (including carbon balance calculation

2 Project Description

2.1 Proposed Development Site

Location

The Proposed Development Site ('the Site') is located on land at Clydaghroe and Cummeenabuddoge, Clonkeen, predominantly within County Kerry, although some grid connection infrastructure is proposed within County Cork. The nearest settlements are Ballyvourney and Millstreet (both in County Cork) located approximately 5km south of and 7km north east of the Site respectively.

The Site is approximately centred on Grid Reference W 20399 83194 and occupies an area of approximately 925ha, (shown bounded by the red line on Figure 1).

Land Use

The land use within the Site is entirely commercial forestry and is crossed by a number of existing forestry tracks. Lands within the red line boundary as shown in Figure 1 are under applicant control. The site is drained by the Clydahroe River which flows east to west along its northern boundary.

Planning Permission (Ref 20/1263) was granted on 30 March 2021 for a 100m high meteorological mast within the Site boundary. This was erected in June 2021.

Environmental Designations

The Site does not lie within any areas designated for ecological or nature conservation interest. However, the Site immediately adjoins and drains directly into the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation (SAC).

The Proposed Natural Heritage Area (PNHA) of Mullaghanish Bog is directly south of the Site.

The Mullaghanish to Mushera Mountains Special Protection Area (SPA) is within 600m to the east and south of the Site. Hen Harriers are the qualifying interest.

Environmental Designations in the vicinity of the Site are shown on Figure 2.

2.2 Site Design and Layout

The exact number, siting and scheme layout for the turbines will be decided as part of the design and EIA process. Initial design work has identified a maximum layout of 19 turbines. Based on turbines available at the scale initially considered, the output from the wind farm would be up to 114MW.

The layout of the Proposed Development will continue to evolve throughout the EIA process, with the aim of avoiding or reducing significant environmental effects as far as reasonably practical. The site design has been carefully considered to balance planning, environmental and commercial constraints.

An initial desktop review of environmental and technical constraints has been undertaken to date. This includes:

- An initial review of Ecological baseline conditions and potential impacts;
- An initial review of Landscape and Visual baseline conditions and potential impacts;
- An initial review and appraisal of the historic environment of the site and surrounding area, including historical landscapes and cultural heritage assets; and
- An initial desktop review of other baseline conditions for disciplines including slope and gradient.

A preliminary layout of the Proposed Development is shown on Figure 3.

2.3 Wind Farm Components

Turbine

The exact rating and design of the turbines is yet to be decided. However, the initial design is based on three-bladed horizontal axis wind turbines, each up to 200m above ground level (agl) maximum blade tip height and a rotor diameter of up to162m.

Finalised turbine dimensions will form the basis of the assessments.

Access Tracks

The design and route of the proposed access tracks will commence following turbine locations being finalised, ground conditions are confirmed, and environmental assessments completed. However, existing forestry tracks will be utilised as much as possible to reduce the need of proposed access track and thus reduce the environmental impact.

Turbine Delivery Route

A number of components will enter the country through the ports including the blades, tower sections and the nacelles. The turbine components will be delivered to site by specialist transport vehicles to be assembled on site.

The Applicant is currently exploring the possible Turbine Delivery Routes (TDRs). However, it is anticipated components will be delivered to Ringaskiddy Port, County Cork, onto the N28, N40 then onto the N22 to Site entrance (NGR W 14106 81485) (Figure 1).

Borrow Pits

The Applicant is currently exploring the possibility of on-site borrow pits , the potential impact of any borrow pits will be considered in the EIA.

Electrical Layout and Grid Connection

The turbines would be electrically connected to each other via inter-array cable circuits.

The proposed onsite substation which would house transformers and associated switch gear would convert the electricity generated by each of the turbines to an appropriate voltage for onward transmission over the grid.

The Applicant is currently considering a number of options for a grid connection. It is anticipated that an underground connection will be made to the existing 220/110kV Ballyvouskil Substation.

The potential impact of construction of the finalised underground route and temporary access track will be considered as part of the EIA.

2.4 Project Phases

Construction

The construction of the Proposed Development is anticipated to take circa 18 months. Subject to the ongoing design process, activities during the construction phase will include:

- Extraction of aggregate for access track, hard-standings and turbine base construction (if borrow pits are utilised);
- Construction of new access tracks to reach the turbine locations;
- Construction of turbine foundation and crane hardstandings;
- Excavation of trenches and cable laying;
- Installation of wind turbines;
- Commissioning of site equipment;
- Installation of Grid Connection; and
- Site restoration.

Many of these operations will be carried out concurrently to reduce the overall length of the construction programme. Post construction Site restoration will be undertaken at the earliest opportunity to minimise potential impact.

Construction will be controlled through a Construction Environmental Management Plan (CEMP) which will implement the specific measures including mitigation measures detailed in the planning application to ensure good practice.

The construction methods will be described further in the EIA Report.

Operation and Decommissioning

The proposed operation of the Proposed Development is anticipated to be 30 years after which the turbines will be decommissioned, and the site restored. Alternatively planning permission for an extension to the permission or repowering may be requested.

3 Reasonable Alternatives

As set out in the EIA Directive, the EIAR is required to provide a description of the reasonable alternatives studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

This will include an assessment of the following:

- **Alternative Sites.** The EIAR will set out the reasonable alternative sites available to the Applicant which will include details of the assessments carried out to identify the Proposed Development Site;
- **Alternative Design**. The EIAR will set out the process and assessments that were undertaken to arrive at the final infrastructure layout;
- **Alternative Processes**. The EIAR will set out the alternative technologies considered and an assessment of their viability; and
- **Alternative Mitigation Measures**. It may be possible to mitigate potentially significant effects in a number of ways. Consideration of alternative mitigation will be undertaken on a case-by-case basis as part of each assessment in the EIAR.

4 Impact Assessment

4.1 EIA Process

EIA is a process which identifies the potential environmental effects of a development and then seeks to avoid, reduce or offset any adverse effects through design or mitigation measures where possible.

The process is intended to be iterative and runs in tandem with project design. As potential effects are identified, the design of the project (for example, the number and layout of the turbines) may be adjusted to reduce potential impacts.

The Applicant considers consultation to be a vital component of the EIA process and will continue throughout each stage of the EIA, contributing to both to the identification of potential effects and mitigation measures.

4.2 EIA Guidance

The EIAR will be prepared in accordance with Schedule 6 of the Planning and Development Regulations 2001 (the Regulations), as amended, which sets out the contents of an EIAR.

In addition, the contents of Directive 2014/52/EU, which was adopted in the EU on 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment will also be incorporated in the preparation of this EIAR (the 2014 EIA Directive).

The EIA will also be prepared with refence to appropriate guidance including:

- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Draft Guidelines on the Information to be contained in Environmental Impact Statements (EPA, September 2015);
- Draft Advice Notes on Preparing Environmental Impact Statements (EPA, September 2015); and
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, August 2017).

4.3 Assessment Methodology

The Regulations outline the information that is required to be presented in the EIAR which includes the following:

- Description of the development;
- Outline of the main design and layout options studied by the Applicant;
- Description of the aspects of the environment likely to be significantly affected by the development;
- Description of the likely significant effects of the Proposed Development on the environment, which should cover the direct effects and any indirect, secondary,

cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development; and

- Description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

The assessments will be undertaken by a number of specialists with expertise relevant to the potential impact being assessed.

The assessments will be coordinated to ensure that each follows a systematic consistent approach, with each EIAR technical chapter following the same structure, specifically:

- A description of baseline conditions;
- Prediction of potential effects including cumulative effects;
- Assessment of effects;
- Identification of appropriate mitigation measures; and
- Assessment of residual environmental effects.

The following sections describe these steps in more detail.

Existing Environment

Information relating to the existing conditions at the Site will be gathered through desk-based assessments, consultation and site surveys. Using this information, potential receptors will be identified, and the sensitivity of those receptors determined for the lifetime of the project.

Agreement on survey methodologies will be sought from relevant consultees and the information collection process and sources described in the EIAR.

Prediction of Potential Environmental Effects

The prediction of effects will be made using the known parameters of the Proposed Development and through experience of similar projects. The prediction of effects includes consideration of the construction, operation and decommissioning phases of the project.

The effects during the decommissioning phase are anticipated to be of the same nature and of no greater intensity of that of the construction effects. Therefore, construction effects are taken as encompassing decommissioning.

Assessment of Effects

As stated in the "Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, August 2017), the criteria for the presentation of the characteristics of potential significant effects will be described with reference to the magnitude, spatial extent, nature, complexity, probability, duration, frequency, reversibility, cumulative effect and transboundary nature (if applicable) of the effect.

The classification and description of effects in the EIAR will follow the terminology provided in Table 3.3 of the Draft EPA Guidelines (2017).

In assessing the significance of identified impacts, a number of factors will be considered including:

- The magnitude of the impact, i.e., the timing, scale, size and duration of the impact;

- The sensitivity of the environmental resource to change including the capacity of the resource to absorb change;
- The likelihood of the impact occurring;
- The certainty with which the potential impacts have been identified; and
- Comparison with the do nothing alternative, i.e., consideration of the possible changes in the environmental receptor should the project not to take place.

Individual methodologies for assessing effects will be explained in each of the technical assessments. For some assessments e.g., noise, the predicted effects will be either "acceptable" or "unacceptable".

However, where the assessment is more subjective the effect significance will generally be considered in the following terms as per the Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017):

- Imperceptible: An effect capable of measurement but without significant consequences;
- Not significant: An effect which causes noticeable changes in the character of the environment but without significant consequences;
- Slight Effects: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities;
- Moderate: An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends;
- Significant Effects: An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment;
- Very Significant: An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment; and
- Profound Effects: An effect which obliterates sensitive characteristics.

Potential Mitigation Measures

The strategies for identification of appropriate mitigation measures, as detailed in the EPA EIAR Draft Guidelines (2017), will be followed in the preparation of the EIAR. Identification of mitigation measures will follow the four established strategies specified by that guidance: avoidance; prevention; reduction and remedy/offsetting.

The potential for environmental effects will be considered at every stage of the design and EIA process with the design of the project refined accordingly to minimise or eliminate impacts where practical.

The final design will be optimised systematically in response to increasing knowledge of the site and potential environmental effects.

Where additional mitigation measures are identified, these will be outlined in the specific technical assessments and follow standard techniques and good practice as appropriate. Mitigation strategies will include specific construction methods and site operations.

Cumulative Effects

The potential cumulative impact of the Proposed Development with other relevant projects in the area on the local community and human health will be addressed in accordance with the guidance. This may include other wind farm developments, other

renewable energy projects or any proposed project which could have the potential to have a cumulative impact.

Interaction Between Factors

The interactions between impacts on different environmental factors will be addressed as relevant within the EIAR Chapters. This will be summarised in a matrix showing where interactions between effects on different factors have been addressed.

4.4 Structure of the EIA Report

The EIAR will consist of four sections:

- Non-Technical Summary;
- Volume I: Main Text. This will contain the written outputs of the assessments. The proposed structure of Volume I is shown in Table 2;
- Volume II: Figures. This will contain the figures to support the text in Volume I ; and
- Volume III: Technical Appendices. This contains the supplementary information and assessments produced in support of the assessments presented in Volume I;

Article 3 of the 2014 EIA Directive states that an: *"environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*

(a) population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC

and Directive 2009/147/EC;

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape;

(e) the interaction between the factors referred to in points (a) to (d)"

The assessments proposed relate to impacts on these factors in the following ways:

Table 2: Factors and Assessments

Factor	Relevant Assessments
Population & Human Health	• Socio Economics • Land Use and Recreation • Visual Impact • Noise • Shadow Flicker
Biodiversity	• Ecology • Ornithology • Forestry
Land, Soil, Water, Air & Climate	• Soils, Geology and Hydrogeology • Hydrology, Water Quality and Flood Risk • Air and Climate
Material Assets	• Traffic Impact and Access Route Assessment • Aviation

Factor	Relevant Assessments
	• Telecommunications
Cultural Heritage	• Cultural and Archaeological Heritage
Landscape	• Landscape Impact Assessment

Table 3 outlines the proposed assessment chapter titles which would be included in the EIA Report.

Table 3: Proposed EIA Report Chapter Titles

Chapter No.	Title
1	Introduction
2	EIA process and methodology (including scoping and consultation)
3	Project description
4	Reasonable alternatives
5	Planning Policy and Development Context
6	Population and Human Health
7	Landscape and visual impact assessment
8	Traffic Impact and Access Route Assessment
9	Biodiversity
10	Soils, Geology and Hydrogeology
11	Hydrology, Water Quality and Flood Risk
12	Air and Climate
13	Noise and Vibration
14	Cultural and Archaeological Heritage
15	Shadow flicker
16	Material Assets (including Aviation and telecommunications)
17	Interaction of the Foregoing

Non-Technical Summary

The Non-Technical Summary (NTS) will be provided, presenting an overview and summary of the main EIAR using non-technical language.

It will be a standalone document presenting a clear and concise summary of the existing environment, characteristics of the proposed development, a clear outline of the potential significant impacts/effects which could result from the Proposed Development and mitigation measures adopted. It will cover the issues that arose in sufficient detail so that the key issues and their implications can be clearly understood.

5 Planning and Energy Policy

This section presents a summary of relevant policies that will be taken into consideration to help inform the Proposed Development design.

The EIAR will set out the relevant policies that have been considered as part of the assessments undertaken as part of the EIA. A separate Planning Statement will provide a detailed appraisal of the Proposed Development against the relevant Development Plan policies, national planning policy and other material considerations.

The EIA Report will also concisely reference climate change policy and the contribution of Proposed Development to the Irish and European climate change goals and policy targets.

The Planning and Energy Policy EIA chapter will include a review of the relevant planning and wind energy development policies included in the Kerry County Council Development Plan and any emerging Development Plan.

The following national policies, regional and local policies will be considered:

- The National Planning Framework: Project Ireland 2040;
- Ireland's Transition to a Low Carbon Energy Future 2015-2030;
- Regional Spatial & Economic Strategy for the Southern Region 2020;
- Kerry County Development Plan 2015 – 2021;
- Kerry County Council Renewable Energy Strategy 2012;
- Cork County Development Plan 2014 – 2021;
- The 2006 Wind Energy Development Guidelines;
- The Draft Approach to Wind Energy Guidelines, superseded by the Draft Revised Wind Energy Development Guidelines published in December 2019; and
- Draft National Energy and Climate Plan 2021-2030.

It is recognised that both the Kerry County Council and Cork County Council 2022-2028 Local Development Plans are being prepared. At the time of writing the Draft Kerry County Development Plan 2022-2028 will be presented to the elected members in September 2021 with the Draft Plan going out for public display following this.

At the time of writing, the Cork County Development Plan 2022-28 is in stage two of a four stage process with a Draft Cork County Development Plan 2021 being prepared in accordance with the provisions of the Planning and Development Act 2000 (as amended) and was on public display for 10 weeks from the 22nd of April 2021. This public consultation period ended on Thursday the 1st of July 2021. It is anticipated that the development plan will be adopted by April 2022.

The Planning and Energy Policy EIA chapter will include a review of the relevant planning and wind energy development policies included in the emerging Development Plans.

6 Population and Human Health

This Chapter will consider the potential socio economic, tourism recreation, land use and human health effects of the construction and operation of the Proposed Development.

The assessment on population will consider the current land use of the proposed site, the current activities occurring within and in the vicinity of the site, local population information, employment profiles, tourism, visitor attractions and community gain opportunities.

The assessment on human health will include a literature review of studies and research carried out on the potential effects of wind farm developments on human health.

Methodology and Guidance

The following guidance and information is of relevance in relation to the Population and Human Health assessment:

- EPA Guidelines - Information to be contained in Environmental Impact Assessment Reports, Draft August 2017 (EPA, 2017);
- Revised Guidelines on the Information to be contained in Environmental Impact Statements, Draft September 2015 (EPA, 2015);
- IWEA Best Practice Guidelines for the Irish Wind Energy Industry 2012;
- Kerry County Development Plan 2015-2021;
- Cork County Development Plan 2014 – 2021;
- County Kerry: A socio-economic profile (Health Service Executive, 2015);
- County Cork: A socio-economic profile (HSE, 2015);
- Central Statistics Office (CSO) information;
- OSI mapping and Aerial Photography; and
- Fáilte Ireland Information.

Existing Environment

The site is located in a rural area with land use on Site dominated by commercial forestry, and therefore having a low recreation and tourism potential. No public Rights of Way cross the Site.

There are separate health profiles available for all local authority areas. The most recent profile published for both Kerry and Cork are from 2015 (HSE). These will be used to establish a community health profile for the proposed wind farm.

Potential Effects

Renewable energy developments have the potential to bring a number of socio-economic benefits, including contribution to tackling climate change, reducing carbon emissions, providing electricity, generating an income to the owner(s) and creating jobs.

The majority of the economic activities are associated with construction of the Proposed Development. The operation of the Proposed Development also has the potential to result in a number of impacts.

Given the short-term nature of decommissioning this is scoped out from further consideration.

There would also be the potential for a number of indirect effects on the local economy through the supply of goods and services to the development particularly during construction.

Impact Assessment

The EIA would consider the potential impact the Proposed Development on the Socio Economics of the area.

It would focus on the key phases of the Proposed Development which are;

Table 4: Wind Farm Lifecycle

Phase	Activity
Construction	Turbine manufacture; including the tower, blades and internal components Balance of plant; including activity and supplies required to install completed turbines; and Grid connection; including connection of installed turbines to the electricity grid.
Operations & Maintenance	Turbine maintenance; such as turbines that are operated and maintained by the turbine manufacturer for a warranty period or those maintained by contract or by technicians working for the owner of the wind farm. Site maintenance; including routine tasks such as maintaining site access tracks and bridges, maintaining drainage ditches and repairing gates and fences.
Decommissioning	There will also be further economic impacts at the decommissioning stage, typically after 30 years operation, where the site will be returned to its original condition

The scale of significance will be described as per the 'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, August 2017) to assess the potential and residual effects of the Proposed Development against baseline conditions. The assessment process aims to be objective and quantifies effect as far as possible; however, some effects can only be evaluated on a qualitative basis.

In terms of socio-economic factors, potential effects would be significant if the Proposed Development resulted in fundamental or material changes in population, structure of the local community or local economic activity during the construction, operation or decommissioning phases.

The assessment of human health for the proposed development will follow the approach set out in the EPA 2017 Guidelines, Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018) and in the Strategic Environmental Assessment (SEA) Implementation Guidance.

In summary, EPA 2017 Guidelines (which also refer to the Commission's SEA Implementation Guidance) advise that:

"in an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc."

7 Landscape and Visual

This chapter sets out the proposed approach to assessing the potential effects of the Proposed Development on landscape character and visual amenity through a Landscape and Visual Impact Assessment (LVIA).

The LVIA will consider direct and indirect effects on landscape resources, landscape character, the implications for designated landscapes and wild land, and cumulative effects, i.e., the incremental effects of the Proposed Development in combination with other existing and proposed developments including wind farm developments.

It will examine the nature and extent of effects arising from the introduction of the proposed turbines, as well as the ancillary infrastructure (i.e., access tracks, masts, transformers etc.) which will be assessed during both the construction and operational phases of the Proposed Development.

The LVIA will consider direct and indirect effects on landscape resources, landscape character, and designated landscapes and the nature and extent of effects on existing views and visual amenity.

The effects of the proposed turbines, as well as the ancillary infrastructure (access track, masts, transformers, grid route etc.) will be assessed during the construction and operational phases of the Proposed Development. The LVIA will also consider cumulative effects i.e. the incremental effects of the Proposed Development in combination with other wind farm developments.

Methodology and Guidance

The LVIA will be undertaken in line with current guidance and good practice to produce a robust and reliable assessment. The following guidance will be referred to where appropriate:

- EPA Guidelines - Information to be contained in Environmental Impact Assessment Reports, Draft August 2017 (EPA, 2017);
- Revised Guidelines on the Information to be contained in Environmental Impact Statements, Draft September 2015 (EPA, 2015);
- IWEA Best Practice Guidelines for the Irish Wind Energy Industry 2012;
- Kerry County Development Plan 2015-2021;
- Cork County Development Plan 2014 – 2021;
- Department of Environment, Heritage and Local Government 2006, Wind Energy Development;
- Guidelines for Planning Authorities;
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations (2015);
- Siting and Designing Wind Farms in the Landscape Version 3a published by SNH (2017);
- Third edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA) published by the Landscape Institute and the Institute of Environmental Management & Assessment (2013);
- Assessing the cumulative impact of onshore wind energy developments, published by Scottish Natural Heritage (2012);

- Residential Visual Amenity Assessment (RVAA): Technical Guidance Note 2/19 (Landscape Institute, March 2019; and
- Visual Representation of Wind Farms published by Scottish Natural Heritage (2017).

The current 2006 Wind Energy Development Guidelines 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:

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

A ZTV for a wider area of 45km radius has also been assessed from the outermost turbines in all directions is proposed for the LVIA, as recommended in current guidance for turbines of over 150m to blade tip (SNH, 2017).

A Zone of Theoretical Visibility (ZTV) plan has been used to identify which landscape and visual receptors require detailed assessment (see Figure 4), and which can be scoped out because they are unlikely to be significantly affected.

Baseline

The general elevation ranges for the area are from 340m at west of the site, to 570m to the east of the site. Despite its elevation in the Derrynasaggart Mountains, this site has the potential to be relatively contained, visually. The site is located on the south of the Clydagh River valley, incorporating the northern slopes of Mullaghanish, Lackabaun, Knocknamork and Knockacummeen.

The lands slope downwards towards the river, on the other side of which the land rises steeply up to a ridge of mountains from Caherbarnagh to The Paps, including Knocknagowan, Knocknabro and The Paps.

The Landscape Character Assessment for this area (Area No. 36 - Upper Clydagh River and the Derrynasaggart Mountains) assesses the quality of the landscape as having been affected by the planted forestry in the area, particularly on the southern side of the Clydagh Valley.

There are scenic routes to the east and to the south west of the proposed development (County Cork). The development site is described as being located within a secondary special amenity area.

The N22 Killarney-Cork Road has a view & prospect towards these mountains. The Landscape Character Assessment states that;

> *"wind farm development on the ridge of ground between the viewpoint and The Paps would detract from this view, and for this reason a small area to the east of the N22 is not considered to have capacity."*

The Site avoids this area.

The potential for views from the proposed Macroom Bypass will be assessed as at the time of writing construction is ongoing on this route.

The cumulative visual impact of the proposed development will be addressed in the context of other developments in the area, particularly, the wind farms present as well as permitted immediately to the north, east and south of the Site.

Impact Assessment

Landscape Effects

Predicted changes on both the physical landscape of the Site and landscape character within the Study Area will be identified. However, it is anticipated that potential significant direct and indirect effects will be limited to a more focussed area, extending up to 15km from the Site.

GLVIA3 states that the nature of landscape receptors (commonly referred to as their sensitivity) should be assessed in terms of the susceptibility of the receptor to change with reference to key characteristics and the value attached through landscape designations or other considerations.

The nature of the effect should be assessed in terms of the scale, geographical extent, duration and reversibility of the effect. These aspects will all be considered to inform a judgement regarding the overall significance of effect.

The LVIA will also consider the implications of the Proposed Development on special qualities of designated landscape areas in the Study Area, which have been taken forward for detailed assessment.

Visual Effects

Visual effects may be experienced at static locations (for example settlements or viewpoints) and at transitional locations (such as sequential views from routes, including roads, foot paths and cycle routes).

Visual receptors are the people who will be affected by changes in views at these places, and they are usually grouped by what they are doing at those places (for example residents, motorists, recreational users etc.).

GLVIA3 states that the nature of visual receptors (commonly referred to as their sensitivity) should be assessed in terms of the susceptibility of the receptor to change in views/visual amenity and the value attached to particular views.

The nature of the effect should be assessed in terms of the scale, geographical extent, duration and reversibility of the effect. These aspects will all be considered to inform a judgement regarding the overall significance of effect.

Assessment of the visual effects of the Proposed Development will be based on analysis of the ZTVs, field studies and assessment of representative viewpoints. The assessment viewpoint locations have been selected to provide a representative range of viewing distances and viewing experiences. This includes views from settlements, points of interest and sequential views from routes.

A list of proposed viewpoints is presented in Table 5. These viewpoint locations may be refined based on observed field conditions.

Table 5: Proposed Landscape Assessment Viewpoints

Viewpoint		Reason for selection	ITM X	ITM Y
1	View from local road (scenic route) in the townland of Coomnaclohy	Scenic route/ promoted path. Approximately 4-6 turbines visible.	520090	579736
2	View from the N22 (scenic route) in the townland of Derrynasaggart	Scenic route/ promoted path. Approximately 10-12 turbines visible.	515604	579524
3	View from the N22 (scenic route), in the townland of Derrynasaggart	Scenic route/ promoted path. Approximately 1-3 turbines visible.	517753	579210
4	View from local road (scenic route) off the R582, in the townland of Caherdowney	Scenic route/ promoted path. Approximately 4-6 turbines visible.	526123	584118
5	View from the local road, in the townland of Derrynafinnia	County Kerry Secondary Special Amenity Area. Approximately 4-6 turbines visible.	514472	584024
6	View from the N22 (scenic route), in the townland of Flats	Scenic route/ promoted path. Approximately 7-9 turbines visible.	520686	576857
7	View from R582 (scenic route), in the townland of Carriganimmy	Scenic route/ promoted path. Approximately 4-6 turbines visible.	528214	581334
8	View from the L1123, in the townland of Tullig	Adjacent to the settlement of Millstreet. Approximately 7-9 turbines visible.	528079	590235
9	View from the L3402 (scenic route), in the townland of Derryfineen	Scenic route/ promoted path. Approximately 13-15 turbines visible.	519418	572415
10	View from the L1123 (scenic route), in the townland of Tullig	Scenic route/ promoted path. Approximately 13-15 turbines visible.	532060	587306
11	View from local road (scenic route), in the townland of Fuhiry	Scenic route/ promoted path. Approximately 16-19 turbines visible.	513983	571987
12	View from the L1120, in the townland of Coole	Approximately 10-12 turbines visible.	529522	592552
13	View from N72, on the border of townlands Meenskeha West and Ardnageeha	Approximately 7-9 turbines visible.	526104	596922
14	View from local track, in the townland of Crohane	County Kerry Secondary Special Amenity Area. Approximately 16-19 turbines visible.	504851	579442
15	View from local road, in the townland of Shronaboy	County Kerry Secondary Special Amenity Area. Approximately 1-3 turbines visible.	504509	585746
16	View from local road, in the townland of Raleigh South	County Cork High Value Landscape Area. Approximately 7-9 turbines visible.	531200	571501
17	View from N22, in the townland of Gurteenroe	Within the settlement of Macroom. Approximately 4-6 turbines visible.	532871	573152

Viewpoint		Reason for selection	ITM X	ITM Y
18	View from road (scenic route), in the townland of Lacknahaghny	Scenic route/ promoted path. Approximately 7-9 turbines visible.	536859	579436
19	View from local road in the townland of Gneevgullia, near Upper Gneeveguilla	Adjacent to small settlement. Approximately 4-6 turbines visible.	512447	597702
20	View from local road (scenic route), in the townland of Crinnaloo North	Scenic route/ promoted path. Approximately 16-19 turbines visible.	536420	591139
21	View from local road (scenic route), in the townland of Kilbarry	Scenic route/ promoted path. Approximately 10-12 turbines visible.	527017	567484
22	View from the R618 (scenic route), in the townland of Ummera	Scenic route/ promoted path on the outskirts of the settlement of Macroom. Approximately 4-6 turbines visible.	535377	572592
23	View from local road (scenic route), in the townland of Inchamay North	Scenic route/ promoted path. Approximately 16-19 turbines visible.	538606	590208
24	View from local road in the townland of Dromickbane	County Kerry Secondary Special Amenity Area. Approximately 1-3 turbines visible.	500502	587056
25	View from forestry track in the townland of Annaghbeg	County Kerry Secondary Special Amenity Area. Approximately 1-3 turbines visible.	506091	596492
26	View from local road in the townland of Gortagullane	County Kerry Primary Special Amenity Area. Approximately 4-6 turbines visible.	498333	585646

Cumulative Effects

The cumulative landscape and visual impact assessment (CLVIA) will be undertaken in accordance with current guidance and good practice previously outlined.

A review of patterns of development will be provided for operational, consented and proposed wind farms which are the subject of a valid planning application, up to 60km from the Site, following SNH guidance.

The CLVIA will focus on wind energy developments considered to have potential to give rise to significant cumulative effects. This is likely to primarily be those wind farms in the more immediate landscape context, within 20km.

Turbines under 50m to tip, single turbines beyond 5km from the Site and schemes at scoping stage will not be included. Figure 5 illustrates the locations of operational, consented and proposed wind farms within the LVIA Study Area.

The LVIA will consider the potential effects of the addition of the Proposed Development to the existing landscape against a baseline that includes existing wind farms and those under construction.

The CLVIA will consider the 'total' cumulative effects of the Proposed Development, against a baseline that includes wind farms that may or may not be present in the landscape in the future (i.e. including wind farms that are consented but unbuilt or undetermined planning applications). Wind farm proposals that have been refused but that are subject to appeal will also be considered in the assessment.

Schemes at scoping stage will be included only where requested through consultation and where sufficient design information is available.

Visualisations

Wireframes and photomontages will be used to consider and illustrate changes to views. Photomontages will involve overlaying computer-generated perspectives of the Proposed Development over the photographs of the existing situation to illustrate how the views will change against the current baseline. Visualisations will be prepared in accordance with SNH (2017) visualisation guidance.

As per the draft revised Wind Energy Development Guidelines (2019), the resolution of the Digital Terrain Model used to prepare the ZTV map should be a maximum of 50 by 50 metres to ensure high resolution. The ZTV and visualisations will be developed using 10m resolution data in the immediate study area (approximately 10km from the site boundary) and up to 50m resolution data for further extents.

Ancillary elements such as permanent anemometer masts and access tracks will be shown in photomontages for viewpoints within 5km where they would be visible. Beyond 5km it is considered unlikely that these ancillary elements would form more than a minor element of the entire Proposed Development when compared to the turbines.

8 Traffic Impact and Access Route Assessment

Assessment of effects in relation to Traffic and Transport will be undertaken in line with current guidance and best practice. The following legislation, guidance and published data sources will be used to inform the assessment including:

- Guidelines for the Environmental Assessment of Road Traffic (IEMA), 2005a);
- Transport Infrastructure Ireland (TII) Traffic and Transport Assessment (TTA) Guidelines, May 2014;
- Guidelines for the Environmental Assessment of Road Traffic, Guidance Note 1. Institute of Environmental Assessment (1993);
- Aerial photography, mapping and details of existing haul routes; and
- Baseline traffic flow information would be obtained from existing datasets augmented by new surveys as appropriate.

A qualitative assessment of the proposed haul routes will be carried out identifying pinch points, tight bends, steep elevations, any sections where the route is in poor condition, road structures, watercourse crossings etc. and the haul routes will be revised where necessary.

Swept path analysis will be undertaken at identified constraints to inform the assessment. Early engagement with third party landowners will be undertaken where details of external road improvements are proposed and these will be included in the EIA as appropriate.

Baseline

The site is served by a reasonable network of access roads, and internal forestry tracks. The existing wind farms in the vicinity support a view that turbines can be reasonably well transported to this site.

The Applicant is currently exploring the possible TDRs. However, it is anticipated components will be delivered to Ringaskiddy Port, County Cork, onto the N28, N40 and then onto the N22 to Site entrance (NGR W 14106 81485) (Figure 1).

Study Area

The study area will include the N22 and the minor roads north from the N22 to the Site. The routes beyond the N22 are considered fit for purpose and comprise major and national roads.

Baseline traffic flow information would be obtained via new surveys for three locations (including the N22) via ATC counters that would be in place for a one-week period.

Potential Effects

Potential effects on the road network would be limited to the construction phase of the project through an increase in the overall traffic volumes associated with the delivery of materials to the site and an increase in the percentage of HGVs using the road network. The main potential effects considered would be:

- Traffic congestion due to an increase in Heavy Goods Vehicle (HGV) traffic related to material and component delivery.

- Environmental effects associated with increased traffic;
- Traffic congestion due to an increase in non-HGV traffic.
- Abnormal or accelerated road wear and tear.
- Road widening/ improvements to accommodate abnormal loads.

The delivery of the larger components may require temporary alterations to street furniture along the delivery route. In some cases, permanent widening of parts of the carriageways may be necessary to facilitate the passage of the largest vehicles.

Impact Assessment

The assessment will be carried out in accordance with the relevant policy and guidance documents including the IEMA Guidelines for the Environmental Assessment of Road Traffic ("the IEMA Guidelines") and the suit of TII guidelines.

Details of the number, size and weight of deliveries to site would be identified along with a potential activity schedule for deliveries. This information would be used to identify the potential number of daily, weekly and total delivery numbers for the Proposed Development.

An estimate of construction employee trips would also be undertaken to gain an understanding of total trips on and off the construction site.

The distribution and assignment of these trips would then be estimated based on the trip origins and the available route options. From this information, it will be possible to assess the percentage impact of generated development trips on the existing road network.

Recognition of the potential disproportionate impact on small settlements will be included during all parts of the assessment and will be considered in terms of access route planning where possible.

The collated traffic flow data is expected to confirm existing traffic levels including LGVs and HGVs within the study area. These figures will be combined with the forecast levels of proposed development traffic in order to identify the likely significant effects within the study area taking cognisance of IEMA Guidelines.

In accordance with the IEMA Guidelines, the method used for assessing environmental effects of increased traffic will be based on a comparison in percentage terms between predicted traffic flows on potentially affected roads with and without the proposed development traffic. In addition to this, the overall carrying capacity of the road in question will be considered in undertaking the assessment.

The IEMA guidelines set out a list of environmental effects which should be assessed for significance in relation to the transport resource (if the identified thresholds are exceeded, i.e. 'Rule 1' or 'Rule 2' described below), as follows:

- Noise and vibration;
- Air pollution;
- Severance;
- Driver delay;
- Pedestrian delay and amenity;
- Accidents and safety;
- Dust and dirt; and

- Hazardous loads.

The assessment will explore whether effects on these are likely to be significant based upon two tests contained within IEMA Guidelines. The guidelines suggest that, in order to determine the scale and extent of the assessment and the level of impact that the development will have on the surrounding road network, the following two 'rules' should be applied:

- Rule 1 - Include highway links where flows are predicted to increase by more than 30% or where the number of HGVs is predicted to increase by more than 30%; and
- Rule 2 - Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

These rules will be used as a screening exercise to determine whether a detailed assessment of effects on the routes within the study area is necessary. Where a detailed assessment is required, sensitivity and magnitude criteria will be used in order to determine the significance of effects.

The traffic, transport and access assessment will seek to provide a robust (worst case) assessment of impacts and effects associated with the proposed development.

A matrix approach would be used (combining the magnitude of effect and receptor sensitivity) to identify the significance of the effect. Where effects are identified as being significant (in accordance with the EIA regulations), mitigation will be proposed, and a re-assessment of the effects undertaken.

The assessment will identify the potential traffic and associated environmental effects on sensitive receptors and mitigation will be proposed where necessary. Mitigation would likely take the form of a CTMP. A framework Traffic Management Plan (TMP) would be produced as a Technical Appendix to the EIAR Chapter.

The TMP would identify the mitigation measures to manage and mitigate impacts from construction traffic associated with the windfarm and grid connection works.

A cumulative assessment would be included if there are other committed construction projects in the area that are likely to share the access routes. Other planned traffic movements such as forestry extraction would also be taken into consideration.

9 Biodiversity

9.1 Ecology

Methodology & Guidance

An Ecological Impact Assessment will be conducted in accordance with the following:

- EPA (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- National Roads Authority (2008): Guidelines for Assessment of Ecological Impacts of National Roads Schemes
- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal;
- DEHLG (2006) Wind Energy Development Guidelines and Draft Revised Wind Energy Development Guidelines (December 2019);
- IWEA (2012) Best Practice Guidelines for the Irish Wind Energy Industry; and
- Accepted specific best guidance for assessing wind farm impacts on birds, bats and other sensitive ecological receptors.

In addition, a Natura Impact Statement (NIS) will be undertaken in light of the immediate proximity to the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment Special Area of Conservation (SAC).

This will take into account the hydrological connectivity between the Site and Lough Leane and the water quality concerns arising as a result of the enrichment history of Lough Leane, the proximity of the Mullaghanish to Mushera Mountains Special Protection Area (SPA), and the nature of its qualifying interests.

A Stage 1 Appropriate Assessment Screening will be conducted in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011. This would be followed by the conduct of a Stage 2 assessment as required.

This will include consideration of the potential impacts on the qualifying species and habitats associated with the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC as a result of any changes in water quality. This includes aquatic invertebrates and fish.

Baseline

The site is an upland predominantly forested site, which affects the species and habitats which are likely to be present. The Site is immediately adjoining and draining directly into the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC.

There are a number of watercourses present within the Site and is drained by Clydahroe River which flows east – west along its northern boundary. The Proposed Development site is in a Freshwater Pearl Mussel (FPM) Sensitive Catchment.

Proposed Surveys

Habitat and Mammals

Targeted mammal surveys will be undertaken, including checking for evidence of activity such as prints, droppings, burrow-holes, dens and food caches, activity trails, disturbed vegetation, and direct visual observations in suitable breeding and foraging habitats will follow the methodologies outlined in Chanin (2003), Bang & Dahlstrom (2006), NRA (2008) and Muir & Morris (2013).

When the baseline ecological survey and mapping are completed, any Important Ecological Features and resources will be identified in line with the CIEEM (2019) Advice Note on the Lifespan of Ecological Reports and Surveys.

Kerry Slugs

Kerry Slugs are known to be present on the site (a 2016 record of three specimens for W18 is retained at National Biodiversity Data Centre that encompasses the western area of the Site).

Kerry Slug Surveys will be undertaken. Metric outcrop trapping will be the primary methodology. However, the survey will include a hand search of the exposed rock or trees within each survey location which will be undertaken in suitable weather (damp and mild). The hand search will involve checking any crevices present and any mosses or other vegetation present as per Reich et al. (2012). This survey type will progress in tandem with the metric outcrop trapping.

The metric outcrop traps comprise synthetic mats designed to attract slugs. The mats are soaked in water before placement in selected areas that may contain Kerry slugs. The mats are pegged to ground surfaces or fixed to boulders or to trees. Kerry slugs, where present, crawl under the mats and are attracted to the heat given off when the moisture in the mat warms up, due to the composition of the material.

While the species has been recorded in dense forest up to 90m from the forest road edge (Reich et al., 2012) transects beginning at forest track edges will be utilised. Approximately 40 traps will be deployed along 8 transects. Reich et al. (2012) suggest that there is a significant positive correlation between Kerry slug abundance and bryophyte/lichen cover the transect locations will be chosen subjectively, on the basis of the extent of lichen cover and humidity.

Metric outcrop traps will be baited with organic carrot and deployed to determine the presence/absence of this species at the locations identified during site reconnaissance surveys.

Once deployed, traps will be checked weekly for 6 weeks and the inspections will be timed to occur in the morning; the bait will be replaced each week and the underside of each trap will be moistened for 15 seconds using a mist gun filled with deionised water after each inspection as per Reich et al. (2012).

The survey will include a hand search of the exposed rock or trees within each survey location which will be undertaken in suitable weather (damp and mild). The hand search will involve checking any crevices present and any mosses or other vegetation present as per Reich et al. (2012).

If no Kerry slugs are found beneath the traps after 4 – 6 weeks it is likely the species is not present within the section surveyed (McDonnell & Gormally, 2011a).

Bats

The forested nature of the Site offers a suitable habitat for bat species accordingly, bat surveys will be undertaken. The latest guidance on surveys, assessment and mitigation in relation to bats and onshore wind turbines was released in January 2019 (SNH *et al.*). This guidance states a minimum level of pre-application survey required using static detectors of 10 nights in each of spring (April-May), summer (June-mid-August) and autumn (mid-August-October).

Guidance suggests that for sites with more than 10 turbines, a detector should be placed at 10 turbine locations plus a third of additional turbine locations over 10. Therefore 13 detectors will be allocated to the survey.

A static detector only approach will be followed and no transect work is proposed. It is important to note that these surveys will be ongoing from Spring 2020 to Autumn 2021, thus capturing two years of bat surveying data.

Aquatic

Aquatic and fisheries surveys will be carried out at watercourses within and downstream of the proposed wind farm. These surveys will aim to characterise the watercourses in terms of morphology, water quality, and ecology.

Electrical Fishing Survey

Electrical fishing will be undertaken to evaluate fish stocks as the watercourses are likely important salmonid production areas. The biological surveys proposed will collate information designed to inform an in-depth aquatic ecological assessment and understanding of the study area. As the Site is located in a FPM Sensitive Catchment and it is possible that freshwater pearl mussel (Margaritifera margaritifera) (FPM) occurs in the main trunk of the River Flesk, a FPM survey is proposed.

Aquatic Habitat Survey

Physical characteristics of survey sites will be recorded on-site in cognisance that fluvial and riparian habitats have a key influence on instream faunal communities. All sites will be evaluated with reference to 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual: 2003 Version' published by the Environment Agency (EA, 2003).

Biological Sampling

Benthic macroinvertebrates or aquatic insects will be used as an indicator of water quality at each location. Semi-quantitative sampling of benthic macroinvertebrates will be undertaken at all locations using kick-sampling (Toner et al., 2005). Three replicate, 3-minute, multi-habitat kick samples will be taken within a 50m stretch using a 1mm mesh kick net.

Biotic Indices

The following biotic indices will be used:

- The Quality Rating (Q) System devised by Toner et al. (2005) will be used to obtain a water quality rating, or Q-value. As per S.I. No. 258 of 1998, 'biological quality rating' means a rating of water quality for any part of a river-based principally on the composition of macroinvertebrate communities/faunal groups present and their general sensitivity to organic pollution.
- Biological water quality at each site will also be assessed using the EPT index. The EPT index (Lenat, 1988) uses three orders of aquatic insects that are easily sorted and identified: Ephemeroptera (mayflies), Plecoptera (stoneflies and Trichoptera (caddisflies), and is commonly used as an indicator of biological water quality.

- The revised BMWP scheme (Walley and Hawkes, 1997) is a biotic index of water quality where each family recorded in the sample is assigned a habitat-specific score. This score depends on the pollution sensitivity of the invertebrate family together with the characteristics of the site where the invertebrates are found. Each of the location sampled will be in riffled habitats.
- The Average Score per Taxon (ASPT) which is a function of the BMWP score is deemed to more accurately gauge biological water quality. The ASPT index calculation is based on the average value of each taxon sampled is calculated by summing up the indicator values and their division by numbers of taxa (families) sampled and ranges from 0 to 10.
- Functional Feeding Group (FFG) analysis is a classification technique for stream macroinvertebrates that involves the functional analysis of invertebrate feeding, based on morpho-behavioural mechanisms of food acquisition.

Water Sampling

In situ physio chemical readings will be obtained at each site using portable meters for pH, Temp, turbidity/TSS, conductivity, and Dissolved Oxygen. Water samples will be taken from each site using aseptic techniques and stored in a cooler box.

Potential Effects

Wind energy developments can influence ecology both directly through habitat loss and indirectly through disturbance or displacement effects on habitats and species. The main potential effects would be as follows:

- Permanent loss of habitat from construction of permanent components (tracks and turbine foundations);
- Temporary loss of habitat from construction of temporary components (construction compound);
- Modification of habitats due to hydrological change;
- Direct impacts such as collision risk of bats;
- Accidental mortality due to construction activities;
- Fragmentation of species ranges or habitats;
- Pollution of the aquatic environment; and
- Disturbance from site traffic, turbine operation, and increased human presence.

The extent of the disturbance and potential effects will be dependent upon a variety of factors including the location of the works, timing, duration and whether permanent or temporary.

Impact Assessment

The impact assessment will be based on the Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).

Impacts upon the following features will be assessed:

- Designated sites: including direct effects (i.e. derived from land-take or disturbance to habitats and/or protected species), and indirect effects (i.e. changes caused by impacts to supporting systems such as groundwater or over land flow);

- Terrestrial habitats: including direct effects (i.e. derived from land-take), and indirect effects (i.e. changes caused by impacts to supporting systems such as groundwater or over land flow);
- Aquatic habitats: impacts are limited to the ecological effects of changes in water conditions through potential pollution impacts; and
- Protected species: including direct effects (i.e. loss of life as a result of the Proposed Development; loss of key habitat; displacement from key habitat; barrier impacts preventing movement to/from key habitats; and general disturbance) and indirect effects (i.e. loss/changes of/to food resources; population fragmentation; degradation of key habitat e.g. as a result of pollution).

The assessment will also consider potential cumulative effects arising from the addition of the Proposed Development with other existing developments.

9.2 Ornithology

Methodology and Guidance

The ornithology assessment and surveys will be carried out in accordance with the principles contained within the following guidance documents:

- Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action (SNH, 2000);
- Assessing the Significance of Impacts from Onshore Wind Farms on Birds at Sites Outwith Designated Areas (SNH Version 1, 2006 and Version 2, 2018);
- Assessing the Cumulative Impacts of Onshore Wind Energy Developments (SNH, 2012);
- Assessing Connectivity with Special Protection Areas (SNH, 2016a);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information (SNH, 2016b);
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH, 2017);
- Avoidance Rates for the Onshore SNH Wind Farm Collision Risk Model (SNH, 2018); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018).

Consideration of the potential impacts on the SPA will be included in the Stage 1 and 2 Appropriate Assessment.

Baseline

Environmental Designations in the vicinity of the Site are shown on Figure 2.

The Mullaghanish to Mushera Mountains SPA is within 600m to the east and south of the Site. Hen Harriers *Circus cyaneus* are the qualifying interest. Breeding Merlin *Falco columbarius* are also known to be present in the SPA.

Two years of bird surveys have been undertaken, generally following Scottish Natural Heritage (now NatureScot) guidance for the methodology of bird surveys on wind farms, including:

- Vantage point surveys (Six VPs);

- Breeding bird surveys;
- Breeding raptor surveys;
- Winter bird transect surveys;
- Hen harrier roost surveys;
- Breeding Woodcock *Scolopax rusticola;* and
- Red grouse *Lagopus lagopus* surveys.

Vantage point locations used are shown in Figure 6. Survey buffers used are shown in Table 6; it should be noted that not all areas were available for access within the buffers.

Table 6: Summary of survey areas

Survey type	Survey area
Breeding bird surveys	Site + 500m
Breeding raptor surveys	Site + 5km
Breeding Woodcock surveys	Site + 500m
Red grouse surveys	Site + 500m in suitable habitat
Winter transect surveys	Site + 500m
Hen harrier roost surveys	Site + 2km

While full details of the survey results will be provided within the ornithological chapter, a total of thirteen target species were recorded during vantage point surveys:

- Buzzard *Buteo buteo;*
- Cormorant *Phalarcrocorax carbo*;
- Golden plover *Pluvialis apricaria;*
- Hen harrier;
- Heron *Ardea cinnerea;*
- Kestrel *Falco tinnunculus;*
- Little egret *Egretta garzetta;*
- Mallard *Anas platyrhynchus;*
- Peregrine *Falco peregrinus;*
- Red grouse;
- Sparrowhawk *Accipiter nisus;*
- Snipe *Gallinago gallinago;* and
- White-tailed eagle *Haliaeetus albicilla*.

Of these, Golden plover (22 flights) and Kestrel (25) were the most commonly recorded. In addition to these sensitive species, Woodcock were also recorded during breeding surveys.

Potential Effects

The key potential effects relating to the Proposed Development are the potential to adversely affect the conservation status of bird species with statutory protection (through inclusion in Annex I of the EU Birds Directive, or otherwise those of high conservation concern.

These impacts can occur through habitat loss, disturbance, displacement, barrier effects and collisions with the turbines. Potential negative impacts (direct or indirect) on ornithology could arise during the construction and operation stages.

These are defined as follows:

- Land Take Impacts: Direct land take for the installation of the proposed development infrastructure (turbine bases, sub-station, access tracks, etc.) would result in the long-term temporary and / or permanent loss of habitat for birds within the Site, albeit such losses would be relatively small in the context of the Site as a whole;
- Construction Impacts: Disturbance caused by construction may directly displace birds from breeding sites, directly affecting breeding success, or may temporarily displace birds from foraging areas, affecting their breeding success and winter survival. In addition, possible impacts on individuals and populations, any wind farm construction work undertaken during the bird breeding season (March to July / August, inclusive) carries a risk of illegal destruction, damage or disturbance to occupied bird nests;
- Operational Impacts
    a. Disturbance / Displacement and Barrier Effects. The operation and maintenance of turbines has the potential to cause disturbance and displace certain bird species from the Site. During the lifetime of the proposed development, birds of some species at least, may habituate to the presence of turbines, however, and so this impact may decline in the long-term;
    b. Collision with Turbines. The assessment will consider the potential collision risk to birds from the proposed turbines on the primary target species that have been identified as using the Site; and
- Cumulative Impacts. It is also important to assess the cumulative impacts of this and other operational and consented wind farms that may affect the broader populations of birds identified as target species in the survey area.

Impact Assessment

The assessment and reporting process will follow CIEEM (2018) with reference to relevant guidance as appropriate. The intended process is set out below:

- Further detailed desk studies and collation of existing material, including all baseline survey data collected for the project, raptor study group data and information from other wind farm developments;
- Identification of the Valued Ornithological Receptors (VORs) at the site, evaluation of the potential impacts of the proposed development during construction and operation and the effects these could have on the VORs;
- Analysis of data including collision mortality modelling, if required, for those VORs with sufficient flight activity within the collision risk zone (Band, 2007), and assessing the potential displacement of VORs with significant populations within the Site;
- Evaluation of the significance of effects by considering the impacts on the VORs by employing appropriate guidance and professional judgement. When describing impacts, in accordance with CIEEM guidelines, reference will be made to the following: magnitude (area or number of individuals to be impacted); extent; duration; and reversibility, i.e., will the impact be permanent or reversible over a given timescale;

- Incorporating measures to avoid and mitigate (reduce) potentially significant effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset significant residual effects (if required);
- Identifying opportunities for ecological enhancement; and
- Cumulative effects assessment along with other developments.

9.3 Forestry

Methodology and Guidance

The Site is primarily commercial forestry and subject to the usual associated crop rotation patterns. It is under the stewardship of Coillte CGA.

The assessment will consider the existing Coillte data, inventories and plans relating to the forestry sub-compartments, crop development stages, species and will describe the existing forestry and discuss the anticipated impacts of development on the forest.

This EIAR chapter will include proposed plans for felling, restocking and forest management practices, and resultant forestry waste and management. This Chapter will also describe the impacts associated with replacement planting required on suitable lands which will be identified by the Developer.

In line with the Forest Service's published policy on granting felling licenses for wind farm developments, areas permanently cleared of forestry for turbine bases, access roads, and any other wind farm-related uses will have to be replaced by the planting of forestry at an alternative location.

The Forest Service policy requires replanting on a hectare for hectare basis. The replacement lands assessment will describe the impacts to the environment due to the afforestation at a number of proposed replacement lands areas. These replacement lands may not be proximate to the Proposed Development.

Baseline

The Site comprises Conifer plantation with smaller pockets of Wet heath, Wet grassland, and Scrub different.

The coniferous plantation consists of different phases of forestry including recent clear-fell, second rotation, immature, semi-mature and mature forestry. The species comprise mainly of sitka spruce. Given the nature of such coniferous plantations, few other woody plant species occur.

Potential Effects

Crane pads and clearance to allow the jib and boom of cranes during turbine erection will generate the largest extent of felling and excavation and our designs will seek to minimise such clearance as much as possible.

A potential effect in relation to forestry is the release of nutrients to surface water (phosphates and nitrates) as a result of felling.

There may be potential effects on forestry in terms of stability against wind following felling.

Impact Assessment

The assessment will determine the additional forest removal required over and above the felling taking place as part of the normal forestry rotation and will take into account the potential for nutrient release and the opportunities for mitigation.

Whilst this potential impact is primarily a consideration for the Hydrology, Water Quality and Flood Risk assessment (See Section 13), it will be also be considered as part of this assessment.

Effects relating to forest stability will be assessed.

Replacement Lands Assessment

The assessment will describe the impacts to the environment due to afforestation of a number of selected replanting areas across the country.

The assessment will present the baseline environment of the proposed lands and describe likely impacts relating to the following aspects of the environment:

- Biodiversity;
- Hydrology, Hydrogeology and Water Quality;
- Land, Soils and Geology;
- Air and Climate Noise and Vibration;
- Population, Human Health and Material Assets;
- Cultural Heritage; and
- Landscape and Visual.

Where necessary mitigation measures will be recommended and any residual impacts will be discussed. The do-nothing scenario will be presented. Cumulative impacts will be addressed.

The replacement Lands Assessment will be presented as an appendix to the EIAR.

10 Soil, Geology and Hydrogeology

Methodology and Guidance

Assessment of effects in relation to soil, geology and hydrogeology (including peat) will be undertaken in line with current guidance and best practice. The impacts on soil, geology and hydrogeology will be assessed will be conducted in accordance with the following:

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2008);
- Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste, Version 1;
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR) (Environmental Protection Agency, 2017);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guidelines for Proposed Electricity Generation Developments – Second Edition (Natural Scotland Scottish Executive, 2017); and
- Geology in Environmental Impact Statements – a Guide (Institute of Geologists of Ireland (IGI) 2002).

The geotechnical and peat stability risk assessment in the study area would include the following steps:

- Desk study of soil, hydrography, wetness, rainfall and other conditioning factors in addition to the national landslide inventory and susceptibility landslide mapping;
- Site reconnaissance of peat, hydrological conditions and morphology (e.g. presence of peat features such as cracking, piping, erosion);
- Site investigation to determine peat condition, fibrosity, humification, water content and strength including the type of underlying soil;
- Determine 3D surface and 3D contours lines of the peat base; and.
- Produce a Factor of Safety (FoS) map using a deterministic approach. This FOS map would identify sectors of high construction risk where mitigation/control measures would need to be implemented; and
- Combine FoS in a qualitative systematic risk analysis along with hydrological and morphological conditioning factors according to the best practice in peat landslide hazard assessment.

Baseline

The main geological formation found within the study area, the *Glenflesk Chloritic Sandstone Formation*, consists of green coloured, medium-grained sandstones, conglomerates, and purple-coloured siltstones. There are two distinctive quaternary soils present within the study area, blanket peats and glacial tills. The peat is likely to be degraded and drained as a result of overlying forestry activity.

Preliminary peat probes indicate peat depths in the range of 0.0-3.2m with an average of 0.9m at the site.

It is estimated that the site slopes seem to be generally about 5 – 7%, which is within the range of slopes that might be at risk of peat slippage. The peat depth and quality will, therefore, be critical factors in assessing risk of slippage.

Potential Effects

The potential effects of the Proposed Development include:

- Potential effects on the groundwater environment for water quality, water quantity and flow; and
- Potential effects on soil and geology across the site, including peat and peat slide hazard risk.

Impact Assessment

The impact assessment will include the potential effects on groundwater particularly during the construction phase of the Proposed Development.

The results of the PLHRA will be incorporated into the windfarm design and appropriate mitigation measures will be specified (e.g., avoidance, re-design, construction measures and/or construction monitoring).

Detailed information and plans for peat management will be included, as part of Peat Management Plan. The plan will address:

- Peat conditions on site;
- Peat depth and habitats (depicted on a detailed map of peat depths with all the built elements (including peat storage areas) overlain);
- Avoidance and minimisation measures to reduce disturbance to peat and consequential release of CO_2;
- Estimates of the quantities of acrotelmic, catotelmic and amorphous peat potentially excavated for each element of the Proposed Development;
- Proposals for re-use of excavated peat in infrastructure and in restoration and rehabilitation, including peat balance;
- Management of peat during construction including proposed phasing of soil stripping, temporary storage and monitoring of works affecting peat by an Environmental Clerk of Works (ECoW);
- Mitigation measures to minimise disturbance and impacts on peat; and
- Revised peat depth contour plan with all built elements overlain.

11 Hydrology, Water Quality and Flood Risk

Methodology and Guidance

The assessment of the impact of the Proposed Development will be undertaken in accordance with the following:

- EU Water Framework Directive (WFD) Directive 2000/60/EC;
- EU Floods Directive 2007/60/EC;
- European Communities Environmental Objectives (Groundwater) Regulations 2010;
- Control of Water Pollution from Construction Sites - Guide to Good Practice, CIRIA 2002;
- C741 Environmental Good Practice On-Site (2015); and
- Guidance on Pollution Prevention (GPP) / Pollution Prevention Guidelines (PPGs) PPG 1 to PPG 26.

Baseline

The Site is located in the upper reaches of the Flesk River catchment, between the slopes of Knocknagowan to the north and Mullaghanish / Lackabaun to the south. Three existing wind farms are located to the east / north-east.

The site is drained by several watercourses discharging to the Clydahroe River. The catchments of the tributaries, and of the upper reaches of the Clydahroe River, exhibit 'flashy' responses to rainfall events.

A desk study of available information for the development and surrounding area will be undertaken to establish the hydrological setting of the area, describe surface water hydrology and identify areas at risk of flooding.

Clydahroe River, which flows east to west along the northern boundary of the site is designated as part of the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Datasets identifying qualifying interest species / habitats received from NPWS shall be reviewed to establish existing sensitive environmental receptors downstream and hydrologically connected to the site.

Baseline water quality sampling will be undertaken to provide a point of comparison and highlight any potential pre-existing pressures. The monitoring locations have been chosen to reflect and capture water quality from water features draining the site and at subsequent incremental points downstream between the development and Lough Leane.

A monitoring strategy has been developed for that purpose and is presented here as Appendix A.

Potential Effects

The potential effects of the Proposed Development to the water environment (prior to any avoidance, careful design, or additional mitigation) may occur during construction, operational, and decommissioning phases. Potential effects may include:

- **Sediment / Suspended Pollution & Sediment-bound Pollutants**: Construction activities (e.g., stripping and excavation of soils, temporary spoil deposition, and construction of hardstanding) have the potential to release fine sediments into the

water environment, thus adversely modifying stream morphologies, smothering habitats, harming aquatic flora and fauna, and potentially polluting potable water sources.
The eutrophication of Lough Leane is a long-recognised problem due in part to application of fertilisers in historical plantations in the wider Leane catchment. The nutrients bound in the soil have the potential to be released from the Proposed Development site into the Clydahroe / Flesk River catchment during site clearing / felling which ultimately discharge into Lough Leane;

- **Chemical Pollution**: Temporary storage and onsite use of chemicals, fuels and oils associated with construction activities, may enter the surface water environment via accidental spillages, improper transport and refuelling, or inappropriate storage and disposal procedures, thus adversely affecting surface water quality, with associated effects to potable supplies, fish and aquatic ecology;
  During the operational phase of the Proposed Development, polluting substances such as hydrocarbons, heavy metals, and polycyclic aromatics hydrocarbons (PAHs) may enter the water environment via runoff from roads and car parking areas;
- **Changes in Runoff and Flow Patterns**: Temporary compaction of soils and creation of permanent impermeable surfaces may cause increased rate and volume of surface water runoff due to the reduced area of permeable land cover. This has the potential to lead to heightened flood risk and increased effects of erosion and scour in downstream watercourses.
  Works to existing surface watercourses (such as installation of culverts) have the potential to cause an obstruction to flow and may alter conveyance capacities. This may potentially cause temporary or permanent restrictions in watercourse channels, affecting upstream water levels and increasing flood risk and bank erosion. Changes in flow patterns may also disrupt surface water-dependent ecosystems;
- **Displacement of Flood Risk**: Development in areas prone to surface water flooding and / or watercourse flooding may cause the development to be at risk of flooding and may displace flood risk to lands elsewhere.

Impact Assessment

The Impact assessment would consist of the following:

- Conduct a desk study to ensure all aspects of the sensitive hydrological and water quality receptors have been fully evaluated including sensitive water-dependent ecological features and areas at risk of flooding;
- Undertake site visits to confirm the current hydrological conditions at the site and surrounding area. This would include the presence and the distribution of peat (in tandem with the assessment of soil and geology (Section 12) at the site; watercourse locations and morphologies; groundwater features, springs, water abstraction locations, dip wells;
- Undertake surface water quality sampling to capture seasonality and a range of meteorological / hydrological conditions (to include up to two reactive post-wet weather round of monitoring). This will be used to establish naturally occurring background ranges of specific physico-chemical parameters. Water quality results will be assessed for compliance against key parameter limits outlined in the Water Framework Directive;

A monitoring strategy has been developed for that purpose and is presented here as Appendix A;

Undertake pollutant transport modelling using water quality sampling data, likely post-felling emission levels, and hydrological flow data to establish assimilative and dilution capacity, and dispersal of specified pollutants (i.e., N, P and TSS);

- Identification of the potential effects of the Proposed Development and assessment of the significance of the effect that these could have on the existing water environment with regards to hydrology, water quality and flood risk;
- Identification of possible measures to avoid and mitigate against any significant adverse effects resulting from the proposed development; and
- Evaluation of the residual significance of these effects by consideration of the sensitivity of the baseline features, potential magnitude of the effects and the probability of these effects occurring following mitigation.

12 Air and Climate

An air and climate impact assessment will be conducted to establish the potential impacts on air quality and climate change as a result of the Proposed Development. In particular the impact on climate change will be assessed by establishing a Greenhouse Gas (GHG) balance for the Proposed Development.

Methodology and Guidance

The GHG balance would assess the effects of the Proposed Development in respect of potential GHG losses and savings (expressed as CO_2 equivalents) by considering:

- Technology lifecycle emissions;
- Additional system cycling emissions; and
- Forestry removal and peatland disturbance emissions.

In addition, it is proposed that 'embedded carbon' is included in the calculation. Embedded carbon is the GHG emissions associated with the manufacture and transportation of construction materials including concrete and steel and those associated with the construction activities themselves.

The Carbon/GHG quantification will be performed in accordance with the GHG Protocol and ISO 14064:1 *Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals.*

This air quality assessment will include the findings of a desk-based air quality assessment using available data from the Environmental Protection Agency in consideration of the Air Quality Standards Regulations, 2002 (SI No. 271 of 2002) and the EU Air Framework Directive.

Baseline

The EIA Report will provide an overview of the existing environment. Specific meteorological data for the site will be obtained from the nearest meteorological and synoptic stations (data will be sourced from Met Éireann). This information will provide historical and existing baseline information for the regional climate in this area.

Potential Effects

The construction phase has the potential to give rise to emissions of oxides of nitrogen, benzene and particulates, which could impact on local air quality. This is often due to plant, equipment and traffic generation.

Given the renewable nature of the Proposed Development, it is not expected to have a negative impact on air quality. Furthermore, it is anticipated that the proposed development will have a positive impact on greenhouse gas emissions such as CO_2. This will be quantified and assessed in terms of European and national targets.

Impact Assessment

The positive effects that the Proposed Development may have on the climate will also be discussed in this chapter, as well as a CO_2 balance calculation for the proposed construction, operation and decommissioning of the Proposed Development.

Impacts on local air quality, particularly as a result of windfarm construction would also be considered as part of this assessment.

13 Noise and Vibration

Methodology and Guidance

Operational noise associated with the Proposed Development will be assessed in accordance with the requirements of the Department of the Environment, Heritage and Local Government Planning Guidelines on wind farm development (DoEHLG, 2006).

It will also incorporate the best practice described within the UK Institute of Acoustics document, 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (GPG) (IOA, 2013).

It should be noted that the Draft Revised Wind Energy Development Guidelines (2019) will be referenced and considered where appropriate as part of the Operational Noise Impact Assessment. However, this document is subject to revision, and should this be re-drafted before lodgement of the planning application, the updated version will be taken into consideration.

Baseline measurements are currently being undertaken at four locations. The derived prevailing background noise levels, over a range of wind speeds, will be used to determine daytime and night-time noise limits as per the requirements of the DoEHLG guidelines referenced above.

In cases where background noise measurements have already been undertaken for other wind farm developments, these measurements will be used to inform the noise limits applied to these properties.

Predictions of the noise levels resulting from the proposed development, also over a range of wind speeds, can then be compared with the derived limits.

Construction and decommissioning noise impacts will be discussed with reference to relevant guidance in the form of BS 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' (BSI, 2014 + 2019).

Baseline

An assessment has been conducted to determine the requirements for baseline measurements, described above, and these are shown on Figure 7. Baseline Noise Monitoring Locations are shown in in Figure 7 and Table 7.

Table 7 Baseline Noise Monitoring Locations

Receptor	ITM (X)	ITM (Y)
NSR 1	518899	583815
NSR 2	517404	583959
NSR 3	517145	580425
NSR 4	516098	583540

The baseline noise environment at all properties with predicted cumulative noise levels above 35 dB L_{A90} will be assessed either by conducting a baseline noise survey or by review of previous baseline noise investigations carried out for the neighbouring wind farms.

Potential Effects

The key issues for this Site in respect of noise are similar to other developments of this type, i.e., meeting noise limits based on background noise. The draft government guidance on noise (Draft Revised Wind Energy Development Guidelines, December 2019) significantly reduces these lower limiting values compared to existing guidance.

Impact Assessment

The results of the noise assessment will be presented in the EIAR. It will consist of a description of noise from wind turbine sites and a review of noise planning guidance for wind farms. A description of the baseline noise measurements and the results will be included together with an explanation of the noise prediction methodology and the modelling results.

This will produce a derivation of the noise limits and a comparison of those noise levels with the specified limits. Finally, a discussion of any cumulative effects; any proposals for mitigation required; and conclusions will be included.

The noise assessment will provide a summary of relevant guidance and best practice construction methods, along with a commitment to adhere to best practicable means of controlling noise from construction activities, as advocated by BS 5228.

The potential influence of construction traffic will be reviewed and assessed as necessary in terms of the increase in traffic noise at roadside locations, except where there is little or very little traffic movement in which case it will be assessed against the criteria in BS 5228.

14 Cultural and Archaeological Heritage

Methodology and Guidance

The study will assess the baseline archaeological, architectural and cultural heritage environment, evaluate potential impacts, and provide mitigation measures.

This will include tangible, physical assets including:

- Historic buildings and structures;
- Archaeological assets;
- The remains of past environments shaped by human action;
- Historic landscapes and townscapes; and
- Other sites, features or places in the landscape that have the potential to provide information on past human activity.

It will also incorporates tangible associations of place with events, such as historical battlefields or with historical figures and folklore.

This will be done in accordance with the policies of the National Monuments Service (Department of Culture, Heritage and the Gaeltacht, DoCHG) and Kerry (and Cork, recognising the proximity to the county border) County Councils, the National Monuments Acts 1930-2004, EIA Directive 2011/92/EU (amended 2014/52/EU) and best practice guidelines.

Baseline

An extensive desktop study and a field inspection will be undertaken. 'Baseline values' will be assigned to each identified site of cultural heritage significance based on its 'importance' and 'sensitivity'. The significance level of an impact will be assessed by combining the magnitude of the impact and baseline value of the feature.

An initial assessment indicates that there is a significant level of archaeological features in the vicinity of the Site; however there appears to be just one hut site on the boundaries of the Site.

The ground disturbance from prior afforestation may have reduced the possibility of uncovering new findings at the site. There are no National Inventory of Architectural Heritage (NIAH) listings in close proximity, although there are some in nearby towns and villages such as Coolea, Baile Mhuirne, Ballymakeera, Carriganimma, Clondrohid and Millstreet.

A total 74 sites of archaeological, and/or cultural heritage significance within the study area have been identified. These comprise 46 sites designated through the Records of Monuments and Places (RMPs), seven areas of archaeological potential (AAPs), 13 townland boundaries, two unregistered cultural heritage sites, five previous archaeological excavations, and one topographical file find location.

Potential Effects

The assessment will consider the effects upon designated and non-designated cultural heritage assets within the study areas.

Based on baseline conditions, it is proposed that the following elements are scoped into the assessment:

- Designated assets with theoretical visibility within the 10km study area or with identified sensitivity to setting change at greater distances;
- Non-designated assets with theoretical visibility within the 5km study area identified as being of high sensitivity to setting change;
- Non-designated assets within the proposed site boundary; and
- Cumulative effects.

Impact Assessment

In terms of cultural heritage impact assessment, impacts are considered in terms of the change to an asset's cultural significance. There are three principal impact types that can affect cultural heritage assets: physical impact, setting change, and cumulative impact.

Impacts can be positive or negative, temporary or permanent, avoidable or unavoidable, individual or cumulative.

1. Physical Impact

   Direct physical effects to assets occur when the fabric of known or undiscovered assets are removed or damaged as a result of development. This will be permanent and generally occurs during the construction phase.

   Indirect physical effects occur as an indirect consequence of the development such as increased/decreased erosion or damage or damage from vibration of piling again, such impacts are likely to be permanent.

2. Setting Change

   'Setting' is the way the surroundings of an asset or place contribute to how it is understood, appreciated and experienced in the present landscape.

   Setting impacts are usually direct and result from the developments causing change within the setting of a heritage asset which affect its significance. For example, through the ability for an asset to be understood, appreciated and experienced within the context of the surrounding landscape.

3. Cumulative Impacts

   Impacts of a cumulative nature can relate to the physical fabric or setting of assets. This can be a result of impact interactions between different impacts of the development or between impacts of other projects. Alternatively, they may be additive impacts from incremental changes caused by the proposal together with other projects already in the planning system.

   The cultural heritage assessment will consider the potential effects to heritage assets against a baseline that includes existing or consented wind farms. Visualisations and photomontages will be used to aid this assessment if appropriate.

Where adverse effects to assets within the site are identified, measures to avoid, reduce and/or offset these effects will be proposed. Where necessary, to prevent accidental damage or potential destruction of assets, appropriate measures will be put in place through a construction management plan.

15 Shadow Flicker

Methodology and Guidance

The shadow flicker assessment will be carried out using windPRO modelling software and in accordance with the guidelines set out in the 2006 Wind Energy Guidelines as well as the Draft Revised Wind Energy Guidelines (December 2019). Consideration will also be given to relevant UK guidance including "Update of UK Shadow Flicker Evidence Base" carried out by Parsons Brinckerhoff in 2010.

Baseline

OSI mapping will be used to identify properties with potential susceptibility to shadow flicker, in line with the Parsons Brinckerhoff study. The area around each turbine location within a distance of 10 rotor diameters (1620m) and 130 degrees either side of north (the zone of potential shadow flicker) will be considered.

Potential Effects & Impact Assessment

Shadow flicker can arise from the passing of the moving shadow of a wind turbine rotor-blade over a narrow opening such as the window of a nearby residence. A similar effect can also occur when the gloss blades of a rotating turbine reflect the sun causing a flashing light.

Shadow flicker happens only when a certain combination of conditions coincide at particular times of the day and year, mainly in the winter months when the sun is low in the sky (BERR 2009).

The occurrence of shadow flicker and the extent of its effects are dependent on a number of factors, namely:

- Distance from the wind turbine;
- Turbine hub height and rotor diameter;
- Speed of blade rotation;
- The proportion of sunny weather during the months when flicker can occur; and
- The size, shape and orientation of any windows or doors of neighbouring properties.

The flickering may have the potential to cause disturbance and annoyance to residents. It is, however, not possible for turbines to cause photosensitive epilepsy.

It is generally accepted that where a separation distance for wind turbines from habitations exceeds ten times the rotor diameter of a turbine blade, the potential for shadow flicker is very low. In the case of the proposed development, shadow flicker may occur at a number of properties.

A shadow Flicker model will be run to identify the worst-case scenario annual shadow flicker occurrence. The Draft 2019 Guidelines note that no shadow flicker should be occur at residential properties. If properties are identified to exceed this limit, mitigation such as automated turbine shut down to eliminate shadow flicker will be considered as appropriate.

16 Material Assets (Aviation, and Telecommunications)

This section provides an initial assessment of potential effects of the construction and operation of the Proposed Development on material assets such as aviation, and telecommunications.

Methodology and Guidance

Telecommunications

A study will be undertaken to analyse the impact of the turbines on telecommunications operator's point-to-point microwave radio links. The study will include a desk based telecommunications constraints mapping. The purpose of this mapping is to identify potential negative impacts on the telecommunications network and facilitate the selection of optimum sites and turbine locations by avoiding telecommunication links where possible, and thereby limiting any potential negative impacts on service providers in the area.

Consultation with relevant stakeholders will continue throughout the design and EIA process to identify potential impacts. Further specialist investigations will be carried out if the telecommunications operators identify potential impacts, for instance 3-dimensional telecommunication impact assessment to calculate clearance zones and whether micrositing allowance could resolve infringement, if applicable.

Aviation

As part of the aviation study, consultation with aviation stakeholders such as Irish Aviation Authority and Kerry Airport will be undertaken. Project details including turbine specifications and locations will be provided and asked to revert with any potential impacts on their aviation assets, such as radar and flight path management protocols.

Baseline

Telecommunication

Initial consultation with telecommunication stakeholders has identified a number of links that intersect the Site. Separation buffers have also been identified and will be taken into consideration as part of the design process. This is detailed in Table 8.

Table 8: Summary of nearby telecommunication links

Operator	Frequency (MHz)	Link Type	Operator Stand Off	Link ID	Start Height (m)	End Height (m)
Vodafone	11000	XPIC	1st Fresnel + 30m + rotor	CK005-CKMGH 11GHz XPIC	15	15
Vodafone	26000	Link	1st Fresnel + 30m + rotor	CK121-CKMGH 26GHz link	10	20
ESB	458	Microwave	2nd Fresnel + 150m	Mullaghanish to Gneeves 38kV	12	6
ESB	458	Microwave	2nd Fresnel + 150m	Mullaghanish to Caherdowney MV	12	6
ESB	458	Microwave	2nd Fresnel +	Mullaghanish to	12	10

Operator	Frequency (MHz)	Link Type	Operator Stand Off	Link ID	Start Height (m)	End Height (m)
			150m	Newmarket 38kV		
2rn	474	DTT	second fresnel	Mullaghanish to Dingle	209.5	27.6
2rn	474	DTT	Second Fresnel	Mullaghanish to Maamclassach	209.5	27
2rn	474	DTT	Second fresnel	Mullaghanish to Knockmoyle	209.5	12.6
2rn	474	DTT	Second Fresnel	Mullaghanish to Femoy	209.5	13
2rn	6000	Microwave	Second Fresnel	Mullaghanish to Castletown	9.5	17.5
2rn	6000	Microwave	Second Fresnel	Mullaghanish to Castletown	26	17.5
2rn	6000	Microwave	Second Fresnel	Mullaghanish to Kildorrey	6.5	21
2rn	6000	Microwave	Second Fresnel	Mullaghanish to Kildorrey	23.5	21
Virgin	6000	Microwave	52m + rotor	RTE Mulliganish to Carron Mt	10	7
ESB	6840	Microwave	2nd Fresnel + 150m	Mullaghanish to Knockmoyle	10	10
2rn	90	DTT	<Null>*	Mullaghanish to Maamclassach	209.5	28
2rn	90	FM	Second Fresnel	Mullaghanish to Knockmoyle	209.5	12.6
2rn	90	FM	Second Fresnel	Mullaghanish to Femoy	209.5	7
2rn	90	FM	Second Fresnel	Mullaghanish to Ballydavid	107	8.5
2rn	90	FM	Second Fresnel	Mullaghanish to Knockanore	107	5.2
TETRA Ireland	Unknown	Unknown	700m	RTE Mulliganish	Unknown	Unknown

* No operator stand off distance identified during consultation. It is assumed that rotor diameter will be used as a separation distance from the identified link.

Aviation

Initial review indicates that the nearest commercial airport is Kerry Airport. At approximately 30km north west of the Proposed Development, it is anticipated that affects will be imperceptible.

Potential Effects & Impact Assessment

Telecommunications

Where necessary, mitigation measures to be agreed with operators including Turbine and / or Telecommunications relocation and underground fibre optic cables to replace microwave link.

Aviation

Once the baseline has been identified, continued consultation with aviation stakeholders will be undertaken to confirm the potential impact. Mitigation will be discussed if required.

Given the distance between Kerry Airport and the Proposed Development (30km), it is anticipated that impacts will be imperceptible.

17 Interaction of the Foregoing

A chapter of the EIAR entitled "Interaction of the Foregoing" will summarise the primary interrelationships of aspects of the various environmental topics with the potential for significant effects as a result of the Proposed Development.

18 List of Consultees

It is proposed that the project team will commence consultation initially with the bodies listed below. All consultees will be asked for any comments or observations they may have on the proposed development relevant to your area of expertise.

- Kerry County Council, including the following departments:
  - Environment Division;
  - County Heritage Officer;
  - Roads Office;
  - Water/Wastewater Division/Irish Water; and
  - County Archaeologist;
- Cork County Council;
- Southern Regional Assembly;
- National Parks and Wildlife Service – local ranger(s), DAU and Regional Manager/Divisional Ecologist;
- The Senior Fisheries Environmental Officer, Regional Fisheries Board;
- Environmental Protection Agency;
- South Western River Basin District Project Officer (or equivalent);
- Principal Environmental Health Office, HSE Killarney;
- An Taisce;
- Senior Conservation Officer, BirdWatch Ireland;
- Irish Raptor Study Group;
- Irish Wildlife Trust;
- Irish Water;
- Inland Fisheries Ireland;
- Kerry Airport;
- EirGrid;
- Telecommunication and Aviation stakeholders
  a. Irish Aviation Authority
  b. Kerry Airport
  c. Eir - (Previously Meteor)
  d. TETRA Ireland Communications Ltd
  e. Virgin Media
  f. BT
  g. Premier Broadband
  h. Vodafone
  i. ESB networks Telecoms
  j. Radio Telefís Éireann
  k. Broadcasting Authority of Ireland
  l. Department of Defence
  m. Irish Aviation Authority

n. O2
o. Irish Telecoms
p. TowerCom Ltd
q. Three
r. Netshare
s. Comreg

- National Monuments Service;
- Teagasc;
- Kerry Energy Agency;
- Geological Survey of Ireland;
- Irish Peatland Conservation Council;
- National Trails Office, Irish Sports Council;
- The Heritage Council;
- Office of Public Works, Killarney;
- Sustainable Energy Authority of Ireland;
- Environment Section, Department of Agriculture, Fisheries and Food;
- Department of the Environment, Climate and Communications;
- Energy and Emissions Services, Environment Division, Department of Agriculture, Food and the Marine;
- Department of Rural and Community Development;
- Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media;
- Department of Housing, Local Government and Heritage;
- Department of Agriculture, Food and the Marine;
- Fáilte Ireland;
- Transport Infrastructure Ireland (TII);
- Waterways Ireland;
- Commission for Regulation of Utilities;
- Geological society of Ireland;
- Bird Watch Ireland;
- Arts Council of Ireland;
- Bat conservation Ireland;
- 3 Counties Energy Agency;
- Forest Service;
- Met Eireann;
- Irish trails/sports Ireland; and
- Climate Action Regional Office (CARO) South.

19 Community Engagement & Public Consultation

Community Engagement will be conducted in accordance with Coillte CGA best practice and Irish industry guidelines from Wind Energy Ireland. Community Engagement will be led by a dedicated Community Liaison Officer (CLO). As a minimum three informative leaflets will be issued to residents within 4km of the Proposed Development at key points in the preparation of the EIAR.

The first leaflet, distributed in July 2021 introduces the Proposed Development to the local community and provided contact information for the CLO, agent and the Applicant in order to engage and establish a line of dialogue with the local community.

In addition to the leaflet, public consultation will be undertaken in the form of virtual events such as one-to-one or group consultation meetings as appropriate.

A dedicated website will also be established to provide information and updates on the progress of the Application.

All responses from public consultation will be recorded with responses provided either on a 1-to-1 basis or collectively where similar issues are raised.

Appendix: Water Quality Monitoring Plan

Introduction

This Water Quality Monitoring Plan (WQMP) has been prepared in connection with the proposed monitoring strategy to inform a planning application for the Proposed Development.

Aims and Objectives

In order to quantify any impact of the Proposed Development on the water environment, it is necessary to establish baseline (pre-planning) trends in water quality.

Baseline water quality sampling is undertaken to provide a point of comparison and highlight any potential pre-existing pressures. The monitoring will help identify changes that may occur in the water environment as a result of the proposed scheme.

The approach and methods outlined in this WQMP are designed to establish baseline trends in water quality and quantity in response to a representative range of temperatures and rainfall events over a baseline period, with a focus on:

- Total Suspended Solids (TSS) / Turbidity: one of the key indicators of the effects of runoff from construction sites;
- Phosphorous and Nitrogen; identified as a key pressure to downstream designated sites; and
- Other chemical constituents of water: to establish the existing health of the waterbodies associated with the proposed development (these may also be compared with Environmental Quality Standards (EQS))

The data gathered will be used to determine existing pressures within the site catchment and from elsewhere to inform quantitative and qualitative assessment of the likely effects of potential development at the site.

At a later date (post-planning / pre-construction), the baseline information can be used to supplement new pre-construction baseline information to allow monitoring and evaluation of the construction of the development. That aspect of work is not considered further by this Plan.

Monitoring Locations and Rationale

Proposed discrete surface water monitoring locations are detailed in Table 9.

Surface water monitoring locations are positioned at strategic points on watercourses crossed by, or running immediately adjacent to and downslope of, the proposed development. These watercourses receive run-off from the proposed development site and have the potential to be impacted by the development.

Additional monitoring locations are proposed at locations hydrologically upstream of the development in order to permit characterisation / sources of pre-existing pressures to water quality from other unrelated land uses.

Rainfall will be monitored by use of Met Éireann data and by a suitable water gauge installed on or proximal to the site to allow measurement of rainfall depths. A rainfall level would be decided upon which would trigger an immediate response to visit site and take samples. This reduces the risks that sampling might miss the flash flood nature of tributaries for summer rainfalls based on Met Éireann gauge or forecasts. The gauge will therefore be installed for the summer season.

Table 9: Monitoring Locations and Rationale

Location Ref	IGR	EPA River Sub-Basin	Watercourse	Monitoring Type	Rational
SW01	520849, 583860	Flesk (Kerry) 010	Clydahroe River	GS, IS	Downstream monitoring point adjacent to the proposed wind farm boundaries. Located in the upper-most section of the catchment hydrologically connected to the proposed development site.
SW01C	522120, 584291	Flesk (Kerry) 010	Tributary of Clydahroe River	GS, IS	Upstream control point adjacent to the proposed wind farm boundaries not hydrologically connected to the proposed development site.
SW02	520780, 583497	Flesk (Kerry) 010	Tributary of Clydahroe River	GS, IS	Downstream monitoring point within the proposed wind farm boundaries. Drains upper-middle section of the proposed development site. Can act as a control point for adjacent catchments during phased construction activities.
SW03	519635, 583591	Flesk (Kerry) 010	Tributary of Clydahroe River	GS, IS	Downstream monitoring point within the proposed wind farm boundaries. Drains lower-middle section of the proposed development site. Can act as a control point for adjacent catchments during phased construction activities.
SW04	519449, 583518	Flesk (Kerry) 010	Tributary of Clydahroe River	GS, IS	Downstream monitoring point within the proposed wind farm boundaries. Drains upper-bottom section of the proposed development site. Can act as a control point for adjacent catchments during phased construction activities.
SW05	518289, 583461	Flesk (Kerry) 020	Tributary of Clydahroe River	GS, IS	Downstream monitoring point within the proposed wind farm boundaries. Drains lower-bottom section of the proposed development site. Can act as a control point for adjacent catchments during phased construction activities.
SW05C	517802, 583237	Flesk (Kerry) 020	Tributary of Clydahroe River	GS, IS	Upstream point adjacent to the proposed wind farm boundaries not hydrologically connected to the proposed development site. Comparable to "SW4" in the Interim Hydrology Report prepared for Coillte by HES (2020). This location had been found to have elevated levels of orthophosphate, turbidity, and BOD, possibly related to on-going forestry works further upstream in that catchment.
SW06	516685, 583900	Flesk (Kerry) 020	Clydahroe River	GS, IS	Downstream monitoring point located approx. 1.5 km downstream from the proposed wind farm boundaries. Samples will determine trends in water quality at incremental points further

Location Ref	IGR	EPA River Sub-Basin	Watercourse	Monitoring Type	Rational
					downstream from the development site. Located within Coillte landholdings for ease of access and sample collection.
SW07	513736, 583647	Flesk (Kerry) 020	Clydahroe River	GS, IS	Downstream monitoring point located approx. 5.5 km downstream from the proposed wind farm boundaries. Samples will determine trends in water quality at incremental points further downstream from the development site. Located at bridge crossing on public road for ease of access and sample collection.
SW08	511099, 582864	Flesk (Kerry) 030	Clydahroe River	GS, IS	Downstream monitoring point located approx. 9 km downstream from the proposed wind farm boundaries. Samples will determine trends in water quality at incremental points further downstream from the development site. Located at bridge crossing on public road for ease of access and sample collection.
SW09	506603, 585448	Flesk (Kerry) 040	Flesk River	GS, IS	Monitoring point on Flesk River located approx. 17 km downstream from the proposed wind farm boundaries, and upstream of confluence with Quagmire River. Samples will determine trends in water quality at incremental points further downstream from the development site. Site can act as a control for subsequent downstream point by separating wider contributing catchment also discharging to Lough Leane i.e. Quagmire River.
SW10	509705, 590968	Bheenagh 010	Bheenagh River	GS, IS	Monitoring point on tributary of Quagmire River. Sample will inform baseline water quality conditions of wider catchment discharging to Lough Leane but not hydrologically connected to the proposed development site.
SW11	508588, 590514	Owneykeagh 010	Quagmire River	GS, IS	Monitoring point on tributary of Flesk River. Point located downstream of WWTW. Sample will inform baseline water quality conditions of wider catchment discharging to Lough Leane but not hydrologically connected to the proposed development site.
SW12	496677, 589491	Flesk (Kerry) 060	Flesk River	GS, IS	Monitoring point on Flesk River located approx. 30 km downstream from the proposed wind farm boundaries. Samples will determine downstream cumulative trends from entire catchment discharging to Lough Leane including watercourses hydrologically connected to the proposed development, and those not connected i.e. Quagmire River. Points sited at location of existing EPA monitoring stations (RS22F020300 (Flesk Br, S of Killarney LHS) and RS22F020310 (Flesk Br S of Killarney RHS)) for comparative purposes.

Sampling Frequency

In order to capture a representative overview of seasonal variance in water quality across a representative range of climatic conditions i.e., temperature and precipitation (including winter storm events characterised by prolonged periods of precipitation, and short intense convective downpours during summer months), an extensive series of snapshot samples, and additional 'intensive' sampling shall be undertaken. These are defined as:

- Snapshot sampling: one sample collected from approximately five – ten monitoring locations sited within the development boundary (including control locations) and at incremental points on Clydahroe River downstream of the proposed development.
- Intensive sampling: two – four samples collected over the course of 24 hours after a storm event at a reduced number of monitoring locations (approximately four) in the catchment downstream from the development site. Samples will also be collected from a control point(s) adjacent to the site.

To capture representative seasonal variance throughout the calendar year, timing of sampling was planned for January/February 2021 for winter snapshot sampling, April/May 2021 for spring snapshot sampling, June/July/August 2021 for summer snapshot, and September/October 2021 for autumnal snapshot sampling.

These will be supplemented by up to three rounds of targeted post-storm event sampling during summer (two) and winter (one) months. Timing of post-storm event sampling (particularly summer storms) will likely be determined at short notice by monitoring Met Eireann weather forecasts.

Table 10 summarises proposed sampling frequency, location, and 'type' (i.e., 'snapshot' and intensive') for pre-planning baseline phase.

These baseline sample results, in conjunction with relevant water quality legislation, will be used as benchmarks for correlation against the monitoring results collected during the construction phase to identify deterioration in water quality and whether the causes are related to the construction of the wind farm or naturally occurring or from non-related sources.

Table 10: Sampling Frequency

Location Ref	Winter 'Snapshot' Sampling	Winter Intensive Sampling	Spring 'Snapshot' Sampling	Summer 'Snapshot' Sampling	Summer Intensive Sampling	Autumn 'Snapshot' Sampling
SW01	✓			✓		
SW01C	✓	✓	✓	✓	✓	✓
SW02	✓			✓		
SW03	✓			✓		
SW04	✓			✓		
SW05	✓			✓		

Location Ref	Winter 'Snapshot' Sampling	Winter Intensive Sampling	Spring 'Snapshot' Sampling	Summer 'Snapshot' Sampling	Summer Intensive Sampling	Autumn 'Snapshot' Sampling
SW05C	✓			✓		
SW06	✓	✓	✓	✓	✓	✓
SW07	✓	✓	✓	✓	✓	✓
SW08	✓	✓	✓	✓	✓	✓
SW09	✓	✓	✓	✓	✓	✓
SW10	✓			✓		
SW11	✓			✓		
SW12	✓			✓		

Methodology and Guidance

Surface water monitoring will be carried out using discrete monitoring: comprising sample collection for laboratory analysis in an INAB / UKAS accredited lab and use of a hand-held sonde to provide supplementary in-situ readings.

Discrete monitoring

Snap shot sampling comprises periodic site visits for the collection of laboratory samples. The following details the requirements of sampling methodology used and site practice:

- Method statements and risk assessments are to be prepared and submitted by the appointed sampler for inspection by the Developer prior to collection of samples;
- All samples will be taken by a suitably trained scientist, engineer, or site staff member, who is familiar with standard sampling techniques, i.e. standard method "ISO 5667-7 Water Quality – Sampling – Guidance in Sampling Rivers and Streams". Care should be taken to avoid disruption to the riverbed during sampling and samples must be taken facing upstream in order to avoid increased turbidity and suspended solids from the sampler;
- Samples should be kept chilled at or below 4°C prior to delivery to the laboratory. All samples must reach the laboratory no later than 48 hours after the sample date;
- The following parameters will be assessed on site using calibrated handheld instruments: pH, temperature, dissolved oxygen, turbidity, and electrical conductivity. The probe is to be immersed in the flowing water until a steady reading is achieved;
- Visual assessments for deposited silt, discoloured water and oily sheens will also be carried out at each sample location. Visual assessments shall be recorded, and results retained;
- All bottle-ware etc should be provided by the laboratory;

- Samples are to be accompanied with laboratory specific Chain of Custody documentation, which will provide details on the sample location. Chain of Custody sheets will be retained for the duration of the Contract; and
- Where for any reason the sample location is unreachable and the sample is taken from an adjacent location, the new location will be recorded using handheld-type GPS equipment and noted for future reference.

Sampling Parameters

Indicator parameters which have the greatest potential to be impacted during construction and/or operation of the proposed development will be monitored. This will encompass parameters which have the potential to cause the greatest impact on any particularly sensitive receptors.

The most prominent concerns are exacerbation of existing pollution in Lough Leane (into which the Flesk River ultimately discharges) which has been subject to historical nutrient pollution / eutrophication from various sources within its contributing catchments.

Samples will be the taken from the monitoring locations and analysed in the INAB / UKAS accredited laboratory for the parameters indicated in the tables below. Table 10 shows the suite of parameters that samples are to be tested for during baseline monitoring.

Handheld monitoring equipment (sonde) will be used to monitor pH, temperature, dissolved oxygen, turbidity, and electrical conductivity.

In order to give qualification to the relative quality of the water sampled at the monitoring locations, results are to be compared (where applicable) with threshold levels and classifications outlined in the relevant following water quality legislation:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities (Drinking Water) Regulations 2014 (S.I. 122 of 2014);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2010 (S.I. No. 610 of 2010); and
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489 of 2011)

Table 11: Surface Water Quality Parameters – Baseline Suite

Field Analysis	
pH	Electrical Conductivity (µS/cm)
Temperature (°C)	Dissolved Oxygen (DO)
Turbidity (NTU)	
Field Analysis	
Alkalinity (mg/l CaCO3)	Turbidity (NTU)

Field Analysis	
Orthophosphate (mg/l P) (Reactive Phosphorus)	Nitrate (mg/l N)
Phosphorus, Total as P (mg/l P)	Nitrite (mg/l N)
Conductivity @ 20°C (us/cm)	Total Oxidized Nitrogen (mg/l)
Ammoniacal Nitrogen (mg/l NH3) Ammonia	Total Aluminium (mg/l Al)
Biological Oxygen Demand (BOD) (mg/l)	Total Iron (mg/l Fe)
Chemical Oxygen Demand (COD) (mg/l)	TPH (mg/l)
Total Suspended Solids (TSS) (mg/l)	Colour Apparent (Hazen)
pH	Chlorine

Table 12 identifies the key parameters in relation to the potential effects of construction of the proposed development on the water environment.

Table 12: Parameter Guidance

Parameter	Expected natural range	Notes
Total suspended solids (mg/l)	< 25 Typical Conditions <100 Flood Conditions	Elevated TSS may indicate increased levels of silt, fine aggregates, or cementitious material discharging to the watercourse.
Turbidity (NTU)	< 10 to protect fish life (may be higher during rainfall events)	Turbidity is a measure of water clarity; how much the material suspended in water decreases the passage of light through the water. Turbidity can be useful as an indicator of the effects of runoff from construction. Turbidity often increases sharply during a rainfall event and monitoring in combination with rainfall data may be appropriate.
Electrical conductivity (µS/cm)	< 800	Conductivity is a measure of the ability of a solution to conduct electricity and is proportional to the concentration of dissolved mineral salts. High conductivity could indicate cement/concrete discharges to water.
Dissolved Oxygen (% saturation)	> 70%	DO is a key indicator of a waterbodies potential to support aquatic life. Reduced DO levels may be caused by: • siltation / suspended solids - Oxygen is more easily dissolved into water with low levels of dissolved or suspended solids. improper disposal of foul waste from on-site facilities.
Oils (TPH)	None	Laboratory measurements greater than trace levels, or visible presence of an oily sheen is an indication of leakage/spillage of oil from construction vehicles etc into watercourses.
pH	6.5 - 8.5 (normal for natural waters; fish will survive at	pH measures the acidity or alkalinity of water. High pH is a likely indication of discharges of cement/concrete into watercourses (pH 12-13 possible).

Parameter	Expected natural range	Notes
	lower pH levels)	
Alkalinity (mg/l CaCO3)	20 – 200 mg/l	Alkalinity refers to how much acid that can be neutralised within the watercourse. Alkalinity acts as a buffer protecting the river and habitats from fluctuations in pH. • UKTAG classifies alkalinity as low (<10), moderate (10-50), high (50-200) and very high (>200). • Levels < 10 mg/l indicate a low buffering potential with the watercourse likely to be susceptible to fluctuations in pH from natural or human sources. • Levels 100-200 mg/l will provide sufficient buffering to reduce significant changes pH levels. Typical levels in freshwater are 20-200 mg/l.
Biological Oxygen Demand (BOD) (mg/l)	< 5	BOD is a measure of the quantity of dissolved oxygen used by microorganisms to break down organic matter present in a given water sample. Spikes in BOD during construction works could be a result of discharge of under-treated sewage and/or decomposition of organic matter following deforestation / ground clearing works.
Chemical Oxygen Demand (COD) (mg/l)	< 20	COD is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water. Causes of raised COD levels would be similar to those for BOD.

Visual Inspection

Quantitative monitoring will be aided by visual inspections during each sample collection. Visual observations shall be logged at each monitoring location. This will include:

- Weather observations;
- Flow rate / velocity;
- Relative water level /depth vs bank full conditions;
- Presence/ absence of vegetation;
- Presence/ absence of turbidity (score 0 – 5); and
- Presence/ absence of visible hydrocarbons.

Screening data

All monitoring data will be screened and checked for anomalies. This will involve:

- Use of duplicate sampling to verify laboratory testing methods;
- Use of visual observations to verify continuous in-situ monitoring data e.g. exposure above water, burial in bed material, clogging of sensors, etc.;
- Use of onsite calibration records to identify monitor drift;
- Comparison of parameters recorded via different techniques to ensure consistency (e.g. in-situ versus laboratory testing);
- Graphing of data to identify unusual trends; and

- Comparison of onsite rainfall with nearest available Met Éireann / site-based rain gauges to ensure consistency.

Where anomalous data is recorded, this will be identified as such on graphed and/or tabulated results and excluded during generation of statistics in order to prevent inaccurate representation of existing conditions.

Cummeennabuddoge Wind Farm

Figure 1
Site Location

Key

- Site boundary
- Site Entrance

atmos CONSULTING

0 1 2 4
Kilometres

N

Scale @ A3:
1:75,000

20/05/2021 61253/SL/017b

Drawn by: RN Checked by: TH Approved by: RN

Cummeennabuddoge Wind Farm

Figure 2
Ecological Designations within 10km

510000 520000 530000

590000 580000

Blackwater River (Cork/Waterford) SAC

Blackwater (Munster)

Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment PNHA

Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC

Laune-Maine-Dingle Bay

Mullaghanish Bog PNHA

Mullaghanish Bog SAC

Mullaghanish to Musheramore Mountains SPA

Lee, Cork Harbour and Youghal Bay

St. Gobnet's Wood PNHA

St. Gobnet's Wood SAC

Prohus Wood PNHA

Dunmanus-Bantry-Kenmare

Sillahertane Bog NHA

Key

- Site boundary
- 5km buffers to 10km
- Ancient & Long Established Woodland
- Natural Heritage Area
- Proposed Natural Heritage Area
- Special Area of Conservation
- Special Protection Area
- Major River Catchment
- Blackwater (Munster)
- Dunmanus-Bantry-Kenmare
- Laune-Maine-Dingle Bay
- Lee, Cork Harbour and Youghal Bay

Water Quality

- High
- Good
- Moderate
- Unassigned

atmos CONSULTING

0 1 2 4
Kilometres

N

Scale @ A3: 1:80,000

10/08/2021	TL01a	61253/EC/006a
Drawn by: RN	Checked by: RN	Approved by: RN

Cummeennabuddoge Wind Farm

Figure 3
Site Layout

Key

- Site boundary
- Existing forestry road
- Proposed Turbine Location

atmos CONSULTING

0 0.5 1 2
Kilometres

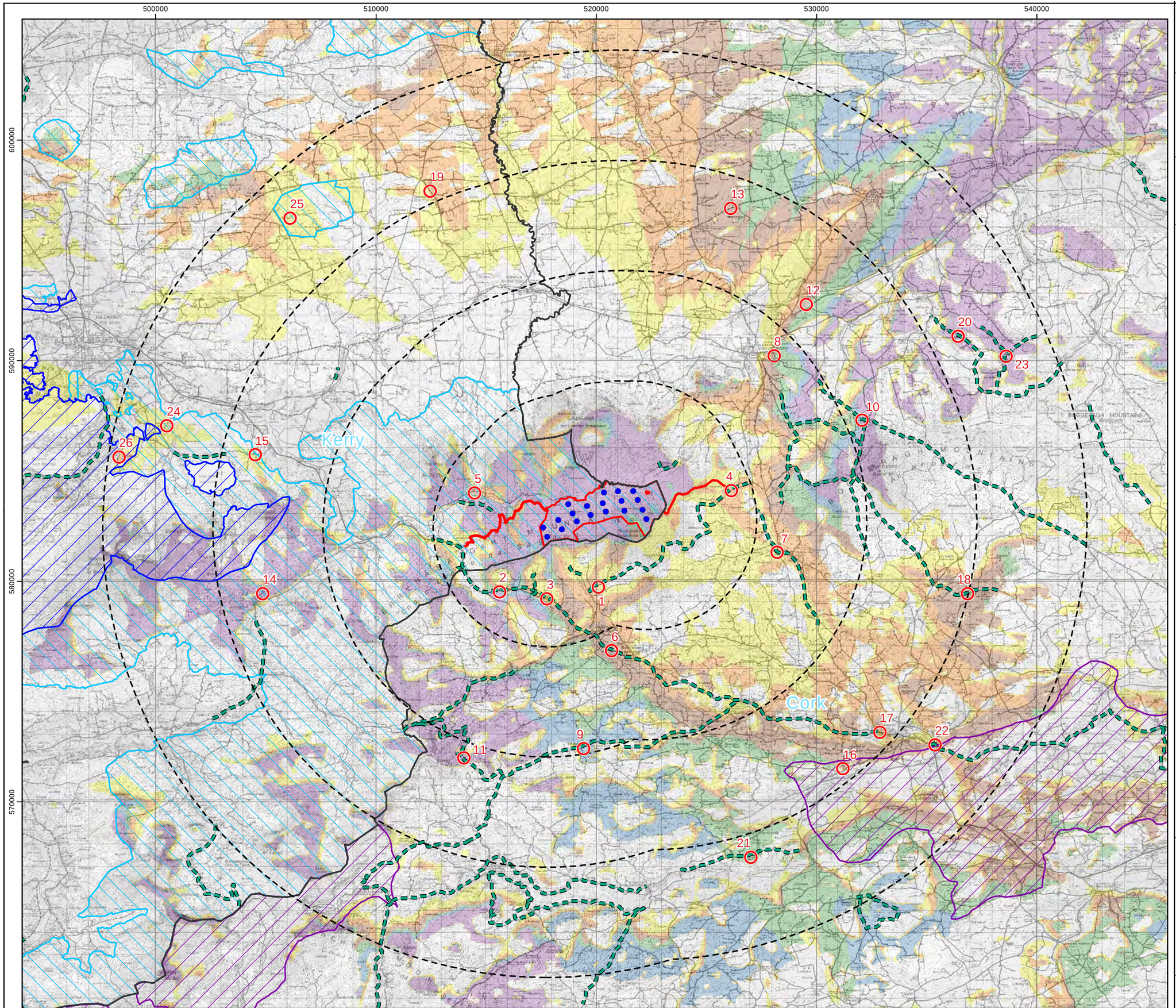
N

Scale @ A3:
1:40,000

20/08/2021 TL01a 61253/SL/019d
Drawn by: TH Checked by: TH Approved by: RN

Cummeennabuddoge Wind Farm

Figure 4
Landscape Designations and Blade Tip ZTV



Key

- County boundary
- Site boundary
- Proposed turbine
- 5km turbine buffers to 20km
- Landscape Viewpoint
- Scenic route / Promoted path
- County Kerry Primary Special Amenity Area
- County Kerry Secondary Special Amenity Area
- County Cork High Value Landscape Area

Zone of Theoretical Visibility

200m blade tip height

- 1 - 3 turbines visible
- 4 - 6 turbines visible
- 7 - 9 turbines visible
- 10 - 12 turbines visible
- 13 - 15 turbines visible
- 16 - 19 turbines visible

Generated using Copernicus Land Monitoring Service EU-DEM Dataset which does not take into account the screening effects of buildings or vegetation.

ZTV calculated using ArcGIS 10.6 Viewshed tool with observer eye height 2m above ground and corrections for earth curvature and atmospheric refraction applied.

Coordinate system: IRENET95 ITM

atmos CONSULTING

0 2.5 5 10

Kilometers

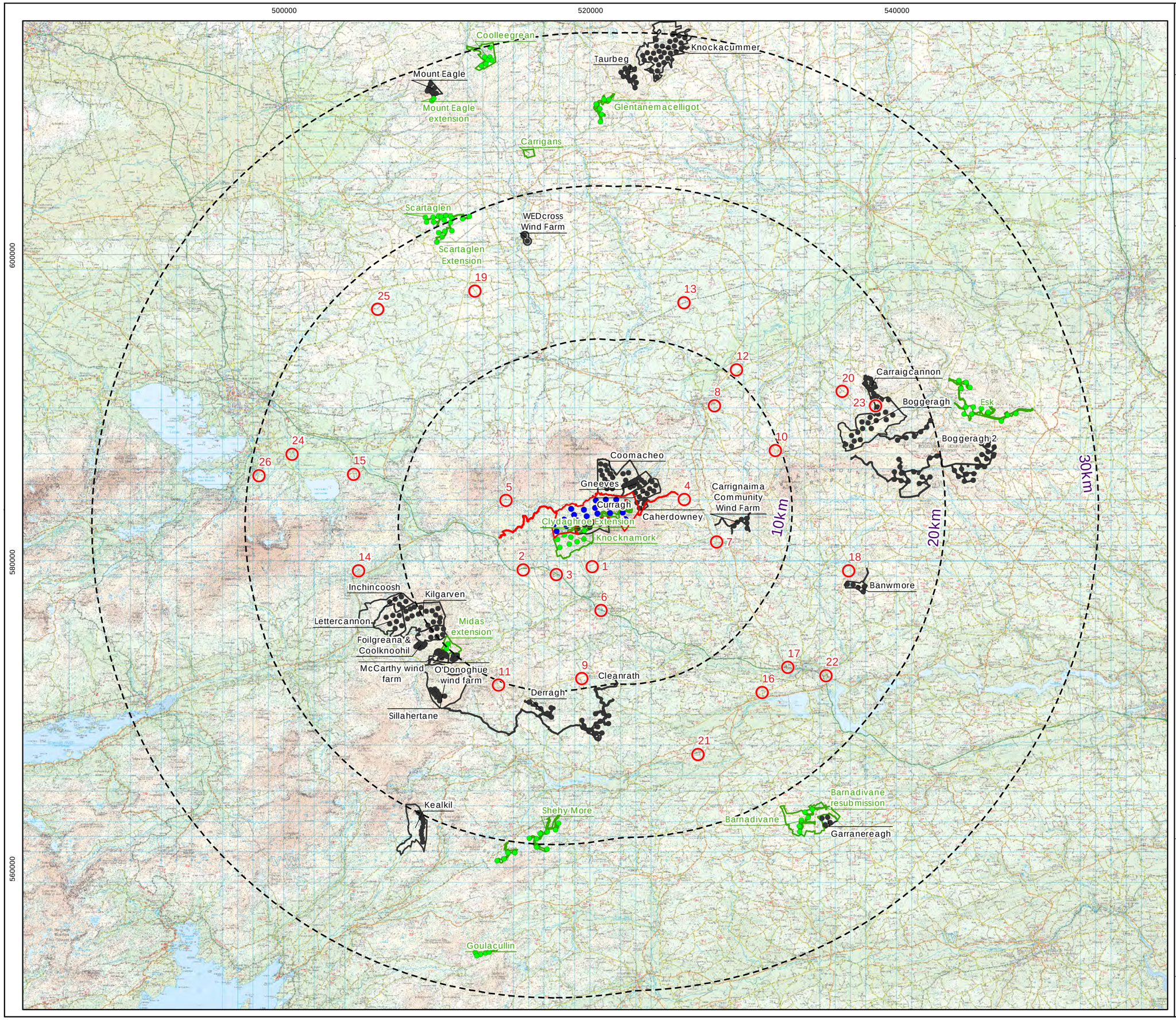
N

Scale @ A3:
1:160,000

10/08/2021	TL01a	61253/ZV/004b
Drawn by: RN	Checked by: RN	Approved by: RN

Cummeennabuddoge Wind Farm

Figure 5
Cumulative Wind Farms
Within 30 km



Key

- Site boundary
- 10, 20 and 30km Site Buffers
- Proposed turbine
- Landscape Viewpoint

Cumulative Wind Farms

- Permitted wind farm
- Operational wind farm
- Permitted turbine
- Operational turbine

atmos CONSULTING

0 2.5 5 10
Kilometres

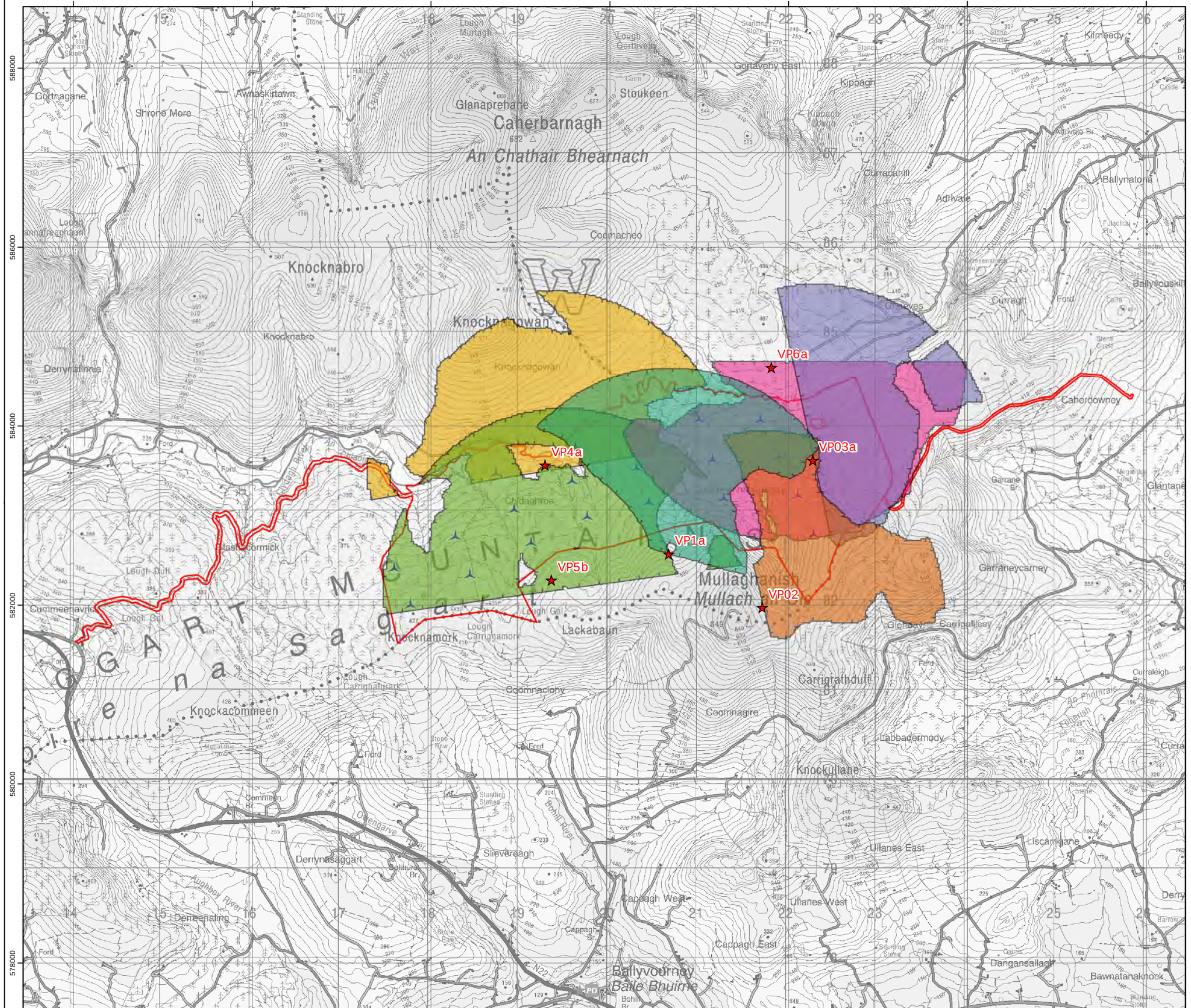
N

Scale @ A3:
1:230,000

10/08/2021 TL01a 61253/LS/013a
Drawn by: RN Checked by: RN Approved by: RN

Cummeennabuddoge Wind Farm

Figure 6
Vantage Point Locations



Key

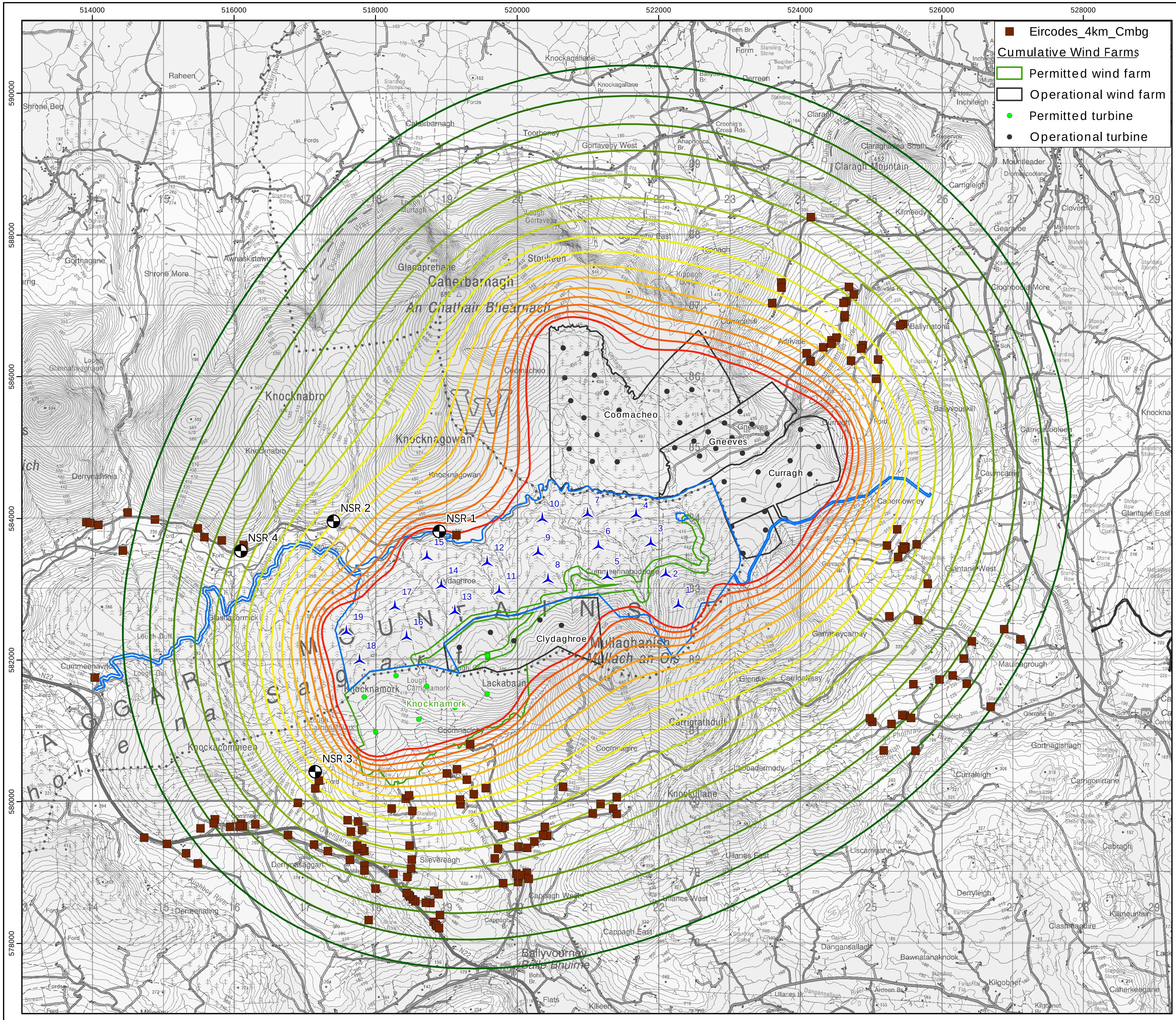
- Site boundary
- Proposed turbine
- Vantage Point Locations

Vantage point viewsheds

- 1a
- 2
- 3a
- 4a
- 5b
- 6a

atmos CONSULTING

10/08/2021	TL01a	61253/OR/029b
Drawn by: RN	Checked by: JB	Approved by: RN



Cummeennabuddoge Wind Farm

Figure 7
Initial noise contours

Key

- Site boundary
- Proposed turbine
- Noise sensitive receptor
- Dwelling

Noise contour (Decibels)

- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45

atmos CONSULTING

0 0.5 1 2
Kilometres

N

Scale @ A3:
1:50,000

12/08/2021 61253/NO/041a
Drawn by: KM Checked by: KM Approved by: RN