

# High Mark Forest Wind Farm

## Scoping Report

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**Report Prepared for:**

Wind Estate (UK) Ltd

**Author:**

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# 1 Introduction

## 1.1 Overview

This Scoping Request has been prepared by Green Cat Renewables (GCR) on behalf of Wind Estate (UK) Ltd hereafter referred to as ('the Applicant'). For the purposes of this Scoping Report, High Mark Forest Wind Farm (the Proposed Development) would have up to eight turbines with a tip height of up to 230m. Depending on the turbine selected for the final design, the turbines could have a potential generating capacity of 6MW, which would give a total capacity of up to 48MW. The Proposed Development would include a number of ancillary elements, such as access tracks, crane hard standings and control building, as well as temporary features such as a construction compound and laydown areas. Further details will be provided within this report.

With a generating capacity of up to 48MW, the Applicant would be seeking permission for the Proposed Development from Dumfries and Galloway Council (the Council) under the Town and Country Planning (Scotland) Act of 1997, as amended *inter alia* by the Planning etc. (Scotland) Act 2006 and the Planning (Scotland) Act 2019. The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations) would therefore also apply. Schedule 2 of the EIA Regulations lists developments for which the need for an Environmental Impact Assessment (EIA) is determined on a case-by-case basis (i.e. if significant environmental effects are considered likely) using applicable thresholds and the selection criteria presented in Schedule 3. The Proposed Development falls under Schedule 2, being an installation "for the harnessing of wind power for energy production (wind farms)" that "involves the installation of more than 2 turbines" with a hub-height that exceeds 15m. However, the selection criteria in Schedule 3 are not clearly defined and therefore each development must be judged on its own merits in terms of whether or not significant environmental effects are in fact likely. It is expected that the Proposed Development will have some significant effects on the environment by virtue of its nature, therefore an EIA is required to be submitted with the planning application.

## 1.2 The Applicant

The Applicant is renewable development company Wind Estate (UK) Ltd. Having developed strong working relationships within the renewable industry in Scotland, Wind Estate have an ambitious long term business plan and are committed to working with landowners, stakeholders and statutory consultees to bring about successful developments.

## 1.3 The Agent

Green Cat Renewables Ltd (GCR) has been commissioned by the Applicant to prepare this Scoping Report.

GCR is an environmental and engineering consultancy focused on all aspects of development support, based in Scotland. With a team of 60 staff spread across three offices, the company's multi-disciplinary resource base spans all stages of project delivery from feasibility and concept development through to planning, engineering, project management and operational asset management. While much of the company's experience is within the renewable sector, GCR's emphasis is on supporting farmers, landowners and developers in a wide range of renewable projects. GCR have also developed expertise in helping a range of businesses find sustainable energy solutions to aid economic viability in a climate where energy costs are forecast to continue to rise.

The GCR EIA team brings a diverse skill set that includes planning, environmental and technical expertise, and is comprised of Project Managers, planners, consultants, environmentalists, engineers, acousticians, CAD technicians, GIS technicians, hydrologists and resource analysts.

GLM Ecology Ltd have been appointed to undertake the Ecological Impact Assessment.

Aviation assessment work will be undertaken by Ian Fletcher of Wind Business Support.

The forestry assessment will be undertaken by a qualified forestry consultant and the archaeology walkover and assessment will be undertaken by a qualified archaeologist.

## 1.4 Purpose of the Scoping Report

The purpose of this Scoping Report is to formally request the opinion of Dumfries and Galloway Council as planning authority and other stakeholders in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. The assessments undertaken, as outlined within this report, will be presented in an Environmental Impact Assessment (EIA) Report, which will be submitted to the council in support of a full planning application.

The scoping report has been prepared as the initial stage of the EIA process in support of a formal request for a scoping opinion from Dumfries and Galloway Council, under regulation 17 of the EIA Regulations.

As outlined in Regulation 17(2) this report includes:

- A description of the location of the development, including a plan sufficient to identify the land;
- A brief description of the nature and purpose of the development and of any likely significant effects on the environment; and
- Such other information or representations as the developer may wish to provide or make.

This report has been produced in line with these requirements.

The EIA process must identify and assess, in an appropriate manner, in light of the circumstances relating to the proposed business development, the direct and indirect significant effects of the proposed development on a number of factors and the interaction between these factors (Regulation 4(2) and (3)). These factors under 2017 Regulations are:

- Population and human health;
- Biodiversity, and in particular species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- Land, soil, water air and climate;
- Material assets, cultural heritage and the landscape.

The purpose of the scoping report is to:

- Identify the key areas to be considered as part of the EIA;
- Identify areas which can be scoped out of the EIA or which do not require to be addressed in greater detail; and
- Review activities which may give rise to potential significant environmental impacts during the lifecycle of the development.

This Scoping Report outlines the proposed approach to the assessment of environmental impacts and the proposed EIA Report content, for approval with Dumfries and Galloway Council and other Statutory Consultees.

The Applicant has appointed an EIA project team to provide relevant assessment, advice and reporting to support the delivery of the EIA. The appointed team have the necessary experience and qualifications to carry out the assessments.



## 1.5 Consultation

Consultation forms an integral part of the EIA process. All application and pre-application consultation activity will comply with the statutory requirements and have regard to the advice on meaningful community engagement as outlined in SG PAN 3/2010.

The Scoping Report also includes questions to consultees to promote positive, focussed early consultation in the EIA process.

A Pre-application Enquiry Advisory Report (PEAR) was received from the Council on 6 July 2022. Some of the key issues identified in the report are identified below. The advice provided in the PEAR was taken into consideration in the drafting of this Scoping Report.

Key issues identified in the PEAR:

- Landscape and Visual impacts – the extent to which the landscape is capable of accommodating the Proposed Development without significant effects, including effects on wild land.
- That the design and scale of the Proposed Development is appropriate to the scale and character of its setting.
- The potential impacts to archaeological interests given that the Proposed Development is partially located in an Archaeologically Sensitive Area (ASA).
- The potential impacts to setting of scheduled monuments as there are a high number of them in the vicinity of the Proposed Development.
- The potential impact to the Glen App and Galloway Moors SSSI and SPA which borders the north, west and south of the Site.

## 2 Project Description

### 2.1 Introduction

The Applicant is proposing to construct, operate and decommission an eight turbine wind farm. The site location, constraints and indicative layout are provided in the following figures that accompany this report:

- **Figure 2.1: Site Location**
- **Figure 2.2: Site Constraints**
- **Figure 2.3: Site Layout**

### 2.2 The Site

The Application Site, hereafter referred to as ‘the Site’ is located in the west of the Dumfries and Galloway Local Authority Area. This is approximately 5km north-east of Cairnryan on the shore of Loch Ryan and immediately North of the Penwhim reservoir. The terrain consists of a sloping elevation of coniferous forest plantation rising from 170m to 190m Above Ordnance Datum (AOD) There is an existing access track within the plantation forest in addition to several fire breaks.

The nearest major road is the A77 approximately 5km west of the Site. The A77 provides access to a single-track route to the site.

To the east, the nearest wind farm is Stranoch: Stranoch 1 (consented 2016) consists of 24 wind turbines of between 110m and 135m to tip height; Stranoch 2 (consented 2021) consists of 20 wind turbines of between 140m and 175m to tip height.

To the west, on the adjacent plantation forest is the proposed wind farm Mid Moile, currently subject to a Section 36 application consisting of 15 turbines up to 230m.

Furthermore, the Site lies within the transition zone of the Galloway and Southern Ayrshire Biosphere Reserve. Additionally, the Site is outwith Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI) which are designated due to breeding Hen Harriers (*Circus cyaneus*).

### 2.3 Proposed Development & Associated Infrastructure

The Proposed Development is anticipated to comprise of up to eight wind turbines with a maximum blade tip of up to 230m. At this stage of the design process, the turbine height is designed to match the height of the proposed wind farm developments in the surrounding area. The Site Boundary (**Figure 2.1: Site Location**) defines the area within which planning permission will be sought and will contain all aspects of the Proposed Development requiring express consent.

A detailed design process, taking account of key technical, environmental, and economic constraints, has been undertaken and will continue throughout the EIA process as required. The result of this initial design process is the preliminary layout identified in **Figure 2.2**.

In addition to the wind turbines, the Proposed Development is anticipated to include the following ancillary components and associated infrastructure:

- Crane hardstandings and laydown area adjacent to each wind turbine;
- Turbine foundations;
- New and upgraded access tracks, passing places and turning heads;
- Temporary construction compound.

- Power cables linking the wind turbines laid in trenches underground, including cable markers;
- A control building including substation, parking, and a small storage compound;
- Drainage works;
- Borrow pits; and
- Health and Safety and other directional signage;

## 2.4 Construction

The construction period for the Proposed Development is expected to approximately 12 to 18 months. Depending on the availability for the wind farm to be connected to the national electricity grid network, it is expected that construction will commence in 2026. Construction activities will include:

- Enabling works to facilitate site deliveries;
- Construction of permanent on-site access tracks;
- Construction of secure site compound including welfare facilities;
- Construction of crane hardstandings;
- Construction of wind turbine foundations;
- Wind turbine delivery and erection;
- Installation of cabling, communication, and earthing arrays;
- Construction of substation;
- Commissioning of development; and
- Reinstatement and site restoration works, as required.

The construction works would broadly follow the order as outlined above, however to reduce the construction time, a number of these activities may be carried out concurrently.

## 2.5 Operation and Maintenance

The Applicant is seeking consent to operate for 35 years. The assessment of potential effects on all environmental aspects considers the operational phase of the Proposed Development as 35 years.

Following the commissioning of the Proposed Development, the temporary construction elements, such as cranes and other plant will be removed from Site. Reinstatement works will be undertaken where appropriate and in line with planning conditions.

During operation, the Site will be visited at regular intervals by approved technicians to undertake maintenance and to ensure the safe operation throughout the lifetime of the Proposed Development. These visits will be undertaken utilising standard road vehicles, there will be no requirement for the specialist vehicles utilised during the operation phase to visit site under normal circumstances.

## 2.6 Decommissioning Phase

Decommissioning effects are not generally considered in detail at this stage. It is proposed that a decommissioning plan will be agreed with the Council and relevant consultees in line with planning conditions. The decommissioning of the Site will broadly involve similar works as the construction phase and include reinstatement of the Site as agreed with the Council.

## 3 EIA Methodology

### 3.1 Introduction

EIA is a statutory process governed by UK and European law. It is a means of drawing together in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development. In Scotland, the relevant regulations are provided in the *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017*.

This section presents an overview of the methodology to be utilised for the production of the EIA. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects and also presents the methodology for the identification and evaluation of potential cumulative and any inter-related impacts.

To ensure that the information is presented in a structured and consistent way in each topic, the assessments will be presented broadly as outlined below;

- Introduction: Identifies key objectives and issues;
- Guidance: summarises the relevant policy and guidance documents used to inform the assessment;
- Methodology: summarises the methods used in undertaking the assessment work;
- Baseline: summarises the existing situation;
- Assessment of Predicted Impacts and Effects: identification and assessment of the predicted effects (both positive and negative) associated with the construction, operation and decommissioning of the development;
- Mitigation: a summary of measures envisaged to avoid, reduce or remedy predicted negative effects of the development;
- Summary of Predicted Impacts and Effects: summary of the impacts and effects predicted and proposed mitigation measures; and
- Conclusions: summary of the conclusions of the assessment.

### 3.2 Assessment Methodology

The individual methodologies for assessing each EIA topic area will be described in more detail in each of the individual chapters of the EIA Report. The following sections briefly outline the overarching assessment methodology to be undertaken.

#### 3.2.1 Baseline

A review of the current environmental conditions will be undertaken to determine the appropriate baseline for assessment. In the majority of assessments, this will involve the following:

- Definition of an appropriate study area, based on guidance and best practice;
- A review of currently available information relating the development study area;
- Identification of likely or potential impacts;
- Outline further data/survey/monitoring required to obtain relevant information if required to support assessment; and
- Review information to ensure sufficient data is available to provide a robust assessment.

Schedule 4 of the EIA Regs requires an outline of the likely evolution of the baseline in the absence of the Proposed Development. This will also be addressed in the EIA Report.

### 3.2.2 Assessment of Impacts

The Applicant has appointed a competent team of EIA specialists who will undertake the required assessments using available data, new data (if required), professional and expert judgement.

The methods for predicting the nature and magnitude of any potential impacts vary dependent on the subject area. Quantitative methods of assessment can predict values that can be compared against published thresholds and indicative criteria in Government guidance and standards. Where it is not possible to use a quantitative method, a qualitative assessment method will be utilised, relying on the experience and professional judgement of the technical specialist.

The potential significant effects of the Proposed Development must be considered in relation to the characteristics of development and the location of the development, with regard to the impact of development on the factors specified in Regulation 3A(3), taking into account:

- The magnitude and special extent of the impact (for example, geographical area and size of the population likely to be affected);
- The nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact;
- The expected onset, duration, frequency and reversibility of the impact;
- Cumulative impacts with the impact of the other existing and/or approved development; and
- The possibility of effectively reducing the impact.

Table 3.1 illustrates how the criteria will be applied to ascertain the level of significance of a potential impact.

**Table 3.1: Significance of Effect Matrix**

Sensitivity	Magnitude of Change			
	High	Medium	Low	Negligible
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:	Potentially Significant in the context of the EIA Regulations			
	Not Significant			

### 3.3 Mitigation

The aim of the EIA is to avoid, reduce and offset any significant adverse environmental effects arising from the proposed development.

Where possible, reasonable steps will be taken during the design process to avoid the creation of significant or adverse impacts. Where these cannot be avoided completely, appropriate mitigation will be proposed to avoid or reduce the impacts to acceptable levels.

### 3.4 Conclusion and Residual Effects

The conclusion will summarise the key findings of the assessment and outline any residual effects which remain following the assessment, appropriate mitigation process and whether these effects are acceptable in EIA terms.

### 3.5 Structure and Content of the EIA Report

It is expected that the EIAR will be structured as below:

- Environmental Impact Assessment Report
  1. Introduction and Background
  2. The Proposed Development
  3. Design Statement
  4. Planning Statement
  5. LVIA
  6. Cultural Heritage
  7. Noise
  8. Hydrology and Hydrogeology
  9. Ecology
  10. Ornithology
  11. Traffic and Transport
  12. Socio-Economics
  13. Shadow Flicker
  14. Aviation and Radar
  15. Telecommunications
  16. Carbon Balance
  17. Forestry
  18. Other Issues
  19. Summary of Mitigation.
- Landscape and Visual Impact Assessment Figures
- Planning Drawings and Technical Figures
- Non-Technical Summary

## 4 Planning Policy

### 4.1 Introduction

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

The EIA Report will set out the relevant energy and planning policies that have been considered as part of the assessments undertaken throughout the EIA. A 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 the Proposed Development to the UK and Scottish Government's climate change goals and policy targets.

### 4.2 National Planning Policy

#### 4.2.1 National Planning Framework 3 (2014)

The National Planning Framework 3 (NPF3) is a long-term strategy for Scotland and is the spatial expression of the Government Economic Strategy and plans for development and investment in infrastructure. The NPF identifies national developments and other strategically important development opportunities in Scotland and is accompanied by an Action Programme.

It is important to note that the latest version of NPF, i.e. NPF4, is currently being prepared by the Scottish Government. The draft NPF4 was published in November 2021 and provides a 'direction of travel' for the new national level planning policy. It is anticipated that a revised version of NPF4 will be published and laid in Parliament in Autumn 2022. NPF3 is likely to be superseded by the time the application for the Proposed Development will be determined.

#### 4.2.2 Scottish Planning Policy (2014)

Scottish Planning Policy (SPP) sets out national planning policies which reflect the Scottish Ministers' priorities for operation of the planning system and for land use and development. It aims to promote a sustainable place, supporting economic growth, regeneration and appropriately designed development.

The SPP principal policies include a presumption in favour of development that contributes to sustainable development, consideration of renewable energy, sustainable economic development, rural development, historic environment, landscape and natural heritage, transport, flooding and drainage and waste management. SPP contains a Spatial Framework to guide wind energy development and sets out detailed development management criteria.

#### 4.2.3 Draft National Planning Framework 4 (2021)

The draft NPF4 was published in November 2021. Once approved, it will become part of the statutory Development Plan. Now that the draft document has been published, it is a material consideration, setting out draft national planning policy.

A statement of 'need' is also provided as follows:

The development would make a valuable contribution in supporting the transition to a net zero economy.

There is a clear recognition in NPF4 that the planning system must be "rebalanced" so that climate change is a primary guiding principle for all plans and decisions. This is an express statement that significant change in the status quo is needed and must be reflected in consenting decisions.

The draft NPF4 contains various policies of relevance however given it is in draft form, these may be subject to change. It is expected however that the NPF4 will come into force later in 2022 and will therefore be a key policy consideration for the determination of the Proposed Development.

### 4.3 The Development Plan

The statutory Development Plan applicable to the Proposed Development is:

- The Dumfries and Galloway Local Development Plan 2 (LDP2) (adopted September 2019);
- LDP2 'Wind Energy Development: Development Management Considerations' Supplementary Guidance (February 2020). The SG contains at Appendix C, the 'Dumfries and Galloway Wind Farm Landscape Capacity Study'.

Key LDP2 policies will include Policy IN1 'Renewable Energy' and Policy IN2 'Wind Energy'.

Other LDP2 policies that will be considered include policies HE1, HE2, HE3, HE4, NE7, NE8, NE11, NE14, CF4, IN7, T1 and T2.

As noted, NPF4 when it comes into force, will also form part of the Development Plan.

### 4.4 Climate Change and Energy Policy

The burning of fossil fuels to produce electricity is a major contributor to climate change through the release of atmospheric carbon dioxide (CO<sub>2</sub>) and other harmful gases known collectively as greenhouse gases.

The Proposed Development relates to the generation of electricity from renewable energy sources and comes as a direct response to national planning and energy policy objectives. The clear objectives of the UK and Scottish Governments will be summarised, in relation to encouraging increased deployment and application of renewable energy technologies, consistent with sustainable development policy principles and national and international obligations on climate change.

The Scottish Government's Energy Strategy (2017) set a target for the equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources. As heat and transport become decarbonised, demand for electricity from renewable sources is expected to increase substantially.

Further deployment of renewable energy generating technology will be required throughout the 2020s in order to meet targets. As a mature technology onshore wind development has a continuing and important role to play, as confirmed by national planning and energy policy and most recently in the draft NPF4.

The Scottish Government's Energy Strategy and Onshore Wind Policy Statement (OWPS) (2017) set out *inter alia* that onshore wind is to play a vital role in Scotland's future – helping to substantively decarbonise electricity supplies and the technology is expected to play material role in growing the economy.

Scotland's overarching statutory target is to achieve a 100% reduction in greenhouse gas emissions to net-zero by 2045, with interim targets of 75% by 2030 and 90% by 2040, now provided for in the Climate Change (Scotland) Act 2009 as amended by the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019 which came into force in March 2020.

The Scottish Government declared a climate emergency on 14 May 2019. The declaration of an "emergency" is a reflection of both the seriousness of climate change and its potential effects and the need for urgent action to cut carbon dioxide emissions. The declaration is a material consideration which will be referenced.

The draft OWPS Refresh was published in 2021 and key points which can be drawn from it include:

- The central requirement for a rapid transition to net zero and the crucial role of further onshore wind development in achieving legally-binding targets, especially through the 2020s.



- Unequivocal Scottish Government policy support for the future role of onshore wind. An onshore wind target of an additional 8-12GW of additional onshore wind capacity to be delivered by 2030 is proposed.
- The urgency of the Climate Emergency and the scale of the necessary ambition – there is express recognition in the draft OWPS of the need for “*meaningful action over the next 12 months*”, “*further and faster*” delivery and that a “*consistently higher rate of onshore wind, and other renewables capacity, will be required year-on-year*”. The scale of deployment required to be operational before 2030 is very considerable and way beyond what has happened in the past.

A large increase in the deployment of this renewable energy technology is supported through a number of UK level policy documents including the latest UK Energy White Paper (2020) and Net Zero Strategy (2021) and the British Energy Security Strategy (2022). Scottish Government policy commitments are also clear – most recently expressed in the draft OWPS and in the draft NPF4 which will be material to the energy and national planning policy positions to be considered for the determination of the application.

The Proposed Development will clearly make a contribution to the attainment of renewable energy and electricity targets and emissions reduction at both the Scottish and UK levels. The quantification of this contribution would be described in the EIA Report.

Dumfries and Galloway Council have also declared a Climate Emergency and have agreed a 12-point action plan<sup>1</sup>. The Council have a specific priority which is to urgently respond to climate change and transition to a carbon neutral region. This will be considered in the policy appraisal.

## 4.5 Conclusion

The EIA Report will summarise the renewable energy policy framework, but a detailed policy appraisal will be provided in a supporting Planning Statement which will make reference to key policy documents such as the forthcoming NPF4 and the new Onshore Wind Policy Statement.

## 4.6 Key Questions for Council and Consultees

- **Q4/1** Can the Council highlight any other planning policies that have not been mentioned above that should be covered in the forthcoming planning application?
- **Q4/2** Can the Council or consultees highlight any other document or guidance that is relevant to the assessment of material considerations that has not been mentioned above?

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<sup>1</sup> Dumfries and Galloway Council Climate Emergency Declaration, June 2019. [Climate Emergency Declaration - appendix 1.pdf \(moderngov.co.uk\)](#) (Accessed on 15/08/2022)

## 5 Landscape and Visual

### 5.1 Introduction

The Proposed Development will consist of up to eight 230m to tip wind turbines and ancillary infrastructure. The Proposed Development has the potential to have a direct impact on the physical characteristics of the landscape as well as indirect impacts through its visual presence, specifically of the wind turbines, on the character of the landscape and other visual receptors in the area. The Proposed Development also has the potential to have a cumulative impact over the landscape and visual resource when seen in conjunction with other similar developments.

### 5.2 Guidance

The methodology for the Landscape and Visual Impact Assessment (LVIA) and the Cumulative Landscape and Visual Impact Assessment (CLVIA) has been undertaken in accordance with the methodology set out below and conforms to, *The Guidelines for Landscape and Visual Impact Assessment*, Third Edition (Landscape Institute and IEMA, 2013). Additional guidance has been taken from the following publications:

- *Dumfries and Galloway Wind Farm Landscape Capacity Study*, Dumfries and Galloway Council, June 2017;
- *Dumfries and Galloway Landscape Character Assessment – SNH Review 94*, Land Use Consultants, 1998;
- *Siting and Designing Wind farms in the Landscape*, NatureScot, Version 3a, August 2017;
- *Visual Representation of Wind Farms*, NatureScot, Version 2.2, February 2017;
- *Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations*; NatureScot, June 2015;
- *Landscape Character Assessment: Guidance for England and Scotland* (Countryside Agency and NatureScot publication, produced by the University of Sheffield and Landuse Consultants), 2002;
- *Residential Visual Amenity Assessment, Technical Guidance Note 2/19*, Landscape Institute, March 2019; and
- *Assessing the Cumulative Impacts of Onshore Wind Energy Developments*, NatureScot Version 3, March 2012.

### 5.3 Consultation

Dumfries and Galloway Council and NatureScot will be consulted with regards to the scope of the LVIA, including, but not limited to, the selection of viewpoints to be included in visualisations (such as photomontages). NatureScot will also be consulted on the requirement for night-time photomontages to assess the impact of any aviation lighting that is required.

### 5.4 Landscape Capacity

The Proposed Development is situated within *Plateau Moorland Landscape Character Type (LCT)*, as seen in **Figure 5.1**, this area was divided up into landscape units as part of this study and is within the Balker Moor unit. The Dumfries and Galloway Wind Farm Landscape Capacity Study (the Capacity Study) concludes that this is an area of large open moorland which has some limited capacity for turbines up to 150m in height as long as a development avoids sensitive edges and has limited impacts on neighbouring sensitive landscapes. The Proposed Development would be situated along the northern part of the *Plateau Moorland* unit and be well separated from more sensitive sections to the south and west. The Capacity Study provides the following description for this landscape:

*Additional developments should avoid impacting on the remaining areas of open moorland lying in the southern Balker Moor area where a strong sense of seclusion can be experienced and where they could affect the integrity and setting of the extensive and multi-layered archaeological features which are a key characteristic of this landscape. Turbines should be sited well away from the sensitive 'edges' of the Plateau Moorland where they abut small settled valleys, the Loch Ryan basin and the designed landscape of Castle Kennedy. The walking experience of the SUW should also be conserved by avoiding siting wind farm developments close to the route.*

While the guidance summarises that there would be no capacity for turbines above 150m in height and very limited capacity for turbines up to 150m in height, the description of opportunities and constraints above would relate well to the Proposed Development. The Proposed Development is in the northern section of the Balker Moor, thus avoiding the southern Balker Moor which has a stronger sense of seclusion; it is not situated within the section of the Balker Moor which is designated as an Archaeologically Sensitive Area; the proposed turbines are well away from any sensitive edges, neither being adjacent to the Water of Luce Valley nor the Loch Ryan Basin; the ZTV indicates that there would be no impact on the Castle Kennedy GDL; and at its closest, the Southern Upland Way would be almost 8km distance.

While the general location of the Proposed Development positively avoids these sensitive constraints, the final design will look specifically to ensure that there are no significant impacts on these.

## 5.5 Methodology

### 5.5.1 Defining the Study Area

An overall study area of 45km radius from the site centre is proposed based on NatureScot guidance. The study area was further defined for each part of the assessment process as follows:

*Landscape and Visual Impact Assessment (LVIA)* – the study area will be restricted to the Site, access routes, and the potential Zone of Theoretical Visibility (ZTV) from where there may be a view of the Proposed Development at up to 45km distance from the outer most parts of the development. The main focus of the assessment with respect of landscape and visual receptors will be 10-15km which would be the distance most likely to experience significant effects as a result of the Proposed Development and is informed with reference to the findings of field survey and viewpoint analysis, as well as professional experience from previous assessments.

*Cumulative Landscape and Visual Impact Assessment (CLVIA)* – will consider existing wind energy development proposals that have permissions, and those that are currently the subject of undetermined applications within a Search Area of 60km radius of the site centre. It is likely that only some of these will have the potential to contribute to a significant cumulative effect following addition of the Proposed Development turbines. Many of these developments can be scoped out of the assessment at this stage due to the lack of combined visibility or being over 20km distance from the proposed site such that they would not contribute to significant cumulative effects. This will assure that the cumulative assessment remains focussed on the schemes that have the greatest potential to give rise to significant cumulative impacts, as to consider all schemes within 60km of the Proposed Development would detract from the key issues relating to the application.

It is also considered proportionate to scope out all turbines under 50m, and turbines under 80m beyond 10 km distance from the site. The cumulative impact assessment will therefore focus primarily on those schemes within approximately 20km of the Proposed Development. **Table 5.1** below lists those developments to be included within the scope of the cumulative assessment, while **Figure 5.2** illustrates all developments inside 45km.

**Table 5.1: Summary of wind energy projects within Cumulative Study Area**

Development Name	Scale of Project (Single turbine, Cluster or Wind farm)	Distance to Project (approx. in km)
<b>Operational Projects</b>		
Glenapp	Wind Farm	3.8
Arecleoch	Wind Farm	6.0
Kilgallioch	Wind Farm	6.5
Balmurrie Fell	Wind Farm	9.7
Glenchamber	Wind Farm	11.0
Airies	Wind Farm	14.2
North Rhins	Wind Farm	15.3
Barlockhart Moor	Wind Farm	16.2
Mark Hill	Wind Farm	18.0
Assel Valley	Wind Farm	24.8
Hadyard Hill	Wind Farm	26.4
Tralorg	Wind Farm	27.2
Dersalloch	Wind Farm	42.8
<b>Consented Projects</b>		
Stranoch	Wind Farm	2.3
Stranoch 2	Wind Farm	4.0
Chirmorie	Wind Farm	8.1
Kilgallioch Extension	Wind Farm	10.4
Arecleoch Extension	Wind Farm	10.7
Gass	Wind Farm	12.3
Barlockhart Moor Extension	Wind Farm	16.5
Larbrax	Wind Farm	16.7
Kirk Hill	Wind Farm	36.0
<b>Projects in Planning</b>		
Mid Moile	Wind Farm	0.5
Garvilland	Wind Farm	11.0

All of the above developments listed in **Table 5.1** will be included on any wirelines and CZTVs will be run for the most appropriate of these in conjunction with the Proposed Development.

### 5.5.2 Zone of Theoretical Visibility

A Zone of Theoretical Visibility (ZTV) was calculated using the ReSoft© WindFarm computer software to produce areas of potential visibility of any part of the proposed wind turbines calculated to blade tip and hub height. The ZTV however, does not take account of built development and vegetation, which can significantly reduce the area and extent of actual visibility in the field and as such provides the limits of the visual assessment study area.

**Figure 5.3** illustrates the ZTV for blade tip height of 230m at a scale of 1:350,000 at A3, **Figure 5.4** illustrates the ZTV to a hub height of 150m at this scale.

### 5.5.3 Baseline Landscape and Visual Resource

This part of the LVIA will refer to the existing landscape character, quality or condition and value of the landscape and landscape elements on the site and within the surrounding area, as well as general trends in landscape change across the study area. A brief description of the existing landscape character and land use of the area which includes reference to settlements, transport routes, vegetation cover, as well as landscape planning designations, local landmarks, and tourist destinations.

### 5.5.4 Assessing Landscape Effects

Landscape Effects are defined by the Landscape Institute as “*changes to landscape elements, characteristics, character, and qualities of the landscape as a result of development*”. The potential landscape effects, occurring during the construction and operation period, may therefore include, but are not restricted to, the following:

- Changes to landscape elements: the addition of new elements or the removal of trees, vegetation, and buildings and other characteristic elements of the landscape character type;
- Changes to landscape quality: degradation or erosion of landscape elements and patterns, particularly those that form characteristic elements of landscape character types;
- Changes to landscape character: landscape character may be affected through the incremental effect on characteristic elements, landscape patterns and qualities and the cumulative addition of new features, the magnitude of which is sufficient to alter the overall landscape character type of a particular area; and
- Cumulative landscape effects: where more than one wind farm may lead to a potential landscape effect.

The Proposed Development may have a direct (physical) effect on the landscape as well as an indirect effect or effect perceived from outwith the landscape character area. Landscape effects will be assessed by considering the sensitivity of the landscape against the degree of change posed by the development. The sensitivity of the landscape to the Proposed Development is based on factors such as its quality and value and is defined as high, medium or low. Examples of landscape sensitivity and criteria are described below:

**High Sensitivity** – This would primarily be rare landscapes, or landscapes which have been afforded either a national or local designation such as National Parks, National Scenic Areas or Areas of Landscape Significance. These landscapes can be fairly dramatic in terms of scale and may feature a number of attractive landscape features, including mature woodland, intricate gorges and river valleys, prominent summits or features of cultural heritage. Man-made features or modifications to the landscape will be minimal and the landscape may have a wild or remote feeling to it;

**Medium Sensitivity** – This would include landscapes which are still relatively attractive and generally rural but do contain some manmade elements. It may be landscapes which have been modified to accommodate farming practices and landscapes which include more prominent settlement pattern and road networks. These landscapes may also contain woodland including plantation forestry and shelterbelts; and

**Low Sensitivity** – This would only be reserved for landscapes which may be deemed unattractive due to heavy modification and prominent man-made features, such as industrial units.

The magnitude or degree of change considers the scale and extent of the proposed development, which may include the loss or addition of particular features, and changes to landscape quality, and character. Magnitude can be defined as high, medium, low or negligible, examples of magnitude are shown below:

**High Magnitude** – This would be a major change to baseline conditions, where the character of the landscape may be altered from its existing state into a landscape with wind farms;

**Medium Magnitude** – This would be a noticeable change in the baseline condition but not necessarily one which would be enough to alter the character of the landscape and will generally diminish with distance;

**Low Magnitude** – This would be a minor change to the baseline conditions where the development would be readily missed by a casual viewer and any character of the landscape would remain intact; and

**Negligible Magnitude** – This would be a change which would be difficult to notice and the baseline conditions are likely to remain almost as they were.

The level of effect is determined by the combination of sensitivity and magnitude of change as shown in Error! Reference source not found.5.2.

**Table 5.2: Magnitude and Sensitivity Matrix for assessing Overall Level of Effect**

Sensitivity	Magnitude of Change			
	High	Medium	Low	Negligible
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:		Significant in terms of the EIA Regulations		
		Not Significant		

The significance of any identified landscape or visual effect will be assessed in terms of Major, Major/Moderate, Moderate, Moderate/Minor, Minor or Minor/Negligible. These categories have been based on combining viewer or landscape sensitivity and predicted magnitude of change. The matrices should not be used as a prescriptive tool but will allow for the exercise of professional judgement.

Any effects that are classified as Major or Major/Moderate, will be considered to be equivalent to likely significant effects referred to in the EIA Regulations. Careful consideration will also be given to Moderate effects to test whether (in the professional opinion of the landscape architect) they are significant in EIA terms or not. In all cases, whether an effect is significant or not is confirmed within the assessment.

### 5.5.5 Assessing Visual Effects

Visual effects are recognised by the Landscape Institute as a subset of landscape effects and are concerned wholly with the effect of the development on views, and the general visual amenity. The visual effects are identified for different receptors (people) who will experience the view at their places of residence, during recreational activities, at work, or when travelling through the area. These may include:

- Visual effect: a change to an existing view, views or wider visual amenity as a result of development or the loss of particular landscape elements or features already present in the view; and
- Cumulative visual effects: the cumulative or incremental visibility of similar types of development may combine to have a cumulative visual effect. Either:
  - Simultaneously - where a number of developments may be viewed from a single fixed viewpoint simultaneously within the viewer’s field of view without moving;
  - Successively - where a number of developments may be viewed from a single viewpoint successively by turning around at a viewpoint, to view in other directions; and
  - Sequentially - where a number of developments may be viewed sequentially or repeatedly from a range of locations when travelling along a route.

The general principles adopted for the assessment of visual effects were taken from *The Guidelines for Landscape and Visual Impact Assessment* Third Edition, produced by the Landscape Institute, 2013. This guidance outlines the approach to define the ‘sensitivity’ for a given view and a ‘magnitude of change’ that would be caused by the development in question over its lifetime. A matrix in the Guidance is then used to assess the overall ‘level of effect’. This matrix is the same format as used to understand landscape effects and can be seen in **Table 5.2**. Examples of visual sensitivity are highlighted below:

**High Sensitivity** – These include residential receptors, such as views from individual properties or views from within residential parts of settlements. Views from both recreational locations, such as hill summits, long distance footpaths, cycle paths and tourist locations such as castles and visitor centres can also be considered to be of high sensitivity;

**Medium Sensitivity** – This would include most other visual receptors such as views from roads, other areas of landscape which would not be classed as recreational areas and views from areas within settlements which would not be considered residential; and

**Low Sensitivity** – This would cover views experienced by people at work and views where the existing view is already dominated by significant man-made features.

In the context of the Proposed Development, the effects during operation are always direct and long term. Effects may also be non-cumulative or cumulative. None of the visual effects relating to the Proposed Development will be considered positive in order to present a worst-case assessment of any effects.

### 5.5.6 Viewpoint Analysis Method

Viewpoint analysis is used to assist the LVIA from selected viewpoints within the study area. The purpose of this is to assess both the level of visual impact for particular receptors and to help guide the assessment of the overall effect on visual amenity and landscape character. The assessment involves visiting the viewpoint location in good weather and viewing wireframes and photomontages prepared for each viewpoint location. Illustrated turbines always face the viewer to give a worst-case impression of the development under consideration. The viewpoints have primarily been selected to meet the following criteria:

- A balance of viewpoints to the north, south, east and west;
- A range of near middle and distance views of the Proposed Development;
- A proportion representing areas known locally where people use the landscape, such as prominent hill tops or footpaths; and
- A proportion representing designated areas.

It is proposed that 14 viewpoints will cover the above criteria as well as representing views from the most relevant visual receptors. Table 5.3 details the proposed viewpoints and they are shown on **Figure 5.3** and **Figure 5.4**.

**Table 5.3: Summary of locations selected for Viewpoint Assessment**

Viewpoint	Reason for Inclusion or Exclusion of Location	Distance
VP1 Diddles Hill / Penwhirn Reservoir	Representative of views experienced by the closest visual receptors.	1.0km
VP2 Ayrshire Coastal Path	Representative of views experienced by walkers on the Ayrshire Coastal Path, as well as impacts on Glen App.	6.2km



Viewpoint	Reason for Inclusion or Exclusion of Location	Distance
VP3 Carlock Hill	Representative of views experienced by walkers on Carlock Hill, as well as illustrating the impacts of the development from the north.	6.6km
VP4 Beneraird	Representative of views experienced by walkers on Beneraird as well as illustrating the impacts of the development from the north.	7.4km
VP5 New Luce	Representative of views experienced by residents of New Luce.	7.7km
VP6 Southern Upland Way at Cairn na Gath	Representative of views experienced by walkers on the Southern Upland Way, as well as illustrating views from the west and impacts on the Cairn na Gath Scheduled Monument.	8.8km
VP7 Kirkcolm	Representative of views experienced by the residents of Kirkcolm, as well as illustrating impacts on Loch Ryan.	8.9km
VP8 Portencalzie	Representative of views from the Rhins Peninsula as well as giving an indication of the views from the Belfast to Cairnryan ferry.	9.3km
VP9 Southern Upland Way at Kilhern Caves	Representative of views experienced by walkers on the Southern Upland Way, as well as the impact on the Kilhern Caves Scheduled Monument.	9.8km
VP10 Stranraer	Representative of views experienced by the residents of Stranraer, as well as illustrating impacts on Loch Ryan.	10.7km
VP11 Leswalt	Representative of views experienced by the residents of Leswalt, as well as illustrating impacts on Loch Ryan.	11.7km
VP12 Southern Upland Way at Crailloch Hill	Representative of views experienced by walkers on the Southern Upland Way at the first point of visibility of the development, when walking east.	14.2km
VP13 A75/A747 at Glenluce	Representative of views experienced by the residents of Glenluce, as well as road users on the A75 and A747.	15.4km
VP14 Sandhead Beach	Representative of views experienced by the residents of Sandhead, as well as illustrating impacts on the beaches and bay.	20.3km

### 5.5.7 Night-time Visualisations

As the turbines are over 150m in height they will require 2000 candela aviation lighting affixed to the nacelle and 32 candela tower lighting halfway up the towers. It is anticipated that 3 visualisations would be sufficient to understand the impact of this proposed aviation lighting. **Viewpoints 1, 2 and 5** will be provided in low light conditions in order to assess the visual impact of the aviation lighting on the turbines. These photographs will be captured at around 30 minutes after sunset to provide a reasonable balance between visibility of the landform and the apparent brightness of the turbine lighting. They will also be provided from the same location 30 minutes beyond this in order to illustrate the impact once fully dark.

### 5.5.8 Methodology for Production of Visualisations

All these locations will be photographed with a full frame digital Single Lens Reflex (SLR) camera set to produce photographs equivalent to that of a manual 35 mm SLR camera with a fixed 50 mm focal length lens. In accordance with *Scottish Natural Heritage, Visual Representation of Wind Farms February 2017*, panoramic images will be



produced from these photographs to record a 53.5° panorama which will be extracted from this. In addition to this, a viewpoint pack will also be produced; the single frame images will be for use at the viewpoint location. These images will be prepared from the same baseline photography as the panorama images. The single frame images will be produced at 75mm (extracted from the original 50mm photographs). The wider 360° of each view will also be taken into account, particularly for any hill summit viewpoints.

Each view will be illustrated using a panoramic photograph, a wireline and, in some cases, a photomontage. Wirelines and photomontages will be produced using ReSoft© WindFarm software and utilising 50m<sup>2</sup> Ordnance Survey Digital Terrain Mapping (DTM) height data covering the study area.

### 5.5.9 Visual assessment of Settlements and Residential Properties

It is proposed that all settlements within 15km of the Proposed Development will be assessed with regards to the level of visual impact the development will have on them. While the study area is 45km, it is unlikely that there will be any significant visual impact on settlements beyond 15km and as such, it is proposed that all settlements beyond 15km are **scoped out** of the LVIA. The assessment will include the settlements of High Mark, Dalnigap, Shennas, Penwhirn Dam 1, Penwhirn Dam 2 and Dalhabboch some of which will have photomontages produced to accompany the assessment, where appropriate. The sensitivity for each of the settlements is considered to be high in accordance with Guidelines for Landscape and Visual Impact Assessment, 2013.

A Residential Visual Amenity Assessment (RVAA) for all dwellings inside 2km of the proposed turbines will be carried out. **Table 5.4** provides a list of the residential dwellings to be included in the RVAA and are shown on **Figure 5.5**. This will include assessing the impact on the dwelling house, the environs including any driveways or access tracks but not include views from upper floor windows. The assessment will be accompanied by wirelines and/or photomontages where appropriate. The *Residential Visual Amenity Assessment*, Landscape Institute, 2019 will be used when conducting this part of the assessment.

**Table 5.4: Residential dwellings included in the RVAA**

Number	Residential Property	Distance (m)
RP1	High Mark	839m
RP2	Dalnigap	822m
RP3	Shennas	905m
RP4	Penwhirn Dam 1	1199m
RP5	Penwhirn Dam 2	1211m
RP6	Dalhabboch	1642m

### 5.5.10 Visual Assessment of Main Transport Routes

A route assessment will be undertaken which will explore the visual impact of the Proposed Development on views experienced by road users along major transport routes in the area and assumes that the viewer would be travelling at typical speed for the road conditions. It also includes assessment of any National Cycle Routes, Long Distance Footpaths and locally valued footpaths which fall within the study area. This part of the assessment will be considered cumulatively along with all other wind energy development within the study area. It is proposed that significant effects may occur from the following routes:

- A716 between Drumore and Thornhill; and

- The Southern Upland Way between Crailloch Hill and Stranraer.

It is not thought that there will be significant effects from any other routes within the 45km study area and these will be **scoped out** of the assessment.

#### 5.5.11 Cumulative Landscape Visual Assessment

In addition to the Landscape Institute methodology for LVIA, the cumulative landscape and visual assessment (CLVIA) has considered the guidance from Scottish Natural Heritage's *Assessing the Cumulative Impact of Onshore Wind Energy Developments*, Scottish Natural Heritage, March 2012. The CLVIA is however, not a substitute for individual wind farm landscape and visual impact assessment.

#### 5.5.12 Predicting Cumulative Landscape Effects

The assessment will consider the extent to which the proposed development, in combination with others, may change landscape character through either incremental effect on characteristic elements, landscape patterns and quality, or by the overall cumulative addition of new features. Identified cumulative landscape effects are described in relation to each individual Landscape Character Area and for any designated landscape areas that exist within the study area.

#### 5.5.13 Predicting Cumulative Visual Effects

The assessment of cumulative visual effects involves reference to the cumulative visibility ZTV maps and the cumulative viewpoint analysis. Cumulative visibility maps are analysed to identify the residential and recreational locations and travel routes where cumulative visual effects on receptors (people) may occur as a result of the proposed development. Table 5.1 lists the projects proposed to be included as part of the cumulative assessment, including Viewpoints and CZTVs.

With potential receptor locations identified, cumulative effects on individual receptor groups are then explored through viewpoint analysis, which involves site visits informed by wireline illustrations that include other wind developments. Travel routes are driven to assess the visibility of different wind developments and inform the assessment of sequential cumulative effects that may occur along a route or journey.

#### 5.5.14 Cumulative Viewpoint Analysis

Each viewpoint will be assessed cumulatively in order to understand whether or not the proposed development introduces a cumulative impact on the view from that location. All visible operational, consented and undetermined planning application wind energy projects are considered along with the High Mark Forest Wind Farm and a level of cumulative magnitude is assigned. The level and significance of cumulative visual effects is determined in the same manner as the main LVIA, using the previous matrix shown in **Table 5.2**.

## 5.6 Baseline

### 5.6.1 Landscape Character

The Site is located within the Plateau Moorland LCT (in the Balker Moor Unit), which forms a backdrop to Loch Ryan and much of the interior of this part of Dumfries and Galloway, forming the foothills of the Southern Uplands. A detailed assessment of both the direct and indirect impacts on this LCT will be an important part of the LVIA. The 45km study area also contains a number of other LCTs, detailed in the table below.

**Table 5.5: Potential impact on Landscape Character Types**

LCTs included in final assessment	LCTs scoped out due to lack of visibility
<b>Dumfries and Galloway Landscape Character Assessment</b>	
<b>Scoped Into assessment</b>	<b>Scoped out due to lack of visibility</b>
1 Plateau Moorland	2 Foothills
6 Shallow Flat Bottomed Valley	3 Foothills with Forest
7 Southern Uplands	4 Rugged Uplands
8 Coastal Flats	5 Rugged Uplands with Forest
9 Moss and Forest Lowland	10 Narrow Wooded River Valley
12 Peninsula	11 Coastal Uplands
13 Peninsula with Gorse Knolls	15 Drumlin Pasture
14 Drumlin Pasture in Moss and Moor Lowland	
16 Upland Fringe	
17 Plateau Moorland with Forest	
<b>South Ayrshire Landscape Character Assessment</b>	
18 Foothills	19 Low Hills
22 Southern Uplands	20 Rugged Uplands
25 Coastal Farmland and Policies	21 Lower Dale
27 Pastoral Valley	23 Southern Uplands with Forest
29 Plateau Moorland	24 Middle Dale
30 Upland Glen	26 Coastal Headlands
32 Rocky Islands	28 Coastal Valley with Policies
	31 Raised Beach Coast and Cliffs

The LCTs in the right hand column are not predicted to have any views of the proposed development and it is suggested that these be **scoped out** of the final LVIA. LCTs beyond 25km are also proposed to be **scoped out**, as the turbines will typically appear as minor features in distant landscapes from these further away LCTs. An assessment of the indirect effects of the development on the remaining LCTs will be carried out as there is potential for significant indirect effects due to the proposed development.

### 5.6.2 Landscape Designations

The site is not designated either nationally or locally, and as such it will have no direct impacts on any landscape designations. Due to the visual impact of the wind turbines there may be indirect impacts on the setting and

character of any designated landscapes within the 45km study area. Those landscapes are listed in **Table 5.6** below and are shown in **Figure 5.6**.

**Table 5.6: Potential impact on designated landscapes**

Designations included in final assessment	Designations scoped out due to lack of visibility
<b>Dumfries and Galloway Local Development Plan</b>	
Rhins Coast Regional Scenic Area	Machars Coast Regional Scenic Area
Mochrum Lochs Regional Scenic Area	Lochryan Garden and Designed Landscape
Galloway Hills Regional Scenic Area	Castle Kennedy Garden and Designed Landscape
Dark Skies Park	Glenapp Garden and Designed Landscape
	Lochnaw Castle Garden and Designed Landscape
	Fleet Valley National Scenic Area
<b>South Ayrshire Local Development Plan</b>	
Carrick Hills Local Landscape Area	Brown Carrick Hills and Coast Local Landscape Area

An assessment of each of these landscapes which is predicted to have visibility of the turbines will be undertaken as part of the LVIA with photomontages from some of the closer designated landscapes. Those designations on the right column above will have no views of the Proposed Development, and, as such, will be **scoped out** of the LVIA. All GDLs have been **scoped out** of the LVIA, due to a combination of distance and lack of visibility.

## 5.7 Summary

The Proposed Development may give rise to some significant effects in terms of both direct and indirect impacts on the landscape character. It may also have significant effects on visual receptors, including residents, road users, hill walkers and visitors to the area. As such, a detailed assessment will be undertaken through a LVIA, which will include accompanying maps and visualisations.

Key Questions for Council and Consultees:

- **Q5/1** Do the Council and consultees agree with the proposed methodology?
- **Q5/2** Do the Council and consultees agree with the scope of the viewpoint assessment, identified in Table 5.3.
- **Q5/3** Do the Council and consultees agree with the methodology and scope of the cumulative assessment and are the Council aware of any additional projects not listed in Table 5.1.
- **Q5/4** Could the Council indicate if any of the projects listed in Table 5.1 are required to have a CZTV produced?
- **Q5/5** Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?
- **Q5/6** Which Core Paths do the Council wish to be considered as part of the assessment?

## 6 Cultural Heritage and Archaeology

### 6.1 Introduction

Cultural heritage is represented by a wide range of features, both above and below ground, which result from past human use of the landscape. These include: standing buildings, many of which are still in use; sub-surface archaeological remains and artefact scatters; industrial remains; earthwork monuments and landscape features such as field boundaries. The aim of this scoping report is to identify elements of archaeological and cultural heritage value that may be directly impacted upon by the proposed development at High Mark Wind Farm, as well as indirectly affecting their setting.

### 6.2 Legislation, Policy and Guidance

#### 6.2.1 Legislation

National legislation relating to the planning and protection of cultural heritage assets includes:

- *The Towns and Country Planning (Environmental Impact Assessment) (Scotland) Regulations*, Scottish Government, 2017;
- *Ancient Monuments and Archaeological Areas Act 1979*, UK Government, 1979; and
- *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*, UK Government, 1997.

#### 6.2.2 Policy

National and local planning policy relating to the proposed development site includes:

- *Historic Environment Scotland Act*, Scottish Government, 2014;
- *National Planning Framework for Scotland 3*, Scottish Government, 2014;
- *Scottish Planning Policy, 'Valuing the Historic Environment'*, (pgs.: 33-35), Scottish Government, 2014;
- *Historic Environment Policy for Scotland*, Historic Environment Scotland, May 2019;
- *Planning Advice Note (PAN) 2/2011 – Planning and Archaeology*, Scottish Government, 2011;
- *Dumfries and Galloway Local Development Plan 2 Policy IN1 – Renewable Energy*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy IN2 – Wind Energy*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE1 – Listed Buildings*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE2 – Conservation Areas*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE3 – Archaeology*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE4 – Archaeologically Sensitive Areas*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE5 – Hadrian's Wall*, Dumfries and Galloway Council, October 2019;

- *Dumfries and Galloway Local Development Plan 2 Policy HE1 – Listed Buildings*. Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE6 – Garden’s and Designed Landscapes*, Dumfries and Galloway Council, October 2019;
- *Dumfries and Galloway Local Development Plan 2 Policy HE7 – Historic Battlefields*, Dumfries and Galloway Council, October 2019.

### 6.2.3 Guidance

In addition to the above legislation and policy, a number of guidance documents have been produced relating to the assessment and protection of cultural heritage assets.

- *Historic Environment Circular 1*, Historic Environment Scotland, June 2016;
- *Managing Change in the Historic Environment: Setting*, Historic Environment Scotland, June 2016 (updated 2020);
- *Designation Policy and Selection Guidance*, Historic Environment Scotland, April 2019 (updated 2020);
- *Local Development Plan 2 Supplementary Guidance – Historic Built Environment*, Dumfries and Galloway Council, February 2020; and
- *Local Development Plan 2 Supplementary Guidance – Wind Energy Development: Development Management Considerations*, Dumfries and Galloway Council, February 2020.

## 6.3 Methodology

In the preparation of the assessment, a range of historical and technical data will be collected and analysed. This will include a review of all potential features that fall under the umbrella term of cultural heritage, such as historic buildings and landscapes, in addition to purely archaeological factors. The following sources will be consulted:

- Dumfries and Galloway Council Archaeology database;
- National Record of the Historic Environment (NRHE);
- Aerial photograph collection held by Historic Environment Scotland (HES);
- National Library of Scotland (Map Library); and
- HES’s database of; Listed Buildings (LBs), Scheduled Monuments (SMs), Gardens and Designed Landscapes (GDLs), Conservation Areas, Inventory Battlefields, World Heritage Sites and monuments proposed for scheduling.

A phased approach to the assessment will be adopted:

### 6.3.1 Direct Impact

The area most at risk of direct impact will be land 50m either side of the access track and any areas within 200m of the proposed wind turbine locations. Any features that are recorded on the local and national HER that fall within these parameters will be considered for direct impact assessment. Given the level of historic assets in the region, the entire site will be considered for direct impact assessment and these features are outlined in **Figure 6.1**

### 6.3.2 Indirect Impact

The indirect impact on the setting and character of known cultural heritage sites will be considered within this assessment. This assessment will include any visual impacts both to and from the monument and any impacts to

sense of place, sense of remoteness, cultural identity, evocation of historical past and associated spiritual responses. Impacts will also be considered cumulatively with other developments in the surrounding area where appropriate.

Nationally significant features such as: Scheduled Monuments, 'A' Listed Buildings, Gardens and Designed Landscapes, Inventory Battlefields and World Heritage Sites will be considered within 10km of the Proposed Development. Any sensitive features beyond this distance may also be considered if there is potential for significant impact.

Regionally significant features such as Conservation Areas will be considered out to 2km of the proposed development, 'B' Listed Buildings will be considered to 5km and Archaeologically Sensitive Areas and Non-Inventory Designed Landscapes will be considered to 10km. See **Figure 6.2a-d**.

In order to keep the EIA proportionate given the extent of features located within the study area, the indirect impact assessment will follow a weighted and focused approach.

#### 6.3.2.1 *Scheduled Monuments*

A Zone of Theoretical Visibility (ZTV) will be used to understand which features are within the ZTV and therefore in an area where the wind turbines are theoretically visible. Those features deemed to be outwith the ZTV will then undergo further analysis to determine whether the feature and the Proposed Development have considerable visibility from a third-party location in order to be considered for assessment.

Given the high number of Scheduled Monuments within the 10km study area features will be considered against the following.

- **Out to 2km:** all Scheduled Monuments that are within the ZTV or are considered to have considerable visibility from a third-party location will be given a detailed assessment.
- **Over 2km and out to 5km:** all scheduled monuments that are within the ZTV or are considered to have considerable visibility from a third-party location will be assessed.
- **Over 5km and out to 10km:** all Scheduled Monuments that are within the ZTV or are considered to have considerable visibility from a third-party location will be grouped appropriately and considered.

Beyond 2km, any features considered to have a potentially significant impact will be given a detailed assessment.

#### 6.3.2.2 *'A' and 'B' Listed Buildings*

A ZTV will be used to understand which features are within the relevant study areas are within the ZTV and therefore included in the assessment. Listed Buildings outwith the ZTV will be scoped out of the assessment.

#### 6.3.2.3 *Gardens and Designed Landscapes and Non-Inventory Gardens and Designed Landscapes*

A ZTV will be used to understand which features within the 10km study area are within the ZTV and therefore to be included within the assessment. GDLs outwith the ZTV will be scoped out of the assessment unless they have considerable third-party views.

#### 6.3.2.4 *Archaeologically Sensitive Areas (ASAs)*

A Zone of Theoretical Visibility (ZTV) will be used to understand which features within the relevant study areas are within the ZTV and therefore included within the assessment. ASAs outwith the ZTV will be scoped out of the assessment unless they have considerable third-party views.

### 6.3.3 *Cultural Heritage and Archaeology Figures*

The assessment will make use of the following visual aids:

- ZTV maps areas that the wind turbines are theoretically visible from. This is a ‘bare earth’ representation which does not take into account local screening from the natural and built environments;
- Cumulative ZTV maps with the development and the feature will also be used to determine if any sites out with the main ZTV have any considerable third-party views; and
- Wirelines and/or photomontages produced using the ReSoft© WindFarm programme where appropriate.

Visual representations will be produced when it is considered to be helpful in visualising the potential indirect visual impact of the development.

#### 6.3.4 Historic Maps

Historic maps held at the National Library of Scotland (Map Library) and aerial photographs will be consulted online as part of the desk-based assessment.

#### 6.3.5 Assessment Criteria

The following general criteria outlined in **Table 6.1** and **Table 6.2** will be used in the assessment of level of effect of any direct or indirect impact on any site of cultural heritage importance.

**Table 6.1– Sensitivity of cultural heritage and archaeological features**

Sensitivity	Definition
<b>High</b>	Category A listed buildings Category B listed buildings Scheduled Monuments Non-statutory List of sites likely to be of national importance Gardens and Designed Landscapes World Heritage Sites Inventory Battlefields
<b>Medium</b>	Category C listed buildings Archaeological sites on the Sites and Monuments Record (of regional and local importance) Conservation Areas D&G Archaeologically Sensitive Areas Non-Inventory Gardens and Designed Landscapes
<b>Low</b>	Archaeological sites of lesser importance

**Table 6.2- Magnitude of cultural heritage and archaeological effects**

Magnitude	Definition
<b>High</b>	Any number of wind turbines and/or ancillary development that would result in: <ul style="list-style-type: none"> <li>● the removal or partial removal of key features, areas or evidence important to the historic character and integrity of the site, which could result in the substantial loss of physical integrity; and/or</li> <li>● a substantial obstruction or addition to the setting where it significantly alters the quality, setting or the visual amenity of the site both to and from the feature.</li> </ul>
<b>Medium</b>	Any number of wind turbines and/or ancillary development that would result in: <ul style="list-style-type: none"> <li>● the removal of one or more key features, parts of the designated site, or evidence at the secondary or peripheral level, but are not features fundamental to its historic character and integrity; and/or</li> <li>● a partial obstruction or addition to the setting which, although not affecting the key visual and physical relationships, could significantly alter the quality of the setting or visual amenity of the site both to and from the feature.</li> </ul>
<b>Low</b>	Any number of wind turbines or ancillary developments that may result in:



	<ul style="list-style-type: none"> <li>• a partial removal/minor loss, and/or alteration to one or more peripheral and/or secondary elements/features, but not significantly affecting the historic integrity of the site or affect the key features of the site; and/or</li> <li>• an introduction of elements that could alter to a small degree the quality of the setting or visual amenity of the site both to and from the feature.</li> </ul>
<b>Negligible</b>	<p>Any number of wind turbines or ancillary developments that may result in:</p> <ul style="list-style-type: none"> <li>• a relatively small removal, and/or alteration to small, peripheral and/or unimportant elements/features, but not affect the historic integrity of the site or the quality of the surviving evidence; and/or</li> <li>• an introduction of elements that could be visible but not intrusive, and the overall quality of the setting or visual amenity of the site would not be affected both to and from the feature.</li> </ul>

The level of both direct and indirect effects that the proposed development may have on the surrounding features of historical significance is determined by the combination of the sensitivity and magnitude of change. The following matrix (**Table 6.3**) is used to determine the overall significance of effect.

**Table 6.3 – Significance of Effect Matrix**

Sensitivity	Magnitude of Change			
	High	Medium	Low	Negligible
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:		Significant in terms of the EIA Regulations		
		Not Significant		

The significance of any identified effects will be assessed in terms of Major, Major/Moderate, Moderate, Moderate/Minor, Minor or Minor/Negligible. The matrices should not be used as a prescriptive tool but will allow for the exercise of professional judgement.

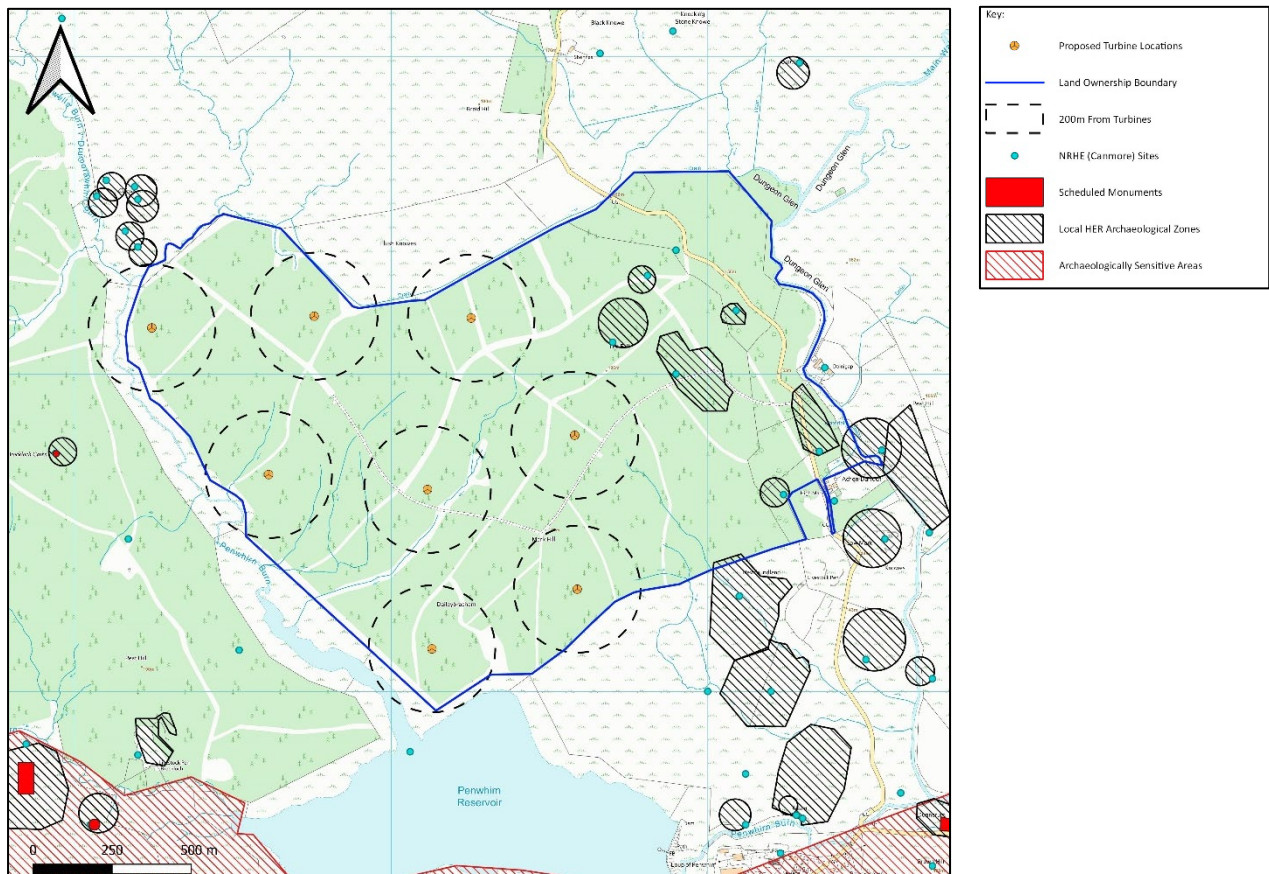
Any effects that are classified as Major or Major/Moderate, will be considered to be equivalent to likely significant effects referred to in the EIA Regulations. Careful consideration will also be given to Moderate effects to test whether they are significant in EIA terms or not. In all cases, whether an effect is significant or not is confirmed within the assessment.

The following section has considered the current settings of the historic features. It is acknowledged that any woodland and vegetation that currently restricts potential views of the proposed wind turbines from any of the historic features within the study radius is subject to change. External factors such as felling, disease and wind damage are outwith the Applicant's control. The assessment has considered the historic features settings at the time of the application submission but recognises that screening provided by vegetation and woodland is potentially subject to change.

## 6.4 Baseline

### 6.4.1 Direct Impacts

There is potential for features of historical significance within 200m of the proposed wind turbines and 50m from the access tracks to be significantly and directly affected by the Proposed Development.



**Figure 6.1 - Direct Impact to Cultural Heritage and Archaeological Features**

Figure 6.1 above illustrates that there are no known archaeological assets within the 200m buffer of the proposed turbine locations. However, there are seven local HER sites and seven NRHE sites located within the site boundary. Given, given that there is a large presence of known features in the surrounding area and due to the proximity to an Archaeologically Sensitive Area, a walkover survey will be undertaken by a qualified archaeologist to understand the archaeological nature of the site and all features within the land boundary will be considered for assessment.

### 6.4.2 Indirect Visual Impacts

Figure 6.2a-d shows the theoretical visibility of the Proposed Development, the regionally significant historical features out to 2km such as 'B' Listed Buildings and conservation areas; regionally significant features to 10km such as Archaeologically Sensitive Areas and Non-Inventory Gardens and Designed Landscapes; and nationally significant features such as 'A' Listed Buildings, Scheduled Monuments, Gardens and Designed Landscapes, Inventory Battlefields and World Heritage Sites. Appendix 6.1 lists these historical features found within study radius.

Within the study area there is 3 'A' Listed Buildings, 275 Scheduled Monuments, 3 Gardens and Designed Landscape, 1 Non-Inventory Garden and Designed Landscape and 1 Archaeologically Sensitive Area. Of the 275 Scheduled Monuments, 108 of them are within 5km of the Proposed Development.

Beyond 5km, there are a further 167 Scheduled Monuments, these are listed in **Appendix 6.2** As outlined in the methodology, where these features meet the assessment criteria, they will be grouped accordingly and assessed. Sites within this list specifically requested by HES or the council archaeologist will also be considered under the assessment.

## 6.5 Proposed Visualisations

In order to aid with the assessment, visualisations in the form of photomontages and/or wirelines could be provided from and in some cases, where relevant, towards some of the following features:

- SM01 Brockloch, cairn (SM1919);
- SM02 Diddles Hill, hut circle and field system (SM7462);
- SM03 Claywarnies, cairn (SM6890);
- SM11 Awies, hut circle (SM7466);
- SM27 Long Tom, standing stone (SM1942);
- SM28 Fairy Knowes, hut circle (SM7383); and
- SM61 Old Hall (SM10430).

Viewpoints requested by HES or the Council's Archaeologist will also be considered.

## 6.6 Issues Scoped into and out of the Assessment

As outlined in the methodology, due to the substantial number of features within the study area, the assessment will follow a focused approach. Therefore, the following issues in **Table 6.4** will be scoped in and scoped out of the assessment.

**Table 6.4 - Issues Scoped into and out of the Assessment**

Issues Scoped into the Assessment	Issues Scoped out of the Assessment
<p><b>Scheduled Monuments</b></p> <ul style="list-style-type: none"> <li>● All Scheduled Monuments within 2km;</li> <li>● Scheduled Monuments beyond 2km within the ZTV;</li> <li>● Scheduled Monuments beyond 5km within the ZTV where impacts are deemed to be potentially significant; and</li> <li>● Scheduled Monuments outwith the ZTV with considerable third-party visibility.</li> </ul>	<p><b>Scheduled Monuments</b></p> <ul style="list-style-type: none"> <li>● Scheduled Monuments outwith the ZTV with little to no third-party visibility; and</li> <li>● Scheduled Monuments beyond 5km where impacts are deemed to be not significant.</li> </ul> <p><b>Listed Buildings</b></p> <ul style="list-style-type: none"> <li>● No 'B' Listed Buildings fall within the 5km study area.</li> <li>● All 'A' Listed Buildings are outwith the ZTV.</li> </ul>
<p><b>Gardens and Designed Landscapes</b></p> <ul style="list-style-type: none"> <li>● While all GDLs are outwith the ZTV, Lochryan GDL will be considered due to third-party views from across the water.</li> </ul>	<p><b>Gardens and Designed Landscapes</b></p> <ul style="list-style-type: none"> <li>● Glen App and Castle Kennedy will be scoped out of the assessment due to lack of visibility demonstrated by the ZTV and their distance from the Proposed Development.</li> </ul>
<p><b>Non-Inventory Gardens and Designed Landscapes</b></p>	

- Corsewell House is within the ZTV and will be considered within this assessment.

#### Archaeologically Sensitive Areas

- There is theoretical visibility across various parts of the East Rhins ASA and therefore, it will be taken forward in the assessment.

## 6.7 Mitigation

Planning guidance (SPP – Historic Environment) states that it is Government policy to protect and preserve archaeological sites and monuments in situ wherever feasible. Where preservation in situ is not possible planning authorities should ensure that an appropriate level of excavation, recording, analysis, publication and archiving is carried out, before and/or during development. If deemed appropriate a Programme of Archaeological Works including an Archaeological Watching Brief may be required during ground-breaking works associated with the construction phase.

### 6.7.1 Permanent Land-take and Operation

Current proposals indicate that the turbine locations avoid the locations of known features of cultural heritage interest and as such direct impacts should be avoided.

This baseline was prepared using data from Historic Environment Scotland and the Dumfries and Galloway Historic Environment Record, however it is nevertheless possible that additional, unrecorded features do exist within the application area and an archaeological walk over will be conducted prior to assessment. In the event that archaeological features are encountered, effort will be made to suitably avoid the features. If this is not possible, a suitable program of archaeological works will be implemented to the satisfaction of the planning authority.

### 6.7.2 Restoration

It is not anticipated that any restoration measures are required, and the design of the Proposed Development is such that it avoids direct impacts on any features of cultural heritage.

## 6.8 Summary

The Proposed Development may give rise to some significant effects in terms of indirect impacts on the setting of features of cultural heritage during the operational phase and there remains potential for direct impact during the construction phase on currently unrecorded/unknown features. As such, a detailed assessment will be undertaken as part of the EIA Report.

## 6.9 Key Questions for Council and Consultees

- **Q6/1** Do the consultees agree with the proposed methodology and scope of assessment?
- **Q6/2** Do the consultees know of any cultural heritage assets in the vicinity of the development which it considers may raise significant issues with the EIA process?
- **Q6/3** Do the consultees know of any cultural heritage assets which have not been included within the assessment scope that require inclusion in the final scope?

# 7 Noise

## 7.1 Introduction

The Proposed Development would consist of up to eight wind turbines with a tip height of up to 230m. For the purposes of scoping the noise assessment, the candidate turbine model is the Vestas V162 with a hub height of 139m, tip height of 220m and rated power output of 6MW. This candidate model has been selected solely to assess the worst-case scenario in respect of operational noise impacts, while still fitting within the parameters of a maximum tip height of 230m.

Noise impacts could potentially arise during the construction, decommissioning and operational phases of the proposed development. The following information is provided to enable the assessment scope to be tailored to the proposed development.

## 7.2 Legislation, Policy and Guidance

The following sources provide guidance on the assessment of wind turbine noise:

- Scottish Government- Onshore wind turbines: Planning Advice<sup>2</sup>;
- Planning Advice Note 1/2011 (PAN1/2011): Planning and Noise<sup>3</sup>;

For the assessment of operational wind turbine noise Planning advice, and Dumfries and Galloway Council<sup>4</sup>, endorses the use of ETSU-R-97 and the Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

### 7.2.1 Guidance – Construction phase noise

Guidance for assessing construction phase noise is given in:

- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites.

The standard provides calculation methodology and indicative sound power data for a wide range of construction plant. Assessment of the significance of impacts can be made through comparison of predicted immission levels with criteria that the standard defines.

### 7.2.2 Guidance – Operational phase noise

Guidance for assessing operational noise from wind farms is given in the Institute of Acoustics Good Practice Guide<sup>5</sup>. This guidance was developed to standardise the approach to noise assessment of wind farms in the UK. The guidance also provides advice on the form of planning conditions that should be adopted for wind farm projects. The GPG does not address the question of what noise limits should be applied as this has been determined by government.

The basis for operational wind farm noise limits that have been adopted in the UK is given in: 'ETSU-R-97: The Assessment and Rating of Noise from Wind Farms (1997)'; the Department of Trade and Industry (usually referred to as the Noise Working Group Recommendations). National planning guidance is clear that the IoA GPG and ETSU-R-97 should be followed in the assessment of operational noise from wind farms.

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<sup>2</sup> Scottish Government (2014), 'Onshore wind turbines: Planning Advice'.

<sup>3</sup> Scottish Government (2011), 'Planning Advice Note 1/2011'.

<sup>4</sup> [https://www.dumgal.gov.uk/media/17607/Part-1-Wind-Energy-Development-Development-Management-Considerations-Screening-Determination/pdf/0892-16\\_Wind\\_Energy\\_Guidance\\_Part\\_1.pdf](https://www.dumgal.gov.uk/media/17607/Part-1-Wind-Energy-Development-Development-Management-Considerations-Screening-Determination/pdf/0892-16_Wind_Energy_Guidance_Part_1.pdf)

<sup>5</sup> Institute of Acoustics (2013), 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

Supplementary Planning Guidance Note Ref: SPG.12 NLLP Policy EDI.3(A)2, refers to consideration of PAN 1/2011 - Planning and Noise. PAN 1/2011 includes an endorsement of ETSU-R-97 as the overarching assessment framework for wind turbine noise.

The International Standard ISO 9613, 'Acoustics – Attenuation of Sound During Propagation Outdoors - Part 2', noise propagation model has been used for the turbine immission calculations.

IEC/TS 61400-14:2005 - Declaration of apparent sound power level and tonality values is a standard providing a method to derive appropriate sound power level values from several independent sources to improve robustness.

### 7.2.2.1 Low Frequency Noise

The current planning guidance<sup>6</sup> states that there are no grounds to suppose that infrasound or low frequency noise (LFN) is an issue at receptor distances from a wind farm and refers to the 2006 study<sup>7</sup> carried out by Hayes McKenzie on behalf of the Department of Trade and Industry (DTI). The report investigates the potential impact of infrasound or low frequency noise arising from wind turbines. The study concluded that infrasound or low frequency noise arising from the operation of wind turbines did not result in adverse health impacts.

A further research study in 2016<sup>8</sup> stated the level of infrasound due to wind turbines is low in comparison to other technical and natural sources. The findings concluded *'that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand.'*

### 7.2.2.2 Amplitude Modulation

Amplitude Modulation (AM) is a feature of turbine immission that has been the subject of considerable research in recent years. The University of Salford conducted a study<sup>9</sup> on behalf of the Department for Business, Enterprise and Regulatory Reform to investigate whether noise complaints arising from wind farms were due to the presence of AM. The report concluded, *'that the causes of AM are not fully understood, and that AM cannot be fully predicted at current state of the art.'* The findings of the investigation were reconfirmed in 2013 in an updated research report by Renewable UK<sup>10</sup>.

In 2016<sup>11</sup> the IoA produced 'A Method for Rating Amplitude Modulation in Wind Turbine Noise', in which amplitude modulation is defined as the following:

*'Wind turbine amplitude modulation is defined as periodic fluctuations in the level of audible noise from a wind turbine (or wind turbines), the frequency of the fluctuations being related to the blade passing frequency of the turbine rotor(s).'*

The report acknowledges that certain levels and/or characteristics of amplitude modulation may lead to disturbance and noise complaints. The guidance does not aim to define the level at which AM could pose an issue but outlines a proposed methodology to assess and rate AM arising from operational wind farms.

As such, the assessment of amplitude modulation can only be conducted post-completion.

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<sup>6</sup> Scottish Government (2014), 'Onshore wind turbines: Planning Advice'.

<sup>7</sup> Hayes McKenzie (2006), 'The measurement of low frequency noise at three UK wind farms'.

<sup>8</sup> Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (2016), 'Low-frequency noise incl. infrasound from wind turbines and other sources'.

<sup>9</sup> University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235, (2007), 'Research into aerodynamic modulation of wind turbine noise'.

<sup>10</sup> e.g. Renewable UK (2013), 'Wind Turbine Amplitude Modulation: Research to improve understanding as to its Cause and effects'.

<sup>11</sup> Institute of Acoustics (2016), 'A Method for Rating Amplitude Modulation in Wind Turbine Noise'.



## 7.3 Methodology

### 7.3.1 Construction phase noise

The assessment of noise impacts from construction activities includes the installation of ancillary infrastructure as well as the turbines themselves.

The factors influencing the impact of plant noise are: the number and character of noise sources; the duration of activity and hours of work; the separation distance between source and receptor; and reduction of noise by absorption or screening.

Although BS 5228-1 does not specify absolute noise limits relating to construction activities, it does provide detailed guidance on the steps that can be taken to minimise potential noise effects.

During the construction phase of the Proposed Development, it is expected that noise levels in the area will be greater due to the operation and movement of plant. In BS 5228-1, the ABC method outlined in E3<sup>12</sup> sets out the following for classifying the significance of the construction noise:

*“Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB  $L_{Aeq, Period}$ , from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.”*

Works and operation of plant on this site are expected to be limited to the daytime periods: Monday to Friday (07.00–19.00) and Saturdays (07.00–13.00). As a result, the cut off value for significant construction noise impact is deemed to be 65dB(A)  $L_{Aeq,T}$ . It is possible that, due to weather constraints (e.g., the impact of weather on the crane operation), the erection of the turbines could occur outside of the working hours defined above. For this or any other activity that extends beyond daytime periods, the lower cut-off limits of 55dB(A) and 45dB(A) would apply dependent on time of day.

The methodology for determining the levels of the construction noise involves calculating the total sound pressure level at the nearest sensitive receptor for a construction task,  $L_{Aeq(12hr)}$ , [equation 1], by summing the total potential sound power level for a given construction phase [equation 2] and subtracting a correction for its distance from the nearest property,  $K_s$  [equation 3]. These three equations are shown below:

$$[1] L_{Aeq,T} = L_{WA} - K_s$$

$$[2] L_{WA} = 10\log\{10^{(L_{activity1}/10)} + 10^{(L_{activity2}/10)} \dots\}$$

$$[3] K_s = 25\log(R)+1 \text{ [for } R > 25\text{m]}$$

The calculations assume by default that each activity lasts for the full daytime period at 100% intensity.

### 7.3.2 Operational phase noise

The assessment of operational noise impacts takes the form of an ETSU-R-97 assessment following the IoA GPG. When considering cumulative impact from third party developments at a given location, the IoA GPG advises: *‘If the proposed wind farm produces noise levels within 10dB of any existing wind farm/s at the same location, then a cumulative noise impact assessment is necessary.’*<sup>13</sup>

<sup>12</sup> BS 5228-1 ‘Code of practice for noise and vibration control on construction and open sites’, p119

<sup>13</sup> IOA Good Practice Guide, page 23

The planning portal of Dumfries and Galloway Council was reviewed for cumulative wind turbine developments within 3km of the Proposed Development. Noise impacts from the operation of the Proposed Development will initially be assessed as a singular project; the potential for cumulative effects would then be considered.

### 7.3.2.1 Noise Limits

The ETSU guidelines recommend that wind turbine noise should be limited to an absolute lower limit between 35 and 40dB(A) [LA90,10min] for quiet daytime periods and 43dB(A) for night-time periods (defined below), or 5dB(A) above the background noise levels, whichever the greater. For locations where the resident has a demonstrable financial involvement in a project, a lower fixed limit of 45dB(A) is applicable, or 5dB(A) above the background noise levels, whichever is the greater.

**Table 7.1 ETSU assessment periods**

The quiet daytime periods (amenity hours) are:	
18:00 - 23:00	Monday to Friday
13:00 - 23:00	Saturdays
07:00 - 23:00	Sundays
Night-time periods are: 23:00 – 07:00 every day	

For a project whose immission levels are not expected to exceed 35dB(A) at the closest Noise Sensitive Receptors (NSRs), a simplified approach may be taken that allows a project to be approved with a single fixed 35dB(A) noise limit applicable at all times or 45dB(A) where a resident has financial involvement. Where proposed project noise levels exceed 35dB(A), the ETSU-R-97 noise assessment should be undertaken with reference to noise limits derived from measured background noise levels. Full ETSU-R-97 limits will also be required where cumulative turbine noise exceeds applicable lower fixed limits.

### 7.3.3 Noise Sensitive Receptors (NSRs)

Noise Assessment Locations (NALs) will be positioned at NSRs, 15m from a dwelling façade in the direction of the nearest turbine unless the curtilage extends less far from the house, in which case the NAL will be located at the nearest property boundary. Where NSRs are located adjacent to each other or readily form a grouping, a single NAL will be selected representing the closest of the adjacent receptors to the proposed turbines.

This approach follows the ETSU-R-97 principle of assessing nearest receptors; focussing on the highest impacts allows for a more concise assessment.

NALs have been proposed based on this approach and are shown on **Figure 7.1** and in **Table 7.4**

### 7.3.4 Cumulative Assessment Methodology

When considering cumulative impact from two or more developments at a given NSR the IoA Good Practice Guide states:

*“If the proposed wind farm produces noise levels within 10dB of any existing wind farm/s at the same location, then a cumulative noise impact assessment is necessary.”<sup>14</sup>*

Although no fixed criteria are given within ETSU-R-97, a search area radius of 3km from any of the proposed turbines is considered a suitable distance at which to assess immission contributions from third-party projects, beyond which impacts on receptors would be negligible.

<sup>14</sup> A Good Practice Guide to the Application of ETSU-R-97 For the Assessment and Rating of Wind Turbine Noise, May 2013, page 23, 5.1.4



Cumulative immissions from all third-party wind projects deemed to lie within the cumulative search area plus the Proposed Development should be limited to a level that does not exceed the limits set out in ETSU-R-97.

For the existing ETSU-R-97 limits to be exceeded, immission levels from the Proposed Development would need to be within 10dB of those ETSU-R-97 limits. Therefore, Proposed Development noise levels would be compared with the cumulative ETSU-R-97 limits to test for level differences of less than 10dB. For locations where predicted levels are within 10dB of cumulative ETSU-R-97 limits, a detailed cumulative assessment should be carried out.

### 7.3.5 Propagation Model

The International Standard ISO 9613, 'Acoustics – Attenuation of Sound During Propagation Outdoors - Part 2', sound propagation model will be used for the turbine immission calculations.  $L_{Aeq}$  sound propagation will be modelled using WindFarm v5.0.1.2 by ReSoft. Predicted wind turbine immission levels will be calculated, inclusive of appropriate allowance for measurement uncertainties.

$L_{A90}$  levels should be derived by subtracting two decibels from the  $L_{Aeq}$  values as per the ETSU-R-97 guidance and subsequent IOA GPG. The input parameters shown in **Table 7.2** will be used and are consistent with the IOA Good Practice Guide.

**Table 7.2 Propagation input parameters**

Atmospheric Attenuation Assumptions	
Temperature (°C)	10
Humidity (%)	70
Ground Attenuation Assumptions	
Attenuation factor, G (all regions)	0.5 (semi-soft ground)
Receptor height (m)	4.0

The attenuation of noise as it travels through the air varies with frequency. The atmospheric attenuation coefficients to be used in the assessment, corresponding to the assumptions in **Table 7.2**, are tabulated in **Table 7.3**.

**Table 7.3 Attenuation coefficients used for the noise propagation model**

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Attenuation Coefficient	0.0001	0.0004	0.0010	0.0019	0.0037	0.0097	0.0328	0.1170

#### 7.3.5.1 Barrier effect

Line of sight visibility will be checked between proposed turbines and each receptor's assessment position at 4m height. For turbines that are screened from a particular receptor, a -2dB adjustment to their contribution at that receptor would apply.

#### 7.3.5.2 Valley effect

Certain topographic characteristics have the potential to reinforce the propagation of sound between two locations. The GPG refers to these characteristics as a 'valley' to describe a concave topographic profile. As far as concave topography exists within the study area, checks will be made as to whether the GPG valley criteria is met between all proposed turbine and sensitive receptor combinations.

### 7.3.5.3 Directivity

Where turbine sound propagates from opposing directions relative to an NAL, the result will be a reduction in predicted immission levels, as the receptor will not experience simultaneous downwind conditions from both directions. Example reductions are given in the GPG<sup>15</sup> at 4.4.

### 7.3.6 Noise Impact Assessment

Predicted turbine immission levels at the nearest receptors resulting from the propagation model will be compared to the applicable noise limits to determine whether those limits would be met. If it is shown that the limits would be met, then the noise impact would be considered acceptable. Should the assessment show exceedance of noise limits, a scheme of mitigation would be proposed that would allow the Proposed Development to operate in compliance with noise limits, thereby reducing potential impacts to acceptable levels.

## 7.4 Baseline

### 7.4.1 Construction Noise Baseline

Insufficient information is available to produce an indicative assessment of construction noise at this time. Any further noise assessments should include a construction noise impact assessment that follows the methodology outlined in **Section 7.3**.

### 7.4.2 Operational Noise Baseline

#### 7.4.2.1 Candidate turbine

For the purposes of assessing maximum potential effects the Vestas V162 6MW has been selected. Noise data provided by the manufacturer for the Vestas V162 turbine shows a declared maximum sound power ( $L_{WA}$ ) of 104.3dB(A). This level assumes that the turbine blades would be fitted with Trailing Edge Serrations (TES), which are fitted as standard, and that the turbines would operate in Standard operating mode. In line with the IoA GPG, manufacturer's sound power spectra specific to the candidate turbine were increased by 2dB to allow for measurement uncertainty given that no such data was provided by Vestas.

This data was used to generate an indicative 35dB(A) contour (**Figure 7.1**) that predicts noise levels for a 10m height ( $v_{10}$ ) wind speed of  $10\text{ms}^{-1}$  when the turbines would be operating at their maximum sound power

#### 7.4.2.2 Study area

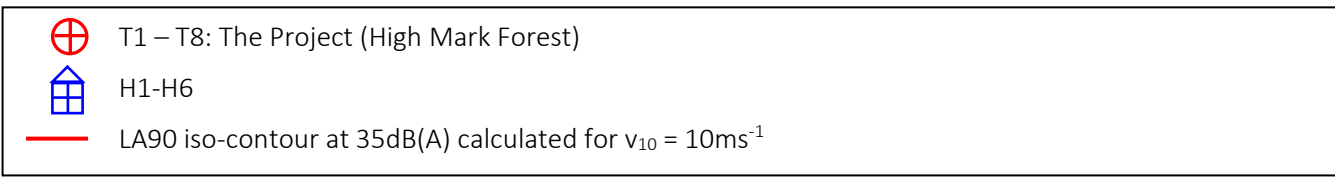
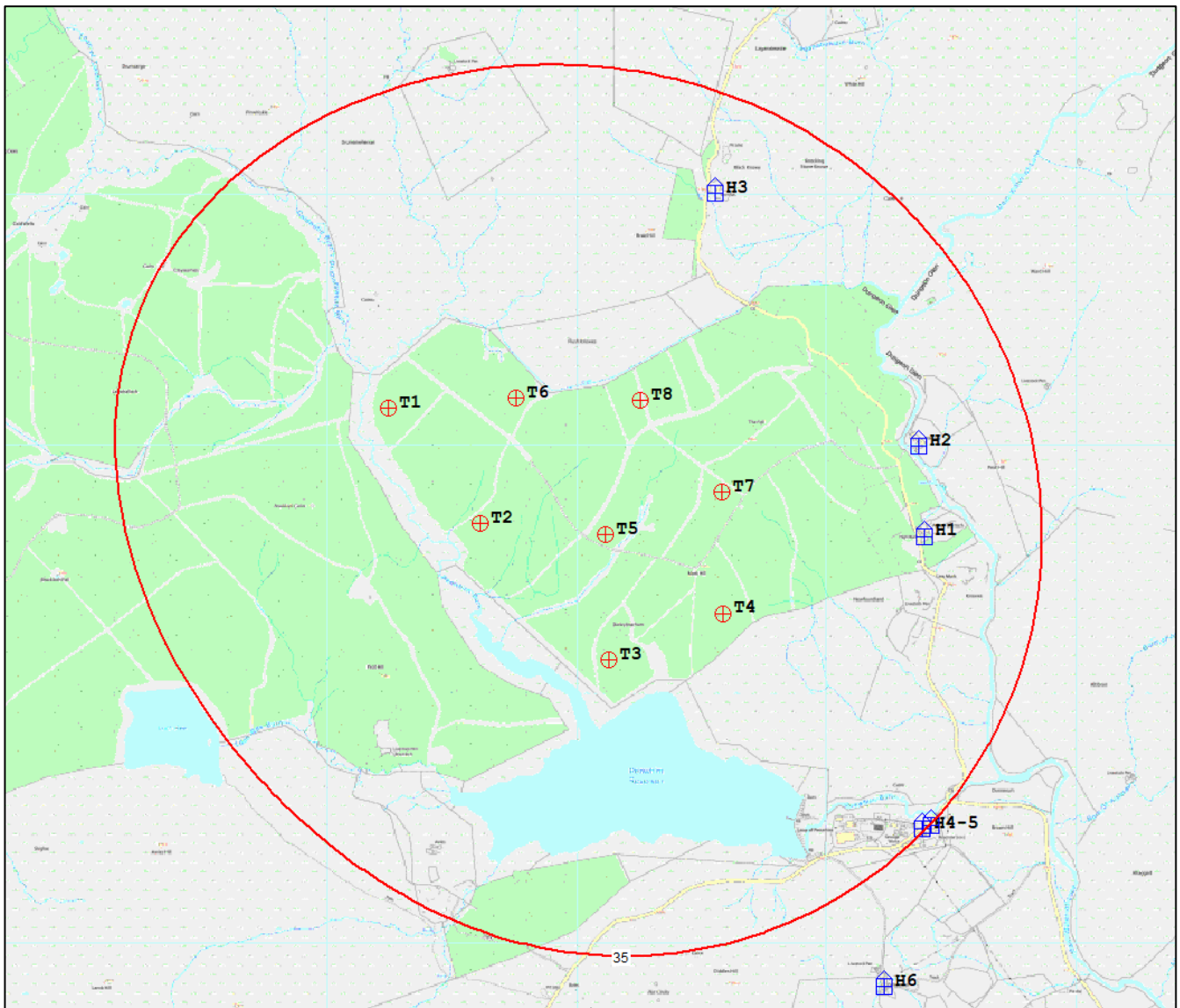
The Proposed Development is located approximately 11km north-northeast of Stranraer, Dumfries and Galloway. The site is in a remote rural location with some forestry. It is sparsely populated with a small number of dwellings lying to the east of the site where background levels are expected to be relatively low. The A77 is the nearest main road which lies approximately 5.5km to the west of the development.

An indicative layout with turbine positions and nearest noise sensitive properties is shown in

T1 – T8: The Project (High Mark Forest)  
H1-H6  
LA90 iso-contour at 35dB(A) calculated for  $v_{10} = 10\text{ms}^{-1}$

**Figure 7.1.** The red contour encloses the worst-case area predicted to receive an L90 turbine noise level in excess of 35dB(A).

<sup>15</sup> A Good Practice Guide to the Application of ETSU-R-97 For the Assessment and Rating of Wind Turbine Noise, May 2013, page 21, 4.4



**Figure 7.1 Study Area**

The properties (to be confirmed as residential dwellings) located within and around the contour are shown in

T1 – T8: The Project (High Mark Forest)
H1-H6
LA90 iso-contour at 35dB(A) calculated for $v_{10} = 10\text{ms}^{-1}$

Figure 7.1.

Table 7.4 lists the names, GPS coordinates of each receptor and the minimum distance to the proposed turbines for each location.

**Table 7.4 Details of noise assessment locations**

Location	Name	X	Y	Approximate Distance to nearest turbine (m)
H1	High Mark	213393	570631	839
H2	Dalnigap	213369	570992	822
H3	Shennas	212556	572006	905
H4	Penwhirn Dam (1)	213385	569457	1199
H5	Penwhirn Dam (2)	213421	569472	1211
H6	Dalhabboch	213230	568827	1642

#### 7.4.2.3 Noise Sensitive Receptors

All receptors predicted to receive immission levels in excess of 30dB have been considered at this stage. Of those identified, three locations, H1-3, fall within the 35dB(A) contour and two locations, H4-5, border the contour.

#### 7.4.3 Cumulative Impact Assessment

##### 7.4.3.1 Cumulative Search Area

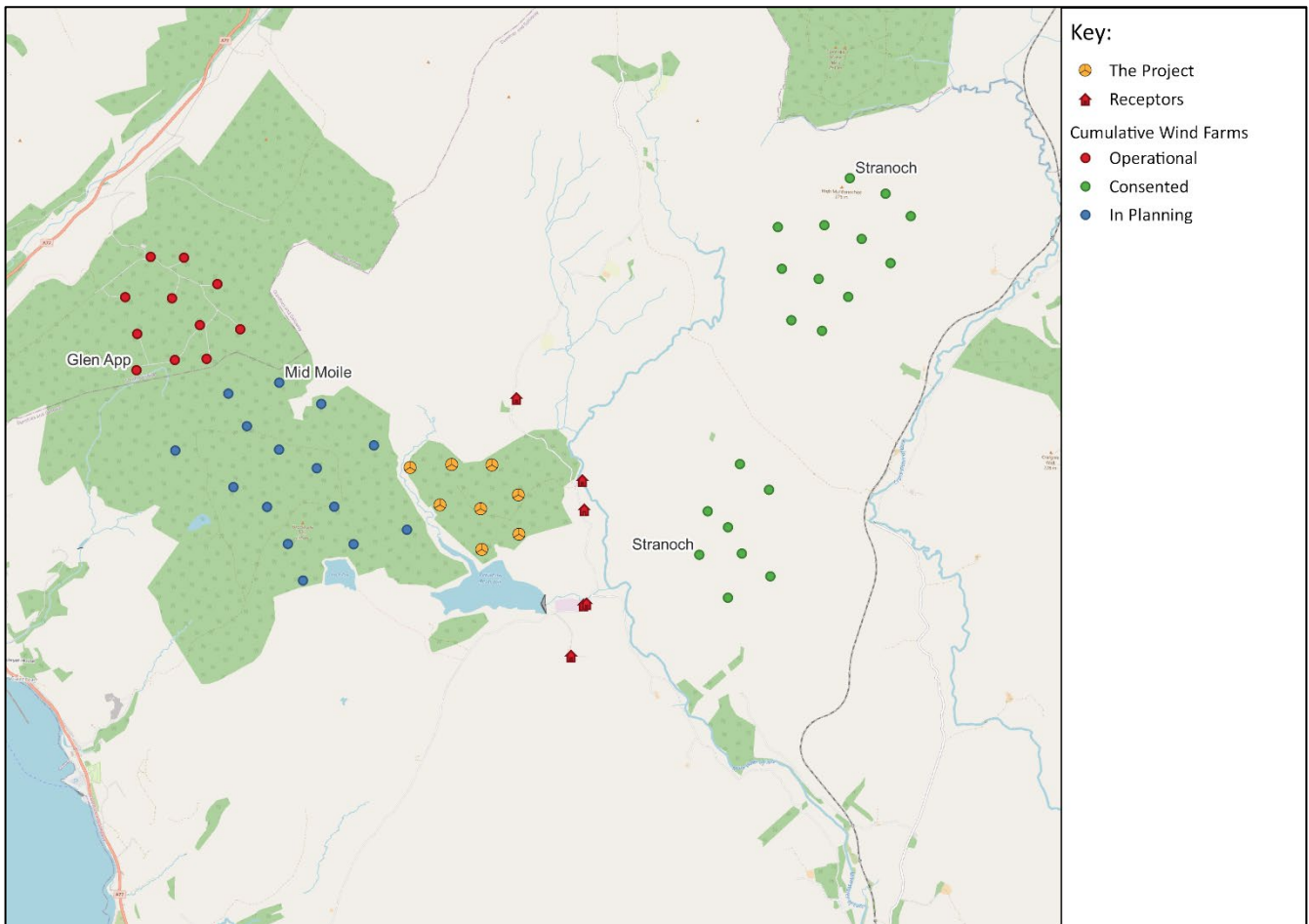
Table 7.5 lists all third-party wind developments that include turbines located within the 3km search area from the Proposed Development turbines; listed clockwise from north.

**Table 7.5 Wind developments that include turbines within or bordering the cumulative search area**

Name	Status	Council	App ref.	Hub Height (m)	No. of Turbines	In Search Area
Stranoch	Consented	D&G	18/1612/S36	82/84/100	20	6
Mid Moile	In Planning	D&G	22/0394/S36	122.5/ 152.5	15	15
Glen App	Operational	SAC	12/01156/APPM	80	11	2

NB: (Dumfries and Galloway Council) D&G; (South Ayrshire Council) SAC

Figure 7.2 shows the location of the third-party wind farms in relation to the Proposed Development.



**Figure 7.2 Cumulative Study Area**

Each of the cumulative developments listed above is discussed in turn in the following section.

### 7.4.3.2 Cumulative wind developments

#### Stranoch (18/1612/S36)

Stranoch Wind Farm was originally consented in 2016 with a total capacity of 72MW. The development was then revised in 2018 and re-consented in November 2021 for a wind farm of up to 20 turbines with a maximum turbine height of 175m and a total capacity of 84MW. Background noise surveys were conducted in support of the original application to determine ETSU-R-97 noise limits and are shown at .

Background noise measurements were conducted to inform Project Development noise limits for use within the Stranoch wind farm EIA. Noise limits derived from the data for standardised ( $v_{10}$ ) windspeeds are shown below for both daytime and night-time.

**Table 7.6 Stranoch Daytime Noise Limits**

Daytime noise limit	Standardised 10 m height wind speed (m/s)								
	4	5	6	7	8	9	10	11	12
2 Penwhirn Dam	40	40	40	40.7	43.8	46.9	49.9	50.3	50.3
Barnvannoch	40	40	40	42.4	45.9	49.2	52.2	54.9	57
Dalnigap	40	40	40	40	40	40	42.1	42.3	42.3
High Mark	40	40	40.7	42.7	45.2	48.4	52.1	56.3	61.2

**Table 7.7 Stranoch Night-time Noise Limits**

Location	Standardised 10 m height wind speed (m/s)								
	4	5	6	7	8	9	10	11	12
2 Penwhirn Dam	43	43	43	43	43	43	43	43	43
Barnvannoch	43	43	43	43	43	43	43	43	43
Dalnigap	43	43	43	43	43	43	43	43	43
High Mark	43	43	43	43	44.7	48.1	52.4	57.4	63.3

### Mid Moile (22/0394/S36)

An application for Mid Moile Wind Farm was submitted to the Energy Consents Unit in January 2022. The development would consist of up to 15 turbines with a maximum tip height of 230m and a maximum capacity of 99.4MW. The current candidate turbine for Mid Moile is the Siemens Gamesa 155 AM 6.6MW.

### Glen App (12/01156/APPM)

Glen App is an 11-turbine operational wind farm located on the border of South Ayrshire and Dumfries and Galloway. The Development was approved in 2015 and become operational in 2017. It consists of 11 G90 2MW turbines with a maximum tip height of 125m. A background noise survey was conducted in 2011 to determine ETSU-R-97 noise limits which are shown at **Table 7.8** and **Table 7.9**.

Background noise measurements were conducted to inform Proposed Development noise limits for use within the Glen App wind farm EIA. Noise limits derived from the data for standardised ( $v_{10}$ ) windspeeds are shown below for both daytime and night-time.

**Table 7.8 Glen App Daytime Noise Limits**

Daytime noise limit	Standardised 10 m height wind speed (m/s)									
	3	4	5	6	7	8	9	10	11	12
Shennas	35	35	35	35.1	37.4	40.1	43	46.1	49.6	53.2
High Croach	40.9	41.6	42.3	43.1	44	44.9	45.9	47	48.2	49.4
Meikle Laight	36.2	37.2	38.5	40.1	42	44.1	46.5	49.1	52.1	55.3
Finnart Farm	38.9	39	39.4	40.3	41.5	43.2	45.4	47.9	50.9	54.3
Craiganlea House	44.5	44.5	44.5	44.5	44.7	45.4	46.4	47.9	49.7	51.9
Dupin Farm	41.6	41.6	41.6	41.6	41.9	42.4	43.3	44.5	46	47.8
Altimeg Farm	42.2	42.2	42.2	42.2	42.6	43.2	44.2	45.5	47.2	49.2
Generic Glen App	38.9	39	39.4	40.3	41.5	42.4	43.3	44.5	46	47.8

**Table 7.9 Glen App Night-time Noise Limits**

Location	Standardised 10 m height wind speed (m/s)									
	3	4	5	6	7	8	9	10	11	12
Shennas	43	43	43	43	43	43	43.2	45.7	48.5	51.4
High Croach	43	43	43	43	43.4	44.2	44.9	45.4	45.8	46.2
Meikle Laight	43	43	43	43	43	43.2	44.8	46.5	48.3	50.2
Finnart Farm	43	43	43	43	43	43	44.5	46.5	48.8	51.4
Craiganlea House	43	43	43	43.4	44.1	44.9	45.8	46.9	48.1	49.4
Dupin Farm	43	43	43	43	43	43	43.1	44.2	45.4	46.7
Altimeg Farm	43	43	43	43	43	43.1	44.1	45.2	46.4	47.7
Generic Glen App	43	43	43	43	43	43	43.1	44.2	45.4	46.7

#### 7.4.3.3 Cumulative Noise Limits

Proposed Development specific sound levels are expected to exceed the simplified 35dB(A) limits at three receptors. Due to the number of third-party wind turbines within the area, it may be necessary for the Proposed

Development to be assigned apportioned limits provided that the cumulative operational assessment shows compliance with total ETSU-R-97 immission limits. Where cumulative immission levels exceed 35dB(A), a cumulative ETSU-R-97 assessment would be undertaken with reference to limit profiles derived from measured background noise levels. Under the current cumulative baseline, it is anticipated that H6 (Dalhabboch) would not meet the criteria for inclusion within the cumulative impact assessment.

Various background surveys have been conducted in the area, with the most recent being for Stranoch. Five noise sensitive locations (of those listed in **Table 7.4**) match those listed within the Stranoch survey, and one location matches data from the Glen App survey.

As such, it is proposed that cumulative ETSU-R-97 limits reference those used for Stranoch and Glen App. Where identical locations were not found, allocation of limits were based on proximity. **Table 7.10** shows the allocation of representative limits.

**Table 7.10 Allocation of ETSU-R-97 limit profiles**

Location	Name	Limit profile	Data Source
H1	High Mark	High Mark	Stranoch
H2	Dalnigap	Dalnigap	Stranoch
H3	Shennas	Shennas	Glen App
H4	Penwhirn Dam (1)	Penwhirn Dam	Stranoch
H5	Penwhirn Dam (2)	Penwhirn Dam	Stranoch
H6	Dalhabboch	Penwhirn Dam	Stranoch

In line with Stranoch a lower fixed limit of 40dB(A) and 43dB(A) for daytime and night-time respectively would be applied. The resulting limits for cumulative immission levels are listed in **Table 7.11** and **Table 7.12**. Should a property become financially interested in the Proposed Development a lower fixed limit of 45dB(A) would be applied.

**Table 7.11 Cumulative daytime ETSU-R-97 limits**

Location	Name	v <sub>10</sub> wind speed (Daytime periods)								
		4	5	6	7	8	9	10	11	12
H1	High Mark	40	40	40.7	42.7	45.2	48.4	52.1	56.3	61.2
H2	Dalnigap	40	40	40	40	40	40	42.1	42.3	42.3
H3	Shennas	40	40	40	40	40.1	43	46.1	49.6	53.2
H4	Penwhirn Dam (1)	40	40	40	40.7	43.8	46.9	49.9	50.3	50.3
H5	Penwhirn Dam (2)	40	40	40	40.7	43.8	46.9	49.9	50.3	50.3
H6	Dalhabboch	40	40	40	40.7	43.8	46.9	49.9	50.3	50.3

**Table 7.12 Cumulative night-time ETSU-R-97 limits**

Location	Name	v <sub>10</sub> wind speed (Night-time periods)								
		4	5	6	7	8	9	10	11	12
H1	High Mark	43	43	43	43	44.7	48.1	52.4	57.4	63.3
H2	Dalnigap	43	43	43	43	43	43	43	43	43
H3	Shennas	43	43	43	43	43	43.2	45.7	48.5	51.4
H4	Penwhirn Dam (1)	43	43	43	43	43	43	43	43	43
H5	Penwhirn Dam (2)	43	43	43	43	43	43	43	43	43
H6	Dalhabboch	43	43	43	43	43	43	43	43	43

If it is considered that the background survey data collected from third-party developments is not suitable for use within this application, further background monitoring within the area would be carried out. The survey would be conducted in consultation with Dumfries and Galloway Council Environmental Health and would typically involve logging L<sub>A90,10min</sub> background levels for a period such that a representative sample of prevailing conditions was



observed. This usually takes 2 to 3 weeks. Concurrent wind speed measurements would log speed and direction averaged over consecutive 10-minute periods. This data would be collected and analysed in line with the IoA GPG recommendations. The resulting trends, showing variation of background noise level with wind speed, would inform the ETSU-R-97 limit criteria. The predicted turbine immission levels would subsequently be tested against these criteria.

## 7.5 Potential Effects and Mitigation

Noise arising during the construction phase will be for a limited duration and can be suitably controlled by a planning condition specifying standard noise limits.

ETSU-R-97 guidelines provide threshold criteria for acceptability, balancing residential amenity with the benefits of wind energy. Provided such limits can be met, it can be concluded that the development would be acceptable in noise terms. Therefore, an unacceptable impact would be noise levels exceeding these threshold limits.

Iterative layout design is expected to result in a Proposed Development that does not require operational mitigation to meet the proposed ETSU-R-97 limits and will consider different turbine models, turbine positions and hub heights.

As is now standard for most commercial wind turbines of large size, the selected turbine model will be sufficiently flexible to allow operation in alternative 'modes' should noise measured post-completion require mitigation.

## 7.6 Summary of Predicted Impacts and Effects

### 7.6.1 Construction phase

There are no particular features of the Site that indicate that construction noise could not be kept to recommended noise limits, as controlled by a suitable planning condition. As such, it is recommended that no construction phase noise assessment is required.

### 7.6.2 Operational phase

Initial predicted levels for the Proposed Development exceed 35dB(A) at three receptors: H1, H2, and H3.

Third party wind developments have been identified within 3km of the Proposed Development. Following the methodology outlined above, where Proposed Development levels are within 10dB of these developments a cumulative ETSU-R-97 assessment will be conducted. The approval status of projects currently under consideration will be reviewed prior to conducting the final assessment.

Turbine noise limits relating to other projects in the area at the nearest receptors to the Proposed Development have lower fixed limits of 40dB(A) and 43dB(A) for daytime and night-time respectively. It is therefore suggested that ETSU-R-97 limits for the Proposed Development use those lower fixed limits or background noise levels plus 5dB, whichever the greater.

Background sound data collected in relation to third-party wind farms has been used to assign representative cumulative ETSU-R-97 limits for each receptor. If the data is deemed not to be representative of the receptors within this assessment, then a further background survey could be conducted in consultation with Dumfries and Galloway Council Environmental Health.

The assessment of operational immission levels should be based on sound power data provided by the proposed turbine manufacturer inclusive of an appropriate uncertainty allowance.



The provision of turbine manufacturer's documentation confirming that the tonality associated with the final turbine selection for the site is below the threshold of audibility<sup>16</sup> should be a pre-commencement condition.

## 7.7 Key Questions for Council and Consultees

**Q7/1:** Do the consultees agree that construction noise can be constrained to recommended limits via a suitable planning condition?

**Q7/2:** Do the consultees agree with the proposed cumulative ETSU-R-97 limits?

**Q7/3:** Do the consultees agree with the proposed methodology to determine compliance with cumulative ETSU-R-97 limits?

**Q7/4:** Do the consultees agree that the provision of information regarding tonality can be requested via a suitable planning condition?

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<sup>16</sup> Re: IEC-61400-11,  $AL_{a,k}$  of 2dB

# 8 Hydrology and Hydrogeology

## 8.1 Introduction

This assessment will present the impact of potential effects of the construction, operation, and decommissioning of the Proposed Development on hydrology, geology, and hydrogeology.

Understanding surface and groundwater environments is critically important to designing a successful project. Surface water includes watercourses, water bodies, and runoff. It provides an important resource for: potable and other uses; amenity; aesthetic value; conservation; ecological environments; and for recharge to groundwater systems. Groundwater is also an important resource. It provides more than a third of the potable water supply in the UK and includes all water stored in permeable underground strata (or aquifers). In addition, it provides essential baseflow to rivers and wetland areas, often supporting important ecological systems.

## 8.2 Policy, Legislation & Guidance

Guidance for assessing the potential impact of the Proposed Development on the hydrological and hydrogeological features of the development site will be based on the following statutory, general, and national guidance. Any appropriate local policy and guidance will also be considered.

**Table 8.1: Policy, Legislation & Guidance**

SEPA Guidance Documents	
	PPG 1 General Guide to the Prevention of Pollution
	GPP 2 Above Ground Oil Storage Tanks
	PPG 3 Use and design of oil separators in surface water drainage systems
	GPP 4 Treatment and disposal of wastewater where there is no connection to the public foul sewer
	GPP 5 Works and maintenance in or near water
	PPG 6 Working at Construction and Demolition Sites
	GPP 8 Safe Storage and Disposal of Used Oils
	GPP 21 Pollution Incident Response Planning
	Managing River Habitats for Fisheries, 2002
	Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2, SEPA, 2006
	Culverting of Watercourses, WAT-PS-06-02, 2015
	Natural Flood Management Handbook, 2015
	Indicative River & Coastal Flood Map (Scotland)
	Planning advice on wastewater drainage, 2011
	Temporary Construction Methods, WAT-SG-29, 2009
	SEPA Flood Risk and Planning Briefing Note, 2009
	Groundwater Protection Policy for Scotland, v3, 2009
	SEPA Position Statement 'The role of SEPA in Natural Flood Management', 2012
	Technical flood risk guidance for stakeholders, SS-NFR-P-002, 2015
	SEPA Regulatory Position Statement – Developments on peat, 2010
	Engineering in the water environment: good practice guide; River crossings, 2010
	Environmental Standards for River Morphology, WAT-SG-21, 2012

	<p>The Water Environment (Controlled Activities) (Scotland) Regulations 2011; A practical guide, Version 8.3 February 2019</p> <p>Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, 2017</p> <p>Land Use Planning System SEPA Guidance Note 4: Planning guidance on onshore windfarm developments, 2017</p> <p>SEPA Water quality classification interactive database (2019 data)</p>
<b>Other Guidance Documents</b>	<p>CIRIA C515 Groundwater Control - Design and Practice</p> <p>CIRIA C532 Control of Water Pollution from Construction Sites</p> <p>CIRIA C648 Control of Water Pollution from Linear Construction Projects</p> <p>CIRIA C689 Culvert Design and Operation Guide</p> <p>CIRIA C741 Environmental Good Practice on Site</p> <p>CIRIA C753 SUDS Manual</p> <p>A handbook on environmental impact assessment; Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland. NatureScot, 2018</p> <p>River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive Good Practice During Windfarm Construction, 2019 (4th Edition), Scottish Renewables (SR), NatureScot, SEPA, Forestry Commission Scotland (FCS), Historic Environment Scotland and Marine Scotland Science</p> <p>Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, on-line version only</p> <p>Forestry &amp; Water Scotland (2018) Protecting Private Water Supplies During Forestry Activities</p>
<b>Scottish Government Policy, Advice and Legislation Documents</b>	<p>The Housing Scotland (Act) 1987 (Sect 86)</p> <p>PAN 79: Water and Drainage, 2006</p> <p>Planning Advice Note (PAN) 61: Planning and SUDS, 2001</p> <p>Scottish Government (2017) Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments</p> <p>Scottish Planning Policy (SPP) 2014</p> <p>Water Environment and Water Services (Scotland) Act 2003</p> <p>The Flood Risk Management (Scotland) Act 2009</p> <p>The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations, 2017</p> <p>The Public and Private Water Supplies (Miscellaneous Amendments) (Scotland) Regulations 2017</p> <p>The Pollution Prevention and Control (Scotland) Regulations, 2000</p>
<b>Retained European Legislation</b>	<p>Freshwater Fish Directive 2006/44/EC</p> <p>Water Framework Directive (WFD) 2000/60/EC</p> <p>Dangerous Substances Directive 76/464/EEC</p>

## 8.3 Methodology

The assessment of the potential impact of the Proposed Development on hydrology and hydrogeology was carried out by the general method described in the following Sub-Sections.

### 8.3.1 Desk Study Assessment Methodology

It is important to establish the baseline conditions so that an accurate hydrological context map can be developed for the site. This will be done by identifying any features within a 1.2km study area around the proposed infrastructure locations that have potential to be impacted by the proposals, as illustrated on **Figure 8.1**. The criteria for defining the study area have been established based on professional judgement, experience regarding expected working areas, relevant SEPA guidance, and other relevant guidance on hydrological assessment. This baseline can then be used to inform the site design.

The following sources of information will be consulted as part of the desk study:

- Draft layout of the Proposed Development including all associated infrastructure;
- Surface and groundwater information, including local water quality and any relevant groundwater level data, will be obtained from Scottish Environmental Protection Agency (SEPA);
- Ground conditions will be initially determined using published geology maps and site-specific geology information will be obtained from the British Geological Survey (BGS);
- Hydrogeological information will be obtained from the BGS;
- Information relating to private water supplies will be obtained from Dumfries and Galloway Council;
- Public water supply information and infrastructure will be obtained from Scottish Water; and
- NatureScot's Carbon and Peatland 2016 mapping.

The desk study will also include a review of relevant historical maps, soil maps, and aerial photographs.

### 8.3.2 Field Survey Methodology

Following the desk study and initial concept design of the site, a site visit will be undertaken across the study area and the following actions carried out:

- Verification of any information collected during the desk study;
- Establishment of a first-hand understanding of the study area, including watercourses and ground conditions, to assess the relative location of all the components of the proposed development; and
- Identification of potential constraints to the Proposed Development from topography and ground conditions.

A National Vegetation Classification (NVC) survey for the study area will be used to screen for the potential presence of Ground Water Dependent Terrestrial Ecosystems (GWDTEs). Areas of potential High and Moderate GWDTE will be investigated to assess whether they are sustained by groundwater as part of the field work.

### 8.3.3 Consultation

Consultation will be carried out with:

- SEPA;
- NatureScot;
- Galloway Fisheries Trust;
- Luce District Salmon Fisheries Board;

- Dumfries and Galloway Council; and
- Scottish Water.

### 8.3.4 Assessment Criteria

The criteria set out in the Tables below will be used in the assessment of any potential effects of the Proposed Development on hydrology, and hydrogeology.

With the baseline established, sensitive receptors can be determined. **Table 8.1** outlines the various factors taken into account when assessing the sensitivity of a variety of receptors.

**Table 8.2: Sensitivity Table**

Sensitivity	Definition
High	<p>Receptor of high quality, rarity of a regional or national scale, and limited potential for substitution or replacement. This includes:</p> <ul style="list-style-type: none"> <li>● Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA) or Special Area of Conservation (SAC)</li> <li>● SEPA Water Quality defined as High</li> <li>● Abstraction for public</li> <li>● Private water supplies – 0 to 100m from construction activities</li> <li>● Designated salmonid fishery and/or salmonid spawning grounds present</li> <li>● Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) &lt;1.2km downstream of development</li> <li>● Active flood plain area (important in relation to flood defence)</li> <li>● Groundwater - public drinking water supply</li> <li>● Groundwater aquifer vulnerability classed 5 in the SEPA vulnerability classification scheme</li> <li>● Geology that is rare or of national importance as defined by SSSI or Regional Important Geological Site (RIGS)</li> <li>● Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 1</li> <li>● Peat defined as Class 1 and Class 2</li> <li>● Peat Slide Risk likelihood of ‘probable’ or ‘almost certain’</li> </ul>
Medium	<p>Receptor of medium quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes:</p> <ul style="list-style-type: none"> <li>● SEPA Water Quality defined as Good</li> <li>● Surface water abstractions for private water supply for more than fifteen people</li> <li>● Private Water Supplies – Surface water abstractions within 100 – 600m of construction activities, groundwater spring abstractions within 100 – 400m of construction activities, and groundwater borehole abstractions within 0 – 200m of construction activities</li> <li>● Designated salmonid fishery and/or cyprinid fishery</li> <li>● Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) &gt;1.2km downstream of development</li> <li>● Groundwater aquifer vulnerability classed as 4d, 4c, 4b, 4a in the SEPA vulnerability classification scheme</li> </ul>

Sensitivity	Definition
	<ul style="list-style-type: none"> <li>● Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 2, and/or defined as ‘Medium Conservation Value’ by Ecologist</li> <li>● Peat Slide Risk of ‘Likely’</li> </ul>
Low	<p>Receptor of low quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes:</p> <ul style="list-style-type: none"> <li>● SEPA Water Quality defined as Moderate or Poor</li> <li>● Occasional or local recreation (e.g., local angling clubs)</li> <li>● Conveyance of flow and material, main river &lt;10 m wide or ordinary watercourse &gt;5 m wide</li> <li>● Existing flood defences</li> <li>● Private Water Supplies – Surface water abstractions &gt;600m from construction activities, groundwater spring abstractions within 400 – 800m of construction activities, and groundwater borehole abstractions within 200 – 600 m of construction activities</li> <li>● May be subject to improvement plans by SEPA</li> <li>● Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries</li> <li>● Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality</li> <li>● Groundwater aquifer vulnerability classed as 2 and/or 3 in the SEPA vulnerability classification scheme</li> <li>● Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 3, and/or defined as ‘Local Conservation Importance’ by Ecologist</li> <li>● Peat Slide Risk of ‘Unlikely’</li> </ul>
Negligible	<p>Receptor of low quality, rarity of a local scale, and limited potential for substitution/replacement. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character. This includes:</p> <ul style="list-style-type: none"> <li>● SEPA water quality defined as Bad</li> <li>● Fish sporadically present or restricted, no designated features</li> <li>● Receptors not used for recreation, e.g., no clubs or access route associated with watercourse</li> <li>● Watercourse &lt;5 m wide – flow conveyance capacity of watercourse low - very limited floodplain as defined by topography, historical information and SEPA flood map</li> <li>● Private Water Supplies – groundwater spring abstraction &gt;800 m from construction activities, and groundwater borehole abstractions &gt;600 m from construction activities</li> <li>● No public drinking water supplies</li> <li>● Groundwater aquifer vulnerability classed as 1 in the SEPA vulnerability classification scheme</li> <li>● Receptor heavily engineered or artificially modified and may dry up during summer months</li> <li>● Geology not designated under a SSSI or RIGS or protected by specific guidance</li> <li>● Peat defined as Classes 3, 4 and 5</li> <li>● Peat Slide Risk of ‘Negligible’</li> </ul>

The significance of each impact on a receptor is based on its magnitude. The magnitude of impact includes the timing, scale, size and duration of the potential impact. For the purposes of this assessment the magnitude criteria are defined as follows.

**Table 8.3: Magnitude of Impact Table**

Magnitude	Criteria	Description and Example
Large	Results in loss of attribute	<ul style="list-style-type: none"> <li>Fundamental (long term or permanent) changes to geology, hydrology, water quality and hydrogeology</li> <li>Loss of designated Salmonid Fishery</li> <li>Loss of national level designated species/habitats</li> <li>Changes in WFD water quality status of river reach</li> <li>Loss flood storage/increased flood risk</li> <li>Pollution of potable source of abstraction compared to pre-development conditions</li> </ul>
Medium	Results in impact on integrity of attribute or loss of part of attribute	<ul style="list-style-type: none"> <li>Material but non-fundamental and short to medium term changes to the geology, hydrology, water quality and hydrogeology</li> <li>Loss in productivity of a fishery</li> <li>Contribution of a significant proportion of the discharges in the receiving water, but insignificant enough to change its water quality status</li> </ul>
Small	Results in minor impact on attribute	<ul style="list-style-type: none"> <li>Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology</li> </ul>
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	<ul style="list-style-type: none"> <li>No perceptible changes to the geology, hydrology, water quality and hydrogeology</li> <li>Discharges to watercourse but no loss in quality, fishery productivity or biodiversity</li> <li>No significant impact on the economic value of the receptor</li> <li>No increase in flood risk</li> </ul>

The sensitivity of the receptor together with the magnitude of impact defines the significance of the impact.

**Table 8.4: Significance of Impact Matrix**

		MAGNITUDE			
		LARGE	MEDIUM	SMALL	NEGLIGIBLE
SENSITIVITY	HIGH	Major	Major	Moderate	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible

Where the significance of an impact is defined to be minor, moderate, or major - mitigation is required to reduce those impacts to be non-significant.

## 8.4 Baseline

### 8.4.1 Preliminary Baseline Conditions

The Proposed Development is situated on and around Mark Hill (197m AOD), approximately 5km to the northeast of Cairnryan and c.9.5km to the northeast of Stranraer, Dumfries and Galloway. The Site is dissected by existing forestry tracks and an unnamed minor road runs through the eastern region of the Site, connecting the various scattered farmhouses. The Penwhirn Reservoir is located directly south of the land ownership boundary.

The Site is comprised of c.237 ha of coniferous forest stands of various ages, with a clear-felled area within the southern section. There are also several other commercial forestry plantations present in the surrounding area, in addition to pockets of raised and blanket bogs, extensive grassland, and various lochs. The wider area has a history of wind energy developments, with the operational Glen App Wind Farm c.2.5km to the northwest, the in-planning Mid Moile Wind Farm directly to the west, and the consented Stranoch Wind Farm c.2.1km to the east of the Proposed Development site.

The terrain within the Site reaches a topographic high at the Mark Hill summit, which then descends to meet the Penwhirn Burn as it passes to the west and to Penwhirn Reservoir to the south. The terrain also slopes to the east towards the Main Water of Luce as it flows to the east of the landholding.

The Proposed Development is discussed in further detail within **Section 2 – the Proposed Development**.

### 8.4.2 Hydrology

The raised terrain within the Site enables water to flow in several directions. The western region of the study area is drained by a network of unnamed burns that converge to form the Penwhirn Burn. This burn then meanders along the western boundary of the Proposed Development site before forming a tributary to the Penwhirn Reservoir. Both of these waterbodies form part of the Water of Luce Catchment of the Solway Tweed river basin district. The Penwhirn Burn then exits the reservoir to the east and flows for c.800m before merging with the Main Water of Luce watercourse.

Loch Ree is situated directly outside of the southwestern boundary of the study area. The Loch Ree Burn stems from this waterbody and flows in an eastern trajectory for c.900m, whilst merging with several tributaries, before dispelling into the Penwhirn Reservoir.

The eastern section of the study area is drained by the Main Water of Luce watercourse as it passes to the east of the development site. There are several unnamed burns that stem from the eastern and southern flanks of Mark Hill and empty into the Main Water of Luce watercourse, but not before passing underneath the unnamed minor road as it runs through the Site. The Water of Luce then flows for c.19km in a southern trajectory before dispelling into Luce Bay at Luce Sands.

The Galloway Fisheries Trust website provides information on the fish populations within the Water of Luce catchment area<sup>17</sup>, which is a popular recreational fishing destination and is known to support good salmon and sea populations. The Penwhirn Reservoir is also a wild trout fishery that offers fly fishing permits, although there is a dam at the southeastern corner which is impassable to fish and connects the waterbody to the rest of the Water of Luce catchment.

The Penwhirn Reservoir also supplies Penwhirn Water Treatment Works (WTW), which in turn provides water to the majority of Wigtownshire in Dumfries and Galloway.

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<sup>17</sup> <https://gallowayfisheriestrust.org/luce-district-salmon-fishery-board.php> (Last Accessed: 29/06/2022)



SEPA have classified the surface water quality of all significant waterbodies in Scotland under the Water Framework Directive (WFD) (2019)<sup>18</sup>. The nearest classified bodies are the Penwhirn Burn (above Penwhirn Reservoir), Penwhirn Reservoir, Penwhirn Burn (d/s Penwhirn Reservoir), and Water of Luce (u/s Cross Water of Luce).

Penwhirn Burn (above Penwhirn Reservoir) has been classified with an overall status of 'Poor' in 2020 on the SEPA Water Classification Hub and is noted to have a 'Poor' grade for Pre-Heavily Modified Waterbody (Pre-HMWB), and overall ecology, and a 'Good' grade for water quality.

Penwhirn Reservoir has been classified with an overall status of 'Poor Ecological Potential' in 2020 on the SEPA Water Classification Hub and is noted to have a 'Bad' grade for Pre-HMWB and overall ecology, and a 'Moderate' grade for water quality.

Penwhirn Burn (d/s Penwhirn Reservoir) has been classified with an overall status of 'Moderate Ecological Potential' in 2020 on the SEPA Water Classification Hub and is noted to have a 'Moderate' grade for Pre-HMWB, overall ecology, and water quality.

Water of Luce (u/s Cross Water of Luce) has been classified with an overall status of 'Moderate Ecological Potential' in 2020 on the SEPA Water Classification Hub and is noted to have a 'Moderate' grade for Pre-HMWB and overall ecology, and a 'Good' grade for water quality.

SEPA's Flood Hazard and Risk Map illustrates the indicative flood extents of high likelihood (1 in 10-year probability), medium likelihood (1 in 100-year probability), or low likelihood (1 in 200-year probability) of coastal, surface, and river floods.

Within the study area, SEPA's Map identified the Penwhirn Burn (above Penwhirn Reservoir), Penwhirn Reservoir, Penwhirn Burn (d/s Penwhirn Reservoir), and Water of Luce (u/s Cross Water of Luce) as being at high risk of surface and river flooding. It is important to note, however, that these flood extents are largely confined to the watercourse channel.

The map also indicates a high likelihood of surface water flooding within some of the forestry rides, which appear to be periodic pools.

There are no 'Potentially Vulnerable Areas' noted within the Study Area, i.e. no potential impacts of flooding on potentially vulnerable areas of people, properties, community services and specific environmental sites.

### 8.4.3 Geology

The British Geological Survey (BGS) 1:50,000 map indicates that the study area is predominantly underlain with Kirkcolm Formation – Wacke, which is a sedimentary bedrock that consists of a turbidite sequence of sandstone and siltstone. There is also an area of Galdenoch Formation – Wacke that runs across the centre of the study area. This bedrock consists of massive wacke and siltstone that form distinctively graded beds. There is also an area of North Britain Siluro-devonian Calc-alkaline Dyke Suite – Felsite underlying the northeast corner of the study area. This igneous bedrock is rich in silica and forms intruded batholiths, plutons, dykes and sills.

The superficial geology information within the study area was also obtained from the 1:50,000 BGS mapping. Peat deposits are the predominant superficial deposit within the study area however, this is intersected with several smaller areas of Till, Devensian – Diamicton, and Alluvium - Silt, Sand and Gravel that are associated with some of the watercourses.

The National Soil Map of Scotland identified the main soil type within the study area as peat, with an area of Peaty Gleys towards the east and west of the study area, and Peaty Podzols to the south.

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<sup>18</sup> <https://www.sepa.org.uk/data-visualisation/water-classification-hub/> (Last Accessed: 20/06/2022)

A review of the Carbon and Peatland Map 2016<sup>19</sup> identified several pockets of Class 1 and Class 2 peat located within the study area, situated to the north of the Proposed Development (see **Figure 8.1**). The northern section of the study area overlaps a group of Class 1 and Class 2 peatlands, and the study area also encompasses some pockets of Class 1 peat to the southwest, southeast, and east of the Site. Class 1 and Class 2 peats are nationally important carbon-rich soils that are likely to be of high conservation value. The study area is also underlain with areas of Class 3 peat (Predominantly peaty soil with some peat soil), Class 4 peat (predominantly mineral soil with some peat soil), Class 5 peat (no peatland vegetation), and non-soils at Penwhirn Reservoir.

#### 8.4.4 Hydrogeology

The BGS Aquifer Classification Dataset for Scotland classifies the potential for bedrock to supply groundwater and describes the potential groundwater flow mechanism.

The various bedrock underlying the study area can largely be classed as low productivity aquifer Class 2C with limited groundwater in near surface weathered zone and secondary fractures and with fracture flows locally yielding between 0.1 to 1 l/s.

SEPA have classified the quality of all groundwater bodies in Scotland under the Water Framework Directive (WFD). This map informs that the study area is fully located upon the Galloway groundwater unit, which SEPA classified as having a 'Good' overall status in 2020.

#### 8.4.5 Designated Sites

The Glen App and Galloway Moors Site of Special Scientific Interest (SSSI) and Special Protection Area (SPA) spans the northern and southern sections of the study area, and also follows along Penwhirn Burn (See Figure 8.1 Hydrological Context Map). This designated site encompasses the moorland habitats within the study area and is noted for its population of Hen Harrier. The site was last assessed as being of a "Favourable Maintained" condition in 2008<sup>20</sup>.

#### 8.4.6 Potential Sensitive Receptors

Several watercourses are susceptible to runoff from the site and could potentially be at risk of adverse impacts to water quality, ecology, or geomorphology. The Water of Luce catchment as a whole and its tributaries, including the Penwhirn Reservoir, are noted to be recreational fishing destinations, and are known to support sea trout and salmon species. The Reservoir is also noted to supply the Penwhirn WTW. As such, these watercourses will be treated as sensitive receptors and form a focus of the hydrological assessment.

Should the ecological surveys identify any groundwater dependent terrestrial ecosystems (GWDTE) on the site, these will be treated as sensitive receptors in the EIA assessment.

It is not currently known whether there are any private water supplies (PWS) located within the proposed 1.2km study area. Should any PWS be identified, they will be classed as a sensitive receptor in the EIA Report.

Areas of Class 1 and Class 2 peat have been identified within the study area, these are of national importance and conservation value. Peat has the potential to be degraded during construction activities and therefore will be included in the hydrological assessment as a sensitive receptor.

The Glen App and Galloway Moors SSSI and SPA borders the Site and therefore there is potential for the Proposed Development to have an adverse effect on the moorland habitat and its sensitive ornithological receptors. As a result, this designated site will be included as a sensitive receptor.

<sup>19</sup> [https://map.environment.gov.scot/Soil\\_maps/?layer=10](https://map.environment.gov.scot/Soil_maps/?layer=10) (Last Accessed: 20/06/2022)

<sup>20</sup> <https://informatics.sepa.org.uk/ProtectedNatureSites/> (Last Accessed: 30/06/2022)

#### 8.4.7 Potential Sources of Impact

The potential impacts the Proposed Development may have on the water environment of the site and the surrounding area are likely to include:

- Increase in run-off;
- Sedimentation, erosion, and silt-laden runoff;
- Chemical pollution of watercourses or groundwater;
- Disruption to the surface and subsurface runoff and watercourses;
- Increased flood risk to areas downstream; and
- Drop in the water table.

### 8.5 Potential Effects and Mitigation

#### 8.5.1 Potential Effects

Potential impacts on the water and ground environment, including environmental receptors dependent upon these resources, will be identified.

A qualitative risk assessment will be used to assess potential impacts on the identified receptors whereby the probability of an effect occurring and the magnitude of the effect, if it were to occur, are considered. This approach provides an established process for identifying the areas where mitigation measures may be required.

The assessment will consider the construction, operational, and decommissioning stages of the Proposed Development.

#### 8.5.2 Mitigation

Mitigation measures, where required, will be identified and based on best practice techniques appropriate to site conditions. It is foreseen that the following types of measures could be relevant:

- Avoidance of sensitive areas;
- Appropriate location of proposed infrastructure;
- The implementation of general pollution prevention measures to protect the water quality of the surrounding waterbodies and groundwater; and
- Suitable surface water management and appropriate design of drainage features.

### 8.6 Summary

Given the presence of sensitive watercourses, Class 1 and Class 2 peat, the Glen App and Galloway SSSI & SPA, and the potential for GWDTEs and PWS, there is potential for significant hydrological effects to occur during the construction, operational, and decommissioning phases of the development.

As such, a full hydrological assessment will be **scoped in** to inform the EIA Report.

### 8.7 Key Questions for the Council / Consultees

- **Q9/1:** Do the Council and Consultees agree with the proposed methodology?
- **Q9/2:** Do the Council and Consultees agree with the proposed study area?
- **Q9/3:** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?

- **Q9/4:** Are the Council or Consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?
- **Q9/5:** Do the Council and Consultees agree with scoping in sensitive watercourses, Class 1 and Class 2 peat, PWS, designated site, and GWDTEs?

## 9 Ecology

### 9.1 Introduction

The ecology chapter will consider the potential impacts of the Proposed Development on the ecological (non-avian) features present within the Site. It will summarise the methods used to establish the baseline conditions within the site and its surroundings, the results of the baseline surveys, and the process used to determine the sensitivity of the habitats and species' populations present. The ways in which habitats or species might be affected (directly or indirectly) by the construction, operation and decommissioning of the Proposed Development will be assessed, prior to and after any mitigation measures are considered. In addition, any cumulative effects will be considered, combining impacts of other wind farm projects in the area, whether operational, consented or at the application stage, along with the significance of any predicted effects of the Proposed Development.

All ecology personnel working on the EIA for the Proposed Development are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and have extensive experience of wind farm developments. The assessment of effects presented within the EIA Report will be based on current Chartered Institute of Ecological and Environmental Management (CIEEM) guidance (2018)<sup>21</sup>.

### 9.2 Legislation, Policy and Guidance

Guidance for assessing the potential impact of the Proposed Development on the ecological features of the development site will be based on the following statutory, general, and national guidance listed in **Table 9.1**. Any appropriate local policy and guidance will also be considered.

**Table 9.1: Policy, Legislation & Guidance**

	Legislation or Guidance Document
<b>Legislation</b>	<p>Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017<sup>22</sup>, which transpose the EIA Directive into the Scottish planning system;</p> <p>Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (The Habitats Directive)<sup>23</sup>;</p> <p>Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive)<sup>24</sup>;</p> <p>The Conservation (Natural Habitats, &amp;c.) Regulations 1994 (as amended) (the Habitats Regulations), which transposes the Habitats Directive into UK law<sup>25</sup>;</p> <p>Environmental Impact Assessment Directive 2011/92/EU, as amended by Directive 2014/52/EU<sup>26</sup>;</p>

<sup>21</sup> Guidelines for Ecological Impact Assessment (EcIA) <https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/>

<sup>22</sup> Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017: <https://www.gov.scot/publications/planning-circular-3-2011-town-country-planning-environmental-impact-assessment/>

<sup>23</sup> European Commission (1992) Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora ( The Habitats Directive) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN>

<sup>24</sup> Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive); [https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF)

<sup>25</sup> The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations), which transposes the Habitats Directive into UK law: <https://www.legislation.gov.uk/ukxi/1994/2716/contents/made>

<sup>26</sup> Environmental Impact Assessment Directive 2011/92/EU: <http://www.legislation.gov.uk/eudr/2011/92>

	Legislation or Guidance Document
	<p>The Water Environment and Water Services (Scotland) Act 2003 (WEWS)<sup>27</sup>;</p> <p>The Water Environment (Controlled Activities) (Scotland) Regulations 2011<sup>28,29</sup>, Amendment Regulations 2021<sup>30</sup>;</p> <p>The Wildlife and Countryside Act 1981 (as amended)<sup>31</sup>;</p> <p>Nature Conservation (Scotland) Act 2004 (as amended)<sup>32</sup>;</p> <p>The Wildlife and Natural Environment (Scotland) Act 2011<sup>33</sup></p> <p>The Protection of Badgers Act 1992<sup>34</sup></p>
<b>Policy</b>	<p>Dumfries and Galloway Council: Dumfries and Galloway Local Development Plan 2 (2019)<sup>35</sup>;</p> <p>Fourth National Planning Framework Draft (NPF4)<sup>36</sup>;</p> <p>Scottish Planning Policy (SPP) (Scottish Government, 2014)<sup>37</sup>;</p> <p>UK Post-2010 Biodiversity Framework (2018-2020)<sup>38</sup>;</p> <p>Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013)<sup>39</sup>;</p> <p>Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0<sup>40</sup>;</p> <p>PAN 51: Planning, Environmental Protection and Regulation (revised 2006)<sup>41</sup>;</p> <p>PAN 60: Planning for Natural Heritage (Scottish Government, 2000)<sup>42</sup>; and</p> <p>Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000)<sup>43</sup></p>
<b>Guidance</b>	<p>Averis et al., (2014). An Illustrated Guide to British Upland Vegetation. Joint Nature Conservation Committee. Peterborough;</p> <p>Bang and Dahlstrøm. (2001). Animal Tracks and Signs. Oxford University Press, Oxford;</p> <p>Chanin (2003a) Monitoring the Otter (<i>Lutra lutra</i>). Conserving Natura 2000 Rivers: Monitoring Series No. 10. English Nature, Peterborough;</p>

<sup>27</sup> The Water Environment and Water Services (Scotland) Act 2003 (WEWS); <https://www.legislation.gov.uk/asp/2003/3/contents>

<sup>28</sup> The Water Environment (Controlled Activities) (Scotland) Regulations 2011; <https://www.legislation.gov.uk/ssi/2011/209/contents/made>

<sup>29</sup> The Water Environment (Controlled Activities) (Scotland) Regulations 2011; A practical guide, Version 8.3 February 2019  
[https://www.sepa.org.uk/media/34761/car\\_a\\_practical\\_guide.pdf](https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf)

<sup>30</sup> The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2021 <https://www.legislation.gov.uk/ssi/2021/412/contents/made>

<sup>31</sup> The Wildlife and Countryside Act 1981 (as amended); UK Government (1981) Wildlife and Countryside Act 1981, Chapter 69. Part 1:  
<http://www.legislation.gov.uk/ukpga/1981/69/section/1>

<sup>32</sup> Nature Conservation (Scotland) Act 2004 (as amended); <https://www.legislation.gov.uk/asp/2004/6/contents>

<sup>33</sup> The Wildlife and Natural Environment (Scotland) Act 2011; <https://www.legislation.gov.uk/asp/2011/6/contents>

<sup>34</sup> The Protection of Badgers Act 1992; <https://www.legislation.gov.uk/ukpga/1992/51/contents>

<sup>35</sup> [https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted\\_LDP2\\_OCTOBER\\_2019\\_web\\_version.pdf?m=637060550180970000](https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000)

<sup>36</sup> <https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/>

<sup>37</sup> Scottish Planning Policy (SPP) (Scottish Government, 2014); <https://www.gov.scot/publications/scottish-planning-policy/>

<sup>38</sup> UK Post-2010 Biodiversity Framework (2018-2020); <https://hub.jncc.gov.uk/assets/587024ff-864f-4d1d-a669-f38cb448abdc>

<sup>39</sup> Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013);  
<https://www.gov.scot/policies/biodiversity/scottish-biodiversity-strategy/>

<sup>40</sup> Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0;  
<https://www.gov.scot/publications/planning-advice-note-1-2013-environmental-impact-assessment/>

<sup>41</sup> PAN 51: Planning, Environmental Protection and Regulation (revised 2006); <https://www.gov.scot/publications/planning-advice-note-pan-51-revised-2006-planning-environmental-protection/>

<sup>42</sup> PAN 60: Planning for Natural Heritage (Scottish Government, 2000); <https://www.gov.scot/publications/pan-60-natural-heritage/>

<sup>43</sup> Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);  
<https://www.gov.scot/binaries/content/documents/govscot/publications/foi-eir-release/2020/01/foi-201900008726/documents/foi-201900008726-information-released-a/foi-201900008726-information-released-a/govscot%3Adocument/FOI%2B-%2B201900008726%2B-%2BInformation%2Breleased%2B-%2BCircular%2B6-1995%2BNature%2BConservation%2B-%2B%2527The%2BHabitats%2Band%2BBirds%2BDirectives%2527%2B%2528Updated%2BJune%2B2000%2529..PDF>

	Legislation or Guidance Document
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<sup>44</sup> CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 3rd edition. Chartered Institute of Ecology and Environmental Management, Winchester: <https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf>

<sup>45</sup> Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good practice Guidelines (3rd edition). The Bat Conservation Trust, London: <https://www.bats.org.uk/resources/guidance-for-professionals/bat-surveys-for-professional-ecologists-good-practice-guidelines-3rd-edition>

<sup>46</sup> European Commission (2011). Wind energy developments and Natura 2000: <https://ec.europa.eu/environment/nature/info/pubs/docs/leaflets/windfarm/en.pdf>

<sup>47</sup> European Commission. (2011). EU Biodiversity Strategy. [http://ec.europa.eu/environment/nature/biodiversity/strategy/index\\_en.htm](http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm)

<sup>48</sup> Scottish Government. (2013). Scottish Biodiversity List. <https://www2.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL>

<sup>49</sup> Scottish Environment Protection Agency (SEPA) (2017) Guidance Note 4 - Planning guidance on on-shore windfarm developments (Issue 9); <https://www.sepa.org.uk/media/136117/planning-guidance-on-on-shore-windfarms-developments.pdf>

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<sup>50</sup> Scottish Environment Protection Agency (SEPA) (2017) Guidance Note 31 - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (Version 3); <https://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf>

<sup>51</sup> Scottish Natural Heritage (Version 2, 2016). Planning for Development: What to consider and include in Habitat Management Plans; <https://www.nature.scot/sites/default/files/2019-01/Guidance%20-%20Planning%20for%20development%20-%20-%20What%20to%20consider%20and%20include%20in%20Habitat%20Management%20Plans.pdf>

<sup>52</sup> Scottish Natural Heritage, (2018). Environmental Impact Assessment Handbook. Guidance for competent authorities, consultation bodies and others in involved in the Environmental Impact Assessment process in Scotland. Natural Heritage Management. Version 5. <https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf>

<sup>53</sup> Scottish Natural Heritage (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments; <https://www.nature.scot/sites/default/files/2019-11/Guidance%20-%20Assessing%20the%20cumulative%20impact%20of%20onshore%20wind%20energy%20developments.pdf>

<sup>54</sup> UKhab Ltd: UK Habitat Classification System <https://ukhab.org>

<sup>55</sup> Scottish Natural Heritage (2016). General Pre-application/ Scoping Advice to Developers of Onshore Wind Farms: NatureScot. (2020). General pre-application/ scoping advice to developers of onshore wind farms: <https://www.nature.scot/general-pre-application-and-scoping-advice-onshore-wind-farms>

<sup>56</sup> The Scottish Government (2019): Scotland’s Forestry Strategy: <https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/>



## 9.3 Methodology

The assessment of the potential impact of the Proposed Development on ecology and nature conservation was undertaken by the general method described in the following Sub-Sections.

### 9.3.1 Desk Study Assessment Methodology

The desk study undertaken to inform the Scoping Report will be extended to inform the EIA Report.

The desk study will seek to identify any data relating to statutory and non-statutory sites, protected and notable species and invasive non-native species. The desk study will cover a distance of 5km from the site boundary for protected species and extending to 10kms for bats. Constraints will be identified and used to inform the final location of the turbines and infrastructure layout.

The following sources of information will be consulted as part of the desk study:

- Existing data on statutory designated sites available through NatureScot Site link website<sup>57</sup>;
- Scotland's Environment<sup>58</sup>;
- Magic Map DEFRA<sup>59</sup>;
- Dumfries and Galloway Council: Dumfries and Galloway Local Development Plan 2 (2019)<sup>60</sup>;
- Records of Ancient Woodland;
- Scottish Forestry<sup>61</sup> & Scottish Forestry Map Viewer<sup>62</sup>;
- Records from Scottish Badgers<sup>63</sup>;
- The UK Biodiversity Action Plan (UKBAP)<sup>64</sup>;
- The Scottish Biodiversity List<sup>65</sup>;
- Records from The South West Scotland Environmental Information Centre (SWSEIC)<sup>66</sup>, and
- NatureScot's Carbon and Peatland 2016 mapping.

The Site is within the Dumfries & Galloway Council area and information and consultation with Dumfries & Galloway Council will be sought. The area also lies within the Galloway and Southern Ayrshire Biosphere Reserve<sup>67</sup>, a non-statutory designation by UNESCO.

The desk study will include a review of relevant historical maps, soil maps and aerial photographs. There are no designated ecological sites within 5km of the Proposed Development (see Chapter 10: Ornithology). There are a

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<sup>57</sup> NatureScot Sitelink; <https://sitelink.nature.scot/home>

<sup>58</sup> Scotland's Environment; <https://www.environment.gov.scot>

<sup>59</sup> MAGIC Map; <https://magic.defra.gov.uk/home.htm>

<sup>60</sup> [https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted\\_LDP2\\_OCTOBER\\_2019\\_web\\_version.pdf?m=637060550180970000](https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000)

<sup>61</sup> Scottish Forestry <https://forestry.gov.scot>

<sup>62</sup> Scottish Forestry Map Viewer <https://scottishforestry.maps.arcgis.com/apps/webappviewer/index.html?id=0d6125cfe892439ab0e5d0b74d9acc18>

<sup>63</sup> Scottish Badgers; <https://www.scottishbadgers.org.uk>

<sup>64</sup> <https://jncc.gov.uk/our-work/uk-bap-priority-species/>

<sup>65</sup> The Scottish Biodiversity List; <https://www.nature.scot/scottish-biodiversity-list>

<sup>66</sup> <https://swseic.org.uk>

<sup>67</sup> <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/europe-north-america/united-kingdom-of-great-britain-and-northern-ireland/galloway-and-southern-ayrshire-biosphere/>

number of non-designated sites, for example, those listed in the Native Woodland Survey Scotland and the Ancient Woodland Inventory Scotland within 2km of the site.

### 9.3.2 Field Survey Methodology

Baseline ecology field surveys will comprise the following:

- Terrestrial habitat & vegetation survey,
- Protected Species survey.

### 9.3.3 Habitat Survey

The UK Habitat Classification<sup>68</sup> System will be utilised for the surveys, as it is a unified and comprehensive approach to classifying habitats. The UKHab classification is designed to provide a simple and robust approach to survey and monitoring. The survey will include searches for scarce or rare plants. The UKHab classification system can also inform Biodiversity Net Gain and is a potentially important tool in de-risking planning applications, as it provides a more robust outcome than Phase 1 habitat surveys previously utilised.

To ensure the collation of complete and current baseline habitat information, a targeted National Vegetation Classification (NVC) survey will be undertaken for the whole site, within the optimum survey window (May to September) following the industry standard survey methodology (Rodwell, 2006).

#### 9.3.3.1 Ground Water Dependent Terrestrial Ecosystems (GWDTE)

SEPA has a responsibility to protect groundwater abstractions and Groundwater Dependant Terrestrial Ecosystems (GWDTE). Foundations, borrow pits and linear infrastructure such as roads, tracks and trenches can disrupt groundwater flow and impact upon these sensitive receptors. Such impacts will vary depending on the scale and location of the development.

The study area will comprise all likely relevant habitat types within the site and out to 300m (to allow for potential micro-siting beyond the 250m buffer as per GWDTE guidance) to comply with SEPA guidance with regards to the identification of GWDTEs for subsequent hydrological assessment. The survey will seek to record the extent of any notable vegetation communities within the study area, including those classified as GWDTEs in accordance with Sniffer guidance (2009).

The results of these surveys will be used to inform a constraints plan. The principal mitigation measures adopted will be the use of buffer zones around sensitive areas of habitat, sensitive construction techniques and habitat management/restoration where appropriate. Potential significant impacts from the scheme will be identified using published CIEEM Guidelines.

### 9.3.4 Protected Species Surveys

Surveys will be undertaken within an ecological survey area buffer of up to 100, 200m or 250m of the planned infrastructure, to take into account variations in micro-siting. Surveys for protected species will follow current NatureScot guidance<sup>69</sup> and will comprise walkover searches for evidence of presence or the potential presence of bats, badger, otter, water vole, red squirrel, mountain hare, pine marten and great crested newt. The surveys will include checks for any suitable bat roost structures and static recorders will be used as per the updated NatureScot 2019 guidance for bat surveys on onshore wind farms<sup>70</sup>.

<sup>68</sup> The UK Habitat Classification System <https://ukhab.org>

<sup>69</sup> NatureScot: Planning and development: protected species; <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-protected-species>

<sup>70</sup> Bats and onshore wind turbines - survey, assessment and mitigation 2019; <https://www.nature.scot/sites/default/files/2019-01/Bats%20and%20onshore%20wind%20turbines%20-%20survey%2C%20assessment%20and%20mitigation.pdf>

#### 9.3.4.1 Bats

All species of bats occurring in Scotland are classed as European Protected Species (EPS) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

For any wild bat species, it is an offence to deliberately or recklessly:

- Capture, injure or kill a bat;
- Harass a bat or group of bats;
- Disturb a bat in a roost (any structure or place it uses for shelter or protection);
- Disturb a bat while it is rearing or otherwise caring for its young;
- Obstruct access to a bat roost or otherwise deny an animal use of a roost;
- Disturb a bat in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species; and
- Disturb a bat in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

It is also an offence to:

- Damage or destroy a breeding site or resting place of such an animal (whether or not Deliberately or recklessly), and
- Keep, transport, sell or exchange, or offer for sale or exchange any wild bat (or any part or derivative of one) obtained after 10 June 1994.

This means that if bats could be affected in these ways by a development, and no action is taken to prevent it, an offence may be committed.

##### *(a) Bat Survey*

Project planning needs to allow sufficient time to undertake the bat surveys at the appropriate spatial and temporal scale.

Bat activity varies considerably both between and within years and on a nightly basis. It is evident that multiple nights of surveying are required to accurately determine species presence and distribution within a site and to correctly categorise the relative level of activity of each species.

Pre-application surveys will take place over a full season of bat activity. To avoid any unnecessary delays to licence and planning applications, surveys will be:

- No more than 18 months old;
- Carried out in line with the Bat Surveys for Professional Ecologists: Good Practice Guidelines (BCT, Collins 2016); and
- Following the guidance within Bats & Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019<sup>71</sup>.

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<sup>71</sup> Bats & Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019 <https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation>

### *(b) Bat Activity Survey*

Surveys will capture a sufficient number of nights with appropriate weather conditions for bat activity (i.e., temperatures of 10°C and above, or 8°C in Scotland) at dusk, maximum ground level wind speed of 5m/s and no, or only very light, rainfall to fulfil the minimum requirements.

Full spectrum automatic detectors will be deployed, as per current guidance. Automated detector surveys will commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late, such as noctules, are recorded.

### *(c) Roost Survey*

Key features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200m plus rotor radius of the boundary of the Proposed Development will be subject to further investigation. The search area may need to be extended if there is a high level of habitat connectivity in the surrounding area and this is considered likely to attract bats into the wind farm area from further afield. The survey will establish presence or absence of roosts and if bats are present the species, numbers (or estimated numbers), function of the roost and flight lines away from the roost. See Collins (BCT, 2016).

### *(d) Ground-level Static Surveys*

The minimum level of pre-application survey required using static detectors is 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October). Surveys in adjacent seasons should not be contiguous, i.e. they should be spaced out to include a reasonable time gap between them and should aim to include periods when migration could be taking place. Ideally, surveys will aim for 10 consecutive nights.

### *(e) Walked transect Surveys*

Either/both of these survey methods can be used to complement the information gained from static detectors and other sources, but their applicability is discretionary and site-specific. Static detectors provide an overview of how bat activity is broadly distributed over the site and which species are present but are less suited to identifying flight lines and understanding the numbers of bats present. Information on these can be collected at certain times i.e. dusk and dawn, using these observational methods.

The choice of method used at sites must be appropriate to identify connections between nearby roosts, linear features (or other potential flight paths, e.g. as used by *Nyctaloid* species) and potential key foraging areas across the development footprint. The existence of such routes might be inferred from other available information, such as the presence of a linear feature within the development footprint linked to a known roost site nearby, and such field knowledge should be incorporated into the survey design. Transect point surveys enable the surveyor to see a long way and across the landscape at early dusk when bats are still visible. They are particularly useful for observing early commuting and foraging species such as noctule bats whilst it is still light.

### *(f) Assessing bat activity levels*

Anabat Static recorders will be used at the site, and along with the roost survey will determine the following information:

- The species assemblage. Bats will be identified to species, or where these cannot be separated with confidence, to species group e.g. *Myotis* sp. or *Nyctaloid* bats (see Collins, 2016) using the site;
- The locations of roosts (particularly maternity and hibernation) and swarming sites in the surrounding area that could be affected by the wind farm proposals at the site;
- The location and extent of commuting or foraging habitat used by bats. This needs to include not only the site itself, but also flight paths and habitats in the surrounding landscape that are likely to bring bats to the site. The

information may also be useful where habitat management is considered as a mitigation measure for predicted impacts on other species (e.g. raptors); and

- The amount of bat activity on the site, and its spatial and temporal distribution.

A measure of relative bat activity will be obtained using the online tool Ecobat<sup>72</sup>.

#### 9.3.4.2 *Badgers*

Both badgers and their setts are protected by law. The Protection of Badgers Act 1992 (Scottish Version) brings together all the previous legislation specific to badgers (except their inclusion on Schedule 6 of the 1981 Wildlife and Countryside Act, as amended Nature Conservation (Scotland) Act 2004). As a result, it is an offence to:

- Willfully kill, injure, possess or cruelly ill-treat a badger, or attempt to do so;
- To intentionally or recklessly interfere with a sett;
- To disturb a badger when it is occupying a sett;
- Damage or destroy a sett; and
- To obstruct access to, or any entrance of a badger sett.

A badger sett is defined in the legislation as 'any structure or place, which displays signs indicating current use by a badger'. 'Current use' does not simply mean 'current occupation' and for licensing purposes it is defined as 'any sett within an occupied badger territory regardless of when it may have last been used'. A sett therefore, in an occupied territory, is classified as in current use even if it is only used seasonally or occasionally by badgers, and is afforded the same protection in law.

##### *(a) Badger Survey Methodology*

The development area (red line boundary) plus a buffer around the site will be surveyed. A standard buffer around the site will be 100m to give consideration to setts outwith, but close to, the development. This buffer will only be increased to larger distance around the site if the works within the site may cause disturbance (e.g. blasting).

All land within the survey area will be surveyed for badgers. This involves viewing all areas of the survey area for setts or other field signs. Badgers will commute from setts to foraging areas along paths, and they will demarcate their territories using dung in pits, often positioned along linear features which form the boundaries of their territory. Open areas such as grazed fields/edges of woodland and plantations will be surveyed.

Transects lines will be walked through the habitat to ensure full ground coverage. The distance between the transect lines will be dependent on the density of the vegetation cover. For example, transect lines in coniferous plantation such as Sitka spruce will need to be positioned at 5m intervals, whereas in open broadleaved woodland, ground cover may permit transects to be 20m apart. Linear landscape features such as walls and fences will also be walked along in order to identify any territory markings or badger crossing points.

A total sett survey will be conducted on site, including determination of where the badgers roam, feed and obtain water. This information will ensure that any future development, will not interfere with the mammal's pathway to its food & water supply, as well as the setts.

The sett survey will include the total number of holes within a sett; number of well used holes & disused holes, which can give a guide to the level of activity of the sett.

Classification of the sett will also be determined into Main, Annex, Subsidiary or Outlier setts. During the survey, each sett entrance will be classified according to its degree of usage:

<sup>72</sup> <http://www.mammal.org.uk/science-research/ecostat/>

- **Well Used (WU)** are clear of debris and vegetation, sides worn smooth but not necessarily excavated recently;
- **Partially used (PU)** are not in regular use and have debris e.g. twigs and leaves in the entrance. They could be used after only a minimal amount of clearance; and
- **Disused (D)** not in use for some time, are partially blocked and could not be used without considerable effort. If the hole has been disused for some time all that may be visible is the overgrown spoil heap and a depression in the ground where the hole used to be. Rabbits and foxes may take over part of a sett and keep disused entrances open.

Field signs of badgers will also be recorded such as path networks, latrines and larger territorial latrines at boundary edges.

Evidence of badger activity searched for will include the following:

- Setts: badger setts typically have characteristic shapes and dimensions;
- Paw prints and badger hair caught on hedges and fences;
- Scratching posts;
- Foraging signs: foraging badgers leave distinctive marks when foraging, such as diggings or snuffle holes (where badgers have inserted their snouts into the ground to search for earthworms and insects);
- Characteristic worn pathways and Paths linking setts and foraging areas; and
- Latrines: badgers defecate in pits, often clustering several pits into a latrine.

#### 9.3.4.3 *Otters*

As a European protected species, the otter is fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). It is an offence to deliberately or recklessly:

- Capture, injure or kill an otter;
- Harass an otter or group of otters;
- Disturb an otter in a holt or any other structure or place it uses for shelter or protection;
- Disturb an otter while it is rearing or otherwise caring for its young;
- Obstruct access to a holt or other structure or place otters use for shelter or protection, or otherwise deny the animal use of that place;
- Disturb an otter in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species; and
- Disturb an otter in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

It is also an offence to:

- Damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly), and
- Keep, transport, sell or exchange, or offer for sale or exchange any wild otter (or any part or derivative of one) obtained after 10 June 1994.

Otter shelters are legally protected whether or not an otter is present. Otters could be affected by a development proposal close to a water course, wetland, coastline or estuary.

### *(a) Otter Survey Methodology*

An otter survey will be carried out for the proposal within 200m of suitable habitat. Otter surveys can be carried out at any time of year but will avoid periods following prolonged heavy rainfall and/or high water when spraints and other signs of otter may have been washed away. Heavy frost or recent snow can also make finding spraints difficult.

All suitable otter habitat within 200m of the proposed works will be surveyed, including a systematic search for:

- Spraints or otter faeces. Often found on boulders, under bridges, elevated positions, fallen trees or on piles of grass;
- Paw prints in muddy or silted areas along the burn edges;
- Hairs;
- Characteristic worn pathways/slides or haul out areas;
- Food remains;
- Sleeping and resting places/shelters including holts, couches and natal dens; and
- Breeding sites.

Type of otter activity (Holts & Couches) explained further:

- Holts: otter holts are often found in various situations. These include cavities in a riverbank, hollow trees, between roots, rocky clefts, rabbit burrows or tunnels in peat. The entrance may be underwater with an air vent into the chamber, which is lined with dry vegetation; and
- Couches: otters often have resting spots or couches when they lay up. An otter may have many holts or resting sites within its home range.

Field signs for recognising a natal den can include:

- A heavily used path or paths from the water into dense cover or an enclosed structure;
- Bedding within the structure which may consist of grass, ferns or reeds (bedding may also be present in other types of resting places);
- A latrine containing a large number of spraints at the den or within 2m of it (this is not always the case – sometimes the female will excrete in the water to ensure that there are no signs of occupation near the natal den);
- A cub play area which may be a well-worn area around a tree or on a bank; and
- Different sized otter prints.

Habitat types associated with breeding sites are:

- Extensive reed beds;
- Ponds and lakes;
- Deciduous woodlands;
- Young conifer plantations; and
- Extensive areas of scrub.

#### **9.3.4.4**      *Water Vole*

The water vole receives partial protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). See the Wildlife and Countryside Act 1981 Schedules 5 and 6 for full details.

In Scotland, this legal protection is currently restricted to the water vole's places of shelter or protection and does not extend to the animal itself, but are listed on the UK BAP. Full protection, to also cover the animal, is proposed. It is an offence to intentionally or recklessly:

- Damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection, and
- Disturb a water vole while it is using any such place of shelter or protection.

#### *(a) Water Vole Survey Methodology*

##### ***Timing:***

The water vole breeding season runs from April to September. This is the ideal time to carry out a water vole survey as the water voles will be highly active and leave many signs, such as latrines (conspicuous piles of droppings) which can be used to confirm their presence during a survey. Habitat assessments can also be undertaken during winter. Surveys at that time can determine presence, although absence of water voles can only be confirmed by spring or summer surveys.

##### ***Habitat Assessment:***

As part of the water vole survey, the habitat suitability for this species will be assessed. This will include an assessment of the foraging resources, the suitability of the banks for burrowing and the presence of adequate cover/shelter.

##### ***Surveying for Water Vole Evidence:***

A water vole survey will involve searching the banks of the watercourse for evidence of water vole, including: burrows, latrines, footprints, runs in the vegetation, grazed 'lawns', feeding remains and actual sightings.

The following field signs include:

- Faeces- these are 8- 12mm long and 4- 5 mm wide, cylindrical with blunt ends. The colour is variable, though often green, and they are generally odourless or have a faint musky smell;
- Latrines- the majority of droppings are deposited at latrine sites, used to mark range boundaries or favoured spots close to burrows. Latrines are typically maintained between February and November and often consist of a flattened mass of old droppings topped with fresh ones;
- Feeding stations- water voles often bring pieces of cut vegetation to favoured feeding stations close to the water's edge and leave remains in neat piles;
- Burrows- many burrows can be found in riverbanks, but those constructed by water voles are typically wider than they are high, with a diameter of 4- 8cm. Around these holes, well-grazed 'lawns' can often be found, where the water voles have chewed the vegetation short; and
- Footprints- these can easily be confused with rat footprints.

Many of these signs may be obliterated by heavy rain or high water levels, so negative surveys carried out in these circumstances should be treated with caution.

#### **9.3.4.5 Red Squirrel**

There is a conifer plantation that bounds the eastern section of the site and is a potential habitat for red squirrel. Red squirrels and their dreys (resting places) receive full protection under Schedules 5 and 6 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to intentionally or recklessly:

- Kill, injure or take a red squirrel;
- Damage, destroy or obstruct access to a drey or any other structure or place which a red squirrel uses for shelter or protection; and
- Disturb a red squirrel when it is occupying a structure or place for shelter or protection.



This protection does not apply to areas where red squirrels only feed. It is also an offence to possess or control, sell, or offer for sale, or possess or transport for the purpose of sale any living or dead red squirrel or any derivative of such an animal. This means that if red squirrels could be affected in these ways by a development, and no action is taken to prevent it, an offence may be committed.

### *(a) Red squirrel Survey Methodology*

#### ***Field Survey Methodology:***

The optimum time to undertake red squirrel surveys is during the months of October, February or March, when the squirrels are most active and foliage on the trees is not too dense. Two survey methods will be employed, Visual Counts and Drey Counts.

#### ***Visual Counts:***

Visual surveys involve making standardised time-area counts of squirrels. This will involve walking along predetermined transect lines, recording all the squirrels seen. The methodology according to Gurnell et al (2001) requires that between 6 and 12 survey lines at a density of approximately one line per 10-20ha are marked out. Each line will be situated along rides or inspection tracks, or between rows of trees in suitable squirrel habitat. The surveyors will stop at 50m intervals along the transects for 5 minutes, taking about 5 minutes to walk between each intervening 50m.

#### ***Drey Counts:***

The presence of active dreys can be used reliably to indicate the presence of squirrels and the density of dreys can give an indication of squirrel numbers. However, there is no obvious difference between a drey built by a red squirrel and a drey built by a grey squirrel. Dreys tend to be semi-permanent when squirrels are resident, thus the number of dreys tend to reflect squirrel numbers over a season, year or even longer. Sometimes squirrels use holes in trees to nest in, called dens. Dreys will be searched for by surveyors whilst walking along the set transects. Any dreys identified will be recorded on a map of the area. The total number of dreys can be related to the area of forest searched. The density of dreys can be used as a crude index of squirrel density and it may be useful as a relative measure of habitat use.

Field signs include:

- Dreys that are;
  - Constructed of compacted twigs in a tree fork.
  - Spherical (approx. 30cm in diameter).
  - Usually located above 6m and exceptionally below 3m. - Usually close to the main trunk of a conifer.
  - Lined with soft hair, moss and dried grass.
- Feeding remains;
- Stripped cores and scattered scales of cones;
- Hazel shells split neatly in two with a small chip at the apex.- Husks of acorns;
- Bark stripping;
- Footprints;
- Only visible in soft ground or snow; and
- Distinctive pattern of smaller fore prints (4 toes) behind larger hind prints (5 toes).- Approximately 60mm or smaller in diameter.

#### 9.3.4.6 Mountain Hare

Since March 2021, the mountain hare has received full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are a Priority Species under the UK Post-2010 Biodiversity Framework. It is an offence to:

- Intentionally or recklessly kill, injure or take a mountain hare at any time of the year, unless a licence is obtained, and
- Possess or control, sell or offer for sale, or transport for the purpose of sale any living or dead mountain hare, or any derivative.

##### (a) Mountain Hare Methodology

Signs of mountain hare will be searched for within all suitable habitat within the site and a 200m buffer (access permitting). Surveys will follow the recommended survey guidance as detailed in Newey, S., et al (2018)<sup>73</sup>. Survey methods included:

- Direct counts – line transect surveys: Walked transects will be undertaken over the site up to a 200m buffer;
- Field signs: checking for the presence of mountain hare ‘forms’ (shallow depressions in the ground or grass) and ‘scrapes’. Mountain hare’s can occasionally make burrows in the earth or in snow, particularly when young. Their runs pass directly up slopes. Browse woody plants such as heather and other dwarf shrubs and tree; and
- Dung plot surveys: Mountain hare dung counts will be collected, where possible.

#### 9.3.4.7 Pine Marten

Pine martens are the second rarest carnivore in the UK. The pine marten receives full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Certain methods of killing or taking pine martens are illegal under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). It is an offence to:

- Kill, injure or take a pine marten;
- Damage, destroy or obstruct access to a nest or den – i.e. any structure or place which such an animal uses for shelter or protection; and
- Disturb such an animal when it is occupying a nest or den for shelter or protection (except when this is inside a dwelling house).

Possession, sale and transport offences are ones of strict liability (they don't require intention or recklessness). It is an offence to:

- Possess or control, sell, offer for sale, or possess or transport for the purpose of sale any living or dead pine marten or any derivative of such an animal, and
- It is also an offence to knowingly cause or permit any of the above acts to be carried out.

##### (a) Pine Marten Methodology

The survey will include a systematic search for signs of pine marten presence and potential den sites within 250m of a development. Pine martens are elusive and largely nocturnal, which makes them difficult to see, but their scats are often quite distinctive and the most commonly encountered field sign. Scats are most easily found along forest tracks. Scat is highly variable depending on diet but classic pine marten scat is highly twisted and contains

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<sup>73</sup> Newey, S., Fletcher, K., Potts, J. & Iason, G. 2018. Developing a counting methodology for mountain hares (*Lepus timidus*) in Scotland. *Scottish Natural Heritage Research Report No. 1022*.

bone fragments and hair. Pine marten scat also has a sweet parma violet fragrance. Pine martens prefer overhead cover in woods and their dens can be found in large holes or cavities in trees and breeding nests can be found in rocks, in hollow trees or in a bird or squirrels' nest. Pine martens are active all year round but are best surveyed between May and September, and ideally in June-August when scats are most abundant. Pine martens are more active at this time (June-August) and weather conditions or leaf litter are less likely to degrade or obscure scats. DNA analysis of scat samples is commonly used to provide a positive identification.

The use of hair tubes and remote infra-red cameras can also be used to confirm the presence of pine martens. Camera traps can also be used to confirm the occupation of den sites and to determine if they are being used for breeding (March-June inclusive). However, using camera traps close to a potential breeding den can cause disturbance and will require a survey licence from NatureScot.

#### 9.3.4.8 *Fish Habitat Assessment*

A fisheries habitat assessment survey is to be carried out which includes an assessment of all watercourses which are present within 500m of site and associated 200m buffer. Further survey work may be required depending on initial results.

##### *(a) Fish Habitat Survey Methodology*

All survey work will be undertaken by Galloway Fisheries Trust (GFT) in accordance with relevant methodologies.

#### 9.3.4.9 *Great Crested Newt*

Any ponds situated within the site boundary (plus 500m buffer) will be assessed using the Habitat Suitability Index (HIS) (Oldham 2000) for their potential to support breeding great crested newt.

## 9.4 Assessment

### 9.4.1 Assessment of Effects

The assessment of effects on the ecological features presented within the EIA Report will consider the potential for significant effects upon important features, as a result of the construction, operational and decommissioning phases of the Proposed Development.

Assessment will be based on current Chartered Institute of Ecological and Environmental Management (CIEEM) guidance (2018) and will include the following stages:

- Determination and evaluation of important ecological features;
- Identification and characterisation of impacts;
- Outline of mitigating measures to avoid and reduce significant impacts;
- Assessment of the significance of any residual effects after such measures;
- Identification of appropriate compensation measures to offset significant residual effects; and
- Identification of opportunities for ecological enhancement.

## 9.5 Mitigation

The adoption of embedded mitigation measures to avoid or minimise adverse impacts upon ecological features will be part of the iterative design process for the Proposed Development. Measures to avoid or otherwise minimise potentially adverse impacts upon ecological features during scheme design will include:

- Land-take- Development infrastructure will be designed to minimise the requirement for land-take and the number of watercourse crossings;

- Watercourse crossings- New watercourse crossings required will be designed in accordance with best practice and enable the free passage of fish and other wildlife;
- Construction Environmental Management Plan- A Construction Environmental Management Plan (CEMP) will be in place during the construction, operational and decommissioning phases of the development. The CEMP will include all good practice construction measures, pollution prevention controls and monitoring to be implemented over the course of the development in line with current guidance; and
- Bat Habitat Features- A minimum 50m buffer (from blade tip) will be applied to watercourses and woodland as far as possible having regard to other ecological and non-ecological constraints.

Full details of embedded and site-specific mitigation measures in relation to ecology will be detailed within the EIA Report.

## 9.6 Reporting

The final report will provide commentary across each phase of the development process construction, operation, and decommissioning.

### 9.6.1 Construction Phase

During the construction phase of the Proposed Development, in the absence of mitigation, adverse effects upon ecological features to be addressed within the EIA Report may arise from:

- Habitat loss, fragmentation, severance or change as a result of the delivery and installation of development infrastructure; and
- Disturbance, inadvertent killing or injuring of protected or otherwise notable species or inadvertent damage to their breeding sites or resting places.

There will be no direct impacts upon any designated site for nature conservation. The potential for indirect effects upon ecological features, including designated sites, as a result of the potential spillage and/or mitigation of pollutants during the construction phase will be considered however, potentially significant effects are considered to be highly unlikely on the basis of spatial separation and on the basis of best practice construction methods and pollution prevention controls.

### 9.6.2 Operational Phase

During operation of the Proposed Development, in the absence of mitigation, adverse effects upon ecological features to be addressed within EIA Report may arise from:

- Disturbance to protected or otherwise notable species as a result of operational activities such as vehicular traffic and maintenance works;
- Habitat loss or change, inadvertent killing or injuring of protected or otherwise notable species resulting from the potential spillage and/or mitigation of pollutants; and
- Interaction of bats with operational turbine blades leading to mortality due to collision or barotrauma.

Such effects are however, considered highly unlikely to be significant due to the nature of the Proposed Development, requiring low levels of continued human presence after commissioning and the incorporation of best practice pollution prevention controls.

The incorporation of buffers from bat habitats features (e.g. woodland and watercourses) will also form part of the iterative design process.

### 9.6.3 Decommissioning Phase

Potential impacts associated with the decommissioning phase are likely to be similar to those identified for the construction phase.

### 9.6.4 Presentation of sensitive information

Ecological data considered sensitive (e.g. that pertaining to the locations of breeding and/or resting places of protected species) will be included in a confidential appendix to the EIA Report. This will not be made publicly available but will be issued to NatureScot.

### 9.6.5 Consultation

Consultation will be carried out with:

- SEPA;
- NatureScot; and
- Dumfries & Galloway Council.

## 9.7 Key Questions for Council and Consultees

**Q9/1:** Do consultees agree that the range of ecological surveys proposed is sufficient and proportionate to inform the design and assessment of the Proposed Development?

**Q9/2:** Do consultees agree that the full range of likely significant effects to be assessed within the EIA Report has been adequately identified and is proportionate to the nature of the Proposed Development?

**Q9/3:** Are there any other relevant consultees who should be contacted with respect to the ecology assessment and scope of baseline information gathering?

# 10 Ornithology

## 10.1 Introduction

This chapter will consider the potential impacts of the Proposed Development on the ornithological features present within the Site and its surroundings. It will summarise the methods used to establish the baseline conditions within the Site and its surroundings, the results of the baseline surveys, and the process used to determine the sensitivity of the bird species’ populations present in their habitats. The ways in which bird species and their habitats might be affected (directly or indirectly) by the construction, operation and decommissioning of the Proposed Development will be assessed, prior to and after any mitigation measures are considered. In addition, any cumulative effects will be considered, taking together impacts of other wind farm projects in the area, whether operational, consented or at application stage, along with the significance of any predicted effects of the Proposed Development.

All ornithological personnel working on the EIA for the Proposed Development are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and have extensive experience of wind farm development. The assessment of effects presented within the EIA Report will be based on current Chartered Institute of Ecological and Environmental Management (CIEEM) guidance (2018)<sup>74</sup>.

## 10.2 Legislations, Policy and Guidance

Guidance for assessing the potential impact of the proposed development on the ornithology of the development site will be based on the following statutory, general, and national guidance listed in **Table 10.1: Policy, Legislation & Guidance**. Any appropriate local policy and guidance will also be considered.

**Table 10.1: Policy, Legislation & Guidance**

	Legislation or Guidance Document
<b>Legislation</b>	<p>European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora;</p> <p>European Union Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (“Water Framework Directive”); and</p> <p>Environmental Impact Assessment Directive 2011/92/EU, as amended by Directive 2014/52/EU/85/337/EEC (the EIA Directive) ;</p> <p>The Wildlife and Countryside Act 1981 (as amended);</p> <p>The Conservation (Natural Habitats &amp;c.) Regulations 1994 (as amended) (“The Habitats Regulations”);</p> <p>The Water Environment and Water Services (Scotland) Act 2003 (WEWS);</p> <p>The Nature Conservation (Scotland) Act 2004 (as amended);</p> <p>The Wildlife and Natural Environment (Scotland) Act 2010; and</p> <p>The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.</p>
<b>Policy</b>	Dumfries and Galloway Council: Dumfries and Galloway Local Development Plan 2 (2019) <sup>75</sup> ;

<sup>74</sup> Guidelines for Ecological Impact Assessment (Ecia) <https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/>

<sup>75</sup> [https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted\\_LDP2\\_OCTOBER\\_2019\\_web\\_version.pdf?m=637060550180970000](https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000)

	Legislation or Guidance Document
	<p>Fourth National Planning Framework Draft (NPF4)<sup>76</sup>;                      Scottish Planning Policy (SPP) (Scottish Government, 2014)<sup>77</sup>;                      UK Post-2010 Biodiversity Framework (2018-2020)<sup>78</sup>;                      Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013)<sup>79</sup>;                      Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0<sup>80</sup>;                      PAN 51: Planning, Environmental Protection and Regulation (revised 2006)<sup>81</sup>;                      PAN 60: Planning for Natural Heritage (Scottish Government, 2000)<sup>82</sup>; and                      Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000)<sup>83</sup></p>
<b>Guidance</b>	<p>CIEEM (2018). Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Edition);                      Joint Nature Conservation Committee (2013). Guidelines for selection of biological Sites of Special Scientific Interest (SSSI);                      Scottish Executive (2019). Scotland's Forestry Strategy (2019-2029) <a href="https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/">https://www.gov.scot/publications/scotlands-forestry-strategy-20192029/</a>;                      Scottish Executive Rural Affairs Department (SERAD) (2000). Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ("The Habitats and Birds Directives"). Revised Guidance Updating Scottish Office Circular No 6/1995;                      Scottish Government (2001). European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements;                      Scottish Environment Protection Agency (SEPA) (2017) Guidance Note 4 - Planning guidance on on-shore windfarm developments;                      Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Scotland (2019). Guidance - Good Practice During Windfarm Construction (4<sup>th</sup> Edition);                      Assessing the impact of small-scale wind energy proposals on the natural heritage: Scottish Natural Heritage (2016);                      Recommended bird survey methods to inform impact assessment of onshore wind farms, Scottish Natural Heritage, 2017;</p>

<sup>76</sup> <https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/>

<sup>77</sup> Scottish Planning Policy (SPP) (Scottish Government, 2014); <https://www.gov.scot/publications/scottish-planning-policy/>

<sup>78</sup> UK Post-2010 Biodiversity Framework (2012); <https://hub.jncc.gov.uk/assets/587024ff-864f-4d1d-a669-f38cb448abdc>

<sup>79</sup> Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013);

<https://www.gov.scot/policies/biodiversity/scottish-biodiversity-strategy/>

<sup>80</sup> Scottish Government (2017). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0;

<https://www.gov.scot/publications/planning-advice-note-1-2013-environmental-impact-assessment/>

<sup>81</sup> PAN 51: Planning, Environmental Protection and Regulation (revised 2006); <https://www.gov.scot/publications/planning-advice-note-pan-51-revised-2006-planning-environmental-protection/>

<sup>82</sup> PAN 60: Planning for Natural Heritage (Scottish Government, 2000); <https://www.gov.scot/publications/pan-60-natural-heritage/>

<sup>83</sup> Nature Conservation: Implementation in Scotland of the Habitats and Birds Directives: Scottish Executive Circular 6/1995 as amended (June 2000);

<https://www.gov.scot/binaries/content/documents/govscot/publications/foi-eir-release/2020/01/foi-201900008726/documents/foi-201900008726-information-released-a/foi-201900008726-information-released-a/govscot%3Adocument/FOI%2B-%2B201900008726%2B-%2BInformation%2Breleased%2B-%2BCircular%2B6-1995%2BNature%2BConservation%2B-%2B%2527The%2BHabitats%2Band%2BBirds%2BDirectives%2527%2B%2528Updated%2BJune%2B2000%2529..PDF>

	Legislation or Guidance Document
	<p>European Commission (2010). Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels;</p> <p>Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746;</p> <p>Gilbert, G., Gibbons, D.W., &amp; Evans, J. (1998) Bird Monitoring Methods: A Manual of Techniques for UK Key Species. The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.</p> <p>Scottish Natural Heritage (2016). Assessing connectivity with Special Protection Areas; and Use of avoidance rates in the SNH wind farm collision risk model (SNH, 2010).</p>

## 10.3 Survey Methodologies

### 10.3.1 Key Target Species

Key target species for the assessment have been identified following NatureScot (SNH, 2018a) guidance using the following criteria:

- Species listed on Annex 1 of the EU Birds Directive;
- Species listed on Schedule 1 of the 1981 Wildlife & Countryside Act;
- Species identified by SNH (2018a) as 'Priority bird species for assessment when considering the development of onshore wind farms in Scotland'. These include (a) species that are widespread across Scotland which utilise habitats or have flight behaviours that may be adversely affected by a wind farm, and (b) as 'restricted range' species;
- Red-listed species on the Birds of Conservation Concern 5 list (Eaton et al. 2021); and
- Designated species for the Glen App & Galloway Moors SPA (hen harrier).

The ornithological assessment will, therefore, consider all species recorded during the baseline surveys at the site that meet any of these criteria.

### 10.3.2 Vantage Point Survey Methodology

Vantage Point (VP) surveys are currently being undertaken for a 24-month period between, and inclusive of, April 2020 to April 2022 (Winter & Summer VP's) to collect data on flight activity for target species. The surveys have and will continue to follow the 2017 standard guidance for onshore wind farms in accordance with NatureScot Guidance<sup>84</sup>.

Data from VP surveys are being utilised as part of the assessment of potential impacts including species presence, density, distribution, behaviour, and the identification of flight-paths and flight heights of target species, such as geese and raptors, and allows any regular patterns of flightlines to be identified, allowing the windfarm to be designed to minimise collision risk to birds.

Three Vantage Point locations are currently being utilised to monitor the site, as illustrated in **Figure 10.1 - Vantage Points Map**. The indicative VPs were selected through GIS analysis and field trials, maximising ground visibility within the flight activity Study Area. The viewsheds extend to 2km from the VP location in a 360 arc and cover as

<sup>84</sup> <https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf>



much of the Study Area as possible, allowing for topographical constraints. These VP's give clear views of the whole site, allowing all flights to be recorded in detail. The ordnance survey coordinates (OSGB) of each VP is as follows:

- VP1- NX 1108 7221
- VP2- NX 1434 7153
- VP3- NX1248 6923

The location, direction of flight and estimated height above the ground of each target species are being recorded. VP times typically cover a period of three hours and cover a range of times between the dawn and dusk periods. During the VPs flight data for both primary and secondary target species are recorded. Details of species, number of birds, flight height (in bands), duration and direction are recorded. The following height bands are to be used in the surveys: A- <70m, B- 70--230m, C- >230m. Any flights recorded at band B and within 200m of the proposed turbine location would be classified as being within the collision risk window.

Primary target species are identified as any Schedule 1 raptors, designated species for the nearby SPA (**Table 10.2**) and red listed Birds of Conservation Concern.

### 10.3.3 Breeding Bird Survey Methodology

Four breeding bird survey (BBS) visits were carried out between April and June in both 2020 & 2021, targeting all areas of suitable habitat within 500m of the Proposed Development, as detailed in SNH, 2017.

#### 10.3.3.1 Scarce Breeding Bird Survey Methodology

Three raptor surveys for scarce raptors within a 2km radius of the site were carried out from April to June in both 2020 & 2021, looking for signs of scarce breeding species with a combination of fixed-point watches and walkovers, following guidance from Hardey 2013.

### 10.3.4 Black Grouse Surveys

Surveys for Black Grouse have followed standard methodology as outlined in Gilbert et al (1998). Areas of potentially suitable habitat within 1.5 km of the Proposed Development (open moorland, woodland edges, tracks and open clearings within woodland) are to be surveyed. Surveys were conducted between the last week in March and mid-May, within two hours of dawn on clear and calm dry days with good visibility to maximise lek detectability. Lek monitoring has included information on the maximum number of males attending the lek and a map showing the location of each lek.

### 10.3.5 Nightjar Surveys

Specific nocturnal surveys for Nightjar (and other nocturnal species) are currently being undertaken, of all suitable habitats within the site and a 1km buffer, from June 2020 to August 2022. The survey methods used for Nightjar are based on Cadbury (1981) and Morris et al (1994) and are detailed in Gilbert et al (2000).

### 10.3.6 Ornithological Survey Timelines

It is considered two years of survey effort will be sufficient to allow a robust characterisation of the baseline ornithological assemblage and usage of the Proposed Development site and surrounding area. Survey data collected will be used in combination with the information and data sets collated from other sources, in particular windfarms in close proximity, Scottish Raptor Group & South West Scotland Environmental Information Centre (SWSEIC).

## 10.4 Assessment Methodology

The assessment of effects on the ornithological features presented within the EIA Report will be consider the potential for significant effects upon important features, as a result of the construction, operational and decommissioning phase of the Proposed Development.

Assessment will be based on current Chartered Institute of Ecological and Environmental Management (CIEEM) guidance (2018) and will include the following stages:

- Determination and evaluation of important ornithological features;
- identification and characterisation of impacts;
- Outline of mitigating measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures;
- Identification of appropriate compensation measures to offset significant residual effects; and
- Identification of opportunities for ecological enhancement.

## 10.5 Baseline

The Proposed Development is located, approximately 5km west of Cairnryan. The Site is a mature commercial forestry plantation with areas of clear fell and newly planted plantation present. To the west more commercial plantations are present. To the south adjacent to site is Penwhirn Reservoir and to the north the Glen App SPA is present.

The terrain within the landholding consists of reasonably level ground in the plantation with the land to the north on the SPA rising from the south to north. The land slopes down to the south to the Penwhirn Reservoir. The Proposed Development is discussed in further detail within **Section 2: Project Description**.

Baseline ornithological conditions to inform the design and assessment of the Proposed Development, will be established by means of:

- Desk-based assessments of existing available data and information;
- Consultations with stakeholders; and
- Field surveys and monitoring.

The process will identify sensitive receptors, particularly those that are the subject of statutory or local designations. Constraints will be identified and used to inform the final layout of the turbines and infrastructure layout.

The ornithological desk study will include a review of, but not limited to:

- Existing data on statutory designated sites available through NatureScot Sitelink website (up to 20 km from the site), specifically where the qualifying feature is related to birds;
- Scotland's Environment;
- Magic Map DEFRA;
- Dumfries & Galloway Council: Dumfries & Galloway Council Local Development Action Plan (2018)<sup>85</sup>; specifically, where the qualifying feature is related to birds;

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<sup>85</sup> [https://www.dumgal.gov.uk/media/19945/Local-Biodiversity-Action-Plan/pdf/Local\\_Biodiversity\\_Action\\_Plan.pdf?m=636561914667330000](https://www.dumgal.gov.uk/media/19945/Local-Biodiversity-Action-Plan/pdf/Local_Biodiversity_Action_Plan.pdf?m=636561914667330000)

- Records from the Scottish Raptor Study Group<sup>86</sup>;
- Records from South West Scotland Environmental Information Centre (SWSEIC)<sup>87</sup>;
- The UK Biodiversity Action Plan (UKBAP); and
- The Scottish Biodiversity List.

**Table 10.2:** Designated sites within 10km of the Proposed Development boundary with ornithological interest only details the designated sites located within 10 km of the Proposed Development that have ornithological interests.

**Table 10.2: Designated sites within 10km of the Proposed Development boundary with ornithological interest only**

Designated Site	Distance from site (approx.)	Description/Qualifying Features of Interest only	Condition (at last assessed date)
Glen App and Galloway Moors SPA <sup>88</sup>	0.1 km	Hen harrier ( <i>Circus cyaneus</i> ) breeding	Favourable, maintained (July 2008)
Glen App and Galloway Moors SSSI <sup>89</sup>	0.1km	Hen harrier ( <i>Circus cyaneus</i> ) breeding	Favourable, maintained (July 2008)
Loch of Inch and Torrs Warren SPA <sup>90</sup>	8km	Hen harrier (non-breeding) & Greenland white fronted goose	Unfavourable Declining

Ornithological surveys follow the standard NatureScot guidance for onshore wind farms. Baseline ornithological field surveys are comprised of the following:

- Summer & Winter Vantage Point Survey Work (24-month period October – September);
- Breeding Bird Surveys from April-June 2020 & 2021;
- Breeding Raptor and Owl Surveys: April-June 2020& 2021 within the Proposed Development site and with a 2 km buffer, as listed on Annex 1 of the Birds Directive, or Schedule 1 of the Wildlife & Countryside Act 1981 (as amended);
- Black Grouse Surveys; and
- Nightjar Surveys.

## 10.6 Mitigation

The adoption of embedded mitigation measures to avoid or minimise adverse impacts upon ecological and ornithological features will be part of the iterative design process for the Proposed Development.

<sup>86</sup> <https://www.scottishraptorstudygroup.org>

<sup>87</sup> <https://swseic.org.uk/about-swseic/>

<sup>88</sup> <https://sitelink.nature.scot/site/8162>

<sup>89</sup> <https://sitelink.nature.scot/site/8162>

<sup>90</sup> <https://sitelink.nature.scot/site/8533>

Measures to avoid or otherwise minimise potentially adverse impacts upon ornithological features during scheme design will include:

- Land-take- Development infrastructure will be designed to minimise the requirement for land-take and the number of watercourse crossings; and
- Construction Environmental Management Plan- A Construction Environmental Management Plan (CEMP) will be in place during the construction, operational and decommissioning phases of the development. The CEMP will include all good practice construction measures, pollution prevention controls and monitoring to be implemented over the course of the development in line with current guidance.

Full details of embedded and site-specific mitigation measures in relation to ornithology will be detailed within the EIA Report.

## 10.7 Reporting

The EIA Report will provide commentary across each phase of the development process construction, operation, and decommissioning.

### 10.7.1 Construction Phase

During the construction phase of the Proposed Development, in the absence of mitigation, adverse effects upon ornithological features to be addressed within the EIA Report may arise from:

- Habitat loss, fragmentation, severance or change as a result of the delivery and installation of development infrastructure; and
- Disturbance, inadvertent killing or injuring of protected or otherwise notable species or inadvertent damage to their breeding sites or resting places

### 10.7.2 Operational Phase

During operation of the Proposed Development, in the absence of mitigation, adverse effects upon ornithological features to be addressed within EIA Report may arise from:

- Disturbance to protected or otherwise notable species as a result of operational activities, such as vehicular traffic and maintenance works;
- Habitat loss or change, inadvertent killing or injuring of protected or otherwise notable species resulting from the potential spillage and/or mitigation e of pollutants; Such effects are however, considered highly unlikely to be significant due to the nature of the Proposed Development, requiring low levels of continued human presence after commissioning and the incorporation of best practice pollution prevention controls; and
- Interaction of birds with operational turbine blades leading to mortality due to collision.

### 10.7.3 Decommissioning Phase

Potential impacts associated with the decommissioning phase are likely to be similar to those identified for the construction phase.

### 10.7.4 Presentation of sensitive information

Ornithological data considered sensitive (e.g. that pertaining to the locations of breeding and/or resting places of protected bird species) will be included in a confidential appendix to the EIA Report. This will not be made publicly available but will be issued to NatureScot.

### 10.7.5 Enhancement

Suitable principles for any appropriate biodiversity enhancement which can feasibly be delivered as part of the Proposed Development will be outlined within the EIA Report. The appropriateness and feasibility of principles will be confirmed in consultation with NatureScot and relevant consultees, as necessary, over the course of the EIA process.

### 10.7.6 Further Consultation

Further consultation with NatureScot is proposed in relation to vantage points and the scope of ornithological baseline information gathering at the earliest convenience.

## 10.8 Key Questions for Council and Consultees

**Q11/1:** Do consultees agree that the range of ornithological surveys proposed is sufficient and proportionate to inform the design and assessment of the Proposed Development?

**Q11/2:** Do consultees agree that the full range of likely significant effects to be assessed within the EIA Report has been adequately identified and is proportionate to the nature of the Proposed Development?

**Q11/3:** As the site is adjacent to designated sites, will a Habitats Regulation Assessment (HRA) be required?

**Q11/4:** Are there any other relevant consultees who should be contacted with respect to the ornithology assessment and scope of baseline information gathering?

# 11 Traffic & Transport

## 11.1 Introduction

This assessment will outline the accessibility of the Site and will consider the potential effects of traffic generated during the construction and operation of the Proposed Development, including identification of possible measures to minimise any disruption to the local and strategic road network.

## 11.2 Legislation, Policy and Guidance

The assessment will be undertaken in line with current guidance and best practice, with reference to:

- Dumfries and Galloway Local Development Plan 2019;
- Scottish Planning Policy 2014; and
- The Transport Assessment Guidance. Transport Scotland (2012).

The assessment will reference any other suitable reports or documents outlined during the scoping process.

## 11.3 Methodology

The study area for the traffic and transport assessment will be the public highway network in the surrounding area of the Site, which would be used during the construction and operation of the wind farm.

A full Abnormal Loads Assessment (ALA) report will be undertaken which will identify any pinch points on the trunk road network. A swept path analysis will be undertaken as part of the ALA and details of all construction traffic will be provided as an appendix to the EIA Report with regard to any required changes to street furniture or structures along the route.

## 11.4 Baseline

The Site for the Proposed Development is situated c.11km north east of Stranraer, between Cairnryan and Glenwhilly. The A77 and the A75 are the main transport links to the area. The A77 links Stranraer and Ayr while the A75 links Stranraer and Dumfries. The road is a single carriageway, two-lane road subject to a 60mph speed limit. The port of delivery is yet to be confirmed.

## 11.5 Mitigation

### 11.5.1 Construction

Construction materials will be delivered to the Site using standard HGV's. It is likely there would be an increase in the local traffic volumes. Traffic management, such as circular routes for vehicles, can greatly reduce any impact on local road users. Locally sourced material for foundations and access tracks will be used where feasible, and traffic will avoid impacting on local communities as far is possible.

Traffic management for any offsite works, such as temporary road widening, may be required on 'A', 'B', 'C' and 'U' classes of road. In such case, two-way temporary traffic lights would be implemented to minimise disruption to road users.

In the event that non-motorised users are not segregated from vehicular traffic, temporary measures to improve safety for pedestrians, cyclists and equestrians will be implemented, if required, through discussions with the Council

An on-site borrow pit, which will minimise trips from the road network, thus reducing the impact upon tourist routes and facilities.

Transportation of abnormal loads could be programmed to avoid peak hours on the road network, thus reducing delays and disruption. Deliveries could also aim to avoid clashing with any major events planned in the area.

Construction activities would generally be limited to normal working hours to minimise noise and other impacts during recreational and leisure periods.

Detail of traffic mitigation will be provided in a TMP, which will be agreed with the Council as a condition of project approval.

### 11.5.2 Operation

It is not considered that there will be a noticeable increase in traffic volumes during the operational phase of the development and as such there is no requirement for any further mitigation to be investigated at this time.

### 11.5.3 Decommissioning

As noted, the decommissioning phase will follow the broad principles of the initial construction phase with the removal of the turbine components from site.

## 11.6 Potential Significant Effects

The majority of potential effects would arise during the construction and decommissioning phases of the development.

### 11.6.1 Construction

During the construction phase of the Proposed Development, there would be an increase in the number of vehicles accessing the Site. The majority of these vehicles will be standard road vehicles, including HGV's.

The transportation of turbine components will utilise specialist HGV trailers, which will require liaison with the roads department and Police Scotland as the use of a convoy system will be required to ensure the safety of road users and the delivery vehicles. During the transportation of these larger components, there is the potential for slow-moving traffic between the point of origin and the Site. There may be a requirement for temporary widening works on the public highway to enable the transportation of abnormal loads, concrete wagons and imported stone, detail to be provided in the TMP.

### 11.6.2 Operation

During the operation of the Proposed Development, planned maintenance visits will be required at regular intervals as stipulated by the manufacturers of the wind turbines, typically once every 6 months, as well as the District Network Operator (DNO) who will require access to the substation. Unplanned maintenance visits will also be required.

These visits will be undertaken using standard road vehicles likely to be long wheelbase vans. There will be a negligible increase in traffic flows in the area due to the ongoing operational maintenance requirements of the development.

### 11.6.3 Decommissioning

The decommissioning of the Site will follow a similar pattern to that of the construction phase. The turbines will be disassembled and transported from site. It is the current intention that these component parts may be reconditioned and sold as second hand machines.

The remainder of the Site will be reinstated using standard plant, either arriving under its own engine power or delivered via flatbed HGV's.

It is expected that decommissioning related traffic will be conditioned.

## 11.7 Summary

Given the nature of the Proposed Development, eight wind turbines with associated infrastructure and the anticipated volume of construction traffic and size of abnormal loads, it is considered that this element should be **scoped in** to the EIA. A traffic and Transport chapter would detail proposed construction movements and abnormal load routing for the consideration of Dumfries and Galloway Council and key Stakeholders.

A Construction Traffic Management Plan, including details of Abnormal Load Transportation, will be provided prior to the commencing of works on site for the consideration of Dumfries and Galloway Council and key Stakeholders.

The effects on transport during the operation of the Development are expected to be negligible. It is therefore proposed that operational effects be **scoped out** of this assessment. Decommissioning traffic should also be **scoped out** as it is anticipated this will be conditioned.

## 11.8 Questions for Council and Consultees

- **Q11/1:** Are the consultees satisfied with the proposed methodology and scope of the traffic and transport assessments?
- **Q11/2:** Are consultees content to scope out operational traffic from further assessment?



# 12 Socio-Economics, Tourism and Recreation

## 12.1 Introduction

This section of the Environmental Impact Assessment Report (EIA Report) evaluates the potential socio-economic, tourism and recreational impacts associated with the Proposed Development. The specific effects considered within this assessment are those affecting:

- The economy;
- Tourism; and
- Recreational facilities.

## 12.2 Legislation, Policy and Guidance

The following legislation, policy and guidance is expected to be utilised for the purposes of this assessment:

- Land Reform Act (Scotland) 2003 (as amended 2016);
- Scottish Planning Policy (2020);
- Dumfries and Galloway Council Local Development Plan (2019);
- Dumfries and Galloway Council Development Plan Scheme (2021);
- Onshore Wind Turbines: Planning advice (2014);
- Office for National Statistics, Wind Energy in the UK: June 2021;
- Renewable UK, Onshore Wind: Economic Impacts in 2014;
- BVG Associates, Economic Benefits from Onshore Wind Farms (2017);
- Scotland's Tourism strategy (2020);
- Dumfries and Galloway Council Regional Tourism Strategy 2016-2020;
- BiGGAR Economics, Wind Farms and Tourism Trend in Scotland (2017);
- VisitScotland Position Statement 92014);
- Onshore Wind – Policy Statement Refresh (2021);
- Mountaineering Scotland, Wind Farms and Tourism in Scotland: A Review with Focus on Mountaineering and Landscape (2017); and
- VisitScotland, Wind Farm Consumer Research (2012).

## 12.3 Methodology

There are no recognised standards or methodologies for assessing the socio-economic, tourism and recreation effects of wind farms. The methodology will be informed by previous experience, established EIA best practice and professional judgment. It will include:

- Consultation with relevant statutory and non-statutory bodies;

- Completion of baseline conditions describing the economic baseline and identifying tourist and recreational activities and facilities within the study area;
- An assessment of the impact of the Proposed Development on the socio-economic, tourism and recreational receptors in the study area; and
- Identification of possible measures to avoid and mitigate against, any potential adverse effects resulting from the Proposed Development.

Given that the Proposed Development will be a Major application, socio-economic impacts will be considered at the regional (Dumfries and Galloway) level, with impacts at the national level also considered where applicable. The impacts of the Proposed Development upon tourist/recreational activity will be considered within a 10km study area.

There are other environmental topics that have relevance to aspects considered in this chapter such as traffic and transport, noise, cultural heritage, and landscape and visual amenity. The potential effects of the Proposed Development on these topics will be reported elsewhere in the EIA Report as separate chapters. The assessments in those chapters will inform the findings of the Socio-economic chapters but will not be reassessed in this chapter.

### 12.3.1 Socio-Economics

Regional employment statistics will be reviewed, and settlements will be identified and described using sources such as the National Online Manpower Information system (NOMIS), National Records of Scotland and the Scottish Index of Multiple Deprivation (SIMD). Socio-economic impacts will be assessed at a regional – Dumfries and Galloway – and national level – Scotland – to understand how Dumfries and Galloway’s socio-economic data compares with the national average.

The assessment will aim to provide the likely employment opportunities, GVA contribution and job creation predicted as a result of the Proposed Development. This assessment will be undertaken on the basis of the maximum anticipated MW output from the Proposed Development to create a best case scenario using the 2014, Renewable UK study ‘Onshore Wind: Economic Benefits in 2014’.

In order to avoid a biased assessment, this section will also make reference to BVG Associates study ‘Economic Benefits from Onshore Wind Farms (2017)’ to understand how the best case scenario, generated from the RenewableUK study, compares with a second assessment.

### 12.3.2 Tourism

A review of national and regional tourism strategies, as well as visitor statistics will be undertaken. Accommodation and tourist attractions within 10km of the site will be identified using public sources such as VisitScotland. A qualitative assessment will be undertaken based on the changes of availability, accessibility and amenity on tourist receptors during the construction and operational maintenance phases. For the purposes of this assessment, amenity is considered to be a combination of visual amenity and noise levels experienced by the users of tourist attractions and accommodation. Air quality has been scoped out of the EIAR assessment and considered to not have a significant effect on tourism receptors.

### 12.3.3 Recreation

This section of the assessment will assess the significance of the Proposed Development on recreation. Any recreational facilities within 10km of the site will be identified and assessed for any potential effects. These will be based on any estimated changes to recreational facilities in the local area. This includes changes in the accessibility and amenity of recreational receptors, which will include core paths, cycle routes and other recreational activities. For the purpose of this assessment, amenity refers to a combination of visual amenity and noise levels experienced by the users of tourist attractions. Air quality has been scoped out of the EIAR assessment as the Proposed Development has no potential to generate significant impacts on tourism receptors during the operational phase.

### 12.3.4 Significance Assessment

The sensitivity and magnitude of effect on each receptor will be assessed in order to determine the overall level of impact. A description of the different significance levels is noted below. In the context of this EIAR, a moderate or major effect is considered significant within the scope of this chapter.

- Major – The value of the receptor and the magnitude of effects are predicted to give rise to major, detectable impacts and may be fundamental in the decision-making process.
- Moderate – The value of the receptor and the magnitude of effects are predicted to give rise to moderate, detectable impacts but alone will not be fundamental in the decision-making process.
- Minor – The value of the receptor and the magnitude of effects are predicted to give rise to minor, detectable impacts but will not be fundamental in the decision-making process.
- Not significant- The value of the receptor and the magnitude of effects are not predicted to give rise to any discernable or detectable impacts outside the norm of typical variation.

## 12.4 Consultation

At this stage of the project, no consultation has been undertaken in relation to socio-economics, tourism or recreation. It is anticipated that the following consultees will be contacted:

- Dumfries and Galloway Council;
- Scottish Rights of Ways Access Society (ScotWays);
- Community Councils;
- British Horse Society;
- Visit Scotland; and
- Mountaineering Scotland.

## 12.5 Baseline

### 12.5.1 Socio-Economic

The Office for National Statistics estimated that the population for Dumfries and Galloway was 148,290, and 5,466,000 in Scotland, in 2020.<sup>91,92</sup> Of this population, 86,200 (58.1%) are working age (aged between 16 to 64) in Dumfries and Galloway which is lower than the Scottish (63.9%) average.<sup>93,94</sup> Overall, the data shows that the total employees across industry sectors in the study are different from the national average. The only sectors that show some similarity with the Scottish National averages are:

- Electricity, Gas, Steam And Air Conditioning Supply;
- Water Supply; Sewerage, Waste Management And Remediation Activities;
- Arts, Entertainment And Recreation; and
- Other Service Activities.

The nearest settlements to the development site are:

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<sup>91</sup> National Records of Scotland (2020) Mid-2020 Population Estimates, Scotland

<sup>92</sup> National Records of Scotland, (2020) Dumfries and Galloway Council Area Profile

<sup>93</sup> NOMIS (2020) Official Labour Market Statistics – Scotland

<sup>94</sup> NOMIS (2020) Official Labour Market Statistics – Dumfries and Galloway

- Cairnryan (5.0km South-West);
- New Luce (7.5km South-East);
- Innermessan (7.4km South-West);
- Kirkcolm (8.7km South-West);
- Auchencrosh (8.7km North);
- Smyrton (9.4km North);
- St Mary's Croft (9.4km South-West);
- Soleburn (9.9km South-West);
- Stranraer (9.9km South-West)

### 12.5.2 Tourism

From 2016 to 2018, Dumfries and Galloway's day tourism numbers have increased by 7% with an average of 5.7 million visits per year in 2019. Overnight tourism numbers have also increased from 2016 to 2018 by 3% to 735,000 overnight visit per year in 2019. At present, Dumfries and Galloway's tourism accounts for around 4% of Scotland's day and overnight tourism. The tourist spend within Dumfries and Galloway in 2019 was £387 million, which has decreased by 1% since 2016. This accounts for 3% of tourist spend within Scotland.<sup>9596</sup>

In 2019, the main purpose of stay for domestic visitors were for a holiday (56%), visiting friends or relatives (29%), business (13%), or for another trip purpose (2%). The main trip purposes for international visitors were for a holiday 961%), visiting friends or relatives (25%), business (11%), or for another trip purpose (3%).

In 2019, the five top rated, free, tourist activities in Dumfries and Galloway were:

- Galloway Forest Park;
- Malbie Forest;
- Dalbeattie Forest;
- Grey Mare's Tail; and
- Forest of Ae.

In 2019, the top five rated, paid, tourist activities in Dumfries and Galloway were:

- Gretna Green Famous Blacksmiths Shop;
- Threave Garden;
- Caerlaverock Castle;
- Logan Botanic Garden; and
- Devil's Porridge Museum.

None of these top rated tourist attractions are within 10km of the Proposed Development.

The tourist facilities within 10km of the Proposed Development are:

- Kitchen Coos and Ewes – Farming (9.3km South-East); and

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<sup>95</sup> Visit Scotland (2020) Dumfries and Galloway Factsheet 2019

<sup>96</sup> Visit Scotland (2020) Key Facts on tourism in Scotland 2019

- Castle Kennedy and Gardens (9.4km South).

There are a variety of different accommodation providers within 10km of the Proposed Development.<sup>97,98,99</sup> These are listed below:

- Cairnryan B&B (5.4km West);
- Cairnryan Caravan Park (5.4 km West);
- Rhins of Galloway Guesthouse Hotel (6.1km South-West);
- Balyett Farmhouse B&B (9.3km South-West);
- Chelenry Farmhouse B&B (9.4km South);
- Ryan Bay Holiday and Residential Park (8.3km South-West); and
- 15 rental cottages/apartments across Cairnryan, Innermessen, Kirkcolm and Castle Kennedy (closest 5.5km to the West, furthest 9.3km to the South-West).

In the study area sits Loch Ryan which is a large lake and historic shipping harbour. There are two ferry routes that operate between Cairnryan and Larne/Belfast. There are 4 ferries a day to Larne with P&O ferries and 6 ferries a day to Belfast with Stena Line. These ferries are responsible for increasing the accessibility of the Cairnryan area with Ireland and making it more popular with tourists.

### 12.5.3 Recreation

There are a small number recreational facilities within 10km of the Proposed Development, including fishing at Black Loch/Loch of Crindil (7.9km South).

There are a number of core paths/cycle paths within the study area.<sup>100,101</sup> They are:

- Corsewall Estate to Lady Bay;
- Kirkholm Circular;
- Rotary Club Path Cairnryan;
- Brockloch Fell Cairnryan;
- Twa tongues;
- Airyolland Loch;
- The Stranoch to Beneraird & Shennas;
- Glenkitten Fell;
- The Southern Upland Way – Portpatrick to Castle Kennedy; and
- The Southern Upland Way – Castle Kennedy to Bargrennan.

<sup>97</sup> VisitScotland (2022) Stranraer

<sup>98</sup> Air BnB (2022)

<sup>99</sup> Booking.com (2022)

<sup>100</sup> Dumfries and Galloway Council (2022)

<sup>101</sup> Walk Highlands – Dumfries and Galloway (2022)

## 12.6 Mitigation

### 12.6.1 Socio-Economics

Depending on the magnitude of effect determined in the EIAR assessment, some of the following mitigation measures may be proposed for the development.

#### 12.6.1.1 Construction

- An on-site borrow pit, which will minimise trips from the road network, thus reducing the impact upon tourist routes and facilities.
- Transportation of abnormal loads could be programmed to avoid peak hours on the road network, thus reducing delays and disruption. Deliveries could also aim to avoid clashing with any major events planned in the area.
- Construction activities would generally be limited to normal working hours to minimise noise and other impacts during recreational and leisure periods.
- Aiming to employ local workforce and procure goods and services locally wherever possible, to maximise local benefits.
- Contractors shall ensure ongoing safe access to all key cycling and walking routes and provide alternatives when feasible.

#### 12.6.1.2 Operation and Maintenance

It is expected that the proposal would create a beneficial effect through the employment opportunities created during construction, operation and decommissioning. However, to follow best working practice the developer will aim to procure goods and services locally wherever possible, to maximise local benefits.

The Applicant is committed to offering a package of community benefits to local communities that could include the opportunity for community organisations to benefit from the Proposed Development once operational. In addition, should the Proposed Development gain consent, a Community Benefit Fund (CBF) will be made available.

### 12.6.2 Tourism and Recreation

Public notices would be issued prior to the commencement of construction to inform local residents, recreational users and business of dates and duration of works. It is anticipated that access may be temporarily restricted for some areas surrounding works during the construction, operation and maintenance phases. In this case, alternative paths or access routes will be provided where possible.

## 12.7 Potential Significant Effects

The Proposed Development has the potential to have both beneficial and adverse impacts on socio-economics, recreation and tourism.

### 12.7.1 Socio-Economics

There is the potential for significant benefits on the local and regional economy during the construction and operation of the Proposed Development. This will be in the form of jobs, gross value added (GVA) contributions and increased use of local facilities during all phases of the development.

### 12.7.2 Tourism

It is anticipated that there will be no significant effects on tourism as a result of the Proposed Development. There is potential for some temporary adverse effects on tourist facilities during construction and maintenance phases of the Proposed Development. The construction and operation of the Proposed Development could affect the

accessibility and amenity of the tourist attractions and the availability of tourist accommodation. Improved access arrangements for tourist attractions may be considered as part of the Proposed Development, which may result in a beneficial effect. The possibility, and suitability, for incorporating such arrangements will be explored within the EIA Report.

### 12.7.3 Recreation

It is anticipated that there will be no significant effects on recreation as a result of the Proposed Development. There is the potential for temporary adverse effects on access to recreational facilities during the construction and operational maintenance activities of the Proposed Development. This would be due to temporary restrictions on the surrounding area. During the construction and operational maintenance phases, the amenity of recreational facilities and activities may be affected which may cause an adverse impact on user experience. Improved access arrangements for recreational facilities and activities may be considered as part of the Proposed Development, which may result in a beneficial effect. The possibility, and suitability, for incorporating such arrangements will be explored within the EIA Report.

## 12.8 Issues Scoped Out

No issues have been scoped out of the EIA Report assessment.

## 12.9 Questions for Council and Consultees

- **Q12/1:** Do you agree with the proposed approach for the chapter Socio-Economics, Recreation, and Tourism. This includes baseline data collection, prediction of effect, significant receptors and significance assessment?
- **Q12/2:** Are there any other receptors that should be included within the scope of the assessment?
- **Q12/3:** Should any other parties be consulted with for the purpose of these assessments?

# 13 Shadow Flicker

## 13.1 Introduction

This section of the report assesses possible shadow flicker impacts as a result of the proposed wind turbines at the Proposed Development.

Tall structures such as wind turbines cast shadows. The shadows vary in length according to the sun's altitude and azimuthal position. Under certain combinations of geographical position and time of day, the sun may pass behind the rotor of a wind turbine and cast a moving shadow over neighbouring properties. Where this shadow passes over a narrow opening such as a window, the light levels within the room affected will decrease and increase as the blades rotate, hence the shadow causes internal light levels to 'flicker' - an effect commonly known as 'shadow flicker'.

Whilst the moving shadow can occur outside, the shadow flicker effect is only considered for indoor receptors where the shadow passes over a window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. A single window in a single building is likely to be affected for a few minutes at certain times of the day for short periods of the year. The likelihood of this occurring and the duration of such an effect depend upon:

- The direction of the residence relative to the turbine(s);
- The distance from the turbine(s);
- The turbine hub-height and rotor diameter;
- The time of year;
- The proportion of time in which the turbine operates;
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and
- The prevailing wind direction.

The further the observer is from the turbine the less pronounced the effect will be. There are several reasons for this:

- There are fewer times when the sun is low enough to cast a long shadow;
- When the sun is low it is more likely to be obscured by either cloud on the horizon or intervening buildings and vegetation; and,
- The centre of the rotor's shadow passes more quickly over the land reducing the duration of the effect.

At a distance, the blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a weak effect is observed at a distance from the turbines.



## 13.2 Guidance

The Scottish Government's online planning guidance for renewable energy<sup>102</sup>, specifically the 'Onshore Wind Turbines' note last updated in October 2012, states that:

*"Where this (shadow flicker) could be a problem, developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem..."*

This has been appraised by ClimateXChange (2017)<sup>103</sup> on behalf of the Scottish Government in the 'Review of Light and Shadow Effects from Wind Turbines in Scotland', which concluded that the guidance is still relevant.

Department of Environment and Climate Change (DECC)<sup>104</sup> studies have shown that even in UK latitudes, shadows from wind turbines can only be cast approximately 130 degrees either side of north relative to the turbine due to the orientation of the earth's axis and the positioning of the sun. This leaves a region between 50 degrees either side of due south where a wind turbine will not cast a shadow; properties within this region will not experience shadow flicker effects, regardless of their distance from the turbine. While DECC has now been replaced by the Department for Business, Energy and Industrial Strategy (BEIS), which does not provide guidance on shadow flicker, these findings are still considered relevant.

## 13.3 Methodology

### 13.3.1 ReSoft WindFarm software

ReSoft Windfarm software has been used to model the shadow flicker effects of The Proposed Development. The program uses simple geometric considerations: the position of the sun at a given date and time; the size and orientation of the windows that may be affected; and the size of the turbine that may cast the shadows. The model assesses the maximum possible impact by assuming that:

- Turbines are facing the sun at all times of the day;
- It is always sunny;
- The turbines are always operating; and
- There is no local screening.

### 13.3.2 Modelling of Façades

Given that the glazed area is not known at every property, windows have been modelled conservatively. The approximate size and orientation of each modelled window is provided in **Table 13.1** below.

The orientation of each façade has been included in the model, measured in terms of degrees clockwise from north. This means, for example, that if a window faces due west it is 270 degrees clockwise from north.

### 13.3.3 Modifying Factors

The degree of shadow flicker impact that will typically occur in practice is always much less than the maximum possible flicker calculated by the model. Modifying factors take into account actual annual hours of sunlight for

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<sup>102</sup> Scottish Government (2014) *Online renewables advice*, <https://beta.gov.scot/publications/onshore-wind-turbines-planning-advice/>

<sup>103</sup> Review of Light and Shadow Effects from Wind Turbines, by ClimateXChange, commissioned by Scottish Government, 2017

<sup>104</sup> Update of UK Shadow Flicker Evidence Base, by PB Power, commissioned by DECC, 2011  
<http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20Energy%20supply/Energy%20mix/Renewable%20energy/ORED/1416-update-uk-shadow-flicker-evidence-base.pdf>

the area and hours of turbine operation. These factors have been applied to the modelling results in order to reach a more realistic estimate of shadow flicker impact that would typically occur in practice.

The modifying factors are derived from the following:

- The average sunlight hours for the local area have been taken as 1564 hours, based on meteorological data for West Freugh (14.5km south of the development)<sup>105</sup>. Therefore, on average, it is sunny for ~35% of the daylight hours.
- The rotor of a modern wind turbine can be expected to turn approximately 90% of the time.
- No adjustment has been made in regards to wind direction and it has been assumed that the turbines are always yawed such that flicker is possible.

Therefore, the realistic hours of flicker were estimated to be <31% of the theoretical maximum ( $0.35 \times 0.90 = 0.31$ ) but no account of wind direction had been made.

### 13.3.4 Assessment of the Impact

There is currently no standard UK Guidance on acceptable levels of shadow flicker. The only guidance that provides suggested levels is Northern Ireland’s Best Practice Guidance to Renewable Energy<sup>106</sup>, which recommends that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year. This document also comments that at distances greater than 10 rotor diameters, the potential for shadow flicker is very low. This position is based on research by Predac, a European Union sponsored organisation promoting best practice in energy use and supply which draws on experience from Belgium, Denmark, France, the Netherlands and Germany. In 2017, this research was reviewed by ClimateXChange<sup>13</sup> and remains an industry standard.

## 13.4 Baseline

Based on the guidance referenced above, a study area of 1620m around the proposed turbines has been considered (based on a maximum rotor diameter of 162m). Five residential properties have been identified within the shadow flicker study area as shown in **Figure 13.1** and detailed in **Table 13.1** below.

**Table 13.1 Potentially Sensitive Receptors Located within the study area**

Property Name	ID	Easting	Northing	Orientation of Façade 1 (degrees from north)	Window Dimensions	Orientation of Façade 2 (degrees from north)	Window Dimensions	Distance from development (m)
High Mark	H1	213404	570646	150	4m x 4m	330	4m x 4m	839
Dalnigap	H2	213382	570999	230	4m x 4m	No Glazing	No Glazing	822
Shennas	H3	212571	572019	140	4m x 4m	No Glazing	No Glazing	905
Penwhirn Dam (1)	H4	213396	569443	345	4m x 4m	255	4m x 4m	1199
Penwhirn Dam (2)	H5	213427	569458	345	4m x 4m	255	4m x 4m	1211

<sup>105</sup> <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcu2pdv8y>

<sup>106</sup> Best Practice Guidance to Planning Policy Statement 18: Renewable Energy, Department of the Environment (Northern Ireland), (2009). [https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy\\_0.pdf](https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy_0.pdf)

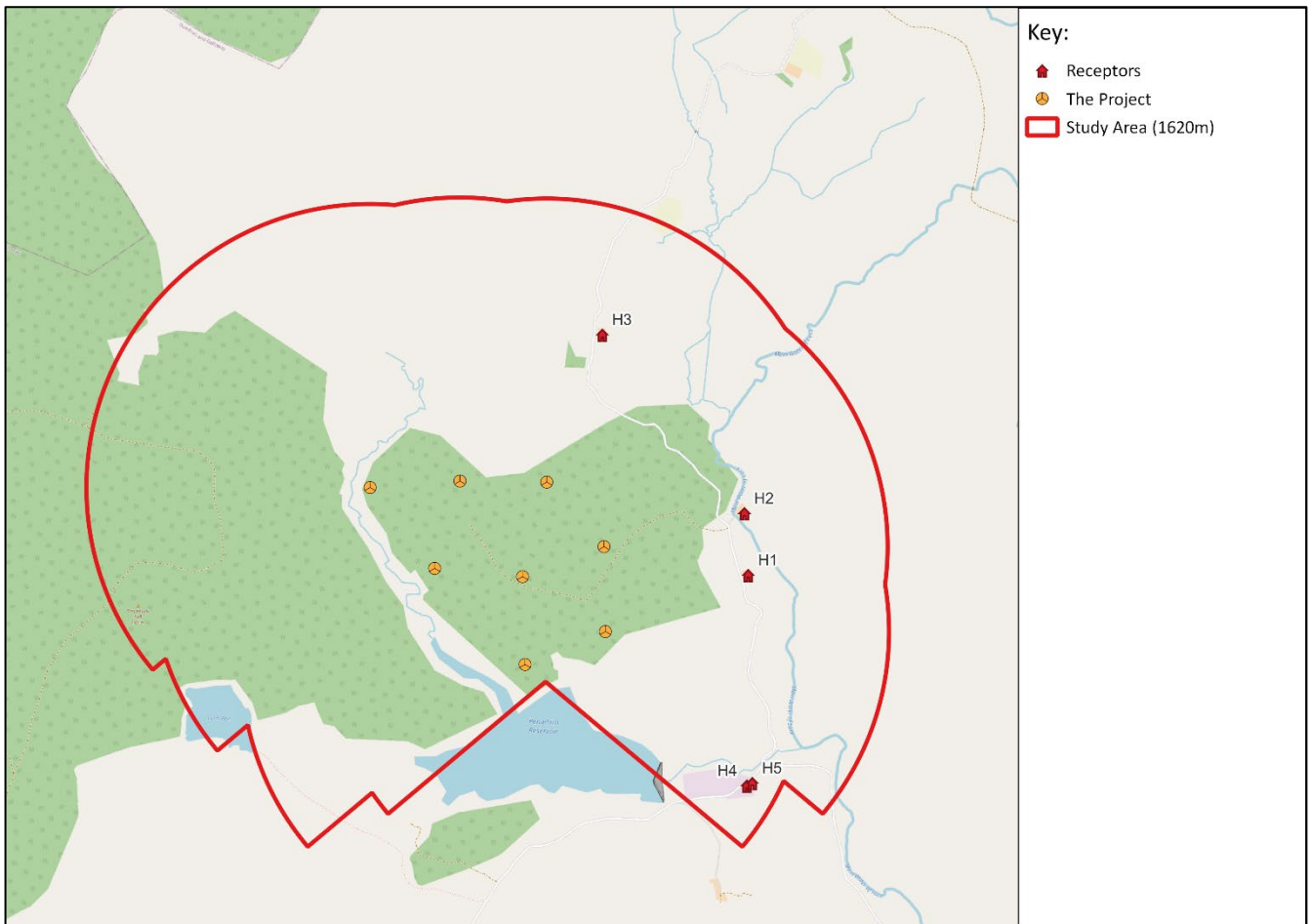
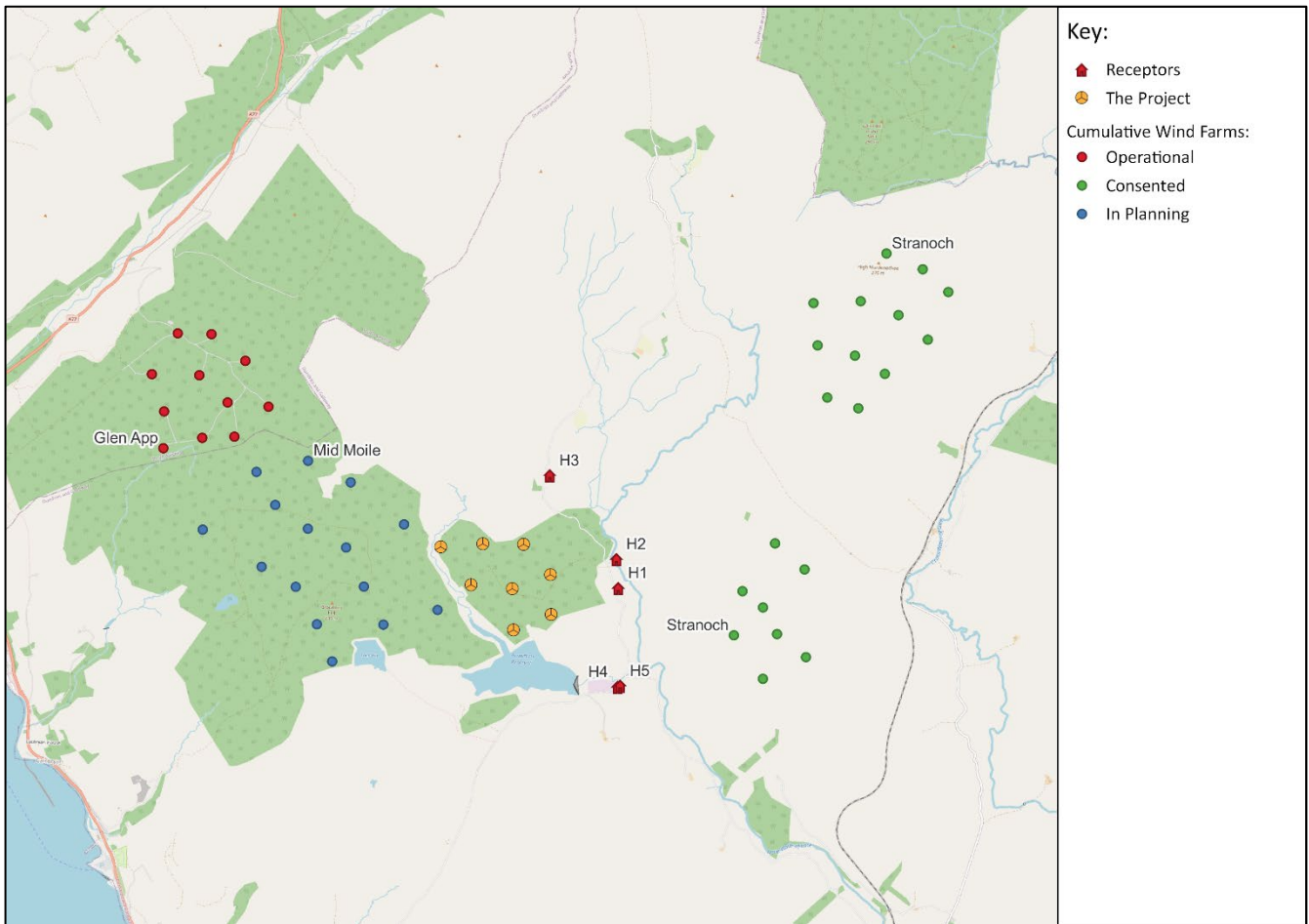


Figure 13.1 Shadow Flicker baseline map

### 13.4.1 Cumulative Wind Farms



**Figure 13.2 Cumulative Baseline Map**

The nearest operational wind farm is Glen App (12/01156/APPM). Third-party developments consented or currently in planning include: Stranoch (18/1612/S36) and Mid Moile (22/0394/S36). All properties within 10 rotor diameters of The Project turbines are greater than 10 rotor diameters away from all third-party developments.

As such, a cumulative impact assessment has not been conducted.

## 13.5 Potential Effects

The results for maximum possible flicker are presented as well as for times where modifying factors such as realistic climatic and operating conditions are considered. These are defined as follows:

**Table 13.2 Modelling Scenario Definitions**

Scenario	Description
<b>Theoretical maximum</b>	Total hours per year assuming the sun is always shining, the turbine is always operational and always yawed in a direction conducive to shadow flicker.
<b>Realistic scenario</b>	Total hours per year assuming average sunlight hours and lack of windiness as discussed in <b>Section 13.3.3</b> . In this scenario, it is still assumed that the turbine is yawed such that flicker is possible and that all wind directions are equally likely.

The realistic scenario is provided to give a real world estimate of the number of hours of flicker likely to be experienced over a year and to determine whether any flicker is potentially significant.

Maximum and realistic shadow flicker results for the Proposed Development are given in **Table 13.3**.

**Table 13.3 Maximum Annual and Realistic Annual Shadow Flicker Impacts for The Project**

Property Name	ID	Theoretical Maximum (hh:mm)	Realistic Scenario (hh:mm)	Potential Significance
High Mark	H1	169:48	53:11	Significant
Dalnigap	H2	116:00	36:20	Significant
Shennas	H3	86:00	26:56	Not Significant
Penwhirn Dam (1)	H4	28:53	9:03	Not Significant
Penwhirn Dam (2)	H5	32:06	10:03	Not Significant

The greatest shadow flicker impact is predicted to occur at H1, High Mark. This location, along with H2 has a realistic potential to exceed the recommended guidance of 30 hours per year and as such the effect could be significant. This suggests that more detailed assessment is required to understand the potential impacts and that mitigation may be required to ensure the project is acceptable in shadow flicker terms.

Once representative climatic and operational conditions are considered, the assessment predicted H3-5 to receive a shadow flicker impact of less than 30 hours per year. This is in line with the recommended guidelines and, therefore, significant shadow flicker impacts are not expected at these locations.

## 13.6 Mitigation

Thirty hours of actual shadow flicker is typically considered the threshold at which the effect has the potential to become unacceptable<sup>107</sup>. A prediction of more than 30 hours of potential flicker does not guarantee that this amount of flicker would be experienced at the property – how the property is used may have a material impact in mitigating the predicted flicker.

When realistic climatic factors are considered, two properties have the potential to receive more than 30 hours of shadow flicker impact per year.

This ‘realistic’ scenario is conservative in the respect that the window sizes initially modelled are larger than the actual windows. Refining this would be likely to lower the predicted flicker.

<sup>107</sup> Best Practice Guidance to Planning Policy Statement 18: Renewable Energy, Department of the Environment (Northern Ireland), (2009). [http://www.planningni.gov.uk/index/policy/policy\\_publications/planning\\_statements/planning\\_policy\\_statement\\_18\\_renewable\\_energy\\_best\\_practice\\_guidance.pdf](http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_18_renewable_energy_best_practice_guidance.pdf)

The 'realistic' scenario also assumes that all wind directions are equally likely. In practice, south-westerly winds are expected to dominate. Incorporating this into the model is likely to reduce the predicted flicker at H1, H4 and H5, though it may increase the predicted flicker at H2 and H3.

Operational mitigation involves programming the turbines to automatically shut-down when environmental conditions are conducive to shadow flicker at affected properties. The turbines would be equipped with a light level sensor, which would be used to ensure that each turbine only shuts down during periods of sufficient light to generate shadow flicker. It is common for planning conditions to be attached to wind farm consents requiring this.

Finally, it should be noted that following this scoping process, the layout may be refined and it may be possible to mitigate the potential for flicker to some degree through turbine siting as part of the overall design process.

## 13.7 Conclusion

It has been shown that potential shadow flicker impact due to The Proposed Development would not be significant at three locations, H3-5. Two locations, H1-2, are predicted to exceed the recommended guidance which highlights the need for a detailed impact assessment to be conducted.

Due to the distance between third party turbines and receptors potentially affected by The Project, cumulative impact is not likely to occur.

It is therefore proposed that any subsequent EIAR should focus solely on impacts arising from The Proposed Development and cumulative shadow flicker impact can be **scoped out** of further assessments.

## 13.8 Key Questions for Council and Consultees

**Q7/1:** Do the Council and consultees agree with the methodology used to assess potential shadow flicker impacts and the threshold for significant impact?

**Q7/2:** Do the Council and consultees agree that provided no receptor falls within 10 rotor diameters of both The Project and a neighbouring development, cumulative shadow flicker can be scoped out of the EIA?

**Q7/3:** Do the Council and consultees agree that shadow flicker can be suitably managed via planning condition?

## 14 Aviation and Radar

This section considers the issues and potential concerns associated with aviation and radar, resulting from the Proposed Development during the construction, operation and decommissioning phases. The Proposed Development has the potential to cause a variety of adverse effects on aviation during wind turbine operation only. There include but are not limited to:

- Physical obstruction;
- Generation of unwanted returns on Primary Surveillance Radar (PSR); and
- Adverse effects on overall performance of Communications, Navigations and Surveillance (CNS) equipment.

An initial impact assessment has been conducted and determined that the Proposed Development will impact the MOD range radar at West Freugh. No other radars in the area are affected.

There are no impacts expected to navigational aids, radio stations or weather radar.

### 14.1 Policy, Legislation and Guidance

Civil Aviation Authority (CAA) guidance, within CAP 764 (CAA Policy and Guidance on Wind Turbines), sets out recommended consultation and assessment criteria for the impacts of wind turbines on all aspects of civil aviation.

The CAA involvement in the Wind Farm Pre-Planning Consultation Process has ceased; CAP 764 now states that “developers are required to undertake their own pre-planning assessment of potential civil aviation related issues” and that “it is incumbent upon the developer to liaise with the appropriate aviation stakeholder to discuss – and hopefully resolve or mitigate – aviation related concerns without requiring further CAA input.”

The primary planning policy document is the Scottish Planning Policy document (SPP), which states a requirement to assess impacts on aviation, other defence matters and seismological recording. As well as this primary document reference will be made, where appropriate to:

Scottish Onshore Wind Policy Statement, December 2017, notes the potential impacts of wind developments, especially on radar, mitigation methods and suggests longer term strategic direction towards self-management of the issues by the aviation sector to reduce the financial burden on the wind energy sector;

CAA guidance, within CAP 764 (CAA Policy and Guidance on Wind Turbines), sets out recommended consultation and assessment criteria for the impacts of wind turbines on all aspects of civil aviation;

CAA CAP 393, The Air Navigation Order and Regulations, specifies the statutory requirements for the lighting of onshore wind turbines over 150 m tall;

Planning Circular 2/03, Safeguarding of Aerodromes, Technical Sites and Military Explosives Storage Areas, contains annexes which describe the formal process by which planning authorities should take into account safeguarding, including in relation to wind energy developments.

As a statutory consultee, the Ministry of Defence (MOD) will be consulted through the scoping application. They publish a guidance document called ‘Wind farms: MOD safeguarding’, Updated 21 Jul 2021. The MOD wind energy team liaises with a broad range of experts to formulate a comprehensive MOD response. Where the MOD has concerns about a development, the team will work with the developer to look for ways to mitigate them.

### 14.2 Proposed Assessment Methodology

The impact assessment aims to identify all stakeholders potentially affected by the Proposed Development. This involves considering all military and civil aerodromes in the wider area out to circa 60 km, all radar installations out to the limit of their range, all navigational aids, air-ground-air communications stations and low flying activities.



The acceptability of the Proposed Development, in terms of net effects on aviation related interests, is established through direct consultation with all relevant stakeholders within the consenting process. The initial task is to independently assess the potential effects and, where significant effects may occur, to enter into a dialogue with the affected stakeholders. Where impacts are of concern additional analysis may be required and where impacts are deemed unacceptable, further mitigation solutions would be identified and explored with the goal of reducing impacts to acceptable levels. While the aim of this dialogue is to avoid objection from all stakeholders before full submission, this is not always possible where stakeholders will only engage once the application has been submitted.

An obstacle lighting scheme will be designed to minimise the visual impacts. Approval for a lighting scheme will be sought from the CAA, having consulted with local airspace users such as the MOD and Scottish Air Ambulance and Police Services.

### 14.3 Potential Effects and Baseline Conditions

The site lies within the West Freugh Range danger area denoted D402B, effective from surface to 3000ft. This has occasional use, notified through NOTAMs. It is beyond the limits, to the west of the military Tactical Training Area depicted TTA 20T, used for low flying training. The extent of turbine development in this area provides a strong case history of impacts being considered as manageable and acceptable to military and civil airspace users. Most notably the Stranoch 2 wind farm, just over 2km east of the site, received no objection responses, including that of the MOD, noting a requirement for aviation lighting.

The site lies beyond the physical safeguarding limits for all civil and military aerodromes. It is not visible to any other military or civil radar.

Because the turbines are over 150m tall, there is a statutory requirement for visible aviation obstacle lighting, operational between dusk and dawn. In addition to this infra-red lighting will be fitted to manage impacts to military low flying.

Overall all aviation impacts are considered to be manageable with the mitigation identified above in place.

### 14.4 Questions for Council and Consultees

- **Q13/1** Do the Council and consultees agree with the proposed methodologies?
- **Q13/2** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- **Q13/3** Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessments?



# 15 Telecommunications

## 15.1 Introduction

Wind farms have the potential to interfere with point-to-point microwave links such as fixed link telecommunications infrastructure. This section considers the following potential interference from the Proposed Development:

- Physical Obstructions;
- Adverse effects on overall performance of Communications;
- Interfere with electro-magnetic signals and potentially affecting television reception and fixed telecommunication links.

### 15.1.1 Policy and Legislation

Guidance for assessing the potential impact of wind turbines on infrastructure is given in:

- Scottish Government (2014) 'Scottish Planning Policy, Subject Policy: Development Management';
- Ofcom (2009) 'Tall Structures and their Impact on Broadcast and other Wireless Systems';
- BBC & Ofcom (2006) 'The Impact of Large buildings and Structures, including Wind Farms, on Terrestrial Television Reception';
- Healthy and Safety Executive – GS 6 (2012) 'Avoiding Danger from Overhead Powerlines';
- Healthy and Safety Executive – HSG 47 (2014) 'Avoiding Danger from Underground Services'.

The potential effects of the Proposed Development will be assessed with reference to these documents.

## 15.2 Methodology

As a general rule wind developments will seek to avoid impacts on telecommunication infrastructure where possible. Consultation will be undertaken with appropriate stakeholders to identify any potential impacts and discuss appropriate mitigation should effects be identified.

## 15.3 Telecommunications

Wind farms produce electromagnetic radiation which has the potential to interfere with broadcast communications and signals. In order to determine the potential impact of the Proposed Development, initial consultation will be undertaken with the following consultees:

- Ofcom;
- Joint Radio Company Windfarm Co-ordinations;
- Atkins Global;
- British Telecom;
- Vodafone;
- EE; and
- O2.

The potential for a significant impact on any fixed radio links within the vicinity of the site will be determined through consultation with these key stakeholders.

## 15.4 Television

Since the digital switchover was completed the potential impacts on television signals from wind farm developments has been significantly reduced as these digital signals are much better at coping with the signal reflections which could cause ghosting effects on an analogue signal.

However, if the development is found to cause interference to TV signals there are a number of options available to mitigate the effects, such as re-aligning the aerial or installing a satellite dish. As potential television reception problems are difficult to predict and identify, assurance that the developer will rectify any problems is normally formalised in a planning condition which is now fairly standard practice with approved wind applications.

## 15.5 Baseline

From initial consultation with Ofcom Spectrum information portal on 05/07/2022, there appears to be no fixed links within the site of Proposed Development. However, because not all microwave links are published, system operators will be individually consulted to ensure there are no impacts on unregistered or presently planned fixed links. The potential impact on these will be assessed and mitigation proposed as required. In the first instance, the mitigation will be to design the Proposed Development to avoid the telecommunication links, however, where unavoidable, the telecommunication link operator will be contacted directly in relation to the acceptance of the proposal.

## 15.6 Mitigation

In the event that a significant impact on a telecommunication link is identified, the first mitigation will be to seek to avoid any direct impacts by micrositing the wind turbines. Where micrositing does not mitigate the potential impacts, a more detailed impact assessment will be undertaken using Fresnel Zone calculations to ascertain the potential for interference on the link resulting from the proposed wind turbines. In cases where these mitigation proposals are not acceptable to the link operator, it may be possible to re-route the link, at the developer's expense, to follow a different communications tower, avoiding the impact from the Proposed Development.

## 15.7 Summary

The proposed development may give rise to some significant effects upon telecommunication links. As such, a full assessment of the potential impacts will be **scoped in** to the EIA.

## 15.8 Key Questions for the Council / Consultees

- **Q10/1** Do the Council and consultees agree with the proposed methodology?
- **Q10/2** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- **Q10/3** Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?

## 16 Carbon Balance

### 16.1 Introduction

This chapter considers the potential impact of the Proposed Development on climate change. The UK and Scottish Governments have developed ambitious targets for tackling climate change:

- The UK Government, in the 2008 Climate Change Act made a commitment to reduce the UK's emissions of CO<sub>2</sub> by 34% (on 1990 levels) by 2020 and 80% by 2050.
- The Climate Change (Scotland) Act 2009 set in statute the Government's Economic Strategy target to reduce Scotland's emissions of greenhouse gases by 80% by 2050 (on 1990 levels), with an interim reduction target of at least 42%.
- Scotland has set a target of becoming net zero by 2045. With a new legally binding target for 2030 of a 75% reduction in emissions compared to 1990.<sup>108</sup>
- The UK Government amended the Climate Change Act of 80% reduction, to 100% reduction by 2050.<sup>109</sup> These targets will be achieved through an investment in energy efficiency and clean technologies such as renewable energy generation.

In June 2019, Dumfries and Galloway agreed to declare a Climate Emergency. This included a commitment to make the Council's activities net zero by 2025. The Council's Carbon Neutral Strategic Plan outlines the commitment to lead on the transition to cleaner and greener technologies with the significant increase in renewable generation.<sup>110</sup>

Renewable electricity generated by wind turbines is already considered to be the cheapest form of new electricity generation<sup>111</sup> and as such, has a vital role to play in achieving the ambitious targets set by both the Scottish and UK Governments.

The manufacturing, construction, and installation of the wind turbines on site has an associated carbon cost, and carbon losses are also generated by the requirement for extra capacity to back up wind power generation. Carbon losses associated with reduced carbon fixing potential and loss of soil organic matter occurs through the excavation of peat for construction and drainage effects.

Turbine blades currently make up approximately 13% of the carbon impact of a wind turbine, and are the hardest section of the turbine to be recycled. However, there are options for recycling or disposal, such as burning the epoxy, which generates energy, that can be recovered. The residues from the fibreglass incineration can be used in other secondary applications such as cement production. The carbon cost of the blades are incorporated into the lifecycle emission of the turbine.<sup>112</sup>

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<sup>108</sup> <https://www.legislation.gov.uk/asp/2019/15/section/1/enacted> (Accessed June 2022)

<sup>109</sup> <https://www.legislation.gov.uk/ukpga/2008/27/section/1> (Accessed June 2021)

<sup>110</sup> <https://www.dumgal.gov.uk/article/21773/Climate-Emergency> (Accessed June 2022)

<sup>111</sup> <https://www.renewableuk.com/general/custom.asp?page=WindEnergy> – (Accessed June 2022)

<sup>112</sup> <https://www.siemensgamesa.com/-/media/siemensgamesa/downloads/en/products-and-services/offshore/brochures/siemens-gamesa-environmental-product-declaration-epd-sg-8-0-167.pdf> (Accessed June 2022)

## 16.2 Guidance

To provide the carbon calculations for the assessment, the Scottish Government's Carbon Calculator Tool V1.6.1<sup>113</sup> will be used to inform the discussion in the EIA Report chapter. Details of the carbon calculator input data, their sources, and results for the expected, maximum and minimum (best and worst case) scenarios can be viewed online via a link and reference provided.

### 16.2.1 Electricity Mix

The UK electricity factor is prone to fluctuate from year to year as the fuel mix consumed in UK power stations (and auto-generators) and the proportion of net imported electricity changes.

These annual changes can be large as the factor depends very heavily on the relative prices of coal and natural gas as well as fluctuations in peak demand and renewables.

In the 2019 greenhouse gas (GHG) Conversion Factors, there was a 10% decrease in the UK Electricity CO<sub>2e</sub> factor compared to the previous year. In the 2020 update, the CO<sub>2e</sub> factor decreased again by 9% (compared with 2019). In the 2021 update, the CO<sub>2e</sub> factor has again decreased by 9% (in comparison to the 2020 update). The above decreases are all due to a decrease in coal use in electricity generation and an increase in renewable generation.<sup>114</sup>

The most recent emissions factor for 2021 grid mix electricity is 0.21tCO<sub>2</sub> per MWh.

## 16.3 Methodology

Once a design has been established and the excavation and construction parameters obtained, the Carbon Calculator will present results based on the input variables entered. The data delivered will inform the quantity of tCO<sub>2</sub> eq over its lifetime. The following activities will be calculated from the calculator:

- Losses due to turbine life (e.g. manufacture, construction, decommissioning)
- Losses due to backup
- Losses due to reduced carbon fixing potential
- Losses from soil organic matter
- Losses due to DOC & POC leaching
- Losses due to felling forestry

## 16.4 Baseline

The Proposed Development is situated in an area of forestry, mainly consisting of Class 5 peat. Following a peat probing assessment of the site, areas of deep peat have the potential to be discovered, mitigation will be put in place if required. Therefore, there will be minimal extraction of carbon-rich soil.

The turbines are anticipated to have a generation capacity of up to 6MW and the proposed development consists of eight turbines, giving an overall site capacity of up to 48MW. This generation will positively contribute to meeting local and national renewable energy targets by producing clean energy to be distributed to the local grid network.

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<sup>113</sup> <https://informatics.sepa.org.uk/CarbonCalculator/index.jsp> - (Accessed June 2022)

<sup>114</sup> <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021> - (accessed June 2022)

## 16.5 Mitigation

Given the Proposed Development will reduce the CO<sub>2</sub> released by the electricity generation system as well as the avoidance of any significant removal or disturbance of peatlands, it is not considered that any mitigation will be required.

The Applicant will seek to incorporate any additional enhancements at the construction phase with their appointed contractor through the provision of a Construction and Environmental Management Plan (CEMP), to be agreed during the discharging of planning conditions. The document will be produced in line with best practice guidance and appropriate consultation with key stakeholders.

## 16.6 Summary

Given the current challenges to deliver net-zero in the timescales outlined by The Scottish Government, it is considered that the Proposed Development will deliver an overall positive effect on carbon savings, contributing to the decarbonisation of the electricity sector in Scotland - there will be low levels of emissions produced during construction and net emissions savings over the life of the turbines. Therefore, the Carbon Balance should be **scoped in** to the EIA.

## 16.7 Key Questions for the Council/Consultees

- **Q15/1** Do the Council and consultees agree with the proposed methodology?
- **Q15/2** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- **Q15/3** Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?

## 17 Forestry

A forestry assessment will be undertaken in line with relevant guidance such as the following:

- Forestry and Land Management (Scotland) Act 2018
- Scotland's Forestry Strategy 2019 – 2029
- The Land Use Strategy for Scotland 2016 – 2021
- Third National Planning Framework
- Scottish Planning Policy
- Control of Woodland Removal Policy
- Dumfries and Galloway Council Local Development Plan 2 – Trees and Development, Supplementary Guidance, February 2020

The forestry assessment will include a wind farm forest plan which will detail felling and replanting proposals, permitted woodland loss and compensatory planting on or off-site. The assessment will be undertaken by a qualified forestry consultant.

## 18 Other

### 18.1 Introduction

This section of the Scoping Report sets out the proposed approach in respect to the 'Other Issues' assessments that are required in order to provide a comprehensive assessment of the potential environmental impacts of the Proposed Development.

Other Issues include:

- Air Quality;
- Population and Human Health;
- Major Accidents and Disasters;
- Material Assets;

### 18.2 Air Quality

The Proposed Development will reduce demand for fossil fuels electricity generation and will support the transition to a low carbon energy system. The Site is not located near an Air Quality Management Area and operational emissions to air, water and soil are anticipated to be negligible given the nature of the Proposed Development. The only likely emission to the air caused by the Proposed Development would be from construction traffic. Given the rural nature of the Site and the potential access routes to be used and low levels of existing air pollution, construction of the Proposed Development is not considered to lead to traffic levels that would emit air pollution that would approach any relevant limit values.

A construction environmental management plan (CEMP) will be prepared and agreed with the Council prior to construction commencing. The CEMP will contain standard industry good practice mitigation regarding emissions during construction that will be put into practice. No significant air quality effects are anticipated, and it is proposed that an assessment of air quality impacts is **scoped out** of the EIA.

### 18.3 Population and Human Health

The Proposed Development will be designed and maintained in accordance with all relevant industry guidelines, standards and regulations including those pertaining to safeguarding the risk to human health. This includes the design and siting of wind turbines at an appropriate distance from sensitive receptors such as roads, core paths and residences. This will minimise the risk to human health during operation. Risks associated with ice build-up, lightning strike and structural failure are removed or reduced through the wind turbine manufacture and guidance on construction procedures.

As the Proposed Development is a non-emitting development, it is considered that it will not present a risk to human health from an emissions perspective. There will be some greenhouse gas and dust emissions during construction and decommissioning, but appropriate air quality and dust management measures will be put in place via the CEMP. As a result, emissions are not considered to present a risk to human health.

There is potential for impacts to the local population in relation to amenity. These will be included as part of the relevant assessments and reported accordingly. This includes the following:

- Visual Impacts (landscape and visual impact assessment);
- Residential and Settlements (landscape and visual impact assessment);
- Noise;

- Shadow Flicker;
- Private Water Supplies (Hydrology and Hydrogeology chapter);
- Traffic and Transportation; and
- Socio-Economics

Given the absence of potential significant effects on human health from emissions and the capture of other population and human health issues in other technical assessments, a stand alone Population and Human Health chapter is proposed to be **scoped out** of the EIA.

## 18.4 Major Accidents and Disasters

The EIA Regulations state that an EIA must identify, describe and assess in an appropriate manner, the expected effects deriving from the vulnerability of the Proposed Development to risks, so far as relevant to the Development, of major accidents and natural disasters.

Renewable energy development has an exemplary safety record, with stringent best practice guidance to minimise risk during the construction, operation and decommissioning phases of the Proposed Development.

During the construction phase, the Site will be under supervision of a suitably qualified team, governed by Health and Safety legislation and best practices. This will include the induction of all staff to the Site and publication of all appropriate H&S practices applicable to the working site.

Climate change is considered in **Section 16** of this Scoping Report. It is considered that the Proposed Development will deliver an overall positive effect on carbon savings and will contribute to the decarbonisation of the electricity sector.

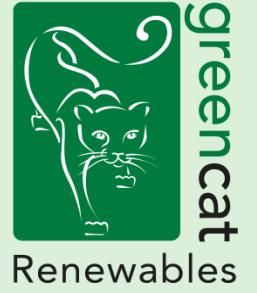
Flood risk will be addressed in the Hydrology and Hydrogeology assessment of the EIA Report.

Given the Proposed Development is not located in an area that is known to be prone to natural disasters, and climate change and flooding risk will be covered in others chapters it is considered that a stand alone chapter for this topic is not required and is therefore **scoped out** of the EIA.

## 18.5 Material Assets

Considering the nature and scale of the Proposed Development, significant effects on material assets are not anticipated. The manufacturing or construction of the Proposed Development is not anticipated to result in significant use of primary or secondary materials; existing access tracks will be used where possible and borrow pits, where required, will be sought on site to avoid the need to import materials. There would be negligible waste generation during construction, and this would be minimised through controls to minimise material use and water generation which will be included with a CEMP which will be prepared and implemented prior to construction commencing. During operation, material resource use and waste generation is anticipated to also be negligible and concern routine maintenance of the wind turbines only. As such, it is therefore proposed that this topic is **scoped out** of the EIA Report.





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