



Cloud Hill Wind Farm

Volume 1 EIA Report

August 2023

Project No.: 0669769

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Acronyms and Abbreviations

Abbreviation	Expanded Term
AMP	Access Management Plan
AOD	Above Ordnance Datum
ASAs	Archaeologically Sensitive Areas
BBPP	Breeding Bird Protection Plan
BDMP	Bird Disturbance Management Plan
BEMP	Biodiversity Enhancement Management Plan
BESS	Battery Energy Storage System
BoCC	Birds of Conservation Concern
BPA	Borrow Pit Assessment
BTO	British Trust for Ornithology
CA	Conservation Area
CAA	Civil Aviation Authority
CCC	Committee on Climate Change
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CLVIA	Cumulative Landscape and Visual Impact Assessment
CMS	Construction Management Statement
CO ₂	Carbon Dioxide
COP26	26 th Conference of the Parties
CRAA	Collision Risk Analysis Area
CRM	Collision Risk Model
CSA	Core Study Area
DBA	Desk Based Assessment
DGC	Dumfries and Galloway Council
DGLDP	Dumfries and Galloway Local Development Plan
DGWLCS	Dumfries and Galloway Windfarm Landscape Capacity Study
DIA	Drainage Impact Assessment
DMP	Drainage Management Plan
EALWCS	East Ayrshire Landscape Wind Capacity Study
EASA	European Aviation Safety Agency

Abbreviation	Expanded Term
ECoW	Ecological Clerk of Works
ECU	Energy Consents Unit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EU	European Union
FRA	Flood Risk Assessment
GDL	Garden and Designed Landscape
GHG Emissions	Greenhouse Gas Emissions
GIS	Geographic Information System
GRP	Glass Reinforced Plastic
GW	Gigawatts
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HA	Heritage Asset
HEPS	Historic Environment Policy for Scotland
HER	Historic Environment Record
HES	Historic Environment Scotland
HGV	Heavy Goods Vehicle
HRA	Habitats Regulation Appraisal
ICAO	International Civil Aviation Authority
IEF	Important Ecological Feature
IEMA	Institute of Environmental Management
IOF	Important Ornithological Feature
kV	Kilovolts
LB	Listed Building
LCT	Landscape Character Type
LCU	Landscape Character Units
LLA	Local Landscape Area
LVIA	Landscape and Visual Impact Assessment
MCIfA	Member of Chartered Institute for Archaeologists
m/s	Metres Per Second

Abbreviation	Expanded Term
MW	Megawatt
NBN	National Biodiversity Network
NCFT	Nith Catchment Fishery Trust
NCI	Nature Conservation Importance
NDC	Nationally Determined Contribution
NDSFB	Nith District Salmon Fisheries Board
NHZ	Natural Heritage Zone
NPF4	National Planning Framework 4
NSA	National Scenic Area
NTS	Non-Technical Summary
NVC	National Vegetation Classification
oBEMP	Outline Biodiversity Enhancement Management Plan
oHMP	Outline Habitat Management Plan
OS	Ordnance Survey
oWCEMP	Outline Water Construction Environmental Management Plan
OWPS	Onshore Water Planning Statement
PAN	Planning Advice Note
PMP	Peat Management Plan
PWS	Private Water Supply
PWSRA	Private Water Supply Risk Assessment
RLB	Red Line Boundary
RSA	Regional Scenic Area
RSPB	Royal Society for the Protection of Birds
RVAA	Residential Visual Amenity Assessment
S36	Section 36
SAC	Special Area of Conservation
SALWCS	South Ayrshire Landscape Wind Capacity Study
SBL	Scottish Biodiversity List
SCADA	Supervisory Control and Data Acquisition
SG	Supplementary Guidance
SLLCS	South Lanarkshire Landscape Capacity Study for Wind Energy
SM	Scheduled Monument
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPEN	Scottish Power Energy Networks

Abbreviation	Expanded Term
SPP	Species Protection Plan
SSSI	Site of Special Scientific Interest
SUW	Southern Upland Way
TCC	Temporary Construction Compound
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
UNFCCC	United Nations Framework Convention on Climate Change
V	Volts
VP	Vantage Point
WCEMP	Water Construction Environmental Management Plan
WECLCCI	Wind Energy Consultancy: Landscape Capacity and Cumulative Impact
WFD	Water Framework Directive
WHS	World Heritage Site
WLA	Wild Land
ZTV	Zone of Theoretical Visibility

Glossary

AGL: Above Ground Level

Background Noise: The background noise level is the underlying level of noise present at a particular location for the majority (usually 90%) of a period of time. As such it excludes any short-duration noises, such as individual passing cars (but not continuous traffic), dogs barking or passers-by. Sources of background noise typically include such things as wind noise, traffic and continuously operating machinery (e.g., air conditioning or generators).

Decibel (dB): The decibel is the basic unit of noise measurement. It relates to the cyclical changes in air pressure created by the sound (Sound Pressure Level) and operates on a logarithmic scale, ranging upwards from 0 dB. 0 dB is equivalent to the normal threshold of human hearing at a frequency of 1000 Hz. Each increase of 3 dB on the scale represents a doubling in the Sound Pressure Level, and is typically the minimum noticeable change in sound level under normal listening conditions. For example, while an increase in noise level from 32 dB to 35 dB represents a doubling in sound pressure level, this change would only just be noticeable to the majority of listeners.

dB(A): Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible frequencies. The ear is most sensitive in the middle range of frequencies (around 1000-3000 Hertz (Hz)), and less sensitive at lower and higher frequencies. The A-weighted noise level is derived by analysing the level of a sound at a range of frequencies and applying a specific correction factor for each frequency before calculating the overall level. In practice this is carried out automatically within noise measuring equipment by the use of electronic filters, which adjust the frequency response of the instrument to mimic that of the ear.

Frequency: The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the number of cycles (vibrations) per second.

Noise Emission: The sound power level emitted from a given source.

Noise Immission: The sound pressure level detected at a given location (e.g. nearest dwelling).

L_{A90,t}: This term is used to represent the A-weighted sound pressure level that is exceeded for 90% of a period of time, t. This is used as a measure of the background noise level.

L_{Aeq,t}: This term is known as the A-weighted equivalent continuous sound pressure level for a period of time, t. It is similar to an average, and represents the sound pressure level of a steady, continuous noise which has the same energy as the actual measured noise.

Low-frequency noise: Noise at the lower end of the range of audible frequencies (20 Hz – 20 kHz). Usually refers to noise below 250 Hz. Should not be confused with infrasound, which is sound below the lowest normally audible frequency, 20 Hz.

Noise: Unwanted sound. May refer to both natural (e.g. wind, birdsong etc.) and artificial sounds (e.g. traffic, noise from wind turbines, etc.).

Noise-sensitive receptors: Locations that may potentially be adversely affected by the addition of a new source of noise (typically residential dwellings).

Sound power (W): The sound energy radiated per unit time by a sound source, measured in watts (W).

Sound power level (L_w): Sound power measured on the decibel scale, relative to a reference value (W₀) of 10-12 W.

Sound pressure (P): The fluctuations in atmospheric pressure relative to atmospheric pressure, measured in Pascals (Pa).

Sound pressure level (Lp): Sound pressure measured on the decibel scale, relative to a sound pressure of 2×10^{-5} Pa.

Tonal element: A characteristic of a sound where the sound pressure level in a particular frequency range is greater than in those frequency ranges immediately above higher or lower. This would be perceived as a humming or whining sound.

Vibration: In this context, refers to vibration carried in structures such as the ground or buildings, rather than airborne noise.

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1. INTRODUCTION

1.1 Purpose of the EIA Report

Cloud Hill Windfarm Ltd (the Applicant) has applied to the Scottish Ministers for consent under Section 36 of the Electricity Act 1989 (s36 consent) to construct and operate a wind farm known as Cloud Hill Wind Farm (hereafter referred to as ‘the Proposed Development’), located approximately 4.5 km south of Sanquhar, and approximately 4 km south-east of Kirkconnel, in the Dumfries and Galloway Council Area (Central Grid Reference 274802, 606254). The installed capacity of the proposed generating station would be over 50MW, comprising up to 11 turbines, with a maximum blade tip height of up to 180 metres, a Battery Energy Storage Facility (BESS) and ancillary infrastructure. Based on the anticipated generating capacity, the Homes Powered Equivalent for the Proposed Development has been calculated as 59,359.3 homes¹.

The Proposed Development has been subject to Environmental Impact Assessment (EIA).

The Applicant has also applied for a direction under Section 57(2) of the Town and Country Planning (Scotland) Act 1997 that planning permission for the development be deemed to be granted².

The Applicant seeks s36 consent and deemed planning permission to operate the Proposed Development for a period of no less than 35 years.

The Applicant also seeks direction under Section 58(1)b of the Town and Country Planning (Scotland) Act 1997 as amended, that deems planning permission lapses if the development has not begun within a period of 5 years.

This EIA Report has been prepared to accompany the application made by the Applicant, for consent to construct and operate the Proposed Development. The location of the Site is presented in **Volume 2a, Figure 1.1**.

This EIA Report sets out the findings of the EIA undertaken for the Proposed Development, which has been carried out in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended (the EIA Regulations)³.

As required by the EIA Regulations, this EIA Report presents information on the likely significant environmental effects which may occur as a result of the Proposed Development. The EIA Report also informs the reader of the nature of the Proposed Development and the measures proposed to protect the environment during site preparation, construction, operation and decommissioning.

This Chapter of the EIA Report is supported by the following figures and those provided in **Volume 2a – Figures excluding Landscape and Visual Impact Assessment (LVIA)**:

- **Figure 1.1:** Site Location;
- **Figure 1.2:** Site Boundary Plan; and
- **Figure 1.3:** Application Layout.

For the purposes of this EIA report, the following terminology can be defined as:

- The Proposed Development – refers to all infrastructure (turbines, BESS & ancillary elements) that will be constructed as part of this application (**Figure 1.3**); and
- The Site – everything within the red line boundary (RLB) as shown on **Figure 1.2**.

¹ Based on RenewablesUK methodology available at: [https://www.renewableuk.com/page/UKWEDEExplained/Statistics-Explained.htm#:~:text=Homes%20Powered%20Equivalent%20\(p.a.\)&text=RenewableUK%20calculates%20homes%20powered%20as,electricity%20consumption%20expressed%20in%20MWh](https://www.renewableuk.com/page/UKWEDEExplained/Statistics-Explained.htm#:~:text=Homes%20Powered%20Equivalent%20(p.a.)&text=RenewableUK%20calculates%20homes%20powered%20as,electricity%20consumption%20expressed%20in%20MWh). (accessed 20/08/2023).

² Scottish Government (2022) The Town and Country Planning (Scotland) Act 1997 as amended Town and Country Planning (Scotland) Act 1997 (legislation.gov.uk) (Accessed 17/07/2023)

³ Scottish Government (2017) The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 <http://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 08/03/2023)

1.1.1 Access to the EIA Report

A copy of the application, with a plan showing the land to which it relates, together with a copy of this EIA Report, discussing the Applicant's proposals and presenting an analysis of the environmental implications, is available for public inspection, free of charge, on the application website <https://www.baywa-re.co.uk/en/wind/cloud-hill-windfarm> or on the Scottish Government Energy Consents website at www.energyconsents.scot under application reference **ECU00003461**.

Members of the public can also view the application submission, free of charge, at the following locations and times as of August 2023:

- Kirkconnel Parish Heritage Society Office, 40 Main Street, Kirkconnel DG4 6NB:
 - Monday, Tuesday and Thursday: 9am – 5pm;
 - Wednesday: 9am – 12noon; and
 - Friday, Saturday and Sunday: Closed
- DC Customer Services – Sanquhar Library, 100 High Street, Sanquhar, DG4 6DZ;
 - Tuesday: 9am – 12noon;
 - Wednesday and Friday: 9am – 12noon and 1pm – 5pm; and
 - Monday, Thursday, Saturday and Sunday: Closed.
- Dumfries and Galloway Council Headquarters, English Street, Dumfries, DG1 2DD:
 - Monday, Tuesday and Thursday: 9am – 5pm;
 - Wednesday: 9am – 12noon; and
 - Friday, Saturday and Sunday: Closed.

1.2 Proposed Development Overview

The Proposed Development comprises 11 three-bladed horizontal axis wind turbines up to 180 m tip height, and BESS unit, with a total generating capacity greater than 50MW. The main components of the Proposed Development are as follows:

- 11 three-bladed wind turbines with a maximum tip height of 180 m, rotor diameters of approximately 150 m and hub heights of approximately 105 m, with associated foundations and hardstanding areas;
- Battery Energy Storage System (BESS);
- Access tracks (existing, upgraded and new);
- Electrical Infrastructure (substation and control room, with underground cabling between each turbine and the substation);
- A temporary construction compound;
- Up to three borrow pits; and
- A permanent met mast (approximately 100 m).

The layout of the Proposed Development is presented in EIA Report **Volume 2a Figure 1.3**. The layout has evolved via the iterative EIA design process. Further details of the design iterations and final layout are provided in **Chapter 4 - Description of the Proposed Development**.

1.3 Site Context

The location of the Site is shown in EIA Report **Volume 2a Figure 1.1**. The Site entrance is located approximately 0.5 km south-west of Sanquhar, with the turbines, BESS and ancillary infrastructure –

such as access tracks, electrical infrastructure and temporary construction compounds – located approximately 4.5 km from Sanquhar. The Site's RLB covers approximately 805 hectares (ha) and is centred on NGR 274802, 606254. The Site is located entirely within the Dumfries and Galloway administrative boundary.

The topography of the Site and immediate vicinity is relatively complex, as shown on **Figure 1.2**. The elevation of the Site ranges from 470 m Above Ordnance Datum (AOD) in the south-east of the Site and falls to around 150 m AOD in the north-east of the Site. There are a number of notable hilltops and ridges across the Site including:

- Corridow Hill (470 m AOD);
- Mid Rig (437 m AOD);
- Cloud Hill (440 m AOD); and
- Whing Head (456 m AOD).

The hills are dissected by a number of watercourses that drain across the Site. These include:

- Whing Burn;
- Glenmaddie Burn;
- Glen Burn; and
- Glenlarie Burn.

The predominant land use within the Site consists of open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. There are a number of forestry plantations within the vicinity of the Site. The Ulzieside Plantation, which currently covers approximately 41 ha, sits adjacent to the north of the northern Site boundary. To the south of the Ulzieside plantation and between the RLB further planting has been undertaken to expand this plantation. The Mains Plantation (approximately 101 ha), and the Brown Hill Plantation (approximately 299 ha) lie adjacent to the eastern Site boundary.

There are 152 operational or consented wind farms within a 45 km radius of the Site (**Volume 2b, Figure 6.12**). **Table 1.1** lists operational or consented wind farms within a 10km radius of the Proposed Development.

Table 1.1 Wind Farm Developments within 10 km

Name /Site	Status	Minimum distance in km from the closest proposed turbine
Whiteside Hill	Operational	0.54
Sanquhar	Operational	2.32
Twentyshilling	Operational	3.49
Sandy Knowe	Operational	4.75
Hare Hill Extension	Operational	6.29
Sunnyside Farm	Operational	6.32
Hare Hill	Operational	7.50
Afton	Operational	9.56
Sanquhar Six WF	Consented	4.31
Lorg	Consented	5.79

No public roads are located within the Site. The closest public roads to the Proposed Development are the unclassified Blackaddie Road, which runs from Sanquhar to Glenglass Substation (to the north of the Site) and the C125N to Ulzieside where the entrance to the Site is located. The Southern

Upland Way (SUW), which is designated as a Core Path (504) in the Dumfries and Galloway Core Paths Map, runs south-west through the centre of the Site for approximately 4.97 km⁴.

As noted above, the nearest settlement is Sanquhar, which has a population of approximately 1,950⁵. Sanquhar is approximately 4.5 km to the north-east of turbine 9 and ancillary infrastructure; however, there are a small number of residential properties found within 2 km of the Proposed Development, principally located along the unclassified road to Glenglass.

1.4 The Applicant

Cloud Hill Windfarm Ltd is wholly owned by BayWa r.e. UK Ltd.

BayWa r.e. is a leading international renewable energy developer and service provider with offices in Glasgow, Edinburgh, Milton Keynes and Cork. BayWa r.e. has been active in the United Kingdom since 2011, being directly involved in the UK's energy transition through its activities and innovations. BayWa r.e. has an onshore wind development pipeline in excess of 400 MW, and a solar pipeline of 1.5 GWp, being delivered from offices in Glasgow and Edinburgh. In addition to onshore technologies, BayWa r.e. UK Ltd. is part of Buchan Offshore Wind, which has secured the rights via the ScotWind leasing round to develop a 960 MW floating offshore wind farm off the northeast coast of Scotland. BayWa r.e.'s services business in the UK is based in Milton Keynes and Edinburgh and manages over 2 GW of solar, onshore wind and BESS sites across the UK and Ireland.

1.5 Project Team

This EIA Report has been compiled by Environmental Resources Management Ltd (ERM Ltd), on behalf of the Applicant, supported by sub-consultants for certain technical assessment chapters. The full project team is listed in **Table 1.2**.

For each topic, the detailed assessment of likely significant effects has been undertaken by organisations with relevant specialist skills, which draws on their qualifications, relevant project experience, good practice in EIA and on relevant published information.

The EIA Report has been reviewed in full by experienced EIA Practitioners.

⁴ Dumfries and Galloway Council (2019) Core Paths: Walking and Cycling in Dumfries and Galloway [Online] Available at: <https://info.dumgal.gov.uk/mapviewers/pathsmap.aspx> (Accessed 08/03/2023)

⁵ City Populations (2021) Sanquhar (United Kingdom) [Online]. Available from: https://www.citypopulation.de/en/uk/scotland/dumfries_and_galloway/S19001173__sanquhar/ (Accessed 08/03/2023)

Table 1.2 Project Team

Chapter Number	Title	Organisation Responsible
1	Introduction	ERM
2	EIA Methodology	ERM
3	Site Selection and Design	ERM
4	Description of the Proposed Development	ERM
5	Planning & Energy Policy	ERM
6	Landscape and Visual Impact Assessment (LVIA)	Optimised Environments Limited (OPEN)
7	Ecology	MacArthur Green
8	Ornithology	MacArthur Green
9	Archaeology and Cultural Heritage	ERM
10	Peat and Ground Conditions	ERM
11	Hydrology and Soils	ERM
12	Noise	ERM
13	Traffic and Transport	ERM
14	Socio-Economics, Recreation and Tourism	ERM
15	Climate Change and Carbon Balance	ERM
16	Other Issues (Aviation, Telecommunications, Shadow Flicker)	ERM
17	Summary of Mitigation	ERM

1.6 Structure of the EIA Report

The EIA Report contains the findings of the assessment of likely significant environmental effects of the Proposed Development and comprises of the following volumes:

- Volume 1 – EIA Report Text;
- Volume 2 – EIA Report Figures;
 - Volume 2a – Figures excluding Landscape and Visual Impact Assessment (LVIA);
 - Volume 2b – LVIA Figures;
 - Volume 2c – LVIA Visualisations;
- Volume 3 – EIA Report Technical Appendices; and
- Volume 4 – EIA Report Non-Technical Summary (NTS).

An outline of Volume 1 of the EIA Report which is split into 17 separate chapters is presented below:

- Chapter 1 - Introduction – Provides background information about the Applicant and an overview of the Proposed Development;
- Chapter 2 - EIA Methodology – Provides an overview of the EIA process, the regulatory context and an outline of the methodology used to assess environmental effects and ensure a consistent and transparent approach to assessment. It describes the Scoping and consultation process that assisted in the identification of likely significant environmental effects to be given further consideration;
- Chapter 3 - Site Selection and Design – Provides details of the site selection exercise and alternative layouts that were considered within the design evolution process;

- Chapter 4 - Description of the Proposed Development – Provides a detailed description of the Proposed Development including details of the construction, operational and decommissioning arrangements;
- Chapters 5 – 16 - Technical EIA Chapters – Each technical chapter, as shown in **Table 1.1**, will provide a description of the baseline environmental conditions specific to the relevant topic, consider the impacts and will assess the potential environmental effects (beneficial or adverse) due to the Proposed Development in line with the EIA methodology. This will include a description of any proposed mitigation or enhancement measures and a statement of predicted residual effects; and
- Chapter 17 - Summary of Mitigation: Provides a tabular summary of all residual effects and proposed mitigation.

1.7 Additional Documents

A Planning Statement (PS) has been prepared to accompany the Application. The PS sets out a full planning policy appraisal, including an assessment of the Proposed Development in the context of the Fourth National Planning Framework as well as the local development plans, energy policy, and emerging planning policies. It also considers the potential benefits and harm which may arise and concludes as to the overall acceptability of the Proposed Development in relation to the planning context. This does not form part of the EIA Report.

In addition, a Pre-Application Consultation (PAC) Report has been submitted with the Application.

2. EIA METHODOLOGY

2.1 Introduction

This EIA has been carried out in accordance with the Electricity Works (Environmental Impact Assessment) Regulations 2017 ('The EIA Regulations'). It is a process which identifies the environmental effects (both beneficial and adverse) of development proposals in order to assist the consenting authority in its consideration and determination of an application. Early identification of potentially adverse environmental effects also leads to the identification and incorporation of appropriate mitigation, management and enhancement measures into the project design. This, in turn, will help to avoid, reduce, and if possible, remedy potentially significant adverse environmental effects. The assessment must be carried out following consultation with statutory consultees, other interested bodies and members of the public. This Chapter of the EIA Report describes the EIA process and the broad methodology that has been used in the EIA for the Proposed Development. It provides an overview of the key stages that have been followed, in line with EIA good practice.

2.2 EIA Process

With an overall generating capacity greater than 50-Megawatt (MW), consent and deemed planning permission for the Proposed Development is being sought from Scottish Ministers under Section 36 of the Electricity Act 1989, as amended⁶. The requirement for EIA in Scotland for wind farm generating stations with an electrical output capacity in excess of 50 MW is provided under Part 2 the EIA Regulations.

The EIA Regulations describe the process of an EIA, the criteria that would determine if an EIA is necessary or not, the relevant environmental studies and statements, and how the information is evaluated by the Energy Consents Unit (ECU) under Section 36 of the Electricity Act 1989 on behalf of the Scottish Ministers as the determining authority⁷.

The Proposed Development falls within the scope of Schedule 2 of the EIA Regulations. This schedule lists certain types of development for which an EIA may be required due to the potential for significant effects on the environment by virtue of factors such as their nature, size or location. Developments that fall within Schedule 2 do not necessarily require an EIA, and the Applicant may wish to submit a request for an EIA Screening Opinion from the Scottish Ministers. In the case of the Proposed Development, the Applicant has voluntarily decided to undertake an EIA rather than submit a request for a Screening Opinion, being of the view that there is a requirement for EIA as set out in Schedule 2 of the EIA Regulations.

To determine the scope of the EIA, the Applicant submitted a request for an EIA Scoping Opinion from the Scottish Ministers in April 2022. In June 2022, the Scottish Ministers published their EIA Scoping Opinion, which is available of the ECU portal under case reference **ECU00003461**⁸. Dumfries and Galloway Council ('the Council') submitted their Scoping Response to Scottish Ministers on 22nd March 2023.

The results of the EIA are presented in this EIA Report which, as prescribed in the EIA Regulations, is required to include a "description of the likely significant effects" of the Proposed Development. Any effects which are not considered to be significant following receipt of the EIA Scoping Opinion from the Scottish Ministers do not need to be described.

⁶ UK Government (1989) Electricity Act 1989 [Online] Available at: <https://www.legislation.gov.uk/ukpga/1989/29/contents> (Accessed 08/03/2023)

⁷ UK Government (1989) Electricity Act 1989 [Online] Available at: <https://www.legislation.gov.uk/ukpga/1989/29/contents> (Accessed 08/03/2023)

⁸ The Cloud Hill Windfarm Scoping Opinion is available at: <https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00003461>

2.3 EIA Methodology

The EIA Report has been prepared following a systematic approach to EIA and project design, by addressing the issues raised in the EIA Scoping Opinion provided by the Scottish Ministers⁹. The process of distinguishing environmental effects is iterative and cyclical, running concurrently with the design process, whereby the design of the Proposed Development is refined to avoid or reduce potential adverse environmental effects.

The EIA process follows a number of stages broadly in line with the following:

- Site selection and feasibility;
- Screening – to determine if an EIA is required (unless an Applicant volunteers an EIA, as is the case with the Proposed Development);
- Pre-application consultation with statutory and non-statutory consultees;
- Scoping - to identify the parameters of the assessment on which the EIA should focus;
- Baseline studies - to establish the current environmental conditions within the Site and its surrounding environment;
- Identification of potential environmental effects, including cumulative effects;
- Mitigation to avoid or reduce effects through iterative design process;
- Assessment of residual effects;
- Preparation of an EIA Report;
- Submission of the EIA Report;
- Consideration of application and environmental information by the relevant local authority (Dumfries and Galloway Council, referred to as 'the Council') and other statutory and non-statutory consultees;
- Pre-application consultation with the Council;
- Determination of application; and
- Implementation and monitoring of EIA mitigation, and s36 consent and deemed planning permission conditions prior to and during construction, operation and decommissioning phases.

The EIA Regulations require that an EIA Report should include a range of information including a description of:

- The Proposed Development;
- Reasonable alternatives;
- Baseline information;
- Likely significant effects of the Proposed Development; and
- Mitigation measures amongst other factors.

This EIA Report has been prepared in accordance with the EIA Regulations and includes the required information.

2.4 Consultation

Consultation has formed an essential part of this EIA. The EIA team and the Applicant have proactively engaged interested parties throughout the EIA process to determine their views on the

⁹ The Cloud Hill Windfarm Scoping Opinion is available at:
<https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00003461>

Proposed Development, proposed assessment methodologies, and to collect baseline information. This engagement has principally been undertaken within the following key stages:

- Pre-scoping – Procuring initial feedback on the Proposed Development and agreeing extent of consultation. Early consultees included the ECU, the Council, NatureScot, Royal Burgh of Sanquhar Community Council and Kirkconnel and Kelloholm Community Council;
- Scoping – Outlining EIA methodology and documentation of key issues (Scoping Report issued to the ECU in April 2022);
- Further Technical Consultation – Gathering baseline information from relevant organisations and confirming survey methodologies outwith the formal Scoping process;
- Gate Check 1 – Set out how the Scottish Ministers' and consultee comments provided in the scoping opinion are to be addressed by the applicant and taken forward in the EIA report;
- Gate Check 2 – Manage the administrative requirements of the submission of the application; and
- Public Engagement - Informing site design through Public Exhibitions by communicating with local communities and considering baseline information.

Further detail on each stage is included in the following subsections.

2.4.1 Pre-scoping

Consultation commenced with the ECU in March 2022, following completion of a feasibility study and prior to Scoping. Other consultees during this stage included Royal Burgh of Sanquhar Community Council and Kirkconnel and Kelloholm Community Council. The primary purpose of this engagement was to introduce the Proposed Development and to agree the approach to Scoping, including agreement on the consultees to be contacted as part of the Scoping exercise.

2.4.2 Scoping

The aim of the Scoping process is to identify the scope and level of detail of information to be provided in the EIA Report. This exercise for the Proposed Development established the work and level of detail required to inform the EIA Report.

Topics that were proposed to be scoped out of the EIA Report include:

- Forestry;
- Human Health, Major Accidents and Disaster; and
- Vulnerabilities and Resilience to Climate Change.

The request for a Scoping Opinion was submitted to the Scottish Ministers via the Scottish Governments ECU in April 2022. The request was accompanied by a Scoping Report which described the Proposed Development, the proposed EIA methodology, and the key issues to be considered within this EIA Report. The Scoping Report was also sent to a range of consultees, as agreed in advance with the ECU.

The Scoping Opinion was issued by the Scottish Ministers in June 2022, which is available online via the ECU planning portal (<https://www.energyconsents.scot/>) under reference **ECU00003461**.

Table 2.1 provides an overview of the issues raised by the consultees at the Scoping stage. The detail of the individual responses received during the EIA, including at the Scoping stage, is set out in the relevant technical chapters (Chapters 6 - 16). Where appropriate, reference is provided as to where the comments have been addressed within this EIA Report. Where 'no response' is noted, the Applicant received no consultation feedback from the consultee. Where 'no comments' is noted, a response was received, but the consultee provided no comments or feedback.

Table 2.1 Scoping Responses

Consultee	No Response	No Comments	Landscape and Visual	Archaeology and Cultural Heritage	Ecology / Ornithology	Hydrology / Hydrogeology	Geology and Peat	Noise, Public safety and Amenity	Existing Infrastructure	Socio-economics / recreation	Access / Traffic	Climate Change / Carbon Balance	Cumulative Effects	Overarching EIA Comments	Relevant Chapter
Dumfries and Galloway Council			✓			✓				✓	✓			✓	Chapter 5, 6, 11, 13, 14
Scottish Environment Protection Agency (SEPA)					✓	✓	✓							✓	Chapter 7, 8, 9, 10, & 11
NatureScot			✓		✓		✓						✓	✓	Chapter 6, 7, 8, 9, 10 & 14
Historic Environment Scotland (HES)				✓											Chapter 9
British Telecommunications									✓						Chapter 15
JRC		✓							✓						Chapter 15
Crown Estate Scotland									✓						Chapter 15
NATS Safeguarding									✓						Chapter 15
Fisheries Management Scotland														✓	N/A
Scottish Forestry															N/A
Galloway Fisheries Trust		✓													N/A
British Horse Society	✓														Chapter 14
Glasgow Prestwick Airport									✓						Chapter 15
Glasgow Airport									✓						Chapter 15
East Ayrshire Council			✓							✓					Chapter 6 & 14
Visit Scotland										✓					Chapter 14
RSPB Scotland		✓											✓		Chapter 8
John Muir Trust		✓													N/A

Consultee	No Response	No Comments	Landscape and Visual	Archaeology and Cultural Heritage	Ecology / Ornithology	Hydrology / Hydrogeology	Geology and Peat	Noise, Public safety and Amenity	Existing Infrastructure	Socio-economics / recreation	Access / Traffic	Climate Change / Carbon Balance	Cumulative Effects	Overarching EIA Comments	Relevant Chapter
Defence Infrastructure Organisation															Chapter 15
Royal Burgh of Sanguhar and District Community Council		✓													N/A
Scottish Wildlife Trust	✓														N/A
Transport Scotland											✓				Chapter 13
Visit Scotland										✓					Chapter 14
Scottish Rights of Way and Access (ScotWays)	✓									✓					Chapter 14
Tynron Community Council														✓	Chapter 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15
Kirkconnel and Kelloholm Community Council		✓													N/A

2.4.3 Gate Check Consultation

In January 2023, the Applicant submitted a Gate Check Report to the Scottish Ministers via the ECU. The Gate Check Report sets out the information required by the ECU to undertake a gate check for the Proposed Development in compliance with the gate check procedure¹⁰.

The purpose of the Gate Check Report is to describe how the design of the Proposed Development has evolved since the Scoping stage, highlighting influencing factors on the design either as a response to environmental constraints identified during the EIA process or through consultation feedback from statutory or non-statutory consultees.

The Report sets out the following in line with the ECU gate checking procedure:

- Description of the design evolution, highlighting key iterations;
- Interactions with the statutory and non-statutory consultees during the EIA process, with a focus on the scoping comments and how these have been addressed;

¹⁰ Scottish Government (2012) Electricity Act 1989 - sections 36 and 37: applications guidance [Online] Available at: <https://www.gov.scot/publications/good-practice-guidance-applications-under-sections-36-37-electricity-act-1989/pages/5/> (Accessed 22/11/2022)

- Description of community engagement undertaken to date; and
- Details of the forthcoming application including a timeline for submission, advertisement requirements, and proposed locations for the application to be publicly viewed.

A copy of the Gate Check Report is provided in **Volume 3: Technical Appendix A2.1**.

2.4.4 Further Technical Consultation

In addition to the formal Scoping process, where appropriate, authors of technical assessments within this EIA Report engaged directly with statutory and non-statutory consultees throughout the duration of the EIA Report preparation stage to further refine the scope for each assessment. Consultees contacted in this manner included:

- Dumfries and Galloway Council Landscape Architect;
- Dumfries and Galloway Council Archaeologist;
- Dumfries and Galloway Council Environmental Health Officer;
- Dumfries and Galloway Countryside Access Officer;
- Transport Scotland;
- Energy Consents Unit;
- NatureScot; and
- Historic Environment Scotland (HES).

Technical consultees were further consulted about the redesign of the Proposed Development and where possible, their recommendations have been incorporated into the final layout (**Figure 1.3**). **Chapter 3 - Site Selection and Design** details how the project has developed following consultation with stakeholders.

A summary of all relevant consultation is documented in the relevant Technical Chapters 6 to 16 of this EIA Report.

2.4.5 Public Engagement

Public consultation is a key component to the EIA process. The Applicant has engaged with members of the local community through hosting two rounds of public consultation events in Sanquhar and Kirkcubbin (**Table 2.2**).

Table 2.2 Community Engagement throughout EIA Process

Date	Exercise
22/06/2022	In person event held at The Cabin, Kirkcubbin 4 attendees
23/06/2022	In person event held at Sanquhar Town Hall 12 attendees
15/03/2023	In person event held at The Cabin, Kirkcubbin 7 attendees
16/03/2023	In person event held at Sanquhar Town Hall 23 attendees

The exhibitions included a series of information boards which outlined details of the Proposed Development as the design evolved, including the proposed number of turbines, access to the Site and anticipated ancillary infrastructure. Over the two rounds of public consultation events, a total of 46 individuals attended.

2.5 The EIA Report

The information that the Applicant is required to submit as part of the EIA process is presented in this EIA Report. The preparation and production of this EIA Report has been conducted in accordance with relevant regulations and good practice guidance. Relevant legislation, policy and guidance are referred to in each of the technical assessments within the EIA Report. Overarching regulation, policy and guidance documents have been used in preparing this EIA Report are:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended;
- The Electricity (Applications for Consent) Regulations 1990¹¹;
- The Electricity (Applications for Consent) Amendment (Scotland) Regulations 2013¹²;
- National Planning Framework 4 (NPF4) (Feb 2023)¹³;
- Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment, 2013¹⁴;
- Planning Circular 1/2017: Environmental Impact Assessment Regulations, 2017¹⁵;
- PAN 51 Planning, Environmental Protection and Regulation (Revised 2006)¹⁶;
- PAN 60 Planning for Natural Heritage (2000)¹⁷;
- PAN 61 Sustainable Urban Drainage Systems (2001)¹⁸;
- PAN 68 Design Statements (2003)¹⁹;
- PAN 73 Rural Diversification (2005)²⁰;
- PAN 75 Planning for Transport (2005)²¹;
- PAN 3/2010 Community Engagement²²;
- PAN 1/2011 Planning and Noise²³;

¹¹ UK Government (1990) The Electricity (Applications for Consent) Regulations 1990 [Online] Available at: <https://www.legislation.gov.uk/uksi/1990/455/contents/made> (Accessed 08/03/2023)

¹² Scottish Government (2013) The Electricity (Applications for Consent) Amendment (Scotland) Regulations 2013 [Online] Available at: <https://www.legislation.gov.uk/ssi/2013/58/introduction/made> (Accessed 08/03/2023)

¹³ The Scottish Government (2023) National Planning Framework 4 [Online] Available at: <https://www.transformingplanning.scot/national-planning-framework/approved-npf4/> (Accessed 08/03/2023)

¹⁴ The Scottish Government (2013, Rev. 2017) Planning Advice Note 1/2013 Environmental Impact Assessment [Online] Available at: <http://www.gov.scot/Publications/2013/08/6471> (Accessed 08/03/2023)

¹⁵ The Scottish Government (2017) Planning Circular 1/2017 Environmental Impact Assessment Regulations [Online] Available at: <https://www.gov.scot/publications/planning-circular-1-2017-environmental-impact-assessment-regulations-2017/> (Accessed on 08/03/2023)

¹⁶ Scottish Government (2006) PAN 51: Planning, Environmental Protection and Regulation [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-pan-51-revised-2006-planning-environmental-protection/> (Accessed 08/03/2023)

¹⁷ Scottish Government (2000) Planning for Natural Heritage: PAN 60 [Online] Available at: Planning Advice Note 60: natural heritage - gov.scot (www.gov.scot) (Accessed 08/03/2023)

¹⁸ Scottish Government (2001) PAN 61: Planning and Sustainable Urban Drainage [Online] Available at: Planning Advice Note 61: Sustainable urban drainage systems - gov.scot (www.gov.scot) (Accessed 08/03/2023)

¹⁹ Scottish Government (2003) PAN 68: Design Statement [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-68-design-statements/> (Accessed 08/03/2023)

²⁰ Scottish Government (2005) PAN 73: Rural Diversification [Online] Available at: <https://www.gov.scot/publications/rural-diversification-planning-advice/> (Accessed 08/03/2023)

²¹ Scottish Government (2005) PAN 75: Planning for Transport [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-pan-75-planning-transport/> (Accessed 08/03/2023)

²² Scottish Government (2010) PAN 3/2010: Community Engagement [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-3-2010-community-engagement/> (Accessed 08/03/2023)

²³ Scottish Government (2011) PAN 1/2011: Planning and Noise [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/> (Accessed 08/03/2023)

- PAN 2/2011: Planning and Archaeology²⁴;
- Environmental Impact Assessment Handbook (Scottish Natural Heritage, 2018)²⁵; and
- Environmental Impact Assessment Guide to Delivering Quality Development (Institute of Environmental Management and Assessment (IEMA), 2016)²⁶.
- Onshore Wind Policy Statement December 2022

This EIA Report conveys the findings of the assessment of the potential significant environmental effects of the Proposed Development during construction, operation and decommissioning.

2.6 Technical Assessments

2.6.1 Overview

Each of the technical assessments follows a systematic approach with the main steps as follows:

- Introduction, assessment methodology and significance criteria;
- Description of the baseline conditions;
- Assessment of potential effects;
- Mitigation measures and residual effects;
- Cumulative effects assessment;
- Summary of effects (residual effects); and
- Statement of significance.

A summary of each step is highlighted below.

2.6.2 Introduction, Assessment Methodology and Significance Criteria

Each technical assessment sets out the relevant legislation, policy and guidance together with scope and methodology used to carry out the assessment of potential effects, including the criteria that are used to establish which effects are significant. The methodology seeks to ensure transparency in the assessment. Each technical assessment has the criteria set out for assessing significance. Where a level of significance is attributed to an effect, this is based on technical guidance and professional judgement, informed by consideration of the sensitivity of the receptor and the degree of the effect.

This section also sets out the scoping requirements and pre-application consultation responses that form the framework and scope of the specialist assessment work for the topic.

2.6.3 Description of Baseline Conditions

In order to evaluate the potential environmental effects, the existing environmental conditions were recorded through field and desktop research. Prior to the initiation of fieldwork studies, desktop studies were undertaken to gain a better understanding of the study area. Site-specific baseline field surveys were then undertaken by experienced professionals to provide an understanding of the current condition of the Proposed Development and the surrounding area.

²⁴ The Scottish Government (2011) Planning Advice Note 2/2011 [Online] Available at <https://www.gov.scot/publications/pan-2-2011-planning-archaeology/> (Accessed 08/03/2023)

²⁵ NatureScot (2018) Environmental Impact Assessment Handbook [Online] Available at: Publication 2018 - Environmental Impact Assessment Handbook V5.pdf (nature.scot) (Accessed 08/03/2023)

²⁶ IEMA (2016) Environmental Impact Assessment Guide to: Delivering Quality Development [Online] Available at: <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiJuvGQ3sz9AhUFaMAKHS1-Co0QFnoECA8QAQ&url=https%3A%2F%2Fwww.iema.net%2Fdownload-document%2F7014&usg=AOvVaw37vBz691GKel7dL9wojy1G> (Accessed 08/03/2023)

This forms the baseline, alongside a prediction of the effects of these conditions continuing into the future. Such predictions can involve a high number of variables and be subject to large uncertainties, and as a result, in some cases, the current baseline condition is assumed to remain unchanged throughout the timeframe of the Proposed Development. The approach taken in each chapter will be described.

The baseline has been used to inform the assessment of the sensitivity of receptors within the study areas. Wind farms that are operational or consented at the time of commencing the assessments are treated as being part of the existing baseline except where specific guidance advises to the contrary.

The approach to describing baseline conditions is set out in each relevant technical chapter. Baseline information is used to inform the layout of the Proposed Development. From baseline information, constraints were identified which were considered as part of the design process. Further detail on the design process adopted for the Proposed Development is detailed in **Chapter 3 – Site Selection and Design** and **Chapter 4 – Description of Proposed Development**.

2.6.4 Assessment of Potential Effects

The prediction of potential significant effects covers the three phases of the Proposed Development – construction, operation and decommissioning – as different environmental effects are likely to arise during each phase. The effects during construction and decommissioning are generally considered to be short term effects, and those arising as a result of the operation of the Proposed Development are generally considered to be long term effects. Each technical assessment considers the nature of effects and includes cumulative effects with other developments where appropriate.

Following identification of potential environmental effects, the baseline information is used to predict changes to existing conditions and conduct an assessment of these changes.

The significance of effects resulting from the Proposed Development will be determined through a combination of the sensitivity of the receiving environment (the sensitivity) and the predicted degree of change (the magnitude) from the baseline state.

2.6.4.1 Sensitivity of Receptors

Environmental sensitivity may be categorised by multiple factors, such as the presence of rare or endangered species, transformation of natural landscapes, soil quality and land-use etc. The initial assessment, consultation and scoping stages identified these factors along with the implications of the predicted changes. This has been identified within each relevant technical chapter.

The sensitivity classification of the receiving environment varies between the different technical areas of assessment (e.g., landscape and visual, ecology, noise etc.). Sensitivity is normally defined as high, medium or low.

Table 2.3 details the overall framework used for determining the sensitivity of receptors; however, each technical assessment will specify their own appropriate sensitivity criteria that will be applied during the EIA and details will be provided in each technical chapter.

Table 2.3 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change or is of little environmental value.

2.6.4.2 Magnitude of Change

For the purposes of environmental assessment, the magnitude of change is an 'impact' that is dependent on the degree to which the change affects the feature or asset, from a fundamental, permanent or irreversible change that changes the character of the feature or asset, to barely perceptible changes that may be reversible. Magnitude of change would also encompass the degree of certainty of whether an impact would occur. Magnitude of change is generally classified as high, medium, or low. General criteria for assessing the magnitude of change are presented in **Table 2.4**. Each technical assessment will apply their own appropriate magnitude of change criteria during the EIA, with the details provided in the relevant EIA chapter.

Table 2.4 Framework for Determining Magnitude of Change

Magnitude of Change	Definition
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character of baseline conditions.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

If the effects of zero magnitude (i.e., none / no change) are identified, this will be made clear in the assessment.

2.6.4.3 Significance of Effect

The sensitivity of the asset and magnitude of change will be used as a guide, in addition to professional judgement, to assess the level of effects. **Table 2.5** summarises guideline criteria for assessing the significance of effects.

Table 2.5 Framework for Assessment of the Significance of Effects

Sensitivity of Receptor

Magnitude of Change	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Major / Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in **Table 2.5**.

A negligible magnitude of change upon a receptor will result in no effect, regardless of sensitivity.

This EIA Report follows the above principles in relation to the identification of significant effects; however, some technical assessments may adopt a variation of this approach where appropriate. The assessment criteria used to determine the significance of effects are made explicit in each technical assessment chapter within this EIA Report.

2.6.5 Mitigation Measures and Residual Effects

The Institute of Environmental Management (IEMA) EIA Guide to Delivering Quality Development Report²⁷ demonstrates that EIA is an iterative process rather than a unique, post-design, environmental appraisal. In adopting this approach, the findings of the technical environmental studies are used to inform the design of the project, and hence achieve a 'best fit' with the environment. This approach has been adopted in respect of the Proposed Development. Where potentially significant effects have been identified, their avoidance or minimisation has been prioritised at the design stage. This is referred to within this EIA Report as 'embedded mitigation' (i.e., mitigation that is embedded within the project design, and includes best practice as well as design features).

In line with the EIA Regulations mitigation hierarchy identified in the Scoping Report, the strategy of avoidance, reduction, and remediation is a hierarchical one, which seeks to²⁸:

- First to avoid potential effects;
- Then to reduce those which remain; and
- Lastly, where no other measures are possible, to propose mitigation measures.

Appropriate mitigation measures are discussed within each technical chapter as relevant, including any proposed monitoring. All mitigation measures proposed for the purposes of this EIA Report can be found in **Chapter 17 – Schedule of Mitigation**.

2.6.6 Cumulative Effects Assessment

In accordance with the EIA Regulations, the EIA Report has considered 'cumulative effects.' These are effects that result from incremental changes caused by past, present or reasonably foreseeable developments together with the Proposed Development being assessed. For the cumulative assessment, the combined effects of several developments in isolation may be insignificant but cumulatively when considered with other developments have a significant effect.

Cumulative assessment addresses the combined effects from the addition of the Proposed Development to a baseline of identified wind farms on landscape and visual, hydrology, ecology, ornithology, noise, cultural heritage, traffic and transport, recreation, tourism and other impacts.

²⁷ IEMA (2016) EIA Guide to Delivering Quality Development Report [Online] Available at: [Delivering-Quality-Development \(3\).pdf](#) (Accessed on 09/08/2023)

²⁸ The Cloud Hill Windfarm Scoping Opinion is available at:
<https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00003461>

Other developments which may come forward in the future, but which do not currently have sufficient information available in relation to their likely effects to make an informed cumulative assessment (e.g. those at scoping stage), are not considered in detail in this EIA Report as per standard practice.

The extent of any cumulative assessment is defined in each technical assessment chapter and can include both existing and proposed wind farm developments and other forms of development. The potential landscape and visual effects, for example, which relate to the intervisibility of individual wind farm development schemes, will be much wider ranging than noise effects which will be limited to receptors in the more immediate vicinity of the Proposed Development.

Consideration of cumulative effects has been undertaken for all technical assessments. Where no cumulative effects are likely, this is stated. Operational wind farms are considered to be part of the baseline in the majority of assessments. In relation to some of the technical chapters, specific guidance and policy exists advising that effects associated with existing wind farm developments should be considered as cumulative effects. Where relevant, these are noted within each chapter.

2.6.7 Summary of Effects

The residual effects of the Proposed Development are those that remain following successful implementation of the identified mitigation and enhancement measures.

Residual effects are identified in each technical assessment alongside an assessment of whether any residual effects are significant or not in terms of the EIA Regulations.

2.7 Assumptions and Limitations of EIA

The following assumptions have been made during preparation of this EIA Report:

- The principal land uses adjacent to the development site remain as they are at the time of the submission of the application, except in cases where permission has already been granted for development. In these cases, it is assumed that the approved development will take place, and these have been treated as contributing to "cumulative" effects; and
- Information provided by third parties, including publicly available information and databases is correct at the time of submission.

The EIA has been subject to the following limitations:

- Baseline conditions are accurate at the time of the physical surveys but due to the dynamic nature of the environment, conditions may change during the site preparation, construction and operational phases; and
- The assessment of cumulative effects has been reliant on the availability of known information relating to existing wind farm developments as of 30th November 2022.

Assumptions specific to certain environmental aspects are discussed in the relevant Chapters of this EIA Report.

3. SITE SELECTION AND DESIGN

3.1 Introduction

This Chapter of the EIA Report contains a description of the land within the Site, consideration of alternatives, site selection process and the design evolution that led to the final layout of the Proposed Development. The Site is centred on NGR 274802, 606254, with 11 turbines, BESS and ancillary infrastructure located approximately 4.5 km from Sanquhar. The entrance to the Proposed Development is located approximately 0.5 km south-west of Sanquhar.

Schedule 4 of the EIA Regulations details the information required to be included within the EIA Report and states:

“3. A description of the relevant aspects of the current state of the environment (the “baseline scenario”) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge.

4. A description of the factors specified in regulation 4(3) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.”

This Chapter details the reasons for selecting the Site, as shown in **Figure 1.2**, and summarises the layout options that were considered by the Applicant during the evolution of the Proposed Development.

This Chapter of the EIA Report is supported by the following figures provided in **Volume 2a - EIA Report Figures excluding LVIA**:

- **Figure 3.1:** Site Constraints Plan;
- **Figure 3.2 (a – c):** Site Design Evolution; and
- **Figure 3.2d:** Application Layout.

3.2 Description of the Site and Surroundings

3.2.1 Location and Characteristics

The Site covers an area of 804 hectares (ha), as shown on **Figure 1.2**. The area in which the turbines are located is surrounded by open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. The Site is adjacent to a number of forestry plantations including Ulzieside Plantation, Mains Plantation and Brown Hill.

The operational Whiteside Hill Wind Farm is located approximately 0.54 km southwest of the nearest proposed turbine and the operational Twentysilling Hill Wind Farm is approximately 3.49 km to the southeast of the nearest proposed turbine. In addition, there are also the nine turbines of Sanquhar Wind Farm to the north, and Hare Hill and Extension further north-west. Although comprising only two turbines at 62 m, there is also Sunnyside Farm on the northern side of Sanquhar.

The Proposed Development consists of 11 turbines with a maximum height to blade tip of up to 180 m (total generating capacity greater than 50 MW). The topography of the Site and immediate vicinity is complex, with elevation ranging from approximately 150 m Above Ordnance Datum (AOD) in the north-east part of the Site to approximately 470 m AOD in the south-east of the Site, at the summit of Corridow Hill. There are a number of other hills within the Site including:

- Mid Rig (437 m AOD) located in the east of the Site;

- Cloud Hill (451 m AOD) located in the south of the Site; and
- Whing Head (456 m AOD) located in the south of the Site.

There are a number of watercourses dissecting the aforementioned hills within the Site. Watercourses within the Site include Whing Burn, Glenmaddie Burn, Glen Burn, and Glenlarie Burn as well as several other smaller burns.

Access to the Proposed Development is proposed from the A76(T) at Sanquhar, using Blackaddie Road and the C125N to Ulzieside Farm where a new entrance to the Site will be formed. **Figure 13.1** presents the proposed access route to the Site for Abnormal Loads and **Figure 13.2** details the proposed access route to Site for general construction traffic.

There are several properties surrounding the Site, including (but not limited to):

- Glenmaddie, located approximately 880 m north of the nearest turbine (T9);
- Glenglass Cottage, located approx. 2.3 km west of the nearest turbine (T2);
- Euchan Cottage, located approx. 2.2 km northeast of the nearest turbine (T9);
- Shiel, located approx. 1.3 km south of the nearest turbine (T7); and
- Polgown, located approx. 1.2 km southwest of Turbine (T1).

3.2.2 Environmental Designations

Table 3.1 lists the environmental designations considered within the study area as defined within the relevant EIA Report chapter.

Table 3.1 Environmental Designations for Each EIA Report Chapter

Chapter	Designations
Chapter 6: LVIA	National Designations The Site is not within any National landscape designation. Within the 45 km Study Area there is one National Scenic Area (NSA), which is the Nith Estuary. Regional / Local Designations The Site is not within any Regional or Local landscape designation. Within the 45 km Study Area are six Regional Scenic Areas (RSAs): ■ Thornhill Uplands (which abuts the southern boundary of the Site and covers a large part of the Study Area, to the south-west); ■ Moffatt Hills; ■ Galloway Hills; ■ Terregles Ridge; ■ Torthorwald; and ■ Solway Coast. Within the 45 km Study Area are five Proposed Local Landscape designations: ■ The Ayr Valley; ■ Doon Valley; ■ Water of Girvan Valley; ■ The Stinchar Valley; and ■ High Carrick Hills Within the 45 km Study Area are two Wild Land Areas (WLA): ■ Merrick; and ■ Talla-Hart Fell. The Landscape Designations listed above are shown on Figure 6.3.
Chapter 7: Ecology	International / National Designations The Site is not within any International / National ecological designation. Within the 5km Study Area are three International / National ecological statutory designated sites: ■ Upper Nithsdale Woodlands Special Area of Conservation (SAC) designated for mixed woodland on base-rich soils associated with rocky slopes;

Chapter	Designations
	- Back Wood Site of Special Scientific Interest (SSSI) designated for upland oak woodland; and - Mennock Water SSSI designated for fen meadow and upland oak woodland. The Ecological Designations listed above are shown on Figure 7.1. Regional / Local Designations Within the 5km Study Area is one area of ancient woodland that lies partially within the Site; however, it will not be adversely affected by the Proposed Development. There are also other areas of ancient woodland within the 5 km Study Area to the north out with the Site. There are no other Regional / Local ecological designated sites within the 5km Study Area. The Ecological Designations listed above are shown on Figure 7.1.
Chapter 8: Ornithology	International / National Designations The Site is not within any International / National ornithology designations. Within the 20 km Study Area there are three ornithology statutory designated sites: - Muirkirk and North Lowther Uplands Special Protection Area (SPA), designated for breeding hen harrier, short-eared owl, merlin, peregrine and golden plover; - North Lowther Uplands SSSI, which is designated for breeding bird assemblage and hen harrier; and - Muirkirk Uplands SSSI, designated for breeding bird assemblage and hen harrier. The Ornithology Designations listed above are shown on Figure 8.3. Regional / Local Designations The Site is not within any Regional / Local ornithology designations. Within the 20 km Study Area there are no Regional / Local ornithology designations.
Chapter 9: Archaeology and Cultural Heritage	International / National Designations There are no Site International / National heritage designations within the Site. Within the 5 km Study Area are no World Heritage Sites or Battlefields. Within the 5 km Study Area are four Scheduled Monuments: - SM656: Kemp's Castle, Iron Age fort 320m SW of Euchan Bridge; - SM687: Crichton Peel & Sanquhar Castle; - SM708: Ryehill, motte; and - SM679: Orchard, cross socket. Within the 5 km Study Area there is 1 Category A Listed Building. The Cultural Heritage Designations listed above are shown on Figure 9.8. Regional / Local Designations Within the 5 km Study Area are 23 Category B and 21 Category C listed buildings. 28 of these Category B and C Listed Buildings sit within Sanquhar Conservation Area. Within the Core Study Area (CSA), there are five non-designated sites present within the Site boundary, which include the following Dumfries and Galloway HER References: - MDG12838 – Deil's Dyke; - MDG27293 – Corridow Hill; - MDG27295 – Welltrees Tappin; - MDG16989 – Great Craigiedhu; and - MDG27361 – Corridow Hill, landscape monitoring point. The Cultural Heritage Designation listed above are shown on Figure 9.2. These assets all date to the post-medieval or modern period, and comprise standing buildings, field boundaries, quarries or monitoring stations. Within the 15 km Site Setting Study Area is one Garden and Designed Landscape (GDL), which is Drumlanrig Castle. The Cultural Heritage Designation listed above are shown on Figure 9.9.
Chapter 11: Hydrology and Hydrogeology	International / National Designations There are Site International / National hydrological designations within the Site. Within the 10 km Study Area there are 10 International / National designations, which consist of; however, all designations hydrologically disconnected from the Site and will not be impacts by the Proposed Development. Regional / Local Designations The Site is not within any Regional / Local geological designations. Within the 10 km Study Area there are no Regional / Local designations.

Chapter	Designations
Chapter 14: Socio-Economic, Recreation and Tourism	There is a Public Rights of Way (PRoW) within the Site: The Southern Upland Way (SUW) is designated as a Core Path (UNNO-504). Within the 10km Study Area there are 14 PRoW: ▪ Sanquhar to Stroanpatrick Path; ▪ St John's Town of Dalry to Sanquhar; ▪ Euchar Fall; ▪ Sanquhar Castle Circular; ▪ Sanquhar Town Walk; ▪ Bogg To Auchentaggart Moor; ▪ Sobjers Bridge Walk; ▪ Mossholm To Wanlock Water (Via Cogshead); ▪ Elioock Grange Walk; ▪ Kelloholm To Kirkconnel (Via River); ▪ Kirkconnel to Mynwhirn Hill; ▪ Bank Hill to Graystone Hill; ▪ Lorg Trail; and ▪ Benbuie to Troston Hill. The PRoW listed above are shown on Figure 14.1.

3.3 Site Selection

The selection of an appropriate site which has the potential to support a commercial wind farm development is a complex and lengthy process. It involves examining and balancing a number of environmental, technical, planning and economic issues. Only when it has been determined that a site is not subject to material environmental, technical, planning or economic constraints is the decision made to invest further resources in developing the proposal and conducting an EIA.

In accordance with the EIA Regulations, the design alternatives need to be studied with key reasoning, taking into account the potential environmental effects. The Site was selected as a suitable location for wind farm development by the Applicant as it met the following criteria:

- Suitable and proven high annual mean wind speed across the Site;
- Viable potential grid connection within 5 km of the Site;
- Suitable and proven port of delivery and road access for the delivery of large components, with the majority of the route having been used for turbine deliveries for the nearby Twentysilling and Whiteside Hill Wind Farm;
- Suitable road access once upgraded;
- Sufficient distance from nearest residential properties to ensure compliance with appropriate noise limits, as well as to reduce adverse residential visual amenity and shadow flicker effects;
- Limited theoretical visibility of wind turbines from densely populated areas;
- Avoided areas of deep peat (which is > 1 m in the context of this EIA) on site; and
- Does not support any International / National ecological, ornithological, cultural heritage or landscape designations.

Following previous feasibility analysis of the Site, and further discussions with interested landowners, an initial turbine layout was developed within the Site. Through ongoing assessments and consultation, the design was updated through an iterative process, as described in this chapter and **Figure 3.2 (a-d)**, to determine the most viable layout capable of obtaining consent from the Scottish Ministers under section 36 of the Electricity Act 1989 and deemed planning permission.

3.4 Site Design

3.4.1 Overview

The purpose of a wind farm development is to harness the power in the wind to generate electricity. The optimum design is therefore to locate wind farms in areas exposed to the highest windspeeds, with turbines located in the optimum position; however, this does not take into account potential environmental effects. The design of a wind farm must therefore achieve a balance between maximising the potential for energy yield, whilst avoiding / mitigating the potential occurrence of significant environmental effects in line with the EIA Regulations.

The optimum layout of a wind farm is based on a range of technical criteria. A minimum distance must be maintained between wind turbines to reduce the effects of turbulence, turbine fatigue and energy yield reduction. This separation distance is between three and five times the rotor diameter and determines the minimum achievable distance between turbines when designing a site. The following additional criteria must also be considered in the design of a wind farm:

- Wind speed;
- Prevailing wind direction;
- Existing infrastructure;
- Topography;
- Ground conditions;
- Local environmental issues; and
- Landscape and visual considerations.

One of the further key factors which is taken into account when designing adjacent to an operational wind farm is consideration of how the design ties in with the existing scheme. This includes elements such as:

- The cumulative visual extent of operational wind farms and the Proposed Development; and
- How the Proposed Development's turbines will interact with the existing turbines from a wind turbulence and energy yield perspective.

All associated infrastructure has also been designed to minimise potential environmental effects through the use of infrastructure where possible, careful design, siting, routing and construction methods.

The identification of potential effects is an iterative process and the layout has been modified to avoid or reduce potential environmental effects as environmental effects and sensitivities have identified. This process has resulted in the layout of the Proposed Development which represents the optimum fit within the technical and environmental parameters of this project.

3.4.2 The Design Strategy

The approach to the design of the Proposed Development has considered, wherever possible, to enhance the existing composition of the Proposed Development through an approach to design that includes:

- Minimising the number of watercourse crossings;
- Avoiding cultural heritage assets;
- Maximising the use of existing tracks and infrastructure such as existing borrow pits;
- Optimising the layout with respect to wind resource and environmental constraints;
- Optimising the layout with regard to topography;

- Limiting the number of turbines visible at key locations;
- Limiting the overall visibility of the wind farm as much as possible;
- Limiting the physical extent of the wind farm; and
- Avoiding areas of peat where practicable, with specific consideration of areas of deep peat (> 1 m) and very deep peat (> 3 m).

Constraints were identified through desk study, site survey and analysis including consideration of the responses received from consultees during the early stages of the EIA process, predominantly during Scoping. The key constraints which have been taken into account during the design process include:

- Visibility from sensitive receptors, including nearby properties, settlements and designated landscape. Wind farm layouts are designed to optimise aesthetics from key viewpoints, taking account of landscape character types and the topography in, and around, the Site;
- Presence of sensitive habitats and protected species;
- Presence of sensitive ornithological species;
- Presence of watercourses, Private Water Supplies (PWS) and related infrastructure;
- Presence of cultural heritage features and the perceived interaction between these (e.g. sightlines);
- Proximity to noise sensitive receptors;
- Presence of peat;
- Ground conditions and topography; and
- Key recreational and tourist routes.

The principles of the design strategy were to maximise the number of turbines and wind energy capture, whilst minimising significant adverse environmental effects. Therefore, some of these constraints were given a 'hard' constraint value in design that was not breached and others were assigned a 'soft' constraint value that could be impinged with sufficient justification that effects were still acceptable. This led to a comprehensive process of constraints mapping.

Embedded mitigation was used to minimise any predicted environmental effects, and where applicable to a specific technical assessment, such mitigation is detailed in the relevant chapter within this EIA Report. This was particularly relevant to the avoidance of direct effects (e.g. on known protected species). By employing an iterative design process, undertaken in conjunction with the EIA process, a number of potential effects were avoided completely.

The design strategy has been informed by a number of general and site-specific design objectives relating to the siting and design of the turbines in the first instance, whilst acknowledging that the feasibility and appropriateness of other ancillary infrastructure locations should also be considered throughout the design process.

The principles of this design strategy have guided the design of this proposal.

3.4.3 Site Specific Technical Constraints

3.4.3.1 Wind Resource

Wind resource can be affected by various site characteristics, such as the prevailing wind direction, and local topography. Typically, the more elevated areas of Site have the greatest wind resource, and this must be balanced against the landscape and visual effects that may arise at higher elevations.

3.4.3.2 Turbine Spacing

The spacing of the turbines is a key consideration in wind farm layout design; turbines need to be arranged a minimum distance apart such that turbulence from a specific turbine does not unduly affect the operation of a turbine which is downwind. The spacing for turbines needs to be larger in the prevailing wind direction and will vary from site to site and between different turbine models. The spacing is directly proportional to the size of the wind turbine rotor, whereby the larger the rotor the larger the spacing between turbines, and the fewer turbines that may be accommodated within a specific area.

3.4.3.3 Topography and Ground Conditions

The suitability of ground conditions was considered during the design of the Proposed Development, which principally considered areas of steep slope and peat.

Where gradients of greater than 14% were identified, these areas were not considered suitable for wind turbines. The presence of steep slopes is also a key consideration in the design of the site infrastructure including access tracks and hardstanding areas.

The presence of peat has been assessed and areas of peat have been avoided where practicable, with specific consideration of areas of deep peat (> 1 m) and very deep peat (> 3 m) as discussed in **Chapter 10 – Peat and Ground Conditions**. An Outline Biodiversity Enhancement Management Plan (**oBEMP; Technical Appendix A7.6**) has been created to support this application, which includes peatland restoration and enhancement techniques in line with NPF4 guidance.

3.4.3.4 Site Access

Access to the Proposed Development is proposed from the C125N where a new entrance to the Site will be formed. **Figure 13.1** presents the abnormal load traffic's proposed access route to the Proposed Development. **Figure 13.2** presents the general construction traffic's proposed access route to the Proposed Development.

Further details on access to the Site is assessed in **Chapter 13 – Traffic and Transport**.

3.5 Design Evolution

3.5.1 Overview

The final layout as presented in the EIA Report has been the subject of a number of iterations and refinements which sought to avoid, or minimise, predicted adverse effects as far as reasonably practicable via design embedded mitigation. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable project. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' within the design of the scheme.

Whilst the Proposed Development has undergone numerous design iterations, a selection of the key turbine layout design iterations is described below and are shown in **Figure 3.2 (a - d)** which demonstrates how the layouts have evolved throughout the EIA process.

Each of the turbine layout iterations was devised based on the following technical parameters and constraints detailed below:

- Minimum turbine spacing/separation of approximately 5 x rotor diameter downwind and 3 x rotor diameter crosswind and a south-westerly prevailing wind direction (approximately 225 degrees);
- Hard constraints:
 - Slopes of 14% or greater;
 - 50 m buffers around the banks of watercourses for turbine locations and infrastructure;

- Avoid all known archaeological records on-site;
 - Avoid Ground Water Dependent Terrestrial Ecosystems (GWDTE);
 - Avoid sensitive ecological habitats, such as potentially sensitive habitats like blanket bog and wet modified bog;
 - Compliance with ETSU-R-97 noise limits at nearby residential receptors;
 - Avoid siting turbines in areas of peat where practicable. No turbines to be sited in area with peat depths > 1 m; and
 - 1 km buffers around the residential properties for centre of all turbine locations.
- Soft constraints:
- Balance visual composition that respects the original design objectives.

Constraints noted above are shown on **Figure 3.1**.

3.5.2 Design Iteration

The EIA, combined with consultation and community engagement, is a key driver for the Proposed Development's design, providing environmental and social information that guides its evolution. In identifying environmental and social sensitivities and constraints at the Site, they can be avoided, or potential impacts mitigated, in later versions of the Proposed Development layout. This iterative design process means EIA layouts change frequently and are led by environmental considerations, validated by engineering reviews for turbine performance and constructability. The final layout submitted for the Proposed Development as assessed in the EIA Report is the culmination of this process where many of the environmental and social constraints and sensitivities of the Site will be avoided.

The following sections provide a summary of the key stages in the process of developing the design for the Proposed Development.

3.5.2.1 Scoping Layout (April 2022) –14 Turbines & Max Tip Height 180 m

At the Scoping stage, the Development consisted of 14 turbines with a maximum height to blade tip of 180 m and a total generating capacity of over 50 MW. The turbine tip height and general dimensions were chosen to reflect current trends in wind turbine technology.

The need to produce lower cost renewable electricity combined with global technological developments has led to viable wind turbines becoming taller, where substantial improvements in yield are achieved by using longer turbine blades. As such, the initial layout maximised potential turbine numbers, reflective of known constraints at the time, which were not necessarily subject to detailed site work. The following design principles were applied:

- Suitable separation distances between turbines based upon anticipated rotor diameters and prevailing wind direction, in order to reduce wake loss and issues associated with wind turbulence;
- Appropriate blade over-sail buffer at the Site boundary (where necessary);
- 50 m buffer to known watercourses and waterbodies to reduce the likelihood of impacts as a result of pollution events, principally during construction;
- 200 m buffer of roads;
- 1 km buffer of residential properties; and
- Avoid areas with a slope in excess of 14%.

The Scoping Layout can be seen on **Figure 3.2a**.

This layout was presented during an initial round of public consultation in June 2022.

Based on this proposed layout, this iteration was scoped under the EIA Regulations, and a Scoping Opinion was received from the Scottish Government in June 2022 (Energy Consents Unit Reference: **ECU00003461**).

3.5.2.2 Pre-Chilled Layout (August 2022) – 11 Turbines & Max Tip Height 180 m

The Pre-Chilled Layout comprised of up to 11 turbines with a maximum height of 180 m.

This iteration took place between the Scoping Layout and the Chilled Layout, and after initial surveys had been conducted including Phase 1 peat depth surveys. In addition to the constraints considered during Scoping, this layout considered:

- On-site non-designated cultural heritage assets identified through consultation with Dumfries & Galloway Council;
- On-site ecology and ornithology receptors identified during surveying;
- Landscape and visual receptors on the north-east of the Site, such as the A76 Sanquhar Castle, Sanquhar Church Road, Euchar Water minor road, Mennoch and SUW east of Sanquhar;
- Areas of peat identified during peat Phase 1 surveying; and
- 50 m buffer of woodland.

Three turbines in the north-eastern side of the Site were removed as these were closer to the transitional landscape between the uplands and the lowlands, and also extended closer to the visual receptors associated with Sanquhar and other settlements in this section of the A76.

During the first round of public consultation in June 2022, potential visual impacts were the main concern raised; this was the primary reason for the reduction in turbines from 14 to 11 between the Scoping and Pre-Chilled Layout, with associated benefits for other factors, including noise.

The Pre-Chilled Layout can be seen in **Figure 3.2b**.

3.5.2.3 Chilled Layout (October 2022) – 11 Turbines & Max Tip Height 180 m

The Chilled Layout comprised 11 turbines with a tip height of 180 m.

The Chilled Layout incorporates infrastructure elements that were not present within the Scoping Layout, including new access tracks, upgrades to existing access tracks, temporary construction compound (TCC) and crane hardstandings.

The new track proposed at the Site entrance is necessary to accommodate the abnormal vehicle loads required for construction and to avoid disruption to a local uninvolved business situated in close proximity to the Site entrance. Additionally, this will avoid disruption to existing farming operations, which require the existing tracks to be accessible for tending to livestock.

The initial proposed location for a BESS is also included in this layout. The Chilled Layout is provided in **Figure 3.2c**.

A number of iterations took place between the Pre-Chilled Layout and this Chilled Layout, taking into account constraints identified during ongoing environmental surveys, with a specific focus on landscape and visual, and noise. The locations of the turbines were refined to avoid visual stacking and achieve a relatively even spacing, in order to reduce the extent of landscape and visual effects. The complex topography of the Site and the numerous watercourses that traverse it were also important considerations during the design process. This factored heavily into the positioning of hardstandings and ancillary infrastructure positions, as well as the turbine access tracks.

3.5.2.4 Application Layout (November 2022) – 11 turbines & Max Tip Height 180 m

The Application Layout comprises of 11 turbines with a tip height of 180 m. The position of turbines and tracks remained the same between the Chilled Layout and the Application Layout, as did the Site boundary. However, the position of the TCC and BESS changed between layouts, and the Application Layout also incorporates a proposed substation location.

The Application Layout is provided in **Figure 3.2d**.

The following environmental factors have been summarised as key drivers which led to the Application Layout.

Landscape and Visual

This iteration of the layout design sought to improve the layout composition and minimise infrastructure visibility from receptors represented on **Figure 6.4** of the Scoping Report (ECU Ref: **ECU00003461**), whilst avoiding onsite constraints including areas of steep slope and watercourses.

The movement of the proposed TCC and BESS locations reflects efforts to utilise the existing Ulzieside Plantation, recently planted forestry to the south of the Ulzieside Plantation and an area of lower topography to reduce landscape and visual impacts on receptors to the north of the Site, including Sanquhar, Kirkconnel & Kelloholm, properties along the Blackaddie Road, and the A76.

The effects on landscape and visual are fully assessed within **Chapter 6 – LVIA**.

Phase 2 Peat Surveys

Peat Phase 2 focused on the proposed infrastructure locations as set out in the Chilled Layout (**Figure 3.2c**). Peat probing found 72.0 % (n = 1,218) of probes to be between 0 and 0.5 m, and 92.7% to be no greater than 1 m. Localised areas of deep peat (> 1 m) were identified along a section of track in the central southern portion of the Site, with floating track proposed to minimise any impacts of these areas. No extensive areas of deep peat were identified.

The effects on peat are fully assessed within **Chapter 10 - Peat and Ground Conditions**.

Ecology Features

Extensive ecological surveys undertaken across the Site generally recorded few protected species or sensitive habitats. Results from the National Vegetation Classification habitat surveys show that the Site is predominately a mosaic of the following, with numerous transitional zones due to complex Site topography and aspect:

- Marsh/marshy grassland;
- Semi-improved acid grassland;
- Unimproved acid grassland;
- Wet dwarf shrub heath; and
- Wet modified bog.

Patches of blanket bog, acid neutral flush, broad-leaved semi-natural woodland and bracken were also encountered, although forming only a minor part of the habitat mosaic across the Site. Areas of blanket bog, an Annex I habitat, were treated as a hard constraint and avoided. Annex 1 habitats inform the basis of selection for Special Areas of Conservation (SAC) sites and are internationally designated. Wet modified bog, wet heath and flushes were treated as a moderate constraint and avoided where possible.

Following the completion of ecological surveys on Site, the following protected species buffers were used during the design process:

- Badger setts – 30 m buffer and 100 m buffer (100 m applies if blasting or piling activities are to be undertaken);
- Otter couch – 30 m buffer;
- Otter holts with both 30 m and 200 m buffer (200 m applies if a breeding holt is located during surveys);
- Potential reptile hibernacula – 20 m buffer; and
- Bat potential roost features – 50 m buffer of woodland from turbines.

Fisheries surveys were conducted by the Nith District Salmon Fishery Board (NDSFB), which identified Atlantic salmon fry and parr on Euchar Water and the River Nith, into which watercourses within the Site drain. Trout parr and fry were identified on Euchar Water and on sampling site on Glen Burn, with trout parr only also identified on a second sampling site on Glen Burn. Fish were absent from several of the sampling locations within the Site, which was attributed to a combination of watercourse gradient and natural rock obstructions to fish migration. No Atlantic salmon fry or parr were found at sampling points within the Site.

The Application Layout considers the above ecological constraints with infrastructure located a suitable distance away from these features. As part of this process the access haul road was amended at the crossing of the Whing Burn located south of Cairnhill to address engineering and ecological concerns at this location, whilst also minimising interaction with the SUW. No notable ecological sensitivities that cannot be avoided or appropriately mitigated have been recorded.

Good practice will be adopted throughout the project lifecycle to avoid disturbance to protected species or direct effects on sensitive habitats.

The effects on ecology are fully assessed within **Chapter 7 - Ecology**.

Ornithology Features

Ornithology surveys were undertaken within and around the Site in line with NatureScot guidance. Surveys identified that the Site is of moderate ornithological value, with curlew and black grouse the key species identified to be using the Site. Barn owl and peregrine falcon breeding locations were also identified during the surveys; however, these are all outwith the Site boundary.

One black grouse lek was identified to the north of the Site, no infrastructure or turbines are located within 500 m of this lek (as per NatureScot guidance) and any turbines or infrastructure within 750 m will be subject to restrictions on construction works during the black grouse breeding season. The details of these restrictions will be provided in the EIA chapter and will also be included in the Breeding Bird Protection Plan (BBPP) prior to construction commencing.

The Application Layout considers the above ornithological constraints and good practice has been adopted to minimise the risk of potential effects on species that may be considered Important Ornithological Features (IOFs) in the assessment.

The effects on ornithology are fully assessed within **Chapter 8 – Ornithology**.

Hydrological Receptors & Private Water Supplies

The Site has several watercourses dissecting numerous undulating hills. When designing the layout, infrastructure was sited outside of 50 m buffers from watercourse channels where possible. New watercourse crossings were minimised, as much as possible, with any watercourse crossings designed in accordance with best practice, SEPA guidelines and SEPA Gate Check response (consultation reference: 7863).

Two new sections of access track are proposed within 50 m of a watercourse, as follows:

- At the site entrance, new track is necessary to accommodate the abnormal vehicle loads required to construct the Proposed Development and to avoid disruption to a local uninvolved business situated near the Site entrance. Additionally, this will avoid disruption existing farming operations, which requires the existing tracks to be accessible for tending to livestock. The track itself would be circa 25 m from the watercourse at its nearest point, however new drainage and ditches will be constructed for both the construction and operational phases of the Proposed Development to mitigate any pollution risk.
- To cross the Whing Burn, approximately 180 m south of Cairnhill cottage, a new c.0.4 km section of track and watercourse crossing is required at grid reference 276580 607984. The new watercourse crossing is required due to the existing track and two watercourse crossings being unable to accommodate construction traffic. A realignment of the existing track was considered however this would result a greater level of earthworks within 50m of the Whing Burn compared to a new, direct track and would also require significant upgrades to the two existing watercourse crossings. The Applicant therefore considers that the optimum solution is to create a new, direct access track and watercourse crossing which will result in less earthworks within 50 m of the Whing Burn.

Further details of the additional mitigation proposed for new access tracks within the 50 m watercourse buffer is provided in **Section 4.2.3.1, Chapter 4 – Description of the Proposed Development, Section 11.5.1.1, Chapter 11 – Hydrology and Soils and Section 3, Technical Appendix A11.1 Outline Water Construction Environmental Management Plan (oWCEMP).**

No other infrastructure elements are located within 50 m of a watercourse.

A Private Water Supply Risk Assessment (PWSRA) has been undertaken for the Proposed Development. The PWSRA aims to identify all Private Water Supplies (PWS) within a 2 km radius of the Proposed Development and seeks to confirm the location of the source water for the supplies, through consultation with the Council's Environmental Health Officer (EHO) and residents, along with site visits. This process informs the risk assessment of the effects of the Proposed Development on the private water supply, source water, and associated distribution infrastructure.

A site visit to facilitate the PWSRA was undertaken on 19th October 2022 by two suitably qualified hydrologists. The findings of the PWSRA form a **Technical Appendix A11.2 – PWSRA**. This assessment considers PWS within 2km of the Project, indicated by the PWS Study Area shown on **Figure 11.1**.

Scottish Water have no assets within the vicinity of the Proposed Development.

The effects on hydrology and PWS are fully assessed within **Chapter 11 – Hydrology and Soils and Technical Appendix A11.2**.

Noise

The potential for noise emissions from the operation of the turbines to affect these sensitive receptors has been modelled. The turbine layout has been designed to adhere to noise limits for the Development through the use of noise modes as mitigation to be used during the operation of the turbines. Additionally, one property (Glenmaddie) which lies adjacent to the northern Site boundary is financially involved.

In addition to turbines, the noise assessment considers construction noise and also takes into account the BESS infrastructure. Regarding BESS, typical noise emitting elements associated with such facilities (such as inverter units) of sound pressure levels of 70 dB(A) at 10 m, result in sound pressure levels lower than 25 dB(A) at 500 m. As there are no Noise Sensitive Receptors (NSRs) within this distance from the compounds, noise from operation of these elements is therefore not assessed further.

Consultation was undertaken with the EHO to confirm the methodology and approach of the assessment in June 2022.

The effects on noise are fully assessed within **Chapter 12 – Noise**.

Cultural Heritage & Archaeology

There are no designated archaeological features located within the Site, however, there are a number of non-designated assets on Site. The most significant of these is Deil's Dyke, a boundary ditch stretching for several kilometres across the landscape and crossing the Site. There are several non-designated assets within 5 km of the Site, including Deil's Dyke.

Additionally, there are several designated assets within 5 km of the Site. Within 1 km of the Site there are two scheduled monuments and 31 Listed Buildings, primarily located in and around the settlement of Sanquhar. The Conservation Area around Sanquhar is also located within 1 km of the Site. Between 1 km and 5 km there are a further two scheduled monuments and 23 Listed Buildings.

The design has sought to avoid the on-site, non-designated features as far as possible, as well as consideration of indirect effects to designated assets in the wider area.

All designated assets within 5 km of the Site have been subject to a setting assessment. Selected assets beyond 5km have also been subject to a setting assessment. Assets included for assessment beyond 5 km have been informed by the Zone of Theoretical Visibility (ZTV) for the Proposed Development and discussions with key stakeholders. Archaeological features subject to a setting assessment were agreed with Historic Environment Scotland (HES) and the LPA as part of the EIA process. A full setting assessment of the agreed archaeological features has been undertaken in the EIA Report and appropriate mitigation, where required, has been included therein.

The effects on cultural heritage assets are fully assessed within **Chapter 9 – Archaeology and Cultural Heritage**.

3.5.3 Infrastructure Design

The Application Layout (**Figure 3.2d**) incorporates infrastructure elements not present on the Scoping Layout, including the access tracks, Substation Compound, BESS, TCC and borrow pits.

A description of associated infrastructure is described in **Chapter 4 – Description of the Proposed Development** of this EIA Report.

3.6 Summary

Various economic, technical and environmental factors were all considered in the iterative design process. These were informed through a variety of baseline surveys and consultation with a range of stakeholders.

The Application Layout and associated infrastructure assessed in this EIA Report has been carefully developed taking these factors into account and is considered to balance the requirement to increase the renewable energy generation capacity of the Site whilst minimising the introduction of adverse environmental effects.

The final turbine layout and associated infrastructure is described in **Chapter 4 – Description of the Proposed Development** and shown on **Figure 3.2d**.

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This Chapter of the EIA Report provides a description of the Proposed Development which forms the basis of the assessments presented within **Chapters 5 to 16**. It provides details of the construction phase, the 35-year operational phase and decommissioning phase of the Proposed Development.

This Chapter includes an overview of the Proposed Development followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Proposed Development to reduce effects, also known as 'embedded' mitigation measures, are set out in the previous chapter (**Chapter 3 – Site Selection and Design**). In addition to these embedded mitigation measures, **Chapters 5 to 16** present mitigation and enhancement measures where specifically relevant to their assessment topic.

This Chapter of the EIA Report is supported by the following figures provided in **Volume 2a - EIA Report Figures excluding Landscape and Visual Impact Assessment LVIA**:

- **Figure 1.3:** Application Layout;
- **Figure 4.1:** Indicative Turbine Elevation;
- **Figure 4.2:** Indicative Foundation Design;
- **Figure 4.3:** Indicative Crane Hardstanding;
- **Figure 4.4:** Indicative Cable Trench Detail;
- **Figure 4.5:** Indicative Temporary Construction Compound (TCC);
- **Figure 4.6:** Indicative Substation Compound Layout;
- **Figure 4.7:** Indicative Control Building and Elevations;
- **Figure 4.8:** Indicative Windfarm Developers Control Building and Elevations;
- **Figure 4.9:** Indicative BESS Design and Elevations;
- **Figure 4.10:** Indicative Access Track;
- **Figure 4.11:** Indicative Culvert Detail;
- **Figure 4.12.1:** Indicative Borrow Pit 1 Layout (a);
- **Figure 4.12.2:** Indicative Borrow Pit 2 Layout (b);
- **Figure 4.12.3:** Indicative Borrow Pit 3 Layout (c);
- **Figure 4.13:** Met Mast Elevation; and
- **Figure 11.4:** Watercourse Crossings.

4.2 Description of the Proposed Development

4.2.1 Development Overview

The components of the Proposed Development are summarised in **Table 4.1** and shown on **Figure 3.2d**. Full details are provided in **Sections 4.2.2 through 4.2.8**.

Table 4.1 Key Parameters of the Development

Element	Details
Turbines and Foundations Figure 3.2d, 4.1 & 4.2	11 turbines, each with a hub height of approximately 105 m, rotor diameter of approximately 150 m and tip height of up to 180 m, Each turbine may require a small external transformer located at its base. Each turbine will have a foundation with a diameter up to approximately 25 m.
Access Track Figure 3.2d, 4.10 & 4.11	Access track to serve the construction and operation of the wind farm with width approximately 5.0 m, this will consist of a combination of existing track (3126.4 m), upgraded track (4493.6 m) and newly constructed track (5619.9 m). New tracks will be constructed of a graded stone or floated design, as appropriate for the ground conditions.
Electrical Infrastructure Figure 3.2d, 4.4, 4.6, 4.7, 4.8 & 4.9	A substation and control building will be located east of T9. The substation and control building will be located within a compound measuring approximately 2955 m ² , which will also include any external electrical infrastructure and vehicle parking. A Battery Energy Storage System (BESS) will be located south of the substation, covering an area of approximately 10,725 m ² . Underground cabling, laid where possible alongside the access tracks, will link the turbine transformers to the onsite substation.
Crane Hardstanding Figure 4.3	Crane hardstandings will be required adjacent to each turbine, this will cover an area approximately 2000 m ² at each turbine. Each turbine will be located within their crane hardstanding area.
Temporary Construction Compound Figure 4.5	A temporary construction compound will be required during the construction of the Proposed Development, forming an area of hardstanding providing space for temporary welfare, parking, lay down areas and potentially concrete batching; this will measure approximately 5,000 m ² .
Borrow Pits Figure 4.12.1, 4.12.2 & 4.12.3	Up to three onsite borrow pits are proposed, as follows: Borrow Pit 1 is approximately 2228 m ² and centred at OS Grid Ref 276630, 607787. Borrow Pit 2 is approximately 5760 m ² and centred at OS Grid Ref 275339 606060. Borrow Pit 3 is approximately 10961 m ² centred at OS Grid Ref 275042, 605749. Further detail is provided in Technical Appendix A10.3: Borrow Pit Assessment (BPA).
Watercourse Crossings Figure 4.11 & 11.4	Access tracks will require fifteen new or upgraded watercourse crossings. The locations of watercourse crossings are detailed in full in Chapter 11: Hydrology and Soils. The type and design of each watercourse crossing will be dependent on the stream morphology, peak flows, local topography and ecological requirements, and will be chosen so as to avoid or minimise potential environmental effects. It is currently anticipated that the crossings will all be culverts, however this would be confirmed at the detailed design stage.
Met Mast Figure 4.13	A permanent Met Mast, will be located at OS grid reference 273700, 605500.

It is estimated that the permanent new footprint of the Proposed Development, including infrastructure and following restoration will be approximately 17.1 ha.

The Applicant has accepted a grid connection offer for the Proposed Development at Glenglass for 2028. The grid connection is subject of further appraisal work and will form a separate application for consent. It is likely to be submitted under section 37 of the Electricity Act 1989 to the Scottish Ministers via the ECU by Scottish Power Energy Networks (SPEN).

4.2.2 Wind Turbines and Associated Infrastructure

4.2.2.1 Wind Turbines

Consent is being sought for the erection of 11 three-bladed horizontal axis wind turbines with a maximum height from base to tip that will not exceed 180 m (with the blade in the vertical position).

Figure 4.1 illustrates a typical turbine of this type.

The candidate turbine model is the Vestas V150 turbine²⁹ which will have a maximum blade tip height of no more than 180 m as this is the upper limit of the environmental and planning parameters considered in the EIA Report. A hub height of approximately 105 m is assessed for the purposes of the EIA Report.

Turbines are typically of a variable speed type, so that turbine rotor speed will vary according to the energy available in the wind. Turbines of the dimensions proposed generate power for all wind speeds between 3 and 25 metres per second (m/s). At speeds greater than 25 m/s, the turbine reduces power output by pitching the blades out of the wind to protect the turbine from damage caused by high wind speeds.

The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all 11 turbines will rotate in the same direction.

When operating, the rotational movement of the blades is transferred through the gearbox, to drive the generator. This produces a three-phase power output typically at 690 Volts (V), which is transferred from the generator to the turbine transformer. The turbines will be controlled and monitored from within the proposed control building and will also be remotely monitored where performance details and statistical information for each turbine will be recorded.

Table 4.2 details the locations of each turbine.

During the construction phase, two cranes are typically required to install the turbines, consisting of a larger 800 – 1000 tonne main crane and a secondary 400 – 500 tonne crane. The cranes would use the crane hardstandings as described in **Section 4.2.2.3**. The construction contractors would determine the actual cranes used following the turbine procurement process, together with the exact programme and number of teams on-site.

The method for erecting each turbine would depend on the turbine supplier and site conditions. Turbine components would either be lifted directly off transportation units for erection or more typically stored adjacent to the crane hardstandings. The tower sections are initially erected, followed by the nacelle and then the hub depending on the blade installation. The turbine blades would then be lifted individually and attached to the hub or if sufficient space is available would be attached to the hub at ground level, then raised together and attached to the nacelle. The overall assembly process for each turbine takes approximately two to four days, depending on weather conditions.

Table 4.2 Wind Turbine Co-ordinates and Elevations

Turbine No.	Easting	Northing	Approximate Elevation (m) AOD
1	272661	604825	460
2	273094	605660	383
3	273179	604912	429
4	273731	605202	418
5	273847	605863	408
6	273377	605381	402
7	274247	605353	390
8	274892	605630	429
9	274508	606358	357
10	273562	606171	384
11	274545	605910	374

²⁹ Further detail on the candidate turbine is available online at: [EnVentus Product Brochure Vestas-150162.pdf \(wind-watch.org\)](#) (accessed 07/09/2023)

4.2.2.2 Turbine Foundations

The foundation for the turbines would comprise a standard concrete gravity foundation constructed of poured concrete with steel reinforcement. Designs vary depending on ground conditions but typically, concrete volumes for turbines of this size range up to 1250 m³ and would include up to 90 tonnes of steel reinforcement. The area of excavation is likely to be up to 35 m by 35 m to allow for an excavated working area around the concrete turbine foundation.

A typical turbine foundation is shown in **Figure 4.2**. Each turbine foundation will consist of an octagonal or circular base approximately 25 m in diameter which sits on the underlying rock or suitable substratum. Foundations are typically between three and five metres below ground level dependant on the ground conditions and topography found at each turbine location. Further ground investigations will be undertaken to confirm the design of each foundation. Atop the concrete foundation, a layer of foundation topsoil backfill will be compacted, typically 300 mm.

The detailed design specification for the foundation would depend on the geotechnical site investigations undertaken during the enabling works to establish the nature of the subsoil condition at each turbine location. Each foundation would be designed separately according to the chosen turbine type and manufacturer specification.

The ground excavation methods would vary depending on the local ground conditions and the nature of the surface vegetation. The general processes would be as follows:

- Topsoil/turf will be stripped and stored in order to be reused in reinstatement/restoration of the turbine construction area;
- Subsoil (if present) will be stripped and stored, keeping this material separate from the topsoil/turf;
- Excavation of turbine foundations will then take place followed by the installation of the steel reinforcement bars and casting of concrete; and
- After the foundation has been poured the area would be backfilled as soon as practicable with spoil, pending turbine installation.

Once the turbines have been installed, the immediate construction area around the turbine bases would be reinstated/restored using the retained topsoil or turf to within approximately 1 m of the tower bases. A 1 m wide gravel path would then be laid around the tower base. Material won from foundation excavations would, if suitable, be used in the landscaping of access tracks and other site infrastructure. If not suitable for reuse within the Site, it would be removed from the Site under duty of care waste documentation to be reused off-site or disposed of at a suitably licensed facility where no other suitable option can be found.

4.2.2.3 Crane Hardstandings

Each turbine requires an area of hardstanding adjacent to the turbine foundation to provide a stable base on which to site the turbine components and cranes for the erection of the turbine.

Each hardstanding will be composed of crushed stone over geotextile membranes and cover an area of approximately 2000 m². There will also be smaller temporary auxiliary crane areas which are required for the assembly of the main crane jib and 'blade fingers' which are required for the storage of the turbine blades.

A typical arrangement is shown in **Figure 4.3**; however, the final arrangement of the hardstanding will depend on the method of erection and exact specification of the cranes chosen by the turbine erection contractor. The hardstandings will be sufficiently level and with a suitable load-bearing capacity for storage of turbine components and operation of the cranes.

Surface water and groundwater levels will be managed, via the implementation of a Construction Environmental Management Plan (CEMP) and supervision by a suitably qualified person, to ensure

that natural drainage patterns are maintained and that water levels within excavations do not rise beyond appropriate and safe limits. Various cable ducts and other ancillaries will be installed within the foundations and under the access track crossing points.

Construction of the crane hardstanding would be similar to the construction of the Site access tracks as described in **Section 4.2.3**. Surplus excavated material would be reused elsewhere within the Site such as for track maintenance during construction or during borrow pit reinstatement. Similarly, any surplus topsoil and turves would be used to reinstate/restore track edges and/or borrow pits after construction.

The crane hardstanding would be left in place following construction in order to allow for the use of similar machinery should major components need replacing during the operation of the Proposed Development. These would also be utilised during decommissioning at the end of the Proposed Development's life, at which point the crane hardstanding areas would be removed and the land reinstated/restored.

4.2.2.4 Transformers and Cabling

Depending on the final choice of turbine, transformers will either be located within the turbine tower (with internal switchgear) or externally, close to the base of the tower. For the purposes of this assessment, it has been assumed that the transformers will be located adjacent to each turbine as a worst-case scenario. An external transformer will normally be placed within a glass reinforced plastic (GRP) housing, the size of housing will depend on the type of transformer selected but in general it will be approximately 3 m by 2.5 m in plan and 2.5 m in height above surrounding ground level, located adjacent to the turbine within the hardstanding area.

The transformers will be either oil-filled with a bunded footing to remove risk of pollution or a solid cast resin type. The transformers will increase the electrical voltage from 690 V to 33 kilovolts (kV).

Turbines will be connected by 33 kV single phase power cables which will be laid in trenches alongside the access tracks, with a depth of approximately 1 m. The excavated trenches will also include Supervisory Control and Data Acquisition (SCADA) cables or fibre optic cables. This will allow interrogation and control of individual turbines as well as remote monitoring. A copper cable will also be located in the trench and will be connected to the substation and each turbine to provide an earthing system to provide protection from lightning strikes and electrical faults. The cables will be laid on a sand bed, then surrounded by further sand and backfilled using suitably graded material. Clay, or equivalent low permeability barriers, will be inserted into the cable trenches at regular intervals to avoid the trenches becoming preferential drainage pathways. Details of typical trenches are shown in **Figure 4.4**.

4.2.2.5 Aviation Lighting

Civil Aviation Authority (CAA) guidance requires that 'en-route obstacles' at or above 150 m above ground level are lit with visible lighting to assist their detection by aircraft. In accordance with the Air Navigation Order 2016. The turbines at the Proposed Development will be fitted with visible lighting in accordance with the CAA Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level Policy Statement³⁰ unless alternative reduced provision is agreed with the CAA.

The Proposed Development has been assessed on the basis of each turbine being lit as follows:

³⁰ Civil Aviation Authority (CAA) (2017) Policy Statement Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level [Online] Available at: https://publicapps.caa.co.uk/docs/33/DAP01062017_LightingWindTurbinesOnshoreAbove150mAGL.pdf. (Accessed 01/02/2023)

- All obstacles at or above 150 m above ground level are fitted with medium intensity (2000 candela) omni directional visible aviation lighting and, in the case of wind turbines, are located on the hub;
- A secondary light (of the same specification) fitted for use only when the primary light fails and would not be lit concurrently; and
- Low intensity (32 candela) aviation lights to be provided at an intermediate level of half the hub height. These would need to be fitted around the towers to allow for 360° horizontal visibility.

The technical specifications for the visible aviation lighting are specific and affects how they are perceived from different viewing angles. **Table 4.3** below summarises the required and recommended intensity settings for 2000 candela lights (as set out in European Aviation Safety Agency (EASA) CS-ADR-DSN Table Q-3 and International Civil Aviation Organisation (ICAO) Annex 14 Table 6-3³¹).

Table 4.3 ICAO/EASA Medium Intensity Light Specifications

Criterion	Value (Candela)
Required minimum average intensity at 0° elevation	2000
Required minimum intensity at 0° elevation	1500
Recommended maximum intensity at 0° elevation	2500
Required minimum intensity at -1° elevation	750
Recommended maximum intensity at -1° elevation	1125
Recommended maximum intensity at -10° elevation	75

These specifications mean that the 2000 candela lights, required by the CAA to be installed on turbines with blade tip heights of 150 m or more, generate their nominal 2000 candela intensity in a relatively narrow band of elevation angles, from the horizontal to several degrees above the horizontal, and that the intensity of the light reduces significantly at angles of elevation below the horizontal. The effect of the Proposed Development's visible lighting will be dependent on a range of factors, including the intensity of lights used, the clarity of atmospheric visibility and the degree of negative / positive vertical angle of view from the light to the receptor.

An assessment of the effects of aviation lighting using these specifications is provided in the **Chapter 6 - Landscape and Visual Impact Assessment** and **Technical Appendix A6.3 Visual Assessment of Visible Aviation Lighting**.

The final lighting specification will be submitted for approval to the Council and CAA prior to construction, secured by an appropriately worded planning condition.

4.2.3 Associated Development

4.2.3.1 Access Tracks

As referenced in **Section 4.2.1**, access to the Site will be taken from the north, as shown in **Figure 3.2d**.

The proposed access has been designed to minimise environmental disturbance and land take wherever possible by re-using as much existing track as possible, avoiding areas of peat and deep peat, environmental constraints identified during the EIA and minimising the number of watercourse crossings.

The length of onsite access tracks will total approximately 12.7 km which consists of approximately 4.7 km of existing tracks and approximately 8 km of new tracks.

³¹ International Civil Aviation Organisation (ICAO) (2018) Annex 14 to the convention on International Civil Aviation Annex 14 Table 6-3 Available at: https://www.icao.int/icao/en/annex14/Annex_14_Vol_1_Aerodromes_8ed_2018_rev.14_01.07.18.pdf [Online]. Accessed 01/02/2023)

New tracks will be constructed to connect the turbine locations to enable the turbine components, construction materials and construction staff to be transported to their locations, and to enable access for subsequent maintenance visits.

The proposed track layout is illustrated in **Figure 3.2d**, with an elevation of both new and upgraded tracks shown in **Figure 4.10**.

Access tracks will be approximately 5.0 m (as described in **Table 4.1**) in width, with an additional 1.5 m verge on either side subject to local ground conditions. The tracks have been designed to have sufficient radii for turning of the construction vehicles, abnormal loads and plant. Turning heads have been included within the design as necessary to allow abnormal load vehicles and cranes to undertake turns during the turbine delivery and assembly process. These are incorporated into the crane hardstanding areas in order to minimise land take.

Figure 4.10 illustrates typical track designs which are likely to be employed for the Proposed Development's onsite tracks, including both new and upgraded access track. Prior to the commencement of construction, a detailed engineering specification for the access track design will be submitted to the Council for approval as part of a Planning Conditions Compliance Statement which will include Construction Method Statements (CMS) for all aspects of construction.

A Drainage Management Plan (DMP), which will detail proposed surface drainage measures to treat and deal with surface runoff from the Site, will be designed in accordance with Sustainable Drainage Systems (SuDS) principles. This plan will form part of a detailed CEMP for the Proposed Development, which shall be secured by an appropriately worded planning condition, with the details agreed with the Council and SEPA prior to commencement of construction.

Where construction works cannot avoid the 50 m buffer from watercourses, additional pollution prevention measures will be undertaken specific to the topography and site conditions at each location. These works shall be completed under the supervision of the Environmental Clerk of Works (ECoW), and may include additional cut-off drains, check dams, sumps, and/or silt fencing, for example.

All access tracks will incorporate robust drainage, including drainage channels running adjacent to the tracks, on one or both sides. The track would be designed to be cambered at gradients up to 4% towards the drainage channels to prevent a build-up of surface water and allowing the track to act as a watercourse. Use of rock or turve check dams and other forms of catchment within access track drainage channels will also help to control surface water run-off speeds and reduce sedimentation, particularly during periods of very wet/thawing weather. The make-up of the tracks will also be as permeable as possible to prevent any instances of surface water build up. Further detail can be found in **Technical Appendix 11.2 Outline Water Construction Environmental Management Plan (oWCEMP)**, which outlines typical measures that will be undertaken to prevent pollution of the water environment.

All construction works will be carried out in accordance with best practice guidance as per NatureScot's 'Good Practice during Wind Farm Construction'³².

The access tracks require negotiating steep and locally very steep slopes to get to each array within the Site. In practice, this leads to large areas of earthworks, primarily 'Cut' material, and overall, an increased footprint. The design process was iterative and the final track alignments presents the best and optimum practical option.

³² NatureScot (2019) Good Practice during Windfarm Construction. [online] Available at: <https://www.nature.scot/doc/guidance-good-practice-during-wind-farm-construction>. (Accessed 01/02/2023)

4.2.3.2 Watercourse Crossings

Construction Industry Research and Information Association (CIRIA) Culvert Design and Operation Guide (C786F)³³ and incorporating the most recent climate change allowances, to ensure sufficient capacities.

This watercourse crossing would be subject to registration under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)³⁴ (CAR) and Water Environment (Miscellaneous) (Scotland) Regulations 2017³⁵.

As such, further consultation with SEPA will be undertaken prior to commencement of construction by the Applicant, or their Principal Contractor, to ensure compliance with CAR via a Construction Site License.

Typical watercourse crossing details are shown on **Figure 4.11**.

4.2.3.3 Substation Compound

The substation compound would be located on an area of crushed stone hardstanding measuring approximately 64 m by 46 m. The compound is centred at approximately NGR 275349, 606469, as shown on **Figure 3.2d**.

The substation compound will be partitioned into two broad sections, accommodating the control building and associated external electrical switchgear. It will also include an area for vehicle parking and storage during the construction period. A typical arrangement is shown in **Figure 4.6**.

The principal element of the substation compound is the control building which contains the electrical infrastructure and control elements of the Proposed Development. This will likely comprise a single storey unit measuring approximately 12.5 m in length by 10 m in width with a pitched roof as shown in **Figure 4.7** and **4.8**. The control building will include control components, including metering equipment, switchgear, the central computer system and electrical control panels as well as welfare facilities, associated air conditioning systems, and a maintenance room. The substation compound will also include a septic tank and buried rainwater tank associated with the control building.

In addition to the electrical infrastructure housed within the control building, there will be external electrical switchgear located within the substation compound, which will be adjacent to the substation. External switchgear would be located within a security fence of up to 3 m height and served via a locked access gate.

The substation building will have its own foul drainage system, as noted above including a rainwater collection tank and septic tank. Surface water will drain via soakaway or other preferred SuDS method. This will be agreed with the Council prior to construction.

The underground cables from the wind turbines would be brought into the substation building via ducts. The ducts would guide the cables to the appropriate switchgear inside the building. Communications cables would enter in a similar manner.

Lighting will be kept to a minimum and will be limited to working areas only and will comply with health and safety requirements. Lighting will be down lit and linked to timers and movement sensors so that light pollution is kept to a minimum.

³³ Benn, J, Kitchen, A, Kirby, A, Fosbeary, C, Faulkner D, Latham, D, Hemsworth, M (Dec 2019) Culvert, screen and outfall manual (C786F) <https://www.ciria.org/ItemDetail?iProductCode=C786F&Category=FREEPUBS> (Accessed 14/02/2023)

³⁴ Scottish Government (2011) The Water Environment (Controlled Activities) (Scotland) Regulations 2011 [Online] Available at: <http://www.legislation.gov.uk/ssi/2011/209/contents/made> (Accessed 14/02/2023)

³⁵ Scottish Government (2017) Water Environment (Miscellaneous) (Scotland) Regulations 2017 [Online] Available at: <http://www.legislation.gov.uk/ssi/2017/389/contents/made> (Accessed 14/02/2023)

4.2.4 Battery Energy Storage System (BESS)

The battery storage compound would be located on an area of crushed stone hardstanding measuring approximately 143 m by 75 m. The compound is centred at approximately NGR 275297, 606320, as shown on **Figure 3.2d**.

The battery storage element is likely to be built up from a number of containerised storage units. These units are typically based around the dimensions of a standard lorry container, either 1.73 m wide by 2.6 m high by 6 m long, or 2.45 m wide by 2.6 m high by 9.3 m long. Technological advances in battery storage are occurring rapidly and so the final installed capacity would be confirmed prior to construction, however at this stage it is anticipated that the BESS will have a capacity of approximately 30 MW installed however this may increase prior to construction given the rapidly evolving battery technology. An indicative drawing of the BESS design and elevation can be found in **Figure 4.9** which would potentially allow for up to 30 MW of storage. As the storage market continues to evolve rapidly, the BESS units may be installed following the construction of the Proposed Development and once the turbines are in operation. For this reason, all carbon calculations within this EIA are based on a worst-case where the BESS is not installed. The proposed layout of the BESS is shown on **Figure 4.9**.

4.2.5 Temporary Infrastructure

4.2.5.1 Temporary Construction Compound

A temporary construction compound will be created for the duration of the build centred at approximately NGR 274863, 606187 as shown on **Figure 3.2d**. This area has been chosen within a relatively level area of the Site, and with suitable separation distance from any environmental constraints identified during the EIA process. The area of the compound will measure approximately 100 m by 50 m and will include space for:

- Temporary construction cabins for site office and staff welfare facilities with provision for sealed waste storage and removal;
- Areas for storing materials;
- Parking for project related vehicles; and
- Containerised storage for tools and spares.

A typical construction compound arrangement is shown on **Figure 4.5**. Welfare facilities for site personnel will be required during construction which would be located within the construction compound. Foul water and effluent would be treated either via septic tank with soakaway designed to SEPA guidelines (including Regulatory Method (WAT-RM-04) Indirect Sewage Discharges to Groundwater³⁶) or by the use of chemical facilities with periodic material for off-site disposal. Any facilities would be subject to agreement with SEPA.

The area to be used for the construction compound would be stripped of topsoil to expose a suitable formation which will be stored for future re-instatement. A geosynthetic material base or similar will then be laid followed by a layer of suitable material then a further geosynthetic material laid prior to the top surface of blended fines.

Appropriate bunding arrangements will be employed in all areas where fuel and oil storage tanks will be situated, in order to prevent contamination of the surrounding soils, vegetation, surface water and ground water. The fuel storage area will be above ground with secondary containment in accordance with SEPA's GPP2 (Guidelines for Pollution Prevention) (Above Ground Oil Storage Tanks), GPP7

³⁶ Scottish environmental Protection Agency (SEPA (2022) Regulatory Method (WAT-RM-04) Indirect Sewage Discharges to Groundwater. Available at: <https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.sepa.org.uk%2Fmedia%2F594197%2Fwat-rm-04-regulation-of-indirect-sewage-discharges-to-groundwater.docx&wdOrigin=BROWSELINK>. [Online] Accessed 01/02/2023)

(Refuelling facilities) and GPP8 (Safe storage and disposal of fuel oils) and will be situated a minimum of 50 m from watercourses to reduce the risk of pollution of watercourses. Any contaminated run-off within the sealed bund will be removed from site with appropriate duty of care waste documentation to a suitably licensed waste management facility.

Following completion of the construction phase the components of the compounds will be removed and the area fully restored.

4.2.5.2 Borrow Pits

Three potential borrow pit locations have been identified within the Site which would be utilised during construction. While a substantive amount of excavation will be utilised in the balance of construction materials, it is also proposed that the re-use potential for the aggregate is maximised and endeavoured during construction. Borrow pit one, the northern most borrow pit, is an existing borrow pit so no extraction will be necessary. This includes the potential for concrete batching, if possible, to promote the use and recycling of secondary materials in development plan policies.

The borrow pit search locations have been selected to avoid known environmental constraints. Borrow pits will be located at:

- Borrow Pit 1 is an existing borrow pit, measuring approximately 2228 m² and centred at OS Grid Ref 276630, 607787. Location and cross section details of Borrow Pit 1 are shown of **Figure 4.12.1**.
- Borrow Pit 2 is approximately 5760 m² and centred at OS Grid Ref 275339 606060. Location and cross section details of Borrow Pit 1 are shown of **Figure 4.12.2**.
- Borrow Pit 3 is approximately 10961 m² centred at OS Grid Ref 275042, 605749. Location and cross section details of Borrow Pit 1 are shown of **Figure 4.12.3**.

Figure 3.2d displays the location of all three borrow pits within the Site.

Based on information available from site investigations undertaken to date it is anticipated that no blasting will be required, with rock extracted by machine. Further site investigations will be undertaken prior to construction to confirm the proposed methodology.

A site-specific CEMP shall be developed prior to construction and agreed with the Council, to be secured by an appropriately worded planning condition in order to manage the borrow pits whilst they are in operation. The CEMP shall include all relevant environmental mitigation, such as ecology management, heritage management, noise management and pollution prevention measures, etc.

Further detail can be found in **Technical Appendix 10.3: Preliminary Borrow Pit Assessment**.

4.2.6 Met Mast

A Met Mast is proposed to be located at approximately National Grid Reference (NGR) 273700, 605500. The met mast will be a free-standing lattice tower approximately 100 m in height, as shown in **Figure 4.13**.

4.2.7 Site Signage

During construction and operation of the Proposed Development, the Site will have suitable signage to protect the health and safety of workers, contractors and the general public.

It is proposed that there will be a sign giving the operator's name, the name of the Proposed Development and an emergency contact telephone number. On the turbines and Substation Compound, there will be further signs giving information about the component, potential hazards, the operator's name, the location grid reference and the emergency telephone number. The final location and design of the signage will be defined through a CEMP with the Council prior to commencement of the Proposed Development.

4.2.8 Micro-siting

In the event that unsuitable ground conditions are encountered during the construction of the Proposed Development, there may be a requirement to micro-site turbines and elements of infrastructure. It is proposed that a 50 m micro-siting allowance in any direction for turbines and all other infrastructure is applied to the Proposed Development. Beyond this distance, any relocation of turbines or infrastructure will require written approval from the Council.

Any likely significant effects arising from this micro-siting allowance have been considered in the preparation of this EIA Report, and specific areas to be avoided have been identified in technical chapters where necessary.

4.2.9 Reinstatement and Restoration of the Site

Site reinstatement will involve reusing peat, soils, turf and other materials on track and hardstanding verges, borrow pits embankments and the temporary construction compound to provide a natural ground profile with non-geometric surfaces and tie-ins with existing undisturbed ground levels. Reinstatement will be undertaken at the earliest opportunity to minimise the time peat, soils, turf and other materials are stored. This will allow the maximum opportunity for the Site to naturally reinstate and blend in with the surrounding habitats as early as possible and in a progressive manner.

The management, and reuse of peat within the Site during construction will be managed by way of a detailed Stage 2 Peat Management Plan (PMP), which will be secured by planning condition and agreed with the Council and relevant statutory consultees prior to the commencement of construction. A Stage 1 PMP is provided as a technical appendix to **Technical Appendix A10.2: Outline Peat Management Plan (oPMP)**. To meet the requirements of Policy 3(b) of NPF4, an Outline Biodiversity Enhancement Management Plan (oBEMP) has been included as part of this application to demonstrate appropriate biodiversity conservation, restoration and enhancement techniques.

Where reinstatement of the Site through natural means, as noted above, is not sufficient or where there is a risk of erosion some areas may require more detailed intervention with site specific restoration techniques, which would need to be determined in due course.

A reinstatement and restoration plan for the Site will be produced as part of a detailed CEMP, which will be secured by planning condition and agreed with the Council and relevant statutory consultees prior to the commencement of construction.

4.2.10 Grid Connection

The Applicant has accepted an offer from Scottish Power Energy Networks (SPEN) to connect the Proposed Development to the existing substation at Glenglass in 2028, located approximately 3.2 km west of the Site.

The grid connection does not form part of the Application for Section 36 (s.36) consent and deemed planning permission for the Proposed Development. Consent for the grid connection will be sought by SPEN, who will be responsible for the consenting, construction, operation and maintenance of the grid connection.

4.3 Construction and Development Phasing

The on-site construction period is estimated to last approximately 18 months and would comprise the principle operations:

- Site mobilisation, including establishment of temporary compound areas and pegging out of preliminary new tracks, borrow pits and potential batching plant;
- Installation of temporary and permanent drainage;
- Extraction of stone from the onsite borrow pits;

- Upgrade of existing access tracks and construction of new access tracks, including watercourse crossing points;
- Construction of the substation and BESS compound areas;
- Construction of turbine foundations;
- Construction of crane hardstanding areas;
- Remedial works to the public highway to accommodate turbine deliveries;
- Construction of the substation building, and installation of electrical infrastructure. Note: The BESS and associated electrical infrastructure may be installed on the BESS compound at a later date;
- Excavation of shallow cable trenches approximately 1 m off the edge of the track and cable laying adjacent to the access tracks and crane hardstandings;
- Delivery, erection and commissioning of wind turbines;
- Connection of onsite electrical distribution cables;
- Commissioning of the site equipment; and
- Reinstatement of the borrow pits and the temporary construction compound.

4.3.1 Construction Period

It is expected that many of the above operations will be carried out concurrently, which will minimise the overall length of the construction programme. An indicative Construction Programme is illustrated in **Table 4.4**.

It is proposed that construction activities be limited to the working hours of 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays, with the exception of any emergency working or turbine deliveries. During the installation phase, there may be a requirement for extended working as some critical elements of installation cannot be stopped once started, such as concrete pouring. Any such works would be agreed in advance with the Council.

Table 4.4 Indicative 18 Month Construction Programme

Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Site Mobilisation																		
Borrow Pit Opening and Stone Extraction																		
Access Track Construction																		
Turbine Foundations																		
Control Building / Substation																		
Cabling and Electrical Works																		
Crane Delivery																		
Turbine Delivery																		
Demobilisation and Reinstatement																		

4.3.2 Construction Methods and Environmental Management

The construction phase will be controlled via a series of detailed method statements, which will be prepared by the Principal Contractor appointed by the Applicant, who will have overall responsibility for environmental management on the Site during construction. While these method statements will be formulated following detailed site investigation and detailed engineering design, it is possible to indicate the outline of the methods that will be used, particularly in relation to environmental management.

The services of specialist advisors will be retained as appropriate, such as an archaeologist and ecologist, to be called on as required to advise on specific environmental issues. The appointed Contractor will ensure construction activities are carried out in accordance with the mitigation measures outlined in this EIA Report.

Prior to construction, a detailed CEMP would be prepared by the Applicants Principal Contractor that collates all measures required during construction to avoid and minimise environmental harm including guidance and best practice. The CEMP would include, but not limited to:

- Site induction and training;
- Working hours;
- Enabling works;
- Surface water and drainage management;
- Waste management;
- Wastewater and water supply monitoring and control;
- Oil and chemical delivery and storage;
- Pollution Prevention Plan (PPP);
- Water quality monitoring;
- Ecological protection measures;
- Construction noise management;
- Cultural heritage protection measures;
- Handling of excavated materials;
- Reinstatement and restoration;
- Traffic management;
- Environment incident response and reporting; and
- Use and extent of borrow pits.

To ensure that the mitigation and management measures detailed within this EIA Report are carried out, construction personnel and contractors will be required to adhere to the CEMP which will form an overarching document for all construction site management requirements.

Contractors will also be required to adhere to the following to minimise environmental effects of the construction process:

- Planning conditions as required under the s.36 consent and deemed planning permission;
- Requirements of statutory consultees including SEPA and NatureScot;
- Any other relevant mitigation measures identified in this EIA Report; and
- All relevant statutory requirements and published guidelines that reflect 'good practice'.

The Applicant will require that all contractors follow the requirements of ISO14001 - 'Environmental Management Systems - Specification and Guidance for Use'³⁷, and will provide the following:

- Details of main contractor's corporate environmental policy;
- Assessment of environmental impacts during construction;
- Procedures and controls for environmental management;
- Environmental monitoring details and reporting systems;
- Schedule of contractual and legislative requirements; and
- Schedule of relevant consents, licences and authorisations.

The CEMP will be agreed with the relevant statutory bodies including SEPA, NatureScot and the Council prior to commencement of construction, and performance against the CEMP will be monitored by the Applicant's Construction Project Manager throughout the construction period.

Particular environmental impacts and associated mitigation measures required to be addressed within the CEMP are discussed in relevant sections of this EIA Report.

4.3.3 Construction Materials

The key materials which would be required for the construction of the turbine foundations, hardstanding areas and cable trenches are:

- Crushed stone;
- Geotextile;
- Cement;
- Sand;
- Concrete quality aggregate: high strength structural grade, which is not prone to substantial leaching of alkalis;
- Steel reinforcement; and
- Electrical cable.

4.3.4 Construction Movements

Various vehicle types are required during the construction stage of the Proposed Development. Of these, the majority would be standard road vehicles of similar type to those using local roads on a daily basis; however, the delivery of some of the wind turbine components would require vehicles and transport configurations that are longer, wider and/or heavier than standard road vehicles (see **Chapter 13 - Traffic and Transportation**).

4.3.5 Waste Management

Waste generation will be minimised as far as possible. All waste will be removed off-site for safe disposal at a suitably licensed waste management facility in accordance with current waste management regulations. Wherever possible, excavated stone or soils will be reused on-site, primarily for the restoration of disturbed ground. All details of this will be included within the CEMP, as agreed with the Council and SEPA.

The main items of construction waste and their sources are:

- Hardcore, stone, gravel from temporary surfaces to facilitate construction waste, and concrete;

³⁷ BS EN ISO 14001:2015 Environmental management systems. Requirements with guidance for use

- Subsoil from excavations for foundations and roads;
- Timber from temporary supports, shuttering and product deliveries;
- Miscellaneous building materials left over from construction of the Substation and Control Buildings;
- Sanitary waste from chemical toilets (if used);
- Plastics packaging of material; and
- Lubricating oils, diesel - unused quantities at end of construction period.

Subsoil not required for reinstatement or restoration purposes and will be collected at the end of the construction phase and reused offsite where possible. If no reuse can be found either on site or off site then it would be removed from site. Whichever option is selected it would be managed under duty of care waste documentation in line with best practise and the Waste (Scotland) Regulations 2012.

Waste oils and diesel will be removed from the Site under the appropriate duty of care documentation and disposed of by an approved waste contractor in accordance with provisions of the Special Waste Regulations 1996³⁸.

4.3.6 Health and Safety Related Issues

Health and safety issues during construction and decommissioning fall under the Construction (Design and Management) (CDM) Regulations 2015³⁹. Health and safety will be initially addressed as part of the Pre-Construction Information Pack prepared by the Applicant for the Principal Contractor. The Contractor will be required to prepare a Construction Phase Plan (Health and Safety Plan) and to forward information to the Applicant during the works to enable the Health and Safety File to be completed.

Turbines are built to withstand extreme wind conditions. The turbines selected for the Proposed Development will have a proven record in terms of safety and reliability.

Day-to-day operational and maintenance activities will be co-ordinated with the private landowner's operational requirements.

Public access to the Site will be managed during the construction and operational phases for health and safety reasons due to the proximity of the SUW. Further information is provided in **Technical Appendix A14.1: Access Management Plan (AMP)**, which gives indicative mitigation measures to ensure the safety of all recreational users and staff. A full AMP will be created in conjunction with the Council, Principal Contractor, Council Access Officer and SUW Rangers if consent is issued.

An Operations and Maintenance Manual for the design life of the Proposed Development will be prepared by the Contractor and will cover all operational and decommissioning procedures.

4.4 Operational Phase

The Proposed Development will have an operational lifespan of up to 35 years from full commissioning of the proposed turbines.

4.4.1 Turbine and Infrastructure Maintenance

Turbine maintenance will be carried out in accordance with the manufacturer's specification. The following routine turbine maintenance will be undertaken:

- Initial service;

³⁸ UK Government (2021) The Special Waste Regulations 1996 [Online] Available at: <https://www.legislation.gov.uk/ukksi/1996/972> (Accessed 27/10/2022)

³⁹ Health and Safety Executive (2015) Construction Design and Management Regulations 2015 [Online] Available at: <http://www.hse.gov.uk/construction/cdm/2015/index.htm> (Accessed 25/10/2022)

- Routine maintenance and servicing;
- Gearbox oil changes;
- Blade, gearbox and generator inspections; and
- Replacement of blades and components as required.

It is likely that operational site inspections will be undertaken on a weekly basis and the servicing of turbines will be undertaken as per the turbine manufacturer requirements, usually once per year, however frequency may change in the event of any equipment failures.

Ongoing track maintenance will be undertaken to ensure safe access is maintained to all parts of the Proposed Development all year round.

All wastes arising as a result of servicing and maintenance (e.g., lubricating oils, cooling oils, packaging from spare parts or equipment, unused paint etc.) will be removed from the Site and reused, recycled or disposed of in accordance with best practice.

4.4.2 Snow Clearance

Safe access Site is required year-round. There is potential for the Site to experience snowfall and therefore clearance of snowdrifts may be necessary via grading of the track using suitable ploughing plant.

4.5 Decommissioning

As noted previously, the operational lifespan of the Proposed Development and associated infrastructure will be up to 35 years. Following this, a future application may be submitted to the Scottish Ministers to retain or replace the turbines, or alternatively they will be decommissioned in line with planning conditions imposed as part of the consent for the Proposed Development.

Decommissioning would involve the following:

- Dismantling and removal of the wind turbines and electrical equipment;
- Reinstatement of the turbine areas and associated hardstanding; and
- Demolition and removal of control building and compound.

Turbine components and electrical equipment would be dismantled and removed in a similar manner to their delivery and erection. Cranage would be used to dismantle the turbine towers and blades into sections which would then be transported from the Site by HGV (i.e., the loads may not constitute abnormal loads). The nacelle is likely to require transport as an abnormal load, and a route assessment will be undertaken prior to decommissioning to identify the best route to remove the nacelle off-site. Turbine components would be broken up off-site in controlled environments ready for reuse, recycling or appropriate disposal.

A similar process would be undertaken for the BESS, Substation and Control Buildings, with the equipment removed off-site for breaking up and appropriate disposal and the building demolished. The top 1 m of the concrete foundation slab would be broken up and removed, and the ground reinstated with topsoil and turves. However, cut faces are likely to be retained, as there would be insufficient material to fully backfill the substation area.

The access tracks will be retained in situ at decommissioning for use by the landowner. The cables will also be left in situ.

Overall, it is estimated that the decommissioning period for the Development would be approximately 12 months.

5. PLANNING AND ENERGY POLICY

5.1 Introduction

This Chapter of the EIA Report sets out the energy and planning policy framework for the proposed Cloud Hill Wind Farm (the Proposed Development). This assessment was undertaken by ERM Ltd.

This Chapter presents the existing and emerging local and national planning policy context applicable to the Proposed Development and relates these policies to individual sections set out within the corresponding technical chapters of the EIA Report. The reference to specific planning policies and guidance within other chapters ensures that there is full knowledge and understanding of planning related issues within the EIA Report.

This Chapter does not provide an assessment of whether or not the Proposed Development complies with extant policy. The **Planning Statement**, which accompanies the application for consent, provides a detailed assessment of the Proposed Development against the policies identified in this Chapter of the EIA Report. Although the two documents are complementary, this Chapter identifies the relevant energy and planning policy framework to inform the other chapters and the **Planning Statement**, whilst the **Planning Statement** contains an assessment of the acceptability of the Proposed Development in energy and planning policy terms.

In the case of an application submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989 (the Electricity Act), the Local Development Plan (the LDP) does not have primacy in the decision-making process but does still inform the Council consultation response. Therefore, the following sections within this Chapter set out the energy policy considered applicable to the Proposed Development, whilst providing an overview of the LDP policies considered relevant to the Proposed Development.

5.2 Legislative Context

5.2.1 The Electricity Act 1989

This Application is made under Section 36 of the Electricity Act. As such, it is governed by the relevant provisions of this Act.

Section 38 Preservation of Amenity and Fisheries: Scotland, Schedule 9 sub-paragraph 3 (1) of the Electricity Act states that:

“3 (1) In formulating any relevant proposals, a licence holder or a person authorised by an exemption to generate, distribute, supply and participate in the transmission of electricity –

(a) shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and

(b) shall do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects.”

Under sub-paragraph 3 (2), in considering proposals, the Scottish Ministers are to have regard to:

“(a) the desirability of the matters mentioned in paragraph (a) of sub-paragraph (1) above; and

(b) the extent to which the person by whom the proposals were formulated has complied with his duty under paragraph (b) of the sub-paragraph.”

Sub-paragraph 3(3) indicates that without prejudice to the above provisions, a licence holder and the Scottish Ministers shall avoid, so far as possible, causing injury to fisheries or to the stock of fish in any waters.

The provisions of sub-paragraphs 3(2) and 3(3) of Schedule 9 of the Electricity Act apply to the Scottish Ministers consideration of the Proposed Development. They set out a number of features to

which regard must be had. While they do not require the features to be retained intact, and do not comprise a development management ‘test’, the effects of the Proposed Development on them require to be assessed.

A decision by the Scottish Ministers provides clarification in relation to how the Schedule 9 duty should be applied. In the decision on a Section 36 application for an extension to the Fallago Rig wind farm⁴⁰, Ministers noted that “*Schedule 9 of the Electricity Act contains no substantive development management tests*”. Therefore, in determining whether to grant planning permission to the Proposed Development, significant weight should be attributed to the current position regarding the need for renewable energy as well as the Development’s compliance with relevant national policy objectives and the LDP.

5.2.2 Town and Country Planning (Scotland) Act 1997

The principal planning statute in Scotland is the Town and Country Planning Act (Scotland) 1997 (the Planning Act) as amended by The Planning etc. (Scotland) Act 2006 and now the Planning (Scotland) Act 2019. With regards to Local Development Plans and NPF 4, section 24 (3) of the Planning Act states that:

“Whether an LDP has been adopted prior to or after the adoption and publication of NPF4, the above legislation states that in the event of any incompatibility between a provision of NPF and a provision of an LDP, whichever of them is the later in date is to prevail.

Supplementary guidance associated with SDPs will no longer have effect following adoption and publication of NPF4. Supplementary guidance associated with LDPs which was in force before the adoption of NPF4, will continue to be in force and be part of the development plan.”

Section 57(2) of the 1997 Act also provides:

“On granting a consent under section 36 or 37 of the Electricity Act 1989 in respect of any operation or change of use that constitutes development, the Scottish Ministers may direct that planning permission for that development and any ancillary development shall be deemed to be granted, subject to any conditions (if any) as may be specified in the direction.”

Section 25 of the Planning Act states that:

“Where, in making any determination under the planning Acts, regard is to be had to the development plan, the determination shall be made in accordance with the plan unless material considerations indicate otherwise”.

Section 57(2) of the Planning Act makes no reference to the provisions of Section 25 which requires regard to be had to the provisions of the Development Plan and the courts have confirmed that Section 57(3) does not operate so as to apply Section 25 to a decision to make a direction to grant deemed planning permission pursuant to Section 57(2)⁴¹.

Accordingly, the Scottish Ministers will determine the application having regard to the statutory duties in Schedule 9 of the Electricity Act, so far as relevant, and any other relevant material considerations, one of which will be relevant aspects of the statutory LDP.

Alongside NPF4, the LDP still forms a basis for the Council’s consultation response to the Proposed Development. The following sections set out the relevant LDP policies and other material considerations at a local and national level.

⁴⁰ The Scottish Government – Decision on Fallago Rig 2 Wind Farm, ref. EC00003102 dated 25 June 2020 [Online] Available at: <https://www.energyconsents.scot/ApplicationDetails.aspx?cr=EC00003102&T=6> (Accessed 26/05/2023)

⁴¹ William Grant & Sons Distillers Ltd, respondent Scottish Government, [2012] CSOH

5.2.3 Climate Change Scotland Act 2009

The Climate Change (Scotland) Act 2009 ('the Climate Change Act') creates a long-term framework for the current and successive administrations in Scotland to ensure a reduction in Scottish greenhouse gas emissions by 80% by 2050 with an interim milestone of 42% by 2020.

5.2.4 The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 requires that "The Scottish Ministers must ensure that the net Scottish emissions account for the net-zero emissions target year is at least 100% lower than the baseline (the target is known as the "net-zero emissions target")." The target year is 2045 and the Act also sets out challenging interim targets. It requires that:

"The Scottish Ministers must ensure that the net Scottish emissions account for the year—

- (a) 2020 is at least 56% lower than the baseline,*
- (b) 2030 is at least 75% lower than the baseline, and*
- (c) 2040 is at least 90% lower than the baseline."*

It is important to note that these targets are minimum targets, they are not maximums or aspirations. The targets legally bind the Scottish Ministers and have largely been legislated to set the framework for Scotland's response to the Climate Emergency.

Setting a carbon neutral, net-zero targets of 2045 is ambitious and ahead of the rest of the United Kingdom's target of 2050. The Government has set ambitious targets for reduction of carbon emissions. Projects, such as the Proposed Development, play a key role in aiding the decarbonisation of the energy sector.

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 Proposed Development will contribute to the attainment of emissions reduction, renewable energy production and storage and electricity targets at both the Scottish and UK levels.

5.3 Renewable Energy Policy Context

In recent years, European, United Kingdom (UK) and Scottish Government policies have all placed greater focus on concerns about climate change and have set numerous targets to try and curtail the effects of greenhouse gas emissions. In turn, each tier of Government has developed intermediate targets, policies and actions designed to achieve said targets.

On 12 December 2015, 196 Parties to the UN Framework Convention on Climate Change (UNFCCC) adopted the Paris Agreement, a legally binding framework for an internationally coordinated effort to tackle climate change. The Paris Agreement's key aim is to strengthen the global response to climate change by keeping a global temperature rise this century below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius⁴². The UK is legally committed to the Paris Agreement through the Climate Change Act 2008.

The 26th UN Climate Change Conference of the Parties (COP26) in Glasgow on 31 October – 13 November 2021 (COP26) brought together world leaders from over 200 countries to seek agreement on the measures necessary to address the effects of climate change. The agreement reached determines the key actions that will be taken over the next decade to achieve further cuts to emissions of CO₂, with the aim of keeping the rise in global temperature to within 1.5°C.

COP26 ended with the Glasgow Climate Pact, a historic agreement incorporating the aim of limiting temperature rise to 1.5°C. All countries agreed to revisit and strengthen their current emissions targets

⁴² UNFCCC 2018 Paris Agreement Overview [online] Available at: <https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement> (Accessed 17/03/2022)

to 2030, known as Nationally Determined Contributions (NDCs) in 2022. This will be combined with a yearly political roundtable to consider a global progress report and a Leaders summit in 2023.

The Paris Rulebook, the guidelines for how the Paris Agreement is delivered, was also put in place after six years of discussions. This will allow for the full delivery of the landmark accord, after agreement on a transparency process which will hold countries to account as they deliver on their targets. This includes Article 6, which establishes a robust framework for countries to exchange carbon credits through the UNFCCC.

The Government's Net Zero Strategy ('the Strategy'), published in advance of COP26, is the Government's long-term plan for the transition to a low carbon economy. The Strategy highlights the significant progress made since 1990 in reducing greenhouse gas emissions from the power sector and introduces an ambitious commitment to ensure that all electricity comes from low carbon sources by 2035, subject to security of supply.

The Strategy calls for the accelerated deployment of low-cost renewable generation and states that a low-cost net zero electricity system is likely to be composed predominantly of wind and solar generation. The Strategy emphasises that the planning system will play an important role in supporting the deployment of renewable energy.

COP27 was then held in Sharm el-Sheikh, Egypt, where 92 heads of state and an estimated 35,000 representatives, or delegates, of 190 countries attended to discuss and negotiate the global commitment to tackling climate change in the face of the current energy crisis. COP27 noted that global emissions remain at record high levels and the world is on track to warming well in excess of 2°C, with intensifying climate damages. COP27 also established new funding arrangements for assisting developing countries that are particularly vulnerable to the adverse effects of climate change to address impacts which cannot or have not been adapted to.

The Sharm El-Sheik Implementation Plan (the COP27 political decision) reaffirms that keeping global warming to 1.5°C will require a 43% reduction in global greenhouse gases (GHGs) by 2030 relative to 2019 levels. It actions the mitigation work programme agreed at COP26, which will focus on urgently scaling up mitigation ambition and implementation and the investment needed to unlock further mitigation action this decade. The Sharm El-Sheik Implementation Plan emphasises the urgent need for immediate sustained reductions in global greenhouse gas emissions by Parties across all applicable sectors, including through increase in low-emission and renewable energy, just energy transition partnerships and other cooperative actions.

5.4 National Planning Policy and Guidance

5.4.1 The National Planning Policy Framework (NPF4)

Scotland 2045 – Our Fourth National Planning Framework was initially published for consultation on 10th November 2021 and was formally adopted on the 13th of February 2023. The consultation period ended 31st March 2022 and following this, NPF4 was laid before the Scottish parliament on 8th November 2022, along with an explanatory report and delivery programme.

The final draft of NPF4 was discussed by the Scottish Parliament before being subject to a vote in the chamber. NPF4 was adopted on the 13th February 2023 and published by the Scottish ministers, NPF4, amongst other things, aims to manage land-use and development in the long-term public interest.

The NPF4 is divided into 4 parts:

- Part 1 sets out an overarching spatial strategy for Scotland in the future;
- Part 2 sets out proposed national developments that support the spatial strategy;

- Part 3 sets out policies for the development and use of land which are to be applied in the preparations of local development plans, local place plans; masterplans and briefs; and for determining the range of planning consents; and
- Part 4 provides an outline of how we will deliver this strategy.

Part 1 of the NPF4 states that *“we have set a target of net zero emissions by 2045 and must make significant progress towards this by 2030. This will require new development and infrastructure across Scotland.”*

The development of new renewable energy infrastructure is a necessity under NPF4 to meet this immediate target.

Regarding the need for renewable electricity generation, Part 2 of the NPF 4 states that *“additional electricity generation from renewables and electricity transmission capacity of scale is fundamental to achieving a net zero economy”*.

Part 3 of the NPF4 sets out the Universal Policies required to achieve a net zero, nature positive Scotland, including but not limited to, *“when considering all development proposals significant weight should be given to the Global Climate Emergency.”*

Policy 1 (Tackling the Climate and Nature Crises) states that when considering all development proposals *“significant weight will be given to the global climate and nature crises”*.

The intention of Policy 2 (Climate Mitigation and Adaptation) is to encourage, promote and facilitate development projects that minimise emissions and adapt to current and future impacts of climate change. Renewable energy developments will be at the forefront when aiming to achieve the aims of this policy.

Policy 11 (Energy) illustrates how support will be given to development proposals for all forms of renewable, low-carbon and zero emissions technologies. This includes the development of wind farms - including extending and expanding windfarms - and battery storage developments. Policy 11 states that development proposals for all forms of renewable, low-carbon and zero carbon and zero emissions technologies will be supported, including *‘wind farms including repowering, extending, expanding and extending the life of existing wind farms’*. The policy will only support such developments where they *‘maximise net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.’*

Policy 18: Infrastructure first considers the impacts of renewable energy developments and states that the impacts of development proposals on infrastructure should be mitigated where possible. Policy 18 states that development proposals will only be supported where it can be demonstrated that provision is made to address the impacts on infrastructure. Where planning conditions, planning obligations, or other legal agreements are to be used, the relevant tests will apply.

Where planning obligations are entered into as a result of Policy 18, the obligations should serve a planning purpose, relate to the impacts of the proposed development, fairly and reasonably relate in scale and kind to the proposed development.

Policy 19 (Green Energy) states that the Scottish Government wants places to support the continued expansion of low-carbon and net zero energy technologies as a key contributor to net zero emissions by 2045. The policy recognises that Scotland’s Energy sector has a significant role to play in reducing carbon emissions and contributing to a green, fair and a resilient economic recovery. Whilst a range of renewable technologies are capable of delivering these benefits, it is likely that onshore wind will play the greatest role in the coming years.

Section d) of Policy 19 states that:

“Outwith National Parks and National Scenic Areas and recognising the sensitivity of any other national or international designations, development proposals for new wind farms should be supported unless the impacts identified (including cumulative effects), are unacceptable. To inform

this, site specific assessments including where applicable Environmental Impact Assessments (EIA) and Landscape and Visual Impact Assessments (LVIA) are required.”

In advance of NPF being adopted in February 2023, a letter was published by the Chief Planner on the 8th of February 2023 stating that NPF4 will form part of the statutory development plan, along with the LDP applicable to the area at that time and its supplementary guidance. NPF4 will supersede National Planning Framework 3 and Scottish Planning Policy (SPP) (2014). NPF3 and SPP will no longer represent Scottish Ministers’ planning policy and should not therefore form the basis for, or be a consideration to be taken into account, when determining planning applications⁴³.

5.4.2 A stronger and more resilient Scotland: The Programme for Government 2022 to 2023

In September 2022, the Scottish Government published ‘A Stronger and More Resilient Scotland’ the programme for Government for 2022-23, which sets out the actions the Government will take in the forthcoming year. The Programme reiterates the continuous support for renewable energy. The development of renewable energy presents an immense opportunity for Scotland to lead by example, ensuring that progress towards net zero is environmentally and economically beneficial.

If consented, the Proposed Development has the potential to make a meaningful contribution to the Government’s objectives for reducing emissions, by increasing the widespread deployment of the renewables industry, encouraging further onshore wind development, as well as encouraging investment in renewable energy, to achieve sustainable economic growth.

5.4.3 Onshore Wind Policy Statement 2022

The Ministerial Foreword to the Onshore Wind Policy Statement 2022 recognises that onshore wind remains vital to Scotland’s future energy mix and that more will be needed in order to progress legally binding net-zero targets.

The policy statement sets out that Scotland’s electricity demand will at least double within the next two decades and that developing more onshore wind could create 17,000 jobs and £27.8 billion in GVA for the country’s economy. The Scottish Government acknowledges that the next decade will see a substantial increase in demand for electricity to support net zero delivery across all sectors. The CCC has suggested electricity demand could double over this period. There will therefore need to be a substantial increase in installed capacity across all renewable technologies, including onshore wind.

The statement sets an overall ambition of 20 GW of installed onshore wind capacity in Scotland by 2030.

Other issues such as community benefit, shared ownership, and the need for financial mechanisms to promote deployment are covered in Chapter 1 of the OWPS.

The OWPS examines the ambition for delivering targets and current levels of deployment and what can be expected to be required by 2030 to achieve Net Zero. At the present time there is approximately 8.4 GW of installed onshore wind capacity within Scotland, part of 14.1 GW deployed across the whole of the UK. In terms of development pipeline, there is approximately 9.7 GW of capacity either in planning or awaiting construction, with 0.43 GW under construction.

The CCC has estimated that the UK will require a total capacity of 25 to 30 GW of onshore wind by 2050 to meet Net Zero, in effect doubling the current level of deployment in the UK.

The Scottish Government is therefore seeking views on an ambition that an additional 8 to 12 GW of onshore wind capacity should be installed in Scotland by 2030 to help achieve Net Zero commitments.

⁴³ Chief Planner Letter: Transitional Arrangements for National Planning Framework 4 [Online] Available at: Chief Planner letter: transitional arrangements for National Planning Framework 4 - February 2023 - gov.scot (www.gov.scot) (Accessed 15/05/2023)

With regard to landscape and visual issues, the OWPS acknowledges that whilst cherished landscapes are a key part of the natural and cultural heritage and should be afforded protection, it is also important to recognise that climate change and Net-Zero ambitions require decisive action. This will result in a Change in how Scotland looks, and it will be necessary to consider how significant volumes of onshore wind generation can be deployed over the next decade to help meet the legal obligations. This deployment is likely to comprise of modern efficient turbines which maximises the generation possible at each site, including the use of taller turbines.

Deployment of onshore wind is mission-critical for meeting our climate targets. As an affordable and reliable source of electricity generation, we must continue to maximise our natural resource and deliver net-zero in a way that is fully aligned with, and continues to protect, our natural heritage and native flora and fauna.

The Scottish Government also expects all onshore wind developments in Scotland to support our national and local supply chains, capitalising on the opportunity to secure significant increases in local content, increase our skilled workforce, see greater diversity and for our energy sector to continue to boost our local economies. As onshore wind is deployed at greater volume over the coming decade, we must collectively maximise the economic, social and environmental benefits in a way that meets the needs of Scottish citizens and our future generations.

5.4.4 The Sixth Carbon Budget: The UK's path to Net Zero

On 9 December 2020, the CCC released The Sixth Carbon Budget⁴⁴ which updates intermediary targets for the UK's progress to net zero.

"Our recommended pathway requires a 78% reduction in UK territorial emissions between 1990 and 2035. In effect, it brings forward the UK's previous 80% target by nearly 15 years. There is no clearer indication of the increased ambition implied by the Net Zero target than this."

These targets must be considered as a factor in the determination of applications for viable wind energy projects. In establishing intermediary targets towards net zero, the context exists for Local Authorities to recognise the action that must be taken sooner rather than later. As concluded in the Sixth Carbon Budget:

"The implication of this path is clear: the utmost focus is required from government over the next ten years. If policy is not scaled up across every sector; if business is not encouraged to invest; if the people of the UK are not engaged in this challenge – the UK will not deliver Net Zero by 2050."

In March 2023, a 'Carbon Budget Delivery Plan' was published to inform Parliament and the public on the government's proposals and policies to enable carbon budgets to be met.

The approach set out in our previous delivery plans to deliver net zero, the Net Zero Strategy, remains the right one. This report provides an update to the Net Zero Strategy and sets out the government's strategy to achieve net zero and to deliver energy security, while at the same time increasing the UK's international economic competitiveness.

Six carbon budgets have been set to date, covering 2008 to 2037. Carbon Budget 6, the first to be set under the UK's new net zero target, was legislated for in June 2021. The UK has already met, and overachieved, its first (2008- 2012) and second (2013-2017) carbon budgets and is on track to meet the third (2018-2022). Between 1990 and 2021, UK emissions fell by 48% while our economy grew by 65%, decarbonising faster than any other G7 country.

The Carbon Budget Delivery Plan will enable the UK to continue in maximising opportunities to drive growth, jobs and investment across the UK whilst reducing emissions.

⁴⁴ The CCC (2020) The Sixth Carbon Budget: The UK's path to Net Zero [Online] Available at: <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf> (Accessed 23/05/2023)

5.4.5 Scotland's Draft Energy Strategy and Just Transition Plan

Scotland's Draft Energy Strategy and Just Transition Plan⁴⁵ sets out the Scottish Government's vision for the future energy system in Scotland, to 2030 and beyond. It explicitly details the priorities for an integrated system-wide approach that considers both the use and supply of energy for heat, power and transport. The Energy Strategy is designed to strengthen the development of local energy, protect and empower consumers, and support Scotland's climate change ambitions while tackling poor energy provision.

The Energy Strategy notes that storage is a strategically important issue, with real potential benefits for Scotland. Storage plays a critical role in helping businesses and communities in areas where the network capacity is limited or weak as having reserve or stand-by power available can protect against temporary losses of supply.

The Strategy also recognises that wind power is one of the lowest cost forms of electricity and the Scottish Government is clear that this is where we should focus - reducing costs in the long term and addressing vulnerability to future energy cost crises.

The strategy looks to achieve the targets set out by significantly scaling up renewable energy production, securing continued and increased investment in the net zero energy economy and by delivering a fairer, more secure energy system that is no longer reliant on volatile international commodity markets and delivers lower costs for consumers.

Scotland already has 13.4 Gigawatts (GW) of renewable electricity generation capacity. The strategy aims to deliver at least 20 GW of additional low-cost renewable electricity capacity by 2030, which could generate the equivalent of about 50% of Scotland's current total energy demand.

For key sectors, such as onshore wind, the strategy aims to increase electricity generation from 8.78 GW, as of June 2022, to over 20 GW by 2030, which is more than double our existing capacity.

Achieving this vision for Scotland's will be a national endeavour and will require a collective effort at local and national levels across government, industry, and our communities.

5.4.6 Planning Advice Notes and Specific Advice Sheets

Planning Advice Notes (PANs) and Specific Advice Sheets set out detailed advice from the Scottish Government in relation to a number of planning issues. Relevant PANs and Specific Advice Sheets relevant to the Proposed Development are summarised in **Table 5.1**.

Table 5.1 Relevant PANs and Specific Advice Notes

Title	Summary of Document
PAN 1/2013 Environmental Impact Assessment ⁴⁶	Provides information on the role local authorities and consultees play as part of the EIA process, and how the EIA can inform development management.
PAN 60 (2000) Planning for Natural Heritage ⁴⁷	Advises developers on the importance of discussing their proposals with the planning authority and NatureScot (formerly known as Scottish Natural Heritage) and use of the EIA process to identify the environmental effects of development proposals and seek to prevent, reduce and offset any adverse effects in ecology and biodiversity.

⁴⁵ Scottish Government (2021) - Draft Energy Strategy and Just Transition Plan [Online]. Available at: Draft Energy Strategy and Just Transition Plan (www.gov.scot) (Accessed 13/06/2023)

⁴⁶ Scottish Government (2013) PAN 1/2013: Environmental Impact Assessment [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-1-2013-environmental-impact-assessment/> (Accessed 12/05/2023)

⁴⁷ Scottish Government (2000) Planning for Natural Heritage: PAN 60 [Online] Available at: [Planning Advice Note 60: natural heritage - gov.scot \(www.gov.scot\)](http://www.gov.scot/publications/planning-advice-note-60-2000-natural-heritage/) (Accessed 12/05/2023)

Title	Summary of Document
PAN 61 (2001) Sustainable Urban Drainage Systems ⁴⁸	Good practice drainage guidance.
PAN 68 (2003) Design Statements ⁴⁹	This PAN covers the importance of design statements, and provides flexible guidance on their preparation, structure, and content. The PAN also outlines the principles underpinning the production of design statements, as expected by the Scottish Government.
PAN 75 (2005) Planning for Transport ⁵⁰	The objective of PAN 75 is to integrate development plans and transport strategies to optimise opportunities for sustainable development and create successful transport outcomes.
PAN 3/2010 Community Engagement ⁵¹	This document provides advice on how to engage with local communities through the planning process.
PAN 1/2011 Planning and Noise ⁵²	This PAN provides advice on the role of the planning system in helping to prevent and/ or mitigate any potential adverse effects of noise. It promotes the principles of good acoustic design and promotes a sensitive approach to the location of new development.
PAN 2/2011 Planning and Archaeology ⁵³	The PAN is intended to inform local authorities and other organisations of how to process any archaeological scope of works within the planning process.
Online Renewables Planning Advice - On Shore Wind Turbines (updated 2014) ⁵⁴	This Specific Advice Sheet provides an overview of the use of the carbon calculator in estimating the carbon savings resulting from wind farm developments. NB: Please note that this Specific Advice Sheet pre-dates the SPP, so areas covered therein in relation to 'spatial framework', 'spatial planning' and 'areas of search' are no longer relevant.
PAN 51 Planning, Environmental Protection and Regulation (Revised 2006) ⁵⁵	Details the role of the planning system in relation to the environmental protection regimes.
Online Planning Advice on Flood Risk (2015) ⁵⁶	Provides advice on the role of the planning system and the assessment and management of flood risk.
Onshore wind planning: frequently asked questions (2016) ⁵⁷	Provides answers to a range of questions in relation to the planning considerations for onshore wind turbine development.

⁴⁸ Scottish Government (2001) PAN 61: Planning and Sustainable Urban Drainage [Online] Available at: [Planning Advice Note 61: Sustainable urban drainage systems - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/planning-advice-note-61-sustainable-urban-drainage-systems-gov.scot/www.gov.scot/) (Accessed 24/04/2023)

⁴⁹ Scottish Government (2003) PAN 68: Design Statement [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-68-design-statements/> (Accessed 24/04/2023)

⁵⁰ Scottish Government (2005) PAN 75: Planning for Transport [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-pan-75-planning-transport/> (Accessed 24/04/2023)

⁵¹ Scottish Government (2010) PAN 3/2010: Community Engagement [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-3-2010-community-engagement/> (Accessed 24/04/2023)

⁵² Scottish Government (2011) PAN 1/2011: Planning and Noise [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/> (Accessed 24/04/2023)

⁵³ Scottish Government (2011) PAN 2/2011: Planning and Archaeology [Online] Available at: <https://www.gov.scot/publications/pan-2-2011-planning-archaeology/> (Accessed 12/05/2023)

⁵⁴ Scottish Government (2014) Onshore Wind Turbines: Planning Advice [Online] Available at: <https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/> (Accessed 24/04/2023)

⁵⁵ Scottish Government (2006) PAN 51: Planning, Environmental Protection and Regulation [Online] Available at: <https://www.gov.scot/publications/planning-advice-note-pan-51-revised-2006-planning-environmental-protection/> (Accessed 24/04/2023)

⁵⁶ Scottish Government (2015) Flood Risk: Planning Advice [Online] Available at: <https://www.gov.scot/publications/flood-risk-planning-advice/> (Accessed 24/04/2023)

⁵⁷ The Scottish Government (2016). Onshore wind planning: frequently asked questions [Online]. Available at: <https://www.gov.scot/publications/onshore-wind-planning-faq/> (Accessed 24/04/2023)

5.5 Material Considerations

5.5.1 The Local Development Plan

Each Local Authority within Scotland also then has a duty under the Planning (Scotland) Act 2006 to prepare a LDP. The LDP relevant to the Proposed Development is the Dumfries and Galloway Local Development Plan 2, adopted on 3 October 2019. (DGLDP2).

The DGLDP2 is supported by Supplementary Guidance (SG) documents that provide more detail than is possible to provide in the DGLDP2. The follow the SG are considered relevant to the consideration of the Proposed Development:

- Design Quality and Placemaking;
- Historic Built Environment;
- Trees and Development;
- Flooding and Development;
- Surface Water Drainage and Sustainable Drainage Systems (SuDS);
- Wind Energy Development: Development Management Considerations; and
- Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' DGLWCS.

DGLDP2, along with any relevant SG documents are summarised within the following section, with policies listed where relevant. SG documents that have not been carried over or adopted for DGLDP2 are not considered. Should the review status of these documents be updated and the form statutory adopted guidance, then the Applicant would reserve the right to consider them at a later date.

5.5.2 Dumfries and Galloway Local Development Plan 2

On 3 October 2019, Dumfries and Galloway Council adopted Local Development Plan 2⁵⁸ which replaces the previously adopted 2014 LDP⁵⁹.

It is reiterated that assessment against all of the following policies is reserved for the accompanying Planning Statement. The intention of this Chapter is simply to note the relevant policies. The following individual policies are not necessarily quoted in full. For full policy wording please refer to the DGLDP2. The following policies are considered relevant to the Proposed Development.

5.5.2.1 Policy IN1: Renewable Energy

The Council will support development proposals for all renewable energy generation and/or storage which are located, sited and designed appropriately. Acceptability of a development will be assessed against the following criteria:

- Landscape and visual impact
- Cumulative impact
- Impact on communities and individual dwellings
- Impact on natural and historic environment
- Impact on forestry and woodland

⁵⁸ Dumfries and Galloway Council (2019) The Dumfries and Galloway Local Development Plan [Online] Available at: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000 (Accessed 18/04/2023)

⁵⁹ The Dumfries and Galloway Council (2014) The Dumfries and Galloway Local Development Plan [Online] Available at: [https://www.dumgal.gov.uk/media/17412/Local-Development-Plan-Section-1/pdf/Section1_LDP_\(policy\).pdf?m=636592298117170000](https://www.dumgal.gov.uk/media/17412/Local-Development-Plan-Section-1/pdf/Section1_LDP_(policy).pdf?m=636592298117170000) (Accessed 18/04/2023)

- Impact on tourism, recreation and public access

5.5.2.2 Policy IN2: Wind Energy

Policy IN2 states that the Council will support wind energy proposals that are located, sited and designed appropriately. The acceptability of a proposed wind energy development will be assessed against the following considerations:

Renewable energy benefits

The scale of contribution to renewable energy generation targets, effect on greenhouse gas emissions and opportunities for energy storage.

Socio-economic benefits

Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.

Landscape and visual impacts

- The extent to which the landscape is capable of accommodating the development without significant detrimental landscape or visual impacts, including effects on wild land; and
- That the design and scale of the proposal is appropriate to the scale and character of its setting, respecting the main features of the site and the wider environment and that it addresses fully the potential for mitigation.

Cumulative impact

The extent of any cumulative detrimental landscape or visual impact or impacts on existing patterns of development from two or more wind energy developments and the potential for mitigation.

Impact on local communities and residential interests

The extent of any detrimental impact on communities, individual dwellings, residents and local amenity, including assessment of the impacts of noise, shadow flicker, visual dominance and the potential for associated mitigation.

Impact on infrastructure

The extent to which the proposal addresses any detrimental impact on road traffic, adjacent trunk roads and telecommunications, particularly ensuring transmission links are not compromised.

Impact on aviation and defence interests

The extent to which the proposal addresses any impacts from the location within an area subject to potential aviation and defence constraints, including the Eskdalemuir Safeguard Area.

Other impacts and considerations

- a) The extent to which the proposal avoids or adequately resolves any significant adverse impact on the natural environment, including biodiversity, forests and woodland, carbon-rich soils, hydrology, the water environment and flood risk, the historic environment, cultural heritage, tourism and recreational interests and public access.
- b) The extent to which the proposal addresses any physical site constraints and appropriate provision for decommissioning and restoration.

5.5.2.3 Policy OP1: Development Considerations

Policy OP 1 states that the Development will be assessed against the following considerations where relevant to the scale, nature and location of the proposal:

a) General Amenity: Development proposals should be compatible with the character and amenity of the area and should not conflict with nearby land uses. The following will be a material consideration in the assessment of proposals:

- Noise and vibration;
- Odour and fumes;
- Potential loss of privacy, sunlight and daylight on nearby properties;
- Emissions including dust, smoke, soot, ash, dirt or grit or any other environmental pollution to water, air, or soil; and
- Light pollution.

b) Historic Environment: Development proposals should protect and/or enhance the character, appearance and setting of the region's rich historic environment principally by ensuring they are sympathetic to the surrounding area.

c) Landscape: Development proposals should respect, protect and/or enhance the region's rich landscape character, scenic qualities and features and sites designated for their landscape qualities or wild land character and should also reflect the scale and local distinctiveness of the landscape.

d) Biodiversity and Geodiversity: Development proposals should respect, protect and/or enhance the region's rich and distinct biodiversity, geodiversity and sites designated for their contribution to the natural environment at any level including ancient and semi-natural woodland. The guidance contained within the Local Biodiversity Action Plan, and any subsequent revised or amended document, will be a material consideration in the assessment of proposals.

e) Transport and Travel: Development proposals should minimise the need for travel by car and encourage active and other more sustainable forms of travel whilst avoiding or mitigating any adverse impact on the transport network or road safety.

f) Sustainability: Development proposals should limit the impacts of climate change and promote sustainable development by:

- Assisting the development of the local economy through sustainable economic growth;
- Minimising adverse impacts on water, air and soil quality;
- Reusing and/or regenerating previously used land and property, including derelict and contaminated land;
- Making the most efficient use of land;
- Integrating with existing infrastructure where possible;
- Supporting the Scottish Government's Zero Waste objectives and the Council's waste resource management objectives;
- Avoiding areas of significant flood risk;
- Using sustainable drainage systems (SuDS); and
- Supporting reduction in carbon emissions through:
 - A reduction in carbon dioxide emissions through the introduction of energy efficiency measures and, where feasible, the installation of on-site renewable energy generation technology;
 - Passive aspects of design including consideration of: location, layout, orientation, massing, materials, detailed design, topography and vegetation; and

- All new buildings are required to demonstrate that a proposition of the carbon emissions reduction standard set by Scottish Building Regulations will be met through the installation and operation of low and zero carbon technologies.
- g) Water Environment: Development proposals should maintain or enhance water quality and take account of the need to manage water quantity, including flooding.

5.5.2.4 Policy OP2: Design Quality and Placemaking

Development proposals should achieve high quality design in terms of their contribution to the existing built and natural environment contributing positively to a sense of place and local distinctiveness. Where relevant proposals should:

- Relate well to the scale, density, massing, character, appearance and use of materials of the surrounding area and in so doing be sympathetic to the local built forms as well as respecting the important physical, historic and landscape features of the site and its vicinity;
- Be designed with people, not vehicle movement, as the primary focus, incorporating the principles set out in 'Designing Streets' and where possible increase connectivity to nearby places, paths, streets and open spaces;
- Ensure that any open space required is of high quality, appropriate and integrated to the development and where possible provides linkages to the wider green network;
- Incorporate a hard landscaping and planting scheme which includes the proposed treatment of existing trees and other landscape features;
- Be designed to create safe, accessible and inclusive places for all people which are well integrated into existing settlements and respect the established historic layout and patterns of development, that are also adaptable to future changes;
- Integrate sustainable energy and design measures.

5.5.2.5 Policy ED1: Business and Industry

Under section b) of Policy ED1, it is the view of the Council that:

Business and industrial development will normally be encouraged to locate on sites allocated or established for such development in the LDP. It will be possible to support business and industry development on unallocated land within or outwith settlements where established or allocated sites are unable to accommodate proposals and where there is a requirement for inward investment or the retention, relocation or expansion of an existing business subject to other policies in the LDP. Where a proposal is not located on an allocated or established business and industry site, the developer will be required to demonstrate the need for the proposal at that location.

5.5.2.6 Policy ED2: Business Development and Diversification in the Rural Area

Proposals which expand existing businesses or create new ones in the rural area will be considered favourably subject to other policies in the LDP. There is a preference that this will generally be within or adjacent to existing settlements. Site outwith settlements may be acceptable where the offer opportunities to diversify an existing business or are related to a site-specific resource or opportunity.

5.5.2.7 Policy ED10: Galloway and Southern Ayrshire Biosphere

The Council supports the designation and aims of the Biosphere and will encourage development that demonstrates innovative approaches to sustainable communities and the economy, and supports the enhancement, understanding and enjoyments of the area as a world class environment. Development must be appropriate to the role of the different zones within the Biosphere.

5.5.2.8 Policy HE1: Listed Buildings

Part a) of HE1 is considered applicable to the Development and it states that in considering development that impacts on the character or appearance of a listed building or its setting, the Council will have to be satisfied that: the layout, design and materials, scale and massing are appropriate to the character of the listed building; the proposals respect the character and features which contribute to its listing; and the proposals will not result in a loss of character or special features.

5.5.2.9 Policy HE2: Conservation Areas

Development within or adjacent to a conservation area will be supported where it preserves or enhances the character and appearance of the area and is consistent with any relevant conservation area appraisal. In considering such development, the Council will need to be satisfied that:

- New development, as well as alterations or other redevelopment of buildings, will preserve or enhance the character, appearance and setting of the conservation area through appropriate design, general scale, massing and arrangement, use of materials and the detailing of such development; and
- The quality of views within, from and into the conservation area will be maintained or enhanced.

5.5.2.10 Policy HE3: Archaeology

- a) The Council will support development that protects significant archaeological and historic assets, and the wider historic environment from adverse effects.

In considering development proposals, the Council will need to be satisfied that:

- The development preserves or enhances the appearance, fabric or setting of the site or asset in situ; and/or
 - Where there is uncertainty about the location, extent or significance of these assets an agreed scheme of assessment and evaluation to inform the application is included with the proposal; and/or
 - Due consideration has been given to the significance and value of the site or asset in relation to the long-term benefit specific need for the development in the location proposed.
- b) Where, due to exceptional circumstances, development is to proceed and the preservation of historic assets in situ including buildings is not possible, a scheme of mitigation involving excavation, recording, analysis, publication and archiving and any other measures appropriate to the case has been with the Council.

5.5.2.11 Policy HE4: Archaeologically Sensitive Areas

The Council will support development that safeguards the character, archaeological interest and setting of Archaeologically Sensitive Areas (ASAs) as designated by the Council.

5.5.2.12 Policy HE6: Gardens and Designed Landscapes

- a) The Council will support development that protects or enhances the significant elements, qualities, character, integrity and settings, including key views to and from gardens and designated landscapes included in the Inventory of Gardens and Designated Landscapes or the Non-Inventory List.

In considering development proposals the Council will need to be satisfied that:

- The development protects and enhances the significant elements of the garden or landscape in situ; and

- Due consideration has been given to the significance and value of the asset in relation to the long-term benefit and specific need for the development in the location proposed.
- b) Developers will be required to submit the results of the assessment of the impact of their proposals on the sites and their settings plus details of and potential mitigation measures.
- c) Proposals that would have a detrimental effect on the special quality, character or integrity of a garden and designated landscape will not be approved unless it is demonstrated that the benefits of the proposal are of sufficient public interest to override that detriment.

5.5.2.13 *Policy HE7: Historic Battlefields*

Where it would not have an adverse impact on the character, appearance, setting or key features of the battlefield, the Council will support development within a site listed in the Inventory of Historic Battlefields.

The siting, scale and design of the development, new buildings or alterations or extensions to existing buildings must preserve, converse or enhance the key characteristics of the battlefield. These may include landscape characteristics, key viewpoints which assist the understanding of the battle and any historic assets (including the potential for archaeological deposits found in situ).

5.5.2.14 *Policy NE1: National Scenic Areas*

Development within or that would have an effect on a National Scenic Area (NSA) should only be permitted where:

- It will not adversely affect the integrity of the area or the qualities for which it has been designated; or
- Any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

5.5.2.15 *Policy NE2: Regional Scenic Areas*

The siting and design of development within a Regional Scenic Area (RSA), should respect the special qualities of the area. Development within, or which affects RSAs may be supported where the Council is satisfied that:

- The factors taken into account in designating the area would not be significantly adversely affected; or
- There is a specific need for the development at that location.

5.5.2.16 *Policy NE4: Sites of International Importance for Biodiversity*

Development proposals likely to have a significant effect on an existing or potential Special Protection Area (SPA), existing or candidate Special Area of Conservation (SAC) or Ramsar Site, including developments outwith the site, will require an appropriate assessment and will only be permitted where:

- The development does not adversely affect the integrity of the site; or
- There are no alternative solutions; and there are imperative reasons of overriding public interest including those of a social or economic nature; and compensatory measures have been identified and agreed to ensure the overall coherence of the Natura network is protected.

5.5.2.17 *Policy NE5: Species of International Importance*

Development proposals that would be likely to have an adverse effect on a European Protected Species will not be permitted unless it can be shown that:

- There is no satisfactory alternative; and
- The development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; and
- The development would not be detrimental to the maintenance of the population of the species at a favourable conservation status in its natural range.

5.5.2.18 *Policy NE6: Sites of National Importance for Biodiversity and Geodiversity*

Development that affects Sites of Special Scientific Interest, not designated as International Sites, and other national nature conservation designation will only be permitted where:

- It will not adversely affect the integrity of the area of the qualities for which it has been designated, or
- Any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

5.5.2.19 *Policy NE7: Forestry and Woodland*

The Council will support the creation and protection of sensitively designed and managed forests and woodlands.

Proposals should seek to ensure that ancient and semi-natural woodlands and other woodlands with high nature conservation value are protected and enhanced.

In determining its response to individual forestry felling, planting and replanting consultations where Forestry Commission Scotland are the determining authority, the Council will:

- Take into account environmental and other interests identified in the Forestry and Woodland Strategy including biodiversity, water (including flood risk management), soil and air, landscape setting, historic environment and land restoration;
- Consider the scheme's location as set out in the Forestry and Woodland Strategy;
- Seek to ensure an appropriate balance between both afforested and un-afforested areas in the locality;
- Encourage planting of a type, scale, design, age, composition and species mix that is appropriate to the locality;
- Actively encourage proposals to have a beneficial effect on nature conservation and/or natural and historic environment interest;
- Encourage proposals to take account of possible recreational use in the design of any planting schemes and indicate how such recreational uses have been investigated; and
- Ensure that proposals do not have an adverse impact on the road network.

5.5.2.20 *Policy NE8: Trees and Development*

In assessing development proposals, the Council will support proposals that:

- promote additional tree planting;
- Protect and enhance ancient woodland sites;
- Maintain trees, woodlands (in particular ancient and semi-natural woodlands), and hedgerows (thereafter referred to as the 'woodland resource') and require developers to incorporate, wherever feasible, the existing woodland resource into their schemes;

- Encourage planting of a type, scale, design, composition and species mix that is appropriate to its locality and appropriately incorporates the woodland resource into the overall design of the scheme; and
- Show how existing trees will be appropriately protected during the construction period.

In submitting development proposals, details should be provided of the arrangements to be made for the long-term maintenance of both the existing woodland resource and any proposed new planting, including providing adequate room for further growth.

If it is demonstrated to the satisfaction of the Council that it is not possible to retain the woodland resource then an appropriate replacement planting scheme will be required to be agreed by the Council. Any such replacement planting scheme should normally be located within the site.

The processes and recommendations contained in BS 5837:2012, and any subsequent revised or amended document, should be taken into account in designing and implementing development proposals.

5.5.2.21 *Policy NE13: Agricultural Soil*

Developments proposed on areas of good quality agricultural soil will only be supported where they conform to the Spatial Strategy of the LDP and there is no alternative on less good quality land.

All developments should adopt:

- Means of minimising impact on soil resources;
- Soil management measures; and
- Opportunities to re-use soils necessarily excavated from the site.

5.5.2.22 *Policy NE14: Carbon Rich Soil*

Support for the role of soils as natural carbon sinks will be material in development decisions. Developments proposed on areas of carbon rich soil will need to clearly justify the loss of the carbon sink. Development may be permitted if it can be demonstrated that in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence the balance of advantage in terms of climate change mitigation lies with the development proposal.

All developments should take account of soil carbon content and, as appropriate, should adopt:

- Means of minimising impact on carbon rich soil; and
- Management measures relative to carbon rich soil.

5.5.2.23 *Policy NE15: Protection and Restoration of Peat Deposits as Carbon Sinks*

The role of natural carbon sinks in retaining carbon dioxide will be maintained by safeguarding and protecting peat deposits, including those not already designated for habitat conservation.

The Council will support peatland restoration, including rewetting.

Developments proposed affecting peat deposits not already designated for habitat conservation reasons may be permitted in the following circumstances:

- a) In areas of degraded peatland where all of the following apply:
- The deposits have been significantly damaged by human activity; and
 - The conservation value is low; and
 - Restoration to functioning peatland is not possible.

In all such cases appropriate site restoration measures, to something other than functioning peatland, will be required; or

- b) Where renewable energy generating development is proposed and it can be demonstrated (in accordance with the Scottish Government's 'carbon calculator' or other equivalent independent evidence) that the balance of advantage in terms of climate change mitigation lies with the energy generation proposal; or
- c) Where surface coal extraction requires removal of peat as an overburden to access the coal and where, following extraction of the coal, the site will be restored to a wetland habitat with a biodiversity value that is no less than the biodiversity value of the site prior to development. Grassland and woodland should not be considered as restoration options. If these requirements cannot reasonably be achieved within the development site, creation of a wetland within the vicinity of the site may be an acceptable alternative.

5.5.2.24 *Policy CF2: Green Networks*

Green networks comprise of a network of green and blue spaces (such as bodies of water and wetlands) as well as green corridors within and around settlements, linking out into wider countryside and across administrative boundaries.

Proposals that add to and/or enhance green networks or connections to them will be supported.

5.5.2.25 *Policy CF4: Access Routes*

a) Development Affecting Existing Access Routes

The Council as Access Authority will assert, protect and keep open and free from obstruction any route, waterway or other means by which access rights may reasonably be exercised. Development proposals should not impact adversely on any of the aforementioned access routes and Core Paths.

The Council will not grant planning permission to development proposals which would result in the loss of such access routes unless a satisfactory alternative route or mitigating measure can be secured. In such cases, future access provision, including any changes to existing access, must be shown in an Access Route Plan.

b) Provision of New Access Routes

New development should consider access issues at an early stage of the design process and, where appropriate, incorporate new and enhanced access opportunities, linked to wider access networks and green networks. For small scale developments these considerations can be demonstrated in an Access Route Statement but for all residential development of 5 units or above and other major developments, an Access Route Plan demonstrating how access routes will be incorporated may be required.

New or alternative access routes and enhancements to existing routes will be supported, especially if these can form part of green networks.

The Council will seek reasonable opportunities from developers to create, manage, maintain and improve access through planning conditions or legal agreements.

5.5.2.26 *Policy IN7: Flooding and Development*

The avoidance principle is the most sustainable form of flood management, in accordance with the policy principle for managing flood risk the Flood Risk Management (Scotland) Act 2009. Where proposed development could lead to an unacceptable on-site or off-site flood risk, as defined by the Risk Framework, then it will not be permitted. Where a proposed development could lead to an unacceptable flood risk, it may be that a Flood Risk Assessment (FRA) is able to clarify to the satisfaction of the Council and SEPA that the level of risk both on and off site would be acceptable. For any site a Drainage Impact Assessment (DIA) may be required to ensure that surface water flows

are properly taken into account in the development design. Consideration should be given to pluvial flows especially those which exceed the capacity of the proposed drainage systems. Design of development must avoid flood risk from exceedance flows. (See also **Policy IN8** for Surface Water Drainage and SuDS)

In order to satisfy the Council in respect of FRAs and DIAs, parties will be expected to provide independent verification of their professional competence, unless it is clear that this is not required.

5.5.2.27 Policy IN8: Surface Water Drainage and Sustainable Drainage Systems (SuDS)

Policy IN8 states that the Council will require Sustainable Drainage Systems (SuDS) to be a part of the proposal and must be included in the submitted plan. This consideration should be initiated as part of any preliminary site assessment and should progressively inform the generation of schemes as they develop. For any site a Drainage Impact Assessment (DIA) at the appropriate level may be required to ensure that surface water flows are properly taken into account in the development design.

Details of the proposed SuDS should demonstrate how they will:

- Ensure the system is designed to avoid flood risk from exceedance flows;
- Be accommodated within the proposed site, and understood as an essential factor in determination of the overall capacity of any site;
- Be based on a unified approach to cover surface water drainage from on-site roads and from the remainder of the site;
- Contribute positively to the biodiversity, general amenity and water quality of the area of the proposal;
- Include a coordinated approach between new development that are adjacent to one another;
- Include the arrangements for its long-term maintenance.

There should be appropriate arrangements for surface water drainage during the construction phase of a development site. This could be by way of a SuDS scheme or some alternative interim solution.

5.5.2.28 Policy T1: Transport Infrastructure

Policy T1 states that proposals for the improvement of existing transport infrastructure and, where appropriate, the provision of new transport infrastructure and/or services will be supported provided they accord with the Regional and Local Transport Strategies; and where it can be demonstrated to the satisfaction of the Council that following appropriate assessment (where needed), the proposal has no adverse effects either alone or in combination on the integrity of any Natura Site. 3

Under Policy T1, impacts upon roads networks are evaluated as follows:

Strategic Network

The strategic transport network includes the trunk road, motorway and rail networks. Development proposals that have the potential to affect the performance or safety of the strategic transport network need to be appraised to determine their effects. The national and strategic role of these routes should not be comprised by development which individually or incrementally materially reduces the level of service of a route.

Regional Network

Development which involves a new direct access onto the regional road network should not, individually or incrementally, materially reduce the level of service on a route.

5.5.2.29 *Policy T2: Location of Development/Accessibility*

Policy T2 states that developments proposals should prioritise travel modes in the following order: walking, cycling, public transport and lastly cars and other motorised vehicles. Proposals must be well-served by sustainable modes of travel, including active travel; must give consideration to the provision of electric vehicle charging points and other infrastructure.

Proposals must take account of accessibility issues early on and should also incorporate appropriate parking provision. Certain types of development should submit a travel and transport plan to demonstrate how increased travel will be accommodated by the development.

Design Quality and Placemaking Supplementary Guidance

The Design Quality and Placemaking SG⁶⁰ was adopted in February 2020 and is intended to provide additional detailed guidance to DGLDP2 Policy OP2: Design Quality and Placemaking, which relates to the design and development of buildings, places and spaces in Dumfries and Galloway.

Which much of the guidance for successful, appropriate design and placemaking relates to more urban or community development and how it will be experiences, key principles are retained and considered of relevance to the development of renewable projects, notably an understanding of scale, massing and appropriate siting within the landscape.

Trees and Development Supplementary Guidance

The Trees and Development SG⁶¹ was adopted in February 2020 and is in place to provide additional detail and support to DGLDP2 Policy NE8: Trees and Development.

Whilst no additional policies are within the SG, the guidance contained therein has influenced the landscape strategy and site design.

Flooding and Development Supplementary Guidance

The Flooding and Development SG⁶² was adopted in February 2020 and is intended to provide practical detail for the application of DGLDP2 Policy IN7: Flooding and Development.

Whilst the SG does not provide additional policies against which to assess the Development, the context and guidance provided are both a valuable factor in determining the Development's compliance with DGLDP2 Policy IN7, and an important reference for the determination of hydrological impact and strategy for the Proposed Development, as reflected in Chapter 9 of this EIA Report.

Surface Water Drainage and Sustainable Drainage Systems

The Surface Water Drainage and SuDS SG⁶³ was adopted in February 2020 and is primarily intended to provide support and additional guidance to DGLDP2 Policy IN8: Surface Water Drainage and SuDS.

⁶⁰ Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Design Quality and Placemaking Supplementary Guidance [Online] Available at: https://www.dumgal.gov.uk/media/22620/Design-Quality-and-Placemaking/pdf/Design_Quality_and_Placemaking_SG_LDP2_Adopted.pdf?m=637184913554170000 (Accessed 18/04/2023)

⁶¹ Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Trees and Development Supplementary Guidance [Online] Available at: https://www.dumgal.gov.uk/media/22638/Trees-and-Development/pdf/Trees_and_Development_SG_LDP2_Adopted.pdf?m=637184980299830000 (Accessed 18/04/2023)

⁶² Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Flooding and Development Supplementary Guidance [Online] Available at: https://www.dumgal.gov.uk/media/22622/Flooding-and-Development/pdf/Flooding_and_Development_SG_LDP2_Adopted.pdf?m=637184917585270000 (Accessed 18/04/2023)

⁶³ Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Surface Water Drainage and Sustainable Drainage Systems (SuDS) Supplementary Guidance [Online] Available at: https://www.dumgal.gov.uk/media/22637/Surface-Water-Drainage-and-Sustainable-Drainage-Systems-SuDS/pdf/Sustainable_Drainage_Systems_SG_LDP2_Adopted.pdf?m=637184978247630000 (Accessed 18/04/2023)

The SG provides a range of hydrological matters that should be considered prior to the submission of a planning application, and these are reflected, where relevant, in the assessments carried out in support of the Proposed Development.

Wind Energy Development: Development Management Considerations Supplementary Guidance

The Wind Energy Development: Development Management Considerations SG⁶⁴ was adopted in February 2020 and is intended to provide further detail in support of the development management considerations in DGLDP2 Policy IN2: Wind Energy, and where relevant Policy IN1: Renewable Energy.

In particular, this SG provides greater detail for the assessment of a wind energy development against the eight assessment considerations listed within DGLDP2 Policy IN2. This is valuable when determining the extent to which the Development accords with the LDP policies.

The SG contains specific maps that are valuable reference tools for understanding spatial context and constraints relative to the development of onshore wind energy.

Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' Dumfries & Galloway Wind Farm Landscape Capacity Study Supplementary Guidance

The Wind Farm Landscape Capacity Study SG⁶⁵ was adopted in February 2020 and serves as an appendix to the Wind Energy Development SG, considered at Section 2.5.1.6. This SG provides a categorisation of all land within the Council boundary, assigned as a Landscape Character Type (LCT). The SG then evaluates these LCTs through a series of landscape and visual sensitivity assessments to determine the degree to which the Council thinks each area may have capacity to accommodate wind turbines of varying sizes.

Whilst this SG does not include any policy beyond that which is listed in the DGLDP2, it does provide a valuable reference tool for the Landscape and Visual Impact Assessment carried out in support of this Development and provided at Chapter 5 of this EIA Report.

The Application Site is located within LCT 19: Southern Uplands and the SG provides commentary and as a result, a sensitivity rating to the development of very large turbines (150m+) is applied within this LCT.

5.6 Summary

This Chapter has identified the relevant energy, and national and local planning policy framework relevant to the Proposed Development. A separate **Planning Statement**, not part of this EIA Report, discusses the policy considerations in greater detail and provides planning balance and conclusions on the acceptability of the Proposed Development in planning terms.

Whilst a full assessment of policy compliance is carried out in the **Planning Statement**, there is a clear in-principle support under national and regional to address the renewable development requirements demonstrated by in-depth research and development guidance.

⁶⁴ Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Wind Energy Development: Development Management Considerations [Online] Available at: https://www.dumgal.gov.uk/media/22639/Wind-Energy-Development-Development-Management-Considerations/pdf/Wind_Energy_SG_Final_PDF_February_2020_Version.pdf?m=637184984806630000 (Accessed 18/04/2023)

⁶⁵ Dumfries and Galloway Council (2020) Dumfries and Galloway Local Development Plan 2 Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' Dumfries & Galloway Wind Farm Landscape Capacity Study [Online] Available at: https://www.dumgal.gov.uk/media/22640/Part-1-Wind-Energy-Development-Development-Management-Considerations-Appendix-C-DGWFLCS/pdf/Wind_Energy_Appendix_C_Landscape_SG_LDP2_Adopted.pdf?m=637184996412100000 (Accessed 18/04/2023)

6. LANDSCAPE AND VISUAL

6.1 Introduction

This Chapter of the EIA Report evaluates the potential effects of the Cloud Hill Wind Farm as described in **Chapter 4 – Description of the Proposed Development** (the Proposed Development) on landscape and visual resources. This assessment was undertaken by Optimised Environments Limited.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in Volume 3 Technical Appendices:

- Technical Appendix A6.1: Landscape and Visual Impact Assessment (LVIA) Methodology;
- Technical Appendix A6.2: Residential Visual Amenity Assessment (RVAA); and
- Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting.

This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Mitigation and Residual Effects;
- Assessment of Physical Effects;
- Assessment of Effects on Landscape Character;
- Assessment of Effects on Landscape Designations;
- Assessment of Effects on Views and Visual Amenity;
- Assessment of Effects on Principal Visual Receptors;
- Assessment of Cumulative Effects;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

This Chapter of the EIA Report is supported by Figures and Visualisations:

- Volume 2b: GIS **Figures 6.1 to 6.16**; and
- Volume 2c: Visualisations **Figures 6.17 to 6.43**.

6.2 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Electricity Act 1989;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended;
- National Planning Framework 4 (Scottish Government, February 2023);
- Dumfries and Galloway Local Development Plan (October 2019);
- Guidelines for Landscape and Visual Impact Assessment: Third Edition (Landscape Institute and IEMA, 2013) (GLVIA3);

- Visual Representation of Wind Farms Version 2.2 (Scottish Natural Heritage, February 2017);
- Technical Guidance Note 06/19: Visual Representation of development proposals (Landscape Institute, 2019);
- Assessing impacts on Wild Land Areas - Technical Guidance. (NatureScot 2020);
- Technical Guidance Note 02/19 Residential Visual Amenity Assessment. (Landscape Institute 2019);
- Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy development. (NatureScot 2021);
- Landscape Character Assessment Guidance for England and Scotland (SNH and The Countryside Agency, 2002);
- Siting and Designing of Windfarms in the Landscape: Version 3 (SNH 2017);
- Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage (SNH 2009);
- Spatial Planning for Onshore Wind Turbines – natural heritage considerations, Guidance (SNH 2015); and
- Good Practice During Windfarm Construction, Version 4 (SNH 2019);
- A Handbook on Environmental Impact Assessment, Appendix 2: Landscape and Visual Impact Assessment, SNH (2018) Version 5
- Dumfries and Galloway Local Development Plan 2 Supplementary Planning Guidance: Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' - Dumfries and Galloway Wind Farm Landscape Capacity Study (February 2020).

6.2.1 Development Plan

The development plan consists of National Planning Framework 4 (NPF4)⁶⁶ (February 2023) and the Dumfries and Galloway Local Development Plan 2 (DGLDP2)⁶⁷ (October 2019). LDP2 includes supplementary guidance on Wind Energy Development: Development Management Considerations (February 2020). A detailed assessment of the planning context is presented in **Chapter 5 Planning and Energy Policy**.

6.2.2 Landscape Capacity Studies

In addition to the list of documents presented at the start of **Section 6.2**, this LVIA has also considered the following landscape capacity study that is relevant to the assessment as it covers the Site:

- Dumfries and Galloway Local Development Plan 2 Supplementary Planning Guidance: Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' - Dumfries and Galloway Wind Farm Landscape Capacity Study (February 2020).

In respect of the relevance of capacity studies to this assessment, GLVIA 3 makes the following statement at Paragraph 5.41, *“The assessment may take place in situations where there are existing landscape sensitivity and capacity studies, which have become increasingly common. They may deal with the general type of development that is proposed, in which case they may provide useful preliminary background information for the assessment. But they cannot provide a substitute for the individual assessment of the susceptibility of the receptors in relation to change arising from the specific development proposal.”*

⁶⁶ Scottish Government (2023). National Planning Framework 4 (Accessed March 2023)

⁶⁷ Dumfries and Galloway Council (2019). Dumfries and Galloway Local Development Plan 2 (Accessed March 2023)

Furthermore, the capacity studies themselves present caveats regarding their role, with the following extract taken from Dumfries and Galloway Windfarm Landscape Capacity Study (DGWLCS).

“It is accepted that the majority of large-scale wind energy developments are likely to incur significant adverse landscape and visual effects. Landscape and visual sensitivity comprise one of a range of issues that need to be considered in determining the potential acceptability of a specific development; these are covered by other sections of the Dumfries and Galloway Local Development Plan and associated supplementary guidance. Strategic Guidance within DGWLCS does not replace the need for independent landscape and visual impact assessment and / or Environmental Assessments for Individual wind farm developments.”

6.2.2.1 Dumfries and Galloway Wind Farm Landscape Capacity Study 2020

The ‘Dumfries and Galloway Wind Farm Landscape Capacity Study’ (DGWFLCS) was published by the Council in February 2020. It revises and updates the 2011 DGWLCS in response to changes in baseline conditions, planning policy and guidance. The DGWLCS sits as a supportive study to LDP2 and is an appendix to the Council’s ‘Part 1 Wind Energy Development: Development Management Considerations’ Supplementary Guidance on Wind Energy’.

The DGWFLCS provides a categorisation of all land within the Councils boundary, assigned as a Landscape Character Type (LCT). The SG then evaluates these LCTs through a series of landscape and visual sensitivity assessments to determine the degree to which DGC considers each area may have capacity to accommodate wind turbines of varying sizes. Whilst this SG does not include any policy beyond that which is listed in the LDP2, it does provide a reference tool for this LVIA. The DGWFLCS acknowledges that its consideration does not replace the need to assess the landscape or visual impacts of individual proposals. The Site is situated in the Dumfries and Galloway council area, and as shown on **Figure 6.2a**, lies within LCT 19: Southern Uplands. The SG provides commentary and applies a sensitivity rating to the development of very large turbines (150m+) within this LCT.

The DGWLCS provides:

- A detailed landscape and visual sensitivity assessment for wind turbine/wind farm developments based on landscape character types and areas defined in the original SNH Landscape Character Assessment for Dumfries and Galloway⁶⁸.
- Guidance on what size of wind energy development would be appropriate, in landscape and visual terms, within the different landscape character types/areas considered in the study and on which areas are unsuitable in landscape and visual terms for wind energy development.
- Consideration of scope for repowering of operational and consented wind energy developments including assessing landscape sensitivity to very large turbines in excess of 150 m to blade tip.
- Information on potential cumulative landscape and visual impacts, identifying where cumulative thresholds for development have been/are close to being reached.
- Siting and design guidance for landscape character types/areas identified as having some potential for development.

The DGWLCS provides an overview of landscape and visual sensitivities across Dumfries and Galloway with recommendations on strategic landscape and visual considerations for wind energy developments within and close to the administrative boundary.

The study is based on the classification of the landscape into LCTs, as defined by SNH (now NatureScot), and Landscape Character Unit (LCUs). LCTs For each landscape character type/unit, the DGWLCS provides a summary of sensitivity, with a combined score for landscape and visual sensitivities; a separate sensitivity in relation to landscape values; cumulative issues and key

⁶⁸ Scottish Natural Heritage (1998). Dumfries and Galloway landscape assessment

constraints; opportunities for development; and concludes with recommendations related to the scope of capacity and guidance on siting of wind turbine development.

The Proposed Development would be located in LCT19 Southern Uplands – Nithsdale LCU, which the DGWLCS considers to be of High sensitivity to Very Large turbines (150 m+).

This High sensitivity relates to the extent of operational, under-construction and consented wind farm development, and commercial forestry within upland areas in this and adjacent LCUs. The DGWLCS explains that these increase the value of the open character of less modified parts of these hills and greatly increase sensitivity to larger typologies, despite the large scale and simple land cover of the sparsely populated LCU. Recreational use by walkers using tracks, minor roads and the SUW further increases visual sensitivity as the dramatic and sculptural hills of the Nithsdale LCU are partially covered by a Regional Scenic Area (RSA) in recognition of their scenic quality and contribution to the scenic diversity of adjacent glens and valleys.

Regarding the Nithsdale LCU and North West Lowthers LCU, the DGWLCS presents the following guidance in paragraph 24.3 (p332):

“There is no scope for the Very Large typology (turbines 150m+) to be accommodated in either of these landscape units due to the increased impact that could occur on more sensitive landscapes, such as the Upland Glens (10) of the Euchar and Scar Water and Shinnel valleys plus the Upper Dale (9) - Upper Nithsdale unit. The scope is also influenced by the significant cumulative effects that would be likely to occur with nearby operational, under construction and consented wind farms which largely comprise turbines of <130m high.”

It also states:

“There are very few, if any, opportunities for additional turbines within the Large typology (80-150m) to be accommodated in the Nithsdale unit given the extent of wind farm development already consented and the key landscape and visual constraints listed in 2.2.2 above in relation to effects on the sensitive Upland Glens (10) and on more pronounced rugged open hills in the southern part of this landscape unit. The Nithsdale unit of the Southern Uplands is concluded to be close to capacity for additional wind turbine development.”

6.2.2.2 East Ayrshire Landscape Wind Capacity Study 2018

The ‘East Ayrshire Landscape Wind Capacity Study’ (EALWCS) was prepared by Carol Anderson Landscape Associates on behalf of East Ayrshire Council and published in 2018. It is Non-statutory Planning Guidance that forms a supporting document to East Ayrshire Council’s Supplementary Guidance within ‘Planning for Wind Energy’ (2017).

The EALWCS 2018 revises and updates the 2013 EALWCS. It aims to inform strategic planning for wind energy development in line with Scottish Planning Policy which has since been superseded by NPF4, and to also provide guidance on the appraisal of individual wind farm and wind turbine proposals in East Ayrshire.

The EALWCS considers the landscape and visual sensitivity of 12 landscape character types within East Ayrshire to a range of wind turbine developments, principally categorised on the basis of turbine height. It considers scope for repowering existing wind farms using larger wind turbines; and potential cumulative issues associated with operational and consented wind farm developments. Guidance on the constraints and opportunities for wind energy development within each landscape character type is set out in the study.

6.3 Assessment Methodology and Significance Criteria

6.3.1 Scoping Responses and Consultations

Consultation for this assessment was undertaken and consideration has been given to the scoping responses and other consultation responses received from the organisations shown in **Table 6.1**.

Table 6.1 Consultation Responses

Consultee / Type and Date	Summary of Consultation Response	Response to Consultee
NatureScot Scoping Response, 10/05/22	"Additional viewpoints further out from the proposed development would help build a clearer understanding of potential visual and landscape impacts. For example, a viewpoint on the top of Meikle Millyea."	Meikle Millyea has been included as assessment Viewpoint 17 shown in Figure 6.33a-d and is assessed in Section 6.9.18
NatureScot Scoping Response, 10/05/22	"Cumulative twilight impacts of lighting should be investigated."	The night-time effects of aviation lighting are assessed in Technical Appendix A6.3 Visual Assessment of Visible Aviation Lighting is taken 30 minutes after sunset, in line with NatureScot guidance ⁶⁹ and capturing twilight effects.
NatureScot Scoping Response, 10/05/22	"Wireline representations of the proposed development in the landscape would also help clarify potential impacts."	Wirelines are presented for all 22 assessment viewpoints and for five additional supplementary viewpoints.
NatureScot Scoping Response, 10/05/22	"We recommend the night time assessment takes account of our 'Visual Representation of Wind Farms' guidance, particularly the section on turbine lighting."	The night-time effects of aviation lighting are assessed in Technical Appendix A6.3 Visual Assessment of Visible Aviation Lighting taking into account NatureScot guidance.
East Ayrshire Council Scoping Response	"The Council suggests that the EIA process should take into account the Galloway and Southern Ayrshire UNESCO Biosphere as it is an important tourist attraction in the area. Although the proposed site sits within the transition area of the Biosphere, it is noted that there is no consideration given to the designation within the Scoping Report."	The effects of the Proposed Development on the Biosphere is assessed in Chapter 14: Socio-economics, Tourism, Recreation and Land Use with reference also made in Chapter 7: Ecology .
Tynron Community Council Scoping Response undated	Are you in agreement with the proposed LVIA Study Area (45 km)? "Cumulative impact studies should cover a wider LVIA, particularly with the need for red aviation warning lights on the turbines."	The cumulative effects are assessed in Section 6.11 . The night-time effects of aviation lighting are assessed in Appendix A6.3 Visual Assessment of Visible Aviation Lighting . In respect of both, potentially significant effects will occur within the first 20 km owing to the limited extents of the ZTV as shown on Figure 6.5a and the extensive baseline influence from other wind farms. Therefore the 45 km study area is appropriate.
Tynron Community Council Scoping Response undated	Are you in agreement that the assessment of the effects on landscape character receptors should focus on those LCTs/LCUs which lie within a 20 km radius of the Development as shown in Figure 6.2 ? "Yes, but the list in Table 6.2 is incomplete."	The effects of the Proposed Development on landscape character are presented in Section 6.7 . All LCTs/LCUs within 20 km of the Proposed Development have been considered in Table 6.3 with those with potential to undergo significant effects assessed in detail in Section 6.7 .
Tynron Community Council Scoping Response undated	Are you in agreement that the assessment of the effects on landscape designations and WLAs should focus on those areas which are highlighted as being relevant to the LVIA in Table 6.1 ? "Yes, but also the GSA Biosphere, Galloway Dark Skies Park, and potential Galloway National Park designation should also be included."	The Galloway Dark Skies Park is not a landscape designation. It lies beyond 25 km and has limited ZTV coverage as shown on Figure 6.9a and therefore is scoped out of the night-time assessment. The Galloway Hill Regional Scenic Area is assessed in Section 6.8 – there is currently no Galloway National Park. The Galloway and Southern Ayrshire

⁶⁹ SNH (February 2017). Visual Representation of Wind Farms: Version 2.2

Consultee / Type and Date	Summary of Consultation Response	Response to Consultee
		Biosphere covers the entire region and is a nature conservation area rather than a scenic landscape designation. The Biosphere is assessed Chapter 14: Socio-economics, Tourism, Recreation and Land Use with reference also made in Chapter 7: Ecology .
Tynron Community Council Scoping Response undated	Do you have any comments or suggestions in relation to the Preliminary Representative Viewpoint Locations shown in Table 6.2 and illustrated in Figure 6.4? "We believe there are multiple representative viewpoint locations omitted from Table 6.2 and Figure 6.4. The resolution of Figure 6.4 is not clear enough to determine specific receptor impacts; Table 6.2 omits the following receptors: Glenwhargen, Hallscaur, Glenmanna and associated cottages, Polskeoch, Dalgonar, Chanlockfoot and other residences in Scaur Glen Appin Lodge, High Appin, Shinnelhead and other residences in Shinnel Glen Colt Hill Striding Arch Allan's Cairn Covenanters memorial Southern Upland Way – multiple viewpoints, not just the immediate vicinity. Tynron Doon and Auchengibbert Hill Cairnkinna Glenwhargen crags Dalzean ridge Crawick Multiverse Afton reservoir The Rhinns of Kells Representative views along hill walking and cycling routes eg between the Striding Arches, along ridges either side of the Dalwhat, Appin, Shinnel and Scaur catchments; on Appin forest tracks."	It is important to note that representative viewpoints are used to represent the viewpoint and the surrounding area in order to identify whether significant effects would occur. It is therefore not necessary to have viewpoints in every location where visibility would arise. Most of the viewpoints suggested are already covered by the original viewpoint list. In response to the suggestions a further five viewpoints have been added to the assessment, including Viewpoint 18 Southern Upland Way, Coupland Knowe (Figure 6.34); Viewpoint 19 Southern Upland Way, Glengaber Hill (Figure 6.35); Viewpoint 20 Cairnkinna (Figure 6.36); Viewpoint 21 Crawick Multiverse (Figure 6.37); and Viewpoint 22 Auchengibbert Hill (Figure 6.38). A further five viewpoints have been added as wirelines to supplement the original viewpoint list including; Viewpoint 23 Colt Hill (Figure 6.39); Viewpoint 24 Glenwhargen Scaur Water minor road (Figure 6.40); Viewpoint 25 Auchentaggart (Figure 6.41); Viewpoint 26 Kelloholm (Figure 6.42) and Viewpoint 27 Whing Head (Figure 6.43). These viewpoints have been agreed with DGC.
Tynron Community Council Scoping Response undated	Do you have any comments on the approach to assessing the effects of the Development on Residential Visual Amenity? "Given the height of these turbines, the need for aviation lighting, and the potential for cumulative impact with other developments, a threshold of 2km from the development is inadequate to assess the effects on residential visual amenity of the development on homes in the vicinity of the development, given their open views, uncluttered vistas, and limited mitigation, and should be extended. 2km is also not a defined limit in the quoted 'Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19'."	The Residential Visual Amenity Assessment (RVAA), included in Technical Appendix A6.2 Residential Visual Amenity Assessment is separate from the LVIA because it has a separate and distinct purpose. While the purpose of the LVIA is to identify significant effects in respect of visual receptors, the purpose of the RVAA is to identify overbearing effects in respect of residential visual amenity. 2 km is considered an appropriate radius for the RVAA. The visual assessment in Section 6.9 assesses receptors beyond this 2km radius.
Tynron Community Council Scoping Response undated	Do you have any comments on the approach to assessing the effects of turbine lighting or the selection of three night-time viewpoints? "These viewpoints are inadequate and do not consider the impacts on local roads	The viewpoint from Mennock has been replaced by the viewpoint from Eucharhead minor road (VP4) which would have greater visibility of the aviation lights. Scaur Water minor road has not been included as there is very limited

Consultee / Type and Date	Summary of Consultation Response	Response to Consultee
	such as the Scaur and Shinnel Glen roads. The impacts of turbine lighting on bats, birds and vegetation should also be assessed. The impact of nighttime 'flicker' of aircraft warning lights from rotating turbine blades should also be assessed."	visibility of turbine hubs as shown on Figure 6.6b to which the aviation lights are fixed. The effects of aviation lighting on ecology are presented in Chapter 7 – Ecology .
Tynron Community Council Scoping Response undated	Do you have any comments or suggestions on the approach to cumulative landscape and visual assessment? "Figure 6.6 does not include Appin Wind Farm or Euchanhead wind farm. The cumulative impact of windfarms with turbines over 150 metres (very large typology) should be especially considered given the step-change in turbine heights in the area (there are currently no consented wind farms with turbine heights in excess of 149.9 metres). The cumulative impact of lit turbines should also be considered and its impact on our Dark Skies, ecology, and residential and visual amenity."	Cumulative effects are assessed in Section 6.11 and all relevant cumulative wind farms shown on Figure 6.12 . Euchanhead Wind Farm is included as an application stage development as shown in Table 6.5 . Appin Wind Farm has not been included as it is currently at scoping stage and is scoped out due to the uncertainty that this scheme will come forward and the lack of adequate information about project details. A cut-off date of 3rd March 2023 has been applied to the cumulative assessment. The effects of aviation lighting on ecology are presented in Chapter 7 – Ecology .
Dumfries and Galloway Council Email response 15/12/2022	"Original viewpoint list: Agree to list, but suggest four possible substitutions, including from the Tynron Community Council list: VP 3 Kirkconnel – check adequate representation from Kelloholm. VP 6 Mennock – consider as an alternative / additional wirelines, views from the B797 descending from the Mennock Pass to Mennock. There are some important reveals where views across the valley open out – and Whiteside Hill becomes visible. Need to see any cumulative effects of Cloud Hill. VP 10 Auchengibbert is a better worst-case scenario than Waulk Hill – and possibly a more popular hill route? VP 11 Benbrack. Please omit this as a main representative VP as there is no visibility likely. Substitute Colt Hill as an alternative. This is an important receptor and also offers good prospect over the cumulative context of committed and in-application schemes."	Auchengibbert Hill has been included in the assessment (Viewpoint 22). Colt Hill and Kelloholm have been included as wirelines (Viewpoint 23 and 26). The B797 has not been included as an additional viewpoint owing to limited visibility and Benbrack has been retained as an assessment viewpoint as there is visibility from this summit and it is a location on the SUW whilst Colt Hill is not.
Dumfries and Galloway Council Email response 15/12/2022	"Tynron CC list: Agree to the selection of four VPs: SUW Glengaber, SUW Coupland Knowe, Cairnkinna, and Crawick Multiverse. Please also include Colt Hill and Auchengibbert Hill as substitutes for VPs 10 and 11. Auchengibbert is > 6km distance from VP 13 and represents a different type of receptor Striding Arch visitor as well as hill walkers. Please also include Whing Head – an important SUW viewpoint and also for consistency with representative VPs for Sanquhar 2 – this proved a useful VP. This an important reveal for walkers crossing between Upper Nithsdale and the Scaur valley."	Auchengibbert Hill has been included in the assessment (Viewpoint 22). Colt Hill and Whing Head have been included as wirelines (Viewpoint 23 and 27).

Consultee / Type and Date	Summary of Consultation Response	Response to Consultee
Dumfries and Galloway Council Email response 15/12/2022	“Summary: additional JS/DGC recommendations, representative VPs and sequential assessments: Representative VP from Kelloholm, or wireline if considered VP 3 Kirkconnel as a worst case scenario for the two settlements. Descent from the Mennoch Pass, possibly as baseline photos and wirelines. Auchengibbert Hill. Colt Hill. Core path 500m NW of Auchentaggart Farm – this has proved a useful representative VP for other schemes in Upper Nithsdale. Please include for consistency. Please include Whing Head SUW viewpoint. Up valley views from the Scaur Water valley – suggest Glenwhargen Farm. Ideally please do a sequential assessment from the minor road up-valley, noting visibility for 1-9 turbines on the ZTV for almost 10km. SUW sequential assessment between Glengaber and Benbrack, where Cloud Hill would be in the direction of travel.”	Auchengibbert Hill has been included in the assessment (Viewpoint 22). Colt Hill, Glenwhargen Farm, Auchentaggart Farm, Kelloholm and Whing Head have been included as wirelines (Viewpoints 23 to 27). The B797 has not been included as an additional viewpoint owing to limited visibility. A sequential assessment of Section 4: Dalry to Sanquhar and Section 5: Sanquhar to Wanlockhead, of the SUW is presented in Section 6.10.8. The assessment focuses on those parts of the SUW that lie within a 10 km radius of the Proposed Development, where there is potential for significant effects to arise, as reflected in the ZTV on Figure 6.10.

6.3.2 Scope of Assessment

The key issues for the assessment of potential landscape and visual effects relating to the Proposed Development include;

- Temporary effects arising from the construction phase such as the presence of materials and plant, the construction of access tracks, foundations, crane pads and borrow pits and the emergence of the wind turbines;
- Permanent effects arising from the operational phase such as the presence and movement of the wind turbines and presence of the tracks, met mast and substation; and
- Indirect effects arising from the construction and operational phases such as the effects on landscape character and visual amenity owing to visibility of the proposed turbines and other infrastructure.

The Proposed Development comprises 11 turbines with associated infrastructure, including access tracks, a compound containing the control building, substation and battery storage facility, up to three on-site borrow pits and a permanent meteorological mast as described in **Chapter 4 – Description of the Proposed Development**. The LVIA is based on turbines of up to 180 m to tip. A hub height of 105 m and a blade diameter of 150 m is shown in the visualisations and evaluated in the assessment as this is considered to be the likely worst case in relation to landscape and visual effects. The likely worst case in respect of night-time effects considers all turbines to be lit with aviation lighting with a lighting intensity of 2,000 cd and 200 cd. Night-time effects are assessed in **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting**.

This assessment covers the construction and operational phase of the Proposed Development. The effects associated with the construction phase would be temporary in nature, while the effects associated with the operational phase would be permanent for the 35-year period of the consent. The decommissioning effects would be similar in magnitude to the construction effects.

In respect of the restoration of the borrow pits, details are set out in **Technical Appendix A10.3: Preliminary Borrow Pit Assessment**. Each borrow pit would be re-instated with topsoil and any available peat, peaty soils and turves to re-establish hydrological and ecological conditions and reduce any potential visual impacts. The reinstated peat/soil surface would be profiled to allow drainage and the re-introduction of appropriate vegetation cover would tie into existing topography. There are a number of coniferous forestry plantations present across the slopes of the Southern Uplands where the Site is located. The most notable is Ulzieside Plantation owing to its location on the lower northern slopes of Whing Head, which lies to the north-east of the Site and which features in views of the Site from Sanquhar and surrounding parts of the Nith Valley. In order to ensure a worst-case scenario is considered in the assessment, it is assumed that Ulzieside Plantation would be removed prior to construction of the Proposed Development and would, therefore, not provide screening of the construction works or subsequent operation of the Proposed Development. There is an area of more recent forestry planting to the south of Ulzieside and for the purposes of the assessment, owing to its recent establishment, it is assumed that this forestry will be present during the 35 year lifespan of the Proposed Development and may gradually come to provide some screening as the planting matures.

6.3.2.1 Elements Scoped Out of Assessment

On the basis of the desk based and site survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects, and policy guidance or standards, the following effects have been scoped out of this LVIA, as proposed and agreed through the scoping process.

- Effects on landscape character types lying beyond a 20 km radius of the Proposed Development and also where the influence of the Proposed Development on the landscape character types would be limited;
- Effects on national and regional designations lying beyond a 20 km radius of the Proposed Development and also where the influence of the Proposed Development on the Designations would be limited;
- Effects on the Merrick and Talla - Hart Fell Wild Land Areas which lie beyond 20 km and also where the influence of the Proposed Development on the Wild Land (WLAs) would be limited;
- The cumulative effect of the Proposed Development in the context of wind farms that lie beyond a 45 km radius from the Proposed Development turbines;
- The cumulative effect of the Proposed Development in the context of scoping stage wind farms;
- Effects arising from the process of decommissioning since they are of a similar nature to construction issues, but of a smaller scale and shorter duration. However, the results of decommissioning (i.e. the removal of the wind farm) are taken into account in assessing on-going and operational effects where appropriate.

6.3.3 Study Area

The initial step in the LVIA is the establishment of the Study Area for the assessment. Guidance developed by SNH (now NatureScot) in their Visual Representation of Wind Farms Version 2.2⁷⁰ indicates that an area with a radius of 45 km from the nearest turbine is appropriate for turbines of the size proposed. This Study Area is shown on **Figure 6.1**. Zone of Theoretical Visibility (ZTV) analysis has been carried out for this Study Area, as has mapping of landscape character, landscape related designations, wild land areas and principal visual receptors.

The Study Area is not intended to provide a boundary beyond which the Proposed Development would not be seen, but rather to define the area within which it may have a significant landscape or

⁷⁰ Scottish Natural Heritage (February 2017). Visual Representation of Wind Farms Version 2.2 (Accessed March 2023)

visual effect. A significant effect is, in reality, very unlikely to occur towards the edges of the Study Area.

A review of the wind farm context within a 45 km radius has been undertaken, based on the latest information contained in the planning portals of the relevant local authorities and the Scottish Government's Energy Consents Unit. It is considered that any cumulative effects that will occur, will arise as a result of the pattern of development within the 45 km Study Area radius, rather than as a result of changes beyond this. **Figure 6.12** shows the locations of wind farms within 45 km that are operational, under construction, consented or which are at planning or application stage and where the turbines are greater than 50 m to blade tip. Scoping stage wind farms are not included in the cumulative assessment owing to the lack of certainty surrounding these early-stage projects. In the absence of any comments on the proposed cumulative assessment, an update to the list was made on the 3rd March 2023, which marks the cut-off date for updates to be included in the assessment.

6.3.4 Site Area

The Site, as defined by the RLB, is shown on **Figure 1.2**. The main part of the Site covers the northern slopes of Cloud Hill and Whing Head, extending north towards the Euchar Water. It is in this main area that the proposed turbines and majority of the infrastructure would be located. The RLB defines a narrow extension to the north-east which covers the proposed access from the north-eastern slopes of Whing Head to Euchar Bridge.

6.3.5 Baseline Survey Methodology

6.3.5.1 Desk Study

The assessment is initiated through a desk study of the Site and the 45 km radius Study Area. This study identifies aspects of the landscape and visual resource that may need to be considered in the landscape and visual assessment, including landscape-related planning designations, landscape character typology, wild land areas, operational and proposed cumulative wind farms, and views from settlements and routes.

The desk study also utilises Geographic Information System (GIS) and Resoft Windfarm software to explore the potential visibility of the Proposed Development. The resultant ZTV diagrams and wirelines provide an indication of which landscape and visual receptors are likely to be key in the assessment.

6.3.5.2 Field Survey

Field surveys were carried out during 2022 and 2023 throughout the 45 km radius Study Area, although the focus is on the areas shown on the ZTV to gain theoretical visibility of the Proposed Development. The baseline field survey has four broad stages:

- A preliminary familiarisation around the Study Area in order to visit the aspects of the landscape and visual resource that have been identified through the desk study and verify their existence and importance. Important features and characteristics that have not become apparent through the desk study are also identified, and particularly sensitive receptors are noted in order to inform the design process;
- A visit onto the Site, in order to establish the potential of the Site for wind farm development and identify the most suitable areas for Proposed Development in landscape and visual terms, along with any constraints that may restrict the developable area;
- Further field survey around the Study Area, concurrent with the design process for the Proposed Development, to identify those receptors that are likely to be particularly important in the assessment and inform the layout design, possible turbine height, and the extent of the Proposed Development;

- The identification of representative viewpoints to include in the landscape and visual assessment, including a wide range of receptors, landscape character, and directions and distances from the Proposed Development; and
- Site work to verify exact locations of representative viewpoints.

6.3.6 Methodology for the Assessment of Effects

The significance of the potential effects of the Proposed Development has been classified by professional consideration of the sensitivity of receptors and the magnitude of the potential effect. This section summarises the methodology and guidance used to carry out the LVIA, which is described in full in **Technical Appendix A6.1: LVIA Methodology**.

6.3.6.1 Categories of Effects

The LVIA is intended to determine the effects that the Proposed Development would have on the landscape and visual resource. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into the following five categories; physical effects, effects on landscape character, effects on landscape designations, effects on visual receptors and cumulative effects.

6.3.6.2 Assessment of Effects

The broad principles used in the assessment of significance of the various categories of effects are the same and are described below. The detailed methodology for the assessment of significance does, however, vary, and the specific criteria used are described in **Technical Appendix A6.1: LVIA Methodology**.

The objective of the assessment of the Proposed Development is to predict the likely significant effects on the landscape and visual resource. The significance of effects is assessed through a combination of two considerations; the sensitivity of the landscape receptor or view and the magnitude of change that will result as a consequence of the addition of the Proposed Development.

6.3.6.3 Sensitivity

Sensitivity is an expression of the ability of a landscape or visual receptor to accommodate the Proposed Development. Sensitivity is determined through a combination of the value of the receptor and its susceptibility to the Proposed Development. The factors that determine these criteria are described in **Technical Appendix A6.1: LVIA Methodology**.

Levels of sensitivity - high, medium-high, medium, medium-low and low - are applied in order that the judgement used in the process of assessment is transparent.

6.3.6.4 Magnitude of Change

Magnitude of change is an expression of the extent of the effect on landscape and visual receptors that will result from the introduction of the Proposed Development. The magnitude of change is assessed in terms of a number of variables, including the size and scale of the impact and the extent of the affected area. The factors that determine these criteria are described in **Technical Appendix A6.1: LVIA Methodology**.

Levels of magnitude of change - high, medium-high, medium, medium-low, low and negligible - are applied in order that the judgement used in the process of assessment is apparent.

6.3.7 Assessment of Significance

The significance and level of effects is assessed through a combination of the sensitivity of the landscape or visual receptor and the magnitude of change that will result from the addition of the Proposed Development. A matrix is included in **Table 6.2** below to illustrate how combinations of

sensitivity and magnitude of change ratings can give rise to findings of significant effects and the level of those effects in terms of major, moderate or minor. The matrix also gives an understanding of the threshold at which significant effects may arise, where a moderate level of effect is assessed.

Table 6.2 Assessment of Significance Matrix

Magnitude Sensitivity:	High	Medium-High	Medium	Medium-Low	Low	Negligible/None
High	Significant (Major)	Significant (Major)	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)
Medium-High	Significant (Major)	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)
Medium	Significant (Major / moderate)	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)
Medium-Low	Significant or Not Significant (Moderate)	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Negligible)
Low	Significant or Not Significant (Moderate)	Not Significant (Moderate / minor)	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Negligible)	Not Significant (Negligible)

Effects within the dark grey boxes in the matrix are considered to be significant with either a Major or Major / Moderate level of effect. Effects within the light grey boxes may be significant or not significant depending on the specific relevant factors that arise at a particular landscape or visual receptor and here the level of effect is Moderate. Effects within the white boxes are considered to be not significant at either a Moderate / Minor, Minor or Negligible level. In accordance with GLVIA3, experienced professional judgement is applied to the assessment of all effects and reasoned justification is presented in respect of the findings of each case.

A significant effect occurs where the Proposed Development will provide a defining influence on a landscape element, landscape character receptor or view, albeit that it may be one of a number of defining characteristics. A not significant effect occurs where the effect of the Proposed Development is not defining, and the baseline characteristics of the landscape element, landscape character receptor, view or visual receptor continue to provide the definitive influence. In this instance, the Proposed Development may have an influence, but this influence will not be definitive.

6.3.8 Cumulative Assessment

NatureScot's 'Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy development'⁷¹ is widely used across Scotland to inform the specific assessment of the

⁷¹ NatureScot (2021). Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy development'.

cumulative effects of wind farms. This guidance provides the basis for the methodology for the cumulative assessment.

“The purpose of a Cumulative Landscape and Visual Impact Assessment (CLVIA) is to describe, visually represent and assess the ways in which a proposed wind farm would have additional impacts when considered with other consented or proposed wind farms. It should identify the significant cumulative impacts arising from the proposed wind farm.”

The addition of the Proposed Development to the operational and under construction wind farm context is assessed in cumulative terms within the main assessment. This includes the assessment of the effects of the Proposed Development in the context of the operational wind farms.

The cumulative section of the LVIA (CLVIA), presented in **Section 6.11**, assesses the effects arising from the addition of the Proposed Development as a potential future baseline split into two possible scenarios as follows:

- Consented scenario – operational and under construction wind farms plus consented wind farms; and
- Application scenario – operational, under construction and consented wind farms plus application and appeal stage wind farms.

Baseline operational and under construction cumulative wind farms are taken into consideration in both the assessment of the Proposed Development itself (as part of the LVIA) and the cumulative assessment, while consented and application-stage wind farms are considered only in the cumulative assessment. It may be the case that not all application stage wind farms are consented and constructed however the latter scenario presents the ‘worst-case’ scenario of greatest overall potential cumulative effects.

The aim of the Cumulative Landscape and Visual Impact Assessment (CLVIA) is to focus on, and determine, the likely significant cumulative landscape and visual effects. Significant cumulative landscape and visual effects are likely to arise where wind farm developments become a prevailing landscape and visual characteristic as a result of the additional effects of the Proposed Development, albeit that they may become one of a number of prevailing characteristics.

6.3.9 Nature of Effects

The ‘nature of effects’ relates to whether the effects of the Proposed Development are beneficial or adverse. Guidance provided in GLVIA3 states that “thought must be given to whether the likely significant landscape and visual effects are judged to be beneficial or adverse in their consequences for landscape or for views and visual amenity” but does not provide an indication as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and reasoned professional opinion. Definitions of beneficial, neutral and adverse effects are presented in **Technical Appendix A6.1: LVIA Methodology**. In respect of this assessment a cautionary approach has been taken in which all effects are assumed to be adverse unless stated otherwise.

6.3.10 Duration and Reversibility of Effects

The effects of the Proposed Development are of variable duration, and are assessed as short-term or long-term, and permanent or reversible. The on-site construction would last approximately 18 months and would be considered short term. They would include those effects associated with the groundworks, construction of the compounds, control building, substation, battery storage compound, access tracks, borrow pits, crane pads and turbine foundations, as well as the erection of the turbines. The tall cranes would be apparent intermittently and over a shorter duration. Borrow pit excavation would also be short-term as borrow pits would be restored at the end of the construction process, although a permanently altered ground profile may remain evident. Further, borrow pit one, the northern most borrow pit, is an existing borrow pit.

It is anticipated that the operational life of the Proposed Development will be 35 years. The turbines, site access tracks and control building, substation and battery storage compound would be apparent during this time, and these effects are considered to be long-term and potentially in perpetuity although they would also be largely reversible if required.

The reversibility of effects is variable. The most apparent effects on the landscape and visual resource, which arise from the presence and movement of the turbines, are reversible as the turbines would be removed at decommissioning. The effects of the tall cranes and heavy machinery used during the construction and decommissioning periods are also reversible. It is anticipated that access tracks would remain in-situ at decommissioning. Turbine foundations and underground cabling would be left in-situ below ground with no residual landscape and visual effects.

In order to avoid repetition, the duration and reversibility of effects are not reiterated throughout the assessment.

6.3.11 Graphic Production

The written LVIA is accompanied by a set of graphics contained in **Volume 2b and 2c**. Reference is made throughout the written text to these graphics, as they are an integral part of the overall assessment and of importance in illustrating specific matters. They should be viewed in accompaniment to the written text.

The graphics can be divided into two categories; maps and visualisations. The maps are based on the 45 km Study Area around the Proposed Development and present data of relevance to the assessment, such as the location and extent of landscape designations and representative viewpoints.

The visualisations are based on the 27 viewpoint locations which are representative of the visual amenity of visual receptors in the area surrounding the Proposed Development. These viewpoints have been agreed with the Council and NatureScot. For each of the 22 assessment viewpoints there is baseline photography, and wirelines of the Proposed Development and the 'bare earth' landform for the same extent as shown in the photography. In accordance with NatureScot's visualisation guidance, all 22 of these viewpoints have accompanying photomontages. These use the baseline photography and add onto this a computer-generated model of the Proposed Development. The five additional viewpoints which were agreed post scoping with DGC are included to supplement the original 22 viewpoints and are represented by wirelines and referenced in the assessment. More detailed information on graphic production is included in the Assessment Methodology in **Technical Appendix A6.1: LVIA Methodology**.

6.3.12 Night-time Assessment

The nature of the daytime and night-time visual effects arising from wind farms differs considerably, as during daylight hours visibility of the large-scale moving turbines gives rise to effects that are very different to the pinpoint effects of lighting at night. As a result, the assessment of sensitivity and magnitude of change for night-time effects is carried out using different criteria/definitions than those for daytime views. These are described in **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting** ..

6.3.13 Assessment Limitations

Photographs and other graphic material such as wirelines and photomontages used in the assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what will be apparent to the human eye. The assessment itself is carried out from observations in the field and therefore may include elements that are not visible in the photographs. The limitations associated with the photographs and other graphic material are presented in detail in **Technical Appendix A6.1: LVIA Methodology**.

6.3.14 Embedded Mitigation and Residual Effects

In respect of the LVIA, embedded mitigation relates to site selection and the iterative design of the layout. **Chapter 3 - Site Selection and Design** presents a detailed description of the iterative design process followed. The Proposed Development will be located in the eastern part of the Southern Uplands where they lie to the west of the River Nith and where wind farm development is an existing feature. The location has been largely determined by the suitability of this upland area for the production of wind energy, its separation from the main centres of population and its location on the edge of an undesignated upland area where a wind farm influence already exists. While initial layouts showed turbines located on the southern side of the SUW, these were removed in subsequent iterations to keep all proposed turbines contained to the northern side of the SUW and to reduce the effects of visibility in the Scaur Water valley to the south of the Site.

There is very limited opportunity to mitigate landscape and visual effects outwith embedded mitigation measures undertaken in the iterative design process. There is, therefore, no additional mitigation considered in the LVIA.

Residual effects are those effects which remain after mitigation. The residual effects that the Proposed Development will have on landscape and visual receptors are assessed in **Sections 6.6 to 6.11**. These are categorised into physical effects, effects on landscape character, effects on landscape designations, effects on viewpoints, effects on principal visual receptors, and cumulative effects. These are considered at the three main stages of the project, namely, construction, operation and maintenance, and decommissioning.

6.4 Baseline Conditions

The baseline section of the LVIA records the existing conditions of the Study Area. Establishing a baseline helps to gain an understanding of what makes the landscape distinctive and what its important components or characteristics are. The baseline is instrumental in the identification of the landscape character receptors, visual receptors and viewpoints that are included in the assessment. This section is presented under the following headings:

- Landscape Character;
- Landscape Planning Designations;
- Viewpoints;
- Principal Visual Receptors;
- Trends and Projected Future Baseline; and
- Cumulative Wind Farm Developments.

6.4.1 Landscape Character

The characterisation of Scotland's landscape is published by NatureScot as a digital resource. This information builds on and supersedes the characterisation studies published in the 1990s. NatureScot state that *'Where there are topic-specific landscape capacity or sensitivity studies, they would take precedence for informing that development type, e.g., windfarms.'*

The 'topic specific' characterisation studies relevant to the Study Area include the following studies:

- Dumfries & Galloway Council area - Dumfries & Galloway Windfarm Landscape Capacity Study, 2020 (DGWLCS);
- Carol Anderson Landscape Associates on behalf of East Ayrshire Council Area – East Ayrshire Landscape Wind Capacity Study, 2018 (EALWCS);
- Carol Anderson Landscape Associates on behalf of South Ayrshire Council Area – South Ayrshire Landscape Wind Capacity Study, 2013 (SALWCS);

- Ironside Farrar on behalf of South Lanarkshire Council area – South Lanarkshire Landscape Capacity Study for Wind Energy, 2016 (SLLCS); and
- Borders Council area - Wind Energy Consultancy: Landscape Capacity and Cumulative Impact, 2013 (WECLCCI).

These capacity studies form the most up to date ‘topic specific’ characterisation studies covering the Study Area and, as such, form the basis of character assessment undertaken in **Section 6.7** of this Chapter.

The original NatureScot reviews and updated datasets, as well as local authority capacity studies, divide the landscape into areas of distinctive character which are generally referred to as landscape character types (LCTs). **Figure 6.2a** shows the LCTs covering the Study Area and **Figure 6.2b** shows the legend of the LCTs. Many of these LCTs are extensive, sometimes covering several landscape character units (LCUs) that are geographically separate, and the effects of the Proposed Development can vary widely across a single LCT. The assessment considers the effects of the Proposed Development on the LCUs, which are subsets of the LCTs. The LCTs are referenced in name of each LCU to explain the type that the unit is a part of. Unlike the DGWLCS, the EALWCS does not provide names for individual LCUs and appropriate names have been assigned by the author for ease of reference.

The Site lies within the ‘Nithsdale’ LCU of LCT19 Southern Uplands, and the ‘Upper Nithsdale’ LCU of LCT 9 Upper Dale LCT, as defined by the DGWLCS.

Given the strong existing baseline of wind farm development within the landscape context of the Site, effects on landscape character are likely to occur within the baseline context of other large scale wind development. As a result, the potential for significant effects is considered to be limited in extent and would not occur beyond approximately 20 km. No objections have been made through the scoping process, to the proposed approach that the assessment of the effects on landscape character should focus on the area lying within 20 km of the Proposed Development. Despite the reduced extent of the landscape assessment, it is important to appreciate the wider context and therefore, the overview presented below considers the full 45 km LVIA Study Area.

6.4.1.1 Overview of Landscape Character

The 45 km Study Area covers a part of south-western Scotland, including the central section of the Southern Uplands within Dumfries and Galloway and extending into Ayrshire, South Lanarkshire and the south-western corner of the Scottish Borders. The 45 km Study Area includes the uplands of southern Scotland, and the majority of the Study Area is characterised by a broad range of upland landscapes. These restrict sparse, small-scale settlement including small towns and villages, and roads to the lower-lying valley landscapes. Farming and commercial forestry are the predominant land uses. Larger settlements lie towards the edge of the Study Area: Kilmarnock, to the north-west; Lanark, to the north; and Dumfries, to the south-east.

The River Nith is the most influential river in the Study Area. From its source in the Carsphairn Hills of East Ayrshire, east of Dalmellington, the river generally flows in a south-easterly direction through Dumfries and Galloway and empties into the Solway Firth at Airds Point. The valley through the Southern Uplands formed by the river is known as Nithsdale. Many small tributaries feed the river along its course and larger settlements have developed within Nithsdale including New Cumnock, Kirkconnel, Sanquhar, Thornhill and Dumfries, where the river approaches the Solway Firth. Running along Nithsdale, the A76 connects these settlements with Kilmarnock and, via the A70, Ayr. Separated from Nithsdale by the Lowther Hills, the M74/A74(M) runs along Annandale, connecting Glasgow with Gretna and the south. The B740, B797, B7040 and A702 follow several valleys through the Lowthers, connecting the M74 and the A76.

The Southern Uplands form much of the Study Area. These hills range between 500 and 800 m AOD, and are characterised by their smooth rounded tops, which collectively form long upland ridges. Rivers subdivide the broad range of hills to form lower-lying, more enclosed, settled and cultivated

landscapes that contrast with the hills. To the north and north-west lie the Lowther Hills, which are part of the wider Southern Uplands, albeit made distinct by their openness and bleakness.

The extent of wind farm development across the Southern Uplands reflects the high wind yields that this area has to offer, as well as the suitability of the broad and simple landscape to accommodate this type of development. The operational wind farms of particular relevance to this assessment include Hare Hill and Hare Hill Extension, Sanquhar and Whiteside Hill, west of the Proposed Development, Sandy Knowe to the north and Twentysilling, to the east. These lie within 10 km of the Site with further operational wind farms just beyond 10 km of the Site at Afton, Windy Standard II and Windy Rig, to the south-west; and Wether Hill, to the south. Cumulative wind farms are considered in more detail in **Section 6.4.6** and the cumulative assessment is presented in **Section 6.11**.

6.4.1.2 Overview of Site Landscape Character

The Site lies mostly within the Nithsdale LCU of the Southern Uplands (LCT 19 Southern Uplands); and extends into the Upper Nithsdale LCU of the Upper Dale (Valley) (LCT 9), as defined by the DGWLCS.

The proposed turbines would lie entirely within the Nithsdale LCU (LCT 19), within the area defined by the Euchar Water and Ulzieside Plantation, to the north; the Whing Burn and forestry at Brown Hill, to the east; the hilltops of Corridow Hill, Whing Head and Cloud Hill, to the south; and a spur of Whiteside Hill between Feuchaw Burn and Glenlarie Burn, to the west. The adjoining operational Whiteside Hill Wind Farm lies on this spur and the other spurs of Whiteside Hill, to the west.

The larger part of the Site covers the spur descending from Cloud Hill (451 m AOD) and Mid Rig (437 m AOD); the adjoining valleys of the Glenlarie and Glen Burns, to either side; and the northern slopes descending from Whing Head, east of Glen Burn. The Site includes the valley of the Whing Burn to the north-east and expands to encompass the west of the Mains Plantation. The Glenlarie, Glen and Glenmaddie burns flow north from the Site to feed the Euchar Water, which is a tributary of the River Nith, joining it at Sanquhar, to the east. A drystone dyke delineates the straighter and more regular southern boundary, with the SUW routed to the south of this southern boundary and loosely following it and then extending north-east such that it lies within the eastern boundary. The Site comprises open uplands and rough moorland.

The Site is predominantly characterised by the surrounding hills and their land uses, the most notable being the operational Whiteside Hill Wind Farm, immediately to the west. The landscape character is rural, with hill sheep farming and forestry denoting the modification of this landscape by human land use practices.

6.4.1.3 Landscape Character Types / Units to be included in the detailed assessment

Table 6.3 presents the preliminary assessment of all of the LCTs and LCUs that are found in the 20 km radius Study Area with reference to the ZTV (**Figure 6.8**) and indicates which of them are considered to have potential to undergo a significant effect or significant cumulative effect as a result of the Proposed Development, and which of them do not require further detailed assessment. The LCTs and LCUs that have potential to undergo a significant effect, or significant cumulative effect, as a result of the Proposed Development, are shaded grey in the table and assessed in detail in **Section 6.7** of this Chapter.

Table 6.3 Preliminary assessment of LCTs and LCUs within 20 km radius Study Area

LCT / LCU	Comments	Detailed Assessment
DG 4. Narrow Wooded River Valleys / Ken	Negligible area of ZTV at northern end of valley, within 10 km of Site. 10 to 11 turbines potentially visible.	No

LCT / LCU	Comments	Detailed Assessment
DG 5. Intimate Pastoral Valley / Cairn & Old Water	Very limited area of ZTV approximately 15 km from Site. 4 to 6 turbines potentially visible.	No
DG 7. Middle Dale (Valley) /Mid Nithsdale	Limited area of ZTV covering slopes descending from Keir Hills and Nithsdale valley south of Thornhill, over 15 km from Site. Up to 7 to 9 turbines potentially visible.	No
DG 9. Upper Dale (Valley) / Upper Nithsdale	Largely consistent coverage by ZTV across the LCU adjoining the eastern boundary of the host LCU and within 10 km of the Site. 10 to 11 turbines potentially visible.	Yes
DG 9. Upper Dale (Valley) / Upper Glenkens	No coverage by ZTV.	No
DG 10. Upland Glens / Dalveen	Intermittent coverage by the ZTV across eastern slope of valley over approximately 15 km from the Site. 10 to 11 turbines potentially visible.	Yes
DG 10. Upland Glens / Mennock	Patchy coverage by ZTV within valley aligning with and framing the Site and extending within 10 km of it. 10 to 11 turbines potentially visible.	Yes
DG 10. Upland Glens / Scour	Patchy coverage by ZTV within valley aligning with and framing the Site and extending within 10 km of it. 10 to 11 turbines potentially visible.	Yes
DG 10. Upland Glens / Shinnel	Negligible coverage by ZTV	No
DG 16. Upland Fringe / Cairn Fringe	Small area nearly 20 km from Site. 7 to 9 turbines potentially visible.	No
DG 16. Upland Fringe / Torthorwald Fringe & Ae Fringe	ZTV in isolated patches across south-west facing slopes and within open farmland at Closeburn, over 15 km from Site. Up to 4 to 6 turbines potentially visible.	No
DG 18. Foothills / Nithsdale	ZTV in isolated patches. Up to 7 to 9 turbines potentially visible at Mill Shoulder (279 m AOD). Up to 7-10 blade tops potentially visible.	No
DG 18. Foothills / Tynron	ZTV limited to area of Tynron Doon (289 m AOD). 10 to 11 turbines potentially visible.	No
DG 18. Foothills / Keir	Limited coverage by ZTV, with consistent visibility at Keir Hills, over 15 km from Site. 10 to 11 turbines potentially visible.	No
DG 18. Foothills / Dalmacallan	Limited coverage by ZTV, with consistent visibility north of Bogrie Hill, over 15 km from Site. Extensive woodland within Dalmacallan Forest limits the potential susceptibility to the Proposed Development. Up to 10 to 11 turbines potentially visible.	No
DG 18a. Foothills with Forest / Stroan	Negligible coverage by ZTV, with only 1 to 3 turbines potentially visible from summit of Wether Hill.	No
DG 18a. Foothills with Forest / Ae	Largely covered by ZTV, over 15 km from Site. 1 to 3 turbines potentially visible east of Garelawbridge, rising to 10 to 11 at Auchenleck Hill.	No
DG 19. Southern Uplands / Carsphairn	ZTV limited to hilltops including Carsphairn, over 10 km from the Site. Operational wind farm development in adjoining landscape limits susceptibility to the Proposed Development. 10 to 11 turbines potentially visible.	No
DG 19. Southern Uplands / Nithsdale	Nithsdale LCU is the host LCU to the Proposed Development, with the ZTV covering much of it, the NW Lowthers and Lowthers LCUs. These latter LCUs lie within 10 km of the Site with south-west facing slopes within Nithsdale having a strong relationship	Yes

LCT / LCU	Comments	Detailed Assessment
	with the Nithsdale LCU. 10 to 11 turbines potentially visible.	
DG 19. Southern Uplands / NW Lowthers	Nithsdale LCU is the host LCU to the Proposed Development, with the ZTV covering much of it, the NW Lowthers and Lowthers LCUs. These latter LCUs lie within 10 km of the Site with south-west facing slopes within Nithsdale having a strong relationship with the Nithsdale LCU. 10 to 11 turbines potentially visible.	Yes
DG 19. Southern Uplands / Lowthers	Nithsdale LCU is the host LCU to the Proposed Development, with the ZTV covering much of it, the NW Lowthers and Lowthers LCUs. These latter LCUs lie within 10 km of the Site with south-west facing slopes within Nithsdale having a strong relationship with the Nithsdale LCU. 10 to 11 turbines potentially visible.	Yes
DG 19a. Southern Uplands with Forest / Ken	LCU adjoins the western boundary of the host LCU, with intermittent coverage by the ZTV. 10 to 11 turbines potentially visible.	Yes
DG 19a. Southern Uplands with Forest / Carsphairn	No coverage by ZTV.	No
EA 7c. East Ayrshire Lowlands / Cumnock	No coverage by ZTV.	No
EA 10. Upland River Valley / Doon	Negligible coverage by ZTV, with only 1 to 3 turbines potentially visible from lower slopes of Wardlaw Hill.	No
EA 10. Upland River Valley / (Nith)	ZTV covers south-west facing slopes within Nithsdale, 10-15 km from the Site and with a strong relationship with the Nithsdale LCU. 10 to 11 turbines potentially visible.	Yes
EA 14. Upland Glen / Glen Afton	No coverage by ZTV.	No
EA 15. Upland Basin / Nith	No coverage by ZTV.	No
EA 17a. Foothills with Forest & Opencast Mining / Martyrs Moss	No coverage by ZTV.	No
EA 18a. East Ayrshire Plateau Moorlands / Wardlaw Hill	Broad patches of ZTV along Nithsdale's northern valley slope; around Wardlaw Hill and clustered about Auchtitench Hill, over 10 km from Site. 10 to 11 turbines potentially visible.	Yes
EA 20a. East Ayrshire Southern Uplands / Ken	ZTV covers high ground within 10km of Site at Blackcraig Hill, and Hare Hill and the area to the east. 10 to 11 turbines potentially visible.	Yes
EA 20a. East Ayrshire Southern Uplands / Benty Cowan	No coverage by ZTV.	No
EA 20c. Southern Uplands & Forestry / Carsphairn	Coverage by ZTV limited to summits of Darronnarron, Milray, Enoch and Prickeny Hills and Benbracks, over 10 km from Site. Up to 4 to 6 turbines visible.	No
SLC 7 Rolling Moorland: (ii) Crawfordjohn/ Cairn Table (South of Douglas Water). (including SLC 7a. Rolling Moorland Forestry)	Patchy ZTV coverage limited to hills including Cairn table, Cairn Kinney; and Urit, Mosscastle and Common Hills, 15 km+ from the Site. 10 to 11 turbines potentially visible.	No
SLC 8 Upland River Valley: (iv) Duneaton Water	No coverage by ZTV.	No
SLC 13 Southern Uplands: (i) East of Clyde / Daer (including SLC 13A Southern Uplands Forestry and SLC 13B Southern Uplands Wind Farm)	No coverage by ZTV.	No

LCT / LCU	Comments	Detailed Assessment
SLC 13 Southern Uplands: (ii) Lowther Hills (Around Daer Water) (including SLC 13A Southern Uplands Forestry and SLC 13c. Southern Uplands Leadhills)	Intermittent ZTV limited to hilltops including White Hill, Pike Law and Wellgrain Dod. Over approximately 15 km from Site. 10 to 11 turbines potentially visible.	No
SLC 13 Southern Uplands: (iii) Lowther Hills (West of Clyde/ Daer) (including SLC 13A Southern Uplands Forestry)	Intermittent ZTV limited to hilltops including Ballencleuch Law and Comb Law. Over approximately 15 km from Site. 10 to 11 turbines potentially visible.	No
SLC 14 Upland Glen: (i) Glengonnar Water	No coverage by ZTV.	No
SLC 14 Upland Glen: (ii) Elvan Water	No coverage by ZTV.	No
SLC 14 Upland Glen: (iii) Daer & Potrail Waters	No coverage by ZTV.	No

6.4.2 Landscape Designations

There are three ways in which local and national landscape designations are relevant to the LVIA:

- The presence of a designation can give an indication of a recognised value that may increase the sensitivity of a landscape character receptor, viewpoint or visual receptor, and may therefore affect the significance of the effect on that receptor;
- The presence of a relevant designation can lead to the selection of a representative viewpoint within the designated area, as the viewpoint will provide a representative outlook from that area; and
- Designated areas may be included as landscape character receptors so that the effects of the Proposed Development on these features of the landscape that have been accorded particular value can be specifically assessed.

Through the EIA scoping and Section 36 Gatecheck process, there was no objection from the statutory consultees to the proposed approach, whereby those local and national designations unlikely to undergo significant effects as a result of the Proposed Development would be scoped out of the LVIA assessment. This judgement was made by undertaking a preliminary assessment of the potential effects, informed by an analysis of the ZTV overlaid on the LCT / LCU map and site reconnaissance. A review of the finalised Proposed Development has also been undertaken to ensure that the impacts will not increase from those considered at the scoping stage.

The Site itself is not subject to any national landscape designations intended to protect landscape quality or scenery. The closest local landscape designation to the Site is the Thornhill Uplands Regional Scenic Area, which adjoins the southern boundary of the Site and covers a large part of the Study Area, to the south-west. Various local and national designated areas are found elsewhere in the Study Area, and these have been considered in the assessment. These are shown on **Figure 6.3** and in conjunction with the blade tip ZTV on **Figure 6.9a and 6.9b**, are described below and with a detailed assessment of the effects presented in **Section 6.8**.

6.4.2.1 Galloway and Southern Ayrshire Biosphere

The Galloway and Southern Ayrshire Biosphere was designated in 2012 by the United Nations Educational, Scientific and Cultural Organisation. While the geographical boundaries are set by the water catchments of this area, there are 'core areas' of high nature conservation value including the Cairnmore of Fleet National Nature Reserve and Silver Flowe Site of Special Scientific Interest. The designation criteria reflects the nature conservation value of the landscape, rather than the scenic value which is the focus of the landscape and visual assessment presented in the LVIA. The separate

LCTs which make up the Galloway and Southern Ayrshire Biosphere and which are relevant to the assessment, are assessed in **Section 6.7** of this LVIA and a detailed assessment of the effects of the Proposed Development against the specific attributes of the biosphere is presented in **Chapter 7 – Ecology** and **Chapter 14: Socio-economics, Tourism, Recreation and Land Use**.

6.4.2.2 Gardens and Designed Landscapes

Historic Environment Scotland is responsible for designating Gardens and Designed Landscapes (GDLs). These are contained in an Inventory⁷² which contain descriptions of the special qualities which merit the designation of each GDL.

Through the EIA scoping process, there was no objection from the statutory consultees to the proposed approach, whereby those GDLs unlikely to undergo significant visual effects as a result of the Proposed Development would be scoped out of the LVIA assessment. The judgement to scope out was made by undertaking a preliminary assessment of the potential visual effects, informed by an analysis of the ZTV overlaid on the designations map and site reconnaissance. A review of the finalised Proposed Development has also been undertaken to ensure that the impacts will not increase from those considered at the scoping stage.

There are 19 GDLs in the 45 km Study Area. The ZTVs on **Figure 6.9a and 6.9b** show that with the exception of Scot's Mining Company House, Drumlanrig Castle and Maxwelton (Glencairn Castle), these lie over 20 km from the Site and only Drumlanrig Castle has potential visibility of the Proposed Development. The preliminary assessment in the Scoping Report concludes that Drumlanrig Castle GDL has no potential to be significantly affected by the Proposed Development and it has not been considered further in this chapter or in Chapter 9: Archaeology and Cultural Heritage.

6.4.2.3 Local Landscape Designations

In the part of the 45 km Study Area covered by the Council there are five Regional Scenic Areas (RSAs). The north-western boundary of the Thornhill Upland adjoins the southern boundary of the Site. In the remaining parts of the 45 km Study Area, there are five Special Landscape Areas (SLAs) in the South Lanarkshire Council area; three Sensitive Landscape Areas in the East Ayrshire Council area; and five Local Landscape Areas (LLAs) in the South Ayrshire Council area.

The LDP2 sets out the protection RSAs are afforded in Policy NE2: Regional Scenic Areas, which states:

“The siting and design of development within a Regional Scenic Area (RSAs) should respect the special qualities of the area. Development within, or which affects Regional Scenic Areas, may be supported where the Council is satisfied that:

- *the factors taken into account in designating the area would not be significantly adversely affected; or*
- *there is a specific need for the development at that location.”*

A preliminary assessment of the potential for significant effects arising from the Proposed Development on designated areas within the 45 km Study Area has been considered in the Scoping Report. Nith Estuary, the sole National Scenic Area within this area, has been excluded from the detailed assessment due to its distance from the Site (38 km+); the limited extent of the ZTV within the NSA; and the influence of closer range operational wind farms on it.

Of the five Regional Scenic Areas within the 45 km Study Area, only the Thornhill Uplands RSA and Galloway Hills RSA are considered to have potential for significant effects, primarily due to their relatively close proximity to the Site. The remaining RSAs, Moffat Hills, Terregles Ridge and

⁷² Historic Environment Scotland (2023). Inventory of Gardens and Designed Landscapes. Available at: <https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/gardens-and-designed-landscapes/> (Accessed June 2023)

Torthorwald Ridge have been excluded due to their long distance from the Site (30 km+) and the limited extent of the ZTV within each.

Within East Ayrshire, the New Cumnock SLA is considered to have potential for significant effects, due also to its close proximity to the Site, while Catrine SLA has been excluded from the detailed assessment owing to the absence of theoretical visibility (**Figures 6.9a and 6.9b**) within this area. There is no theoretical visibility experienced in any LLA within South Ayrshire, as shown on **Figures 6.9a and 6.9b**, and these have also been excluded from the detailed assessment.

Designated landscape areas with potential to be significantly affected by the Proposed Development and assessed in detail in **Section 6.8** include:

- Thornhill Uplands RSA (Dumfries and Galloway);
- Galloway Hills RSA (Dumfries and Galloway); and
- New Cumnock SLA (East Ayrshire).

6.4.2.4 Wild Land

WLAs are not a landscape designation but a Mapped Interest, defined and described by NatureScot and considered to be of national importance. Wild Land Areas (WLAs) are shown on SNH's 2014 wild land mapping. This mapping is referred to in SPP 2014 and the National Planning Framework for Scotland and is supported by a document titled 'Advice to Government' (June 2014)⁷³ which includes information about the evolution of the map, the consultation process that proposed WLAs were subject to, and advice as to how the mapping is to be used.

The Site is not located in a Wild Land Area and NPF4 Policy 4 confirms that there are no buffer zones to be applied and development outwith wildland areas will not be a significant consideration.

There are two WLAs within the Study Area: WLA 01. Merrick and WLA 02. Talla - Hart Fell, as shown on **Figure 6.3** and in conjunction with the blade tip ZTVs on **Figures 6.9a and 6.9b**. These WLAs lie more than 30 km from the Proposed Development and are shown on the ZTV to have limited theoretical visibility of the Proposed Development. For this reason, a wild land assessment is not included with the LVIA.

6.4.3 Viewpoints

The assessment of landscape and visual effects is informed by a series of 22 assessment viewpoints which have been selected to represent visibility from LCTs, landscape planning designations and principal visual receptors around the Study Area. These include points of specific importance such as recognised viewpoints, designated landscapes, settled areas, important routes, and attractions. A variety of LCTs and locations from different directions and distances have also been represented. Viewpoints for the LVIA have been discussed and agreed in consultation with NatureScot and the Council. These consultations have led to a further five viewpoints being added and although these are not fully assessed in the LVIA, owing to their close proximity and / or similar representation to the original viewpoints, they are referenced and illustrated using wirelines.

It should be noted that while the majority of the viewpoints are chosen to represent receptors that have potential to undergo a significant effect, this is not always the case, and some viewpoints that are included demonstrate a lower level of visibility from certain locations. A detailed assessment is presented for all 22 viewpoints. **Table 6.1** sets out the consultation responses which focused largely on additional viewpoints. As a result, six viewpoints were added to the original list of 16 presented at scoping and five further viewpoints have been added as wirelines and are shown on **Figures 6.39 to 6.43**. As these are close to viewpoints in the original list, they have been included to supplement the assessment from these locations.

⁷³ Scottish Natural Heritage (2014). Advice to Government. (Accessed March 2023)

The viewpoints assessment is used to inform and illustrate the assessment of effects on landscape character as well as the assessment of effects on views and principal visual receptors. The viewpoints used in the assessment are set out in **Table 6.4**, and a detailed assessment of each of these is presented in **Section 6.9**. The viewpoint locations are shown in conjunction with the blade tip ZTV on **Figures 6.5a** (45 km) and **6.5b** (20 km) and the hub height ZTV on **Figures 6.6a** (45 km) and **6.6b** (20 km).

The process of identifying viewpoints involves extensive investigation to ensure that the final viewpoints are representative of levels of visibility around the Study Area, and that they clearly illustrate the predicted visibility of the Proposed Development.

Table 6.4 Representative Viewpoints

Viewpoint	Grid reference		Distance (km) / Direction	Representative of Receptors / Landscape Designations
	Easting	Northing		
VP1: A76 Sanquhar Castle	278728	609317	5.15	Road users / residents / walkers
VP2: Sanquhar Church Road	277846	610276	5.15	Road users / residents / walkers
VP3: Kirkconnel	273703	612094	5.79	Road users / residents / walkers
VP4: Euchan Water minor road	277016	609163	3.76	Road users / residents / walkers
VP5: Shiel, Scaur Water minor road	274481	603931	1.44	Road users / residents / walkers Thornhill Uplands RSA
VP6: Mennock	281075	607842	6.57	Road users / residents / walkers Thornhill Uplands RSA
VP7: Southern Upland Way east of Sanquhar	279158	610717	6.37	Walkers Thornhill Uplands RSA
VP8: Polgown, Scaur Water minor road	271901	603838	1.25	Road users / residents / walkers
VP9: Durisdeer	289385	603656	14.63	Road users / residents / walkers Thornhill Uplands RSA
VP10: Wauk Hill	284124	590945	17.35	Walkers Thornhill Uplands RSA
VP11: Benbrack	268044	597060	9.03	Walkers
VP12: Cairnsmore of Carsphairn	259441	597993	14.88	Walkers Galloway Hills RSA
VP13: Blackcraig	264774	606405	8.04	Walkers New Cumnock Sensitive Landscape Area
VP14: Corsencon Hill	267159	614699	10.66	Walkers
VP15: Todholes Hill	274552	614994	8.64	Walkers
VP16: Lowther East Mount	287857	609987	13.68	Walkers Leadhills and the Lowther Hills Special Landscape Area
VP17: Meikle Millylea	251839	582886	30.25	Walkers
VP18: Southern Upland Way, Coupland Knowe	281269	611643	8.58	Walkers
VP19: Southern Upland Way, Glengaber Hill	280627	594425	12.68	Walkers
VP20: Cairnkinna	279118	601879	5.65	Walkers
VP21: Crawick Multiverse	277643	611769	6.25	Visitors
VP22: Auchengibbert Hill	284779	613786	12.59	Walkers

Viewpoint	Grid reference		Distance (km) / Direction	Representative of Receptors / Landscape Designations
	Easting	Northing		
VP23: Colt Hill (wireline only)	269852	599005	6.46	Walkers
VP24: Glenwhargen Scaur Water minor road (wireline only)	276686	602498	3.61	Residents / Road-users
VP25: Auchentaggart (wireline only)	281036	609129	7.07	Residents / Walkers
VP26: Kelloholm (wireline only)	273830	611027	4.72	Residents / Road-users
VP27: Whing Head (wireline only)	274902	605498	0.13	Walkers

6.4.4 Principal Visual Receptors

A number of visual receptors such as settlements and travel routes are considered in the assessment as views from them may be affected by the Proposed Development. It is not possible to consider every potential visual receptor in the Study Area due to the extent of ground that it covers and the assessment therefore concentrates on the key visual receptors that may gain visibility of the Proposed Development such as settlements and routes. Principal visual receptors are shown on **Figure 6.4** and in conjunction with the blade tip ZTV on **Figure 6.10**.

6.4.4.1 General Visibility

The ZTV on **Figures 6.5a and 6.5b** shows a well-defined pattern the theoretical visibility of the Proposed Development. In general terms, this relates to the fact that the Site is located within an upland landscape where more elevated hills summits and ridgelines to the west and east of the Upper Nithsdale valley create some degree of containment.

Within the first 10 km radius the ZTVs show that theoretical visibility across the western half of the Study Area is contained by a series of ridges and pronounced summits across the Southern Uplands that broadly extend from The Knipe (575 m AOD) to the north-west, Blackcraig Hill (700 m AOD) to the west, Colt Hill (598 m AOD) to the south-west, and Green Hill (545 m AOD) and Countam (500 m AOD). The pattern of visibility within this contained area extends across hill tops and ridgelines of a comparable height to those of the site, and from fragmented locations within upland glens and facing slopes in close proximity, producing a fragmented pattern of theoretical visibility.

To the east is the Upper Nithsdale Valley, where the ZTV shows a fuller extent of theoretical visibility across the near north-facing slopes and low-lying valley floor and facing hillsides on the opposite side of the valley up to a range of approximately 10 km. Visibility becomes increasingly fragmented with distance further to the east across the hill summits and ridgelines of the southern uplands, with the exception of more extensive patches around Lowther Hill and Durisdeer at approximately 13 to 15 km.

Theoretical visibility becomes highly fragmented beyond approximately 15 km. More distant areas of theoretical visibility occur across the Upland Fringes and East Ayrshire Plateau Moorlands LCTs to the south and south-east around Kirkland and Thornhill at a range of approximately 18 to 35 km, and in fragmented patches to the north around Glenmuir at approximately 18 m.

Beyond approximately 30 km, the lower dale and coastal flats around Dumfries presents an opening through which theoretical visibility extends south-eastwards towards Lochar Moss, Blackshaw Bank, and the Solway Firth. Patches of heavily fragmented visibility extend around parts of the lowlands and plateau moorlands around Mauchline to the north-west at a range of approximately 25 to 35 km.

6.4.4.2 Settlement and Residents

The location of settlement is shown together with the ZTV on **Figures 6.4 and 6.10**. The pattern of settlement closely follows the topography, with small settlements found along the broad valleys, larger towns situated in more open basins and lowland landscapes, and clusters of properties and individual houses spread more sparsely within upland areas.

Settlement within the upland area immediately surrounding the Site is sparse. The closest individual and small clusters of residential properties sit within the upland glens of the Euchar Water to the north and Scaur Water to the south. The Residential Visual Amenity Assessment (RVAA) presented in **Technical Appendix A6.2: Residential Visual Amenity Assessment**, sets out the detailed assessment of the individual properties within 2 km radius of the Proposed Development that have the potential to be significantly affected.

To the east of the site, the A76 connects a series of settlements in the Upper Nithsdale Valley, including: Sanquhar, Menzies, Kirkconnel and Kelloholm (approximately a minimum of 5.5 km, 6.0 km, 5.8 km and 5.2 km from the closest turbine of the Proposed Development, respectively). The ZTV on **Figure 6.10** shows a pattern of extensive theoretical visibility across these settlements and also taking into account their proximity to the Proposed Development it is considered that they require a detailed assessment.

New Cumnock, Cumnock, and Thornhill (approximately a minimum of 6.5 km, 11.5 km, and 8 km from the Proposed Development, respectively) do not fall within the ZTV of the Proposed Development and are not assessed further. The small settlements of Durisdeer and Durisdeermill fall within an isolated and patch of the ZTV at a minimum of approximately 6.5 km and taking this separating distance into account the settlement would not be significantly affected. At a minimum distance of approximately 32 km, 42 km, 40 km and 38 km (respectively), the larger settlements of Mauchline, Kilmarnock, Lanark, and Dumfries are too distant and with too many other human influences, such as urban development, roads, and surrounding / intervening wind farms, to require detailed assessment.

Sanquhar, Menzies, and Kirkconnel are the settlements with potential to be significantly affected and, therefore, are assessed in detail in **Section 6.10** of this Chapter.

6.4.4.3 Road and Railway Routes

The location of road and railway routes is shown together with the ZTV on **Figures 6.4 and 6.10**. Vehicular routes within the Study Area tend to follow low-lying valley floors, with access to the uplands provided by a sparse network of minor roads and upland passes.

The M74 is the only motorway in the Study Area, linking Glasgow with Carlisle. The ZTV on **Figure 6.10** show that there would be no theoretical visibility from the section of this route that passes through the Study Area.

The A76 (T) traverses the Study Area from the north-west to the south-east, connecting the road networks in the lowlands to the west with the coastal settlements and road networks on the Solway Firth. This route follows the Upper Nithsdale Valley through the Southern Uplands and connects the settlements of Cumnock, New Cumnock, Kirkconnel, Kelloholm and Sanquhar within the valley to Glasgow in the north-west and Dumfries to the south-east. At its closest point, the A76 lies approximately 5 km to the north-east of the Proposed Development. The ZTV on **Figure 6.10** shows that there would be theoretical visibility of the Proposed Development from a section of this route between Kirkconnel and Menzies at an approximate range between 5 km and 7 km, with more distant and fragmented visibility between Thornhill and Dumfries to the south-east and Mauchline to Kilmarnock to the north-west.

The A70 and A702 pass broadly east-west through the Study Area. At their closest points, these routes pass approximately 21 km to the north, and 13.5 km to the south-east of the Proposed Development, respectively. The A762 and A713 lie to the west of the study area, passing at a

minimum distance of approximately 20 km and 27 km to the Proposed Development, respectively. The ZTV on **Figure 6.10** show that there would be little theoretical visibility from these routes.

Beyond approximately 30 km, the ZTV on **Figure 6.10** show that sections of the A70, A75, A77, A701, A706, A710, A712, A719, and A743 would experience either short duration theoretical visibility, or no visibility at all as they pass through the outer limits of the Study Area. It is not considered that these roads show sufficient levels of theoretical visibility, or are in close enough proximity, whereby they would have the potential to undergo significant effects.

The Glasgow - Carlisle Railway Line is the only main railway line in the Study Area. Its route passes from south-east to north-west, through the Upper Nithsdale Valley, extending onwards to the East Ayrshire Lowlands in the north and to Dumfries in the south. Within the narrow confines of the valley, the line runs close to, and to the north of, the A76. The ZTV on **Figure 6.10** that there would be theoretical visibility of the Proposed Development from this route between New Cumnock and Menzies at an approximate range between 5 km and 8 km, with more distant and fragmented visibility between Thornhill and Dumfries to the south-east and Mauchline to Kilmarnock to the north-west.

In the wider Study Area, there are a number of 'B' roads and minor roads, often connecting small settlements and isolated rural residences with each other, and with the major roads and settlements. The routes of relevance to this assessment are located within the primary area of theoretical visibility up to approximately 10 km from the Proposed Development, as shown on **Figure 6.10**. These comprise truncated minor / unclassified roads that provide access to isolated properties and farmsteads, and the remote landscapes of the Southern Uplands to the south of the Upper Nithsdale Valley. The B797 and B740 enter the Upper Nithsdale Valley from South Lanarkshire, and there is little ZTV coverage shown from these routes as they follow the course of steeply enclosed valleys, and the extent of theoretical visibility is not considered sufficient to result in significant effects.

Minor roads that are located within settlement are not considered to have potential to experience significant effects owing to the screening presence of adjacent built form within the urban areas, which reduces the level of actual visibility, and the influence of these urbanising features, that characterises views from these roads. There are, however, a small number of minor roads that provide access between the settled Nithsdale Valley and uplands, that the ZTV on **Figure 6.10** shows within areas of theoretical visibility. Routes within enclosed valleys and glens have the potential for significant effects to arise, notably the minor roads within the Euchar Water valley, and minor road within the Scaur Water valley. A small number of truncated minor roads to the east of the Nithsdale Valley that provide access to the uplands and isolated properties and farmsteads at Lagrae, Kirkland, and Fingland, are shown to have relatively extensive sections of ZTV coverage and are considered further in the assessment.

In summary, the A76, the Glasgow – Carlisle railway, the minor roads within the Euchar Water and Scaur Water valleys, minor roads leading to upland areas to the east of the Nithsdale Valley, all within a range of approximately 10 km, are considered to have potential to be significantly affected by the Proposed Development and are assessed in detail in **Section 6.10** of this Chapter.

6.4.4.4 Walking and Cycling Routes

The location of walking and cycling routes is shown together with the ZTV on **Figure 6.10**. There are three long distance recreational routes within the Study Area, all of which are part of the collection of Scotland's Great Trails⁷⁴; the SUW, the Romans and Reivers Route, and the River Ayr Way.

The SUW⁷⁵ (also part of the core path network) is Scotland's only long-distance coast to coast walking route. The 344 km path connects Portpatrick on the west coast with Cockburnspath on the east coast, broadly following a south-west to north-east route through the south of Scotland. The

⁷⁴ <https://www.scotlandsgreattrails.com/aboutsgts/> (Accessed March 2023)

⁷⁵ <https://www.scotlandsgreattrails.com/trail/southern-upland-way/> (Accessed March 2023)

route of the SUW as it passes through the Study Area is shown on **Figure 6.10**. Approximately 4 km of the route would pass through the Site and in close proximity to the proposed turbines, borrow pits and access tracks. The ZTV on **Figure 6.10** shows that theoretical visibility would occur in sections of this route primarily within the first 10 km from the Proposed Development as it crosses the Upper Nithsdale Valley and continues onwards across the undulating upland landscapes to the east and west.

The Roman and Reivers Route⁷⁶ is an 84 km route that starts in the Ae Forest and follows old Roman roads, forest tracks, drove roads, and quiet lanes to its eventual end point at Hawick. At its closest point, this route would pass a minimum distance of approximately 24 km to the south-east the Proposed Development. The ZTVs on **Figure 6.10** confirm that there would be very limited, if any, theoretical visibility of the Proposed Development from this route within the Study Area, large sections of which lie within forestry.

The River Ayr Way⁷⁷ is a 66 km route that starts at Glenbuck Loch and finishes in Ayr. At its closest point, this route would pass a minimum distance of approximately 20 km to the north of the Proposed Development. The ZTVs on **Figure 6.10** confirm that there would be very limited, if any, theoretical visibility of the Proposed Development from this route.

National Cycle Route 74 is a long-distance cycle route connecting Uddingston to Carlisle. Within the Study Area the route runs broadly parallel, and generally in close proximity to, the M74. The ZTVs on **Figure 6.10** show that there would be no theoretical visibility from the section of this route that passes through the study area.

In the area around the Site, there are several core paths (see **Figure 6.10**). The majority of these are upland walks located between valleys, glens, and roads. The ZTV on **Figure 6.10** shows that those core paths with the potential to be significantly affected are found within the primary area of theoretical visibility within the first 10 km of the Proposed Development, where they either lie in close proximity and / or would theoretically experience long-duration visibility. The core paths considered further in the assessment are Path 84 - Kirkconnel to Mynwhirn Hill; Path 88 - Kirkconnel to Black Law (Via Fingland & Kirkland); Path 108 - Bogg To Auchentaggart Moor; Path 109 – Sodgers Bridge Walk; and Path 111 – Sanquhar Castle Circular. While Path 112 Euchar Fall lies a minimum of 3km from the closest turbine, this is a riverside walk and the enclosure formed by the enclosing valley landform and the mature riparian woodland limits both theoretical and actual visibility and, therefore, there is no potential for significant effects to arise and this core path is not assessed in detail.

The SUW which comes within the Site, and the core path network within a range of approximately 10 km from the Proposed Development, all with the potential to be significantly affected by the Proposed Development, are assessed in detail in **Section 6.10** of this Chapter.

6.4.5 Trends and Projected Future Baseline

In terms of Climate Change, the Sixth Assessment Report⁷⁸ produced by the International Panel for Climate Change makes the following headline statements;

“A. The Current State of the Climate

A.1 It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.

⁷⁶ <https://www.scotlandsgreattrails.com/trail/romans-reivers-route/> (Accessed March 2023)

⁷⁷ <https://www.scotlandsgreattrails.com/trail/river-ayr-way/> (Accessed March 2023)

⁷⁸ IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844 (Accessed May 2022)

A.2 The scale of recent changes across the climate system as a whole and the present state of many aspects of the climate system are unprecedented over many centuries to many thousands of years.

A.3 Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the Fifth Assessment Report (AR5)."

The key features of climate change in respect of the Scottish climate are generally warmer and wetter conditions as reported in the Met Office's United Kingdom Climate Projections (2022)⁷⁹. As well as an increase in rainfall, there will also be a greater risk of flooding with more frequent occurrence of heavy downpours over short periods of time. As settlement and roads are typically located along the valley floors of the Study Area this means these areas are most susceptible to flooding. Farmland will also be increasingly at risk, especially where run-off from adjacent hillsides washes into lower-lying areas or where rivers spread into farmed floodplains. Warmer conditions are also giving rise to the spread of pests and diseases, which are not only endangering forestry and other tree species, but also the wildlife dependent on tree cover for their survival.

The most notable changes which are occurring throughout the Study Area are the increase in wind farm developments and the felling and replanting of coniferous forestry, which has become mature. **Figure 6.12** shows the extent of operational, under construction and consented wind farm developments, as well as those at application stage. The approach of the assessment to cumulative effects is outlined below and a more detailed assessment is contained in 'Assessment of Cumulative Effects' in **Section 6.11**. It must be noted that wind farm consents are time limited and that in the absence of a successful application for repowering, decommissioning would be the default position.

Existing settlements at close range are relatively small and their growth has typically occurred incrementally. The Council's 'Local Development Plan 2'⁸⁰ presents an assumption against rural development with new development being concentrated in or around existing settlements. The Plan shows some limited provision for future growth in surrounding settlements such as Sanquhar, Kirkconnel and Kelloholm, while the majority of developments in the rural area comprise individual properties or small clusters of properties, which are unlikely to grow substantially.

Forestry comprises a substantial part of the landcover across the Study Area, especially in parts of the Southern Uplands covered by DGC, EAC and SLC. In the Council's 'Dumfries and Galloway Forestry and Woodland Strategy'⁸¹ the Site is included in a wider area that extends across much of the Southern Uplands LCT that is highlighted as a 'preferred area' for native woodland planting (Map1) and a 'potential area' for softwood forest (Map 3). The Dumfries and Galloway council area is already one of the most forested regions in Scotland, with approximately 31% of the land being used in this way. The expansion of forestry will further alter the landscape character by increasing enclosure and reducing more distant views from hill sides and lower hills.

6.4.6 Cumulative Wind Farm Developments

Both NatureScot and GLVIA3 advise in their guidance that the assessment of the cumulative impacts associated with the Proposed Development should encompass the effects of the proposal in conjunction with existing, under construction, consented and application stage wind farms awaiting determination. Schemes that are at the pre-planning or scoping stage are not considered in the assessment of cumulative effects because firm information on which to base the assessment is not available. As detailed in NatureScot guidance (2021, p4)⁸², an assessment of cumulative impacts

⁷⁹ Met Office (2022). UK Climate Projections: Headline Findings (Accessed May 2022)

⁸⁰ Dumfries and Galloway Council (2019). Local Development 2 (Accessed May 2022)

⁸¹ Dumfries and Galloway Council (2014). Dumfries and Galloway Forestry and Woodland Strategy (Accessed May 2022)

⁸² NatureScot (2021). Guidance – Assessing the cumulative landscape and visual impact of onshore wind energy development' (Accessed May 2022)

associated with a development proposal should encompass the impacts of the proposal in combination with the following:

- “existing development, either built or under construction;
- approved development, awaiting implementation; and
- proposals awaiting determination within the planning process with design information in the public domain. Proposals and design information may be deemed to be in the public domain once an application has been lodged, and the decision-making authority has formally registered the application.”

The cumulative developments to be included within the CLVIA are set out in **Table 6.5** below. As stated in NatureScot guidance (2021, p5):

“The key principle for all impact assessments is to focus on the likely significant impacts and those which are likely to influence the outcome of the consenting process.”

The baseline presented in the LVIA would be altered by the introduction of further wind farms and this is assessed in the CLVIA based on cumulative scenarios as follows:

- The first scenario involves the assessment of the addition of the Proposed Development to wind farms which have been consented (i.e., approved schemes which may not have been constructed) in addition to under construction and operational wind farms (as identified and included in the LVIA baseline); and
- The second scenario involves the assessment of the addition of the Proposed Development to existing, under construction and consented wind farms, together with valid (but as yet undetermined) wind farm planning applications.

The cumulative situation changes frequently as applications are made or withdrawn, and the layouts of submitted application wind farms may also evolve. It is, therefore, necessary to agree on a ‘cut-off’ date after which the sites, layouts and status of projects within the Study Area to be included in this CLVIA are fixed. This has been set at the 3rd March 2023. Any changes in the cumulative baseline after this date are not reflected in the assessment.

The size of the cumulative wind farms is also of relevance to the CLVIA, in terms of the number and size of the turbines. In respect of the cumulative context, the strongest influences will arise from those wind farms in close proximity to the Proposed Development. The larger the development, generally the higher the likelihood of a significant cumulative effect. Turbines of less than 50 m are not included within the assessment as they have a limited influence as part of the cumulative context, in order to ensure that the CLVIA focuses on those schemes which have the greatest potential to give rise to significant cumulative effects.

A total of 156 sites lie within a 45 km radius of the Proposed Development and these are listed in **Table 6.5** below. Sites that lie outwith a 45 km radius of the Proposed Development have been scoped out due to their distance from the Proposed Development which ensures that either one or both will be seen from a considerable distance away and, therefore, their potential to give rise to significant cumulative effects is limited.

Table 6.5 Cumulative Wind Energy Development within a 45 km radius

Name /Site	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from the closest proposed turbine
Whiteside Hill	Operational	10	121.2	0.54
Sanquhar	Operational	9	126.5	2.32
Twentysilling	Operational	9	140	3.49
Sandy Knowe	Operational	24	125	4.75

Name /Site	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from the closest proposed turbine
Hare Hill Extension	Operational	35	91	6.29
Sunnyside Farm	Operational	2	62	6.32
Hare Hill	Operational	20	62.5	7.50
Afton	Operational	25	120	9.56
Wether Hill	Operational	14	91	10.96
Windy Standard I	Operational	36	53.5	11.01
Windy Rig	Operational	12	125	11.18
High Park Farm	Operational	1	75	11.80
Windy Standard II	Operational	30	119.5	12.62
Blackcraig	Operational	23	110	20.08
Andershaw	Operational	11	140	20.45
Middle Muir	Operational	15	152	20.54
Galawhistle	Operational	22	121.2	23.16
Clyde	Operational	152	125	23.40
Hagshaw Hill Extension	Operational	20	80	23.94
Hagshaw Hill	Operational	26	55	24.36
Dalswinton	Operational	15	125	24.88
Hazelside Farm	Operational	3	74	25.40
Harestanes	Operational	68	121.5	25.80
Nutberry	Operational	6	125	26.02
Douglas West	Operational	13	149.9	26.12
Bankend Rig	Operational	11	76	27.88
Minnygap	Operational	10	125	28.70
Crofthead Farm	Operational	1	77	28.79
Dersallock	Operational	23	125	29.49
Dungavel	Operational	13	120	29.50
Clyde Extension	Operational	54	142	30.37
Lower Waterhead Farm	Operational	1	67	30.90
High Waterhead	Operational	1	67	31.08
Auchrobert	Operational	12	132	31.12
Birkhill Commercial Park	Operational	1	99.5	31.17
JJ's Farm	Operational	1	99	31.20
Nether Fauldhouse	Operational	1	77	31.26
Kype Muir	Operational	26	132	31.56
Low Whiteside Farm	Operational	1	54	32.00
Auchren Farm	Operational	1	67	32.80
Woodlands Farm	Operational	1	69	33.11
Woodlands Farm 2	Operational	1	69	33.27
North Brackenridge	Operational	1	76	33.39
Harehawhead	Operational	1	63.5	33.93
Burnbrae Farm	Operational	2	66	34.00
High Dyke Farm	Operational	1	84	34.15
Eastertown	Operational	1	67	34.17
Nether Kypeside	Operational	1	67	34.44

Name /Site	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from the closest proposed turbine
Ladehead Farm	Operational	3	74	34.50
Netherhall Farm	Operational	1	67	35.25
High Blackwood Yards	Operational	1	67	35.74
Garlewood	Operational	1	77	36.25
Couplaw Farm	Operational	1	67	36.59
Yards Farm	Operational	1	77	36.84
Calder Water	Operational	13	147	36.93
Dykehead Road	Operational	1	79	37.06
Dykehead Farm 2	Operational	1	79	37.37
Auchnotroch	Operational	1	53.7	37.90
Westtown Farm	Operational	1	77	38.01
Tanhill	Operational	1	77	38.05
West Browncastle	Operational	12	126.5	38.09
Southfield Farm	Operational	1	63.1	38.19
Whitelee	Operational	140	110	38.68
Draffan 1	Operational	1	119	38.79
Low Lanrigg	Operational	1	70	39.00
Whitehill Farm	Operational	1	77	39.19
Netherburn West	Operational	1	100	39.28
Low Bowhill	Operational	1	74	39.46
Whitelee Extn Phase 1 & 2	Operational	75	140	39.59
Draffan 2	Operational	1	119	39.65
Glenkerie	Operational	11	120	39.66
Lochhead Extension	Operational	2	100	40.19
Lochhead East	Operational	1	99.5	40.26
Lochhead	Operational	3	100	40.67
Logoch Farm	Operational	1	67	40.74
Wellgreen	Operational	1	66	42.52
Craigthornhill Farm	Operational	1	77	42.56
Hadyard Hill	Operational	52	101	43.27
Plascow Farm	Operational	3	76.5	43.28
Rosti	Operational	1	110	43.42
Myres Hill	Operational	2	76	43.56
Boghead Farm	Operational	2	67	43.97
Lampits Farm	Operational	2	64	45.03
Ardoch	Operational	3	110	45.07
South Kyle	Under construction	50	149.5	15.35
Kennoxhead	Under construction	19	180	16.57
Torrs Hill	Under construction	2	100	25.24
Dalquhandy	Under construction	15	149.9	26.41
Kype Muir Extension Variation	Under construction	15	220	29.81
Sneddons Law	Under construction	15	130	41.04
Carrot Moor Farm	Under construction	1	67	43.43

Name /Site	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from the closest proposed turbine
Sanquhar "Six" WF	Consented	6	130	4.31
Lorg	Consented	9	149.9	5.79
Glenmuckloch	Consented	8	149.9	10.01
Cornharrow	Consented	8	149.9	10.60
Lethans Resub	Consented	22	220	10.62
Pencloe Forest Resub	Consented	19	149.9	11.19
Windy Standard III	Consented	20	177.5	13.99
Penbreck	Consented	9	145	14.06
Troston Loch	Consented	14	149.9	14.80
Enoch Hill Variation	Consented	16	149.9	15.35
Kennoxhead Extension	Consented	8	220	16.46
Margree	Consented	9	200	16.80
Glenshimmeroch	Consented	10	149.9	17.59
Benbrack Variation	Consented	18	149.5	18.82
North Kyle	Consented	54	149.9	19.06
Fell	Consented	9	200	19.61
Over Hill	Consented	20	180	21.22
Knockman Hill	Consented	5	81	21.67
Crookedstane	Consented	4	126.5	22.76
Lion Hill	Consented	4	126.5	23.17
Hagshaw Hill Repowering	Consented	14	200	23.59
Hare Craig	Consented	8	230	24.31
Douglas West Extension	Consented	13	200	25.43
Cumberhead Resub	Consented	14	180	25.51
Cumberhead West	Consented	21	200	26.10
Polquhairn	Consented	9	100	26.44
Priestgill Variation	Consented	7	200	27.87
Bankend Rig Extn	Consented	3	126.5	28.86
Mochrum Fell	Consented	8	126.5	28.88
Knockshinnoch	Consented	2	126.5	30.44
Birkhill	Consented	2	99.9	31.36
Halls Burn (Stoneyhill)	Consented	1	100	31.43
Broken Cross Resubmission	Consented	10	149.9	31.80
West Dykes Farm	Consented	1	150	32.77
Auldtou Farm	Consented	1	61	33.78
Whitelaw Brae Variation	Consented	14	136.5	34.50
Hallburn Farm	Consented	1	67	36.23
Mount Farm	Consented	1	87	36.25
Feoch	Consented	1	67	37.85
Glenkerie Extension	Consented	6	100	38.76
Plascow Farm Extension	Consented	1	86.5	43.89
Auchenfin Farm	Consented	1	100	44.08
Lampits Farm 2	Consented	1	64	44.84

Name /Site	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from the closest proposed turbine
Shepherds Rig	Appeal	17	149.9	13.62
West Auchenlongford	Appeal	5	149.5	26.25
Clauchrie	Appeal	18	200	42.4.
Sanquhar II	Application	44	200 (2T@149)	1.69
Euchanhead	Application	21	230	4.54
Sandy Knowe Extension	Application	6	149.9	5.73
Cornharrow Variation	Application	7	180	10.60
Lethans Extension	Application	10	251	11.03
Penbreck Resub (Kennoxhead Phase 2)	Application	8	220	14.87
Greenburn	Application	16	149.9	18.95
Daer	Application	17	180	22.47
Garcrogo	Application	9	180	24.17
Knockkippen	Application	12	180	28.01
Harestanes South	Application	8	200	28.48
Bankend Rig Extn Resub	Application	3	250	28.54
Mill Rig	Application	6	250	30.04
Scienteuch	Application	9	200	30.16
Grayside	Application	21	200	31.71
Carrick	Application	13	200	34.57
Scoop Hill	Application	75	250	38.08
Marshall North	Application	1	180	39.84
Craigmoddie	Application	14	200	40.04

The separation distance of the wind farms from the closest proposed turbine, turbine height and number, and potential for inter-visibility are the key reasons for including them or not in the cumulative assessment. Those that are not referenced are considered to not have a notable cumulative interaction with the Proposed Development or an influence on the cumulative context.

All operational and under construction developments with turbines greater than 50 m to blade tip are included in the LVIA assessment as they form a part of the baseline. Their presence has the potential to influence the assessment of effects on landscape character and the assessment of effects on views. The cumulative assessment of the operational and under construction sites, as well as the consented and application sites, is presented in the 'Assessment of cumulative effects' in **Section 6.11**. This assessment differs from that contained in the 'Assessment of Effects on Landscape Character' in **Section 6.7** and 'Assessment of Effects on Views and Visual Amenity' in **Section 6.9**, in that it focuses specifically on the cumulative effect of the Proposed Development in association with all other cumulative sites (assuming that those schemes in planning/at application stage are consented) and assesses whether there will be significant cumulative landscape and/or visual effects (including the totality of effects).

6.5 Embedded Mitigation and Residual Effects

6.5.1 Potential Effects

Potential effects are those which could result from the construction, operation and decommissioning of a wind farm, according to the Proposed Development, Site and receptor characteristics and their interactions.

Table 6.6 describes typical landscape and visual effects that can occur from a wind farm, their inclusion does not imply that they will occur, or be significant in the case of the Proposed Development. The iterative design of the Proposed Development incorporated a variety of landscape and visual mitigation measures to prevent, reduce or offset potential landscape and visual effects.

Section 6.5 'Embedded Mitigation and Residual Effects' describes these. **Section 6.7** 'Assessment of Effects on Landscape Character', **Section 6.8** 'Assessment of Effects on Landscape Designations', **Section 6.9** 'Assessment of Effects on Views and Visual Amenity' and **Section 6.10** 'Assessment of Effects on Principal Visual Receptors' assesses the residual effects of the Proposed Development – those effects remaining after mitigation that will materialise when the Proposed Development is under construction, operation or decommissioning.

Table 6.6 Potential Effects of Construction, Operation and Decommissioning

Activity	Specific Element	Potential Effects	Potential Sensitive Receptors
Construction	Construction plant, borrow pit excavation, temporary construction facilities, temporary meteorological mast, construction cranes, forestry felling	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views Temporary cumulative effects	Physical landscape features e.g. trees and ground cover Landscape character receptors – landscape character types, wild land areas and designated landscapes Views – experienced by different receptors e.g. residents, road users, walkers
Operation	Turbines, access tracks, restored borrow pits, meteorological masts, substation, site office, transformers	Long term effects on landscape character Long term effects on views Long term cumulative effects with other wind farms	
Decommissioning	Construction plant, cranes	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views	

The effects of the Proposed Development on the landscape and visual resource will arise principally from the construction, operation and decommissioning of the turbines, control building, substation and battery storage facility, access tracks and borrow pit search areas. The temporary construction facilities, such as cranes, construction vehicles, construction compounds, laydown areas and delivery vehicles required during the construction will also have effects on the landscape and visual resource. It is anticipated that on-site construction of the Proposed Development will take up to approximately 18 months; the construction effects identified are therefore predicted to occur during this period and end at the start of the operational stage. While the majority of the effects during the construction phase would relate to the tall cranes, it is anticipated that four months would be the maximum period during which the cranes would be active on the Site, making this an especially short-term effect. A Construction Environmental Management Plan (CEMP) will be prepared that will further detail the mitigation measures to be implemented during the construction phase. It is anticipated that the Proposed Development will be in operation for 35 years. On completion of its operational life the Site may be re-commissioned following further consent and/or approvals or will be decommissioned.

6.5.2 Mitigation

This section describes the project design and mitigation measures which have been incorporated through the iterative design of the Proposed Development in order to prevent, reduce or offset potentially adverse landscape and visual effects caused by the construction, operation and decommissioning of the Proposed Development. This includes measures to address significant landscape and visual impacts. It should be read in conjunction with the full project description and the rationale for site selection and scheme design in **Chapter 3 - Site Selection and Design** and **Chapter 4 - Description of the Proposed Development**.

6.5.2.1 Site Selection

The proposed turbines lie within an area of LCT 19 Southern Uplands LCT which is characterised by broad, steeply sided and rounded hills covered by open moorland and coniferous plantations. The suitability of the landscape of the Site for wind farm development, derives from its character and this has been realised through the location of the Sandy Knowe, Hare Hill (and Hare Hill Extension), Sanquhar, Whiteside Hill and Twentyshilling Wind Farms on these hills. These have established wind farm development as a baseline feature of this landscape.

The Proposed Development would not directly affect a designated NSA, or the mapped interest of any WLA. The Proposed Development would not be located in an RSA or SLA but would be located adjacent to the northern boundary of the Thornhill Uplands RSA and a minimum of approximately 11.5 km from the Galloway Hills RSA, the only RSAs within the Study Area; and approximately 6.5 km from the New Cumnock SLA.

The Site abuts the eastern edge of Whiteside Hill Wind Farm, such that the Proposed Development may be perceived as an extension to it. Further operational wind farms are located in the vicinity of the Site within the Southern Uplands LCT. The number of operational wind farm developments within the area surrounding the Site would prevent the Proposed Development from introducing wind farm development into an otherwise undeveloped upland landscape and would help concentrate this type of development within one upland area. The 11 proposed turbines of the Proposed Development would appear as a relatively small addition to the existing turbines of Whiteside Hill (10); and within the context of turbines of Twentyshilling Wind Farm (9), Sanquhar (12), Sandy Knowe (24), Hare Hill (20) and Hare Hill Extension (35) Wind Farms.

The proposed turbines would be located on the hills forming the southern valley side of the Nithsdale Valley. While this would bring the northern extent of wind farm development closer to the settled landscapes to the north-east; this increase would be incremental, especially as design iterations have limited the northerly extent of wind farm development, in order to reduce potential impacts relating to noise and visual amenity. The Proposed Development would be well separated from settlement at Sanquhar, to the north-east, Kirkconnel, to the north, and New Cumnock, to the north-west; and from most of the more local rural properties.

Section 6.4.4.1 describes general visibility of the Proposed Development in detail, highlighting the relatively contained pattern of visibility that would arise across the Study Area. This would be patchy to the west, east and south but more consistent to the north, largely due to the screening effect of surrounding uplands, which would notably reduce the extent of visibility across these parts of the Study Area.

The visibility of the Proposed Development from visual receptors within the wider area, including roads, settlements and core paths, is generally limited to localised areas and short sections of routes. **Section 6.9** assesses the potential effect of the Proposed Development on visual receptors.

6.5.2.2 Layout Design

The design of the wind farm layout is a vital part of the EIA process as it is the stage where the most notable contribution can be made to mitigate potential landscape and visual effects. This helps to

create a wind farm which limits significant effects on the existing landscape character and visual amenity of an area. The iterative design process allows the effects of different wind farm layouts to be assessed then modified to prevent, reduce or offset effects. The residual effects reported in the following sections, therefore, include considerable embedded mitigation in the form of design refinement and consideration against landscape and visual objectives, for example, arranging turbines with respect to landform features, particular consideration of a view of the wind farm from a highly valued landscape, or ensuring the arrangement of turbines is aesthetically balanced from sensitive viewpoints.

In order to minimise adverse effects on landscape character and visual amenity, a number of design principles were considered. Insofar as was possible, given the other technical and environmental constraints on the Site, these principles sought to reduce significant effects through alterations to layout, design and siting, management practices and mitigation. The design objectives are based upon the characteristics of the existing landscape and visual environment, described in **Section 6.4: Baseline Conditions** above, and are set out as follows:

- To create a visually legible design, insofar as was possible on a site, which is constrained by other environmental and technical issues, and create a simple, positive layout, viewed consistently from different positions;
- To ensure that the Proposed Development in views from the Nithsdale Valley appear as a relatively well-defined group in which the turbines relate well to the landform and each other;
- To use existing access tracks where possible and ensure that new access tracks are sympathetic to the natural landform, as far as possible;
- To locate borrow pits with consideration of topography, proximity to access tracks and orientation in respect of visibility, and to restore these areas through replacing topsoil and natural vegetation, albeit with rock faces exposed;
- To group turbines to create a balanced and coherent image from key viewpoints, avoiding where possible excessive 'stacking' or overlapping of turbine rotors in lines, favouring an irregular cluster, that reflects the nature of the undulating landscape;
- To site buildings and the BESS within low lying and less exposed areas that are screened to key receptors; and
- To group the infrastructure in order to limit the number of areas affected.

The iterative design process refined the original layout to help mitigate the potential effects of the Proposed Development on the landscape and visual receptors. The key considerations have been the potential effects on the close range Euchar Water to the north and Scaur Water to the south, the SUW which passes adjacent to the southern side and through the eastern part of the Site, and the Nith Valley through which the A76 and Glasgow to Dumfries rail line passes and where settlements including Sanquhar and Kirkconnel are located. Viewpoints 1, 2 and 3 representing these locations have been used in the iterative design process.

The iterative process has reduced turbine numbers from 14 to 11; a reduction which has had a notable effect on potential landscape and visual effects. This has meant that whilst previously turbines extended to the south of the SUW, they are now contained to the north and this avoids the sense of enclosure on both sides that walkers might have otherwise experienced. Despite the closer proximity of some of the proposed turbines to the SUW than in earlier layouts, the effects will remain the same as walkers will still be experiencing the effects of especially close-range turbines.

The reduction in turbine numbers has also meant that the turbines closest to the Scaur Water valley have been removed and in so doing, the effects of closer range turbines and higher levels of visibility in this landscape have been reduced. The reduction in turbine numbers has meant improved spacing between the turbines which has helped reduce effects of stacking and overlap in views from many viewpoints.

Environmental constraints, relating to areas with special sensitivities in respect of cultural heritage assets, ornithology, hydrology and peat, as well as constraints of gradient and set back from the existing Whiteside Hill turbines, have also been taken into account in the design iteration and this has discounted areas from wind farm development.

A detailed description of the iterative design process is presented in **Chapter 3: Site Selection and Design**.

6.5.3 Residual Effects

Sections 6.6 to 6.11 below assess the residual effects (i.e., those which remain after mitigation) of the Proposed Development on the landscape and visual resource. These are categorised into physical effects, effects on landscape character, effects on landscape designations, effects on views, and effects on principal visual receptors as described previously and as presented in **Sections 6.7 to 6.10**. Cumulative effects are assessed in the 'Assessment of cumulative effects' later in this Chapter at **Section 6.11**.

6.6 Assessment of Physical Effects

6.6.1 Introduction

The first category of effects covered in the assessment is physical effects, which are direct effects on the fabric of the Site, such as the removal of ground cover vegetation. Physical effects are found only on the Site, where existing landscape elements may be removed or altered by the Proposed Development. This category of effects is made up of landscape elements and, in this case, there is only one element involved - rough grass moorland.

The methodology for the assessment of physical effects is described in full in **Technical Appendix A6.1: LVIA Methodology**.

6.6.2 Rough Grass Moorland

Baseline

Rough grass moorland is the predominant landcover across the Site. It comprises mostly rough grasses, which grow from soil that tends to be often waterlogged, albeit with drier upper slopes and summits. This type of landcover is typical throughout much of the Southern Uplands. It contributes to the open and exposed parts of the upland landscape and provides contrast from the enclosure of the commercial forestry plantations. While ecological diversity occurs within the rough grass moorland at a detailed scale, the general appearance is of a homogenous landcover.

Sensitivity

The rough grass moorlands contribute to the open character of the upland landscape which typifies this area. While it is a relatively abundant landscape element that is not rare or recognised for its value, within the diversity at the detailed scale there are landscape elements within it which are of greater value owing to the importance of the flora and fauna. The value of the rough grass moorland is medium.

The susceptibility of the rough grass moorland to the effects of the Proposed Development is low as it occurs in abundance across the Southern Uplands. Furthermore, the rough grass species are sufficiently prolific to enable them to re-colonise disturbed areas and can re-establish in relatively short periods of time.

The combination of these factors results in a **medium** sensitivity being attributed to the rough grass moorland on the Site.

Magnitude of Change

Changes to the rough grass moorland landscape element would result as a consequence of the removal of soil and vegetation from the routes of the new access tracks, in the areas of the temporary construction compound and borrow pits, and the longer-term substation compound, crane pads and turbine foundations.

The magnitude of change on the rough grass moorland element would be **medium-low** as the Proposed Development would result in the removal of relatively small areas, which constitute a small proportion of this extensive landscape element. This rating has also taken into account the relative ease with which this vegetation type can re-colonise. The location of the turbines, tracks and other associated infrastructure have been carefully located to avoid the more sensitive habitats within this landscape element.

Significance of Effect

The physical effect of the Proposed Development on the rough grass moorland would be **moderate** and **not significant**. This is primarily due to the medium sensitivity of the landscape element, the limited proportion of the landscape element that would be affected, and the high potential for the visual mitigation of any direct effects through reinstatement of the rough grass moorland ground cover.

6.6.3 Summary of Physical Effects

The principal physical effects that the Proposed Development would have on the landscape fabric of the Site are the removal of contained areas of rough grass moorland within a much wider extent of rough grass moorland. These effects would be not significant, largely owing to the extensive nature of this landcover type and the relative ease with which reinstatement can take place both post-construction in respect of the temporary infrastructure, and post-decommissioning, in respect of specific components of the permanent infrastructure.

6.7 Assessment of Effects on Landscape Character

6.7.1 Introduction

Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and relates to the way in which this pattern is perceived. The capacity studies that cover the Study Area divide the landscape into areas of distinctive character which are generally referred to as LCTs. **Figure 6.2a** shows the LCTs / LCUs covering the Study Area and **Figure 6.2b** shows the legend of the LCTs / LCUs. Many of the LCTs are extensive, sometimes covering several LCUs that are geographically separate. The effects of the Proposed Development can vary widely across a single LCT and repeats of the LCT. The assessment considers the effects of the Proposed Development on the LCUs, which are subsets of the LCTs. The LCTs are referenced in the name of each LCU to explain the type that the unit is a part of.

Effects on landscape character are manifested both on the Site; where the pattern of elements that characterises the landscape would be directly altered by the addition of the Proposed Development to the landscape; and off-site, around the Study Area, where visibility of the Proposed Development may alter the way in which this pattern of elements is perceived. For example, if the Proposed Development is visible from the Upper Nithsdale LCU of the Upper Dale LCT, the perceived experience of this area may be altered as the visibility of the wind farm introduces new external influences and characteristics, despite its physical location in a different, geographically separate, LCT.

Landscape character receptors fall into two groups:

- LCTs / LCUs; and

- Designated areas.

The following sections of this Chapter describes the assessment of effects on these receptors. The detailed methodology for the assessment of effects on landscape character is described in **Technical Appendix A6.1: LVIA Methodology**. The distribution of the LCTs / LCUs in conjunction with the ZTV is shown on **Figure 6.8**.

6.7.2 Assessment of Effects on LCTs / LCUs

The LCTs and LCUs that cover the 20 km radius Study Area are shown in conjunction with the ZTV on **Figure 6.8**. A further review of those LCTs and LCUs within the 20 km radius is presented in **Section 6.4.1**. This has found that the following LCTs and LCUs have the potential to undergo significant effects and, therefore, require a detailed assessment in the LVIA.

- DG LCT 9. Upper Dale (Valley) / Upper Nithsdale LCU.
- DG LCT 10. Upland Glens / Dalveen LCU.
- DG LCT 10. Upland Glens / Mennock LCU.
- DG LCT 10. Upland Glens / Scaur LCU.
- DG LCT 19. Southern Uplands / Nithsdale LCU.
- DG LCT 19. Southern Uplands / North West Lowthers LCU.
- DG LCT 19. Southern Uplands / Lowthers LCU.
- DG LCT 19a. Southern Uplands with Forest / Ken LCU.
- EA LCT 10. Upland River Valley / Nith LCU.
- EA LCT 18a. East Ayrshire Plateau Moorlands / Wardlaw Hill LCU.
- EA LCT 20a. East Ayrshire Southern Uplands / Ken LCU.

6.7.3 DG LCT 9. Upper Dale (Valley) / Upper Nithsdale LCU

Baseline

Viewpoints 1, 2, 3, 4 and 6 are located in this LCU and are representative of the potential effects. The north-eastern part of the Site extends into the western edge of this LCU, where it covers the lower part of the access track. The ZTV is shown on **Figure 6.8**.

The Upper Nithsdale LCU covers the valley of the River Nith between the boundary with East Ayrshire, in the north-west; and Thornhill, in the south-east. Uplands generally contain the Upper Dale (Valley) (LCT 9), with these hills being more steeply sloping and dramatic in the south-east, becoming more rounded, with gentle slopes as they enclose the dale in the north-west. Prominent outcrop hills along the dale mark the change between broader, more open valley containing the settlements of Sanquhar and Kirkconnel and the narrower valley to the south-east, beyond Enterkinfoot. The valley floors extend to gentle, rounded slopes sometimes interrupted by broad terraces or steeply rising side slopes. The generally diverse landscape includes improved pasture, wet grassland, rough grazing and bracken covered slopes. Hedges and dykes define the upper boundaries of these fields that vary in elevation. Woodland cover includes isolated field trees, parkland, policies, such as at Drumlanrig, and semi-natural woodlands to the south-eastern section of the valley.

The River Nith flows through agricultural land covering the valley floor, with intervening patches of woodland and commercial forestry further upslope. The A76 and Glasgow to Carlisle railway line broadly follow the river, connecting Sanquhar (the largest settlement in the LCU) to smaller settlements at Kirkconnel and Mennock. Open cast coal mining and reclaimed land features are notable in the north-western part of Nithsdale. Nithsdale is well settled and easily accessible with a sense of seclusion restricted to some of the smaller side valleys.

The wider landscape context includes the large scale gently sloped uplands which provide a backdrop to the upper dale. Inter-visibility between the dale and surrounding hills is high and there is a strong relationship between the two. A number of operational wind farms and large wind turbines in the adjoining hills to the south-west includes Hare Hill (and Hare Hill Extension), Sanquhar, Whiteside Hill and Twentyshilling. Near Kirkconnel, the operational Sandy Knowe Wind Farm spills over into the dale.

Sensitivity

The value of the Upper Nithsdale LCU is medium-high south of Enterkinfoot, where the Thornhill Uplands RSA overlaps the LCU and denotes the scenic value of the area at a regional level; and medium in all remaining parts owing to the absence of any national or regional landscape designations, which would otherwise denote a special landscape value.

The susceptibility of the LCU to the effects of the Proposed Development is medium within the broader valley north-west of Enterkinfoot, and medium-low in the narrower south-eastern section where steeper slopes and woodland create enclosure.

The proposed turbines and most of the associated infrastructure would lie within the Nithsdale LCU of LCT19 Southern Uplands, which lies adjacent to the western side of the valley and which presents a strong influence on the landscape character of the valley. While the Site boundary also extends into the Upper Nithsdale LCU of LCT9 Upper Dale, this coincides with the lower part of the access track which will have a much lesser effect. Operational wind farm development lies within the Nithsdale LCU of LCT 19 Southern Uplands and LCT19a Southern Uplands with Forest. These comprise Whiteside Hill, Sanquhar, and Hare Hill wind farms which influence the broader section of Upper Nithsdale, with Sandy Knowe partially entering it. The near regular spacing of the Whiteside Hill, Sanquhar and Sandy Knowe wind farms and their pattern along the enclosing ridge to the valley, means their influence is consistent along much of its length and is most notable around Sanquhar. South-east of Enterkinfoot, the pattern of wind farm development and the topography of the area, means that Twentyshilling Wind Farm appears in front of these other operational wind farms and is most influential. In addition to the wind farms, settlement, extensive farmland, commercial forestry and transport infrastructure including the A76 and the Glasgow – Carlisle railway line, modifies Upper Nithsdale LCU (LCT 9) and reduces its susceptibility to the Proposed Development.

The medium or medium-high value of the Upper Nithsdale LCU (LCT 9), combined with its medium susceptibility in the broader part of the LCU and medium-low susceptibility of the part of the LCU in the south-east, gives rise to an overall medium sensitivity for this LCU as a whole.

Magnitude of Change During Construction

The ZTV on **Figure 6.8** shows largely continuous visibility across the valley sides of the broader section of the valley between Durisdeer and the boundary with East Ayrshire; and becomes more fragmented to the east and west of the southern valley side where there are small patches where the ZTV indicates no visibility. 10 to 11 turbines are theoretically visible from much of the valley, mainly concentrated on the northern side. Patches of lower theoretical visibility lie on the southern valley side above Menzies. The settlements of Kirkconnel, Sanquhar and Menzies lie within the broadest area of visibility indicated by the ZTV reflecting the width of the valley. The proposed turbines would lie approximately 2 to 4.5 km from the closest Upper Nithsdale LCU boundary and much of the valley lies within 10 km of the Site.

During the construction phase, the magnitude of change would be medium-high, medium or medium-low within Nithsdale north-west of Enterkinfoot and medium-low or low, to the south-east. No change would occur in areas with no visibility of the Proposed Development.

Hills at the transition from Southern Uplands (LCT 19) to Upper Dale (Valley) (LCT 9) would screen ground level construction works related to the proposed turbines, while much of the associated high-level construction works would be visible above the ridgeline. The presence and activity of the

construction cranes and the emerging turbines would influence the Upper Nithsdale LCU, especially in the closest area around Sanquhar out to approximately 5 km, gradually reducing to the south-east and north-west as the orientation of the valley relative to the Proposed Development changes, the intervening distance increases and the influence of closer range operational wind farms increases. While in the central section around Sanquhar the proposed turbines would appear as large-scale structures in contrast to the scale of the valley and the scale of the operational wind farms, this effect would be moderated to some extent by the wider scale of the valley and upland landscapes.

South-east of Enterkinfoot and as far as Durisdeer, the operational Twentysilling Wind Farm would form a stronger and closer range influence on the area and when combined with the greater enclosure from landform and woodland, would moderate the effect of the construction works of the Proposed Development on the character of this part of the LCU. In the north-west part of the LCU beyond Kirkconnel, Sanquhar and Sandy Knowe wind farms would have a similar moderating effect on the visibility of the construction works which would be seen as a slightly more distant example of an emerging wind farm.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would remain medium-high, medium or low within the Upper Nithsdale LCU west of Enterkinfoot and medium-low or low, to the south-east. No change would occur in areas with no visibility of the Proposed Development.

The proposed turbines would occupy a relatively small proportion of the LCU's wider landscape context, with the nearer Twentysilling Wind Farm exerting a greater influence in the area south-east of Enterkinfoot and Sanquhar and Sandy Knowe exerting a greater influence in the area to the north-west of Kirkconnel. Their greater height, relative to neighbouring wind turbines, combined with their closer proximity to the ridgeline enclosing the valley, would make the proposed turbines appear as large scale and prominent structures, in the area around Sanquhar out to approximately 5 km from the nearest turbines, and here, their influence on the character of the valley would be more pronounced than that of the operational wind farms nearby and would give rise to a medium-high magnitude of change. While operational wind farms are an established characteristic feature of the uplands that already exert a notable influence on the valley, the closer range and larger scale of the Proposed Development, in respect of the central parts of this LCU would have a notable influence on local landscape character.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Upper Dale (Valley) LCT / Upper Nithsdale LCU out to approximately 5 km north-east would be **moderate** and **significant** during both the construction and operational phases; and **moderate / minor** or **minor** and **not significant** during both phases, to the south-east and north-west. The proposed turbines and the majority of the infrastructure would be located within an adjoining LCT from where it would form a close range and prominent feature, despite the extent of operational wind farm developments in the wider landscape. While the northern end of the access track would be located in the Upper Nithsdale LCU it would have a very limited effect on landscape character during both the construction and operational phase.

6.7.4 DG LCT 10. Upland Glens / Dalveen LCU

Baseline

Viewpoint 9 is located in this LCU and is representative of the potential effects.

The Upland Glens LCT covers the upper reaches of the river valleys which act to divide different hill groups in the Southern Uplands LCT. Lying within the south-east quadrant of the 20 km Study Area, the high sided valleys are often sinuous and narrow, with irregular, abrupt ridgelines. Their relatively

even and steep sided slopes fall away into complex, irregular lower hillsides and largely flat floors. Drystone dykes, part way up the hillsides, separate open grass moor on the upper slopes from unimproved pasture on the lower slopes. Similar dykes enclose small fields of improved pasture along the narrow valley floors. Woodland lies within the lower reaches of the glens and is sometimes sparse. The diverse cover includes clumps of broadleaved trees associated with farms, riparian woodland, coniferous woods and occasional policy woodland. The upland glens contain the A7, A702 and the A708; and smaller, often narrow and winding roads. Apart from occasional estate houses within the lower reaches, settlement generally comprises farms and cottages dispersed along the edge of the valley floor and is often associated with side valleys. Settlement is increasingly sparse towards the heads of the glens. The upland glens are visually cut off from other landscape types, apart from the surrounding upland character types, whose edges form the upper rim of the glen sides. The snaky form of several of the valleys limits longer views and reinforces their strong sense of enclosure, particularly when flanked by the Southern Uplands (LCT 19).

The Dalveen LCU includes the glen of Dalveen Lane, which runs southwards from the boundary with South Lanarkshire to Durisdeer Mill. The watercourse of Dalveen Lane flows loosely southwards through the moderately wide valley floor. East of the village of Dalveen, steep sides rise either side to summits generally between 500 and 600 m AOD, with Well Hill (606 m AOD) being the highest summit. Landcover comprises uncultivated moorland and there is little tree cover. South of Dalveen, the watercourse straightens, and the glen broadens as it merges with the larger Nithsdale valley. A pastoral landscape of fields enclosed by post and wire fencing and stone walls lies along this part of the valley floor. The watercourse is increasingly wooded as it heads south, with sporadic small woodlands often associated with large farmsteads increasing the tree cover. Well contained in the steep upper reaches of the glen, the A702 road skirts the southern edge of the hills through the sparsely settled glen. As the valley widens and becomes shallower, it becomes more closely associated with the wider area and its contextual character.

Operational wind farm development does not lie within the glen but is located within Southern Uplands (LCT 19 / Nithsdale LCU) within the wider landscape context. Twentysilling Wind Farm is the closest to the glen and it exerts a relatively close-range influence on the mouth of the glen.

Sensitivity

The value of the Dalveen LCU is medium-high, reflecting its coverage by the Thornhill RSA, a designation which denotes the scenic value of the area at a regional level.

The susceptibility of the Dalveen LCU to the effects of the Proposed Development is medium-low, due to the glen's highly enclosed nature. While the glen is inherently susceptible to the effects of wind farm development within it or in the adjacent uplands, there is a more limited association with the Southern Uplands LCT where the Proposed Development would be located. The A702, settlement, extensive farmland within the glen and areas of commercial forestry in the wider landscape context have modified the glen, also reducing its susceptibility. Nearer the mouth of the glen, there is a stronger relationship with the wider landscape context where the operational Twentysilling Wind Farm exerts an influence.

The medium-high value of the Dalveen LCU, combined with its medium-low susceptibility to the effects of the Proposed Development gives rise to an overall medium sensitivity.

Magnitude of Change During Construction

As shown in the ZTV on **Figure 6.8**, the landform restricts the extent of theoretical visibility to the eastern side slope descending from Blackhill (531 m AOD). The ZTV is near continuous across this part of the small LCU, where 10 to 11 turbines are theoretically visible. These would be a middle range influence on the LCU as the nearest proposed turbine would lie approximately 14 km from it. Remaining areas of the LCU would have no visibility of the construction works.

During the construction phase, a low magnitude of change would occur across the eastern side slope descending from Blackhill. No change would occur to Dalveen LCU where there would be no visibility of the works.

While landform would screen much of the ground level construction works, the high-level construction works form a middle range influence on the slopes below Blackhill. The presence and activity of construction cranes and the emerging turbines would form part of the wider landscape context of the Dalveen Lane glen, although at a range of approximately 14 km, and occurring in the context of operational Twentysilling Wind Farm, this influence on the landscape character of the glen would be limited.

Magnitude of Change During Operation

During the operational phase, a **low** magnitude of change would occur to the eastern side slope descending from Blackhill. **No change** would occur to areas of the Dalveen glen where there is no visibility of the Proposed Development.

The level of operational wind farm development within the LCU's wider landscape context, and the small proportion of this context the proposed turbines would occupy, would limit their influence on the character of the Dalveen LCU. The turbines of the nearer operational Twentysilling Wind Farm would exert a stronger and closer-range influence. This wind farm would intervene between the glen and the Proposed Development, and the operational turbines would appear larger in scale and more prominent than those of the Proposed Development. No change to the enclosing ridgeline of the glen would arise due to the Proposed Development.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Upland Glens / Dalveen LCU would be **minor** and **not significant** during both the construction and operational phases. The Proposed Development would not redefine the landscape character of the Dalveen glen owing principally to its enclosed character and the weaker association it has with the Nithsdale LCU (LCT 19) hosting the Proposed Development. The aspect of the valley and the stronger influence of Twentysilling Wind Farm would also limit the influence of the Proposed Development.

6.7.5 DG LCT 10. Upland Glens / Mennock LCU

Baseline

The Mennock LCU covers the glen of the Mennock Water between Wanlockhead to the north, and Auchengruith, to the south. The glen is narrow with steep sides rising either side to typically round-topped and smooth summits over 400 m AOD; including Brown Hill, Wether Hill, White Dod and Bail Hill, to the north; and Meikle Snout, Threelock Height and East Mount Lowther, to the south. The latter is the highest adjoining summit at 631 m AOD. The Mennock Water follows an irregular course, winding through the glen. Landcover comprises uncultivated moorland and there is little tree cover. The B797 road follows the watercourse through this largely unsettled LCU. Steep side slopes strongly contain the glen and restrict associations with the wider area to the southern end from where there is a vista across the Nith Valley. Here, the wider landscape context has more influence on the more open area at the mouth of the glen, despite containment by the lower side slopes the valley.

The scale of the glen means it does not contain operational wind farms, but the wider landscape context includes Southern Uplands (LCT 19 / Nithsdale LCU) that hosts several. Of these, Twentysilling Wind Farm is the closest to the glen, located on the opposite side of the Nith Valley. It exerts a close-range influence on the mouth of the glen, from where it forms a visible feature within the wider valley landscape.

Sensitivity

The Mennock LCU is of medium-high value, reflecting its coverage by the Thornhill RSA, a designation which denotes the scenic value of the area at a regional level.

The susceptibility of this LCU to the Proposed Development is medium. The Proposed Development lies well away from the glen, which is particularly susceptible to wind farm development in adjoining uplands and/or on the skyline. The operational Twentyshilling Wind Farm has a close-range influence on the glen and other wind farms within the Nithsdale LCU (LCT 19) have established this type of development within its wider landscape context, reducing the glen's susceptibility to the Proposed Development. The glen's orientation, irregular course and strongly enclosed form restricts susceptibility to the Proposed Development, to the mouth of the glen and its upper slopes.

The medium-high value of the Mennock LCU, combined with its medium susceptibility to the effects of the Proposed Development, gives rise to an overall medium-high sensitivity.

Magnitude of Change During Construction

During the construction phase, a medium-low magnitude of change would occur across the hilltops around the glen. No change would occur to areas of the Mennock glen where there is no visibility of the works.

The ZTV on **Figure 6.8** shows that a combination of the meandering glen and steep valley sides restricts the extent of theoretical visibility to the upper slopes and summits of the enclosing hills, including Brown Hill, Wether Hill, White Dod and Bail Hill, to the north; and Meikle Snout, Threehope Height and East Mount Lowther, to the south. Visibility is patchy within this small LCU, and while 10 to 11 turbines are theoretically visible from the more elevated parts, the steep side slopes mean that the Proposed Development would not be visible from the lower parts of the glen. The proposed turbines would exert a close to middle range influence as the nearest proposed turbine would lie approximately 10 km from the LCU.

Much of the construction works, including those at ground level, would be visible at from the surrounding hilltops, due to their elevation and the broad alignment of the glen towards the Proposed Development. The presence and activity of construction cranes and the emerging turbines would exert some influence on the landscape character of the upper slopes of Mennock glen. The baseline influence of operational wind farm development, comprising Twentyshilling Wind Farm nearby and Whiteside Hill immediately beyond the Proposed Development, would limit its influence on the character of the glen. These developments lie within a contained part of the glen's wider landscape context, within which the Proposed Development would be located.

Magnitude of Change During Operation

During the operational phase, a **medium-low** magnitude of change would occur across the upper slopes of the Mennock LCU, while no change would occur to areas without visibility of the Proposed Development.

While the Proposed Development would not be visible from within the glen it would be visible from the upper slopes and summits of the enclosing hills, from where the 13 turbines would form a notable feature. The influence would, however, be moderated by the baseline influence from closer-range operational Twentyshilling Wind Farm and other operational wind farm developments at Whiteside Hill, Sanquhar and Hare Hill Extension Wind Farms. The Proposed Development would occupy only 5 to 10 degrees of the wider 360 degree landscape context and occur in an upland area, which is already characterised by operational turbines. The magnitude of change would also be moderated by the location of the proposed turbines at a minimum of approximately 10 km which would mean that they would appear as medium range elements, albeit larger in scale than neighbouring Whiteside Hill, Sanquhar and Hare Hill Extension Wind Farms.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Upland Glens / Mennock LCU would be **moderate** and **not significant** during both the construction and operational phases. The Proposed Development would not redefine the landscape character of the Mennock LCU, principally because its highly enclosed character severely restricts the influence of its wider landscape context. At the mouth of the glen, where the wider landscape context has some influence, the settled nature of the Upper Nithsdale (LCT 9) and the number of operational wind farms in the Southern Uplands LCT greatly restricts the influence of the Proposed Development.

6.7.6 DG LCT 10. Upland Glens / Scaur LCU

Baseline

Viewpoints 6 and 16 are located in this LCU and are representative of the potential effects.

The Scaur LCU covers the glen of the Scaur Water which lies between Glenwhargen Craig, to the north, and Penpont, to the south. A tributary of the River Nith, the Scaur Water flows broadly south-eastwards through the moderately wide glen. In the north, side slopes rise either side to rounded summits generally between 450 and 550 m AOD. Cairnkinna (552 m AOD) is the highest summit along the valley. Uncultivated moorland covers the upper side slopes, with grazing and rough pasture enclosed by post and wire fencing and/or stone walls along lower slopes and over the valley floor. North of Cairnkinna there is little tree cover while south of the hill, the glen is quite well wooded with trees along the watercourse, dispersed field trees, boundary trees and small woodlands, often associated with farmsteads, regularly spaced along the glen. A minor road runs along the floor of the infrequently settled glen. The glen contains the road until it opens out on the approach to the A702. Here, the LCU's association with the wider landscape context is stronger.

While the glen does not contain operational wind farms, the adjoining Southern Uplands (LCT 19 / Nithsdale LCU) contains several. Constituent turbines are visible above the enclosing ridgeline towards the north of the LCU, beyond Cairnkinna Hill. These comprise Whiteside Hill, in the north; and Twentyshilling, to the east.

Sensitivity

The Scaur LCU is of medium-high value, reflecting its coverage by the Thornhill RSA, a designation which denotes the scenic value of the area at a regional level.

The susceptibility of the Scaur LCU to the effects of the Proposed Development is medium-high due to the relatively natural and undeveloped nature of the glen; and its influence by the operational Whiteside Hill and Twentyshilling wind farms.

The glen is inherently susceptible to the effects of wind farm development, owing to the prominence and importance of the enclosing ridgelines and their influence on the character of the valley. The susceptibility of the LCU is, however, moderated by the influence of farmland across the lower slopes and floor of the glen, and development, comprising a few well separated small farmsteads and houses along the minor road. North of Glenwhargen Craig, the glen aligns with the operational Whiteside Hill Wind Farm emphasising its influence on the glen further west. Twentyshilling, to the east, intermittently exerts an influence on the glen. The modified landscape and baseline presence of wind farm developments, reduce the LCU's susceptibility to the Proposed Development.

The Scaur LCU's medium-high value and its medium-high susceptibility gives rise to an overall **medium-high** sensitivity.

Magnitude of Change During Construction

Although much of the Scaur LCU aligns north-west towards the Proposed Development, the steep sides and the height of the enclosing Southern Uplands restricts coverage by the ZTV to the upper

slopes and summits of the valley sides adjoining the glen. The ZTV on **Figure 6.8** shows theoretical visibility across Countam (476 m AOD), Black Craig Hill and Countam (502 m AOD), to the west; and Jarney Knowes, Black Rig and Cairnkinna, to the east. The ZTV forms patches across the north facing slopes of these hills, although only with the peripheral edges included in the LCU. The highest number of turbines (10 to 11) are theoretically visible from the highest areas, dropping off as the ZTV enters the glen. The lowest number of turbines (1 to 3) are theoretically visible from a short section of the valley floor, south of Chanlockfoot to Auchenhessnane, from where it rises to 7 to 10 turbines on the western slopes of Doon. The nearest proposed turbine would lie approximately 2.5 km from this LCU.

During the construction phase, a medium magnitude of change would occur across the upper slopes and summits enclosing the glen with a low magnitude of change through the glen in those locations where visibility would arise. No change would occur to areas of the LCU without visibility of the construction works.

The steep sides of the glen would screen ground level construction works from much of this LCU, although on the upper northern slopes, high-level construction works would provide a relatively close-range influence. The presence and activity of construction cranes and the emerging turbines would influence the character of the Scaur LCU in this area, comprising the spurs and hilltops of the hills enclosing the edge of the glen. The emerging large-scale structures would contrast with the small scale of the glen, albeit alongside the baseline influence of the operational Whiteside Wind Farm, to the immediate west of the Site, and the operational Twentysilling Wind Farm, further south-east of the glen.

Magnitude of Change During Operation

During the operational phase, a medium magnitude of change would occur across the upper slopes and summits enclosing the glen with a low magnitude of change through the glen in those locations where visibility would arise. No change would occur to areas of the LCU without visibility of the construction works.

The ZTV on **Figure 6.8** shows localised patches of 7 to 9 and 10 to 11 turbines visible from the upper slopes and summits enclosing the glen. In contrast, only 1 to 3 or 4 to 6 turbines are theoretically visible from within the valley, with localised patches occurring below Glenwhargen Craig and Hallscour Craig. The proposed turbines would be larger than those of Whiteside Hill and would exert a close-range influence on this largely undeveloped glen, especially in the northern part between approximately 2.5 and 5.0 km. The influence of wind farm development would noticeably increase, particularly from higher areas. The extent to which the proposed turbines would be visible, and the baseline influence of operational wind farm development would limit their influence and the magnitude of change to the character of the LCU. This would be markedly lower within the glen and with distance, from where the influence of the Proposed Development would be much more limited, due to screening by the valley sides.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Scaur LCU would be **moderate** and **significant** during construction and operation, although this would be restricted to the northern part of the LCU, out to approximately 5 km and occurring across localised upper slopes and summits enclosing the glen and within close-range localised parts of the glen. Within these limited areas, the Proposed Development would redefine the landscape character of this LCU because the proposed turbines would increase the influence of operational wind farm development on the glen. Within the glen, the effect of the Proposed Development would be **moderate** and **not significant** during the construction phase, with the exception of those closer-range patches of visibility within 5 km. Where no visibility would arise, there would be no change and **no effect**.

6.7.7 DG LCT 19. Southern Uplands / Nithsdale LCU

Baseline

Viewpoints 5 and 8 are located in this LCU and are representative of the potential effects.

The Southern Uplands (LCT 19) extend into neighbouring South Lanarkshire and East Ayrshire. The Upper Nithsdale LCU (LCT 9) separates the North West Lowthers and Lowthers LCUs from the Nithsdale LCU. These hills, lying between 400 and 500 m AOD, are generally lower and less rugged than is typical within the Southern Uplands of Dumfries and Galloway. Their overall character is open and expansive, with subtle landform and simple land cover. In the north to north-west, the Southern Uplands comprise gently undulating plateaux with subtly rounded hills and few pronounced peaks. South of Nithsdale, the Southern Uplands are characterised by broad ridges divided by valleys that are often deeply incised. Here, occasional, pronounced hills are rugged, and often conical. The simple land cover predominantly comprises grass moorland, occasional patchy heather and often angular patterns of coniferous forestry on lower hill slopes.

These units of the LCT are sparsely settled with small, isolated farms within narrow valleys accessed by no through roads. A number of long-established hill tracks and the long distance route of the SUW lie within them. The landform of the valleys generally restricts the visibility of these uplands from within the valleys but there are extensive views of them from settlements and roads within Upper Nithsdale (LCT 9); the abutting Upland Glens (LCT 10) of the Scaur and Shinnel Waters; and Upper Nithsdale, south-east of Enterkinfoot, where they provide a rugged backdrop to the valley. Existing wind farm development is a common feature of these views as a large number of operational wind farm developments are located in this and adjoining landscapes. Another common feature is commercial forestry, and the combination of these land uses limits the Southern Uplands' sense of naturalness and remoteness. Away from the fringes of the LCT, development has a weaker influence on the Nithsdale and North West Lowthers LCUs.

The Nithsdale LCU abuts the southern edge of the Upper Nithsdale LCU (LCT 9) and is characterised by broad ridges incised by Upland Glens (LCT 10) and occasional more pronounced summits. From Upper Nithsdale (LCT 9), long, gentle hill slopes ascend to the broad ridges of the LCT. Deep Upland Glens (LCT 10) along the Euchar and Scaur Waters incise the ridges. Between the glens, the upland topography is more irregular and knolly with pronounced steep-sided, and often conical hills. Cairnkinna Hill (554 m) is a higher and more distinctive hill within the LCU. Land cover is simple with predominantly grass moorland and occasional patchy heather. Isolated coniferous plantations tend to lie on lower slopes above the Upper Nithsdale LCU (LCT 9), and include Ulzieside Plantation and Brown Hill. While it is assumed for the purposes of the assessment that Ulzieside Plantation will be removed prior to construction, there is a more recent small plantation on the southern side that infills the gap between the existing forest edge and the Site. More extensive forestry lies to the west, within Southern Uplands with Forest (LCT 19a). To the south-east, the LCU abuts Foothills (LCT 18) divided by the Scaur and Shinnel Upland Glens (LCT 10).

The operational Whiteside Hill, Sanquhar and Twentysilling Wind Farms are located within the LCU. More operational wind farms are located within the surrounding landscapes, including Hare Hill and Extension, within East Ayrshire's Southern Uplands (EA LCT 20a) and Sandy Knowe, within Southern Uplands with Forest (LCT 19a) and spilling over into the Upper Nithsdale LCU (LCT 9). These uplands and existing wind farm development therein, are highly visible from settlements and roads within the adjoining Upper Nithsdale LCU (LCT 9) and with some visibility from the Upland Glens (LCT 10) of the Scaur and Shinnel Waters. The hills also provide a rugged backdrop to the south-east section of Upper Nithsdale LCU (LCT 9) encompassing the designed landscape of Drumlanrig Castle. Their influence on the character of the LCU, along with commercial forestry, reduces the sense of naturalness within the north of the LCU; and also reduces the sense of remoteness, notably within and around the glen of the Scaur Water (LCT 10).

Sensitivity

The value of the Nithsdale LCU is medium-high in the southern part of the LCU which overlaps with the Thornhill Uplands SLA, and medium in all remaining parts owing to the absence of any national or regional landscape designations, which would otherwise denote a special landscape value.

The Proposed Development would be located in the Nithsdale LCU and as such it is of medium-high susceptibility to the effects of the Proposed Development. The addition of further wind turbines to the LCU would have a direct effect on the character of the LCU. The operational Twentyshilling, Whiteside Hill and Sanquhar Wind Farms lie entirely within this LCU. Their influence on the LCU lowers its susceptibility to the Proposed Development, as wind farm development is an established, integral part of the baseline character.

Where the Thornhill Uplands SLA overlaps the Nithsdale LCU, the LCU is of medium-high sensitivity to the effects of the Proposed Development, due to its medium-high value and the medium-high susceptibility of this area. Outwith the Thornhill Uplands, the Nithsdale LCU is of medium-high sensitivity to the effects of the Proposed Development, derived from its medium value and its medium-high susceptibility.

Magnitude of Change During Construction

The pattern of theoretical visibility within this upland LCU is varied, both in terms of levels and extents of visibility. As shown on **Figure 6.8**, the ZTV is almost continuous across the eastern slopes of Black Hill, north of the Euchar Water; across much of the area between the Euchar and Scaur Waters, where the Proposed Development would be located; and the hills and spurs immediately south of the Scaur, as far as Blackcraig Hill. The ZTV shows theoretical visibility of 10 to 11 turbines from upper slopes and summits, predominantly within 5 km of the Site. Reflecting the topography of the LCU, this is more continuous in the north and more fragmented to the south-east where several valleys adjoin the south-westerly orientated glen of the Scaur Water. As shown on the ZTV on **Figure 6.8**, there is theoretical visibility of 1 to 3 or 4 to 6 turbines from the Whing Burn valley, and the north side the Scaur glen below the Site and Whiteside Hill. Within the side valleys adjoining the glen, there is no theoretical visibility of the Proposed Development.

Magnitude of Change During Construction

During the construction phase, the magnitude of change would be medium-high in the north, out to the northern LCU boundary at approximately 4 km; to the east, out to the eastern LCU boundary at approximately 2 km; and to the south, out to the ridgeline through Peat Hill at approximately 2 km. The magnitude of change would be medium further south and south-east out to the ridgeline through Blackcraig Hill approximately 4 to 5 km, with a magnitude of change that is medium-low and low occurring further south and south-east, and out to the western LCU boundary at approximately 2 km. No change would occur in areas with no visibility of the Proposed Development.

Ground level and higher-level construction works would have direct effects on the northern part of the LCU, where the Proposed Development would be located. The construction of access tracks, borrow pits, construction compounds, crane pads, turbine foundations, substation compounds and turbines would contrast with the undeveloped upland character of the Site's baseline. The location of the operational Whiteside Hill Wind Farm, to the immediate west of the Proposed Development would notably reduce the magnitude of change of the construction works as they would occur within the context of an immediate wind farm. Other wind farms at Sanquhar, Hare Hill and Extension, and Twentyshilling, establish wind farm development as an existing influence on the LCU and prevent the magnitude of change from being high. Further south and south-east, the magnitude of change would reduce to medium-low or low as the influence of the construction works would decrease with distance and the influence of the other wind farms, such as Twentyshilling, would increase.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would be medium-high in the north, out to the northern LCU boundary at approximately 4 km; to the east, out to the eastern LCU boundary at approximately 2 km; and to the south, out to the ridgeline through Peat Hill at approximately 2 km. The magnitude of change would be medium further south and south-east out to the ridgeline through Blackcraig Hill approximately 4 to 5 km, with a magnitude of change that is medium-low and low occurring further south and south-east, and out to the western LCU boundary at approximately 2 km. No change would occur in areas with no visibility of the Proposed Development.

The close proximity of Whiteside Hill Wind Farm and other operational wind farms located west and north-west of the Site, would limit the perceived change to the character of the Nithsdale LCU arising during operation of the Proposed Development, as these developments establish wind farms as a key feature of the Southern Uplands and are either located in or on the boundary of this LCU. The nature of the Proposed Development would be consistent with adjoining wind farm development, and this would also moderate the effect. Despite these factors, the location of the Proposed Development in this LCU and the close-range influence of these eleven larger scale turbines, compared to the operational turbines, would give rise to a new defining feature within the local area as shown on the ZTV on **Figure 6.8** extending a minimum of approximately 4 km to the north, 2 km to the east and 4 to 5 km to the south and south-east.

Further south and east, the influence of the Proposed Development would become weaker as it becomes less of a close-range, individual influence on the character of the LCU and is perceived more as a part of the existing operational wind farms. While appearing as a notable extension to these, increasing separation from the Proposed Development and a greater depth of turbines in these areas would moderate its influence, despite the larger size of the proposed turbines.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Southern Uplands / Nithsdale LCU would be **major / moderate** or **moderate** and **significant** during the construction and operational phases in the northern part of the LCU where the Proposed Development would be located and out to approximately 4 km to the north, 2 km to the east and 4 to 5 km to the south and south-east. The Proposed Development would redefine the landscape character of the northern part of this LCU, despite the presence of the Whiteside Hill Wind Farm, because of their greater scale and the increase in wind farm development it would represent within this part of the LCU.

6.7.8 DG LCT 19. Southern Uplands / North West Lowthers LCU

Baseline

Viewpoints 14 and 15 are located in this LCU and are representative of the potential effects of the Proposed Development on this LCU.

The North West Lowthers LCU appears more homogenous than the other units of Southern Uplands within the 20 km Study Area. It generally consists of gently undulating plateaux with subtly rounded hills and few pronounced peaks. The hills are typically rounded, with distinctive, higher hills lying outside the LCU at Blackcraig Hill, in neighbouring East Ayrshire; and Cairn Kinney, close to the boundary with South Lanarkshire. Complex and deeply incised valleys, that are characteristic of the Southern Uplands, are less of a feature in this LCU. The Spango Water, feeding the Crawick Water in the adjoining Lowthers LCU, carves a shallower valley in the north. Grass moorland covers the hills with occasional patches of heather. The southern corner of the LCU contains a small number of relatively small conifer plantations with angular footprints. More lie east of a disused open cast mine extending into the Upper Nithsdale LCU (LCT 9), near the boundary with East Ayrshire.

The LCU is largely unsettled with a single road providing access to Fingland and a property nearby. A forest track adjoins the road. Operational wind farm development is not located within the North West

Lowthers LCU but within the closely associated Nithsdale LCU (LCT 19) beyond the Nithsdale valley. While this influences the southern fringe of the LCU, the interior of the upland plateau is less influenced by wind farms or other development. Much of the LCU has a sense of naturalness and remoteness derived from the lesser influence of development.

Sensitivity

The value of the North West Lowthers is medium owing to the absence of any national or regional landscape designations, which would otherwise denote a special landscape value.

This LCU is of medium-low susceptibility to the Proposed Development across the southern part of the LCU adjacent to the Upper Nithsdale (LCT 9), medium-low in the northern part and medium in the central part, where there is less influence from development.

The southern and northern parts of this LCU are less susceptible to the effects of wind farm development, owing to operational wind farm development within the Southern Uplands, both within South Lanarkshire to the north, and Dumfries and Galloway to the south. Whiteside Hill, Sanquhar, Hare Hill and Extension, and Sandy Knowe wind farms are prominent features above the ridgeline enclosing the Nithsdale valley and present a notable baseline influence. While operational wind farm development does not lie within the LCU, it is influenced by this type of development as an established part of the surrounding context. As the interior of the LCU has a weaker association with the Southern Uplands adjoining it to the north and south, there is less of an influence from these developed or modified landscapes and as a result the interior has a higher susceptibility.

Where the North West Lowthers merge into Upper Nithsdale, the combination of the medium-low value and medium susceptibility to the effects of the Proposed Development, gives rise to an overall medium sensitivity. The interior of the North West Lowthers is of a medium sensitivity, due to the combination of the medium value and medium susceptibility.

Magnitude of Change During Construction

As shown on **Figure 6.8**, the ZTV covers the area adjoining the southern boundary with the Upper Nithsdale Valley, where the Southern Uplands (LCT 19) transition into Upper Dale (Valley) (LCT 9); and also covers isolated hilltops further north. This pattern of visibility covers the slopes facing toward the Proposed Development, which are generally south to west facing, with no visibility across the north facing slopes and the interior of the uplands. The highest number of turbines (9 to 11) is theoretically visible, only reducing to less on the edges of further afield fragments. Theoretical visibility occurs within a range of approximately 6 to 13 km between the LCU and the closest proposed turbine.

During the construction phase, a **medium-low** magnitude of change would occur across the south facing slopes of the LCU at the transition to Upper Nithsdale (LCT 9) below Kirkland Hill (507 m AOD) and Todholes Hill (481 m AOD); and a **low** magnitude of change would occur to hilltops further afield: Glenguffock Hill (483 m AOD), Polholm Rig (491 m AOD), Shiel Hill (486 m AOD) and Kirklea (468 m AOD). Where there is no theoretical visibility of the Proposed Development, **no change** would occur.

Ground level construction works would have little influence on the slopes of the North West Lowthers LCU which adjoin the Upper Nithsdale LCU (LCT 9) due to screening by intervening hills immediately around the Proposed Development and distance. While the presence and activity of the construction cranes and the emerging turbines would have more of an influence due to their large scale and vertical form, the separation distance of approximately 6 to 13 km, combined with the baseline influence from the operational Whiteside Hill, Sanquhar and Sandy Knowe Wind Farms, which are an established feature of the same upland landscape, would moderate this influence.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would be **medium-low**, across the south facing slopes of the North West Lowthers adjoining Upper Nithsdale (LCT 9); **low**, further north where

the Proposed Development would be less of an influence; and **no change** would occur to remaining areas.

Those factors which potentially would add to the magnitude of change include the additional number of proposed turbines and their larger scale, compared to those of the operational wind farms in the area; which would be apparent from the closer parts of the Lowthers. Those factors which would detract from the magnitude of change include the number and extent of operational wind farms within the Southern Uplands / Nithsdale LCU, where the Proposed Development would also be located and which form an important part of the wider landscape context to the North West Lowthers LCU.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Southern Uplands / North West Lowthers LCU would be **moderate / minor** or **minor** and **not significant** during both the construction and operational phases. The Proposed Development would increase the level of wind farm development within the landscape context but would not redefine the landscape character of this LCU, as this type of development is already well established within the landscape context. Where the North West Lowthers merge into Upper Nithsdale, the effect of the Proposed Development will be **moderate-minor** reducing to **minor** within the interior of the North West Lowthers, which is less associated with the Nithsdale LCU (LCT 19) and influenced by wind farms within South Lanarkshire.

6.7.9 DG LCT 19. Southern Uplands / Lowthers LCU

Baseline

The Lowthers LCU extends south-westwards from the boundary with South Lanarkshire to the Upper Nithsdale LCU (LCT 9). The Crawick Water valley define the area's western boundary with the North West Lowthers LCU. The glens of the Mennoch Water and Dalveen Lane separate the hills of the LCU.

Generally typical of the Southern Uplands, the LCU is characteristically open, large scale and reduces in scale within narrow valleys. The Lowther Hills contain higher hills within Dumfriesshire with peaks between 500 and 700 m AOD, including some 'Corbetts' (hills over 800 m AOD). Smooth hills with rounded summits that are characteristic of the Southern Uplands LCT here, also includes deeply folded slopes, corries and dramatic, incised valleys. Distinctive landmarks within the surrounding landscapes include the Moffat Hills, Cairnmore of Carsphairn, and Queensberry Hill, which is visible from Annandale and Nithsdale. The high, dramatically steep slopes of the Lowther Hills form a dramatic rugged backdrop to Nithsdale. Grass moorland predominates the simple land cover, and tree cover is limited to small blocks of woodland with some commercial forestry confined within the area adjoining the Crawick Water. Native trees and shrubs lie within narrow valleys while heather moorland is notable on the hills.

The small settlement of Wanlockhead lies within the Lowther Hills, but otherwise the LCT is unsettled. Two roads traverse the LCU; the B740, loosely following the Crawick Water; and the B797, along the Mennoch Water. The Lowther Hills provide a distinctive backdrop to nearby settled areas of Nithsdale and Annandale, and further afield, the Glenkens. They lend scenic richness and diversity to the wider context where commercial forestry often detracts from scenic quality. The hills also contribute to the setting of designed landscapes such as Drumlanrig in Nithsdale. A strong sense of naturalness derives from the general absence of built development, although roads, evidence of mining activity near Wanlockhead and a radar installation at Lowther Hill, reduce the LCU's secluded quality.

Sensitivity

The Lowthers LCU is of medium-high value, as it covered by the Thornhills RSA, a designation which denotes the scenic value of the area at a regional level.

This LCU is of medium-low susceptibility to the Proposed Development across the southern part of the LCU adjacent to the Upper Nithsdale (LCT 9) and medium in the central and northern parts of the LCU where there is less influence from development. At the transition between LCTs, operational wind farms, including Whiteside Hill, Sanquhar, Hare Hill and Extension and Sandy Knowe, all located within the same part of the Nithsdale LCU (LCT 19) as the Proposed Development, reduce the susceptibility of the LCU to the effects. These are prominent wind farms, set above the ridgeline enclosing the valley, which influence its character. Modification by farmland, settlement, transport infrastructure, and mining activity in the adjacent Upper Nithsdale LCU (LCT 9) also reduce susceptibility of the Lowther LCU to the Proposed Development.

A series of operational wind farms, lying to the north-west between Abington and Well Hill, exert a medium range influence on the interior of the Lowthers. This area of the uplands is weakly associated with the Nithsdale valley and the Southern Uplands adjoining it to the south. The modified landscape of Upper Nithsdale (LCT 9) and wind farm development in the Nithsdale LCU (LCT 19) have a limited influence on this part of the Lowthers LCU (LCT 19). Some commercial forestry within the LCU and to its periphery slightly modifies its largely natural and remote character.

Much of the Lowthers LCU adjoining Upper Nithsdale (LCT 9), are of medium sensitivity to the effects of the Proposed Development, due to the combination of medium-high value and medium-low susceptibility. The more remote parts, due to the combination of medium-high value and medium susceptibility, are of medium-high sensitivity.

Magnitude of Change During Construction

As shown on **Figure 6.8**, the ZTV covers the closest slopes facing toward the Proposed Development, which are generally south-west to west facing, with no visibility across the north-east to east facing slopes and the interior of the uplands. The highest number of turbines (10 to 11) is theoretically visible and occurs within a range of 8 to 20 km between the LCU and the closest proposed turbine.

During the construction phase, a **medium-low** magnitude of change would occur across the south-west facing slopes of the LCU where it transitions into Upper Nithsdale (LCT 9) below Conrig Hill (485 m AOD), Brown Hill (476 m AOD) and Cairn Hill (449 m AOD); and the upper slopes and summits further afield: Wedder Dod (445 m AOD) and Stood Hill (587 m AOD). A **low** magnitude of change would occur across the small patches of visibility in the remainder of the Lowther Hills, from where the operational Twentysilling Wind Farm would from a similar baseline influence, including from Thirstane Hill (583 m AOD) and Steygall (573 m AOD) between the glens of Mennoch Water and Dalveen Lane, and the area to its east. Where there is no theoretical visibility of the Proposed Development, **no change** would occur.

Ground level construction works would have little influence on the slopes adjoining Upper Nithsdale (LCT 9) due to a combination of screening by intervening hills immediately around the Proposed Development and a minimum distance of approximately 6 km. The presence and activity of the construction cranes and the emerging turbines would have more of an influence due to their large scale and vertical form. The operational Whiteside Hill Wind Farm, just to their west, would moderate this influence as the turbines would be visible in the context of a similar development that is already an established feature of the upland landscape. Further east, the operational Twentysilling Wind Farm would exert a similar influence on the landscape character of the Lowthers LCU, as it is nearer to this area than the Proposed Development, albeit comprising smaller turbines.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would be **medium-low**, across the south-west to west facing slopes of the Lowthers adjoining Upper Nithsdale (LCT 9); **low**, further north and east where the Proposed Development would be less of an influence; and **no change** would occur to remaining areas.

Those factors which would add to the magnitude of change include the additional number of proposed turbines and their larger scale, compared to those of the operational wind farms in the area; which would be apparent from the closer parts of the Lowthers LCU at a range of approximately 6 to 10 km. The magnitude of change would be moderated by the number and extent of operational wind farms within the baseline context; those within the Nithsdale LCU of the Southern Uplands (LCT 19) which forms an important part of the wider landscape context of the Lowthers LCU; and Twentyshill, which is a closer range, more prominent and more influential wind farm across those parts of the LCU to the east.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Southern Uplands / Lowthers LCU would be **moderate / minor** or **minor** and **not significant** during the construction and operational phases. The Proposed Development would increase the level of wind farm development within its landscape context but would not redefine the landscape character of this LCU, as this type of development is already well established within this part of the Southern Uplands. Where the Lowthers LCU merge into the Upper Nithsdale LCU, the effect of the Proposed Development will be **moderate / minor** reducing to **minor** within the interior of the Lowthers and further east, being less associated with the Nithsdale LCU (LCT 19) and influenced by wind farms within South Lanarkshire.

6.7.10 DG LCT 19a. Southern Uplands with Forest / Ken LCU

Baseline

Viewpoint 11 is located in this LCU and is representative of the potential effects of the Proposed Development on this LCU.

The Southern Uplands with Forest LCT comprises an expansive and gently undulating upland plateau, generally between 350 and 500 m AOD in height, with a few higher and pronounced peaks. The LCT extends into neighbouring authority areas, notably at the Ken and Carsphairn LCUs which abut similar upland areas in East Ayrshire.

The Upper Nithsdale LCU (LCT 9) adjoins the northern boundary of the expansive Ken LCU. Foothills (LCT 18a) adjoin the LCU's southern boundary. Southern Uplands (LCT 19), Upland Glens (LCT 10) and Foothills (18), adjoin its eastern boundary; and Southern Uplands (LCT 19 and EA LCT 20a), adjoin the western boundary. The Ken LCU is largely typical of the Southern Uplands. Its hills are generally smooth with rounded summits and deeply intercut by narrow valleys that form a number of smaller scale local landscapes and dramatic corries at the heads of glens. The LCU is made distinct by the steep-sided hills and defined summits of Benbrack, Cairn and Blackcraig, near the head of the Dalwhat Glen (LCT 10); and Stroanfreggan and Round Craigs towards the west of the LCU, which are further landmark features. In contrast to much of the LCT, the Ken LCU includes a comparatively large amount of open ground, largely covered by grass moorland. Within the prevailing coniferous forestry, rides, forest roads, compartment and ownership boundaries form contrasting patterns. Some small areas of hill pasture fringe the lower hill slopes.

The Ken LCU is very sparsely settled, with few public roads. It contains a network of core paths and promoted Heritage Routes. The SUW runs along the ridge of the Benbrack, Alhang, Cairn and Blackcraig hills, where the Andy Goldsworthy Striding Arches sculptures are also located. The rural tracks and roads, and ownership boundaries associated with commercial forestry mark out a geometric pattern across this LCU, with felling activity adding to the textural contrasts across this landscape. The Southern Uplands with Forest LCT tends to be set back from small scale valleys and glens but some hills on its edge form a contrasting backdrop to the adjoining sparsely settled and farmed Dalwhat LCU (LCT 10). These are more prominent from surrounding roads and settlement than the interior of these uplands. Extensive forestry restricts outward views from the LCU. At the head of the Upper Dalwhat, the Benbrack, Alhang, Cairn and Blackcraig hills form a key visual focus. Otherwise, there are few landmark features within the LCU. Further west, between the Ken and

Carsphairn units, the sculptural hill of Cairnsmore of Carsphairn (LCT 19) provides a dramatic feature. Distance from settlement and public roads lends the interior of the LCT a remote quality while extensive commercial forestry and wind farm development inhibits a strong sense of naturalness. Within the LCU are the Sanquhar and Wether Hill Wind Farms, the former lying in the north near Mid Hill; and the latter lying in the south, around the head of the Craiglearn Burn valley.

Sensitivity

The LCU is of medium value, as is not covered by a designation which denotes the scenic value of the area at a national, regional or local level.

The susceptibility of the Ken LCU to the Proposed Development is medium-low. Wind farm development is a key feature of the LCU which contains the operational Hare Hill and Extension, and Wether Hill, to the north and south, respectively. Sandy Knowe and Sanquhar Wind Farms lie on the LCU's north-eastern boundary. These establish wind farm development as an integral part of the LCU's baseline character and reduce its susceptibility to the Proposed Development.

The combination of medium value and medium-low susceptibility, means that the overall sensitivity of the Ken LCU is medium.

Magnitude of Change During Construction

As shown on **Figure 6.8**, the patchy and intermittent ZTV covers most of the upper east-facing slopes and summits of the LCU within 10 km of the Site. The ZTV indicates theoretical visibility of mostly 10 to 11 turbines occurring patchily across the central and northern parts of the LCU and then with practically no visibility across the southern parts and also at the head of the Polskeoth Burn.

During the construction phase, the magnitude of change will range from medium-low in the northern part, to medium in the central part. No change will occur across most of the southern part and other parts of the LCU which have no theoretical visibility of the Proposed Development.

The topography of the Southern Uplands limits the influence of the Proposed Development to the upper east-facing slopes and summits within the LCU. These are closely associated with the surrounding Southern Uplands within Dumfries and Galloway (LCT 19) and East Ayrshire (LCT 20a). While this landform, in combination with commercial forestry, is likely to screen ground level construction activity in many parts, construction cranes and the emerging turbines will be more visible, at approximately 2.5 to 7 km from hilltops and upper slopes facing the Proposed Development. Operational wind farms in the north of this LCU and the adjoining LCTs will moderate the influence of construction activity associated with the cranes and the emerging larger scale turbines of the Proposed Development. South of the Polskeoth Burn and Water of Ken, the influence of these wind farms decreases, and construction works associated with the Proposed Development will be perceived as a greater influence. In the southern part there would be practically no visibility of the construction works.

Magnitude of Change During Operation

During the operational phase, the magnitude of change will range from medium-low in the northern part, to medium in the central part. No change will occur across most of the southern part and the parts of the LCU which have no theoretical visibility of the Proposed Development.

Operational wind farm development exerts a strong influence on the northern parts of the LCU, with this influence decreasing to the south. Several operational wind farms lie within the north of the LCU and the immediately adjoining landscape. The proposed turbines, despite being larger than existing turbines, conform with the baseline pattern of wind farm development in which turbines are set along the ridgelines and upper slopes of the Southern Uplands. Further south, the level of operational wind farm development is much lower, as the enclosure of topography and forestry restrict much of its influence. The Proposed Development would adjoin the operational Whiteside Hill Wind Farm, slightly increasing its influence and that of wind farm development generally.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Southern Uplands / Ken LCU would be **moderate** or **moderate / minor** and **not significant** during the construction and operational phases. The Proposed Development would increase the level of wind farm development within the immediate landscape context of the LCU but would not redefine the landscape character of this LCU, as this type of development is already well established within the landscape context. The effect of the Proposed Development will be **moderate-minor**, reducing to **minor** within the south which is less associated with the Nithsdale LCU (LCT 19) and more influenced by wind farms to the north-west and north.

6.7.11 EA LCT 10. Upland River Valley / Nith LCU

Baseline

Viewpoints 5 and 8 are located in this LCU and are representative of the potential effects of the Proposed Development on this LCU.

Plateau Moorlands (EA LCT 18a, 18b), Southern Uplands (EA LCT 20a, 20c) and Foothills (EA LCT 17a, 17b) enclose the broad but relatively small Nith LCU of the Upland River Valleys LCT.

Although the often steep, valley sides vary in gradient, there are also gentler lower slopes, occasional broader terraces and subtle knolls in places. The valleys often contain open floodplains, which are wide and flat at the Rivers Nith and Doon, and narrower at the Rivers Irvine and Ayr. Riparian woodland, mixed policy woodlands and small woodlands occur in localised areas, while coniferous woodland is a common feature on upper valley sides. Shelterbelts, hedges and stone dykes enclose small to medium sized fields on lower slopes with semi-improved pasture, open grass moorland above. The LCT is a relatively well settled landscape with major 'A' roads along the valleys and minor roads providing access to small farms and houses on lower hill slopes. The LCT contains built industrial infrastructure and coal mining operations, both active and inactive, and several designed landscapes. Operational wind farms are not located in this LCT but Hare Hill Wind Farm and Extension are prominent within the immediate vicinity of the Nith valley. From the valleys, the uplands define the skyline, which becomes lower and less distinctive in places. Prominent landmark hills lie on the edges of the surrounding uplands.

The Nith LCU covers Nithsdale between New Cumnock and the southern border with Dumfries and Galloway. The Southern Uplands within Dumfries and Galloway (LCT 20a) and East Ayrshire (EA LCT 18) strongly contain the relatively broad valley and flat floodplain formed by the meandering River Nith, although the valley sides are gentler than in other parts of Nithsdale. The river and associated wetlands and water bodies are prominent land cover features within Nithsdale. Numerous small watercourses drain into the River Nith, with associated riparian woodland, hedgerow trees and occasional shelterbelts comprising the relatively low tree cover. The LCU is largely agricultural, with small to medium sized fields across the valley floor and lower slopes, often enclosed by stone dykes or hedges. Upper valley sides contain semi-improved pastures, more open grass moorland and, around Corsencon Hill, coniferous woodlands. The relatively straight A76 runs along the floor of the valley with the Glasgow - Carlisle Railway Line following this pattern further north. Minor roads and access tracks connect a number of farms and houses dispersed across the lower hill slopes. These have elevated views across the Nith valley, where the enclosing uplands are lower and less distinctive. Lying on the northern side of the valley, Corsencon Hill is a prominent landmark within the LCU. Two wind turbines lie within the LCU at Meikle Garclough. Otherwise, operational wind farm development lies outside the LCU but within its wider landscape context, notably at Hare Hill and Extension on the enclosing ridgeline to the south.

Sensitivity

The Nith LCU of the Upland River Valley LCT (East Ayrshire) is of medium-high value, as it is covered by the New Cumnock Sensitive Landscape Area (East Ayrshire), a designation which denotes the scenic value of the area at a local level.

The susceptibility of the Nith LCU to the effects of the Proposed Development is medium-low. This LCU is susceptible to wind farm development within the adjoining area of Southern Uplands within East Ayrshire, and Dumfries and Galloway. This area includes the operational Sanquhar, Sandy Knowe and Hare Hill wind farms which influence this part of Upper Nithsdale. Due to the pattern of wind farm development and the topography of the area, Hare Hill has a close range influence on the LCU. Settlement, transport infrastructure including the A76, extensive farmland and areas of commercial forestry modify the landscape character of the LCU and reduces its susceptibility to the Proposed Development.

The medium-high value of the Nith LCU, combined with its medium-low susceptibility to the effects of the Proposed Development, gives rise to an overall medium sensitivity.

Magnitude of Change During Construction

ZTV coverage is restricted to the northern valley slope, extending from Corsencon Hill (475 m AOD) to Avisyard Hill (330 m AOD) within the East Ayrshire Plateau Moorlands (LCT 18a / Wardlaw Hill LCU), to the east and west, respectively. The fragmented ZTV indicates theoretical visibility of 10 to 11 turbines across the upper slopes, reducing gradually across the middle to lower slopes, as well as reducing over the rounded summits above the upper slopes. The remaining parts of the LCU have no theoretical visibility of the Proposed Development.

During the construction phase, the magnitude of change would be **medium-low**. **No change** would occur where there is no theoretical visibility of the Proposed Development. The opposite southern slopes of the valley would screen ground level construction works, from the northern slopes, while high-level construction works associated with construction of the turbines would be visible. The presence and activity of the construction cranes, and the emerging turbines would exert some influence on this LCU. While the separation distance of over 10 km and the settled and modified nature of the valley tempers the magnitude of change, it is the extent of operational wind farm development in the LCU's landscape context that moderates much of the effect of the Proposed Development. These are a characteristic feature of the Southern Uplands in Dumfries and Galloway (LCT 19 / Nithsdale LCU) that enclose the Upper Nithsdale valley.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would be **medium-low** and **no change** would occur where there would be no visibility of the Proposed Development. The proposed turbines would be theoretically visible across the northern valley side of this LCU. The Proposed Development would influence the character of the LCU as the proposed turbines would appear as medium scale and prominent structures in close proximity to the ridgeline enclosing the valley.

The settled and modified nature of the valley would moderate the effect of the Proposed Development on its character, to a degree, while the extent of operational wind farm development in the LCU's landscape context would moderate much of its effect. Operational wind farms at Whiteside Hill, Sanquhar, Sandy Knowe, Hare Hill and Hare hill Extension exert a greater influence on the LCU and are a characteristic feature of the Southern Uplands in Dumfries and Galloway (LCT 19 / Nithsdale LCU). Furthermore, the Proposed Development would be seen at a minimum of approximately 10 km which would contain its extent within the wider landscape context and although the proposed turbines would be taller than the operational turbines, their more distant range would reduce the disparity.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Upland River Valley / Nith LCU would be not **moderate / minor** and **not significant** during both the construction and operational phases. The effects of the Proposed Development would be indirect and it would not redefine the landscape character of the Nith LCU, mainly because the Proposed Development would be located within an adjoining LCT where operational wind farm development is a key feature. Across the remainder of the LCU there would be no visibility and therefore no effect.

6.7.12 EA LCT 18a. East Ayrshire Plateau Moorlands / Wardlaw Hill LCU

Baseline

Viewpoint 14 is located in this LCU and is representative of the potential visual effects of the Proposed Development on this LCU.

Plateau Moorlands extend into South Lanarkshire and Dumfries and Galloway, providing a backdrop to the settled Lowlands (EA LCT 7c) and abutting the settled Upland River Valleys (EA LCT 10) of the upper Ayr, Irvine and Nith. These upland plateaux are generally undulating with subtly rounded hills below 400 m AOD and some prominent, more defined hills which form landmark features from the adjoining landscapes (EA LCTs 10 and 15) and further afield, the Lowlands (EA LCT 7c). Land cover is predominantly grass moorland, with coniferous plantations on the lower, outer fringes, and small, enclosed pasture and mixed woodlands on lower hill slopes. While the LCT is largely inaccessible by road, the B743 and narrow minor roads provide access to settlement on lower hill slopes south-east of Galston. Settlement is very sparse within the interior of the LCT but, at the transition with the Lowlands (EA LCT 7c) and Upland River Valleys (EA LCT 10), dispersed farms and houses lie on lower hill slopes. Visibility of the surrounding landscape from the LCT is limited. To the east, the B743 provides views into its interior while dense woodland restricts views from its narrow minor roads. Where open, these tend to focus on panoramic views to the west. Dramatic views are available from the summits of prominent landmark hills.

Centred on Wardlaw Hill (497 m AOD), the Wardlaw LCU extends east from Cumnock and the A70 to the Southern Uplands (LCT 19) within Dumfries and Galloway. The LCU is characteristic of the Plateau Moorlands and comprises undulating upland plateaux and more defined, prominent landmark hills. Within this LCU, these are Cairn Table, on the boundary with South Lanarkshire; Wardlaw Hill; and Corsencon Hill, in the south-eastern corner of the LCU. The latter is prominent from the neighbouring Nith valley (EA LCT 10) and its Upland Basin (EA LCT 15). The LCU is predominantly open and covered by grass moorland, with tree cover restricted to its edges. A broad band of coniferous forestry runs along the south-eastern boundary, while a coniferous plantation lies west of Wardlaw Hill at Glenmuir. The south-west fringes contain small, enclosed pastures on lower hill slopes. From the northern, western and southern boundaries a few minor roads and access tracks extend towards the interior of the LCU. Settlement is restricted to dispersed farms and houses on lower hill slopes abutting Upland River Valleys (EA LCT 10) and Upland Basin (EA LCT 15). Disused and operational opencast workings with access tracks and spoil heaps lie on the periphery of the area, east of Airds Moss and north of New Cumnock. While the interior has a distinct sense of naturalness and can feel secluded, commercial forestry and mine workings towards the edges of the LCU detract from these qualities.

Operational wind farm development is not located within this LCU, but associated areas of South Lanarkshire and Dumfries and Galloway do contain wind farms that influence the character of the LCU. The ridgeline enclosing the Upper Nithsdale LCU (LCT 9) in particular, is populated by turbines with the Whiteside Hill, Sanquhar, Hare Hill and Sandy Knowe wind farms. Wind farm development within South Lanarkshire, being much further away, exerts less of an influence on the LCU.

Sensitivity

The Wardlaw Hill LCU is of medium-high value, as it is covered by the New Cumnock Sensitive Landscape Area (East Ayrshire), a designation which denotes the scenic value of the area at a local level.

The susceptibility of the Wardlaw Hill LCU to the effects of the Proposed Development is medium-low. This LCU does not contain operational wind farm development and, while similar development is located in adjoining areas of South Lanarkshire and Dumfries and Galloway, their influence is medium range. Where the southern edge of the plateaux descends into Upper Nithsdale, the Wardlaw Hill LCU is more susceptible to the effects of wind farm development. Operational wind farms at Whiteside Hill, Sanquhar, Hare Hill and Sandy Knowe wind farms are prominent features above the ridgeline enclosing the Upper Nithsdale valley. The influence these have on the character of the Wardlaw Hill LCU reduces its susceptibility, and the modified nature of the valley landscape reduces it further.

Where the southern edge of the plateaux descends into Upper Nithsdale, the medium-high value and medium-low susceptibility gives rise to an overall medium sensitivity. The interior of the plateaux is more closely associated with the surrounding uplands and have a weaker association with LCT 19 / Nithsdale LCU, whose modified landscape and operational wind farm development exert little influence on the remote and largely natural character of the plateaux interior. Here, the medium-high value and the medium susceptibility gives rise to an overall medium-high susceptibility.

Magnitude of Change During Construction

The ZTV covers three areas: the plateau fringe adjoining the Upper Nithsdale valley (EA LCT 10 / Nith LCU); the summit of Wardlaw Hill and adjoining upper slopes; and a group of three lower hills including Auchtitench Hill. The ZTV is slightly fragmented and indicates theoretical visibility of 10 to 11 turbines, generally reducing gradually across south-facing slopes towards the Proposed Development. The remaining parts of the LCU have no theoretical visibility of the Proposed Development.

During the construction phase, the magnitude of change would be **medium-low** across the plateau fringe and **low** across the hill summits and upper slopes. **No change** would occur where there is no theoretical visibility of the Proposed Development.

From the plateau fringe, the local topography would limit the influence of the construction works to high-level construction works associated with construction of the turbines. In particular, the presence and activity of construction cranes, and the emerging turbines would influence this LCU. The settled and modified nature of the valley would moderate this to some degree, while the extent of operational wind farm development in the LCU's landscape context enclosing the Upper Nithsdale valley, that is characteristic of the Southern Uplands in Dumfries and Galloway (LCT 19 / Nithsdale LCU), would greatly moderate the effects of the development.

Extensive commercial forestry covers the area around Auchtitench Hill, extending south-west to Corsencon Hill. The scale of this forestry compounds the settled and modified nature of the Upper Nithsdale valley and also restricts visibility of the Proposed Development. These factors, in combination with the level of operational wind farm development lying on the ridge enclosing the valley greatly moderates the influence of construction works on the character of the LCU.

The area around Wardlaw Hill lies over 10 km from the Site and the Upper Nithsdale valley is less influential here than the surrounding plateau. In this area, distance and areas of extensive commercial forestry are limiting factors regarding the effects of construction. Operational wind farm development along the valley's ridgeline is particularly influential on this area due to its southerly aspect.

Magnitude of Change During Operation

During the operation phase, the magnitude of change would be **medium-low** across the plateau fringe and **low** across the hills. **No change** would occur where there is no theoretical visibility of the Proposed Development.

The plateau fringe between Corsencon Hill and Avisyard Hill is closely associated with the Upper Nithsdale valley and the enclosing Southern Uplands. The valley's settled and modified nature would moderate the effects of the Proposed Development to some extent. Operational wind farm development within the Southern Uplands in Dumfries and Galloway (LCT 19 / Nithsdale LCU) is an established feature of this landscape forming part of the LCU's landscape context. While the Proposed Development would increase the indirect influence of wind farm development on the plateau moorlands, closer-range, existing wind farm development would moderate the influence of the Proposed Development on this area. This would decrease further in the area around Auchtitench Hill, due to the additional moderating effects of distance from the Proposed Development and commercial forestry which restricts its visibility. Similar factors limit the effects of the Proposed Development in the area around Wardlaw Hill, which is further away from the Site and more closely associated with the surrounding plateau.

Significance of Effect

The effect of the Proposed Development on the landscape character of the East Ayrshire Plateau Moorlands / Wardlaw Hill LCU would be **moderate / minor** or **minor** and **not significant** during the construction and operational phases. The Proposed Development would increase the level of wind farm development within the immediate landscape context of the LCU but would not redefine the landscape character of this LCU, as this type of development is already well established within the landscape context.

6.7.13 EA LCT 20a. East Ayrshire Southern Uplands / Ken LCU

Baseline

This LCT comprises a relatively narrow band of hills, between 360 and 700 m AOD in height, enclosing Glen Afton and bordering the Southern Uplands and Southern Uplands with Forestry LCTs in East Ayrshire and Dumfries and Galloway. The LCT lies in two units either side of Glen Afton. The Ken LCU lies to the east, where the hills are higher, steeper and more distinct with interlocking ridges cut deeply by water courses. Hare Hill and the rugged Blackcraig Hill are notable in this area. To the west, the hills are gentler and lower with complex interlocking ridges. Grass moorland and occasional patchy heather covers the generally open uplands. Public roads and settlement do not lie within the LCT, but operational wind farm development, extensive commercial forestry and associated access tracks are located within it. These inhibit the area's qualities of naturalness and wildness. Walking routes to Blackcraig Hill from Afton Reservoir, over the uplands from this hill and from Cairnsmore of Carsphairn (LCT 19) provide close range views of the uplands. The hills are visible from roads and settlement within the Nith Valley (EA LCT 10) and its related Upland Basin (EA LCT 15), adjoining the northern boundary; and Afton Glen, bisecting the LCT. They form a scenic backdrop that contrasts with lower and simpler upland areas within the wider surrounding area.

Operational wind farm development lies within this LCT and adjoining landscapes. This includes Hare Hill and Extension Wind Farm which extends eastwards into Southern Uplands within Dumfries and Galloway (LCT 19 / Nithsdale); and Afton Wind Farm, within the Upland Glen of Glen Afton (EA LCT 14). Both are visually prominent, due to their locations on a well-defined steep-sided hill and close to the edge of the cleft cut by the Afton Glen, respectively.

Sensitivity

The Ken LCU is of medium-high value, as it is covered by the New Cumnock Sensitive Landscape Area (East Ayrshire), a designation which denotes the scenic value of the area at a local level.

The LCU is of medium-low susceptibility to the effects of the Proposed Development. Operational wind farms within the LCU (Hare Hill and Hare Hill Extension) and within its immediate landscape context (Afton, Windy Standard II and Windy Rig) are a key feature of the LCU. As wind farm development is an integral part of the LCU's baseline character this greatly reduces its susceptibility to the effects of the Proposed Development.

The combination of medium-high value and medium-low susceptibility, means that the Ken LCU (East Ayrshire) is of medium sensitivity.

Magnitude of Change During Construction

Within this relatively small LCU, the ZTV on **Figure 6.7** shows visibility occurring in isolated patches covering the upper slopes of Hare Hill, Blackcraig Hill and the northern slopes of Blacklorg Hill. A series of hills north-east of Blacklorg Hill and along Kello Water lying between 525 and 593 m AOD effectively screen the Proposed Development from much of the LCU, apart from these hilltops.

During the construction phase, the magnitude of change would be medium-low at Hare Hill and Blackcraig Hill; and no change would occur across the remaining parts of the LCU, which have no theoretical visibility of the Proposed Development. The hills along Kello Water would screen ground level works from much of this LCU. Construction cranes and the emerging turbines would form a readily visible, close-range feature from the hilltops of Hare Hill and Blackcraig Hill. Operational wind farms at Hare Hill, Hare Hill Extension, Sanquhar and Whiteside Hill would moderate the influence of construction activity associated with the cranes and the emerging larger scale turbines of the Proposed Development. Further operational wind farms further south at Afton, Windy Standard and Windy Rig also influence Blackcraig Hill.

Magnitude of Change During Operation

During the operational phase, the magnitude of change would be **medium-low** at Hare Hill and Blackcraig Hill; and **no change** would occur across the remaining parts of the LCU.

The Proposed Development would have some influence on the character of this LCU, as it would lie a minimum of approximately 6 km and proposed turbines would be larger than existing wind turbines in the area. The Proposed Development would occupy an upland area already defined by wind farm developments within the landscape context of the LCU. Operational wind farms entirely within the LCU (Hare Hill, Hare Hill Extension); extending into the LCU from adjoining landscapes (Sandy Knowe); and exerting a strong influence from within adjoining landscapes (Sanquhar, Whiteside Hill, Afton, Windy Standard and Windy Rig) would moderate this influence.

No change would occur in those areas where there would be no visibility of the Proposed Development.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Ken LCU (East Ayrshire) would be **moderate / minor** and **not significant** during the construction and operational phases. The Proposed Development would increase the level of wind farm development within the immediate landscape context of the LCU but would not redefine the landscape character of this LCU, as this type of development is an already established feature of the landscape context. While the proposed turbines would have a noticeable influence on the character of the LCU, this would be within the close-range influence of several operational wind farms. The effect of the Proposed Development would be **moderate-minor**, during both phases and would be restricted to the hilltops of Hare Hill and Blackcraig Hill with no effect across the remainder of the area.

6.8 Assessment of Effects on Landscape Designations

The effects of the Proposed Development can vary widely across a landscape planning designation and the distinction where significant and not significant effects may occur within the same designation is of particular importance in the assessment. Where this is the case, the assessment has defined boundaries through the designation which express the differing effects of the Proposed Development.

The scoping process involved a preliminary assessment to identify those landscape designations with potential to undergo significant effects as a result of the Proposed Development. Statutory consultees have raised no objections to focusing the detailed assessment on the landscape designations presented below, which have potential to be significantly affected.

- Thornhill Uplands RSA;
- Galloway Hills RSA; and
- New Cumnock SLA (East Ayrshire).

A series of documents and technical papers supporting the LDP2 provide background information and guidance that is not included in the Plan. The technical paper 'Regional Scenic Areas'⁸³ (Dumfries and Galloway Council, 2018), describes the Thornhill Uplands and Galloway Hills RSAs.

Information about the East Ayrshire Sensitive Landscape Area is provided within the 'Sensitive Landscape Area - Background Paper'⁸⁴ (East Ayrshire Council, 2015). This confirms the LCUs that make up the SLA and outlines their key characteristics and reasons for inclusion within the local designation. These are shown in Table 1 (pp5-7) and mapped in Map 1 (p4). The discrete units of the SLA are shown on Map 2 (p8).

The effects on landscape planning designations with potential to be significantly affected are assessed below.

6.8.1 Thornhill Uplands Regional Scenic Area

Baseline

The Thornhill Uplands RSA covers the area around the River Nith and its tributaries between Menzies and Auldgrith. Within the 20 km Study Area, it covers the Nithsdale valley (LCTs 9 and 7), parts of the adjoining Southern Uplands (LCT 19) including the Lowther Hills, and associated foothills (LCT 18) and upland glens (LCT 10). These strongly contrasting upland and valley landscapes lend the RSA a varied character, with a relatively smooth topography despite their contrasting relief. Compared with the Galloway Hills RSA to the west, the RSA is generally more populated and has a more managed quality.

The comparatively lush and strongly contrasting character of the Nith valley ranges from steep wooded gorge (LCT 9 / Upper Nithsdale), to broad and pastoral (LCT 7 / Mid Nithsdale, LCT 5 / Upper Cairn LCU), in the south. Outcrop hills demarcate this change. The River Nith flows through agricultural land covering the valley floor. Relatively extensive tree cover includes patches of mostly broadleaved woodland, as well as policy woodlands at Drumlanrig, and with some blocks of coniferous forestry encroaching from the hills and into the valley. The A76 and Glasgow to Carlisle railway line broadly follow the river, while the broader, more open part of the valley contains the settlements of Sanquhar and Kirkconnel, while farmsteads are dispersed across the lower valley sides.

The enclosing upland hills (LCT 19) are steep sided, but rounded and smooth. Deep clefts and long, deep, U-shaped glens incise the hills which form complex spurs and ridges. The summits of the

⁸³ Dumfries and Galloway Council (2018). Regional Scenic Areas. <https://www.dumgal.gov.uk/article/15343/Technical-Papers-Land-Use-Audits-and-Supporting-Documents> Accessed May 2022

⁸⁴ East Ayrshire Council (2015). Sensitive Landscape Area - Background Paper. <https://www.dumgal.gov.uk/article/15343/Technical-Papers-Land-Use-Audits-and-Supporting-Documents> Accessed May 2022

Lowther Hills, in the north, are exposed and remote. Heather moorland and rough grassland covers higher areas; bracken and rushes cover the lower slopes of the glens; and some improved pasture covers the valley floor. Drystone dykes enclose lower areas. To the west of the RSA, commercial forestry encroaches on valley heads and side valleys but otherwise tree cover is relatively sparse. Roads along the deep glens provide access to isolated farms.

To the south, the narrow glens of the Scaur, Shinnel and Dalwhat Waters (LCT 10) incise the Foothills (LCT 18) descending from the western uplands to the Nithsdale valley. Towards the valley, these comprise a complex landform of small hills with a diverse and intricate pattern of land cover. This includes policy woodlands and small fields interspersing scrub and species-rich grassland on steeper hill slopes. Lower slopes host dispersed farmsteads and houses. Further west, the landform is largely irregular with rugged, open slopes and well-defined peaks that provide a backdrop to the glens. These provide a scenic contrast from the Cairn valley and middle Nithsdale. Descending from the eastern uplands to the Nithsdale valley, a small area of Foothills with Forest (LCT18a) merges into Upland Fringe (LCT 16) above Thornhill. This settled area's rolling landform has a diverse cover including broadleaved woodlands and small enclosed pastures on lower slopes.

Sensitivity

The value of the Thornhills Uplands RSA is medium-high, as recognised by designation at the regional level, which denotes a special landscape value of regional importance.

The RSA is of medium-high susceptibility to the effects of the Proposed Development within approximately 10 km of the Site. This area of Southern Uplands (LCT 19 / Nithsdale LCU) and Upland Glens (LCT 10 / Scaur LCU) would be most influenced by the Proposed Development. To the north-east, the Upper Nithsdale LCU (LCT 9) and adjoining areas of the Lowther Hills LCU (LCT 19) are of medium susceptibility, due to the close-range influence of the operational Twentysilling Wind Farm. Within the area of the RSA south-east of Benbuie, Auchenhessnane and Drumlanrig; the Dalveen Lane glen; the southern end of Upper Nithsdale (LCT 9) and Mid Nithsdale (LCT 7), susceptibility is medium-high, as operational wind farm development has little to no influence on these areas.

The sensitivity of the RSA to the effects of the Proposed Development is medium-high, in the Southern Uplands (LCT 19), the upper valley sides enclosing the Scaur LCU (LCT 10), the Upper Nithsdale LCU (LCT 9), adjoining areas of the Lowther Hills (LCT 19), the Upland Glens (LCT 10) and the area of the RSA to the south-east.

Magnitude of Change During Construction

The upland topography of the area largely restricts the theoretical visibility to the northern half of the RSA, which lies closest to the Proposed Development. Patches of visibility occur across the hills that enclose the Scaur Water which lie to the immediate south of the Proposed Development and across the hills that enclose the Nith Valley to the east and south-east of the Proposed Development. These patches of visibility occur within approximately 5 to 10 km of the Proposed Development, with visibility beyond this extent reduced to isolated patches, the most notable being around Wauk Hill at approximately 16 to 18 km.

In the north-western part of the RSA, the ZTV indicates that theoretical visibility is largely continuous near the Site and swiftly breaks up into long patches covering the ridges adjoining the glen of the Scaur Water. A similar pattern is observable further north-east, where increased fragmentation of visibility is due to the numerous valleys adjoining the Upper Nithsdale valley. As the valley curves south westwards, landform limits visibility to within 10 km of the Site on the southern side of the valley, while it continues as far south as Bellybought Hill (436 m AOD), approximately 16 km from the Site on the northern side. The ZTV indicates theoretical visibility of 10 to 11 turbines, reducing to no visibility as the northern side slopes descend to the area around Thornhill. Within the valley, patches of lower theoretical visibility (1 to 3 turbines) south of Enterkinfoot combine as the land rises to create larger patches with moderate levels of theoretical visibility (7 to 10 turbines) at the RSA's southern

boundary. Beyond these areas, the ZTV is generally restricted to hilltops with large areas of no theoretical visibility in between.

During the construction phase, the magnitude of change would be **medium-high** to **medium**, across the Southern Uplands (LCT 19) and localised parts of the Scaur LCU (LCT 10) out to approximately 5 km to the south and south-east, where the RSA lies adjacent to the southern edge of the Proposed Development. The RSA does not lie to the west or north of the Proposed Development. The RSA is offset approximately 4 to 5 km from the eastern edge of the Proposed Development and beyond this, the magnitude of change would be **medium-low** or **low**, owing to the closer range influence of operational Twentyshilling Wind Farm and / or the screening effect of intervening landform. Where there would be no visibility, there would be **no change**.

Ground level construction works would have little visible presence or influence on the RSA beyond the area of the Southern Uplands (LCT 19) to the immediate south of the Site. The presence and activity of tall cranes and the emerging turbines would be the most prominent and influential construction elements where visibility occurs in the RSA, owing to their height. Ground level construction elements, including the excavation of borrow pits and formation of tracks, BESS, substation, foundations and crane pads would also have an influence, albeit only on closer range parts and with screening from the enclosing ridgeline. The influence of the cranes and emerging turbines would be strongest across the Southern Uplands adjoining the glen of the Scaur Water (LCT 10 / Scaur LCU), decreasing to the east where the operational Twentyshilling Wind Farm is a stronger, close-range influence. Further afield, the Southern Uplands (LCT 19) is less prominent within the wider landscape context including in respect of the Lowther Hills, and operational wind farms therein would limit the additional influence of the Proposed Development's emerging turbines.

The uplands hosting the Proposed Development enclose the glen of Scaur Water and are strongly associated with it, but the location of the Proposed Development is such that the glen's enclosing ridgeline would limit its influence during construction to higher level works and the emerging turbines. Their influence within the valley would be intermittent and variable in level, becoming more high level and consistent on the adjoining side valley ridges that continue into the uplands. The deep glens of the Mennock Water and Dalveen Lane, contained by the Lowther Hills, have limited visibility of the Proposed Development and little association with the upland landscape hosting the Proposed Development, whose construction would have little influence on their character.

Magnitude of Change During Operation

During the operation phase, the magnitude of change would be **medium-high** to **medium**, across the Southern Uplands (LCT 19) and localised parts of the Scaur LCU (LCT 10) out to approximately 5 km to the south and south-east, where the RSA lies adjacent to the southern edge of the Proposed Development. The RSA does not lie to the west or north of the Proposed Development, is offset approximately 4 to 5 km from the eastern edge of the Proposed Development and lies adjacent to the southern boundary. Beyond this, the magnitude of change would be **medium-low** or **low**, owing to the closer range influence of operational Twentyshilling Wind Farm and / or the screening effect of intervening landform. Where there is no theoretical visibility of the Proposed Development, **no change** would occur.

The proposed turbines would form a notable presence within approximately 5 km of the Proposed Development. They would comprise large scale, vertical structures within the simple upland landscape, where operational turbines already populate and strongly influence the area. The greater scale of the proposed turbines compared to the operational turbines means they would be more prominent, would provide some contrast to the operational turbines, and would have a slightly greater influence on the landscape.

The influence of the Proposed Development would be medium-high or medium on those closest parts of the RSA that coincide with the Southern Uplands (LCT19) and the ridges of side valleys adjoining the glen of the Scaur Water (LCT 10) within approximately 5 km of the Proposed Development.

Initially strong in the north, where the proposed turbines would be partially visible above the enclosing ridgeline, the influence of the Proposed Development on the largely natural and remote glen would quickly reduce further south to low or no change in those large parts without visibility.

The close association between the Upper Nithsdale LCU (LCT 9) and the adjoining uplands means that the Proposed Development would also clearly influence the Nithsdale valley, north-west of Enterkinfoot, alongside operational wind farms including Twentysilling, Whiteside Hill and Sanquhar. These are dispersed across the uplands above the valley with Twentysilling distinctly separate from the other developments. The cumulative ZTV in **Figure 6.13a** shows that the Proposed Development and Whiteside Hill would be visible from broadly the same extents, with the Proposed Development mostly seen to the fore. The cumulative ZTV in **Figure 6.13h** shows that from the RSA, visibility of the Proposed Development would also coincide with visibility of Twentysilling, with the latter being closer range and with the extents of visibility being greater across the RSA than that of the Proposed Development. Many of the operational turbines in these developments are visible above the ridgeline enclosing the settled valley. The Proposed Development would be contiguous with Whiteside Hill Wind Farm, apparently increasing its geographical extent and increasing its influence on the surrounding area. Here the magnitude of change would range from medium to low, with no change in those parts without visibility.

Beyond 10 km of the Site, limited visibility of the operational Proposed Development would largely restrict its influence on the RSA across the Lowthers LCU (LCT 19). This is less closely associated with the Nithsdale LCU (LCT 19) and more influenced by the adjoining Southern Uplands extending into South Lanarkshire. The pattern of wind farm development within the LCU and the topography of the wider surrounding area would weaken their influence east of Enterkinfoot. Distance from the Site would compound this decreasing influence. The operational Twentysilling Wind Farm is prominent within this area of the RSA and more influential than the operational wind farms within the Nithsdale LCU (LCT 19). It would exert more of an influence than the operational Proposed Development. The influence of the Proposed Development on these areas would be **low**, decreasing to **no change** where there would be no visibility.

Within the RSA south of Enterkinfoot, the upland landscape hosting the Proposed Development weakly influences the Nithsdale valley, due to screening by intervening landform; and the mouths of the Mennoch Water and Dalveen Lane glens, due to their highly enclosed nature and very limited association with the wider landscape context. The closer and more prominent Twentysilling is more influential on these areas. The influence of the Proposed Development on these areas would be **low**, decreasing to **no change** where there would be no visibility.

Significance of Effect

Due to the influence of topography, the effect of the Proposed Development would vary in significance across the RSA. By and large, the significance of effects would not change between the construction and operation phases because the magnitude of change arising from the Proposed Development largely derives from the emerging or completed proposed turbines.

During both phases, the effect of the Proposed Development on the landscape character of the Thornhill Uplands RSA during construction and operation would be **major / moderate** and **significant** within the uplands adjacent to the Site (LCT 19 / Nithsdale LCU) and enclosing the glen of the Scaur Water (LCT 10 / Scaur LCU). There would also be **moderate** and **significant** effects in the northern part of the Scaur Water (LCT 10 / Scaur LCU).

The vast majority of the RSA would either undergo no effect owing to no visibility or a limited effect owing to limited visibility. During both phases, the effect of the Proposed Development on these remaining parts of the Thornhill Uplands RSA would be **not significant**, with a **moderate** to **moderate-minor** effect on the Upper Nithsdale Valley (LCT 9 / Upper Nithsdale LCU), **moderate-minor** effect on the Lowther Hills (LCT 19 / Lowthers LCU) and the glen of the Mennoch Water, and **minor** effect on the glen of Dalveen Lane.

The Proposed Development would represent an increase in wind farm development within the immediate landscape context of the northern part of the RSA, where its influence would be strongest due to its close proximity and in an area where wind farm development is already an established characteristic feature. The vast majority of the RSA would undergo **not significant** effects owing to no or limited visibility of the Proposed Development. Where significant effects would arise, these would be localised and would not affect the integrity of the RSA as a whole, which would continue to be defined by the contrasting upland and valley scenery. All effects would be indirect owing to the location of the Proposed Development outwith the RSA and therefore would relate to the extents to which the Proposed Development would be visible from within the RSA.

6.8.2 Galloway Hills Regional Scenic Area

Baseline

Adjoining the southern boundary with Ayrshire, the Galloway Hills RSA covers the area between the Glenkens valley (LCTs 8 and 9) and the valley of the River Cree (LCT 4) as far south as the coast at Wigtown (LCT 2), Gatehouse of Fleet and Castle Douglas. It covers central Galloway's Rugged Granite Uplands (LCT 21), Coastal Granite Uplands (LCT 20), and includes the Fleet Valley NSA and its setting. South of the Fleet Estuary the RSA merges into the Solway Coast RSA. The diverse character of the RSA includes heather covered slopes and granite outcrops in the massive, craggy Rugged Granite Uplands (LCT 21); smooth and round Foothills (LCT 18); and Foothills with Forest (LCT18a), in particular at the eastern slopes of the Rhinns of Kells. These hills are the second-highest range of the Galloway Hills, and includes the highest hill, Corserine (814 m AOD).

The RSA extends north-east from the Upper Glenkens (LCT 9) to include the dramatic sculptural peaks of Cairnsmore of Carsphairn (LCT 19). Peripheral Narrow Wooded Valleys (LCT 4) along the River Cree adjoining Wigtown's Coastal Flats (LCT 2), and north of the associated bay, provide a scenic juxtaposition with the broader area of uplands. The central area of the RSA is only accessible via forestry roads, the A712 'Queensway', the Rusko or Coarse of Slakes roads, or by foot and is devoid of settlement. Villages and small towns, including Wigtown, Gatehouse of Fleet and Newton Stewart, lie at the mouth of or within the peripheral valleys, alongside various tourist facilities, camping and caravan sites. Reflecting the scale of the Galloway Hills and the relationship of the constituent upland, valley and coastal landscapes, this is the largest RSA. Views of the hills, particularly from west of Wigtown Bay and parts of the valley are sweeping and dramatic.

Sensitivity

The value of the Galloway Hills RSA is medium-high, as recognised by its designation at the regional level, which denotes a special landscape value of regional importance.

Within the Galloway Hills RSA, the cluster of higher hills around Cairnsmore of Carsphairn and within the Rhinns of Kells, are of medium-low susceptibility to the Proposed Development; and remaining areas of the RSA are of low susceptibility.

As the Southern Uplands / Nithsdale LCU is part of the RSA's wider landscape context, the influence of operational wind farms is indirect and mid to long-range. The extensive RSA lies at least 11 km from the Site and extends beyond the 45 km Study Area, as shown on **Figure 6.11**. Higher landform, that provides greater visibility of the wider landscape context, makes two areas within the RSA more susceptible to the effects of the Proposed Development. The first lies within approximately 15 km of the Site and comprises a cluster of several hills within the Southern Uplands / Carsphairn LCU: Cairnsmore of Carsphairn (797 m AOD), Beninner (710 m AOD) and Moorbrock Hill (650 m AOD). The second lies between 20 and 30 km from the Site and includes Corserine Hill (814 m AOD) and Meikle Millyea (746 m AOD) within the Rhinns of Kells. Beyond these higher areas, the lower landform means that remaining areas of the RSA are less susceptible to the effects of the Proposed Development.

A relatively large number of operational wind farms lie within the landscape north-east of the RSA towards the Site. These comprise the Windy Rig, Windy Standard II and Afton Wind Farms, clustered around the glen of the Afton; and further north-west, Hare Hill and Extension, Sandy Knowe, Sanquhar and Whiteside Hill, with Windy Rig turbines extending into the RSA. Further south are the outliers of Wether Hill and Blackcraig. Wind farm development is an established and integral part of the baseline character of the RSA's wider landscape context. Patches of commercial forestry, that are occasionally extensive, further modify the landscape and reduce the RSA's susceptibility to the effects of the Proposed Development.

The combination of the Galloway Hills RSA's medium-high value; medium-low susceptibility at Carsphairn and Rhinns of Kells; and low susceptibility within remaining parts, make the RSA of medium sensitivity to the effects of the Proposed Development.

Magnitude of Change During Construction

Reflecting the relief of the wider landscape, the ZTV on **Figure 6.8** indicates that theoretical visibility is patchy and concentrated within the area around Rhinns of Kells; and much less extensive and patchier around the Cairnsmore of Carsphairn. Visibility is shown over the north-eastern slopes of Corserine Hill and Meikle Millyea, approximately 12 km from the nearest proposed turbine, with 10 to 11 turbines theoretically visible from these slopes, gently reducing to the east and dropping completely between the two hills. The much smaller, patchier area of visibility towards the north-east of the RSA, covers the summits of Cairnsmore of Carsphairn, Beninner and Moorbrock Hill, approximately 12 km from the nearest proposed turbine. 10 to 11 turbines are theoretically visible from these slopes. Beyond these areas, visibility is intermittent and levels of theoretical visibility are generally low, in the 1 to 4 or 5 to 8 bands with large areas showing no theoretical visibility of the development in between.

During the construction phase, the magnitude of change would be **negligible**. In general, intervening distance and landform; and the pattern of operational wind farm development within the Southern Uplands (LCT 19), would limit the influence of the Proposed Development. Across substantial parts of the RSA where there would be no visibility, there would be **no change**.

Within the RSA, the closer hills of Cairnsmore of Carsphairn, Beninner and Moorbrock Hill lie within Southern Uplands adjoining the Glenkens. They are closely associated with the Southern Uplands which host the Proposed Development and other operational wind farms: Whiteside Hill, Sanquhar, Sandy Knowe and Hare Hill; and the nearer Afton, Windy Standard and Windy Rig. While these nearer wind farms form a cluster loosely aligned with the Afton Glen, the more distant wind farms are dispersed across hilltops above the Nithsdale valley, marking its alignment. Topography would limit the influence of the construction phase of the Proposed Development to the presence and activity of cranes, higher level works and the emerging turbines. The relatively high number and wide geographical spread of operational wind farms within this part of the RSA, moderates the effect of the Proposed Development during its construction.

The more distant hills, Corserine Hill and Meikle Millyea, lie within Rugged Granite Uplands (LCT 21), which are closely associated with adjoining landscapes. Rugged Granite Uplands with Forest (LCT 21a), adjoin to the west; and Foothills with Forest (LCT 18a) and the Upper Glen (LCT 9) of the Glenkens separate the hills from the Southern Uplands (LCT 19 and 19a). These form a large part of the wider landscape context to the north-east and are quite distant.

Topography would limit visibility of the construction works, and their resulting influence, to the presence and activity of cranes, activity at height and the emerging turbines. These would contrast with the relatively natural and remote landscape of the Rhinns of Kells. The scale of the construction works within the wider landscape; the influence of operational wind farms within the southern Uplands; and the weaker association between the Southern Uplands (LCT 19 and 19a) and Rugged Granite Uplands (LCT 21), means that construction of the Proposed Development would have little influence on these more distant hills within the RSA.

Magnitude of Change During Operation

During the operational phase, the magnitude of change to the Galloway Hills RSA would remain **negligible**. Across substantial parts of the RSA where there would be no visibility, there would be **no change**.

The larger scale of the proposed turbines would be imperceptible from much of the RSA, and the Proposed Development would extend and continue the existing pattern of wind farm development within the Southern Uplands / Nithsdale LCU. The combination of several factors would limit the influence of the operational Proposed Development. Primarily, this would be distance from the Proposed Development, but intervening landform and the pattern of operational wind farm development within the Southern Uplands / Nithsdale LCU are also relevant factors.

Within the RSA, the closer hills of Cairnsmore of Carsphairn, Beninner and Moorbrock Hill lie within Southern Uplands adjoining the Glenkens. They are closely associated with the Southern Uplands hosting the Proposed Development and other operational wind farms: Whiteside Hill, Sanquhar, Sandy Knowe and Hare Hill; and the nearer Afton, Windy Standard and Windy Rig. While the nearer wind farms form a cluster loosely aligned with the Afton Glen, the more distant wind farms are dispersed across hilltops above the Nithsdale valley. Operational wind farms, which exert a stronger and established influence on these closer hills, and areas of commercial forestry across the hills, would moderate their influence on the relatively natural Carsphairn LCU (LCT 19).

While the Proposed Development would contrast with the scale of the Rhinns of Kells landscape; and its relatively natural, unsettled and remote qualities, several factors substantially reduce the Proposed Development's influence. The primary factor is the distance between the development and the Rhinns of Kells. This weakens its association with the Southern Uplands / Nithsdale LCU; and limits the extent and prominence of the Proposed Development within the Rhinns of Kells' wider landscape context. The secondary factor is the modification of the landscape, by commercial forestry in the area immediately surrounding the Rhinns of Kells; and by wind farm development in the more distant Southern Uplands. This moderates the impact of the Proposed Development which would extend a type of development that is well established within the Southern Uplands.

Significance of Effect

The effect of the Proposed Development on the landscape character of the Galloway Hills RSA would be **minor** and **not significant** during construction and operation.

The Proposed Development would have a **minor** effect on the character of the RSA, including the Carsphairn (LCT 19) and the Rhinns of Kells areas despite their greater relief and higher elevation. This effect would be indirect and visual as the Proposed Development represents an increase in wind farm development within the wider landscape context of these areas, where wind farm development is already an established characteristic feature. Remaining areas of the RSA with visibility of the Proposed Development would be less affected, due to the even lower visibility of the Proposed Development and its resulting lower influence. There would also be large areas with no visibility and therefore no change and **no effect**.

6.8.3 New Cumnock Sensitive Landscape Area (East Ayrshire)

Baseline

The eastern and southern boundaries of this unit of the SLA adjoin Dumfries and Galloway and includes, from north to south, Plateau Moorland centred on Wardlaw Hill (EA LCT 18a); the Nith Upland River Valley (EA LCT 10); Southern Uplands (EA LCT 20a), bisected by Glen Afton's Upland Glen (EA LCT 14); and west of Gen Afton, Southern Uplands with Forestry (EA LCT 20c). The border with Dumfries and Galloway and the western edge of commercial forestry between Stony Hill and Corsencon Hill, defines the eastern and southern boundaries of this unit of the SLA. The western

edge of plateaux is enclosed by the A70, New Cumnock and the B741, with the eastern edge of the forestry, defining the western boundary.

Subtly rounded hills, shallow basins and gentle lower slopes characterise the expansive Plateau Moorland (EA LCT 18a), while higher hills with steep slopes and defined ridge summits, such as Cairn Table and Blacklaw present notable, contrasting landmarks. The land cover is simple with grass moorland predominating and small areas of mixed woodlands, coniferous forestry and pasture. Settlement is restricted to dispersed farms and houses on lower slopes of the plateaux exterior. Abutting the southern edge of the plateau, is Nithsdale (EA LCT 10): a broad, lush valley of open farmland, established settlements, farm steadings, and the A76 contained by plateaux and open expansive uplands. Enclosing Nithsdale to the south, the expansive, large scale Southern Uplands (EA LCT 20a) extend into Dumfries and Galloway. Grass moorland covers much of the uplands. Glen Afton (EA LCT 14) bisects this area of the uplands with defined landmark hills including Blackcraig Hill and Hare Hill lie to its east; and the more complex, interlocking ridges of lower hills including Benty Cowan Hill, to the west. Running south from New Cumnock, the small, intimate glen is narrow, steep sided and strongly enclosed. Its diverse land cover includes riparian woodland; small pastures on the valley floor and lower slopes enclosed by stone dykes; and semi-improved pasture and grass moorland above. West of the glen, rounded hills covered with commercial forestry (EA LCT 20c) contrast with the more dramatic uplands further south.

Sensitivity

The value of the New Cumnock SLA is medium-high, as recognised by designation at the local level, which denotes a special landscape value of local importance.

The SLA is of medium-low susceptibility to the Proposed Development, where operational wind farms within the SLA (Hare Hill) and adjoining the uplands (Sanquhar and Whiteside Hill) exert a direct and immediate influence on it; and the Upper Nithsdale Valley and the fringe of the Southern Uplands, where the influence remains close-range. Further north, the influence of operational wind farm development within the Nithsdale LCU (LCT 19) reduces and the SLA is of low susceptibility.

The medium-high value of the New Cumnock SLA, and its medium-high susceptibility to the effects of the Proposed Development in the north, means the northern part of the SLA is of medium-high sensitivity. The combination of medium value and the medium-low susceptibility of the southern part of the New Cumnock SLA, means a medium sensitivity overall.

Magnitude of Change During Construction

The ZTV covers Wardlaw Hill, the northern side of Upper Nithsdale valley and higher hills near the border with Dumfries and Galloway: Stony Hill, Connor Hill, West Foredibban Hill, Auchtitench Hill and Clocklowie Hill, north of Nithsdale; and Hare Hill and Blackcraig Hill, south of Nithsdale. The theoretical visibility shown in the ZTV on **Figure 6.8** is slightly fragmented and indicates theoretical visibility of 10 to 11 turbines at a minimum of approximately 6 km, generally reducing relatively gently on edges facing the Proposed Development. The remaining area of the SLA has no theoretical visibility of the Proposed Development.

The magnitude of change during the construction phase, would be medium-low across the southern hills of the Southern Uplands; the northern side of the Upper Nithsdale valley, where the Upper River Valley (EA LCT 10) merges into Plateau Moorlands (EA LCT 18a); and low across Wardlaw Hill and the Plateau Moorland (EA LCT 18a) bordering Dumfries and Galloway. No change to the character of the SLA would occur beyond these limited areas of the SLA, due to the likely lack of visibility of the Proposed Development.

Hills along Kello Water would limit the influence of ground level construction works on the southern hills of the Southern Uplands. High-level construction activity, cranes and the emerging turbines would exert a close-range influence on the SLA. Operational wind farms within and immediately adjoining the SLA would moderate its influence.

The southern valley sides would restrict the visibility of ground level construction works and their influence on the Upper River Valley / Plateau Moorlands transition. Clearly visible high-level construction works would exert a relatively close-range influence on the SLA. The settled and modified nature of the valley and the extent of operational wind farm development in the valley's wider landscape context would moderate much of the Proposed Development's effect.

A combination of several factors greatly moderates the influence of construction works on Wardlaw Hill and the Plateau Moorlands (LCT 18a) to its east. These are: distance from the works at a minimum of approximately 6 km; the settled and modified nature of the Upper Nithsdale valley; extensive commercial forestry that restricts visibility of the Proposed Development and modifies the landscape; and operational wind farm development within the Southern Uplands and South Lanarkshire, to the north. Wardlaw Hill, some 10 km from the Site, is less closely associated with the Upper Nithsdale valley. The hill is more influenced by the surrounding plateau and extensive areas of commercial forestry within the intervening landscape. These would reduce the influence of the Proposed Development further.

Magnitude of Change During Operation

The magnitude of change during the operation phase, would be **medium-low** across the Southern Uplands and the Upper River Valley / Plateau Moorlands transition; and **low** across Wardlaw Hill and the Plateau Moorlands (LCT 18a) bordering Dumfries and Galloway. **No change** to the character of the SLA would occur beyond these limited areas of the SLA, due to the likely lack of visibility of the Proposed Development.

The Proposed Development would be a very close-range influence on Southern Uplands (LCT 20a) within the SLA, within its immediate context where extensive wind farm development characterises the adjoining landscape (LCT 19 / Nithsdale LCU).

While the Proposed Development would exert a close-range influence on much the Upper Nithsdale valley, this would diminish within the SLA. The orientation of the valley in combination with intervening landform, would restrict the visibility and influence of the Proposed Development. Operational wind farm development which influences the settled and modified valley, would moderate the influence of the proposed turbines. Within this part of the SLA, Hare Hill Wind farm is particularly prominent and exerts a close-range influence on the area.

As the Proposed Development would be located some 10 km from Wardlaw Hill, the proposed turbines would have a relatively weak influence on its character. The hill's closer association with the surrounding plateau would limit the influence of the Upper Nithsdale valley. Extensive areas of commercial forestry within the intervening landscape, the valley's modified nature and the existing influence of operational wind farms to the north would reduce the influence of the Proposed Development further. This remains true for other hills within Plateau Moorland (LCT 18a) nearer the Dumfries and Galloway border.

Significance of Effect

The effect of the Proposed Development on the landscape character of the New Cumnock SLA would be **moderate** or **moderate-minor** and **not significant** during construction and operation. The Proposed Development would slightly alter the character of the SLA within the closest areas of the Southern Uplands (EA LCT 20a) and the Upper Nithsdale Valley (EA LCT 10) where it transitions into Plateau Moorland (EA LCT 18a). This is mainly due to the larger scale of the emerging and operational proposed turbines in relation to operational wind turbines within the immediate context of the valley (LCT 19 / Nithsdale LCU). These largely moderate the effect of the Proposed Development within the SLA, particularly further north where the contrast in scale would be less perceptible. The effects of the Proposed Development would not affect the integrity of the SLA as a whole.

6.9 Assessment of Effects on Views and Visual Amenity

6.9.1 Assessment of Effects on Representative Viewpoints

The first stage in the assessment of visual effects comprises an evaluation of the effects at each of the representative viewpoints. This is carried out on site, using wirelines and photomontages to inform the assessment.

The viewpoint locations are shown in conjunction with the blade tip ZTV on **Figures 6.5a and 6.5b** and in conjunction with the hub height ZTV on **Figures 6.6a and 6.6b**. Views from each viewpoint are illustrated on **Figures 6.17 to 6.38**, where a photograph of each viewpoint is accompanied by a computer-generated wireline and a photomontage of the Proposed Development in situ. These are presented with a 53.5-degree field of view and a 90-degree field of view. In the wirelines, the Proposed Development turbines are shown in red, operational wind farms are shown in black, under construction wind farms are shown in purple, consented wind farms are shown in green and application wind farms are shown in blue. The visualisations have been produced in accordance with NatureScot's guidance on visualisations.

6.9.2 Viewpoint 1: A76, Sanquhar Castle (Figure 6.17)

Baseline

This viewpoint is located on the A76, to the south-east of Sanquhar village. The viewpoint is representative of road users on this busy route; residential properties on the edge of the settlement with potential visibility of similar, open views towards the Proposed Development; and walkers on core path 111: Sanquhar Castle Circular. The focus of this view is on the ruins of Sanquhar Castle, seen in the fore-to-midground against the backdrop of the Southern Uplands to the south. Open and wide-ranging views are gained on the A76 to the east of Sanquhar, beyond which the enclosure of built form and vegetation in the town enclose road-side views.

The foreground of the view to the south is characterised by pastoral grazing land, contained within a pattern of medium-scale field parcels enclosed by low stone walls. Scattered buildings of 'Castle Mains', including its derelict outbuildings, detract from the prominence of the castle ruins. To the south-west, post-war housing denotes the edge of Sanquhar village. The leading edge of the village is partially contained by mature tree cover; however, this is not representative of the settlement edge further to the south- south which in the main is more open, with wide-ranging views along the Upper Nithsdale Valley and towards the Southern Uplands. Sanquhar village sits slightly elevated above the River Nith and its adjacent flood plain, thus views of the midground are restricted as landform falls away to the south of the castle and settlement seen in the view. The background of the view is characterised by the large-scale rolling landscape of the Southern Uplands. Lower slopes are overlain by agriculture and rough grazing, which gives way to moorland land cover and large-scale forestry across upper slopes and hill summits.

The existing Twentysilling Wind Farm sits prominently on the ridgeline of the valley to the south-east, appearing quite isolated from schemes further west. The Whiteside Hill and Sanquhar Wind Farms also appear above the ridgeline and large blocks of forestry seen beyond the Sanquhar Castle ruins. The more distant Hare Hill and Hare Hill Extension are visible on undulating, open ridgeline to the west. Sandy Knowe Wind Farm is visible, though partly screened by the tree canopy in the foreground.

This viewpoint has been used as a representative viewpoint in the assessment of night-time effects presented in **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting**.

Sensitivity

The value of the view is medium. This is not a formally recognised viewpoint. The viewpoint does not lie within a nationally or locally designated landscape, which would otherwise denote a special scenic

value. However, the composition of this view includes the focal point of Sanquhar Castle ruins seen against the backdrop of the Southern Uplands and is therefore assessed to have local importance that contributes to its value.

The susceptibility of receptors at this location is moderated by the presence of several existing wind farms seen within this view and on the approach to Sanquhar, which establish this type of development as a feature of the baseline view.

The susceptibility of road-users to the Proposed Development is medium. The Southern Uplands form enclosure along this road to the south, where the Site is located. Views of west-bound users would present slightly oblique views towards the Site, while for east-bound travellers it would lie largely opposite to the direction of travel.

The susceptibility of residents is medium-high. Taking the precautionary approach, this assessment considers the 'worst case' scenario in which nearby local residents within the settlement would have direct views towards the Site from the main frontage of their properties. The susceptibility of residents would be higher than that of road-users owing to the static nature and potentially long duration of their views.

The susceptibility of walkers on the Sanquhar Castle Circular Core Path is medium-high. This reflects their attention to and interest in the surrounding landscape, and the influence of adjoining urban development, traffic on the road and operational wind farm development in the area.

The sensitivity of road users is rated medium, on account of the medium value of the views and their medium susceptibility. The medium-high susceptibility of residents and walkers leads to an overall medium-high sensitivity rating for these receptors.

Magnitude of Change during Construction

The magnitude of change to the view would be medium. It is likely that landform and forestry would largely screen ground level construction work within the Site, including the construction of access tracks, crane pads and foundations. This screening would limit visibility such that the emerging turbines and construction cranes would be the most readily visible components of the Proposed Development. Ulzieside Plantation forms the main block of forestry on the intervening hillside and although it is assumed that this will be removed prior to construction, new planting on the southern side will form some screening as it matures. The track would be visible where it lies on the eastern edge of the removed Ulzieside Plantation with the remaining sections higher up the hillside screened by the new forestry and then screened by landform beyond the ridgeline. The borrow pits adjacent to T8 will also be visible along the ridgeline, adding to the overall construction effects. Given the minimum distance of 5.15 km, these construction works would be seen at relatively close range. Within the context of the Upper Nithsdale Valley and adjoining Southern Uplands, construction of the Proposed Development would form a relatively compact feature within the wider view. This would occupy a contained proportion of the low, undulating skyline, amounting to 10 to 20 degrees of the full 360 degree view as shown on the Horizontal Angle ZTV on **Figure 6.7**. The presence and activity of the cranes and the closer proximity and larger size of the emerging turbines would, however, be apparent in comparison to the operational turbines and this would add to the prominence of the construction works.

Magnitude of Change during Operation

The magnitude of change to the view from the A76, Sanquhar Castle would be medium. From this viewpoint, the Proposed Development would be readily apparent at a minimum distance of 5.15 km, bringing wind farm development closer to Sanquhar. **Figure 6.17** shows that the rotors, hubs and upper towers of the proposed wind turbines would be visible set along the long ridgeline. The scale of the proposed turbines would appear relatively large compared to the surrounding hills, and larger compared to the operational turbines. The Proposed Development would lie in front of the Whiteside Hill Wind Farm and the turbines of both developments would appear similar in form and spacing,

albeit with the proposed turbines appearing closer and larger in scale. As such, it would appear as a northwards extension to the operational wind farm. While the level of wind farm development and its horizontal extent within the view would notably increase, the baseline influence from the operational developments would moderate the overall magnitude of change.

Significance of Effect

For road users, local residents and walkers, the effect of the Proposed Development during both phases would be **moderate** and **significant**. Despite the baseline influence from the operational wind farms in the view, the closer range and larger scale of the Proposed Development will make it a prominent feature. The effects of the Proposed Development would be short-term and temporary during the construction phase; and long-term and permanent during the operational phase. As the nature of the effects during construction and operation does not vary with viewpoint location, they are not restated within the individual viewpoint assessments below.

6.9.3 Viewpoint 2: Sanquhar Church Road (Figure 6.18)

Baseline

This viewpoint is located on Sanquhar Church Road, which connects the A76 to the B740, passing through the historic core of the village and past St. Brides Parish Church. The road is situated to the north of the A76 which is the main transport route through Sanquhar. The minor road is enclosed by adjacent built form within the settlement from its junction with the A76 to St. Brides Parish Church; at this point, the road passes to the north of Sanquhar Academy Playing Field where it loses some elevation and the views become more open and wide-ranging. The viewpoint is situated next to the playing fields where open views are gained to the south-west, where the Proposed Development is located. The viewpoint is representative of road-users and residents on the north-western fringes of the settlement.

There is no particular focus to the view. To the south-west, the open expanse of the amenity playing fields, together with Lorimer Park to the south of the A76, defines the foreground of the view. There is limited enclosure to these immediate parts of amenity space, thus there is an opportunity to appreciate the wider landscape context. Tall floodlights and amenity facilities within Lorimer Park are notable built features in the foreground of the view. In contrast to the openness of the foreground, the layering effect of woodland lining the River Nith and within Sanquhar Golf Course gives the impression of a well-wooded mid-ground amid the lower-lying parts of the valley further south. In gaps between the woodland vegetation are glimpses of the Blackaddie Industrial Estate on the south-western edge of Sanquhar, and isolated properties on the undulating foothills to the south.

The backdrop of the Southern Upland hills is viewed from a settled landscape; large scale forestry and moorland land cover, the apparent absence of settlement, and presence of several wind farms provides contrast to the landscape of the valley floor. The operational Whiteside Hill and Sanquhar Wind Farms sit prominently above the ridgeline to the south. Further south-west, the Sandy Knowe Wind Farm is glimpsed in gaps through vegetation. To the south-east, parts of the Twentyshilling Wind Farm are visible above, and in gaps between, built form and vegetation within Sanquhar.

Sensitivity

The value of the view is medium. This is not a formally recognised viewpoint. The viewpoint does not lie within a nationally or locally designated landscape, which would otherwise denote a special scenic value.

The susceptibility of receptors is moderated by the presence of several existing wind farms seen within this view, which establish this type of development as a feature of the baseline.

The susceptibility of residents is considered to be medium-high. Taking the precautionary approach, this assessment considers the 'worst case' scenario in which nearby local residents within the

settlement would have direct views towards the Site from the main frontage of their properties. The susceptibility of residents would be higher than that of road-users owing to the static nature and potentially long duration of their views.

The susceptibility of road-users to the Proposed Development is medium. West and east-bound users would experience oblique views south-west towards the Site. The susceptibility of road-users would also be moderated by the transitory nature and short duration of their views.

The overall sensitivity of road users is rated as medium on account of the medium value of the view and their medium susceptibility, while the medium-high susceptibility of residents leads to an overall medium-high sensitivity rating.

Magnitude of Change during Construction

The magnitude of change to the view during the construction phase would be **medium**. It is likely that landform and new forestry would screen most of the ground level construction works within the Site, including the construction of sections of the access tracks, crane pads and foundations, with the exception of where turbines will be seen set along the ridgeline. The section of existing track that requires upgrading would be visible, while the section that does not require upgrading would not be visible. The borrow pits adjacent to T8 would also be visible along the ridgeline. The most readily apparent features of the construction would, however, be the emerging turbines, works at height and construction cranes. These would be seen above the long undulating ridgeline and at a minimum distance of 5.15 km. While the construction activity would appear at variance with the predominantly rural context, it would be contained within a moderate proportion of the view, amounting to 10 to 20 degrees of the full 360 degree view (**Figure 6.7**). The vertical scale of the emerging turbines and construction cranes would appear larger than the operational turbines in the view owing to their closer range and greater height.

Magnitude of Change during Operation

The magnitude of change to the view due to the Proposed Development would be **medium**. The Proposed Development would be visible at a minimum distance of 5.15 km from this viewpoint.

Figure 6.18 shows that the rotors and towers of the proposed wind turbines would be readily visible on the skyline, just above the ridgeline of the enclosing hills. The operational Proposed Development would occupy a moderate proportion of the view. The Proposed Development would form a distinct group of turbines separate from more distant turbines on the skyline within Whiteside Hill and Sanquhar Wind Farms. In comparison to the existing turbines in view, with which they would appear similar in form and spacing, the proposed turbines would appear larger in vertical scale, owing to their closer proximity and greater height. The three wind farms would appear as three separate groups of turbines extending over a large proportion of the view with an observable increase in the overall horizontal extent of wind farm development resulting from the Proposed Development.

Significance of Effect

The effect of the Proposed Development on the view from Sanquhar Church Road would be **moderate** and **significant** for residents and road-users, during both the construction and operational phases. While the baseline influence from operational wind farms would moderate the effect of the Proposed Development, its closer proximity and larger turbines would mean it would form a prominent feature in this view.

6.9.4 Viewpoint 3: Kirkconnel (Figure 6.19)

Baseline

This viewpoint lies within the village of Kirkconnel. It is located to the south of the A76, on the eastern edge of the village which affords more open views southwards towards the Proposed Development. Kirkconnel is a linear settlement that stretches along the A76 to the west, north of the River Nith. This

viewpoint is representative of the views of road-users on the A76 and local residents + night time visual.

Owing to the orientation of the A76 and linear development of Kirkconnel, the alignment of properties within the village is broadly east-west. This means open views are typically focussed southwards within the valley and / or screened by surrounding built form. There are also open views from public open spaces and local roads within the settlement.

The foreground of the view looks across open pastoral land and the watercourse of the River Nith. During summer months, riparian woodland provides screening cover along the riverbanks in the foreground. The village of Kelloholm lies in close proximity to Kirkconnel, to the south of the River Nith. The village occupies gently rising slopes to the south of the river and can be seen across the undulating landform to the south of this viewpoint. Views from Kelloholm are represented by an additional viewpoint (Viewpoint 26), with a high-level assessment presented at **Section 6.9.24** and a cumulative wireline presented on **Figure 6.42**.

Views of the Southern Uplands are partially restricted by a combination of the rising landform to the south of the River Nith, and by vegetation and built form within Kelloholm. The visible part of the uplands is distinguished by its simple landcover of moorland and forestry and by the groups of existing wind turbines within the Sanquhar and Whiteside Hill Wind Farms. Sandy Knowe Wind Farm occupies lower slopes within the Upper Nithsdale Valley to the west of this location. Twentyshilling Wind Farm is visible, though more distant, to the east.

This viewpoint has been used as a representative viewpoint in the assessment of night-time effects presented in **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting**.

Sensitivity

The value of the view is medium. This is not a formally recognised viewpoint; the view does, however, present a natural vantage point across the River Nith and towards the Southern Uplands that provide a backdrop to the settlement.

The susceptibility of receptors is moderated by the presence of several existing wind farms seen within this view which establish this type of development as a feature of the baseline.

The susceptibility of road-users is medium. The east-west alignment of the A76 offers oblique views towards the Site, although the view is often screened by intervening built form and occasional vegetation. The susceptibility of road-users is moderated by the transitory nature and short duration of their views.

The susceptibility of local residents is medium-high. The linear nature of Kirkconnel means that a number of the properties are orientated towards the Site, there is the potential for resident's views to be direct from the main frontage. The susceptibility of residents is higher than that of road-users owing to the static nature and potentially long duration of their views.

The combination of the medium value of the view and the medium susceptibility of road users leads to an overall sensitivity rating of medium, while the medium-high susceptibility of residents leads to an overall medium-high sensitivity rating.

Magnitude of Change during Construction

The magnitude of change to the view during the construction phase would be medium-low. Landform, vegetation and built form would screen most of the ground level construction works within the Site, including the construction of access tracks, borrow pits, crane pads and foundations. Screening would restrict visibility of the Proposed Development to the emerging turbines, works at height and construction cranes. These would be seen above the skyline at a minimum distance of 5.79 km. While construction activity would add further development into the view, it would occupy a small proportion of the wider view, amounting to 10 to 20 degrees of the full 360 degree view. It would also be seen

adjacent to the closer range Sanquhar Wind Farm and Sandy Knowe Wind Farm further to the north-west.

Magnitude of Change during Operation

The magnitude of change to the view arising from the operational Proposed Development would be **medium-low**. The Proposed Development would be visible beyond the village of Kelloholm, at a minimum distance of 5.79 km and seen set on a low skyline that gently rises to the west. The Proposed Development would not form an especially prominent feature from this location owing to the combination of the separation distance, the partial screening by small trees in the foreground and the baseline presence of the closer range Sanquhar turbines.

Figure 6.19 shows that the upper towers and rotors would appear moderately close to the viewpoint. The vertical scale of the proposed turbines would appear similar to that of the enclosing hills and that operational wind turbines visible on the skyline would appear similar in scale, form and spacing to that of the proposed turbines. The Proposed Development would appear to adjoin Sanquhar Wind Farm, to which it would appear as an extension. An increase in the level of wind farm development within the view would be noticeable but would be contained within a small proportion of the view. As the Twentysilling and Sanquhar Wind Farms would lie to the east and west of the Proposed Development, respectively, the overall horizontal extent of wind farm development within the view would not increase.

Significance of Effect

The lower sensitivity road users would observe a **moderate-minor** and **not significant** effect. For residents; who are higher sensitivity receptors, the effect of the Proposed Development on the view would be **moderate** and **not significant**. This takes account of a number of factors moderating its effect, including partial screening by landform and vegetation and the number of similar and equally visible operational wind farms on the skyline.

6.9.5 Viewpoint 4: Euchan Water Minor Road (Figure 6.20)

Baseline

This viewpoint is located at the junction of the minor road that runs along the Euchan Water valley and an access road to properties at 'Barr'. The viewpoint is representative of users of the minor road and local residents in scattered properties to the south of Sanquhar. Residential dwellings within this rural landscape tend to be slightly elevated within the undulating landscape. There is no specific focus to this view, but it offers an open, wide-ranging vantage to the upland landscape to the south.

The view looks south across an undulating landscape of pastoral agriculture that occupies the fore-to-midground. Field parcels are medium-large in scale, enclosed by rectilinear low stone wall boundaries. Linear belts of woodland follow the watercourses that run through depressions in the undulating landform, with further woodland grouped around scattered properties.

The view south towards the Site presents a contrast between the settled valley and the large-scale landscape of the Southern Uplands, which enclose the southern side of the Upper Nithsdale Valley. The majority of the upland landscape is characterised by open moorland, covering the steep hill sides, and rounded summits. The hills interlock to form an extensive undulating ridgeline, cut by incised river valleys.

The operational Whiteside Hill and Sanquhar Wind Farms spread across the ridgelines to the south-west, making wind farm development a notable feature in views towards the Site. The blades and rotors of the Twentysilling Wind Farm are visible along the skyline to the south. The existing track onto Cloud Hill is visible in this view, although the more distant southern section south of the forestry is not visible.

This viewpoint has been used as a representative viewpoint in the assessment of night-time effects presented in **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting**.

Sensitivity

The value of the view is medium. This is not a formally recognised viewpoint, nor does it lie within a nationally or locally designated landscape, which would otherwise denote a special scenic value. Nonetheless, the composition of the view is highly representative of the transitional landscape between the LCT 9: Upper Dale (Valley) and LCT 19 Southern Uplands which is considered to contribute to its value.

The susceptibility of receptors is moderated by the presence of several existing wind farms seen within this view which establish this type of development as a feature of the baseline.

The susceptibility of road-users is medium. The road is broadly aligned south-west towards the Euchar Water glen. However, the view is often screened by the intervening undulating landform of the Southern Uplands foothills and by occasional vegetation. The susceptibility of road-users is moderated by the transitory nature, although south-bound road users would have relatively long duration views which would be direct to oblique in closer proximity to the Site.

The susceptibility of residents is considered to be medium-high, owing to their static nature and potentially the long duration of views. Taking the precautionary approach, this assessment considers the 'worst case' in which local residents would have direct views towards the Site from the main frontage of their properties. In actuality, as illustrated within the view, the orientation of scattered properties varies.

The combination of the medium value of the view and their medium susceptibility means the sensitivity of road users is rated medium. The medium-high susceptibility of residential receptors leads to an overall sensitivity rating of medium-high.

Magnitude of Change during Construction

The magnitude of change to the view during the construction phase would be medium-high. It is likely that landform and new forestry would largely screen ground level construction work within the Site, including the construction of access tracks, crane pads and foundations, although there may be some visibility of infrastructure along the ridgeline and the borrow pits adjacent to T8. While visibility of the Proposed Development would be limited to works at height, including the emerging turbines and associated construction cranes, these would be seen at a minimum of 3.76 km above the gently undulating skyline, making them prominent features which would define the views of residents and road-users in the Euchar valley.

Magnitude of Change during Operation

The magnitude of change to the view would be **medium-high**. The Proposed Development would be visible at close range on the skyline and the proposed turbines would appear nearly comparable in vertical scale to the hills upon which they sit. As shown on **Figure 6.20**, intervening landform and tree cover would restrict visibility of the Proposed Development to the upper towers and rotors of the proposed turbines, including eight hubs. Existing Whiteside Hill wind turbines lie on the skyline at Whiteside Hill and existing Sanquhar wind turbines further north on Black Hill. Between Whiteside Hill and Cloud Hill, the valley of the Glenlarie Burn separates Whiteside Hill Wind Farm from the Proposed Development. The proposed turbines would form a distinct group which would appear similar in form and spacing to those within Whiteside Hill Wind Farm, albeit larger in scale. The Proposed Development would notably increase the horizontal extent of wind farm development within this sector of the wider panorama, occupying 10 to 20 degrees of the full 360 degree view (**Figure 6.7**).

Significance of Effect

For road users, the effect of the Proposed Development would be **moderate** and **significant** during both phases. For residents, the effect of the Proposed Development would be **major / moderate** and **significant** during both phases. This reflects the proximity of the Proposed Development to these receptors, despite the baseline influence from other operational wind farms visible in views from this area.

6.9.6 Viewpoint 5: Shiel, Scaur Water Minor Road (Figure 6.21)

Baseline

This viewpoint lies on the minor road that runs the length of the Scaur Water valley. It is located near the isolated property 'Shiel Cottage', found towards the head of the valley. This viewpoint is representative of road users and residential receptors.

The focus of properties tends to be along the line of the valleys, and in the case of Shiel Cottage, the focus is south-eastwards towards the dramatic landform of Glenwhargen Craig. The property is sited within the lower contours of the valley, which is typical of scattered settlement within the upper glens. This view looks towards the Site to the north and is slightly more elevated as the road follows higher contours around the valley spurs.

Views north-west towards the Site, to the east, and to the south, are largely contained by the rising landform of Cloud Hill (456 m AOD), Welltrees Tapping (476 m AOD), and Peat Hill (470 m AOD). Collectively, these hill summits are joined by upland landform to form an extensive and gently undulating ridgeline that encloses the valley. More distant views along the valley are gained to the south as it widens out. To the north, more distant views appear through interlocking spurs of landform.

The valley sides and hill summits are covered by rough grassland, as are many of the surrounding areas. Land use is predominantly rough grazing, though with some improved pasture in lower-lying valley floors. Tree cover is very limited and tends to be clustered around isolated properties. Wood pole lines follow the lower slopes along the valley floor. A small number of turbines and blades of the operational Whiteside Hill Wind Farm are visible through an opening between the valley spur to the north-west.

The Scaur Water is also represented by Viewpoint 8 Polgown, Scaur Water and the additional Viewpoint 24 Glenwhargen, Scaur Water which is assessed at a high level in **Section 6.9.24** and illustrated in cumulative wirelines on **Figure 6.40**.

Sensitivity

The value of the view is medium-high. This is not a formally recognised viewpoint. However, the viewpoint is located within the Thornhill Uplands RSA and therefore lies within a landscape recognised for its special scenic value. This view is highly representative of the landscape qualities of the narrow glens that descend from the western uplands to the Nithsdale Valley.

The susceptibility to change is moderated by the presence of the Whiteside Hill Wind Farm seen within this view which establishes this type of development as a feature of the baseline.

The susceptibility of road-users is medium. Typically, the susceptibility of road-users is moderated by the transitory nature and short duration of their views; however, this route is located within an RSA, and it is reasonable to expect that these receptors would have greater awareness of the landscape compared to users of other routes within the study area.

The susceptibility of residents is considered to be high, owing to their static nature and potentially the long duration of views. While there is some limited visibility of Whiteside Hill, there is not a strong influence from existing wind farm developments owing to the screening effect of the surrounding landform, and residents are considered more susceptible to the type of change proposed. Using the precautionary approach, this assessment considers the 'worst case' in which local residents would

have direct views towards the Site. In actuality, as illustrated within the view, the orientation of scattered properties tends to follow the direction of the valley floor and is thus in the opposite direction to the Site.

The medium-high value of the view and medium susceptibility leads to an overall medium-high sensitivity rating for road users with the high susceptibility of residential receptors leading to their overall high sensitivity rating.

Magnitude of Change during Construction

The magnitude of change to the view would be medium-high. The enclosing landform would restrict visibility of the Proposed Development to the nearest emerging turbines, works at height and construction cranes; and would screen ground level construction work within the Site, such as construction of access tracks, crane pads and foundations. Construction activity would be seen at a minimum of 1.44 km and seen above the gently undulating skyline defined by the enclosing hills. Close proximity and the elevation of the landform at this location means the emerging turbines would appear comparable in vertical scale to the valley sides. While some of the Whiteside Hill turbines are perceptible, a relative lack of visible operational wind farms within the wider panorama, the highly enclosed nature of the surrounding valley, and a distinct lack of settlement would emphasise the visual impact of the construction works.

Magnitude of Change during Operation

The magnitude of change to the view would be medium-high. Visibility of the Proposed Development would be very close range and restricted by the enclosing landform. As shown on **Figure 6.21**, seven proposed turbines would be visible above the skyline, including their upper towers, blades and six hubs. These would be comparable in vertical scale to the valley sides, which appear relatively low in height at this location. Proximity to the viewpoint and the scale of the proposed turbines means they would be very prominent features on the skyline. They would appear as a group of much closer turbines distinct from those of Whiteside Hill Wind Farm, to the north-west and would extend across a large proportion of the view. The highly enclosed and lightly settled nature of the valley would emphasise the introduction of the Proposed Development compounded by the relative lack of visible operational wind farms within the wider panorama. The Proposed Development would extend the horizontal extent of wind farm development within the wider panorama and would introduce this type of development within a sector of the view hitherto free of wind turbines.

Significance of Effect

Road users would observe a **major / moderate** and **significant** effect during both phases of the Proposed Development. This reflects the additional factor of the Proposed Development's location directly ahead which counteracts the transient nature of the view for road users.

For residents, the Proposed Development would have a **major** effect on the view during both phases that would be **significant**. This is due to the Proposed Development's very close proximity to the viewpoint; its extent within the view; the highly enclosed and lightly settled nature of the valley; and the relatively low influence of wind farm development.

6.9.7 Viewpoint 6: B797 Mennock (Figure 6.22)

Baseline

This viewpoint is located on the B797, at the junction with the A76 to the east of the settlement of Mennock. The B797 is one of the main upland passes between the Upper Nithsdale Valley, the M74 in the east, and beyond to Edinburgh. This viewpoint is principally representative of road-users, and residents of a small number of properties to the east of the settlement at Mennock that would have similar elevated and open views.

Around the viewpoint, the road starts to ascend into the very steeply incised and wooded Mennock Pass to the north-east, beyond which it follows the valley floor and lower slopes, with views largely contained by the surrounding landform until it reaches the Upper Nithsdale Valley. There is a short section of this road, at its southern extent, where open views along the Upper Nithsdale Valley landscape can be appreciated.

There is no specific focal point to the view. The foreground of the view includes the A76 and associated road infrastructure, including tall lighting columns around the junction with the B797 and westwards towards Mennock. Beyond the immediate foreground to the west, landform falls away steeply to the River Nith. This part of the Upper Nithsdale Valley is notably steeper sided and narrower than sections further south and to the north. The lower valley slopes to the west of the viewpoint are characterised by pastoral agriculture and substantial swathes of mixed woodland blocks. The enclosure of mixed woodland within the valley, leaves a thin strip of the Southern Upland landscape visible above the intervening treeline. The simple composition of open moorland and rough grassland and large-scale forestry seen across the gently undulating skyline provide a contrast to settled valley floor. There are few focal features within the uplands, however, the Twentyshilling Wind Farm can clearly be seen to the south-west of this location within the uplands and beyond the skyline.

Sensitivity

The value of the view is medium-high. This is not a formally recognised viewpoint. However, the viewpoint is located within the Thornhill Uplands RSA and therefore lies within a landscape recognised for its special scenic value. The composition of the view is representative of the contrasting landscapes of LCT 9: Upper Dale (Valley) and LCT 19: Southern Uplands.

The susceptibility to change is moderated by the presence of the Twentyshilling and Whiteside Hill Wind Farms seen within this view which establish this type of development as a feature of the baseline.

The susceptibility of road-users is considered to be medium. Typically, the susceptibility of road-users is moderated by the transitory nature and short duration of their views. However, as this route is located within an RSA, it is reasonable to expect that these receptors would have greater awareness of the landscape compared to users of other routes within the study area.

The susceptibility of residents is considered to be medium-high, owing to their static nature and potentially the long duration of views. Using the precautionary approach, this assessment considers the 'worst case' for a small number of local residents to the east of Mennock who have direct and open views towards the Site.

The combination of the medium-high value of the view and the medium-high susceptibility of residents leads to an overall medium-high sensitivity for these receptors, while road users are considered to have an overall medium sensitivity on account of their lower susceptibility to change.

Magnitude of Change during Construction

The magnitude of change to the view would be medium-low. Landform would screen ground level construction work within the Site, including construction of the access tracks, crane pads and foundations. Landform would restrict visibility of the Proposed Development to the uppermost parts of the nearest emerging turbines, works at height and construction cranes. A small proportion of the works would be seen at a minimum distance of 6.57 km and seen above the skyline. These would be visible within the context of the settled valley, the B797 and associated traffic. While construction activity would be prominent against the sky, the magnitude of change to the view would be limited by restricted visibility of the proposed turbines, the contained extent of the construction works and the baseline influence from Twentyshilling Wind farm in the same sector of the view.

Magnitude of Change during Operation

The magnitude of change to the view would be medium-low. The Proposed Development would be partially visible at a minimum distance of 6.57 km and seen on the skyline. The partial screening from the skyline means only seven of the proposed turbines be seen to partial extents and this would moderate their prominence in the view. As shown on **Figure 6.22**, intervening landform and tree cover would limit visibility of the proposed turbines to their blade tips and only one hub. The Proposed Development would appear at a comparable range to Twentysilling Wind Farm, located to the east, and would appear similar in form, layout and scale. The introduction of the Proposed Development would increase the presence of wind farm development but not the overall horizontal extent within the view. The horizontal angle ZTV on **Figure 6.7** shows that the Proposed Development would amount to only 5 to 10 degrees of the wider 360 degree view. Despite the middle range of the view and the location of the Proposed Development on the skyline, limited visibility of the Proposed Development combined with the baseline presence of Twentysilling Wind Farm, would limit the magnitude of change.

Significance of Effect

The effect of the Proposed Development on the view from Mennock would be **moderate / minor** and **not significant**, for road users; and **moderate** and **not significant**, for residents, during both the construction and operational phases. For both receptor classes, restricted visibility of the Proposed Development and the influence of other operational wind farms on the skyline would reduce the effects of the Proposed Development to not significant levels.

6.9.8 Viewpoint 7: Southern Upland Way, east of Sanquhar (Figure 6.23)

Baseline

This viewpoint is located on the SUW, on a section of the route to the east of Sanquhar, near to Sanquhar Moor. This viewpoint is representative of users of the long-distance trail heading south, amongst the lower slopes to the north of the Upper Nithsdale Valley.

The view is wide-ranging, with a focus towards the Southern Uplands on the opposite side of the valley. The view looks across a foreground of enclosed pasture and rough grazing, with pockets of forestry and short sections of linear tree belts along field margins. Landform drops away to the west, such that the settled valley floor and influence of Sanquhar are not perceived from this location. The Southern Uplands, seen to the south of this location, present the characteristic profile of steep sides with broad rounded summits, rough grassland cover and large-scale coniferous plantations.

There are several large-scale wind farm developments spanning the skyline, upper slopes, and upper valley sides to the south, that influence the otherwise predominantly rural character experienced from this section of the SUW. Twentysilling Wind Farm is set noticeably apart from other schemes to the south-east. The Whiteside Hill Wind Farm is seen along the line of the SUW from this location. Further to the north-west, several schemes visible in close proximity to and slightly overlapping one another include the Sanquhar, Hare Hill and Hare Hill Extension, and Sandy Knowe Wind Farms.

The rural area to the south of this viewpoint is represented by the additional Viewpoint 25 Auchentaggart, which is assessed at a high level in **Section 6.9.24** and illustrated in cumulative wirelines on **Figure 6.41**.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is located on a well-publicised and popular walking route.

The viewpoint is representative of walkers on the SUW, whose susceptibility to the Proposed Development is medium. While awareness and appreciation of their surroundings heightens the susceptibility of these walkers, this is moderated by the number of existing wind farm developments

visible and extending across the Southern Uplands, to the south. As such, the baseline view experienced by walkers already features similar developments in the same sector of the view as the Proposed Development.

The combination of the medium-high value of the view and the medium susceptibility of walkers leads to an overall sensitivity rating of medium-high.

Magnitude of Change during Construction

The magnitude of change to the view would be medium. Hilltops would partially screen ground level construction work within the more distant parts of Site, while works related to the nearer proposed turbines would be readily visible, with the construction of access tracks, borrow pits, crane pads and foundations would be visible. The emerging turbines and construction cranes would be visible at a minimum of 6.37 km, extending above the relatively even skyline. Construction activity would be observable but contained within a small area of the hills adjoining Upper Nithsdale, amounting to 10 to 20 degrees of the wider view (**Figure 6.7**). While the most prominent features during the construction phase would be the tall cranes and emerging turbines, there would also be some visibility of ground level works, such as the construction of tracks and excavation of borrow pits along the ridgeline. These would add to the construction effect, despite their relatively small scale and separation distance. The large scale of this landscape and the expansive nature of the view would limit the magnitude of change arising from construction activity related to the Proposed Development. Visible on the skyline within the same sector of the view as the Proposed Development; Twentysilling, Whiteside Hill, Sanquhar and Sandy Knowe Wind Farms would also limit the magnitude of change.

Magnitude of Change during Operation

The magnitude of change to the view from the SUW, east of Sanquhar, would be medium. Much of the Proposed Development would be visible at a minimum of 6.37 km, visible on the skyline and occupying a small area of the expansive view. **Figure 6.23** shows that all of the rotors and the hubs of the proposed turbines would be visible above the skyline while the bases of some of the towers would be screened by long hill ridges adjoining the Upper Nithsdale valley. Atop the hills, the proposed turbines would appear relatively large in vertical scale in comparison to their low, massive profile. The Proposed Development would appear in front of and partially overlapping Whiteside Hill Wind Farm. As the proposed turbines would appear larger in scale but similar in form and spacing to those within this wind farm, the Proposed Development would appear as an extension to it. This would noticeably increase the number of wind turbines within a small proportion of the view, while not increasing the overall horizontal extent containing wind farm development. While the Proposed Development would form a cluster with operational Whiteside Hill Wind Farm, the gaps between Sanquhar Wind Farm to the right and Twentysilling to the south would ensure the Proposed Development would remain distinct from these developments.

Despite the presence of wind farm development in the view, the closer proximity and larger scale of the Proposed Development combined with the alignment of this section of the SUW towards the Proposed Development, would make it a prominent feature in the views of walkers.

Significance of Effect

During both the construction and operational phases the effect of the Proposed Development on the view from the SUW, east of Sanquhar would be **moderate** and **significant**. The changes to the baseline view arising from both phases of the Proposed Development would be readily apparent directly ahead of southbound receptors, albeit seen within the context of existing wind farms.

6.9.9 Viewpoint 8: Polgown, Scaur Water Minor Road (Figure 6.24)

Baseline

This viewpoint is located adjacent to Polgown, an isolated residential property within the narrow glen of Scaur Water, close to the head of the valley. It is representative of the small number of residents who live in this sparsely populated area, but also the views of walkers on the SUW and road-users travelling south-bound on this truncated minor road.

This section of the minor road follows the valley floor within the upper reaches of the Scaur Glen, at approximately 320 m AOD. Properties lie in close proximity to the road, with a wood pole line running broadly parallel to the road along the valley floor. The surrounding uplands enclose the valley landscape with their smooth rounded hills and interlocking spurs, which in turn, focus views along the line of the valley. The landcover is predominantly rough grasses which form an open moorland. Fields of semi-improved grassland occur along the valley floor with occasional enclosure from stone dykes. The view is characterised by the combination of this open and relatively bleak upland landscape, and the farmed land-use it is put to.

The Whiteside Hill Wind Farm can be seen in close proximity, behind the hills on the northern side of the valley. The Twentyshilling Wind Farm can be seen further away to the east, on the open skyline above the glen.

The Scaur Water is also represented by Viewpoint 5 Shiel, Scaur Water and the additional Viewpoint 24 Glenwhargen, Scaur Water which is assessed at a high level in **Section 6.9.24** and illustrated in cumulative wirelines on **Figure 6.40**.

Sensitivity

The value of the view is medium. This is not a formally recognised viewpoint. This viewpoint does not fall within a landscape designated for its scenic value, nonetheless it has a composition that is representative of some of the landscape qualities of the narrow glens within the nearby Thornhill Uplands RSA.

The susceptibility of road-users is medium. Typically, the susceptibility of road-users is moderated by the transitory nature and short duration of their views; however, as a result of the enclosed nature of the road, and its circuitous nature, it is considered that receptors would have greater awareness of the landscape compared to users of other routes within the study area.

The susceptibility to change is moderated by the presence of the Whiteside Hill Wind Farm, seen in close proximity on the skyline to the north of this view and less so by Twentyshilling, which establish this type of development as a feature of the baseline. The influence of operational wind farms on views experienced at this location is more apparent than at Viewpoint 5 (**Figure 6.21**), owing to their closer proximity.

The susceptibility of residents is considered to be high, owing to their static nature and potentially the long duration of views.

The susceptibility of walkers on the SUW is medium-high. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of existing wind farm developments which are seen above the valley skylines.

Road users are considered to have an overall medium sensitivity owing to the short duration and transitory nature of their views. For residential receptors, the combination of the medium value of the view and high susceptibility means their sensitivity is rated medium-high. Walkers on the SUW are also assessed as having an overall medium-high sensitivity, owing to their heightened awareness and appreciation of their surroundings.

Magnitude of Change during Construction

The magnitude of change to the view would be medium-high. The enclosing landform would screen ground level construction works within the Site from this location on the valley floor, including the construction of access tracks, crane pads and foundations. Landform would restrict visibility to the nearest emerging turbines and associated construction cranes. While only a small proportion of the construction works would be visible above the skyline, they would be seen at the minimum distance of 1.25 km. Proximity to the works and the large scale of the emerging turbines in relation to the hills forming the valley sides, are the main factors determining the magnitude of change. While some of the Whiteside Hill and Twentyshilling turbines are already visible, the highly enclosed nature of the valley and the distinct lack of settlement in this rural landscape would emphasise the variance of the construction works.

Magnitude of Change during Operation

The magnitude of change to the view from Polgown would be medium-high. Visibility of the Proposed Development would be very close range but restricted by the landform of the valley to the upper towers and blades of five proposed turbines, including four hubs, as shown on **Figure 6.24**. These would appear similar in scale and form to those within the Whiteside Hill Wind Farm nearby, to the west. Close proximity to the viewpoint and the apparently low height of the surrounding hills mean that the proposed turbines would appear large in scale, compared to the hills. The proposed turbines would be prominent on the skyline between and isolated from those within both operational wind farms. The highly contained nature of the valley; low level of development within the valley; and the limited presence of operational wind turbines on the skyline would emphasise the introduction of the proposed turbines. While this would occur within a part of the view previously free of wind turbines, the Proposed Development would not extend the overall horizontal extent of wind farm development within the view and this would moderate the overall magnitude of change.

Significance of Effect

For road users, the effect would be **moderate** and **significant**, during both the construction and operational phases. This reflects the presence of the Proposed Development directly ahead of road-users as they progress southwards, which would counteract the transitory nature of their views and increase the level of effect.

For residents and walkers on the SUW, the effect of the Proposed Development on the view from Polgown would be **major / moderate** and **significant** during both development phases. Very close proximity and clear visibility of the proposed turbines above the skyline are the main factors determining the level of effect for these receptors.

6.9.10 Viewpoint 9: Durisdeer (Figure 6.25)

Baseline

This viewpoint is located at the edge of Durisdeer, a small settlement that lies on the lower slopes of the Southern Uplands, to the east of the Upper Nithsdale Valley. The village is sited within the shallow valley of the Kirk Burn, to the south of a thick copse of mixed woodland.

Properties within the settlement are loosely arranged around a central village green and parish church and are generally orientated towards these features. Dwellings to the north of Durisdeer are set within dense woodland. As a result, many of the views from the village are enclosed by a combination of landform, adjacent built form, and by vegetation both within curtilage of properties and by that along the Kirk Burn, although the screening effect of vegetation would reduce during winter months. A small number of properties to the south and east of the settlement have more open views of the wider landscape. This viewpoint is representative of residents in this settlement.

Views to the west open up as the land falls away towards the broad Upper Nithsdale Valley. The fore-to-midground is characterised by a gently undulating landscape under pastoral agriculture use. Field parcels are medium to large in scale, enclosed by a rectilinear pattern of stone dykes. Extensive woodland cover is visible across the midground of the view within the low-lying valley floor. Beyond the wooded valley, views extend west to the larger hills of the Southern Uplands, which in contrast are open and exposed aside from large blocks of commercial forestry. The Twentysilling and Whiteside Hill Wind Farms are visible along the open skyline to the north-west, below the distinctive silhouette of Black Rig.

Sensitivity

The value of the view is medium-high. While there are no formal viewpoints in Durisdeer, this location does present a natural vantage point across the surrounding landscape. The viewpoint is also located within the Thornhill Uplands RSA which is formal recognition of the local scenic value of this landscape.

The susceptibility of local residents is medium-high. Although not many of the properties are orientated towards the Site, there is the potential for residents views to be affected. Twentysilling and Whiteside Hill Wind Farms, seen on the distant skyline to the north-west establish this type of development as a feature of the baseline in views towards the Site and moderate the susceptibility of local residents.

The combination of the medium-high value of the view and the medium-high susceptibility of residents leads to an overall medium-high sensitivity for these receptors.

Magnitude of Change during Construction

The magnitude of change to the view would be low. Landform would screen ground level construction work within the Site, including construction of the access tracks, crane pads and foundations. Visibility of the Proposed Development would be restricted to the uppermost parts of the nearest emerging turbines, works at height and construction cranes. These elements, forming a small proportion of the works, would be seen at a minimum of 14.63 km. Construction of the development would form a very small feature in the view, especially in comparison to Black Rig, due to the scale of the hill on the skyline. This would be visible within the context of operational turbines within the Twentysilling and Whiteside Hill Wind Farms.

Magnitude of Change during Operation

The magnitude of change to the view would be low. The Proposed Development would be partially visible at a minimum of 14.63 km, seen above intervening landform and tree cover, within the context of the much more prominent and large-scale hill of Black Rig, to the south-east. Due to the hill's distinctive profile, it is a focal point relatively near to, but separate from, the Proposed Development. **Figure 6.25** shows that from this viewpoint, the Proposed Development would appear as a distant feature on the skyline beyond Twentysilling Wind Farm and closer than Whiteside Hill Wind Farm, barely perceptible further west. A smaller proportion of the Proposed Development, comprising the hubs and blades of five proposed turbines, would be visible. These would be distinct from turbines within Twentysilling Wind Farm but would appear similar in form and spacing, if noticeably smaller in vertical scale. The Proposed Development would partially overlap the lateral extent of the more distant Whiteside Hill Wind Farm. While the Proposed Development would increase the level of Wind Farm development within the view, it would be contained within 5 to 10 degrees of the wider 360 degree view and would not increase its overall horizontal extent.

Significance of Effect

Residents would observe a **moderate / minor** effect on the view from Durisdeer due to the Proposed Development being **not significant**, during both the construction and operational phases. While the

addition of the Proposed Development would be visible from parts of Durisdeer, the very limited visibility of the Proposed Development, its containment within a small proportion of the view, the greater prominence of Black Rig on the skyline, and the greater presence of the operational Twentyshilling Wind Farm would all moderate the overall effect.

6.9.11 Viewpoint 10: Wauk Hill (Figure 6.26)

Baseline

This viewpoint is located on Wauk Hill, whose highest point is marked by a trig point, at 357 m AOD, with largely unimpeded 360° views over the surrounding landscape. The near isolated hill at the northern end of the Keir Hills provides expansive views of the surrounding lowlands, the wider landscape and to the north, the Southern Uplands. The viewpoint is representative of walkers on the hill.

The foreground of the view is characterised by moorland, rounded crags and commercial forestry on lower slopes. Across the valley of the Shinnel Water, the Southern Uplands appear as a landscape of broad hills covered by rough grassland and commercial forestry with long ridgelines and interlocking spurs formed by burns. Several wind farm developments are visible on hilltops defining the skyline. These contrast with the relatively low level of development within the view but distance from the viewpoint means they do not provide focal points within the panoramic view. Directly ahead, Sanquhar and Whiteside Hill Wind Farms comprise a group of wind turbines on the skyline, with outlying developments at Wether Hill and Twentyshilling to the south-west and north-east, respectively. To the north-east, the wider panorama takes in the wide, settled valley landscape and agricultural fields of lower Nithsdale, enclosed by the Lowther Hills.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers. The location of the viewpoint in the Thornhill Upland RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

Viewer susceptibility is medium-high. While the susceptibility of walkers on the hill is heightened by their awareness and appreciation of their surroundings, this is moderated by the visibility of existing wind farm developments, particularly the closer Wether Hill and Twentyshilling; and Sanquhar and Whiteside Hill, directly behind the Site. These establish wind farm development as a characteristic of the baseline view to which the Proposed Development would appear similar.

The medium-high value of the view and medium-high susceptibility of walkers on the hill to changes arising from the Proposed Development means their sensitivity is rated as medium-high.

Magnitude of Change during Construction

For walkers on Wauk Hill the magnitude of change to the view during the construction phase would be low. Ground level construction works at the Site would be screened by intervening landform. Visibility of construction activity would be restricted to the emerging turbines and associated construction cranes, which would appear at a minimum distance of 17.35 km. During construction, the Proposed Development would occupy 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). The emerging turbines and construction activity would be visible against the backcloth of open sky, contained within a small section of the skyline and behind the expansive intervening landscape. The much larger scale of the surrounding hills and landscape would limit the resulting magnitude of change. The location of the construction works in the same sector of the view as operational wind turbines beyond the Site, including Sanquhar and Whiteside Hill Wind Farms; and further afield, within Wether Hill and Twentyshilling Wind Farm, further reduce the magnitude of change to the view.

Magnitude of Change during Operation

During the operational phase, the magnitude of change to the view for walkers on Wauk Hill would be low. The Proposed Development would appear as a distant feature on the skyline at a minimum distance of 17.35 km. **Figure 6.26** shows partial visibility of the turbines, with nine hubs visible and the lower parts of the turbines screened by intervening landform. The Proposed Development would appear in front of and partially overlapping the horizontal extent of Twentyshilling Wind Farm, just perceptible in the far distance. It would also overlap Whiteside Hill Wind Farm but would be contained within a small area of the background against open sky. While the overall horizontal extent of wind farm development in this view would not increase, an increase in the presence of wind farm development would be apparent but contained within 5 to 10 degrees of the full 360 degree view. The location of the Proposed Development in the same sector of the view as existing operational wind farms would further reduce the magnitude of change.

Significance of Effect

The effect of the Proposed Development on the view would be **moderate-minor** and **not significant** during both the construction and operational phases for walkers on Wauk Hill. Distance from the viewpoint, restricted visibility of the Proposed Development and the panoramic nature of the view are the main factors limiting its effect. The existing influence of similar wind farm development would also moderate the effects of the Proposed Development during both phases.

6.9.12 Viewpoint 11: Benbrack (Figure 6.27)

Baseline

This viewpoint is located on Benbrack (581 m AOD), with largely unimpeded 360° views over the surrounding landscape. The near isolated hill provides expansive views of the surrounding Southern Uplands.

The foreground of the view is characterised by the gently rounded hill summit and its rough grassland cover. A red sandstone arch, one of sculptor Andy Goldsworthy's 'Striding Arches', lies in the immediate foreground. Another is located on the summit of Colt Hill (598 m AOD), to the north-east. Colt Hill is represented by an additional viewpoint (Viewpoint 23), with a high-level assessment presented in **Section 6.9.24**, and represented by a cumulative wireline in **Figure 6.39**.

Being located within the Southern Uplands, the view encompasses the surrounding landscape of broad, rounded hills with long ridgelines and interlocking spurs formed by burns covered by grassland and patches of commercial forestry. While development is not readily apparent across the local hills, several wind farm developments are visible on hilltops to the north and north-east including Sanquhar, Whiteside Hill and Twentyshilling. Despite contrasting with the rural landscape, distance from the viewpoint and the panoramic nature of the view means they do not provide focal points. Wether Hill and its wind farm lie to the east. To the south-east are the more dramatic hills of the Glenkens. Above these, Windy Rig Wind Farm is prominent on the skyline with Windy Standard, Windy Standard II and Afton Wind Farms being less prominent on the hilltops defining the skyline.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers with the added attraction of the sculpture at the summit.

The susceptibility of walkers is medium. While susceptibility is heightened by the awareness and appreciation of walkers of their surroundings, this is moderated by the visibility of existing wind farm developments, including Hagshaw Hill, Hagshaw Hill Extension, Sanquhar, Whiteside Hill and Twentyshilling. These establish wind farm development as a characteristic of the baseline view to which the Proposed Development would appear similar.

The medium-high value of the view and the medium susceptibility of walkers on the hill to changes arising from the Proposed Development means their sensitivity is rated as medium-high.

Magnitude of Change during Construction

The magnitude of change to the view would be medium-low. It is likely that intervening landform would screen ground level construction work within the Site from this location, including the construction of access tracks, crane pads and foundations. Visibility of the construction works would be restricted to the emerging turbines and associated construction cranes, seen at a minimum distance of 9.03 km.

During construction, the Proposed Development would form a relatively contained feature within this panoramic middle range view. The emerging turbines and construction activity would be framed by nearby hills, contained within a small area of the middle ground and readily visible against the backdrop of receding hills. The larger scale of the surrounding hills and landscape would limit the resulting magnitude of change, while the location of the construction works in the same sector of the view as existing operational wind farms, within the middle and background, would further reduce their influence.

Magnitude of Change during Operation

The magnitude of change to the view from Benbrack arising from the operational Proposed Development would be medium-low. The Proposed Development would be visible at a minimum distance of 9.03 km, seen above and between intervening landform and tree cover. **Figure 6.27** shows that the proposed turbines would appear as middle range features, immediately to the east of the Whiteside Hill turbines and distinct from the Twentyshilling turbines, further east. The upper towers, rotors and ten of the hubs would be visible, with only one hub appearing above the skyline. These would appear similar in form and layout to those within Whiteside Hill Wind Farm, to which it adjoins and may appear as an extension. While the Proposed Development would form a readily apparent addition within the middle ground, the overall horizontal extent of wind farm development within the wider panorama would not appear to increase.

In this view, the proposed turbines would appear similar in vertical scale to the closer range hills, albeit slightly larger in scale to the operational turbines. Most of the proposed turbines' towers would lie below the skyline and against a backdrop of hills and together they would occupy only 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). These factors, in combination with the large-scale of the wider surrounding landform and landscape, would limit the resulting magnitude of change. The location of the Proposed Development in the same sector of the view as existing operational wind farms would further reduce the magnitude of change.

Significance of Effect

During both the construction and operational phases the effect of the Proposed Development on the view would be **moderate** and **not significant** for walkers on Benbrack. Distance from the viewpoint, the panoramic nature of the view and contained extent of the Proposed Development are the main factors that would reduce its effect at this location. The existing influence of similar wind farm development would also moderate the effects of the Proposed Development during both phases.

6.9.13 Viewpoint 12: Cairnsmore of Carsphairn (Figure 6.28)

Baseline

This viewpoint is located on Cairnsmore of Carsphairn (797 m AOD), with largely unimpeded 360° views over the surrounding landscape. The highest hill of the Carsphairn and Scaur Hills, Cairnsmore of Carsphairn provides expansive views of the surrounding Southern Uplands.

The foreground of the view is characterised by the rock-strewn summit and contains a cairn in the immediate foreground. The panoramic, long-range view encompasses the surrounding landscape of

the Southern Uplands and Southern Uplands with Forest. These are characterised by broad, rounded hills with long ridgelines and interlocking spurs formed by burns covered by grassland and patches of commercial forestry. Numerous wind farm developments are visible on hilltops within the fore, middle and background to the north and north-west. These contrast with the otherwise low level of development within the view but despite the number and extent of visible turbines, they exert less influence on the view than the enclosing hills receding into the far distance.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers. The location of the viewpoint in the Galloway Hills RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

Viewer susceptibility is medium. While the susceptibility of walkers on the hill is heightened by their awareness and appreciation of their surroundings, visibility of numerous existing wind farm developments reduces their susceptibility to the Proposed Development.

The medium-high value of the view and the medium susceptibility of walkers on the hill to changes arising from the Proposed Development means their sensitivity is rated as medium-high.

Magnitude of Change during Construction

The magnitude of change to the view would be low. It is likely that intervening landform would screen ground level construction work within the Site, including the construction of access tracks, crane pads and foundations. Visibility of the construction works would be restricted to the emerging turbines and associated construction cranes. These would be seen at a minimum distance of 14.88 km and seen below the skyline of receding hills.

During construction, the Proposed Development would form a small-scale feature within the panoramic and long-range view. The emerging turbines and construction activity would be contained within 1 to 5 degrees of the full 360 degree view, although appearing readily apparent, against the backdrop of receding hills. The much larger scale of the surrounding hills and landscape would limit the resulting magnitude of change. The location of the construction works in the same sector of the view as existing operational wind farms, within the fore, middle and background, would further reduce their influence.

Magnitude of Change during Operation

The magnitude of change to the view from Cairnsmore of Carsphairn arising from the operational Proposed Development would be low. The Proposed Development would be visible at a minimum distance of 14.88 km and seen above intervening landform and below the skyline defined by distant hills. It would appear as a distant feature partially overlapping the horizontal extent of Whiteside Hill Wind Farm, in the middle ground. Landform would restrict visibility of the proposed turbines to their upper towers, hubs and rotors, as shown on **Figure 6.28**. The Proposed Development would appear as an extension to Whiteside Hill Wind Farm, to which it adjoins, as the proposed turbines would appear similar in form and layout, with the increase in height not readily apparent from this range. The Proposed Development would increase the overall horizontal wind farm development within the view to the south-east.

The addition of the operational Proposed Development to the baseline view would be readily visible but would appear relatively small-scale. The proposed turbines would lie below the skyline defined by the backdrop of the Lowther Hills. They would be distinct features contained within a small area at the transition from middle ground to background. The large-scale of the surrounding landform and landscape would limit the resulting magnitude of change. The location of the Proposed Development within the fore, middle and background in the same sector of the view as existing operational wind farms, within the fore, middle and background, would further reduce their influence.

Significance of Effect

For walkers on Cairnsmore of Carsphairn, the effect of the Proposed Development on the view would be **moderate-minor** and **not significant** during both the construction and operational phases. The Proposed Development would have a discernible effect on the view during both phases but intervening distance; its appearance below the skyline; and the influence of similar operational wind farm development which extends across much of the view, would reduce the level of effect.

6.9.14 Viewpoint 13: Blackcraig Hill (Figure 6.29)

Baseline

This viewpoint is located on Blackcraig Hill (700 m AOD). The hill has a broad and gently undulating summit plateau. The highest point is marked by a trig point, which offers opportunities for 360° views. Views from the trig point into the surrounding valley landscapes are partly screened by the foreground plateau landform. There are also a series of smaller undulations and rocky outcrops around the trig point which offer more open views of the wider landscape and into the surrounding lowlands, and it is evident from the network of tracks that people visiting this hill would walk around the plateau summit for this reason. The viewpoint is representative of walkers on the minor summit to the east of the trig point which has greater visibility of the Upper Nithsdale Valley.

The foreground of the view is characterised by moorland with small rocky outcrops and rounded crags. The wider view to the south-east spans from Blackcraig Hill to surrounding hills that define the Upper Nithsdale Valley. These more distant hills appear as rolling landscape of long ridgelines, overlain by a landcover of rough grassland and commercial forestry. A series of wind farm developments are sited on the northern fringes of these hills and act as a focal point of the view from this summit. The more extensive Sandy Knowe Wind Farm is visible on lower slopes of the valley to the north, with Sanquhar, Whiteside Hill, and Twentysilling Wind Farm sited on similar elevations further to the east.

Towards the background, views into the settled valley landscape and agricultural lower valley slopes are restricted by intervening landform. The expanse of the Southern Uplands then rises again to a series of rounded summits and hills that enclose the valley to the north. More distant wind energy development is glimpsed between gaps in the intervening landform and hill summits.

Sensitivity

The value of the view is medium-high. Blackcraig Hill is not identified as a formal viewpoint on OS maps. Nonetheless, this hill is a notable high point at the westernmost end of the Upper Nithsdale Valley. The viewpoint also falls within the East Ayrshire Sensitive Landscape Area designation, specifically within the East Ayrshire Southern Uplands and Southern Uplands with Forestry LCUs that make up this part of the SLA; the (2015) SLA citation for the 'sensitivity' of the landscape notes, "the Uplands to the east of Glen Afton as an important area for recreation / hill walking".

The susceptibility of viewers is medium-low. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a large number of existing wind farm developments seen in the round from this viewpoint, including views eastwards towards the Site. These developments are a defining feature of baseline views experienced by walkers.

On balance, the combination of the medium-high value of the view and the medium-low susceptibility of viewers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

Walkers on the summit of Blackcraig Hill would observe a medium-low magnitude of change to the view during the construction phase. It is likely that intervening landform would screen much of the ground level construction works within the Site but the emerging turbines and associated construction

cranes would be visible at a minimum of 8.04 km. Despite relatively close proximity to the viewpoint, construction of the Proposed Development would appear relatively contained, amounting to 10 to 20 degrees of the full 360 degree view. Construction activity would be contained within a small area of the nearer middle ground and readily visible, relatively close by on the moorland plateau. The much larger scale of this landform and the surrounding, large-scale landscape would limit the resulting magnitude of change. The location of the construction works in the same sector of the view as existing operational wind farms, within the fore, middle and background, would further reduce their influence.

Magnitude of Change during Operation

The magnitude of change to the view from Blackcraig Hill arising from the operational Proposed Development would be medium-low. The Proposed Development would be visible at a minimum of 8.04 km, seen above intervening landform and tree cover, and below the skyline defined by the Lowther Hills in the far distance. As shown on **Figure 6.29**, the proposed wind turbines would appear as relatively close features immediately behind the Whiteside Hill turbines and in front of the more distant Twentysilling turbines. The proposed turbines would appear similar in form and layout, to those within Whiteside Hill Wind Farm, albeit of an increased scale. The upper towers, hubs and many of the proposed turbines' rotors would be visible and the horizontal extent of wind farm development would visibly increase. The proposed turbines would appear to increase the density of turbines associated with Whiteside Hill Wind Farm.

The addition of the operational Proposed Development to the baseline view would be readily apparent but would appear relatively contained, occupying only 10 to 20 degrees of the full 360 degree view. The proposed turbines would lie below the skyline defined by the backdrop of the Lowther Hills and the much larger scale of this landform and the surrounding, large-scale landscape of the Southern Uplands and the Lowther Hills would limit the resulting magnitude of change. The location of the development in the same sector of the view as existing operational wind farms, within the fore, middle and background, would further reduce their influence.

Significance of Effect

For walkers on Blackcraig Hill, the effect of the Proposed Development on the view would be **moderate-minor** and **not significant** during both the construction and operational phases of the Proposed Development. Distance from the viewpoint, the panoramic nature of the view, the Proposed Development's containment within a smaller proportion of the view, and its appearance below the skyline are the main factors that reduce the level of its effect on the view. The Proposed Development would also be sufficiently similar to existing wind farm development that its introduction would not be significant.

6.9.15 Viewpoint 14: Corsencon Hill (Figure 6.30)

Baseline

This viewpoint is located on the hilltop of Corsencon Hill (475 m AOD), at the trig point that marks the summit point. This viewpoint is representative of walkers on this hill and in the surrounding upland areas at the western extent of the Upper Nithsdale Valley.

360° panoramic views are available from this hill summit. This view looks eastwards, where the focus is along the line of the Upper Nithsdale Valley. The broad hill summit is overlain by rough grassland, which occupies the foreground and undulating upper slopes to the east. As the landform falls away to the east, the view opens up across the Upper Nithsdale Valley. From this perspective, the wide, gently sloping profile of the valley between Menzies to Kirkconnel can be appreciated. The settlements of Kirkconnel and Kelloholm, and Sanquhar in the distance, are seen along the valley floor, together with the A76 and Glasgow-Carlisle railway. Agriculture and improved grassland land use extends across the valley floor surrounding these settlements and across the gently rising lower valley sides,

eventually giving way to bracken, rough grassland, and large-scale forestry landcover amid the upper valley sides and uplands.

The expanse of the Southern Uplands encloses the valley to the north and south, and also terminates the view along the valley as it curves gently southwards, to the east of Menzies. Appearing enclosed on three sides adds further focus into the valley from this elevated viewpoint. The operational Hare Hill, Hare Hill Extension, Sanquhar, Whiteside Hill and Twentyshilling Wind Farms spread across the broad, open ridgelines and uplands to the south of the Upper Nithsdale Valley, making wind farm development a notable feature in views towards the Site. The Sandy Knowe Wind Farm spills into the upper slopes of the valley and somewhat disrupts the arrangement of other schemes seen along the skyline.

Sensitivity

The value of the view is medium-high. Corsencon Hill is not identified as a formal viewpoint on OS maps. Nonetheless, this hill is a notable high point at the westernmost end of the Upper Nithsdale Valley. The viewpoint also falls within the East Ayrshire Sensitive Landscape Area designation, specifically within the East Ayrshire Plateau Moorland LCU that makes up this part of the SLA.

The susceptibility of viewers is medium-low. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a large number of existing wind farm developments spread across the upper slopes and skyline of the Southern Uplands to the south, and south-east towards the Site. These developments are a notable feature of baseline views experienced by walkers.

On balance, the combination of the medium-high value of the view and the medium-low susceptibility of viewers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

For walkers on the summit of Corsencon Hill, a medium-low magnitude of change to the view would arise during the construction phase. It is likely that intervening landform would screen ground level construction works within the Site, while the emerging turbines and associated construction cranes would be readily visible. These construction works would appear medium in range, given the separation distance of 10.66 km.

Construction of the Proposed Development would appear small-scale within this wide middle range view. The emerging turbines would be visible within a surrounding, large-scale landscape context that includes the wide valley of Upper Nithsdale and the enclosing hills. The construction works would be contained within 10 to 20 degrees of the full 360 degree view and this would limit the magnitude of change to the view. The location of the Proposed Development in the same sector of the view as existing operational wind farms, across the hills to the south of the Nithsdale Valley, would further reduce its influence.

Magnitude of Change during Operation

A medium-low magnitude of change to the view from Corsencon Hill would arise from the operation of the Proposed Development. This would be visible at a minimum of 10.66 km, seen on the skyline defined by hills enclosing the Upper Nithsdale valley. **Figure 6.30** shows that the proposed wind turbines would appear as relatively close features immediately behind the Sandy Knowe and Sanquhar turbines. Twentyshilling Wind Farm, further east, would appear more distant. Many of the proposed turbines' upper towers, rotors and nine of the hubs would be visible just above the skyline. These would visibly increase the number of wind turbines within a contained proportion of the view. Appearing similar in layout and form to the turbines within Sanquhar and Sandy Knowe Wind Farms, the Proposed Development would appear as an extension to them, whilst not increasing the overall horizontal extent of wind farm development within the view.

The Proposed Development would form a relatively contained feature within the panoramic view. Enclosure emphasises the landform of the Upper Nithsdale valley which is the main focus of the view. The Site is located on the valley's periphery, occupying 10 to 20 degrees of the full 360 degree view and the proposed turbines would be discernible in the middle ground against the skyline. The scale of the landform and the extent of the landscape within which the Proposed Development would appear would limit the magnitude of change, along with the number and dispersal of operational wind farms along adjoining ridgelines.

Significance of Effect

For walkers on Corsencon Hill, the effect of the Proposed Development on the view would be **moderate / minor** and **not significant** during both the construction and operational phases. The Proposed Development would be contained within a small proportion of the view, seen at middle range and set low above the skyline, thus reducing its effect during both phases. The number and extent of operational wind farm development within the view would reduce the level of effect further.

6.9.16 Viewpoint 15: Todholes Hill (Figure 6.31)

Baseline

This viewpoint is located on the hilltop of Todholes Hill, near to the telecoms mast that marks the summit point (481 m AOD). This viewpoint is representative of walkers on this hill and in the surrounding upland area to the north of the Upper Nithsdale Valley. The view from the summit is wide-ranging and affords vistas along the valley, and into the Southern Uplands that enclose the valley to the south. There is no specific focus to the view.

The broad upper slopes of Todholes Hill occupy the foreground of the view. The topography falls away to the south to reveal the settled valley floor in the distant mid-ground of the view. The elevated, western fringes of Kelloholm and adjacent pastoral agriculture fields are visible to the south-west towards the Site. The moderate range view extends to hills, which enclose the Upper Nithsdale Valley to the south. These hills form part of the wider Southern Uplands and are typical of their steep sides and rounded summits, as well as the way in which they interlock to form an extensive undulating landform with few distinct peaks.

In the view to the west and south-west, the closest operational wind farm is Sandy Knowe which occupies a location on the upper valley sides. Twentyshilling Wind Farm sits apart amongst the upper slopes and interlocking hill summits to the south-east. The Whiteside Hill, Sanquhar, and Hare Hill and Hare Hill Extension Wind Farms extend across the views towards the Southern Uplands on the opposing side of the valley.

Sensitivity

The value of the view is medium. Todholes Hill is an undistinguished hilltop, not identified as a formal viewpoint on OS maps and not located within a landscape designated for its scenic qualities. Nonetheless, the wide-ranging and panoramic views across a variety of landscapes gained from this location are considered to contribute to its value.

The susceptibility of viewers is medium. While the susceptibility of walkers could be heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a number of existing wind farm developments seen in amongst the upper slopes and uplands on the opposing side of the valley, including views south towards the Site.

The combination of the medium value of the view and the medium susceptibility of viewers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change to the view would be medium-low. While hilltops would screen some of the ground level construction work within the more distant parts of Site, works related to the nearer proposed turbines including the construction of access tracks, crane pads and foundations, would be visible. Along with the emerging turbines, works at height and construction cranes, would be visible at a minimum distance of 8.64 km. During the construction phase, the Proposed Development would form a relatively contained feature within the panoramic and middle range view. Within the large-scale of the surrounding landscape context, including the wide valley of Upper Nithsdale, the construction works would be contained within 10 to 20 degrees of the full 360 degree view. Furthermore, wind turbines within Twentyshilling, Whiteside Hill, Sanquhar and Sandy Knowe Wind Farms would be visible within the same sector of the view as the Proposed Development and would also moderate the influence of the construction works within the view.

Magnitude of Change during Operation

The magnitude of change to the view from Todholes Hill arising from the operational Proposed Development would be medium-low. The Proposed Development would be visible across the Upper Nithsdale valley, on the nearer hilltops of the enclosing Southern Uplands at a minimum of 8.64 km. The proposed wind turbines would appear as relatively close features adjoining those within Whiteside Hill Wind Farm, as shown on **Figure 6.31**. The Proposed Development would appear as an eastward extension of the group of existing turbines comprising Whiteside Hill, Sanquhar and Sandy Knowe Wind Farms. Those within Twentyshilling Wind Farm, further east, would appear as a more distant and isolated group. The proposed turbines would be visible against the background of hills, with four hubs just visible above the skyline. The proposed turbines would appear similar in form and layout, to those of Whiteside Hill and would not differ greatly from existing turbines within the view, albeit appearing slightly larger in scale. The Proposed Development would appear to extend wind farm development eastwards, and its overall horizontal extent within the view appear to increase. The substantial separation distance between the Proposed Development and operational Twentyshilling Wind Farm would, however, ensure that these developments avoid coalescence.

The Site occupies a small area within the large-scale landscape and the Proposed Development would occupy 10 to 20 degrees of the full 360 degree view (**Figure 6.7**). Its proposed turbines would be discernible in the middle ground against and above the skyline defined by hills within the Southern Uplands. As these hills would appear larger in scale compared to the proposed turbines, the scale of this landform and the extent of the landscape within which the Proposed Development would appear would limit the magnitude of change to the view arising from the operational Proposed Development. The number and dispersal of operational wind farms within the view would further limit the magnitude of change.

Significance of Effect

For walkers on Todholes Hill, the effect of the Proposed Development on the view would be **moderate-minor** and **not significant** during both the construction and operational phases. The panoramic nature of the view, containment of the proposed turbines within a sector of the view, their limited visibility above the skyline and relatively low number visible, mean that the level of effect would be not significant. A high level of wind farm development within the view, to which the Proposed Development would appear similar, would also reduce the level of effect.

6.9.17 Viewpoint 16: Lowther East Mount (Figure 6.32)

Baseline

This viewpoint is located on Lowther East Mount (631 m AOD), with largely unimpeded 360° views over the surrounding landscape.

The foreground of the view is characterised by the rounded summit and rough grassland cover of the hill. The view encompasses the wide Nithsdale Valley and the adjoining Southern Uplands, beyond. These appear as a landscape of broad hills covered by rough grassland and commercial forestry with long ridgelines and interlocking spurs formed by burns. The broad Nithsdale valley extends across the view. The valley floor is covered by a patchwork of agricultural fields interspersed with small woodlands, often extending up the lower slopes of the valley sides. Further above are larger patches of coniferous forestry. Isolated settlements are discernible, dotting the eastern part of the valley, while a larger concentration further west comprises the village of Sanquhar. Several wind farm developments are visible on hilltops adjoining the valley. Constituent turbines are taller features that contrast with the wide, shallow valley and its relatively low level of development. While these provide points of interest within the panoramic and long-range view, the scale of the valley and surrounding landscape is of comparable interest. Distant hills define the skyline such that the wind farms, including Twentysilling, Whiteside Hill, Sanquhar and Sandy Knowe, are seen below the skyline against the nearer hills.

Sensitivity

The value of the view is high. This is a formal viewpoint shown on OS maps. The location of the viewpoint in the Thornhill Uplands RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

Viewer susceptibility is medium. While the susceptibility of walkers on the hill is heightened by their awareness and appreciation of their surroundings, visibility of numerous existing wind farm developments reduces their susceptibility to the Proposed Development.

The high value of the view and the medium susceptibility of walkers on the hill to changes arising from the Proposed Development means their sensitivity is rated as medium-high.

Magnitude of Change during Construction

The magnitude of change to the view would be low. The landform of the Site and the elevated viewpoint would enable visibility of construction works within the Site, including the construction of access tracks, crane pads and foundations, emerging turbines, works at height and construction cranes. These would be seen at a minimum distance of 13.68 km and set below the skyline defined by the Southern Uplands hills.

During the construction phase, the Proposed Development would form a relatively small feature within the panoramic and middle range view. The proposed turbines would be visible within a surrounding, large-scale landscape context, including the wide valley of Upper Nithsdale and distant hills to the south-west. Within this context, the introduction of the construction works would be contained within a small area of the middle ground. Furthermore, operational wind farms that are almost regularly dispersed across the hilltops adjoining Upper Nithsdale, are visible extending across much of the view. Whiteside Hill Wind Farm would appear immediately behind and adjoining the Proposed Development. The influence of this type of development on the view would limit the magnitude of change to the view during the construction phase.

Magnitude of Change during Operation

The magnitude of change to the view from Lowther East Mount arising from the Proposed Development would be medium-low. The Proposed Development would be visible at a minimum of 13.68 km on the hilltops of the Southern Uplands adjoining Upper Nithsdale. **Figure 6.32** shows that the proposed turbines would be almost entirely visible against the hills behind. They would appear similar in form and layout, although with the increase in height potentially apparent. There would be a perceptible increase in the number of wind turbines within a contained part of the view already occupied by wind turbines. The Proposed Development would appear as an eastward extension to

the adjoining Whiteside Hill Wind Farm, but the overall horizontal extent of wind farm development within the view would not appear to increase.

The Site occupies a small area within the large-scale landscape and the Proposed Development would occupy 10 to 20 degrees of the full 360 degree view. Its proposed turbines would be discernible in the middle ground against and below the skyline defined by hills within the Southern Uplands. The scale of this landform and the extent of the landscape within which the Proposed Development would appear would limit the magnitude of change to the view arising from the operational Proposed Development. The number and dispersal of operational wind farms within the view would further limit the magnitude of change.

Significance of Effect

For walkers on Lowther East Mount, the effect of the Proposed Development on the view would be **moderate** and **not significant** during both the construction and operational phases. The panoramic nature of the view, low number of proposed turbines, and appearance below the skyline would moderate the effects of the Proposed Development. Similar operational wind farm development along the edge of the Nithsdale valley within the view would also reduce the level of effect.

6.9.18 Viewpoint 17: Meikle Millyea (Figure 6.33)

Baseline

This viewpoint is located on Meikle Millyea (749 m AOD), with largely unimpeded 360° views over the surrounding landscape. It is the southernmost summit on the Rhinns of Kells ridge and provides expansive views of the surrounding Southern Uplands.

The foreground of the view is characterised by the isolated summit covered by rough grassland and strewn with rocks. The view overlooks the wide valley of the Glenkens, enclosed by the Southern Uplands with the Lowther Hills providing a distant backcloth. The valley appears largely unsettled, with sporadic settlements dotting a valley floor covered by rough grassland and coniferous woodland. The latter extends up the slopes of the rounded hills in large patches, generally leaving the hilltops bare. Few minor roads and tracks snake through the valley. Wind farm development lies on the periphery of the valley, on nearer hilltops and typically against the backcloth of distant hills. These include Windy Standard II, Afton, Windy Rig, Sanquhar, Whiteside Hill and Twentysilling wind farms.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers. The location of the viewpoint in the Galloway Hills RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

The susceptibility of viewers is medium-low. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of numerous existing wind farm developments, which are dispersed across much of the view. These developments mean that the baseline views experienced by walkers already feature similar types of development in the same sector of the view towards the Site.

The combination of the medium-high value of the view and the medium-low susceptibility of viewers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change to the view would be low. Landform would screen ground level construction work within the Site including the construction of access tracks, crane pads and foundations. The emerging turbines and associated construction cranes would, however, be visible above the intervening landform, albeit at a minimum distance of 30.25 km would not be readily apparent. During the construction phase, the Proposed Development would form a relatively small feature within the

panoramic and very long-range view, which extends to the Lowther Hills. The landform of the Southern Uplands would appear larger in scale than the emerging turbines and much of the surrounding, large-scale landscape would be visible. At a comparable distance from the viewpoint, the operational Windy Standard II, Sanquhar, Whiteside Hill, Twentysilling and Wether Hill Wind Farms appear on the skyline and the influence of the construction works on the view would be further reduced within the context of these developments.

Magnitude of Change during Operation

The magnitude of change to the view from Meikle Millyea arising from the operational Proposed Development would be low. The Proposed Development would be visible at a minimum of 30.25 km on the hilltops of the Southern Uplands adjoining Upper Nithsdale. **Figure 6.33** shows that the proposed wind turbines would appear as distant features just perceptible behind Whiteside Hill Wind Farm, and to which they would appear as an eastward extension. Due to screening by landform, only the proposed turbines' upper towers, hubs and blade would be visible with the blades and hub of one appearing above the skyline. The proposed turbines would appear similar in form, layout, vertical scale and height to those of Whiteside Hill. While the Proposed Development would appear to extend wind farm development eastwards, its overall horizontal extent within the wider view would not increase.

The operational Proposed Development would occupy 1 to 5 degrees of the full 360 degree view. The proposed turbines would be discernible in the middle ground against and below the skyline defined by very distant hills. The Southern Uplands, rising to the high moorland plateau where the Proposed Development would lie, would appear large in vertical scale compared to the proposed turbines. The scale of this landform and the extent of the landscape within which the Proposed Development would appear would limit the magnitude of change to the view arising from the operational Proposed Development. The number and dispersal of similarly distant operational wind farms within the view would further limit the magnitude of change.

Significance of Effect

For walkers on Meikle Millyea, the effect of the Proposed Development on the view would be **minor** and **not significant** during both the construction and operational phases. The Proposed Development would be a distant and small-scale feature within this panoramic and very long-range view, seen against more distant hills. As such, the effect of the development on the view would not be significant and the extent of operational wind farm development serves to consolidate this assessment.

6.9.19 Viewpoint 18: Southern Upland Way, Coupland Knowe (Figure 6.34)

Baseline

This viewpoint is located on the SUW, on a section of the route to the north-east of Sanquhar. Coupland Knowe is a small summit situated between the valley of the Nith to the south-west and the higher summits of the Southern Uplands to the north-east. This view is representative of users of the long-distance trail heading south-west, amongst the lower slopes to the north of the Upper Nithsdale Valley.

The view is relatively wide-ranging and focusses on the south, towards the Nithsdale Valley. Development within Sanquhar is seen along the valley floor, and the horizon is formed by the hills to the south of the valley. The surrounding land cover is formed by rough grassland and moorland, and there are several pockets of forestry across the lower ground to the south. The Southern Uplands, seen to the south of this location, present the characteristic profile of steep sides with broad rounded summits, rough grassland cover and large-scale coniferous plantations.

There are several large-scale developments spanning the skyline, upper slopes, and upper valley sides to the south, that influence the otherwise predominantly rural character experienced from this

section of the SUW. Twentysilling Wind Farm is noticeably set apart from other schemes to the south-east. Whiteside Hill Wind Farm is seen along the line of the SUW from this location. Further to the north-west, several schemes are seen in close-proximity and slightly overlapping one another, including Sanquhar, Hare Hill and Hare Hill Extension, and Sandy Knowe Wind Farms.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is located on a well-publicised and popular walking route. The location of the viewpoint in the Thornhill Uplands RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

The susceptibility of viewers is medium. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a number of existing wind farm developments, which are seen to extend across the Southern Uplands to the south. These developments mean that the baseline views experienced by walkers already feature similar types of development in the same sector of the view towards the Site.

The combination of the medium-high value of the view and the medium susceptibility of viewers leads to an overall medium-high rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change on the views of walkers on the SUW at Coupland Knowe would be medium-low during the construction phase. Some ground level construction works are likely to be visible, including the construction of access tracks, crane pads and foundations, although overall construction works would be largely screened by intervening landform. The emerging turbines and associated construction cranes would be visible on the skyline of the enclosing hills adjoining the Upper Nithsdale valley. The minimum separation distance of 8.58 km would ensure that they would appear as a relatively contained feature within this expansive view, amounting to 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). Construction of the Proposed Development would be seen within the context of the wide valley and the enclosing hills. The location of the construction works, in the same sector of the view as operational wind farms across the hills south of Sanquhar, would further reduce the influence of the construction works on the view.

Magnitude of change during Operation

The magnitude of change to the views of walkers on this section of the SUW would be medium-low during the operational phase. The Proposed Development would be located a minimum distance of 8.58 km from the viewpoint, making it a relatively contained feature within the panoramic view, which encompasses much of the Upper Nithsdale Valley and the enclosing Southern Uplands. **Figure 6.34** shows that each of the proposed turbines would be seen to almost their full extents above the skyline and would appear similar in form and spacing with those of Whiteside Hill Wind Farm, although slightly larger in height. The Proposed Development would appear between Twentysilling Hill and Whiteside Hill Wind Farms. Partially overlapping with the horizontal extent of Whiteside Hill Wind Farm, the Proposed Development would possibly be perceived as an extension of this development. It would also increase the horizontal extent of wind farm development towards Twentysilling, albeit still maintaining a sizable separation between these two wind farms.

The operational wind farm developments which lie within the same sector of the view as the Proposed Development and to the north-west would limit the magnitude of change arising from the operational Proposed Development, as it would not present a notable contrast with the baseline view, despite the relatively close proximity of the Proposed Development to this viewpoint.

Significance of effect

For walkers on the SUW at Coupland Knowe the effect of the Proposed Development on the view would be **moderate** and **not significant** during both the construction and operational phases. Whilst the Proposed Development would be visible above the skyline from this upland viewpoint, the panoramic nature of the view and the visibility of operational wind farm development on the enclosing horizon and directly adjacent to the Site at Whiteside Hill, would moderate its effect on this view.

6.9.20 Viewpoint 19: Southern Upland Way, Glengaber Hill (Figure 6.35)

Baseline

This viewpoint is located adjacent to the SUW, on a summit to the south of the route, north-west of Wanlockhead. The SUW passes broadly south-west between Wanlockhead and Sanquhar along this section. Glengaber Hill is situated at a slightly higher elevation than the SUW itself, but the viewpoint is considered to be representative of walkers travelling south-west along this elevated section of the route and those on the hilltop itself.

The view from the summit is relatively wide-ranging, and panoramic in nature. Relatively long-distance views are available in all directions towards summits within the wider Southern Uplands. The surrounding hills present the characteristic profile of steep sides with broad rounded summits and rough grassland cover. There are pockets of coniferous forestry across the surrounding landscape.

To the south-west, the view is over the steep-sided valley of the Glenlosk Burn, flanked by rounded hill summits. In the middle distance, lower ground within the Upper Nithsdale Valley can be seen, although the settlement within the valley is screened from view from this location by the intervening summits. Beyond this, hills to the south of the valley form the horizon in relatively long-distance views.

Wind farm development forms a feature in views in all directions, and there are several large-scale developments throughout the landscape. To the south-west, wind farms including Twentysilling, Whiteside Hill, Sandy Knowe, Sanquhar, Hare Hill and Afton are visible, predominantly backclothed against the landscape beyond in views from this elevated location. Several large-scale developments can also be seen in long-distance views to the north, including Middle Muir and Andershaw, and a large cluster of developments including Hagshaw Hill.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is located adjacent to a well-publicised and popular walking route. The location of the viewpoint in the Thornhill Upland RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

The susceptibility of walkers is medium. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a number of existing wind farm developments, which are seen to extend across the surrounding hill ranges, including the Southern Uplands to the south. These developments mean that the baseline views experienced by walkers already feature similar types of development in the same sector of the view towards the Site.

The combination of the medium-high value of the view and the medium susceptibility of viewers leads to an overall medium-high rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change on the views of walkers on the SUW at Glengaber Hill would be medium-low. Ground level construction works at the Site are likely to be visible, including the construction of access tracks, crane pads and foundations. The emerging turbines and associated construction cranes would also be visible. However, given the separation distance of approximately 12.7 km to the

nearest turbine, these construction works would appear as a relatively distant feature, while their location in the same sector of the view as the existing operational wind farms across the hills to the south of the Nithsdale Valley would reduce their influence.

Magnitude of change during Operation

The magnitude of change to the view from the SUW, Glengaber Hill would be medium-low. The nearest proposed turbine would be located 12.7 km from the viewpoint, making the Proposed Development a relatively distant and contained feature, amounting to 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). **Figure 6.35** shows that each of the proposed turbines would be seen to almost their full extents above the horizon in direct views to the south, although the turbines would be backclothed against more distant hills to the south-west. The Proposed Development would appear to overlap with the horizontal extent of the view occupied by Whiteside Hill Wind Farm and would bring turbines into slightly closer proximity to the viewpoint than the existing turbines. The Proposed Development would be positioned between Whiteside Hill and Twentysilling Hill wind farms and as such would be seen in a sector of the view which is already influenced by wind farm development. The Proposed Development would however contribute to the increasing influence of wind farm development on this enclosing horizon in direct views to the south. While the Proposed Development would be apparent from this viewpoint, the factors set out above would moderate the magnitude of change such that the additional effect would be limited.

Significance of effect

For walkers on the SUW at Glengaber Hill, the effect of the Proposed Development on the view of would be **moderate** and **not significant** during both the construction and operational phases. Whilst the Proposed Development would be visible above the skyline to the south in views from this upland viewpoint, the separation distance of 12.7 km combined with the existing visibility of wind farm development on the enclosing horizon and directly adjacent to the Site at Whiteside Hill would moderate its effect.

6.9.21 Viewpoint 20: Cairnkinna (Figure 6.36)

Baseline

This viewpoint is located on the summit of Cairnkinna, a relatively large hill towards the eastern extent of the Scaur Hills. The hill is located to the north of the Scaur Water at Chanlockfoot. At 552 m AOD it forms a high point in the immediate surroundings. The viewpoint is representative of walkers within the Scaur Hills.

The view from the summit is relatively wide-ranging and panoramic in nature. Views to the east and south are most long-distance, towards and beyond the Nithsdale Valley. The Solway Firth is visible in long-distance views to the south-east. In other directions the horizons are formed at slightly closer proximity by hill summits within the Southern Uplands. The surrounding hills present the characteristic profile of steep sides with broad rounded summits and rough grassland cover. There are pockets of coniferous forestry across the surrounding landscape.

The Site is located to the north-west of the summit, and in this direction the view is over a high moorland plateau. Twentysilling Wind Farm is located in close proximity to the summit and occupies a relatively wide extent of the view to the north. There are several other wind farm developments visible in slightly longer-distance views to the north-west, including Whiteside Hill, Sanquhar and Sandy Knowe. Wind farm development is also present in views in other directions, including across hills to the north of the Douglas Water to the north and extensive development at Clyde Wind Farm, seen beyond the Lowther Hills to the north-east.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers. The location of the viewpoint in the Thornhill Upland RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

The susceptibility of viewers is medium-low. While the susceptibility of walkers is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a number of existing wind farm developments, particularly at Twentyshilling which is located in close proximity to the summit and which occupies a relatively large proportion of the view to the north. Overall, these developments mean that the baseline views experienced by walkers already feature similar types of development in the same sector of the view towards the Site.

The combination of the medium-high value of the view and the medium-low susceptibility of viewers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change to the views of walkers on the summit of Cairnkinna would be medium during the construction phase. While ground level construction works at the Site are likely to be screened from view by the intervening landform, the emerging turbines and associated construction cranes would be readily visible. Given the minimum separation distance of 5.65 km these construction works would appear as a relatively close feature. The high-level construction works would, however, occupy only 20 to 30 degrees of the full 360 degree panorama visible from this hill top and they would be seen in the broader context of the hills and valleys of the Southern Uplands. Furthermore, the construction works would be seen set beyond the closer range operational Twentyshilling Wind Farm and adjacent to operational Whiteside Hill Wind Farm, with these baseline influences also moderating the magnitude of change.

Magnitude of change during Operation

The magnitude of change to the views of walkers on the summit of Cairnkinna would be medium during the operational phase. The Proposed Development would be located a minimum distance of 5.65 km from the viewpoint, making it a relatively close feature. **Figure 6.36** shows that each of the proposed turbines and their hubs would be visible to the north-west, with the lower parts of the turbines screened by intervening landform. Many of the turbines would be backclothed against more distant hills to the north-west. The Proposed Development would visibly overlap with the horizontal extent of the view occupied by Whiteside Hill, Sanquhar and Sandy Knowe Wind Farms, and would bring turbines into closer proximity to the viewpoint than these developments, although the closest development would remain as Twentyshilling Wind Farm, to the north. The Proposed Development is likely to appear as part of a larger development alongside Whiteside Hill and would be contained within a sector of the view in which wind farm development is widespread.

The operational Proposed Development would form a relatively contained feature within the wider landscape context of the panoramic view, amounting to 20 to 30 degrees of the full 360 degree view. The proposed turbines would largely appear below the skyline, backed by nearby hills, albeit with the blades and hub of one turbine appearing just above distant hills. Lying within high moorland plateau, the proposed turbines would appear smaller in scale compared to the surrounding hills and valleys of the Southern Uplands, and while they would appear larger than the adjacent Whiteside Hill turbines, they would also appear smaller than the closer range Twentyshilling turbines. The baseline influence from these operational wind farms is a key factor in moderating the magnitude of change.

Significance of effect

For walkers on the summit of Cairnkinna, the effect of the Proposed Development on the view would be **moderate** and **not significant** during both the construction and operational phases. Despite its close proximity to the viewpoint, the influence of operational wind farms in the same sector, including

close range Twentyshilling, combined with the contained extents of the Proposed Development, would ensure it would not redefine the character of this view.

6.9.22 Viewpoint 21: Crawick Multiverse (Figure 6.37)

Baseline

This viewpoint is located within Crawick Multiverse, a visitor attraction to the north-west of Sanquhar. It is a land art installation formed of several designed landforms on the site of a former open-cast coal mine. The viewpoint is representative of recreational visitors to the site, which is open to the public.

The viewpoint is located adjacent to the Belvedere landform, which forms a high point at the site, and affords wide-ranging views over the Upper Nithsdale Valley to the south, as well as over hills within the Southern Uplands to the east and west. Views to the north are more contained by the landform to the north of the Nithsdale Valley as well as by the landform of the Belvedere.

The foreground to the south is formed by the landscape of the Multiverse. The River Nith is visible beyond, flanked by riparian woodland along its banks. There are other areas of woodland, including deciduous and coniferous, within the valley. Development within the valley at Sanquhar and Kirkconnel is visible to the south-east and south-west respectively. In this direction, the horizon is formed by hills within the Scaur Hill range to the south of the Nithsdale Valley. To the east, the horizon is formed by the Lowther Hills, while to the west views are contained to the west of Kirkconnel by the landform to the north and south of the valley. Across the lower slopes to the north and south of the valley, the landcover is primarily pastoral land, while on the higher slopes and summits rough grassland and moorland predominates.

There are several large-scale developments spanning the skyline, upper slopes, and upper valley sides to the south, that influence the otherwise predominantly rural character experienced from this viewpoint. Twentyshilling Wind Farm is set noticeably apart from other schemes to the south-east. Whiteside Hill and Sanquhar Wind Farms are seen to the south-west as distinct developments but in relatively close proximity to one another and at a similar distance from the viewpoint. Sandy Knowe and Hare Hill Wind Farms are also visible to the south-west, partially backclothed against the landscape beyond.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is located at the highest point of this popular visitor attraction and offers views over the surrounding landscape. The viewpoint is not located within any landscape designations.

The susceptibility of recreational visitors is medium. While the susceptibility of recreational visitors is heightened by their awareness and appreciation of their surroundings, this is moderated by the presence and influence of a number of existing wind farm developments, which are seen to extend across the Southern Uplands to the south. These developments mean that the baseline views experienced by visitors to Crawick Multiverse already feature similar types of development in the same sector of the view as the Site.

The combination of the medium-high value of the view and the medium susceptibility of viewers leads to an overall medium-high rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change on the views of recreational visitors to Crawick Multiverse would be medium during the construction phase. Elements of ground level construction work at the Site would be likely to be visible from this viewpoint, including the construction of access tracks, crane pads and foundations. The emerging turbines and associated construction cranes would also be visible. Given the minimum separation distance of 6.25 km to the nearest turbine, these construction works would appear as a relatively close proximity feature. However, their location in the same sector of the view

as the existing operational wind farms across the hills to the south of the Nithsdale Valley would reduce their influence.

Magnitude of change during Operation

The magnitude of change on the views of recreational visitors to Crawick Multiverse would be medium during the operational phase. The Proposed Development would be located a minimum distance of 6.25 km, making it a relatively close-proximity feature. **Figure 6.37** shows that each of the proposed turbines would be seen above the horizon in views to the south, with only the lower parts of several turbines being screened by the intervening landform. The Proposed Development would be located immediately to the east of Whiteside Hill Wind Farm and is likely to be perceived as part of one larger development from this viewpoint. The Proposed Development would be seen at a similar distance as the operational turbines within Whiteside Hill and would extend wind farm development closer to Twentyshillings Wind Farm, to the south-east of this viewpoint. Not only would this increase the horizontal extent of the enclosing horizon, which is occupied by wind farm development, but the larger size of the proposed turbines would be evident, and this would increase their prominence in the view.

Significance of effect

The effects of the Proposed Development on the views of recreational visitors to Crawick Multiverse would be **moderate** and **significant** during both the construction and operational phases. This reflects the readily visible increase in wind farm development arising from the Proposed Development, in relatively close proximity and seen above the skyline in views from this popular visitor attraction. This would be significant for these higher sensitivity receptors despite the existing influence of wind farm development on the enclosing skyline to the south.

6.9.23 Viewpoint 22: Auchengibbert (Figure 6.38)

Baseline

This viewpoint is located on Auchengibbert Hill, whose highest point is marked by a trig point, at 372 m AOD, with open 360° views over the surrounding landscape. Auchengibbert Hill lies within the Foothills (LCT 18) which form a band of hills with a north-west to south-east orientation, bounded by the Shinnel Water to the west and the Scaur Water to the east and with landform generally rising to join the Southern Uplands (LCT 19) to the north. The rivers flow south-east to join the River Nith, while to the south, groups of low hills, including Wauk Hill form enclosure to the network of rivers. The viewpoint is representative of walkers on the hill.

The foreground of the view is characterised by moorland, rounded crags and commercial forestry on lower slopes. Across the valley of the Shinnel Water, the Southern Uplands appear as a landscape of broad hills covered by rough grassland and commercial forestry with long ridgelines and interlocking spurs formed by burns. Several wind farm developments are visible on hilltops defining the skyline. These contrast with the relatively low level of development within the view but distance from the viewpoint means they do not provide focal points within the panoramic view. Directly ahead, Sanquhar and Whiteside Hill Wind Farms comprise a group of wind turbines on the skyline, with outlying developments at Wether Hill and Twentyshillings to the south-west and north-east, respectively. To the north-east, the wider panorama takes in the wide, settled valley landscape and agricultural fields of lower Nithsdale, enclosed by the Lowther Hills.

Sensitivity

The value of the view is medium-high. This is not a formal viewpoint on OS maps; however, it is a popular walking route used by hillwalkers. The location of the viewpoint in the Thornhill Upland RSA denotes the recognised scenic value of this area at the local level, and this adds to the overall value.

Viewer susceptibility is medium-high. While the susceptibility of walkers on the hill is heightened by their awareness and appreciation of their surroundings, this is moderated by the visibility of existing

wind farm developments, particularly the closer operational Wether Hill and Twentyshilling wind farms, and Sanquhar and Whiteside Hill wind farms, directly behind the Site. These establish wind farm development as a characteristic of the baseline view to which the Proposed Development would appear similar.

The medium-high value of the view and medium-high susceptibility of walkers on the hill to changes arising from the Proposed Development means their sensitivity is rated as medium-high.

Magnitude of Change during Construction

For walkers on Auchengibbert Hill the magnitude of change to the view during the construction phase would be medium-low. Ground level construction works at the Site would be screened by intervening landform. Visibility of construction activity would be restricted to the emerging turbines and associated construction cranes, which would appear at a minimum distance of 12.59 km. During construction, the Proposed Development would occupy 10 to 20 degrees of the full 360 degree view (**Figure 6.7**). The emerging turbines and construction activity would be visible against the backcloth of open sky, contained within a small section of the skyline and behind the expansive intervening landscape. The much larger scale of the surrounding hills and landscape would limit the resulting magnitude of change. The location of the construction works in the same sector of the view as operational wind turbines beyond the Site, including Sanquhar and Whiteside Hill wind farms; and to the south-east and north-east with Wether Hill and Twentyshilling wind farms, further reduce the magnitude of change to the view.

Magnitude of Change during Operation

During the operational phase, the magnitude of change to the view for walkers on Auchengibbert Hill would be medium-low. The Proposed Development would appear as a middle range feature on the skyline at a minimum distance of 12.59 km. **Figure 6.38** shows all 11 turbines to be visible, with ten hubs visible and towers largely concealed by the intervening landform. The Proposed Development would appear in front of and partially overlapping the horizontal extent of Whiteside Hill and Sanquhar wind farms, also seen set below the intervening ridgeline such that the operational turbines are partly concealed. While the overall horizontal extent of wind farm development in this view would increase incrementally, and there would be an increase in the presence of wind farm development in this view, this would be contained within 10 to 20 degrees of the full 360 degree view (**Figure 6.7**). The location of the Proposed Development in the same sector of the view as existing operational wind farms would further reduce the magnitude of change.

Significance of Effect

The effect of the Proposed Development on the view would be **moderate** and **not significant** during both the construction and operational phases for walkers on Auchengibbert Hill. Distance from the viewpoint, restricted visibility of the Proposed Development and the panoramic nature of the view are the main factors limiting its effect. The existing influence of similar wind farm development would also moderate the effects of the Proposed Development during both phases.

6.9.24 Assessment of Effects on Additional Viewpoints

In response to consultation comments received from the Council and Tynron Community Council, as set out in **Table 6.1**, five additional viewpoints have been added to the assessment. As each of these viewpoints is similar in location, direction and extents to one of the original viewpoints, a detailed assessment for each is not included in this LVIA. An outline assessment is, however, presented in **Table 6.7** below, which highlights the potential effects that would arise as a result of the Proposed Development and relates this assessment back to the assessment of the closest associated original viewpoints to present a broader understanding of the extent to which the visual effects may vary in that local area. Wirelines for these additional viewpoints are presented on **Figures 6.39 to 6.43** in **Volume 2c: Visualisations**.

Table 6.7 Assessment of Visual Effects on Additional Viewpoints

Viewpoint	Association	Assessment
VP 23 Colt Hill	Colt Hill is located 2.7 km to the north-east of VP 11 Benbrack. At 598 m, Colt Hill is smaller than Benbrack, at 680 m, and is not located on the SUW, although the location of Andy Goldsworthy's Striding Arches sculptures on both hills makes them an attraction to hill walkers. Both hills present open summits amidst a broader extent of commercial forestry.	The assessment for VP11 Benbrack combines the medium-high sensitivity of hill walkers in this location with the medium-low effect of the Proposed Development to result in a moderate and not significant effect. The sensitivity of hill walkers on Colt Hill will remain medium-high. In respect of the magnitude of change, although Colt Hill is located a minimum of 6.46 km from the Proposed Development, the magnitude of change would remain medium-low owing to the baseline influence from Whiteside Hill and Twentysilling wind farms at similar ranges and in the same sector, the location of the Proposed Development between these two wind farms such that it would not increase the extent of development in this upland area, the relatively small number of turbines would mean that they would occupy only 5 to 10 degrees of the wider view and they would be seen partly backclothed by the more distant hills. The effect on the viewpoint at Colt hill would also be moderate and not significant.
VP 24 Glenwhargen Scaur Water minor road	The two assessment viewpoints in the Scaur Water are VP5 Shiel, Scaur Water and VP8 Polgown, Scaur Water, located a minimum of 1.44 km and 1.25 km respectively from the Proposed Development. Glenwhargen is located 2.6 km south of Shiel and a minimum of 3.61 km from the Proposed Development and, therefore, presents a less close range viewpoint in an area where there would be lower levels of visibility – 4 to 6 turbines.	The assessment for VP5 Shiel, Scaur Water and VP8 Polgown, Scaur Water found significant effects in respect of both with a major effect relating to residents and walkers at Shiel and major/moderate effect relating to residents and walkers at Polgown. The sensitivity of residents and walkers represented by Glenwhargen would be medium-high while the sensitivity of road-users would be medium, these ratings relating to the comparative longer and shorter duration of views and the closer association residents and walkers have with their views. The wireline in Figure 6.40b shows that only five of the proposed turbines would be visible and that they would be seen in the same location as the five operational Whiteside Hill turbines. Although appearing slightly larger, the proposed turbines would appear closely associated with the operational turbines and this would moderate their effect. Furthermore, their perceived scale would be reduced by the larger scale of the closer range enclosing valley sides. Taking these factors into account, the magnitude of change would be medium-low, despite the relatively close range of this viewpoint and would lead to a moderate and not significant effect.
VP 25 Auchentaggart	The Auchentaggart viewpoint is located on the track that traverses the western side of Auchentaggart Moor to the north of Mennock. Although the residents in Mennock and road-users on the A76 are represented by VP6, Auchentaggart is more elevated and presents more open views, albeit experienced by a smaller number of walkers. This view is similar to VP7 SUW east of Sanquhar.	The assessment for VP7 SUW east of Sanquhar found a moderate and significant effect would arise as a result of the medium-high sensitivity of walkers and the medium magnitude of change that would arise as a result of the Proposed Development. Although there are operational wind farms already visible from this viewpoint, the location of the Proposed Development to the left of Whiteside Hill Wind Farm and the orientation of the path towards to Proposed Development. The sensitivity of walkers to the Proposed Development would be medium-high. With Auchentaggart at a minimum of 7.07 km from the Proposed Development and VP7 SUW east of Sanquhar at 6.37 km they represent a similar range. The key differences, however, are that from Auchentaggart the Proposed development is seen to the fore of Whiteside Hill and is not seen to increase the extents of wind farm development, operational Twentysilling Wind Farm is closer and has a stronger baseline influence and the orientation of the path is north-south such that it does not align towards the Proposed Development. These differences mean that the magnitude of change would be

Viewpoint	Association	Assessment
		medium-low and not medium as assessed in respect of VP7. The resultant effect would be moderate and not significant.
VP 26 Kelloholm	Kelloholm forms part of the settlement of Kirkconnel, extending across the flood plain to the south-east of the historic core. The viewpoint at Kelloholm lies approximately 1.2 km to the south of VP3 Kirkconnel and at a minimum of 4.72 km from the Proposed Development as opposed to 5.79 km from Kirkconnel.	The assessment for VP3 Kirkconnel found that the effect of the Proposed Development would be moderate and not significant as a result of the medium-high sensitivity combined with the medium-low magnitude of change. The key factors considered in this assessment include the extent to which the Proposed Development would be screened by the intervening tree cover and landform, as well as the closer range baseline influences from Sandy Knowe and Sanquhar in the same sector of the view. The sensitivity of residents in Kelloholm would also be medium-high and the magnitude of change would be low. The wireline on Figure 6.42b shows that because Kelloholm is closer to the rising landform on the south-western side of the River Nith this would have more of a screening effect such that the proposed turbines would not be seen to their full extents. There would also be a closer range influence from Sandy Knowe and Sanquhar which would further moderate the visual effect of the Proposed Development. The effect would be moderate / minor and not significant.
VP 27 Whing Head	Whing Head is located on the section of the SUW which passes through the Site and, therefore, presents an especially close range of the Proposed Development. The closest relatable viewpoint is VP5 Shiel, Scaur Water and although this is located only 1.7 km to the south, the viewpoint at Whing Head occupies an exposed position on the hill top with full visibility, while VP5 Shiel Water sits within the enclosure of the Scaur Water valley where visibility is partly screened.	The assessment for VP5 Shiel, Scaur Water found major effects in respect of residents and major/moderate effects in respect of road-users, with these effects being significant in respect of both receptors. The sensitivity of walkers at Whing Head will be medium-high; with the value of the view increased by its location on the SUW but the susceptibility of walkers reduced by the baseline influence of nearby Whiteside Hill and other wind farms. Despite these baseline influences, the magnitude of change would be high owing to the very close proximity of the proposed turbines as shown on Figure 6.43b . The effect on walkers would be major and significant.

6.10 Assessment of Effects on Principal Visual Receptors

The second part of the assessment of effects on views is the assessment of the effects that the Proposed Development would have on the views from principal visual receptors. The principal visual receptors considered in the assessment include settlements and route corridors, including roads, walking route and national cycle routes, shown on **Figure 6.4**, and shown in conjunction with the ZTV on **Figure 6.10**. The principal visual receptors assessed in detail have been selected as they have potential to undergo significant effects as a result of the Proposed Development.

A preliminary assessment to identify these receptors has been carried out through the use of ZTVs and wirelines to indicate the extents, level and nature of theoretical visibility, and site work to determine the extents, level and nature of actual visibility. This process has identified the following principal visual receptors as requiring detailed assessment:

- Sanquhar;
- Mennock;
- Kirkconnel;
- A76;

- Glasgow – Carlisle Railway Line;
- Euchan Water valley Minor Road;
- Scaur Water valley Minor Road;
- East of Nithsdale Valley Minor Roads;
- Southern Upland Way;
- Kirkconnel to Mynwhirr Hill Core Path;
- Kirkconnel to Black Law (via Fingland and Kirkland) Core Path;
- Bogg to Auchentaggart Moor Core Path;
- Sodjers Bridge Walk Core Path; and
- Sanquhar Castle Circular Core Path.

6.10.1 Sanquhar

Baseline

Sanquhar is a village set within the Upper Nithsdale Valley within LCT 9: Upper Dale (Valley), to the north of the River Nith. The underlying topography of the settlement rises gently eastwards towards the Glasgow – Dumfries railway line, which runs along the foot slopes to the north of the valley. The southern edge of the settlement sits on raised landform above the River Nith flood plain, resulting in slightly elevated and generally open views (**see Viewpoint 1, Figure 6.17**). While built form encloses many of the views from within the settlement, there are some isolated locations where there is sufficient openness to allow views to extend out across the broad valley landscape to the uplands to the south (**see Viewpoint 2, Figure 6.18**).

The Southern Uplands, where the Site is located, form the western edge to the Upper Nithsdale Valley. The upland slopes rise gently out of the broad valley at first but become increasingly steep, eventually forming an undulating ridgeline with a north-west to south-east alignment, such that it sits parallel to the village. These hills are characterised by a simple mix of forestry blocks and moorland land cover. This, together with the operational Twentysilling, Whiteside and Sanquhar Wind farms, and more distant operational schemes of Sandy Knowe and Hare Hill to the north-west, create an impression of a large-scale landscape, changed by human activity.

Viewpoints 1, 2 and 7 (**Figures 6.17, 6.18 and 6.23**) are representative of locations in and around the settlement of Sanquhar where visibility would likely arise. Visibility from other parts of Sanquhar would mostly be screened by intervening buildings and vegetation.

Sensitivity

The value of the view is medium. Sanquhar neither lies within nor overlooks a nationally or locally designated landscape, which would otherwise denote a special scenic value. The ruins of Sanquhar Castle provide a focal point nearby seen against the backdrop of the Southern Uplands that is locally important and contributes to its value.

Residents are considered to be of medium-high susceptibility. This assumes a 'worst case' scenario in which residents within the settlement have direct views from the front of their properties towards the Site. The ZTV (**Figure 6.10**) indicates coverage of the entire settlement. Existing wind farms seen within the surrounding landscape moderates receptor susceptibility to the Proposed Development.

The combination of the medium value of the view and the medium-high susceptibility of residents leads to an overall **medium-high** sensitivity at Sanquhar

Magnitude of Change during Construction

The magnitude of change at Sanquhar would remain medium or medium-low during the construction phase with no change where there would be no visibility. Screening by landform would in all probability restrict visibility of the construction works to the emerging turbines and associated construction cranes, while ground level works such as construction of crane pads and foundations would not be visible. Given the relatively close proximity of these works, their influence would be noticeable on the skyline but limited by the level of similar development already present on the skyline. The combination of the level nature of the valley floor and built form within Sanquhar would largely limit this influence to the village's southern edge and more open or elevated internal parts. The density and pattern of built form would also allow glimpses of the Proposed Development between buildings. Although there is varied orientation of streets and individual buildings, there is a general north south orientation with many properties facing across the valley toward the Southern Uplands where the construction works would occur and where open views occur, this adds to the magnitude of change.

Magnitude of Change during Operation

The magnitude of change at Sanquhar would remain medium or medium-low during the operational phase with no change where there would be no visibility. The Proposed Development would be readily visible at close range with rotors, hubs and upper towers of the proposed wind turbines visible. These would appear contained within a moderate proportion of the long ridgeline and would occupy 10 to 20 degrees of the full 360 degree landscape context around Sanquhar, as shown on **Figure 6.7**. While the Proposed Development would appear similar in form and spacing to Whiteside Hill Wind Farm, seen to the rear, the proposed turbines would appear larger and collectively would appear to increase the horizontal and northwards extent of wind farm development in this area. The Proposed Development would form a prominent and large-scale feature from the southern edge of the village and from elevated or open parts within the village. For receptors within much of the village, the Proposed Development would either not be readily visible or would be occasionally glimpsed at an angle, with the frontages of a low proportion of buildings offering open and direct views towards the Site.

Significance of Effect

The Proposed Development would have a **moderate** or **moderate / minor** effect on views from Sanquhar during both phases, that would be **significant** for residents facing the Site directly from the front of properties on the southern edge of the village and other open and elevated parts; and **not significant**, from remaining parts where it would be glimpsed at an angle and between buildings within the village or screened.

6.10.2 Mennock

Baseline

Mennock is a small linear village set within the Upper Nithsdale Valley. The village is bisected by the A76. The Glasgow – Carlisle railway line runs parallel to the east of the A76 and defines the easternmost extent of the settlement. The River Nith passes close to the west of the settlement as it meanders through the valley floor. A well-wooded tributary ('Routin Linn') of the River Nith cuts through the northern part of the settlement along its course from the uplands to the east. The underlying topography generally falls to the west, towards the shallow valley of the River Nith, but also towards the tributary valley in the northern part of Mennock.

Properties to the south of the settlement, next to the A76, tend to be slightly elevated, with generally open views overlooking the River Nith towards the Southern Uplands. Properties further to the west of the road, and to the north of the settlement, sit at lower elevations as the landform falls away to the

River Nith and tributary and tend to be more enclosed by woodland that line these watercourses, resulting in less open views.

Where views of the landscape occur, these are characterised by the contrasting landscapes of the settled valley floor with its major transport corridors, lower valley sides and the uplands, with the valley made distinct by the pattern of the agricultural fields and enclosure from linear belts and blocks of woodland, which serve to contrast with the more open and elevated hill slopes covered by rougher pasture and larger blocks of intermittent forestry plantations. Wind farm development forms part of the baseline views from Mennock, with operational Twentyshilling wind farm, Sanquhar Wind Farm, and Whiteside Wind Farm visible in more open views.

Viewpoint 6 (**Figure 6.22**) is representative of views from Mennock.

Sensitivity

The value of the view is medium-high. Mennock is located within the Thornhill Uplands RSA and overlooks a landscape recognised for its special scenic value at a local level. The composition of the view is representative of the contrasting landscapes of LCT 9: Upper Dale (Valley) and LCT 19: Southern Uplands.

Mennock's residents are considered to be of medium-high susceptibility, owing to their static nature and potentially the long duration of views. Their susceptibility is moderated by the presence of the Twentyshilling and Whiteside Hill Wind Farms which establish this type of development as a feature of the village's surroundings.

This medium-high value of the view and medium-high susceptibility of residents means that residential receptors within Mennock are of medium-high sensitivity.

Magnitude of Change during Construction

The magnitude of change would be medium-low or low with no change where there would be no visibility. Landform would restrict visibility of the Proposed Development to the uppermost parts of the nearest emerging turbines and associated construction cranes while ground level construction works within the Site would be screened. The works would have a limited influence on receptors within Mennock due to the limited extent to which the Proposed Development would be visible; the separation distance of 6.5 to 7km; and the baseline influence of closer range Twentyshilling Wind Farm. The Proposed Development would be visible to residents north of the road, due the aspect of their properties and their relative elevation, but less visible to residents south of the road, which lie at a lower elevation. These properties would observe less change due to screening by landform and vegetation cover along the access road, and their aspect, which does not directly face the Site.

Magnitude of Change during Operation

The magnitude of change would be medium-low or low, with no change where there would be no visibility of the Proposed Development. As shown on **Figure 6.22**, limited visibility of the Proposed Development combined with the greater influence from Twentyshilling Wind Farm moderates the overall magnitude of change. The Proposed Development would be visible to residents north of the road, due the aspect of their properties and their relative elevation, but less visible to residents south of the road, which lie at a lower elevation. These properties would observe less change due to screening by landform and vegetation cover along the access road, and their aspect, which does not directly face the Site.

Significance of Effect

For residents of Mennock the effect of the Proposed Development would be **moderate** or **moderate-minor** and **not significant**, during both the construction and operational phases. This takes account of the limited visibility of the Proposed Development, the baseline influence of closer range

operational Twentyshilling Wind Farm and the further limiting factors of building orientation, local topography and variations in local screening features.

6.10.3 Kirkconnel and Kelloholm

Baseline

The settlement of Kirkconnel is a small village bisected by the A76, with its northern boundary defined by the Glasgow – Carlisle railway line. Kelloholm is a separate village found to the south-east of Kirkconnel. Over time, as the two settlements have expanded, they have coalesced and now appear as a single settlement.

The River Nith meanders to the south of Kirkconnel, passing next to the A76 at the eastern and western edge of the village. The Kello Water tributary marks the eastern edge of Kelloholm as it flows north to join the River Nith. The settlements lie across a location where the valley widens out, with properties on the northern and southern extents of the villages slightly elevated above the low-lying and level valley floor. The topography of Kirkconnel has a generally south-facing aspect, while that of Kelloholm has a north-facing aspect. Generally, properties in Kirkconnel align broadly east-west, following the orientation of the A76 as it passes through the settlement. To the south of the River Nith, particularly within Kelloholm, the orientation of properties overlooks the road pattern, and as a result is more varied.

The rise in landform to the south of the River Nith limits distant views southwards from properties within Kelloholm, with the exception of some more elevated parts of the settlement to the south. There are open views overlooking the valley and towards the Southern Uplands from properties within Kirkconnel, particularly those immediately to the south of the A76.

Viewpoint 3 (**Figure 6.19**) is representative of views from Kirkconnel and Viewpoint 26 (**Figure 6.42**) is representative of views from Kelloholm.

Sensitivity

The medium value of the view reflects its local importance and the absence of designated landscape within it. The view towards the Site and the Southern Uplands is locally valued as a backdrop and setting to the settlement.

The susceptibility of local residents is medium-high. A number of residential properties' frontages would face the Site due to the linear nature of Kirkconnel and the less dense pattern of development within Kelloholm. The resulting susceptibility of receptors is moderated by the presence of several existing wind farms within the setting of the village.

The medium value of the view and the medium-high susceptibility of residents leads to an overall medium-high sensitivity for these receptors.

Magnitude of Change during Construction

The magnitude of change would be medium-low or low with no change occurring where there would be no visibility. Screening by landform would restrict visibility of the construction works such that only the higher-level works featuring the emerging turbines, and associated construction cranes would be visible. Properties along the southern boundaries of Kirkconnel and Kelloholm and select properties within the villages with an elevated and / or open aspect, in particular on Kirkconnel's Main Street and Kingsway, would have medium range visibility of the high-level works, although the effect would be moderated by the baseline influence from closer range Sanquhar, and Sandy Knowe wind farms, as well as adjacent Whiteside Hill Wind Farm. Within remaining areas of both villages, visibility of the Proposed Development would be intermittent due to screening by local built form, vegetation and landform. Vegetation and built form would limit the influence of the construction works on properties within Kirkconnel, which tend to face the Site. The more varied orientation of properties in Kelloholm combined with the increased screening effect of local landform present the limiting factors for this

village. Between the two villages, large buildings within the Browns Food group site provides further screening for adjoining properties to the north and north-west.

Magnitude of Change during Operation

The magnitude of change would be medium-low or low with no change occurring where there would be no visibility. The operational Proposed Development would be an apparent but not particularly prominent feature, from Kirkconnel and Kelloholm. **Figure 6.19** indicates that visibility of the Proposed Development from both villages would be restricted to the proposed turbines' upper towers and rotors such that they would form a middle range feature on the low skyline. The pattern and density of built form within the villages would largely restrict the Proposed Development's influence to properties that face the Site along the villages' boundaries and occasional properties within which have an open and / or elevated aspect, including those on Dryburn Road, Kingsway and Main Street. For residents of the remaining areas of both villages, the operational Proposed Development would be intermittently visible due to the screening effect of built form and/or vegetation, particularly within Kelloholm, due to the varied orientation of its properties. The main moderating factor would, however, be the baseline influence from closer range Sanquhar, and Sandy Knowe wind farms, as well as adjacent Whiteside Hill Wind Farm.

Significance of Effect

The effect of the Proposed Development on views from Kirkconnel and Kelloholm would be **moderate** or **moderate-minor** and **not significant**, during both the construction and operational phase. The factors which would moderate the Proposed Development's effects would be the limited extent of visibility from properties within these settlements owing to intervening landform, built form and vegetation, the baseline influence from operational wind farms in the same sector of views and on the same ridgeline, the relatively low number of proposed wind turbines and their comparable scale to those of the closer range wind farms.

6.10.4 A76

Baseline

The A76 is the main road that connects Kilmarnock in East Ayrshire with the town of Dumfries in Dumfries and Galloway. It traverses the Study Area broadly from the north-west to the south-east.

The section of the route that is of relevance to this assessment occurs between New Cumnock and Thornhill; a section which covers approximately 36 km and which falls within the Upper Nithsdale LCU of the Upper Dale (Valley) (LCT 9). The ZTV on **Figure 6.10** shows that visibility of the Proposed Development would theoretically be experienced for long durations along this section of the route. The road is routed along the valley floor on the northern side of the River Nith, close to the river course where the valley narrows, but more separated where it broadens out.

Views experienced by road-users on this section are characterised by the contrast in landscapes between the settled valley floor and surrounding uplands. The settled valley landscape is defined by a pattern of urban areas, transport corridors, agricultural fields and enclosure from linear belts and blocks of woodland. The River Nith is lined by a narrow band of riparian mixed woodland and vegetation as it meanders through the valley floor. Tributary streams that join the River Nith from upland areas are often lined by linear belts of woodland as they flow through the lowland landscape.

The uplands define and form enclosure to the Upper Nithsdale Valley, making them a readily visible and prominent feature along both sides of the road. The uplands present a contrast to the valley floor owing to the mix of large-scale forestry plantations, moorland, and relative lack of settlements. The valley becomes steeper and more enclosed along short sections of the route between Carronbridge and Menzies, and west of Kirkconnel to New Cumnock. Operational wind farms are part of the baseline experience of this route and are most often appreciated as part of the upland landscape.

Travelling from south to north, Twentysilling, Whiteside Hill, Sanquhar, Sandy Knowe and Hare Hill Wind Farms are visible across the upland ridgeline and upper valley sides to the south of the A76.

Viewpoints 1, 2, 3 and 6 (**Figures 6.17, 6.18, 6.19 and 6.22**) are all located adjacent to the A76 and represent the various views of the Proposed Development that are available from this section of the road.

Sensitivity

The value of the view from the A76 ranges from medium-high to medium. East of Menzies, the road runs through the Thornhill Uplands RSA and overlooks a landscape recognised for its special scenic value. West of Menzies, as visibility of the landscape within the RSA decreases, views from the road are less valued. In general, views from this section of the road are valued for their composition, which is representative of the contrasting landscapes of the Upper Dale (Valley) (LCT 9) and Southern Uplands (LCT 19).

Road-user susceptibility is generally medium. In general, the transient nature and short duration of views seen by road users moderates their susceptibility. For receptors on the A76, this is reduced further by the location of the Site, which is peripheral to the direction of travel for both east and westbound receptors; intermediate screening by built form and/or vegetation, particularly within settlements; and the presence of operational wind farm development, which establishes this type of development as a feature of the baseline.

Road user sensitivity is considered to be **medium-high**, along the section of road from Menzies to Dalpeddar Hill; and **medium**, along the remaining section of the A76. This takes into account the lower susceptibility of road users, the medium value of views from much of the road and the higher value of views overlooking the Thornhill Uplands RSA.

Magnitude of Change during Construction

The magnitude of change to the views of road-users on the A76 would range from medium to low, for both north-west and south-east bound road-users, with no change occurring where there would be no visibility.

The stretch of road between Kirkconnel in the north-west and Dalpeddar Farm in the south-east, is shown on the ZTV on **Figure 6.10** to have theoretical visibility of the Proposed Development. Landform would largely screen ground level construction works, such that these would have a very limited influence on the views of road-users. In contrast the emerging turbines and associated construction cranes would be visible above the enclosing skyline of the Southern Uplands. As the Proposed Development is closest to the A76 around Sanquhar, and the orientation of the landform in this section is generally south towards the Southern Uplands where the Site is located, the construction works would have the most notable influence on this section to the south of the town, where open views towards the Site occur and are not screened by the built form of the town or road-side vegetation. The magnitude of change would be medium in the section between Eliock Bridge and the southern edge of Sanquhar at a distance of approximately 5 to 6 km.

To the south-east of Eliock Bridge, the influence of the construction works would be moderated by the increase in separation distance beyond 6 km, the increase in screening from intervening landform that would reduce the extent of the construction works visible, and the containment of the Proposed Development within 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). The layout of the emerging turbines in relation to local topography would appear relatively contained on the skyline from much of the road. The magnitude of change from this section of the A76 would be medium-low reducing to low and with no change south-east of Dalpeddar Farm where there would be no visibility.

To the north-west of Sanquhar, the south-east to north-west alignment of the road would mean that the road would not align towards the Proposed Development to the south-west and that as a result, the views of road-users would be oblique in this direction. The construction works would be located beyond 6 km and would be seen to occupy 10 to 20 degrees of the full 360 degree view (**Figure 6.7**).

These factors, along with the baseline influence from operational wind farms in the same sector of the view and on the same ridgeline would moderate the magnitude of change which is rated as medium-low between Sanquhar and Kirkconnel. Visibility through Kirkconnel would be reduced by the screening effect of built form and beyond Kirkconnel the A76 passes out of the ZTV, such that there would be no visibility and no change.

The magnitude of change to views from the A76 would be low from Dalpeddar Farm to Eliock Bridge, rising to medium as the road approaches Sanquhar, and decreasing to medium-low on the approach to Kirkconnel. No change to the views would occur, where there would be no visibility of the Proposed Development owing to screening.

Magnitude of Change during Operation

The magnitude of change to the views of road-users on the A76 would range from medium to low, for both north-west and south-east bound road-users, with no change occurring where there would be no visibility.

The stretch of road between Dalpeddar Farm to the south-east and Kirkconnel to the north-west, is shown on the ZTV on **Figure 6.10** to have almost continuous theoretical visibility. Approaching Mennock from Dalpeddar Farm, the Proposed Development would become visible on the skyline, owing to the orientation and relative proximity of the road from the Site, combined with the relative openness of the adjoining landscape. Visibility of the Proposed Development would remain largely continuous between Mennock and Sanquhar albeit with intermittent interruptions from roadside vegetation. Approaching and leaving Sanquhar, the Proposed Development would be readily visible while built form within the village would frequently screen it. West of Sanquhar, as the road rises and there is less intervening vegetation, the Proposed Development would remain readily visible until the approach to Kirkconnel. As roadside vegetation and nearby built form increases, first within Kelloholm and then in Kirkconnel, the Proposed Development would become less visible. Roadside trees would screen the Proposed Development entirely on the western edge of Kirkconnel, where open farmland would briefly allow visibility, before Polshag Hill screens it entirely.

The Proposed Development would be an apparent, close-range feature, visible along much of the A76, while visibility of operational wind farms from the road would vary. Twentyshilling Wind Farm would appear closer and more prominent on the skyline, in the southern parts of this section of the A76, while other schemes west and north-west of the Proposed Development would be less prominent. As road-users proceed north-west, the prominence of Twentyshilling Wind Farm would diminish and around Sanquhar and on to Kirkconnel, Whiteside Hill and Sanquhar wind farms would become more prominent, and then West of Kirkconnel, Sandy Knowe and Hare Hill and Extension wind farms would become more prominent. Within this context, the Proposed Development would form an apparent expansion of wind farm development, most evidently along the central stretch of road within the vicinity of Sanquhar. The oblique direction of road-users relative to the Proposed Development, combined with their transitory nature and baseline influence from operational wind farms, would moderate the overall magnitude of change.

The magnitude of change to views from the A76 would be low from Dalpeddar Farm to Eliock Bridge, rising to medium as the road approaches Sanquhar, decreasing to medium-low on the approach to Kirkconnel and then no change occurring further west of Kirkconnel, from where the Proposed Development would be screened.

Significance of Effect

The effect of the Proposed Development on views from the A76 would be **moderate** and **significant** within the section between Eliock Bridge and Sanquhar; and **moderate / minor** and **not significant** within the areas around Kirkconnel and Mennock during both the construction and operational phases. Where there would be no visibility, there would be **no effect**.

6.10.5 Glasgow – Carlisle Railway Line

Baseline

The section of the route between New Cumnock and Thornhill is relevant to this assessment and covers approximately 36 km. The ZTV on **Figure 6.10** shows that visibility of the Proposed Development would theoretically be experienced for long durations along this section of the route. This section of the Glasgow – Carlisle railway line falls within the Upper Nithsdale LCU of the Upper Dale (Valley) (LCT 9). It runs along the valley floor on the northern side of the River Nith and A76, following the lower contours of the valley sides.

Between Enterkinfoot and Kirkconnel the nature of views experienced by users of the railway would be similar to those of road-users on the A76 owing to the close proximity and orientation of both routes. This section of the route is embanked and slightly elevated above the road although there are also frequent, albeit short sections within enclosed cuttings and sections enclosed by rail-side vegetation. Onward sections of the railway to the north and south begin to diverge from the A76 and fall out of the ZTV coverage.

Viewpoints 1, 2, 3 and 6 (**Figures 6.17, 6.18, 6.19 and 6.22**) are adjacent to the A76 and, for the reasons given above, indicate the likely effects on users of the Glasgow – Carlisle railway.

Sensitivity

The value of the view from the railway line ranges from medium-high to medium. East of Menzies, the rail line runs through the Thornhill Uplands RSA and overlooks a landscape recognised for its special scenic value. West of Menzies, as visibility of the landscape within the RSA decreases, views from the rail line are less valued.

Rail user susceptibility is generally medium. In general, the transient nature and short duration of views seen by rail users moderates their susceptibility, along with the oblique location of the Site relative to the direction of travel for both east and westbound receptors; intermediate screening by built form and/or vegetation, particularly within settlements; and the presence of operational wind farm development, which establishes this type of development as a feature of the baseline.

Rail user sensitivity is considered to be medium-high, along the section of road from Menzies to Dalpeddar Hill; and medium, along the section between Menzies and New Cumnock. This takes into account the lower susceptibility of rail users, the medium value of views from much of the rail line and the higher value of views overlooking the Thornhill Uplands RSA.

Magnitude of Change during Construction

The magnitude of change to views from the railway line would range from medium to low, for both east and westbound rail-users.

Because the Glasgow – Carlisle railway line largely follows the same route as the A76 and often runs parallel to it, visibility of the construction phase Proposed Development and the resulting magnitude of change on rail users would be similar to that seen by road-users.

The magnitude of change to views from the Glasgow – Carlisle railway line would be low between Dalpeddar Farm and Eliock Bridge, rising to medium as the route approaches Sanquhar, decreasing to medium-low on the approach to Kirkconnel, and with no change to the views occurring to the west of Kirkconnel, due to a lack of visibility.

Magnitude of Change during Operation

The magnitude of change to views from the Glasgow – Carlisle railway line would range from medium to low, for both north-west and south-east bound road-users, with no change occurring where there would be no visibility.

Because the Glasgow – Carlisle railway line largely follows the same route as the A76 and often runs parallel to it, visibility of the construction phase Proposed Development and the resulting magnitude of change would be similar to that seen by receptors on the road.

The magnitude of change to views from the Glasgow – Carlisle railway line would be low between Dalpeddar Farm and Eliock Bridge, rising to medium as the route approaches Sanquhar, decreasing to medium-low on the approach to Kirkconnel, and with no change to the views occurring to the west of Kirkconnel, due to a lack of visibility.

Significance of Effect

The effect of the Proposed Development on views from the Glasgow – Carlisle railway line would be **moderate** and **significant** within the section between Eliock Bridge and Sanquhar; and **moderate / minor** and **not significant** within the areas around Kirkconnel and Mennock during both the construction and operational phases. This reflects the incidental nature of views towards the Site for rail passengers on the line; the scale of the surrounding landscape context; the relatively small-scale of the construction works within this context; and the number of operational wind farms influencing its character.

6.10.6 Euchan Water Valley Minor Road

Baseline

The minor road within the Euchan Water valley passes to the north and north-east of the Proposed Development, within approximately 1 km of the nearest turbine at its closest point. From the junction with the A76 at its eastern extent, to its end point at Glenglass in the west, the route covers approximately 9 km. Travelling from east to west, visual containment is provided by built form within Sanquhar and vegetation along the course of the River Nith, and by woodland around Sanquhar Golf Club. To the west of Sanquhar, views open up amid the rolling foot slopes of the Southern Uplands. Further west, views are curtailed by intermittent woodland within the Euchan Water valley, although where gaps in vegetation occur there are more extensive views of the hill tops and the rolling landscape that is characteristic of the Southern Uplands (LCT 19). Travelling west from the junction with the A76, the existing Whiteside Hill, Sanquhar, and Twentyshilling wind turbines become visible amid the uplands. Within the upper reaches of the Euchan Water, the Whiteside and Sanquhar turbines become increasingly prominent above the steep valley sides.

The ZTV covers approximately 5.5 km of the 9 km route, from the junction with the A76 at its eastern extent, to where it passes directly to the north of the Site at approximately 1 km from the nearest proposed turbine.

Viewpoint 4 (**Figure 6.20**) is representative of the minor road along the valley of the Euchan Water.

Sensitivity

The value of the view is medium. The minor road neither lies within nor overlooks a nationally or locally designated landscape. It does, however, run through an area that is highly representative of the transitional landscape between the LCT 9 Upper Dale (Valley) and LCT 19 Southern Uplands, and this contributes to its value.

The susceptibility of receptors is moderated by the presence of several existing wind farms seen within this view which establish this type of development as a feature of the baseline.

The susceptibility of road-users is medium-low. The Proposed Development would lie at angle to the road, due to its south-westerly alignment, but would appear ahead of southbound receptors. The transient nature of road users, and screening by landform and vegetation reduces their susceptibility to the Proposed Development.

Due to the medium value of the view and their medium-low susceptibility to change, users of the minor road are of medium sensitivity.

Magnitude of Change during Construction

The magnitude of change during the construction phase would be high to medium. While landform and/or tree cover would generally screen ground level construction work within the Site, there would potentially be some visibility of access tracks across the hill slopes. Visibility of the Proposed Development would, however, mostly comprise the emerging turbines and associated construction cranes, which would be seen above the gently undulating skyline. At the eastern end of the Euchar Water minor road, the magnitude of change would be medium, as the high-level construction works would be readily apparent behind the enclosing hill side to the west at approximately 3 to 4 km, albeit with some intermittent vegetation forming screening. Entering the River Euchar valley, the landscape becomes less settled and the influence of the high-level works would become more pronounced. From the closest section of the road at approximately 1.3 km to the north, these high-level works would have a close-range influence on the views of road-users and here the magnitude of change would be high. Beyond Glen Burn, forestry and landform would screen visibility and there would be no change.

Magnitude of Change during Operation

The magnitude of change would be high to medium. The Proposed Development would be a close to very close-range feature on the skyline, whose scale and contrasting nature would increase as the road proceeds south-west, from Sanquhar into the Southern Uplands. Intermittent screening by landform and vegetation would limit the Proposed Development's influence on the view's of road-users at the eastern end of the road, while the Proposed Development's influence ceases at the western end, west of the residential property 'Glenmaddie', where the road passes the Site and Mid Rig would increasingly screen the Proposed Development. In these sections at either end there would be a low magnitude of change or no change.

In the section between Sanquhar Golf Course and Glenmaddie, the magnitude of change will range from medium to high, depending on the proximity of the road-users to the development between approximately 1.3 and 4.2 km and the relative openness of the road or enclosure owing to localised road-side vegetation. While there would be a baseline influence from the presence of Whiteside Hill Wind Farm to the rear of the Proposed Development and Sanquhar to the north-west, the closer proximity and larger size of the proposed turbines, combined with their location along the ridgeline, would make them a more prominent feature in the views of road-users.

Significance of Effect

The effect of the Proposed Development would be **major / moderate** and **significant** during both phases. This is due to the close proximity of the road to the Proposed Development, the relative openness of the landscape and the prominence of the Proposed Development despite the influence of other operational wind farms. Where there would be no visibility, there would be **no effect**.

6.10.7 Scaur Water Valley Minor Road

The Scaur Water valley minor road is located to the south of the Proposed Development. The route follows the Scaur Water from Penpont in the south to its endpoint at the Polskeoch Bothy in the north, over approximately 22 km. The ZTV shown on **Figure 6.10** shows that there would be limited theoretical visibility of between 1 to 3 turbines from this route between Penpont and Chanlockfoot. More notable theoretical visibility would occur across a section of this route between Glenwhargen Craig and Dalgonar over approximately 7 km. Along this section of the minor road, the extent of vegetation cover along the Scaur Water reduces as the route climbs towards Dalgonar and so the views become more open. The visual experience is defined by the steeply incised valley landform, spurs, and open ridgelines of the Upland Glens (Scaur LCT).

Travelling west, the existing Whiteside Hill wind turbines become visible amid the uplands between Shiel and Polgown, within the upper glen. Travelling east from Shiel, the turbines of the Twentyshilling Wind Farm become visible from a short section of this route seen along the skyline of the steeply rising valley landform.

Viewpoints 5 and 8 (**Figures 6.21 and 6.24 respectively**) are representative of the Scaur Water minor road.

Sensitivity

The value of the view is medium-high. The road runs through and overlooks the Thornhill Uplands RSA, a landscape recognised for its special scenic value which is highly representative of the narrow glens descending from the Southern Uplands to the Nithsdale Valley.

The susceptibility of road-users is medium. Typically, the view is incidental for road users but on this minor road, which runs through an RSA, it is likely that receptors would be more aware of the surrounding landscape. The level of operational wind farm development that is perceptible within this context does, however, moderate receptor susceptibility to change.

Due to the medium-high value of the view and their medium susceptibility to change, users of the minor road are of medium-high sensitivity.

Magnitude of Change during Construction

The magnitude of change to views of road-users on the minor road would be medium-high within a limited section, for westbound and eastbound receptors, and low or no change in remaining sections. Enclosing landform and distance would screen ground level works within the Site and restrict visibility to the high-level works comprising emerging turbines and associated construction cranes. These factors would also limit the visibility of the high-level works to the bend in the valley, between Glenwhargen Craig and Dalgonar. Within this area, the construction works would often lie directly ahead of north-bound road-users, and although the turbines would be partly screened by intervening landform, and possibly seen in the context of other partly screened Whiteside Hill turbines, their close proximity would make them a prominent feature. A distinct lack of settlement, the limited presence of operational wind farms and the highly enclosed nature of the valley would emphasise the presence of these high-level construction works. In sections outwith this section, the magnitude of change would be low owing to the low levels of visibility or no change where there would be no visibility.

Magnitude of Change during Operation

The magnitude of change to views from the minor road would be medium-high within the section at the bend in the valley between Glenwhargen Craig and Dalgonar, and low or no change in remaining sections.

The enclosure of the valley landform would restrict visibility of the operational Proposed Development to the upper towers and rotors of the proposed turbines. These would be seen along the section to the north of Glenwhargen Craig and east of Dalgonar. The ZTV on **Figure 6.10** shows that visibility would mostly be of 7 to 9 turbines, with smaller patches of 10 to 11 turbines and 4 to 6 turbines showing. The turbines would not be seen to their full extents owing to the screening effect of the steeply sided valley landform, with typically blades or blades and rotors with parts of towers visible.

Travelling north-east from Dalgonar and travelling north-west from Glenwhargen, the road would broadly align towards the Proposed Development, and this would raise the prominence of the turbines in the views of road-users. While the effect would be moderated by existing visibility of the Whiteside turbines, their limited level of visibility combined with the predominantly rural and undeveloped nature of the valley would make the proposed turbines at variance. Furthermore, the turbines would be seen at a range of approximately 1 to 4 km and this close proximity combined with their relatively large scale would add to the magnitude of change.

Significance of Effect

The effect of the Proposed Development would be **moderate-major** and **significant** within the section between Glenwhargen Craig and Dalgonar during both phases of the Proposed Development. **Minor** and **not significant** changes would occur to views from remaining sections of the route, where visibility of the Proposed Development would be limited. Along the majority of the road there would be no visibility and, in these sections, there would be **no effect**.

6.10.8 Southern Upland Way

The SUW is one of Scotland's Great Trails. It also forms part of the core paths network. Two sections of the publicised route⁸⁵, Section 4: Dalry to Sanquhar and Section 5: Sanquhar to Wanlockhead, are relevant to this assessment, with the Site located in Section 4. Views from Section 6: Wanlockhead to Beattock are unlikely to be significantly affected by the Proposed Development due to the intervening distance at over 10 km from the Site; and the level and extent of similar operational developments within these views. Sections 1 to 3 lie further south-west of St John's Town of Dalry where there would be no or very limited and distant visibility. Section 1 to 3 and 6 are, therefore, not included in the assessment.

6.10.8.1 Section 4: Dalry to Sanquhar

Baseline

Section 4 of the SUW extends between St. John's Town of Dalry in the south to Sanquhar to the north, covering approximately 42 km. **Figure 6.10** shows that theoretical visibility from this section of the route would begin as the SUW rises to its second highest summit at Benbrack (580 m AOD), within LCT 19a: Southern Uplands with Forest. The route description for this section notes that there are far-reaching views across open moorland, before dropping into forestry, the route then heads onwards into the Scaur Glen (**Viewpoint 8, Figure 6.24**) before rising again onto moorland with panoramic views available to Glenwhargen Craig and across the Nith Valley to Sanquhar. The ZTV shows a pattern of continuous theoretical visibility would be experienced between Benbrack and Polskeath, and between the head of the Scaur Glen as far as Sanquhar. Across this section of the route, 4.8 km of the SUW would pass within the Site, in very close proximity to the proposed turbines. This forms a small proportion of the 341 km length of the overall route.

Viewpoints 8, 11 and 27 (**Figures 6.24, 6.27 and 6.43**) are representative of this section of the SUW. While the Proposed Development would be more prominent from those sections of the SUW that align towards the Site, the ability of walkers to experience views in any direction from any point means that this assessment does not reduce the magnitude of change in relation to the direction of walkers.

Sensitivity

The value of the views from the northern part of Section 4 of the SUW which has ZTV coverage is medium. This reflects the absence of landscape designations and absence of formal OS mapped viewpoints along this section of the route.

The susceptibility of walkers on this section is medium. While the susceptibility of walkers on the Southern Uplands Way is heightened by their awareness and appreciation of their surroundings, this is moderated by the visibility of operational schemes that establish wind farm development as a characteristic of the baseline view, to which the Proposed Development would appear similar. This is particularly notable on the upland plateau containing the Site, where visibility of such development is both widespread and close to far ranging.

The overall sensitivity of walkers is rated as **medium**, due to the medium value of the view and the medium susceptibility of walkers to the Proposed Development.

⁸⁵ <https://dgtrails.org/southern-upland-way/route/#routeSections> (accessed May 2022)

Magnitude of Change during Construction

During the construction phase, the magnitude of change to views from Section 4 of the SUW would range between medium-low and high. There is no potential visibility of the Proposed Development south-west of Benbrack, while to the north-east, this is initially localised on the Benbrack summit before becoming continuous within the Scaur Water valley east of Dalgonar and continuing to Sanquhar.

Landform would screen ground level construction work within the Site and restrict visibility of the construction works to the emerging turbines and associated construction cranes from Benbrack (**Viewpoint 11, Figure 6.27**). These would form a relatively contained feature in the middle ground of the panoramic and medium range view and here the magnitude of change would be medium-low.

Approaching the Site, proximity to the works and the large scale of the emerging turbines would make them a larger feature of close-range views, such as from Polgown (**Viewpoint 7, Figure 6.23**) where the magnitude of change would be **medium-high**. Screening by landform would limit the full extents of their visibility within the valley, whereas views from the open upland plateau would be uninterrupted and very close-range, such that ground level and high-level construction works would be especially prominent and a **high** magnitude of change would arise.

As set out in **Technical Appendix A14.1: Access Management Plan**, the SUW would not be closed during construction and management measures would be implemented to ensure the safety of walkers through the Site. The SUW remaining open means walkers would experience close views of the emerging turbines and associated tall cranes, as well as the construction of the tracks, foundations, crane pads, BESS, substation and borrow pits, with T8 and the borrow pits located immediately adjacent to the SUW and the access track crossing it.

East of Cloud Hill, landform would increasingly screen the ground level construction works as the route descends to the valley floor, although the emerging turbines and cranes would still appear close range and large scale, with a medium-high magnitude of change arising. Within the Upper Nithsdale Valley, the Proposed Development would become more visible due to flat topography, surrounding open fields and decreasing screening by landform, although owing to the slightly greater separation distance the magnitude of change would remain medium-high. This would reduce to medium and then medium-low as the route approaches and enters Sanquhar due to increased screening by vegetation and built form and the urban rather than rural character that would prevail.

Operational wind turbines are readily apparent from the route west of the Site but have little presence within the valley of the Scaur Water. The influence of these turbines increases approaching the upland plateau and whilst it continues into the Upper Nithsdale Valley to the east, reduces gradually with distance.

Magnitude of Change during Operation

During the operational phase, the magnitude of change to views from Section 4 of the SUW would range between medium-low and high. There is no potential visibility of the Proposed Development south-west of Benbrack, while to the north-east, this is initially localised on the Benbrack summit before becoming continuous within the Scaur Water valley east of Dalgonar and continuing to Sanquhar.

The Proposed Development would form a relatively contained feature in the middle ground of the panoramic and middle range view from Benbrack where operational wind farms at similar ranges and on either side would ensure that it would not form a new defining feature. Here the magnitude of change would be medium-low. The ZTV on **Figure 6.10** also shows visibility on the summits of Cairn Hill and Black Hill to the north of Benbrack, beyond this and regardless of the extent of visibility becoming patchy as the path passes over into the Scaur valley, the extent of forestry cover would ensure that actual visibility would be very limited.

Visibility would resume just east of Dalgonar where the landform of the Scaur valley would restrict visibility of the Proposed Development to the upper towers and rotors, and this would continue over the approach towards the Site as seen from within the valley of the Scaur Water. The close proximity and large scale of the proposed turbines at this range between 2.5 and 1 km would make them a prominent feature and the medium-high magnitude of change would increase to high as the route ascends out of the Scaur valley and onto the upland plateau. Here the SUW would pass adjacent to the southern boundary of the Site for approximately 2 km, before turning north-east to pass through the Site for a further approximate 4.8 km. The proposed turbines would be contained on the northern side of the SUW following design improvements to remove those on the southern side of the SUW. They would, nonetheless, form close range and large-scale features with a notable influence on the experience of walkers. Furthermore, there would be a residual influence from the borrow pits located close to the SUW, and while these would be restored post construction, through infilling of ground level materials and replanting of vegetation, the quarry faces would remain exposed and this would add to the effect on walkers in this especially close range section.

The magnitude of change would decrease east of Cloud Hill due to the screening by landform, while the influence of neighbouring wind farms at Whiteside Hill, Sanquhar and Sandy Knowe would increase with visibility opening up to the north-west and north. Despite these factors, the magnitude of change would be medium-high as the turbines would still be in close proximity and appear large scale. Within the Upper Nithsdale Valley, the Proposed Development would become more visible due to flat topography, surrounding open fields and decreasing screening by landform, although owing to the slightly greater separation distance the magnitude of change would remain medium-high. This would reduce to medium and then medium-low as the route approaches and enters Sanquhar due to increased screening by vegetation and built form and the urban rather than rural character that would prevail.

Significance of Effect

During both the construction and operational phases, the effect of the Proposed Development on the views of walkers from Section 4 of the SUW would be **moderate** and **not significant** within the vicinity of Benbrack; **moderate** and **significant** between Dalgonar and Polgown, **major / moderate** and **significant** over the upland plateau, and **moderate** and **significant** towards and within the vicinity of Sanquhar. The effects on Section 4 of the SUW would be localised within approximately 5 km of the Proposed Development and extend across an approximate 10 km extent. This would form a small proportion of the much wider 341 km route, the vast majority of which would remain unaffected or would not be significantly affected.

6.10.8.2 Section 5: Sanquhar to Wanlockhead

Section 5 of the SUW extends between Sanquhar to Wanlockhead. It is noted as the shortest section of the route at 13 km long. The route rises from Wanlockhead into the Southern Uplands where the description notes several miles of scenic hill walking between this point to the Nith Valley. The route description highlights opportunities for views back to Sanquhar, particularly from higher locations within the valley. The ZTV shows limited theoretical visibility from Wanlockhead to where the route passes to the south-east of Conrig Hill, aside from a small and distant patch of theoretical visibility from a high point near Stood Hill. Further west, there is largely continuous theoretical visibility as the route descends from the Southern Uplands into the Upper Nith Valley. While these views would be readily apparent to west-bound walkers, they will also be apparent to east-bound walkers.

Viewpoints 7, 18 and 19 (**Figures 6.23, 6.34 and 6.35**) are representative of this section of the SUW.

Sensitivity

The value of the views from this section of the SUW is medium in the section between Sanquhar and Bogg Farm where there are no formal viewpoints and the route is not covered by any landscape

designations. Between Bogg Farm and Wanlockhead, the Thornhill Uplands RSA raises the value to medium-high.

The susceptibility of walkers on this section is medium. While the susceptibility of walkers on the Southern Uplands Way is heightened by their awareness and appreciation of their surroundings, this is moderated by the visibility of operational schemes that establish wind farm development as a characteristic of the baseline view, to which the Proposed Development would appear similar. This is particularly notable looking across the Nith Valley as the SUW approaches Sanquhar.

The overall sensitivity of walkers is rated as medium between Sanquhar and Bogg Farm owing to the medium value of the views and medium susceptibility of walkers, and medium-high between Bogg Farm and Wanlockhead, due to the medium-high value of the views and the medium susceptibility of walkers.

Magnitude of Change during Construction

The magnitude of change to views from Section 5 of the Southern Uplands Way would be medium in the section between Sanquhar and Bogg Farm and medium-low, low or no change in the section between Bogg Farm and Wanlockhead. Ground level construction work would be partially visible in the form of access tracks, crane hard-standings and foundations, while the emerging turbines and construction cranes would be fully visible and would form a prominent feature within the range of approximately 5 to 7 km. Although the construction works would be contained within 10 to 20 degrees of the full 360 degree view (**Figure 6.7**), and would be seen in the context of other operational wind farms in the same sector, the closer proximity and larger scale of the emerging turbines would make this a defining feature in the views of walkers on this section.

In the section from Bogg Farm to Conrig Hill, the magnitude of change would reduce to and management measures would be implemented to ensure the safety of walkers through the Site as the separation distance would increase to approximately 7 to 10 km and the construction works come to occupy only 5 to 10 degrees of the full 360 degree view (**Figure 6.7**). Furthermore, the construction works would be seen as a smaller part of a wider landscape view, in which Whiteside Hill, Sanquhar and Sandy Knowe wind farms present a notable baseline influence that would moderate the additional influence of the construction works. Beyond Conrig Hill, there would be no visibility until a patch over Glengaber Hill at 11.5 to 12.5 km where the magnitude of change would reduce to **low** owing to the greater separation distance and the wider influence from the baseline landscape and wind farm development.

Magnitude of Change during Operation

The magnitude of change to views from Section 5 of the Southern Uplands Way would be medium in the section between Sanquhar and Bogg Farm and medium-low, low or no change in the section between Bogg Farm and Wanlockhead.

In the section between Sanquhar and Bogg Farm, all 11 of the turbines would be visible at a range of approximately 5 to 7 km. While these would be readily apparent to west-bound walkers, they would also be visible to east-bound walkers. They would appear as readily apparent features at a relatively close range, with most of the rotors and hubs of the proposed turbines visible above the skyline. While the Proposed Development would sit adjacent to Whiteside Hill and could potentially appear as an extension, the turbines would appear closer in range and larger in scale, such that they would form a new defining feature in the views of walkers and here the magnitude of change would be medium. While visibility would continue beyond Bogg Farm and onto Conrig Hill at a range of approximately 7 to 10 km, the combination of the increased separation distance and the more contained appearance of the Proposed Development relative to the wider landscape and the greater influence from the operational wind farms that characterise this area of the Southern Uplands, would moderate the additional influence of the Proposed Development, such that the magnitude of change would be medium-low. Beyond Conrig hill, the SUW falls out of the ZTV as shown on **Figure 6.10** and only

picks up again at a range between 11.5 and 12.5 km as it crosses the hill slopes of Glengaber Hill. Again, the greater separation distance and the wider landscape and wind farm influence would further reduce the magnitude of change to low.

Potentially, the Proposed Development would be visible as far north as Glengaber Hill (c. 515 m AOD) at approximately 12.7 km.

Significance of Effect

During both the construction and operational phases, the effect of the Proposed Development on views from Section 5 of the Southern Uplands Way would be **moderate** and **significant** between Sanquhar and Bogg Farm, and **moderate** or **moderate / minor** and **not significant** within remaining sections. Alteration to the baseline view arising from both phases of the Proposed Development would be readily apparent directly ahead of south-west bound receptors, and despite the influence of existing wind farms, this factor, alongside the scale of the Proposed Development and its relative proximity to the viewpoint, would give rise to a **significant** effect within this close-range section. The effects on Section 5 of the SUW would be localised within an approximate range of 5 to 7.5 km of the Proposed Development and extend across an approximate 2.5 km extent. This would form a small proportion of the much wider 341 km route, the vast majority of which would remain unaffected or would not be significantly affected.

6.10.9 Core path network

Core paths of relevance to this assessment, as shown on DGC mapping available online, include: Path 84 - Kirkconnel to Mynwhirr Hill (KIRD/84/3); Path 88 - Kirkconnel to Black Law (Via Fingland & Kirkland) KIRD/88/5; Path 108 - Bogg To Auchentaggart Moor (ROYS/108/1); Path 109 – Sodjers Bridge Walk (ROYS/109/2); and Path 111 – Sanquhar Castle Circular (ROYS/111/1). These routes provide access to the upland landscape that encloses the Upper Nithsdale Valley.

Broad conclusions regarding the level of visibility and the effect that the Proposed Development would have on these routes within the wider core path network can be drawn from the Assessment of Effects on Representative Viewpoints in **Section 6.9** and the ZTV shown on **Figure 6.10**. ZTV coverage indicates continuous visibility of the proposed turbines within approximately 5 km of the Site boundary, across the northern valley side and across the valley floor. This is largely contained by the Corsencon, Kirkland, Todholes, Conrig and Cairn Hills. ZTV coverage to the south of the valley indicates similar visibility on ground rising from the Nithsdale and Euchar Water valleys that is progressively fragmented away from the Site. The Hare, Blackcraig, Colt, Countam and Cairnkinna Hills largely contains visibility of the Proposed Development, south of the river.

Viewpoints 7, 14, and 15 (**Figures 6.23, 6.30 and 6.31 respectively**) are representative of the core path network.

6.10.9.1 Kirkconnel to Mynwhirr Hill Core Path (Core Path 84)

Baseline

Kirkconnel to Mynwhirr Hill Core Path is a linear route that starts at the southern edge of Kelloholm and passes across the upper slopes of the Nithsdale Valley south-west to Mynwhirr Hill (c. 418 m AOD). The full length of the path is approximately 11 km. At its closest point, the route runs approximately 2.2 km to the north of the Proposed Development.

The ZTV on **Figure 6.10** shows relatively continuous ZTV coverage from Kelloholm to Sandy Knowe, before the path drops into the Kello Water valley and out of the ZTV due to screening by intervening landform. There is ZTV coverage of the route as it rounds Mynwhirr Hill, although the level of visibility in this section is variable.

As the path climbs the slopes of the Upper Nithsdale Valley it passes through, and between, extensive blocks of plantation woodland which would restrict actual visibility compared to the

theoretical visibility suggested by the ZTV. However, there would be opportunities for more open views between the start of the route at Kelloholm as far as Polshag Hill.

Travelling west, users of this route would gain visibility of the wind turbines and infrastructure of Sandy Knowe Wind Farm, and views to the Sanquhar and Whiteside Hill Wind Farms to the south.

Sensitivity

The value of the views of walkers on Kirkconnel to Mynwhirr Hill Core Path is medium. This takes account of the popularity and value ascribed locally to the path which otherwise does not intersect formal OS mapped viewpoints and is not located within or overlooks landscapes designated for their landscape value.

The susceptibility of walkers on the Kirkconnel to Mynwhirr Hill Core Path is medium. Awareness and appreciation of their surroundings raises the susceptibility of walkers on this core path. The high level and visibility of operational wind farms, which establishes wind farm development as a characteristic of the baseline view, does however limit the susceptibility of walkers to the Proposed Development.

Due to the medium value of the views from this core path and the medium susceptibility of walkers on it, their overall sensitivity is rated as medium.

Magnitude of Change during Construction

The magnitude of change to views of walkers on the Kirkconnel to Mynwhirr Hill Core Path would range from medium to low during the construction phase, with no change occurring where there would be no theoretical visibility or no actual visibility owing to the screening effect of forestry. Where visibility would arise, construction works would be seen at a minimum distance of approximately 4.5 to 6.4 km. Between Kelloholm and Polshag Hill the magnitude of change would be medium, reflecting the relative close proximity of this section of core path and the openness of this landscape which would ensure that the emerging turbines and associated cranes would form a readily visible feature, despite the baseline influence from operational Whiteside Hill and Sandy Knowe wind farms in the same upland area. Between Polshag Hill and Mynwhirr Hill, the core path largely drops out of the ZTV such that there would mostly be no change, albeit with some small patches of low-level visibility where the magnitude of change would be low.

Magnitude of Change during Operation

The magnitude of change to walkers' views would be medium to low during the operational phase, with no change occurring where there would be no theoretical visibility or no actual visibility owing to the screening effect of forestry. The addition of the Proposed Development would be visible between Kelloholm to Polshag Hill, and from this section the views of walkers would be altered by the addition of a relatively large scale and close-range wind farm, seen at a minimum of 4.5 to 6.4 km, with all the proposed turbines theoretically visible along this section. While these 11 additional turbines would be seen in the context of operational wind farm development, the slightly closer range and larger scale of the proposed turbines would be apparent, and these factors would give rise to a medium magnitude of change. Between Polshag Hill and Mynwhirr Hill, this visibility would reduce with limited coverage of ZTV, low levels of visibility occurring in small patches and a further reduction from the enclosure of forestry. While there would be no change across much of this section, where visibility would occur, the magnitude of change would be low.

Significance of Effect

During the construction and operational phases, the effect of the Proposed Development on views from the core path would be **moderate** and **significant** between Kelloholm and Polshag Hill. Between Polshag Hill and Mynwhirr Hill there would mostly be no effect owing to no visibility and where visibility would arise the effect would be **moderate-minor** and **not significant**.

6.10.9.2 *Kirkconnel to Black Law (via Fingland and Kirkland) Core Path (Core Path 88)*

Baseline

Kirkconnel to Black Law (via Fingland and Kirkland) Core Path is a linear route that passes from the settled Nithsdale Valley at Kirkconnel to the Southern Upland landscape and large block of plantation forestry at Black Law (c. 408 m AOD). The full length of the path is approximately 12 km. At its closest point, the route passes 6.2 km to the north of the Proposed Development.

The ZTV on **Figure 6.5b** shows theoretical visibility from this route between Kirkconnel to where the route rises out of the Nithsdale valley, to the east of Kirkland Hill, at a minimum range of 6.2 km. Actual visibility is likely to be less than indicated by the ZTV as this section of the route passes through the narrow and partially vegetated Pulbower Burn and a short section of commercial plantation as it rises out of the valley, which is anticipated to reduce the visibility of the Proposed Development. Nonetheless, it is acknowledged that walkers on the core path would have elevated and unrestricted views particularly from where the route crosses the upper valley sides.

From the upper valley sides walkers gain views of the existing Twentysilling, Whiteside Hill, Sanquhar, Hare Hill and Hare Hill Extension, and Sandy Knowe wind farms that lie to the south of the valley and across the ridgeline of the Southern Uplands further south. In the far distance views encompass many more distant and varied clusters of wind turbines spread across the upland landscape to the south of the Nithsdale Valley.

Sensitivity

The value of the views of walkers on the Kirkconnel to Black Law (via Fingland and Kirkland) Core Path is medium. This takes account of the popularity and value ascribed locally to the path which otherwise does not intersect formal OS mapped viewpoints or overlook landscapes designated for their landscape value.

The susceptibility of walkers on the Kirkconnel to Black Law (via Fingland and Kirkland) Core Path is medium. Awareness and appreciation of their surroundings raises the susceptibility of walkers on these core paths to the Proposed Development. The high level and visibility of operational wind farms, which establishes wind farm development as a characteristic of the baseline view, limits their susceptibility to the Proposed Development.

The combination of the medium value of the view and the medium susceptibility of walkers leads to an overall medium rating for sensitivity.

Magnitude of Change during Construction

The magnitude of change to walkers' views during the operational phase would be medium-low in the open parts, no change where landform or vegetation, including forestry, provides screening. Visibility of the construction works would be limited from the closest parts of the core path owing to the screening effect of landform and vegetation along the Pulbower Burn and around Kirkland. It is only once the core path reaches the lower slopes of Kirkland Hill that views of the construction works would open up. The elevation of this section would mean that parts of the ground level works as well as the high level works would be visible, although the magnitude of change would be moderated by the minimum distance of approximately 8 km and the extensive baseline influence from operational Twentysilling, Whiteside Hill, Sanquhar, Hare Hill and Hare Hill Extension, and Sandy Knowe wind farms that lie to the south of the valley and across the ridgeline of the Southern Upland. Here the magnitude of change would be medium-low. Towards the northern extent of the core path, there would be no visibility and therefore there would be no change.

Magnitude of Change during Operation

The magnitude of change on the views of walkers during the operational phase would be medium-low in the open parts, while there would be no change in those parts enclosed by landform or forestry. Unobstructed views of the Proposed Development would be restricted to a short section of the core path where it crosses the lower slopes of Kirkland Hill above Milldam Plantation. The route's orientation at this section places the Site at an oblique angle to the direction of walkers, albeit more apparent to those travelling south-west. While the route aligns with the Site along Pulbower Burn, here it is likely that landform and vegetation would largely screen the Proposed Development. For these reasons, the Proposed Development's visibility from this core path is likely to be lower than on other nearby core paths. Furthermore, the proposed turbines would be seen in the same sector of the views as operational turbines and although their larger scale may be perceptible, the magnitude of change would be moderated by the extents to which wind farms are present in this part of the Southern Uplands.

Significance of Effect

The effect of the Proposed Development on views from Kirkconnel to Black Law (via Fingland and Kirkland) Core Path would be intermittently **moderate / minor** and **not significant** across the more elevated and open sections where visibility would arise, during both development phases. In those sections where there would be no theoretical or actual visibility there would be **no effect**.

6.10.9.3 Bogg to Auchentaggart Moor Core Path (Core Path 108)

Baseline

Bogg to Auchentaggart Moor Core Path is a circular hill route following access roads that join the farmstead at Bogg, north of Sanquhar, to the farmsteads of Auchentaggart and Auchengruith, that lie to the north-west of the B797. The full length of the path is, approximately 8 km. At its closest point, the route lies approximately 7 km to the north-east of the Proposed Development.

The ZTV shows continuous visibility from much of this route, apart from the sections that descend into the incised valley of the Mennoch Water, near Auchentaggart and Auchengruith farmsteads and the B797, where it falls out of ZTV coverage owing to the screening effect of intervening landform.

From open and elevated sections of the core path, users of the route would gain wide-ranging views to the Southern Uplands to the south of the Nithsdale Valley and clusters of existing wind turbines including those of the Twentysilling, Whiteside Hill, and Sanquhar Wind Farms.

Sensitivity

The value of the views of walkers on the Bogg to Auchentaggart Moor Core Path is medium-high. The core path does not intersect formal OS mapped viewpoints but lies within and overlooks the Thornhill Uplands RSA, which indicates the value of the surrounding landscape.

The susceptibility of walkers on this core path is medium. Awareness and appreciation of their surroundings will raise their susceptibility to the potential effects of the Proposed Development. The level and visibility of operational wind farms in the same sector of the view as the Site, including Twentysilling, Whiteside Hill, and Sanquhar, limits their susceptibility to the Proposed Development.

The medium-high value of the view and the medium susceptibility of walkers leads to their overall sensitivity rating of medium-high.

Magnitude of Change during Construction

The magnitude of change to the views of walkers on the Bogg to Auchentaggart Moor Core Path would be medium-low on the open and elevated sections and with no change in the sections enclosed by landform and / or forestry. The construction works would be visible between a range of 7.1 and 8.4

km such that they would form a middle range feature. Much of the emerging turbines and construction cranes would be readily visible, particularly from the southern section of the core path as it is closer range and with open views across the valley, compared to the more distant and partly enclosed by tree cover northern section. These works would appear contained within 5 to 10 degrees of the full 360 degree view and this, along with the baseline influence from other operational wind farms in the same part of the southern uplands would moderate the effect.

Magnitude of Change during Operation

The magnitude of change to views from the Bogg to Auchentaggart Moor Core Path would be medium-low on the open and elevated sections and with no change in the sections enclosed by landform and / or forestry. Openness and elevation would mean unobstructed and continuous visibility of the operational Proposed Development from much of the path, although the prominence of the Proposed Development would be moderated by the perpendicular orientation of the path and the peripheral location of the Site in relation to the direction of travel. All of the proposed turbines would be visible, with the nearest seen to their full extent. These would form a contained group within the wider landscape context, with the proposed turbines similar in vertical scale to the hills upon which they stand. While the proposed turbines would appear slightly larger than the operational turbines, their location within a part of the Southern Uplands where wind farm development has a strong baseline influence would ensure that they do not redefine the character of the views from this core path. There would be no change across the eastern parts of the circular route where the screening effect of the valley landform and / or forestry would prevent visibility.

Significance of Effect

During both development phases, the effect of the Proposed Development on the views of walkers from the Bogg to Auchentaggart Moor Core Path would be **moderate** and **not significant** along much of the circular route with **no effect** within the Mennock Water Valley. While the Proposed Development would make a readily apparent addition to wind farm development from this view, it would be seen as a contained development within a wider extent of operational wind farms.

6.10.9.4 Sodjers Bridge Walk Core Path (Core Path 109)

Baseline

Sodjers Bridge Walk Core Path is a linear walk that passes from the small settlement of Crawick at its westernmost extent to the SUW at its easternmost extent. The length of the route extends to approximately 1.5 km. At its closest point, the path passes 6.4 km to the north-east of the Proposed Development.

The ZTV on **Figure 6.10** shows continuous coverage across the eastern part of this route. The western part of the route passes through the heavily wooded Lawyer's Brae, where the combination of the enclosed landform and the woodland cover reduces theoretical and actual visibility. Nonetheless, the eastern half of the route passes across more elevated and open ground with opportunity for wide-ranging views.

In open views to the south from the eastern part of the core path, the existing Twentysilling, Whiteside Hill, Sanquhar, and Hare Hill Wind Farms are present across the Southern Uplands on the opposite side of the Nithsdale Valley.

Viewpoint 7 (**Figure 6.23**) is representative of the SUW but also lies close to the easternmost extent of Sodjers Bridge Walk Core Path.

Sensitivity

The value of the views of walkers on Sobjers Bridge Walk Core Path is medium. This takes account of the popularity and value ascribed locally to the path which otherwise does not intersect formal OS mapped viewpoints or overlook landscapes designated for their landscape value.

Receptor susceptibility is medium. Awareness and appreciation of their surroundings raises the susceptibility of walkers on these core paths to the Proposed Development. The high level and visibility of operational wind farms, which establishes wind farm development as a characteristic of the baseline view, limits the susceptibility of walkers to the Proposed Development.

The combined medium value of the views and the medium susceptibility of walkers on this core path leads to an overall medium sensitivity rating.

Magnitude of Change during Construction

The magnitude of change to the views of walkers on Sobjers Bridge Walk Core Path on the eastern part would be medium while on the western part it would be medium-low where visibility occurs or no change where there is no visibility. While visibility of the ground level works would be limited by the screening effect of the enclosing ridgeline on and behind which the Proposed Development would sit, most of the emerging turbines and associated construction cranes would be readily visible above the skyline. Seen at a minimum of 6.4 km, these structures would be contained within 20 to 30 degrees of the full 360 degree view. While they would be seen to add further to the extent of wind farm development, this baseline influence would moderate the additional effect of the construction works in views from this path.

Magnitude of Change during Operation

The magnitude of change to the views of walkers on Sobjers Bridge Walk Core Path on the eastern part would be medium while on the western part it would be medium-low where visibility occurs or no change where there is no visibility. While landform would screen the bases of some of the proposed turbines, the remaining extents would be fully visible from the eastern part of the path adjoining a minor road and the SUW. The Proposed Development would be readily visible, albeit as a contained group of turbines that appear similar in vertical scale to their underlying landform. While these would be closer and larger scale than the operational turbines clustered on adjoining hilltops, this baseline influence would moderate the effect as they would not be seen as a new feature and would appear as an extension to existing Whiteside Hill set behind. Although the Proposed Development would visibly increase both the level and horizontal extent of wind farm development, it would be largely consistent with the character of the baseline view.

Significance of Effect

The effect of the Proposed Development on the views from Sobjers Bridge Walk Core Path would be **moderate** and **not significant** along the straight stretch adjoining the SUW; and **moderate/minor** and **not significant** in remaining sections or with no effect where there would be no visibility.

6.10.9.5 Sanquhar Castle Circular Core Path (Core Path 111)

Baseline

The Sanquhar Castle Circular Core Path (111) is a short circular walk that passes around the southern edge of Sanquhar and a short section of the River Nith, and to the east of Sanquhar Castle. The full length of the path is approximately 2.25 km. At its closest point, the route passes 4.8 km to the north-east of the Proposed Development.

The ZTV on **Figure 6.10** shows continuous theoretical visibility from Sanquhar Castle Circular Core Path, although the level of actual visibility would be variable along the section of the route next to the River Nith. Sections of the path that run adjacent to the settlement are slightly elevated and open.

Stretches of the route adjacent to the River Nith are lower-lying and are likely to be partially restricted by riparian woodland that encloses the watercourse and linear belts of woodland that run parallel to the river within the valley floor.

In open views from this circular walk the Twentyshilling, Whiteside Hill, and Sanquhar Wind Farms are visible across the upland landscape and ridgeline to the south of the Nithsdale Valley, and the upper portions of the Sandy Knowe Wind Farm visible on the lower valley slopes further west.

Sensitivity

The value of the view from the Sanquhar Castle Circular Core Path is medium. This takes account of the popularity and value ascribed locally to the path which otherwise does not intersect formal OS mapped viewpoints or overlook landscapes designated for their landscape value.

The susceptibility of walkers is medium. Awareness and appreciation of their surroundings raises the susceptibility to the Proposed Development of walkers on these core paths. The high level and visibility of operational wind farms, which establishes wind farm development as a characteristic of the baseline view, limits their susceptibility to the Proposed Development.

The sensitivity of walkers is rated as medium overall, due to the medium value of the view and their medium susceptibility to the Proposed Development.

Magnitude of Change during Construction

The magnitude of change to the views of walkers on Sanquhar Castle Circular Core Path would be medium-high during the construction phase. Visibility of the construction works would occur at a minimum of 4.8 km making them relatively close range. Landform would screen much of the ground level construction work within the Site and would restrict visibility of the Proposed Development to the emerging turbines and associated construction cranes. The emerging turbines and construction cranes would appear relatively large and prominent compared to the surrounding turbines and hills. Although construction activity would be introduced to the views, the level of wind farm development, settlement, farming and forestry within the area would moderate their visual influence.

Magnitude of Change during Operation

During the operational phase, the magnitude of change to the views of walkers on Sanquhar Castle Circular Core Path would be medium-high due to proximity to the Site and the alignment of sections of the route towards it. This would be most notable from the south-westerly section passing the castle, where the Site lies directly ahead, the route is elevated, and the intervening landscape is open. Remaining sections of the route would be less influenced by the Proposed Development, due to their orientation, lower-lying nature and screening by woodland, particularly along the riverside. The operational Proposed Development would be a readily visible feature on the skyline and the proposed turbines would appear larger than the operational turbines of Whiteside Hill to the rear. Relative close proximity and visibility of all the proposed turbines would make the Proposed Development a defining feature in the views of walkers on this path.

Significance of Effect

During both development phases, the effect of the Proposed Development on the views of walkers on Sanquhar Castle Circular Core Path would be **moderate** and **significant**, particularly from the south-westerly section passing Sanquhar Castle.

6.11 Cumulative Effect Assessment

6.11.1 Introduction

All operational and under construction wind farms have been included as part of the baseline in the main assessment. This means that their influence on the main assessment has been taken into

account in relation to the landscape and visual receptors assessed in detail in the 'Assessment of effects on Landscape Character' in **Section 6.7**, 'Assessment of Effects on Landscape Designations' in **Section 6.8**, 'Assessment of Effects on Views and Visual Amenity' in **Section 6.9** and 'Assessment of Effects on Principal Visual Receptors' in **Section 6.10**. The cumulative effect of the Proposed Development in conjunction with the operational and under construction wind farms is assessed in more detail in this section, in relation to two different cumulative scenarios.

- Cumulative Scenario 1 assesses the effects of adding the Proposed Development to a cumulative baseline comprising all relevant operational, under construction and consented wind farms.
- Cumulative Scenario 2 assesses the effects of adding the Proposed Development to a cumulative baseline comprising all relevant operational, under construction, consented and application wind farms.

'The overall totality of the effect, when the Proposed Development is considered alongside the other operational and proposed schemes is also assessed in **Section 6.11.23** as the 'in-combination' effects.

6.11.2 Methodology for the Cumulative Assessment

The methodology for the cumulative effects differs in some respects from that used in the main assessment. The full methodology for the cumulative assessment is described in **Technical Appendix A6.1: LVIA Methodology**. The purpose of this cumulative assessment is to establish whether or not the addition of the Proposed Development, in conjunction with other relevant existing and proposed wind farms, may lead to wind farm development becoming a prevailing characteristic, albeit that the wind farms may become one of a number of prevailing characteristics. It should be noted that even if the Proposed Development itself is assessed to have a significant effect, it does not necessarily follow that the cumulative effect would also be significant.

6.11.2.1 Wind Farm Sites Included in the Cumulative Assessment

Section 6.4.6 sets out which of the cumulative sites will potentially be relevant to the cumulative assessment. Cumulative sites that lie within a 45 km radius of the Proposed Development have been listed in **Table 6.5** and their locations shown on **Figure 6.12**. This shows that there are eight operational wind farms within or partly within a 10 km radius of the Proposed Development; Twentysilling, Sanquhar, Whiteside Hill, Sandy Knowe, Sunnyside Farm, Hare Hill, Hare Hill Extension and Afton. It also shows that there are numerous consented and application stage wind farms within the 45 km Study Area, most beyond 20 km from the Site and a few within 10 km. The relevance of the wind farms to the cumulative assessments relate principally to a combination of their size, proximity and extent of visibility. These considerations have been made in identifying the relevant cumulative wind farms relevant to each landscape and visual receptor assessed.

Cumulative ZTVs that show the visibility of the cumulative site, or group of sites, along with the visibility of the Proposed Development have been run for all of the operational, under construction, consented and application wind farms that are considered relevant in the cumulative assessment, as shown on **Figures 6.13a to 6.13j**. These show the extent to which each wind farm would be visible in conjunction with visibility of the Proposed Development and are referred to in the following detailed assessments.

The cumulative sites are shown in the cumulative wirelines for each of the representative viewpoints, as shown on **Figures 6.17 to 6.38**. In these wirelines, the Proposed Development turbines are shown in red; operational and under-construction wind farms are shown in black; consented wind farms are shown in green and application wind farms are shown in blue.

In some instances, wind farms show up in the wirelines although they are beyond their own Study Area radius. Where this occurs, the wind farm is not included in the written assessment as it lies

outwith its own Study Area radius and is, therefore, considered to lie beyond the radius within which it may contribute to a significant cumulative effect.

6.11.3 Assessment of Cumulative Effects on Landscape Character

The assessment of cumulative effects on landscape character uses the same receptors as the assessment of effects on landscape character carried out previously in this chapter. These are in two groups:

- Landscape character types; and
- Designated areas.

The cumulative assessment for both of these groups of receptors is described in the following section of this chapter. The detailed methodology for the assessment of cumulative effects on landscape character is described in **Technical Appendix A6.1: LVIA Methodology**.

The first stage in the cumulative assessment of the landscape character types and designated areas is a filtering process to ascertain which of them have the potential to undergo significant cumulative effects as a result of the Proposed Development. This process is carried out through a desk study and site survey which examines the visibility of the Proposed Development in conjunction with other assessed sites from the landscape character types and designated areas around the Study Area, using the ZTV and wirelines.

Table 6.8 determines that there are three landscape character types and one designated landscape with potential to undergo significant cumulative effects as a result of the addition of the Proposed Development. So that the CLVIA is proportionate and focuses on the potentially significant cumulative landscape effects, these receptors are the focus of the detailed assessment of cumulative effects on landscape character. Reference is made in the table to the findings of the main assessment to indicate the long-term effects of the Proposed Development outwith Scenario 1 and Scenario 2.

Table 6.8 Potential for Significant Cumulative Effects on Landscape Receptors

Receptor	Main Assessment during operational phase	Potential for Scenario 1 significant cumulative effect	Potential for Scenario 2 significant cumulative effect
DG LCT 9. Upper Dale (Valley) / Upper Nithsdale LCU	Significant west of Enterkinfoot and Not significant south-east of Enterkinfoot.	Yes – Lorg and Sanquhar “Six” Community wind farms would influence the character of this LCU, which lies within 10 km of the Site with combined theoretical visibility of both these consented schemes and the Proposed Development.	Yes – Eucharhead and Sanquhar II wind farms would influence the character of this LCU, which lies within 10 km of the Site with widespread combined theoretical visibility of both these application stage schemes and the Proposed Development.
DG LCT 10. Upland Glens / Dalveen LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: ■ the minimum separation distance of 10.5 km from the Proposed Development; ■ the contained horizontal angle of the Proposed Development within the wider landscape; ■ the very limited extent to which the Proposed Development would be visible across this LCU; and ■ the very limited influence of the consented cumulative wind	No - There would be limited potential for significant cumulative effects owing to: ■ the minimum separation distance of 10.5 km from the Proposed Development; ■ the contained horizontal angle of the Proposed Development within the wider landscape; ■ the very limited extent to which the Proposed Development would be visible across this LCU; and ■ the very limited influence of the application stage cumulative

Receptor	Main Assessment during operational phase	Potential for Scenario 1 significant cumulative effect	Potential for Scenario 2 significant cumulative effect
		farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j . These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j . These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
DG LCT 10. Upland Glens / Mennock LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of operational wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of operational wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
DG LCT 10. Upland Glens / Scaur LCU	Significant across northern part out to approximately 5 km. Not significant in all remaining parts.	Yes – Lorg and Sanquhar “Six” wind farms would influence the character of this LCU, which lies on the southern side of the Site with widespread combined theoretical visibility of both these application stage schemes and the Proposed Development.	Yes – Eucharhead and Sanquhar II wind farms would influence the character of this LCU, which lies on the southern side of the Site with widespread combined theoretical visibility of both these application stage schemes and the Proposed Development.
DG LCT 19. Southern Uplands / Nithsdale LCU.	Significant across LCU out to south and south-east to approximately 5 km. Not significant in all remaining parts.	Yes – despite the location of the Proposed Development within this LCU and the strong influence this would present, there would also be cumulative interactions with close range Sanquhar “Six” Community and Lorg consented wind farms.	Yes – despite the location of the Proposed Development within this LCU and the strong influence this would present, there would also be cumulative interactions with close range Sanquhar II and Eucharhead application wind farms.
DG LCT 19. Southern Uplands / North West Lowthers LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other operational cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j.	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other -operational cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j.

Receptor	Main Assessment during operational phase	Potential for Scenario 1 significant cumulative effect	Potential for Scenario 2 significant cumulative effect
		These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
DG LCT 19. Southern Uplands / Lowthers LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other operational wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other operational wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
DG LCT 19a. Southern Uplands with Forest / Ken LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the influence of other operational cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the influence of other (operational) cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
EA LCT 10. Upland River Valley / Nith LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 8 km from the Proposed Development; - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the close-range influence of operational Hare Hill and Extension wind farm across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 8 km from the Proposed Development; - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the close-range influence of operational Hare Hill and Extension wind farm across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the

Receptor	Main Assessment during operational phase	Potential for Scenario 1 significant cumulative effect	Potential for Scenario 2 significant cumulative effect
		Proposed Development on the landscape character of this LCU.	Proposed Development on the landscape character of this LCU.
EA LCT 18a. East Ayrshire Plateau Moorlands / Wardlaw Hill LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 9 km from the Proposed Development; - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 9 km from the Proposed Development; - the contained horizontal angle of the Proposed Development within the wider landscape; - the limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13a to 6.13j. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
EA LCT 20a. East Ayrshire Southern Uplands / Ken LCU	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 6 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 6 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other cumulative wind farms across this LCU as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.
Thornhill Uplands RSA	Significant within the uplands containing the Site (LCT 19 / Nithsdale LCU) and enclosing the glen of the Scaur Water (LCT 10 / Scaur LCU). Not significant in all remaining parts.	Yes – Lorg Wind Farm would be situated to the west of the RSA and would have a strong influence on the character of this RSA, within 7 km of the Site with combined theoretical visibility of both this consented wind farm and the Proposed Development.	Yes – Sanquhar II Wind Farm would enter into this RSA and would have a strong influence on the character of this designated area, within 5 km of the Site with combined theoretical visibility of both this application stage scheme and the Proposed Development.

Receptor	Main Assessment during operational phase	Potential for Scenario 1 significant cumulative effect	Potential for Scenario 2 significant cumulative effect
Galloway Hills RSA	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 11 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this RSA; and - the extensive influence of other cumulative wind farms across this RSA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this LCU.	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 11 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this RSA; and - the extensive influence of other cumulative wind farms across this RSA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this RSA.
New Cumnock SLA	Not significant	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 6 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this LCU; and - the extensive influence of other cumulative wind farms across this SLA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this SLA.	No - There would be limited potential for significant cumulative effects owing to: - the minimum separation distance of 6 km from the Proposed Development; - the very limited extent to which the Proposed Development would be visible across this SLA; and - the extensive influence of other cumulative wind farms across this SLA as shown on the cumulative ZTVs on Figures 6.13 to 6.22. These factors would limit the cumulative influence of the Proposed Development on the landscape character of this SLA.

6.11.4 DG LCT 9. Upper Dale (Valley) / Upper Nithsdale LCU

The sensitivity of this LCU has been assessed as medium and the magnitude of change that it would undergo as ranging from medium-high to medium-low, with effects ranging from **moderate** and **significant** to **moderate-minor** and **not significant**. This LCU is represented by the following representative viewpoints;

- Viewpoint 1: A76 Sanquhar Castle (**Figure 6.17**)
- Viewpoint 2: Sanquhar Church Road (**Figure 6.18**)
- Viewpoint 3: Kirkconnel (**Figure 6.19**)
- Viewpoint 4: Euchan Water minor road (**Figure 6.20**)
- Viewpoint 6: Mennock (**Figure 6.22**)
- Viewpoint 7: Southern Upland Way east of Sanquhar (**Figure 6.23**)
- Viewpoint 21: Crawick Multiverse (**Figure 6.37**)
- Viewpoint 25: Auchentaggart (**Figure 6.41** - wireline only)

- Viewpoint 26: Kelloholm (**Figure 6.42** - wireline only)

Cumulative Scenario 1

The addition of the Proposed Development to the operational, under construction and consented wind farms is considered under Scenario 1. The following wind farms have been identified as being relevant to this assessment, owing to a combination of their proximity to the Proposed Development, their potential visual influence and their size and extent. The closest of these wind farms are shown in the cumulative ZTVs on **Figures 6.13a to 6.13j**. The full list of cumulative wind farms is presented in **Table 6.5** in **Section 6.4.6**.

- Operational: Afton, Andershaw, Hare Hill, Hare Hill Extension, Middle Muir, Sandy Knowe, Sanquhar, Sunnyside Farm, Twentysilling, Whiteside Hill;
- Under construction: Kennoxhead; and
- Consented: Glenmuckloch, Kennoxhead Extension, Lethans Resub, Lorg, Penbreck, Sanquhar "Six" Community.

Of the operational developments, only operational Sandy Knowe extends into this LCU, from the adjoining LCT 19 Southern Uplands / Nithsdale LCU. Hare Hill and Hare Hill Extension are located further south-west within East Ayrshire LCT 20a Southern Uplands / Wardlaw Hill LCU. This LCU is represented by Viewpoints 1, 2, 3, 4, 6, 7 and 21. Viewpoint 18 is located on the boundary between this LCU and LCT 19: Southern Uplands / Lowthers LCU.

Cumulative magnitude of change

The cumulative magnitude of change would remain medium-high or medium within Nithsdale north-west of Enterkinfoot and medium-low, to the south-east.

The landform of the surrounding Southern Uplands and dispersal of the cumulative wind farms within it would largely restrict their cumulative interaction with the Proposed Development to nearer operational schemes along the edges of the Nithsdale valley, as identified within the main assessment. Primarily, this includes Twentysilling, Whiteside Hill, Sanquhar and Sandy Knowe wind farms. Intervisibility with consented schemes, which would generally lie to the north, west and south of the Site, would be limited by their distance typically over approximately 10 km from the Site. Only the Sanquhar "Six" and Lorg wind farms would lie within 10 km of the Site, with Glenmuckloch and Lethans Resubmission wind farms lying just beyond this distance. As these consented schemes would be located just outside the Nithsdale valley, within the Southern Uplands, the valley sides and adjoining hills would limit their visibility across the LCU.

The addition of the Proposed Development would increase the level of wind farm development within the setting of the LCU, with an influence that would largely be restricted to areas within approximately 5 km of the Site, for similar reasons. The low level of consented development and its limited intervisibility with the Proposed Development are such that the cumulative magnitude of change would be effectively the same as assessed in the main assessment.

Significance of cumulative effect

The cumulative effect on the landscape character of the Upper Nithsdale LCU would remain **moderate** and **significant**, within approximately 5 km of the Site; and **moderate/minor** and **not significant**, within remaining areas. This is mainly due to the very limited extent of intervisibility between the Proposed Development and the consented wind farm developments; and its limited visibility within the LCU, resulting from the surrounding landform in combination with the visual effects of distance.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, under construction, consented and application stage wind farms is considered under Scenario 2.

In addition to the operational, under construction and consented wind farms assessed under Scenario 1, the following wind farms have been identified as being relative to the cumulative assessment, with those closest shown in the cumulative ZTVs on **Figures 6.13a to 6.13j**.

- Application: Eucharhead, Lethans Extension, Penbreck Resubmission (Knoxhead Phase 2), Sandy Knowe Extension, Sanquhar II.

Turbines within Sandy Knowe Extension would be located within this LCU and the adjacent LCT20a East Ayrshire Southern Uplands / Wardlaw Hill LCT.

Cumulative magnitude of change

The cumulative magnitude of change would remain medium within approximately 5 km of the Site and medium-low, within remaining areas.

Sanquhar II and Eucharhead would be the nearest application stage wind farms intervisible with the Proposed Development. These would be located south of the Nithsdale valley within the Southern Uplands, along with several operational and consented developments. Collectively these wind farms would form an almost continuous extent along the ridgeline of the Southern Uplands, albeit with fuller visibility occurring from the more elevated parts of the LCU.

These cumulative developments would have a close-range influence on the LCU within approximately 5 km of the Site, including much of the LCU between Menzies and Kirkconnel. The addition of the Proposed Development to the cumulative developments would give rise to a medium cumulative magnitude of change owing to the closer range and larger size of the proposed turbines which would present a contrast with the cumulative turbines along the same ridgeline. This rating also considers the relatively small number of turbines proposed. Beyond approximately 5 km, the development would be seen to occupy a more contained extent of the wider landscape context in which the operational and cumulative wind farms would form the characterising feature. The addition of the development would have less of an additional effect and the cumulative magnitude of change would be medium-low. Where there would be no visibility, there would be no change.

Significance of cumulative effect

The cumulative effect of the Proposed Development in conjunction with the operational, in construction, consented and application wind farms would be **major / moderate** and **significant**, within approximately 5 km of the Site; and **moderate / minor** and **not significant**, within remaining areas where visibility arises and with **no effect** where there would be no visibility.

6.11.5 DG LCT 10. Upland Glens / Scaur LCU

The sensitivity of this LCU has been assessed as medium-high and the magnitude of change that it would undergo as ranging from medium to low or no change, with effects ranging from **moderate** and **significant** to **moderate-minor** and **not significant**. This LCU is represented by Viewpoint 24: Glenwharven (**Figure 6.40 – wireline only**).

Cumulative Scenario 1

The addition of the Proposed Development to the relevant operational, under construction and consented wind farms is considered under Scenario 1. The following wind farms have been identified as being relevant to the cumulative assessment, and the closest are shown in the cumulative ZTVs on **Figures 6.13a to 6.13k**.

- Operational: Sandy Knowe, Sanquhar, Twentyshilling, Whiteside Hill; and

■ Consented: Lorg.

The cumulative ZTV in **Figure 6.13h** shows that despite the close proximity of both Twentyshilling Wind Farm and the Proposed Development to the LCU, at a minimum of 1.9 km to the north-east and 2.4 km to the north-west respectively, only small patches of intervisibility would occur across the northern end of the Scaur LCU at approximately 4 to 5 km. The cumulative ZTV in **Figure 6.13i** shows that visibility of consented Lorg Wind Farm, at a minimum of 7.5 km to the west would be limited owing to the enclosing landform of the valley. This limits the potential for a significant cumulative effect to arise in respect of Scenario 1 and, therefore, no detailed cumulative assessment in respect of this LCU is required.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, under construction, consented and application stage wind farms is considered under Scenario 2. In addition to the operational and consented wind farms assessed for Scenario 1, Scenario 2 includes the following wind farms, with those that are relevant shown in the cumulative ZTVs on **Figures 6.13a to 6.13k**.

■ Application: Eucharhead, Sanquhar II.

None of the operational or proposed turbines would be located in this LCU. Twentyshilling is the closest operational wind farm at a minimum of 1.9 km to the north-east of the closest LCU boundary, while application stage Sanquhar II would come closer at a minimum of 1.2 km to the west.

Cumulative magnitude of change

The cumulative magnitude of change would increase to medium within the northern part of the LCU where small patches of visibility occur and remain as medium-low or low in remaining parts or with no change where there would be no visibility.

Sanquhar II Wind Farm would be the nearest application stage development intervisible with the Proposed Development. The cumulative ZTV in **Figure 6.13k** shows that intervisibility between the Proposed Development and Sanquhar II would occur in patches within this long and narrow LCU, with a small patch in the northern part at approximately 3.5 to 4.3 km and a longer patch at approximately 6.2 to 8.8 km.

In Scenario 2, the Proposed Development would be added to the north of this cumulative context comprising Sanquhar II to the west and Twentyshilling to the north. The close proximity of these wind farms to the LCU would present a notable effect, and the Proposed Development would be seen from some localised areas, to partly infill the space between the two cumulative developments. This effect would, however, be moderated by the limited extent of visibility with only small patches of intervisibility occurring, and also the limited extents to which the wind farms would be visible with the steep slopes of the intervening valley sides screening turbines and parts of turbines.

The addition of the Proposed Development to the cumulative developments would give rise to a medium cumulative magnitude of change owing to the notable addition amidst an extensive cumulative context. Beyond approximately 5 km, the influence of the Proposed Development and other cumulative wind farms would be reduced owing to their comparison with the closer range valley sides and enclosing hills. They would be seen to occupy a more contained extent of the wider landscape context in which the operational and cumulative wind farms would form the characterising feature. The addition of the development would have less of an additional effect and the cumulative magnitude of change would be medium-low or low. Where there would be no visibility, there would be no change.

Significance of cumulative effect

The cumulative effect of the Proposed Development in conjunction with the operational, consented and application wind farms would be **major / moderate** and **significant**, within approximately 5 km of

the Site; and **moderate** and **not significant**, within remaining areas where visibility arises and with **no effect** where there would be no visibility.

6.11.6 DG LCT 19. Southern Uplands / Nithsdale LCU

This LCU has been assessed as having a medium-high sensitivity, a magnitude of change that would range between medium-high and low, and effects that would be **significant** within parts of the 5 km radius of the Proposed Development and **not significant** in all remaining parts, during operation and construction, as a result of the addition of the Proposed Development. This LCU is represented by the following viewpoints;

- 5: Shiel, Scaur Water Minor Road (**Figure 6.21**);
- 8: Polgown, Scaur Water Minor Road (**Figure 6.24**) and
- 20: Cairnkinna (**Figure 6.36**).

Cumulative Scenario 1

The addition of the Proposed Development to the operational and consented wind farms is considered under Scenario 1. The following wind farms have been identified as being relative to the cumulative assessment and are shown on the cumulative plan on **Figure 6.12** with the closest shown on the cumulative ZTVs on **Figures 6.13a to 6.13k**.

- Operational: Afton, Hare Hill, Hare Hill Extension, Sandy Knowe, Sanquhar, Sunnyside Farm, Twentyshilling, Wether Hill, Windy Rig, Windy Standard I, Windy Standard II;
- Under Construction: South Kyle, Kennoxhead; and
- Consented: Cornharrow, Lethans Resub, Lorg, Margree, Pencloe Forest Resub, Sanquhar "Six" Community, Troston Loch, Windy Standard III.

The operational Twentyshilling and Whiteside Hill wind farms and six of the eight turbines within Sanquhar Wind Farm lie within this LCU.

Cumulative magnitude of change

The cumulative magnitude of change would remain medium-high to medium within 5 km of the Site; and medium-low, within remaining areas. No change would occur in areas without visibility of the Proposed Development. The Proposed Development would lie within and have significant effects upon this LCU, as described in **Section 6.7**.

The relief of the surrounding landscape and dispersal of the cumulative developments within it would largely restrict cumulative interactions with the Proposed Development to nearer operational schemes, as identified within the main assessment. This includes the schemes along the southern edge of the Nithsdale valley, primarily Twentyshilling, Whiteside Hill, Sanquhar and Sandy Knowe wind farms. The cumulative ZTVs for these wind farms in conjunction with the Proposed Development show broad extents of intervisibility across this LCU. On **Figure 6.13a**, visibility of the Proposed Development is shown to broadly coincide with visibility of operational Whiteside Hill, with the exception of localised patches to the east and west. Similarly, the intervisibility between the Proposed Development and Twentyshilling is shown to be extensive, albeit with visibility only of the Proposed development across the Site and in parts of the Scaur valley.

Intervisibility with consented schemes, which would generally lie to the north, east and south of the Site, would be limited by their distance, typically over approximately 10 km from the Site. Only the Sanquhar "Six" Community and Lorg wind farms would lie within 10 km of the Site, with Glenmuckloch and Lethans Resubmission wind farms lying just beyond this distance. The low level of consented development and its limited intervisibility with the Proposed Development are such that the cumulative magnitude of change would be marginally greater than the magnitude of change arising from the Proposed Development alone.

Significance of cumulative effect

The cumulative effect on the landscape character of the Southern Uplands LCT / Nithsdale LCU would be **moderate** and **significant**, within 5 km of the Site; and **moderate / minor** and **not significant**, within remaining areas. This is due to the low level of consented development and its limited intervisibility with the Proposed Development.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2, which includes the Eucharhead and Sanquhar II wind farms shown in the cumulative ZTVs on **Figures 6.13a to 6.13k**.

Cumulative magnitude of change

The cumulative magnitude of change would be medium-high in the northern part of the LCU; medium, further south and east out to approximately 5 km from the Site; medium-low or low where visibility would arise beyond 5 km; and no change would occur in areas without visibility of the cumulative developments.

Two nearby application stage wind farms would be intervisible with the Proposed Development. Sanquhar II wind farm, which extends between Blackcraig Hill, Mid Hill and Countam Hill, to the west, north and south-east respectively; and Eucharhead, slightly further west. The former would lie within this LCU and LCT19a, adjoining its western boundary, while the latter would be entirely contained within LCT19a.

Intervisibility of the Proposed Development and the application stage developments would be determined by the relief of the landform within the Nithsdale LCU, as shown in the cumulative ZTVs in **Figure 6.13j and 6.13k**. This would contain the extent within which these developments would be simultaneously visible and would largely restrict this visibility to nearby valleys, facing upper slopes and hill summits. Within these areas, the cumulative developments would have a notable influence on the character of the LCU, often at very-close range. Towards the Nithsdale valley, wind farm development would be a strong influence. Reduced visibility of wind farm development and development in general, within the glens of the Euchar and Scaur waters would increase the influence of the cumulative developments on these areas. Further south, topography would restrict the influence of the cumulative developments.

Significance of cumulative effect

The cumulative effect would be **moderate / major** or **moderate** and **significant** in the northern part of the LCU out to approximately 5 km, **moderate / minor** and **not significant** in remaining areas with visibility, and with **no effect** where there would be no visibility.

6.11.7 Thornhill Uplands RSA

This RSA has been assessed as having a medium-high sensitivity, a magnitude of change that would range between medium-high and low; and effects that would be significant within parts of the 5 km radius of the Proposed Development and not significant in all remaining parts, during operation and construction, as a result of the addition of the Proposed Development.

The cumulative assessments presented above in respect of the Upper Nithsdale LCU of the Upper Dale (LCT9) and the Nithsdale LCU of the Southern Uplands (LCT19) also apply to the Thornhill Uplands RSA which covers these LCUs. It can therefore be concluded that the cumulative effect would be **moderate / major** or **moderate** and **significant** in the north-western part of the RSA out to approximately 5 km, **moderate / minor** and **not significant** in remaining areas with visibility, and with no effect where there would be no visibility.

6.11.8 Assessment of Cumulative Effects on Views and Visual Amenity

The assessment of cumulative effects on views and visual amenity is carried out using the same two categories of effects on views as described previously in this chapter:

- Assessment of effects on representative viewpoints; and
- Assessment of effects on principal visual receptors.

The detailed methodology for the assessment of cumulative effects on views is described in **Technical Appendix A6.1: LVIA Methodology**.

The first stage in the cumulative assessment of the viewpoints and principal visual receptors is a filtering process to ascertain which of them have the potential to undergo significant cumulative effects as a result of the Proposed Development. This process is carried out through a desk study and site survey which examines the visibility of the Proposed Development in conjunction with other wind farm sites from the viewpoints and principal visual receptors within the Study Area, using the cumulative ZTVs and wirelines. This process determines the Potential for Significant Cumulative Effect on Visual Receptors as presented in **Table 6.9**.

The assessment of cumulative effects on views assesses the potential cumulative effects of the Proposed Development on the views from principal visual receptors including settlements and route corridors such as roads, walking routes and national cycle routes. Principal visual receptors are shown on **Figure 6.4** and shown in conjunction with the ZTV on **Figure 6.10**. The principal visual receptors with potential to be significantly affected by the Proposed Development and which are assessed in detail have been identified in **Table 6.9**. A preliminary assessment to identify these receptors has been carried out through the use of ZTVs and wirelines to indicate the extents, level and nature of theoretical visibility, and site work to determine the extents, level and nature of actual visibility.

Table 6.9 Potential for Significant Cumulative Effects on Visual Receptors

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP1: A76 Sanquhar Castle	Significant	Yes – visibility of the consented Sanquhar “Six”, Glenmuckloch and Lethans Resubmission wind farms would have an influence on the cumulative situation experienced from this viewpoint.	Yes – principally due to close range visibility of the application stage Euchanhead and Sanquhar II wind farms behind.
VP2: Sanquhar Church Road	Significant	Yes –visibility of Sanquhar “Six” y Wind Farm, visibility of Glenmuckloch and Lethans Resubmission wind farms in another sector of the view.	Yes – principally due to visibility of the application stage Euchanhead and Sanquhar II wind farms behind.
VP3: Kirkconnel	Not significant	No – principally due to limited visibility of consented Sanquhar “Six” and distant visibility of Glenmuckloch and Lethans Resubmission in another sector of the view.	No – owing mainly to limited visibility of application stage wind farms nearby.
VP4: Euchan Water minor road	Significant	No – principally due to limited visibility of consented Sanquhar “Six” and screening of Glenmuckloch and Lethans Resubmission by intervening vegetation.	Yes – principally due to close range visibility of the application stage Euchanhead and Sanquhar II wind farms behind.
VP5: Shiel, Scaur Water minor road	Significant	No – there are no consented wind farms readily visible from this viewpoint.	Yes – principally due to close range visibility of the application stage Euchanhead and Sanquhar II wind farms.

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP6: Mennock	Not significant	No – owing to very limited visibility of consented Sanquhar “Six” Wind Farm.	No – owing mainly to limited visibility of the Proposed Development and application stage wind farms nearby.
VP7: Southern Upland Way east of Sanquhar	Significant	No – principally due to limited visibility of consented Sanquhar “Six” Wind Farm, Glenmuckloch and Lethans Resubmission.	Yes – principally due to visibility of the application stage Eucharhead and Sanquhar II wind farms behind, on the skyline.
VP8: Polgown, Scaur Water minor road	Significant	No – owing to very limited visibility of consented Lorg Wind Farm.	Yes – principally due to visibility of the application stage Eucharhead and Sanquhar II wind farms in the same sector of the view.
VP9: Durisdeer	Not significant	No – owing to very limited visibility of consented Sanquhar “Six” Wind Farm.	No – owing to limited visibility of the Proposed Development and application stage wind farms.
VP10: Wauk Hill	Not significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development.	No – owing to limited visibility of the Proposed Development and application stage wind farms.
VP11: Benbrack	Not significant	No – consented Lorg Wind Farm would be visible at 2 km in the same sector of the view as the Proposed Development, as shown on Figure 6.27 , such that the additional cumulative effect of the Proposed Development would be limited and not significant.	No – application stage wind farms, including Eucharhead and Sanquhar II would be visible at 2.5 km and 4.8 km in the same sector of the view as the Proposed Development, as shown on Figure 6.27 , such that the additional cumulative effect of the Proposed Development would be limited and not significant.
VP12: Cairnmore of Carsphairn	Not significant	No – operational Windy Rig Wind Farm at 2.6 km, Windy Standard II at 2.9 km and Windy Standard I at 3.7 km would form an extensive and close-range influence that would reduce the influence of the consented wind farms and the Proposed Development on the cumulative situation.	No – operational Windy Rig Wind Farm at 2.6 km, Windy Standard II at 2.9 km and Windy Standard I at 3.7 km would form an extensive and close-range influence that would reduce the influence of the application stage wind farms and the Proposed Development on the cumulative situation.
VP13: Blackcraig	Not significant	No – consented Sanquhar Six Wind Farm would be visible at 2.4 km in the same sector of the view and to the fore of the Proposed Development, as shown on Figure 6.29 , such that the additional cumulative effect of the Proposed Development at 8.0 km would be limited and not significant.	No – application stage wind farms, including Eucharhead at 2.8 km and Sanquhar II at 1.0 km would be visible in the same sector of the view and to the fore of the Proposed Development, as shown on Figure 6.29 , such that the additional cumulative effect of the Proposed Development at 8.0 km would be limited and not significant.
VP14: Corsencon Hill	Not significant	No – owing to limited visibility of consented Sanquhar “Six” Wind Farm, Glenmuckloch and Lethans Resubmission.	No - despite the number and extent of application stage wind farms visible at short range from this viewpoint, including Eucharhead at 8.3 km, Sanquhar II at 7.8 km, Sandy Knowe Extension at 3.8 km, the additional cumulative influence of the Proposed Development at 10.7 km would be comparatively very limited.

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
VP15: Todholes Hill	Not significant	No – owing mainly to the limited influence of the consented wind farms seen to the rear of operational wind farms in this part of the Southern Uplands where wind farms form a baseline feature.	No - the number and extent of operational and application stage wind farms visible from this viewpoint, including operational Sandy Knowe at 8 km and Extension at 5.9 km, means the additional cumulative influence of the Proposed Development at 8.6 km would be comparatively very limited.
VP16: Lowther East Mount	Not significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development.	No - although application stage wind farms would be visible and occupy a notable extent of this sector of the view, the additional cumulative influence of the Proposed Development would be limited owing to the distance of 13.68 km and more contained extent.
VP17: Meikle Milylea	Not significant	No - owing to the separation distance of 30.2 km such that the Proposed Development would have a very limited influence on the cumulative situation.	No - owing to the separation distance of 30.2 km such that the Proposed Development would have a very limited influence on the cumulative situation.
VP18: Southern Upland Way, Coupland Knowe	Not significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development.	No - although application stage wind farms would be visible and occupy a notable extent of this sector of the view, the additional cumulative influence of the Proposed Development would be limited owing to the distance of 8.6 km and more contained extent.
VP19: Southern Upland Way, Glengaber Hill	Not significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development.	No - although application stage wind farms would be visible and occupy a notable extent of this sector of the view, the additional cumulative influence of the Proposed Development would be limited owing to the distance of 12.7 km and more contained extent.
VP20: Cairnkinna	Not significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development and the closer range influence of operational Twentyshilling Wind Farm at 1.1 km.	No – owing to the extensive and closer range influence of the application stage wind farms including Sanquhar II at 5.1 km and Eucharhead at 8.6 km and operational Twentyshilling at 1.1 km, which would by comparison limit the additional cumulative influence of the Proposed Development.
VP21: Crawick Multiverse	Significant	No – owing to limited and distant visibility of consented wind farms, either behind operational wind farms or in the opposite direction from the Proposed Development.	Yes – principally due to the number and extent of application stage wind farms visible from this viewpoint, including Eucharhead and Sanquhar II.
VP22: Auchengibbert Hill	Not significant	No – owing to limited and distant visibility of consented wind farms.	No - although application stage wind farms would be visible and occupy a notable extent of this sector of the view, including Sanquhar II at 7.7 km and Eucharhead at 10.7 km, the additional cumulative influence of the Proposed Development would

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
			be limited owing to distance of 12.6 km and limited visibility.
Sanquhar	Significant	Yes – owing mainly to the close-range visibility of the Proposed Development from this viewpoint.	Yes – owing mainly to the close-range visibility of the Proposed Development from this viewpoint.
Mennock	Not significant	No – visibility of any of the consented wind farms would be limited owing to the position of the settlement within valley, and the limited visibility of the nearest consented wind farm.	No – visibility of any of the application stage wind farms would be limited owing to the position of the settlement within valley, and the limited visibility of the nearest application wind farm.
Kirkconnel	Not significant	No – visibility of the nearest consented wind farm Sanquhar “Six” Wind Farm would be limited and distant.	No – visibility of any of the application stage wind farms would be limited by the route along the valley floor, including the nearest developments likely to contribute to cumulative effects, Euchanhead, Sanquhar II and Sandy Knowe.
A76	Not significant	No – owing to very limited visibility of the consented Sanquhar “Six” wind farm.	No – visibility of any of the application stage wind farms would be limited by the route along the valley floor, including the nearest developments likely to contribute to cumulative effects, Euchanhead, Sanquhar II and Sandy Knowe.
Glasgow – Carlisle railway line	Not significant	No – owing to very limited visibility of the consented Sanquhar “Six” wind farm.	No – visibility of any of the application stage wind farms would be limited by the route along the valley floor, including the nearest developments likely to contribute to cumulative effects, Euchanhead, Sanquhar II and Sandy Knowe.
Minor road - Euchan Water valley	Significant	No – owing to the limited visibility of the consented developments.	Yes – owing mainly to the close-range visibility of the Proposed Development.
Minor road – Scaur Water valley	Significant	No – owing to the limited visibility of the consented developments.	Yes – owing mainly to the close-range visibility of the Proposed Development.
Southern Upland Way	Significant	No – owing to the limited visibility of the consented developments.	Yes – owing mainly to the close-range visibility of the Proposed Development.
Core Path 84 – Kirkconnel to Mynwhirr Hill	Significant	No – owing to the limited visibility of the consented developments.	Yes – owing mainly to the close-range visibility of the Proposed Development and the nearest consented developments (Euchanhead and Sanquhar II).
Core Path 88 - Kirkconnel to Black Law (via Fingland and Kirkland)	Not significant	No – owing to the limited visibility of the consented developments.	No – potential for significant effects would be limited by the level and extent of visible operational wind farms within the surrounding Southern Uplands and the limited additional effect that would arise as a result of the Proposed Development.
Core path 108 Bogg to Auchentaggart Moor	Not significant	No – owing to the limited visibility of the consented developments.	No – potential for significant effects would be limited by the level and extent of visible operational wind farms within the surrounding Southern Uplands and the limited

Receptor	Main Assessment	Potential for Scenario 1 significant cumulative effects	Potential for Scenario 2 significant cumulative effects
			additional effect that would arise as a result of the Proposed Development.
Core Path 109 – Sodjers Bridge Walk	Not significant	No – owing to the limited visibility of the consented developments.	No – potential for significant effects would be limited by the level and extent of visible operational wind farms within the surrounding Southern Uplands and the limited additional effect that would arise as a result of the Proposed Development.
Core path 111 – Sanquhar Castle Circular	Significant	No – owing to the limited visibility of the consented developments.	Yes – owing mainly to the close range visibility of the Proposed Development and the nearest consented developments (Euchanhead and Sanquhar II).

As indicated by **Table 6.9** above, seven of the viewpoints and six of the visual receptors are considered to have potential to undergo significant cumulative effects. This is due to the extent and dispersal of cumulative wind farm developments across the Study Area; their intervisibility with the Proposed Development; the close to very close-range visibility of the Proposed Development and cumulative schemes; the extent of the skyline which would be occupied by turbines; and their prominence on the skyline.

6.11.9 Viewpoint 1: A76, Sanquhar Castle

This viewpoint has been assessed as having a medium-high sensitivity in respect of residents and medium sensitivity in respect of road-users, a medium-high magnitude of change, and a significant effect at a moderate level during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 1

The addition of the Proposed Development to the operational and consented wind farms is considered under Scenario 1. Those developments of particular relevance to the Cumulative Scenario 1 assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.17** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (4.8 km), Whiteside Hill (6.8 km), Sanquhar (7.6 km); and
- Consented: Sanquhar “Six” (10.0 km), Glenmuckloch (10.1 km) and Lethans Resub (10.7 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be **medium**. Cumulative wind farm development comprising the operational Whiteside Hill, Sanquhar, Hare Hill and Extension, and Sandy Knowe wind farms, along with the consented Sanquhar Six Wind Farm would be visible above much of the skyline and would extend across the larger part of the view. Screening by landform would restrict visibility of the more distant turbines within these existing wind farms to their upper parts and only the turbines in front of the ridgeline would be visible in their entirety. While the appearance of these developments would be discontinuous, the addition of the Proposed Development would increase the level of such development within the close-range view and its horizontal extent along the ridgeline.

This view would undergo a **moderate** cumulative effect that would be **significant**. This is due to the closer proximity of the Proposed Development and the larger scale of its turbines which would make a notable addition to the existing influence from the operational and consented wind farms.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.17** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (4.8 km), Whiteside Hill (6.8 km), Sanquhar (7.6 km);
- Consented: Sanquhar “Six” (10.0 km), Glenmuckloch (10.1 km) and Lethans Resub (10.7 km); and
- Application: Eucharhead and Sanquhar II (6.4 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be **medium**. Cumulative wind farm development would be visible above much of the skyline and would extend across the larger part of the view. Screening by landform would restrict visibility of the more distant turbines within these developments to their upper parts and only the turbines in front of the ridgeline would be visible in their entirety. The cumulative developments would appear as a near continuous but low-lying band of turbines within a larger proportion of the skyline. The addition of the Proposed Development would represent an increase in the presence of wind farm development within the close range view and increase its horizontal extent.

This view would undergo a **moderate** cumulative effect that would be **significant**. This is due to the closer proximity of the Proposed Development and the larger scale of its turbines which would make a notable addition to the existing influence from the operational, consented and application stage wind farms.

6.11.10 Viewpoint 2: Sanquhar Church Road

Residents and road-users represented by this viewpoint have been assessed as having a medium-high and medium sensitivity respectively, a medium magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.18** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (5.8 km), Whiteside Hill (6.6 km), Sanquhar (7.0 km);
- Consented: Sanquhar “Six” (9.5 km), Glenmuckloch (8.8 km) and Lethans Resub (9.4 km); and
- Application: Eucharhead (10.1 km) and Sanquhar II (6.4 km).

Cumulative Magnitude of Change and Significance of Effect

This viewpoint would undergo significant effects in the main assessment. Cumulative wind farm development would appear as several groups on the skyline, the largest comprising the Whiteside Hill (operational) and Eucharhead and Sanquhar II (both application stage) wind farms. These would extend across the larger part of the view, with screening by landform restricting visibility of more distant turbines. A limited number of turbines would be visible in their entirety in front of the ridgeline. Visibility of application stage developments would largely be limited to their upper parts with 20 hubs lying above the skyline. The addition of the Proposed Development would notably increase the level of such development and its lateral extent within the close-range view but relatively low visibility of the

application stage developments means the cumulative effects would remain similar to that of the Proposed Development alone, with a **medium** magnitude of change arising.

The cumulative effect on the view from Sanquhar Church Road would be **moderate** and **significant**, for residents and road users. This is due to the closer proximity of the Proposed Development and the larger scale of its turbines which would make a notable addition to the existing influence from the operational and consented wind farms.

6.11.11 Viewpoint 4: Euchar Water Minor Road

Residents and road-users represented by this viewpoint have been assessed as having a medium-high or medium sensitivity respectively, a medium-high magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.20** (distances are measured from the closest point).

- Operational: Twentyshilling (4.8 km), Whiteside Hill (5.3 km), Sanquhar (5.9 km); and
- Consented: Sanquhar “Six” (8.3 km), Glenmuckloch (9.1 km) and Lethans Resub (9.6 km).
- Application: Eucharhead (9.0 km) and Sanquhar II (5.3 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the views of residents, road-users and walkers would be **medium-high**. Cumulative wind farm development would appear as several groups on the skyline, the largest in extent comprising the Whiteside Hill (operational) and Eucharhead and Sanquhar II (both application stage) wind farms. A narrower and more dense grouping of wind farms much further east would comprise Hare Hill, Hare Hill Extension, Sandy Knowe (all operational) and Sandy Knowe Extension (application stage). These would extend across much of the wider panorama of the view, with screening by landform restricting visibility of turbines beyond the ridgeline. Visibility of application stage developments would be limited, with only a few hubs visible above the skyline, which would appear as an extension to operational developments. For this reason, the cumulative magnitude of change arising from the addition of the Proposed Development to Scenario 2 would remain similar to the addition of the Proposed Development to the baseline as assessed in **Section 6.9**.

The cumulative effect of the Proposed Development on the views of residents and walkers represented by the Euchar Water Minor Road viewpoint would remain **major / moderate** and **significant**, while for road-users it would remain **moderate** and **significant**.

6.11.12 Viewpoint 5: Shiel, Scaur Water Minor Road

Residents and road-users represented by this viewpoint have been assessed as having a high or medium-high sensitivity respectively, a medium-high magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.21** (distances are measured from the nearest turbine).

- Operational: Operational: Whiteside Hill (2.5 km), Sanquhar (1.5 km); and
- Application: Eucharhead (5.5 km) and Sanquhar II (1.5 km).

Cumulative Magnitude of Change and Significance of Effect

Two of the application stage Sanquhar II turbines would be prominent on the skyline at a minimum distance of approximately 1.5 km to the west, with other Sanquhar II turbines visible at greater distance to the north-west, along with Eucharhead turbines at a minimum distance of approximately 5.5 km and operational Whiteside Hill visible at 2.5 km. While these wind farms would not be seen to their full extents both in terms of numbers and structures owing to the screening effect of the intervening landform, they would, nonetheless, form a notable influence on views from this part of the Scaur Water.

The Proposed Development would be seen at a minimum distance of 1.4 km to the north of the viewpoint as 12 prominent and relatively large-scale turbines. This addition to the cumulative baseline context would give rise to a **medium-high** cumulative magnitude of change, owing to the increase in extents into a new sector of the view and the close range and large-scale appearance of the turbines relative to the equally close range albeit smaller number of Sanquhar II turbines.

The cumulative effect of the Proposed Development on the view from Shiel, Scaur Water Minor Road would remain **major** or **major / moderate** and **significant**.

6.11.13 Viewpoint 7: Southern Upland Way, east of Sanquhar

This viewpoint has been assessed as having a medium-high sensitivity and a medium magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figure 6.23** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (6.3 km), Whiteside Hill (8.0 km), Sanquhar (8.4 km);
- Consented: Sanquhar "Six" (10.8 km), Glenmuckloch (9.5 km) and Lethans Resub (10.1 km).
- Application: Eucharhead (11.5 km) and Sanquhar II (7.8 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be **medium**. Cumulative wind farm development would appear continuous across much of the western and south-western skyline and would occupy much of the view in these directions. The wind farms would appear similar in their location along the ridge of the Southern Uplands, as well as similar in scale and range with a large number located between approximately 8 and 11.5 km. The exception would be Twentyshilling Wind Farm which would be located to the south at the closer range of 6.3 km and seen separate from the continuous group to the west and south-west.

It is within this context that the addition of the Proposed Development would be readily apparent owing to its comparatively close proximity at 6.4 km and the larger size of the turbines which will present a contrast with the cumulative turbines. The cumulative magnitude of change would, however, be moderated by the fact that the Proposed Development would not increase the horizontal extents of wind farm development, as application stage Sanquhar II would be visible to the rear, albeit partly screened by the intervening landform, and operational Twentyshilling would be visible further to the south.

The cumulative effect of the Proposed Development on the view from SUW, east of Sanquhar would remain **moderate** and **significant**.

6.11.14 Viewpoint 8: Polgown, Scaur Water Minor Road

This viewpoint has been assessed as having a medium-high or medium sensitivity and a medium magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative wirelines on **Figures 6.24** (distances are measured from the nearest turbine).

- Operational: Whiteside Hill (1.0 km), Sanquhar (1.0 km); and
- Application: Eucharhead (3.4 km) and Sanquhar II (1.0 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be **medium-high**. Operational wind farms Whiteside Hill and Sanquhar would be visible to the north and north-west at a minimum of approximately 1 km. Application stage wind farms Eucharhead and Sanquhar II would be visible between the south and west at a minimum of approximately 1 to 3.4 km and would be prominent on the skyline at very close range. The operational and application stage turbines would enclose much of this viewpoint with a concentration of turbines seen through the extension of the valley to the west. The addition of the Proposed Development would be seen at similarly close range and would be seen to increase the extent of wind farm development into the north-eastern sector. This would form a notable addition despite the cumulative baseline influence from other close range wind farms.

The cumulative effect of the Proposed Development on the view from the Scaur Water minor road would be **major / moderate** and **significant**.

6.11.15 Viewpoint 21: Crawick Multiverse

This viewpoint has been assessed as having a medium-high sensitivity and a medium magnitude of change and a significant effect during construction and operation as a result of the addition of the Proposed Development to the baseline context.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.37** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (7.3 km), Whiteside Hill (7.5 km), Sanquhar (7.6 km), Sandy Knowe (7.0 km); and
- Consented: Sanquhar "Six" (9.9 km), Glenmuckloch (7.6 km) and Lethans Resub (8.3 km).
- Application: Eucharhead (10.6 km) and Sanquhar II (7.0 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be **medium-low**. Cumulative wind farm development would appear continuous across much of the western and south-western skyline and would occupy much of the view in these directions. The wind farms would appear similar in their

location along the ridge of the Southern Uplands, as well as similar in scale and range with a large number located between approximately 7.0 and 10.6 km. The exception would be Twentyshilling Wind Farm which would be located to the south at the closer range of 7.3 km and seen separate from the continuous group to the west and south-west.

It is within this context that the addition of the Proposed Development would be readily apparent owing to its comparatively close proximity at 6.3 km and the larger size of the turbines which will present a contrast with the cumulative turbines. The cumulative magnitude of change would, however, be moderated by the fact that the Proposed Development would not increase the horizontal extents of wind farm development, as application stage Sanquhar II would be visible to the rear, albeit partly screened by the intervening landform, and operational Twentyshilling would be visible further to the south.

The cumulative effect of the Proposed Development on the view from Crawick Multiverse, north of Sanquhar would remain **moderate** and **significant**. This finding reflects the medium-high sensitivity of visitors to this location.

6.11.16 Assessment of Cumulative Effects on Visual receptors

6.11.17 Sanquhar

Residential receptors within Sanquhar have been assessed as having a medium-high sensitivity, undergoing a medium magnitude of change to the baseline context, with a significant effect arising from addition of the Proposed Development during both the construction and operation phases.

Viewpoints 1 and 2 (**Figures 6.17 and 6.18**) are representative of the range of views experienced from within and around Sanquhar.

Cumulative Scenario 1

The addition of the Proposed Development to the operational and consented wind farms is considered under Scenario 1. Those developments of particular relevance to the Scenario 1 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (5 km), Whiteside Hill (7 km), Sanquhar (7 km); and
- Consented: Sanquhar “Six” Wind Farm (10 km), Glenmuckloch (10 km) and Lethans Resub (11 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to views from Sanquhar would be **medium**, as indicated by representative Viewpoints 1 and 2.

Views from Sanquhar would undergo significant effects in the main assessment. In respect of the consented wind farms, visibility of Sanquhar “Six” Community Wind Farm would be limited owing to the small number of turbines visible, their partial concealment behind the ridgeline and their location behind more readily visible operational Sanquhar. In the northern sector of the view, while consented Glenmuckloch and Lethans Resub wind farms, would occupy a section of the skyline, their prominence would be moderated by the general orientation of the town to the west and not the north. The consented wind farms would not increase the perceived level of wind development to such an extent that the magnitude of change would be greater than that arising from the Proposed Development relative to the operational baseline. The addition of the Proposed Development under this scenario would appear very similar to that of the main assessment with the same medium magnitude of change arising.

The cumulative effect on views from Sanquhar would be **moderate** and **significant**, for residents of properties with visibility of the Proposed Development, on the southern edge and within the village

where built form allows and whose frontages face the Site; and **moderate / minor** and **not significant**, from remaining areas where it would be glimpsed at an angle and between buildings within the village.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the nearest turbine).

- Operational: Twentyshilling (5 km), Whiteside Hill (7 km), Sanquhar (7 km);
- Consented: Sanquhar "Six" Wind Farm (10 km), Glenmuckloch (10 km) and Lethans Resub (11 km); and
- Application stage: Eucharhead (10.6 km) and Sanquhar II (6.9 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to views from Sanquhar would remain **medium**, as indicated by representative Viewpoints 1 and 2.

Cumulative wind farm development, including the operational Whiteside Hill and Sanquhar wind farms, and application stage Eucharhead and Sanquhar II wind farms, would form an almost continuous development along the upland ridgeline to the west of Sanquhar, although with partial screening for the application stage turbines which would sit behind the ridgeline. The addition of the Proposed Development would notably increase the influence of wind farm development owing to its closer proximity and larger turbines. Relatively low visibility of the application stage developments means they would be noticeable but not sufficiently so that the cumulative magnitude of change would be greater than for the Proposed Development alone. The addition of the Proposed Development under this scenario would appear very similar to that of the main assessment with also a medium cumulative magnitude of change.

The cumulative effect on views from Sanquhar would be **moderate** and **significant** for residents of properties with visibility of the Proposed Development; and **moderate-minor** and **not significant** for receptors within remaining areas with glimpses of it between buildings. The addition of the Proposed Development would be notable but owing to the comparable influence from the operational wind farms, compared to all the cumulative wind farms, the effect of the Proposed Development under this scenario would appear very similar to that of the main assessment with a similar cumulative significance of effect.

6.11.18 Minor road - Euchar Water valley

Road-users on the Euchar Water minor road have been assessed as having a medium sensitivity, undergoing a medium-high or medium magnitude of change to the baseline context, with a significant effect arising from the addition of the Proposed Development during both the construction and operation phases. Viewpoint 4 (**Figure 6.20**) is representative of the minor road along the valley of the Euchar Water.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the closest point).

- Operational: Twentyshilling (4 km), Whiteside Hill (1 km), Sanquhar (0.5 km);

- Consented: Sanquhar “Six” Wind Farm (1 km); and
- Application stage: Euchanhead (3.5 km), Sanquhar II (1 km) Sandy Knowe Extension (4.5 km) and Lethans Extension (10 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the view would be slightly greater but similar to Scenario 1 and would remain medium or medium-high, with no change where there would be no visibility. Visibility of application stage schemes within the same sector of the view as the Proposed Development would be limited owing to the screening effect of the intervening landform and their greater distance relative to the operational Whiteside Hill and Sanquhar wind farms. While Euchanhead and Sanquhar II wind farms would be visible on or behind the skyline, their influence would be moderated by their assimilation with the operational wind farms. Sandy Knowe Extension and Lethans Extension Wind Farms would present very limited visibility in another sector of the view.

The cumulative effect of the Proposed Development on views from the minor road along Euchan Water would be similar to that of the Proposed Development in respect of the baseline assessment, which would be **moderate** and **significant**. There would be **no effect** where there would be no visibility.

6.11.19 Minor road – Scaur Water valley

Road-users on the Scaur Water minor road have been assessed as having a medium-high sensitivity, undergoing a medium-high to low magnitude of change to the baseline context, with a significant effect arising between Dalgonar and Glenwhargen and not significant effects or no effects arising in the remaining sections, during both the construction and operation phases.

Viewpoints 5 and 8 (**Figures 6.21 and 6.24 respectively**) are representative of the range of views experienced from the Scaur Water minor road.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the closest point).

- Operational: Twentyshilling (3 km), Whiteside Hill (1 km), Sanquhar (3 km);
- Consented: Sanquhar “Six” Wind Farm (3.5 km), Lorg Extension (1.5 km); and
- Application stage: Euchanhead (1 km) and Sanquhar II (0.5 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to the views from the road would be medium-high between Glenwhargen Craig and Dalgonar. The addition of the Proposed Development to the Euchanhead and Sanquhar II Wind Farms would increase the visual influence of wind farm development along this section of the road owing to the similarly close proximity at a minimum of approximately 1 km, the larger scale of the turbines and the increased spread of wind farm development into this new north-easterly sector. For much of this section these schemes would appear close-range within an enclosed valley with little visible wind farm infrastructure.

The cumulative effect of the Proposed Development on views from the Scaur Water minor road would be and **major-moderate** and **significant** between Glenwhargen Craig and Dalgonar and **moderate-minor** and **not significant** or **no effect** in all remaining sections.

6.11.20 Southern Upland Way

The SUW has been assessed as having a medium-high or medium sensitivity, undergoing a high to low magnitude of change relative to the baseline, with a major / moderate or moderate and significant effect extending from Dalgonar in the Scaur Water to Bogg Farm east of Sanquhar, during both the construction and operational phases. In the remaining sections the effect would be **moderate** or **moderate / minor** and **not significant** and there would be no effect where there would be no visibility.

Viewpoints 7, 18 and 19 (**Figures 6.23, 6.32 and 6.33**) are representative of the SUW.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the closest point).

- Operational: Twentyshilling (3 km), Whiteside Hill (0.5 km), Sanquhar (2.5 km);
- Consented: Sanquhar “Six” Wind Farm (3.5 km)
- Application stage: Eucharhead (1 km) and Sanquhar II (0 km).

Cumulative Magnitude of Change and Significance of Effect

The magnitude of change to views from the SUW would range between medium-low and high. There is no potential visibility of the Proposed Development south-west of Benbrack, while to the north-east, this is initially localised on the Benbrack summit before becoming continuous within the Scaur Water valley east of Dalgonar and continuing to Sanquhar. The magnitude of change in the section between Sanquhar and Bogg Farm would be medium and then medium-low, low or no change in the section between Bogg Farm and Wanlockhead.

The magnitude of change arising from the addition of the Proposed Development to the operational, consented and application stage developments would be notably higher in very-close proximity to the Site. This is due to the location and extent of Eucharhead and Sanquhar II Wind Farms, to the west and south of the Site. The addition of the Proposed Development to these two wind farms would be greater than for the Development without the cumulative wind farms, as experienced from the nearest section of the route, along the Scaur Water valley, adjacent to the southern boundary of the Site, passing through the Site over a distance of approximately 4.8 km and descending from Cloud Hill to the Upper Nithsdale Valley.

Receptors on other parts of the route would observe a change in the view but, as application stage developments would appear to extend similar operational development, the resulting alteration of the view would be less pronounced.

The cumulative magnitude of change would be medium-low at Benbrack, rising to medium-high through the Scaur Water and high as the route approaches and passes the Site. As the route enters the Upper Nithsdale Valley, the magnitude of change would reduce to medium, and then reducing with distance from the cumulative developments to low at Glengaber Hill.

During both the construction and operation phases, the cumulative effect on views from the SUW would be greater in close proximity to the Site than for the Proposed Development in respect of the baseline context. The cumulative significance would be **moderate** and **not significant** at Benbrack; **major / moderate** and **significant** through the Scaur valley; **major** and **significant** on the upland plateau; **moderate** and **significant** towards and within the vicinity of Sanquhar; **moderate** and **not significant** between Sanquhar and Glengaber Hill; and **minor / moderate** or **minor** and **not significant** within all remaining sections.

6.11.21 Kirkconnel to Mynwhirr Hill Core Path

The viewpoint has been assessed as having a medium sensitivity, undergoing a medium or low magnitude of change in respect of the baseline, with a **moderate** and **significant** effect arising between Kelloholm and Polshag Hill and a **moderate / minor** and **not significant** effect arising from the remainder of the path, during both the construction and operational phases. Where there would be no visibility, there would be no effect.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.1k** (distances are measured from the closest point).

- Operational: Twentyshilling (7 km), Whiteside Hill (4 km), Sanquhar (1.5km);
- Consented: Sanquhar “Six” Wind Farm (2 km); and
- Application stage: Euchanhead (6 km) and Sanquhar II (1 km).

Cumulative Magnitude of Change and Significance of Effect

The cumulative magnitude of change to views from the core paths within the Upper Nithsdale Valley would be medium or low. There would be no change, where there would be no visibility.

The cumulative magnitude of change to views from core path 84 would largely remain medium between Kelloholm and Polshag Hill and reducing to low around Mynwhirr Hill. The Proposed Development would be added to a cumulative situation comprising the operational, consented and application stage wind farms, which would collectively form an almost continuous extent of turbines along the ridgeline to the south and west of this core path. As there would already be a strong cumulative baseline influence, this would moderate the additional influence from the Proposed Development. It would nonetheless form a notable addition owing to its relatively close proximity to the path and the larger size of the turbines.

The effect of the Proposed Development on views from core path 84 would be **moderate** and **significant** between Kelloholm and Polshag Hill, decreasing to **moderate-minor** and **not significant** around Mynwhirr Hill. Where there would be no visibility, there would be **no effect**.

6.11.22 Sanquhar Castle Circular Core Path

The Sanquhar Castle Circular Core Path has been assessed as having a medium sensitivity, undergoing a medium-high magnitude of change in respect of the baseline, and with a significant effect arising from the addition of the Proposed Development during both the construction and operation phases.

Viewpoint 1 (**Figure 6.17**) is representative of this core path.

Cumulative Scenario 2

The addition of the Proposed Development to the operational, consented and application stage wind farms is considered under Scenario 2. Those developments of particular relevance to the Scenario 2 cumulative assessment includes the following wind farms as shown in the cumulative ZTVs on **Figures 6.13a to 6.13k** (distances are measured from the closest point).

- Operational: Twentyshilling (4 km), Whiteside Hill (5.5 km), Sanquhar (7km);
- Consented: Sanquhar “Six” Wind Farm (9 km)
- Application stage: Euchanhead (6.5 km) and Sanquhar II (6 km).

Cumulative Magnitude of Change and Significance of Effect

Walkers on the core path would observe a medium-high cumulative magnitude of change to the view from the path passing the castle. The level and extent of operational wind farm development on the skyline would increase with the addition of the cumulative developments and the Proposed Development itself. Limited visibility of the former and the contained extent of the latter means that this increase would be sufficiently similar to the addition of the Proposed Development in isolation that the magnitude of change would not markedly increase. For receptors on Core Path 111 this would be most apparent where the route adjoins the village or passes Sanquhar Castle with the Site directly ahead. The influence of the Proposed Development would reduce in lower-lying sections of the route.

The cumulative effect of the Proposed Development on views from the Sanquhar Castle Circular Core Path (111) would be **moderate** and **significant** from the south-westerly section passing Sanquhar Castle reducing slightly in remaining sections, where the Proposed Development would not be directly ahead or would be less readily visible.

6.11.23 In Combination Cumulative Effects

The in-combination cumulative effects relate to the effect of the Proposed Development in combination with all other wind farm developments which have an influence on the cumulative situation as experienced in respect of the landscape and visual receptors being assessed.

In considering the broad pattern of wind farm development across the 45 km Study Area, **Figure 6.12** illustrates the distinct pattern in which the existing, under-construction, consented, and application stage wind farms have developed clusters within the upland and moorland landscapes. This is evident across the hill group from the immediate west of the Proposed Development out to approximately 15 km, where operational Whiteside Hill, Sandy Knowe, Hare hill and Extension, Windy Standard I and II, and Afton Wind Farms are located, with under construction, consented and application stage wind farms located between. A similar pattern occurs to the east, albeit beyond 20 km, where operational Clyde and Clyde Extension cover a broad extent of the upland landscape and with Harestanes and Minnygap Wind Farms extending this influence further south. The influence of the wind farms to the north and south would have a lesser effect on the area around the site as they lie within separate landscapes without the same visual connectivity as the hills to the west and east.

The location of the Proposed Development on the eastern side of Whiteside Hill Wind Farm would conform with this broad pattern of development by adding a relatively small proportion to an existing cluster that extends across the upland ridges to the west, and would prevent the spread of wind farm development into other landscapes where there is currently a limited influence from such developments.

In considering the Proposed Development in combination with all other operational and proposed developments, significant effects would cover broader extents than if considering the Proposed Development in conjunction with all other operational and proposed developments. This relates to the fact that there are a lot of operational and proposed wind farms, many of which are large in terms of number and size of turbines. This means that the operational and proposed wind farms, including the Proposed Development, would have an extensive influence across the Study Area, with significant effects extending further than they do when considering only the additional effect of the Proposed Development.

In respect of landscape and visual receptors, the in-combination effect of the Proposed Development and all other operational and proposed wind farms would likely extend across the landscapes and viewpoints contained within the viewshed of this part of the Southern Uplands. To the east a significant in-combination cumulative effect would extend out to the ridgeline formed by the Lowther Hills, at approximately 15 to 18 km. Beyond this ridgeline, visibility of the operational and proposed wind farms notably reduces and the effect would be not significant. To the west, significant in-combination effects would likely extend into the Southern Uplands to a range of approximately 20 km,

while to the north and south they would be better contained by the lower hills, giving a range of approximately 7 to 14 km.

Consideration of the relationship between the combined developments and the landscape, and the extent to which the combined developments will redefine landscape character and views, has informed an assessment of the in-combination cumulative effects, where the conclusion is that these effects would be significant within the close to middle range area around the Proposed Development and cluster of operational wind farms in this area, as would be expected, but not significant across all remaining areas.

6.12 Summary of Effects

6.12.1 Introduction

The potential effects on the landscape and visual receptors that would arise as a result of the Proposed Development have been assessed in this chapter. The process taken involved identifying those receptors with the potential to be significantly affected and assessing the potential effects that the construction and operation of the Proposed Development would give rise to in respect of these receptors. The significance of these effects has been assessed through combining the sensitivity of each receptor with a prediction of the magnitude of change that would arise as a result of the Proposed Development. The findings of the assessment are presented in summary in **Table 6.10** and **Table 6.11** below.

The Proposed Development comprises 11 turbines each up to 180 m to blade tip with associated infrastructure, including access tracks, a compound containing the control building, substation and battery storage facility, up to three on-site borrow pits, and a permanent meteorological mast, as described in **Chapter 4: Description of the Proposed Development** and shown in **Figure 1.3**.

The Study Area for the Proposed Development covers a radius of 45 km and within this area, those receptors with the potential to be significantly affected have been assessed in detail. This has included one landscape element, 11 LCTs / LCUs, three designated landscape areas, 22 assessment viewpoints and 13 principal visual receptors. Photomontages have been prepared for all 22 of the assessment viewpoints and wirelines prepared for the five additional viewpoints referenced in the assessment. The figures also include a wireline of the Proposed Development on its own and a wireline with all other cumulative wind farms. **Figures 6.1 to 6.16** show plans of the Study Area, landscape receptors, visual receptors and ZTVs of the Proposed Development on its own and in combination with other cumulative windfarms, while **Figures 6.17 to 6.38** show the photographs, wirelines and photomontages from the representative viewpoints.

6.12.2 Landscape Character Effects

In respect of the physical effects on landscape elements, the assessment found no significant effects would arise in relation to the loss of the rough grass moorland as a result of the construction of the Proposed Development. The losses would comprise only a small proportion of a much wider landscape resource and would be relatively easy to re-establish either post- construction or post-decommissioning, depending on the short, or long-term use of the area.

The assessment of effects on landscape character found that significant effects, during the construction and operational phases would arise as a result of the Proposed Development within parts of three of the 11 of the LCTs / LCUs that occur in the Study Area. The Proposed Development would be located in LCT 19. Southern Uplands / Nithsdale LCU with the northern part of the access track extending into LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU. Those parts of the LCTs that would undergo significant effects are as follows with the remaining parts either not significantly affected or not affected:

- DG LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU to the east and north-east of the Proposed Development out to approximately 5 to 6 km;

- DG LCT 10. Upland Glens / Scaur LCU to the south of the Proposed Development out to approximately 5 km; and
- DG LCT 19. Southern Uplands / Nithsdale LCU to the north, east and south of the Proposed Development out to approximately 5 to 6 km.

These significant effects would extend out to a radius of approximately 5 to 6 km. The effect of the Proposed Development on all other LCTs / LCUs would be not significant during construction and operation.

A detailed assessment of the effects on the Thornhill Uplands RSA found that the Proposed Development would give rise to significant effects coinciding with the extent of effects identified in respect of landscape character described above. The effect of the Proposed Development on the remaining parts of the Thornhill Uplands RSA and all other RSAs and SLAs would be not significant during construction and operation.

6.12.3 Visual Effects

The assessment of the effects of the Proposed Development has found that significant effects would occur during the construction and operational phases at seven of the 22 viewpoints and eight of the 13 principal visual receptors. The viewpoints and visual receptors which would experience significant effects during the construction and operational phases all lie within a 7.5 km radius of the Proposed Development and are as follows;

- Viewpoint 1: A76, Sanquhar Castle;
- Viewpoint 2: Sanquhar Church Road;
- Viewpoint 4: Euchan Water Minor Road;
- Viewpoint 5: Shiel, Scaur Water Minor Road;
- Viewpoint 7: Southern Upland Way, east of Sanquhar;
- Viewpoint 8: Polgown, Scaur Water Minor Road; and
- Viewpoint 21: Crawick Multiverse;
- Sanquhar;
- A76;
- Glasgow – Carlisle Railway Line;
- Euchan Water minor road;
- Scaur Water minor road;
- Southern Upland Way;
- Kirkconnel to Mynwhirr Hill core path; and
- Sanquhar Castle Circular core path.

The viewpoints and principle visual receptors would mostly be affected owing to either their close proximity to the Proposed Development, and / or their greater sensitivity to the Proposed Development. While the representative viewpoints within a 6.5 km radius would be significantly affected, not all visual receptors within this radius would be significantly affected, especially as there are patches with no or low-level visibility. The SUW passes through the Site and therefore walkers would experience close range significant effects. No viewpoints or principal visual receptors beyond this 7.5 km radius were found to experience significant effects as a result of the construction or operation of the Proposed Development.

6.12.4 Cumulative Landscape Effects

The cumulative effects of the Proposed Development in conjunction with the operational wind farms which form the baseline context are considered in the main assessment in **Sections 6.7, 6.8, 6.9 and 6.10**. The cumulative effects of the development in conjunction with the operational, consented and application stage wind farms are considered in **Section 6.11**. The findings of this assessment are that the cumulative effects largely reflect the effects of the Proposed Development in conjunction with the baseline operational wind farms presented in the main assessment.

The assessment of cumulative effects on landscape character and landscape designations has identified that significant cumulative effects would arise as a result of the addition of the Proposed Development in respect of the following parts of the three LCUs and one RSA which lie between 5 and 6 km radius of the Proposed Development:

- LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU to the east and north-east of the Proposed Development out to approximately 5 to 6 km;
- LCT 19 Southern Uplands / Nithsdale LCU to the north, east and south of the Proposed Development out to approximately 5 to 6 km;
- LCT 10 Upland Glens / Scaur LCU out to approximately 5 km
- Thornhills RSA, corresponding parts identified in respect of the DG LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU and DG LCT 19. Southern Uplands / Nithsdale LCU.

While significant cumulative effects in localised parts would occur in LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU, LCT 19 Southern Uplands / Nithsdale LCU and corresponding parts of Thornhill RSA in respect of both Scenario 1 and Scenario 2, in relation to LCT 10 Upland Glens / Scaur LCU, significant cumulative effects would only occur in respect of Scenario 2. It should also be noted that the majority of the Proposed Development lies within LCT 19 Southern Uplands / Nithsdale LCU, with the access track extending into LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU.

6.12.5 Cumulative Visual Effects

The assessment of cumulative effects on visual amenity and principal visual receptors has identified that significant cumulative effects would arise as a result of the addition of the Proposed Development in respect of the following seven representative viewpoints and parts of six principal visual receptors which lie within 7.5 km radius of the Proposed Development:

- Viewpoint 1: A76, Sanquhar Castle;
- Viewpoint 2: Sanquhar Church Road;
- Viewpoint 4: Euchan Water Minor Road;
- Viewpoint 5: Shiel, Scaur Water Minor Road;
- Viewpoint 7: Southern Upland Way, east of Sanquhar;
- Viewpoint 8: Polgown, Scaur Water Minor Road;
- Viewpoint 21: Crawick Multiverse;
- Sanquhar;
- Euchan Water minor road;
- Scaur Water minor road;
- Southern Upland Way;
- Kirkconnel to Mynwhirr Hill core path; and
- Sanquhar Castle Circular core path.

Significant cumulative effects would arise in respect of Scenario 2 and not Scenario 1, with the exception of Viewpoint 1: A76 Sanquhar Castle and Sanquhar as a settlement, where they would arise in respect of both Scenario 1 and Scenario 2. The SUW passes through the Site, giving rise to close range significant cumulative effects.

6.12.6 In Combination Cumulative Effects

The 'in-combination' cumulative assessment has considered the combined effect of the Proposed Development alongside all other operational and proposed developments. The conclusion is that in combination cumulative effects would be significant within the close to middle range area around the Proposed Development and surrounding operational and proposed wind farms, as would be expected owing to the clustering of development in this upland area, but not significant across all remaining areas.

6.12.7 Visual Assessment of Visible Aviation Lighting

In **Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting**, the visual effect of the turbine aviation lighting has been considered from three representative viewpoints. The assessment has considered the worst-case scenario in terms of assuming that the intensity of lighting experienced at the representative viewpoints would be 2,000cd, with an assessment also of the reduced intensity at 200cd that would be deployed in clear visibility at a range greater than 5 km. This assessment found that one of the three viewpoints would be significantly affected by the 2,000 cd lighting, namely Viewpoint 4 which is representative of the views experienced from the Euchar Water valley. The other viewpoints were considered to not be significantly affected, largely owing to baseline lighting within the developed Nith Valley.

6.12.8 Residential Visual Amenity Assessment

In **Technical Appendix A6.2: Residential Visual Amenity Assessment**, the RVAA has considered the impact of the Proposed Development on the visual amenity of the four properties that lie within a 2 km radius. The effect of the Proposed Development on all four properties would be significant. The magnitude of change on the Euchar River Station would be medium-high, and high on Glenmaddie, Polgown and Shiel. The high magnitude of change has meant that these three properties required also to be considered for a Step 4 Residential Visual Amenity Threshold Assessment. The conclusion of this Step 4 assessment is that whilst a high magnitude of change and major significant effect is predicted, the nature of the visual impact at these three properties would not be sufficient to be characterised as an overwhelming or overbearing effect on visual amenity.

6.12.9 Summary

In summary, the Proposed Development would give rise to significant effects on landscape character during the construction and operational phases of the Proposed Development, albeit contained within the localised extent of approximately 5 to 6 km. There would be a significant effect on the corresponding parts of the Thornhills RSA. The Proposed Development would give rise to significant effects on visual amenity and principal visual receptors in some locations out to approximately 7.5 km during the construction and operation of the Proposed Development, noting there are a number of principal visual receptors within 7.5 km which would not be significantly affected. While landscape and visual receptors beyond these ranges may be affected by visibility of the Proposed Development, these effects would not be significant. Significant cumulative effects would arise in respect of the same landscape and visual receptors.

All effects during the construction of the Proposed Development would be short-term and reversible and all effects during the operation of the Proposed Development would be long-term and reversible. In adopting a precautionary approach to this assessment, it is assumed that all effects would be adverse in nature.

Table 6.10 provides a summary of the effects detailed within the main assessment and **Table 6.11** provides a summary of the effects detailed within the cumulative assessment.

Table 6.10 Summary of Effects

Receptor	Sensitivity	Construction		Operation	
		Magnitude of Change	Significance of Effect	Magnitude of Change	Significance of Effect
Rough Grass Moorland	Medium	Medium-low	Not significant (moderate / minor)	N/A	N/A
DG LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU	Medium	Medium-high medium or low – north-west part of LCU Medium-low or low – south-east part of LCU	Significant (moderate) – north-west part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – remainder of LCU	Medium-high or medium – north-west part of LCU medium-low – south-east part of LCU	Significant (moderate) – north-west part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – remainder of LCU
DG LCT 10 Upland Glens / Dalveen LCU	Medium	Low No change	Not significant (minor) No effect	Low No change	Not significant (minor) No effect
DG LCT 10 Upland Glens / Mennock LCU	Medium-high	Medium-low No change	Not significant (moderate) No effect	Medium-low No change	Not significant (moderate) No effect
DG LCT 10 Upland Glens / Scaur LCU	Medium-high	Medium Low No change	Significant (moderate) - northern part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – all remaining areas. No effect	Medium Low No change	Significant (moderate) – northern part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – all remaining areas. No effect
DG LCT 19. Southern Uplands / Nithsdale LCU	Medium-high	Medium-high or medium Medium-low or low No change	Significant (major / moderate or moderate) – out to approx. 4 km to north, 2 km to east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility	Medium-high and medium Medium low or low No change	Significant (major / moderate or moderate) – out to approx. 4 km to north, 2 km to east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility
DG LCT 19. Southern Uplands / North West Lowthers LCU	Medium	Medium-low or low No change	Not significant (moderate / minor) No effect	Medium-low or low No change	Not significant (moderate / minor) No effect

Receptor	Sensitivity	Construction		Operation	
		Magnitude of Change	Significance of Effect	Magnitude of Change	Significance of Effect
DG LCT 19. Southern Uplands / Lowthers LCU	Medium Medium-high in remote interior	Medium-low or low No change	Not significant (moderate / minor or minor) No effect	Medium-low or low No change	Not significant (moderate / minor or minor) No effect
DG LCT 19a. Southern Uplands with Forest / Ken LCU	Medium	Medium or medium-low No change	Not significant (moderate or moderate / minor) No effect	Medium or medium-low No change	Not significant (moderate or moderate / minor) No effect
EA LCT 10. Upland River Valley / Nith LCU	Medium	Medium-low or low No change	Not significant (moderate / minor or minor) No effect	Medium-low or low No change	Not significant (moderate / minor or minor) No effect
EA LCT 18a. East Ayrshire Plateau Moorlands / Wardlaw Hill LCU	Medium	Medium-low or low No change	Not significant (moderate / minor or minor) No effect	Medium-low or low No change	Not significant (moderate / minor or minor) No effect
EA LCT 20a. East Ayrshire Southern Uplands / Ken LCU	Medium	Medium-low No change	Not significant (moderate / minor) No effect	Medium-low or low No change	Not significant (moderate / minor) No effect
Thornhill Uplands RSA	Medium-high or Medium	Medium-high or medium Medium or low No change	Significant (major-moderate or moderate) Not significant (moderate to minor) No change	Medium-high or medium Medium or low No change	Significant (major-moderate or moderate) Not significant (moderate to minor) No change
Galloway Hills RSA	Medium	Negligible No change	Not Significant Minor No effect	Negligible No change	Not Significant Minor No effect
New Cumnock SLA	Medium - southern part Medium-high – northern part	Medium-low or low No change	Not significant (moderate / minor or minor) No effect	Medium-low or low No change	Not significant (moderate / minor or minor) No effect
Viewpoint 1: A76, Sanquhar Castle	Road users: Medium	Medium	Significant Moderate	Medium	Significant Moderate
	Residents: Medium-high				
	Walkers: Medium-high				
Viewpoint 2: Sanquhar Church Road	Road users: Medium	Medium	Significant Moderate	Medium	Significant Moderate
	Residents: Medium-high				
Viewpoint 3: Kirkconnel	Road users: Medium	Medium-low	Not Significant Moderate / minor	Medium-low	Not Significant Moderate / minor
	Residents: Medium-high		Not Significant Moderate		Not Significant Moderate

Receptor	Sensitivity	Construction		Operation	
		Magnitude of Change	Significance of Effect	Magnitude of Change	Significance of Effect
Viewpoint 4: Euchan Water Minor Road	Road users: Medium	Medium / high	Significant Moderate	Medium / high	Significant Moderate
	Residents: Medium-high		Significant Major / moderate		Significant Major / moderate
Viewpoint 5: Shiel, Scaur Water Minor Road	Road users: Medium-high	Medium-high	Significant Major / moderate	Medium-high	Significant Major / moderate
	Residents: High		Significant Major		Significant Major
Viewpoint 6: B797 Mennoch	Road users: Medium	Medium-low	Not Significant Moderate / minor	Medium-low	Not Significant Moderate / minor
	Residents: Medium-high		Not Significant Moderate		Not Significant Moderate
Viewpoint 7: Southern Upland Way, east of Sanquhar	Medium-high	Medium	Significant Moderate	Medium	Significant Moderate
Viewpoint 8: Polgown, Scaur Water Minor Road	Road users: Medium	Medium-high	Significant Major / moderate or Moderate	Medium-high	Significant Major / moderate or Moderate
	Residents: Medium-high				
	Walkers: Medium-high				
Viewpoint 9: Durisdeer	Medium-high	Low	Not Significant Moderate / minor	Low	Not Significant Moderate / minor
Viewpoint 10: Wauk Hill	Medium-high	Low	Not Significant Moderate / minor	Low	Not Significant Moderate / minor
Viewpoint 11: Benbrack	Medium-high	Medium-low	Not Significant Moderate	Medium-low	Not Significant Moderate
Viewpoint 12: Cairnmore of Carsphairn	Medium-high	Low	Not Significant Moderate / minor	Low	Not Significant Moderate / minor
Viewpoint 13: Blackcraig Hill	Medium	Medium-low	Not Significant Moderate / minor	Medium-low	Not Significant Moderate / minor
Viewpoint 14: Corsencon Hill	Medium	Medium-low	Not Significant Moderate / minor	Medium-low	Not Significant Moderate / minor
Viewpoint 15: Todholes Hill	Medium	Medium-low	Not Significant Moderate / minor	Medium-low	Not Significant Moderate / minor
Viewpoint 16: Lowther East Mount	Medium-high	Low	Not Significant Moderate	Medium-low	Not Significant Moderate
Viewpoint 17: Meikle Millyea	Medium	Low	Not Significant Minor	Low	Not Significant Minor
Viewpoint 18: Southern	Medium-high	Medium-low	Not Significant Moderate	Medium-low	Not Significant Moderate

Receptor	Sensitivity	Construction		Operation	
		Magnitude of Change	Significance of Effect	Magnitude of Change	Significance of Effect
Upland Way, Coupland Knowe					
Viewpoint 19: Southern Upland Way, Glengaber Hill	Medium-high	Medium-low	Not Significant Moderate	Medium-low	Not Significant Moderate
Viewpoint 20: Cairnkinna	Medium	Medium	Not Significant Moderate	Medium	Not Significant Moderate
Viewpoint 21: Crawick Multiverse	Medium-high	Medium	Significant Moderate	Medium	Significant Moderate
Viewpoint 22: Auchengibbert	Medium-high	Medium-low	Not significant Moderate	Medium-low	Not significant Moderate
Sanquhar	Medium-high	Medium / medium-low No change	Significant Moderate – on southern side of town and where open / elevated views occur towards the Proposed Development No effect	Medium / medium-low No change	Significant Moderate – on southern side of town and where open / elevated views occur towards the Proposed Development No effect
Mennock	Medium-high	Medium-low / low No change	Not Significant Moderate or moderate / minor No effect	Medium-low / low No change	Not Significant Moderate or moderate / minor No effect
Kirkconnel and Kelloholm	Medium-high	Medium-low / low No change	Not Significant Moderate or moderate / minor No effect	Medium-low / low No change	Not Significant Moderate or moderate / minor No effect
A76	Medium-high / medium	Medium Medium-low / low No change	Significant Moderate – between Eliock Bridge and Sanquhar Not significant Moderate-minor – all remaining sections	Medium Medium-low / low No change	Significant Moderate – between Eliock Bridge and Sanquhar Not significant Moderate-minor – all remaining sections
Glasgow – Carlisle Railway line	Medium-high / medium	Medium Medium-low / low No change	Significant Moderate – between Eliock Bridge and Sanquhar Not significant Moderate-minor – all remaining sections	Medium Medium-low / low No change	Significant Moderate – between Eliock Bridge and Sanquhar Not significant Moderate-minor – all remaining sections
Minor road – Euchan Water valley	Medium	Medium-high / Medium No change	Significant (major / moderate) No effect	Medium-high / Medium No change	Significant (major / moderate) No effect

Receptor	Sensitivity	Construction		Operation	
		Magnitude of Change	Significance of Effect	Magnitude of Change	Significance of Effect
Minor road – Scaur Water valley	Medium-high	Medium-high – between Glenwhargen Craig and Dalgonar Low No change	Significant Major / moderate – between Glenwhargen Craig and Dalgonar Not Significant No change	Medium-high – between Glenwhargen Craig and Dalgonar Low No change	Significant Major / moderate – between Glenwhargen Craig and Dalgonar Not Significant No change
Southern Upland Way – Section 4	Medium	High, medium-high or medium Medium-low or low No change	Significant Major / moderate or moderate between Dalgonar and Sanquhar. Not significant No effect	High, medium-high or medium Medium-low or low No change	Significant Major / moderate or moderate between Dalgonar and Sanquhar. Not significant No effect
Southern Upland Way – Section 5	Medium-high or medium	Medium Medium-low or low No change	Significant Moderate – between Sanquhar and Bogg Farm. Not significant No effect	Medium Medium-low or low No change	Significant Moderate – between Sanquhar and Bogg Farm. Not significant No effect
Core Path 84 – Kirkconnel to Mynwhirr Hill	Medium	Medium Low No change	Significant moderate – between Kelloholm and Polshag Hill Not significant – moderate / minor No change	Medium Low No change	Significant moderate – between Kelloholm and Polshag Hill Not significant – moderate / minor No change
Core Path 88 – Kirkconnel to Black Law (via Fingland and Kirkland)	Medium	Medium-low No change	Not significant Moderate / minor No change	Medium-low No change	Not significant Moderate / minor No change
Core Path 108 – Bogg to Auchentaggart Moor	Medium-high	Medium-low No change	Not significant Moderate No change	Medium-low	Not significant Moderate No change
Core Path 109 – Sodjers Bridge Walk	Medium	Medium / medium-low No change	Not significant Moderate or moderate / minor No effect	Medium / medium-low No change	Not significant Moderate or moderate / minor No effect
Core Path 111 – Sanquhar Castle Circular	Medium	Medium-high	Significant Moderate – along much of the circular route	Medium-high	Significant Moderate – along much of the circular route

Table 6.11 Summary of Cumulative Effects

Receptor	Sensitivity	Scenario 1		Scenario 2	
		Cumulative Magnitude of Change	Cumulative Significance of Effect	Cumulative Magnitude of Change	Cumulative Significance of Effect
DG LCT 9 Upper Dale (Valley) / Upper Nithsdale LCU	Medium	Medium-high medium or low – north-west part of LCU Medium-low or low – south-east part of LCU	Significant (moderate) – north-west part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – remainder of LCU	Medium-high or medium – north-west part of LCU medium-low – south-east part of LCU	Significant (moderate) – north-west part of LCU out to approx. 5 km Not significant (moderate / minor or minor) – remainder of LCU
DG LCT 10 Upland Glens / Scaur LCU	Medium-high	Medium Medium-low or low No change	Significant (major / moderate) – out to approx. 5 km to south Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility	Medium Medium low or low No change	Significant (major / moderate) – out to approx. 5 km to south Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility
DG LCT 19 Southern Uplands / Nithsdale LCU	Medium-high	Medium-high or medium Medium-low or low No change	Significant (major / moderate or moderate) – out to approx. 4 km to north, 2 km to east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility	Medium-high and medium Medium low or low No change	Significant (major / moderate or moderate) – out to approx. 4 km to north, 2 km to east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU No effect – no visibility
Thornhill Uplands RSA	Medium-high	Medium-high or medium Medium-low or low No change	Significant (major / moderate or moderate) – out to approx. 5 km to north-east and east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU	Medium-high and medium Medium low or low No change	Significant (major / moderate or moderate) – out to approx. 5 km to north-east and east and 4-5 km to south and south-east Not significant (moderate or moderate / minor) – remaining parts of LCU

Receptor	Sensitivity	Scenario 1		Scenario 2	
		Cumulative Magnitude of Change	Cumulative Significance of Effect	Cumulative Magnitude of Change	Cumulative Significance of Effect
			No effect – no visibility		No effect – no visibility
Viewpoint 1: A76, Sanquhar Castle	Medium-high or medium	Medium	Significant (moderate)	Medium	Significant (moderate)
Viewpoint 2: Sanquhar Church Road	Medium-high or medium	Not assessed	Not assessed	Medium	Significant (moderate)
Viewpoint 4: Euchan Water Minor Road	Medium-high or medium	Not assessed	Not assessed	Medium / high	Significant (major / moderate or moderate)
Viewpoint 5: Shiel, Scaur Water Minor Road	High or medium-high	Not assessed	Not assessed	Medium-high	Significant (major / moderate or moderate)
Viewpoint 7: Southern Upland Way, east of Sanquhar	Medium	Not assessed	Not assessed	Medium	Significant (moderate)
Viewpoint 8: Polgown, Scaur Water Minor Road	Medium-high or high	Not assessed	Not assessed	Medium	Significant (major / moderate)
Viewpoint 21: Cairnkinna	Medium-high	Not assessed	Not assessed	Medium-low	Significant (moderate)
Sanquhar	Medium-high	Medium or medium / low No change	Significant (moderate) Not significant (moderate / minor) No effect	Medium or medium / low No change	Significant (moderate) Not significant (moderate / minor) No effect
Minor road – Euchan Water valley	Medium	Not assessed	Not assessed	Medium-high / Medium No change	Significant (major / moderate) No effect
Minor road – Scaur Water valley	Medium-high	Not assessed	Not assessed	Medium-high Low No change	Significant (major / moderate) Not significant (moderate / minor) No effect
Southern Upland Way	Medium	Not assessed	Not assessed	High / medium-high / medium Low No change	Significant (major / moderate or moderate) Not significant (moderate / minor) No effect
Kirkconnel to Mynwhirr Hill Core Path (84)	Medium	Not assessed	Not assessed	Medium Medium-low No change	Significant (moderate) between

Receptor	Sensitivity	Scenario 1		Scenario 2	
		Cumulative Magnitude of Change	Cumulative Significance of Effect	Cumulative Magnitude of Change	Cumulative Significance of Effect
					Kelloholm and Polshag Hill Not significant (moderate / minor) No effect
Sanquhar Castle Circular Core Path (111)	Medium	Not assessed	Not assessed	Medium-high	Significant (moderate) along much of the circular route

6.13 Statement of Significance

The rationale for site selection and scheme design is presented in **Chapter 3: Site Selection and Design**. The suitability of the Site relates to its upland setting which ensures high wind yields, as well as the existing influence from other operational wind farms, which establish this type of development as a feature of the baseline context in this local area. Visibility of the Proposed Development would occur mostly in areas where the operational wind farms are currently visible, as shown in the cumulative ZTVs in **Figures 6.13a to 6.13k** and cumulative wirelines in **Figures 6.17 to 6.43**. The Proposed Development has been designed to relate to the upland landscape through a compact arrangement on the upper slopes of the hill group. The proposed turbines are taller than the operational Whiteside Hill Wind Farm turbines, which is the closest wind farm. However, the Proposed Development has been designed so that the scale and distance between the two are such that they it will be typically perceived as an easterly extension and will keep wind farm development contained within this upland landscape. The Proposed Development will be seen to conform with the baseline pattern of wind farm development occurring across the ridges of the southern uplands to the west of the Nith Valley.

The LVIA has found that there will be significant effects and significant cumulative effects on landscape and visual receptors within the local area around the Proposed Development. Such effects are to be expected within the local area around a wind farm of this size, 11 turbines each 180 m to blade tip height. The Proposed Development will have notable direct and indirect effects on landscape character out to 5 to 6 km and indirect effects on visual amenity out to a similar range of distance. While landscape and visual receptors beyond these ranges may gain views of the Proposed Development, these effects have been found not to be significant. It has been found that landscape and visual receptors within the 5 to 6 km range would have limited visibility, for example tracts of landscape enclosed by forest cover or where screening by landform occurs. Significant landscape and visual effects would, therefore, be well contained within a localised area and occur intermittently within that localised area.

7. ECOLOGY

7.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on non-avian ecology, including designated sites, terrestrial and aquatic habitats, and protected species. This ecological assessment was undertaken by MacArthur Green.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in Volume 3 Technical Appendices:

- Technical Appendix A7.1: National Vegetation Classification (NVC) and Habitats Survey;
- Technical Appendix A7.2: Protected Species Survey Report⁸⁶;
- Technical Appendix A7.3: Bat Survey Report;
- Technical Appendix A7.4: Electrofishing Survey Report;
- Technical Appendix A7.5: Species Protection Plan; and
- Technical Appendix A7.6: Outline Biodiversity Enhancement Management Plan.

This Chapter is supported by the following Figures provided in Volume 2 Figures:

- **Figure 7.1:** Ecological Designated Sites and Ancient Woodland within 5 km;
- **Figure 7.2:** Carbon and Peatland Map 2016;
- **Figure 7.3:** National Vegetation Classification (NVC) Survey Area and Survey Results;
- **Figure 7.4:** Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) Survey Area and Survey Results;
- **Figure 7.5:** Protected Species Survey Area and Results;
- **Figure 7.5C:** Confidential Protected Species Survey Results;
- **Figure 7.6:** Bat Survey Area and Anabat Locations and Preliminary Bat Roost Assessment Results;
- **Figure 7.7:** Overall Risk Assessment 2020 (May - September) - Common Pipistrelle;
- **Figure 7.8:** Overall Risk Assessment 2020 (May - September) - Soprano Pipistrelle;
- **Figure 7.9:** Overall Risk Assessment 2020 (May - September) - Nyctalus sp;
- **Figure 7.10:** Electrofishing Locations and Survey Results; and
- **Figure 7.11:** Outline Biodiversity Enhancement Management Plan

The Confidential Annex of **Technical Appendix A7.2: Protected Species Survey Report** and **Figure 7.5C** will not be published with the EIA Report due to the potential risk to protected species. However, they will be issued to the Scottish Ministers and NatureScot.

This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Cumulative Effect Assessment;

⁸⁶ Includes a Confidential Annex for sensitive protected species information.

- Mitigation and Residual Effects;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

7.2 Legislation, Policy and Guidance

The following legislation, policy and guidance have been considered in carrying out this assessment.

7.2.1 Legislation

- European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora ('Habitats Directive')⁸⁷;
- 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')⁸⁸;
- Environmental Impact Assessment Directive 85/337/EEC, as amended ('EIA Directive') (as subsequently codified by Directive 2011/92/EU, as amended by Directive 2014/52/EU)⁸⁹;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017⁹⁰;
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) ('the Habitats Regulations')⁹¹;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS)⁹²;
- Nature Conservation (Scotland) Act 2004 (as amended)⁹³;
- Wildlife and Natural Environment (Scotland) Act 2011 (WANE)⁹⁴;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011⁹⁵;
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003⁹⁶;
- The Wildlife and Countryside Act 1981 (as amended)⁹⁷; and

⁸⁷ European Union Council Directive 92/43/EEC (1992). Available at: [The Habitats Directive \(europa.eu\)](#) [Accessed August 2023]

⁸⁸ European Union Council Directive 2000/60/EC (2000). Available at: [Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy — European Environment Agency \(europa.eu\)](#) [Accessed August 2023]

⁸⁹ Environmental Impact Assessment Directive (2011). Available at: [untitled \(europa.eu\)](#) [Accessed on August 2023]

⁹⁰ The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations (2017). Available at: [The Electricity Works \(Environmental Impact Assessment\) \(England and Wales\) Regulations 2017 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹¹ The Conservation (Natural Habitats &c.) Regulations (1994). Available at: [The Conservation \(Natural Habitats, &c.\) Regulations 1994 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹² The Water Environment and Water Services (Scotland) Act (2003). Available at: [Water Environment and Water Services \(Scotland\) Act 2003 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹³ Nature Conservation (Scotland) Act (2004). Available at: [Nature Conservation \(Scotland\) Act 2004 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹⁴ Wildlife and Natural Environment (Scotland) Act (2011). Available at: [Wildlife and Natural Environment \(Scotland\) Act 2011 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹⁵ The Water Environment (Controlled Activities) (Scotland) Regulations (2011). Available at: [The Water Environment \(Controlled Activities\) \(Scotland\) Regulations 2011 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹⁶ Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act (2003). Available at: [Salmon and Freshwater Fisheries \(Consolidation\) \(Scotland\) Act 2003 \(legislation.gov.uk\)](#) [Accessed August 2023]

⁹⁷ The Wildlife and Countryside Act (as amended) (1981). Available at: [Wildlife and Countryside Act 1981 \(legislation.gov.uk\)](#) [Accessed August 2023]

7.2.2 Planning Policy

- JNCC and DEFRA (2012) UK Post-2010 Biodiversity Framework⁹⁹;
- Scottish Government (2022) Scottish Biodiversity Strategy to 2045. Tackling the Nature Emergency in Scotland¹⁰⁰; and
- Scottish Government (2023) National Planning Framework 4¹⁰¹.

7.2.3 Guidance

- Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine¹⁰²;
- Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition)¹⁰³;
- Dumfries and Galloway Local Biodiversity Action Plan¹⁰⁴;
- Galloway and Southern Ayrshire Biosphere¹⁰⁵;
- European Commission, Directorate-General for Environment (2010) Wind Energy Developments and Natura 2000¹⁰⁶;
- NatureScot (2020) General Pre-application and Scoping Advice for Onshore Wind Farms¹⁰⁷;
- Joint Nature Conservation Committee (JNCC) (2019) Guidelines for selection of biological Sites of Special Scientific Interest (SSSI)¹⁰⁸;
- Scottish Badgers (2018) Surveying for Badgers: Good Practice Guidelines¹⁰⁹;

⁹⁸ The Protection of Badgers Act (1992). Available at: [Protection of Badgers Act 1992 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/1992/26/section/1) [Accessed August 2023]

⁹⁹ JNCC and DEFRA UK Post-2010 Biodiversity Framework (2012). Available at: [UK Post-2010 Biodiversity Framework | JNCC - Adviser to Government on Nature Conservation](#) [Accessed August 2023]

¹⁰⁰ Scottish Government Scottish Biodiversity Strategy to 2045, Tackling the Nature Emergency in Scotland (2022). Available at: [Biodiversity strategy to 2045: tackling the nature emergency - gov.scot \(www.gov.scot\)](https://www.gov.scot/biodiversity-strategy-to-2045) [Accessed August 2023]

¹⁰¹ Scottish Government National Planning Framework 4 (2023). Available at: [National Planning Framework 4 - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/national-planning-framework-4/pages/68/default.aspx) [Accessed august 2023]

¹⁰² Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (2018). Available at: [ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf](https://www.cieem.net/wp-content/uploads/2018/04/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf) (cieem.net) [Accessed August 2023]

¹⁰³ Collins, J. Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition) (2016). Available at: [Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition - Guidance for professionals - Bat Conservation Trust](#) [Accessed August 2023]

¹⁰⁴ Dumfries and Galloway Local Biodiversity Action Plan (2009). Available at: <https://swseic.org.uk/resource/dglbap-part1/>. [Accessed November 2022].

¹⁰⁵ Galloway and Southern Ayrshire Biosphere (2022). Available at: <https://www.gsabiosphere.org.uk/>. [Accessed December 2022].

¹⁰⁶ European Commission, Directorate-General for Environment Wind Energy Developments and Natura 2000 (2010) Available at: [Wind energy developments and Natura 2000 - Publications Office of the EU \(europa.eu\)](https://ec.europa.eu/euipo/euipo_en) [Accessed August 2023]

107 NatureScot General Pre-application and Scoping Advice for Onshore Wind Farms (2020). Available at: [General pre-application and scoping advice for onshore wind farms | NatureScot](#) [Accessed August 2023]

¹⁰⁸ Joint Nature Conservation Committee (JNCC) Guidelines for selection of biological Sites of Special Scientific Interest (SSSI) (2019). Available at: [Guidelines for selection of SSSIs | JNCC - Adviser to Government on Nature Conservation](#) [Accessed August 2023]

¹⁰⁹ Scottish Badgers Surveying for Badgers: Good Practice Guidelines (2018). Available at: [Surveying-for-Badgers-Good-Practice-Guidelines_V1-2020-2455979.pdf \(scottishbadgers.org.uk\)](#) [Accessed August 2023]

- SEPA (2017) Land Use Planning System Guidance Note 4 - European Commission, Directorate-General for Environment (2010)¹¹⁰;
- SEPA (2017) Land Use Planning System Guidance Note 31 – Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems¹¹¹;
- Scottish Executive (2000) 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. 6/1995¹¹²;
- SERAD (Scottish Executive Rural Affairs Department) (2001) European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements¹¹³;
- Scottish Government (2016) Draft Peatland and Energy Policy Statement¹¹⁴;
- Scottish Government (2017) Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0¹¹⁵;
- Scottish Government (2017) Planning Circular 1/2017: Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017¹¹⁶;
- Scottish Government, Scottish Natural Heritage (SNH) and SEPA (2017) Peatland Survey – Guidance on Developments on Peatland¹¹⁷;
- Scottish Government (2019) The Scottish Forestry Strategy (SFS)¹¹⁸;
- Scottish Government (2020) EU Exit: The Habitat Regulations in Scotland¹¹⁹;
- Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update¹²⁰;

¹¹⁰ SEPA Land Use Planning System Guidance Note 4 - European Commission, Directorate-General for Environment (2017). Available at: [Guidance and advice notes | Scottish Environment Protection Agency \(SEPA\)](#) [Accessed August 2023]

¹¹¹ SEPA Land Use Planning System Guidance Note 31 – Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017). Available at: [lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions.pdf \(sepa.org.uk\)](#) [Accessed August 2023]

¹¹² Scottish Executive 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 (2000). Available at: [CIR 6/95 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, Scottish Office - Publication Index | NBS \(thenbs.com\)](#) [Accessed August 2023]

¹¹³ SERAD European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements (2001). Available at: [European protected species, development sites and the planning system, Scottish Executive - Publication Index | NBS \(thenbs.com\)](#) [Accessed August 2023]

¹¹⁴ Scottish Government Draft Peatland and Energy Policy Statement (2016). Available at: [Peatland and energy: draft policy statement - gov.scot \(www.gov.scot\)](#) [Accessed August 2023]

¹¹⁵ Scottish Government Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0 (2017). Available at: [Planning Advice Note 1/2013: Environmental Impact Assessment - gov.scot \(www.gov.scot\)](#) [Accessed August 2023]

¹¹⁶ Scottish Government Planning Circular 1/2017: Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations (2017). Available at: [Planning Circular 1/2017: Environmental Impact Assessment regulations - gov.scot \(www.gov.scot\)](#) [Accessed August 2023]

¹¹⁷ Scottish Government, Scottish Natural Heritage (SNH) and SEPA Peatland Survey – Guidance on Developments on Peatland (2017). Available at: [govscot:document \(www.gov.scot\)](#) [Accessed August 2023]

¹¹⁸ Scottish Government The Scottish Forestry Strategy (SFS) (2019). Available at: [Scotland's Forestry Strategy 2019-2029](#) [Accessed August 2023]

¹¹⁹ Scottish Government EU Exit: The Habitat Regulations in Scotland (2020). Available at: [eu-exit-habitats-regulations-scotland.pdf \(www.gov.scot\)](#) [Accessed August 2023]

¹²⁰ Scottish Government Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update (2020). Available at: [Executive Summary - Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot \(www.gov.scot\)](#) [Accessed August 2023]

- Scottish Government (2020) Update to the Climate Change Plan 2018-2032¹²¹;
- Scottish Government (2021) Freshwater and diadromous fish and fisheries associated with onshore wind farm and transmission line developments: generic scoping guidelines¹²²;
- SNH (2015) Scotland's National Peatland Plan¹²³;
- SNH (2016) Decommissioning and Restoration Plans for wind farms¹²⁴;
- SNH (2016) Planning for Development: What to consider and include in deer assessments and management at development sites (Version 2)¹²⁵;
- SNH (2016) Planning for Development: What to consider and include in Habitat Management Plans. Version 2¹²⁶;
- SNH (2018) Advising on carbon-rich soils, deep peat and priority peatland habitat in development management¹²⁷;
- SNH (2018) Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland¹²⁸;
- Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Environment Scotland & AEECoW (2019) Good Practice During Windfarm Construction (4th Edition)¹²⁹;
- NatureScot (2021) Assessing the cumulative landscape and visual impact of onshore wind energy developments¹³⁰; and
- NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2019, with minor updates 2021) Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation¹³¹.

¹²¹ Scottish Government Update to the Climate Change Plan 2018-2032 (2020). Available at: [Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/securing-a-green-recovery-on-a-path-to-net-zero/climate-change-plan-2018-2032-update/pages/2.aspx) [Accessed August 2023]

¹²² Scottish Government Freshwater and diadromous fish and fisheries associated with onshore wind farm and transmission line developments: generic scoping guidelines (2021). Available at: [Freshwater and diadromous fish and fisheries associated with onshore wind farm and transmission line developments: generic scoping guidelines - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/freshwater-and-diadromous-fish-and-fisheries-associated-with-onshore-wind-farm-and-transmission-line-developments-generic-scoping-guidelines/pages/2.aspx) [Accessed August 2023]

¹²³ SNH (2015) Scotland's National Peatland Plan (2015). Available at: [Scotland's National Peatland Plan: Working for our future | NatureScot](https://www.nature.scot/publications/scotland-s-national-peatland-plan-working-for-our-future/pages/2.aspx) [Accessed August 2023]

¹²⁴ SNH Decommissioning and Restoration Plans for wind farms (2016). Available at: [Guidance - Decommissioning and Restoration Plans for wind farms - February 2016 | NatureScot](https://www.nature.scot/publications/guidance-decommissioning-and-restoration-plans-for-wind-farms-february-2016/pages/2.aspx) [Accessed August 2023]

¹²⁵ SNH Planning for Development: What to consider and include in deer assessments and management at development sites (Version 2) (2016). Available at: [Guidance - Planning and Development - What to consider and include in Deer Assessment and Management at Development sites | NatureScot](https://www.nature.scot/publications/guidance-planning-and-development-what-to-consider-and-include-in-deer-assessment-and-management-at-development-sites/pages/2.aspx) [Accessed August 2023]

¹²⁶ SNH Planning for Development: What to consider and include in Habitat Management Plans. Version 2 (2016). Available at: [Advice Note \(webarchive.org.uk\)](https://www.nature.scot/publications/advice-note-webarchive.org.uk/pages/2.aspx) [Accessed August 2023]

¹²⁷ SNH Advising on carbon-rich soils, deep peat and priority peatland habitat in development management (2018). Available at: [Advising on peatland, carbon-rich soils and priority peatland habitats in development management | NatureScot](https://www.nature.scot/publications/advising-on-peatland-carbon-rich-soils-and-priority-peatland-habitats-in-development-management/pages/2.aspx) [Accessed August 2023]

¹²⁸ SNH Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland (2018). Available at: [Publication 2018 - Environmental Impact Assessment Handbook V5.pdf \(nature.scot\)](https://www.nature.scot/publications/publication-2018-environmental-impact-assessment-handbook-v5.pdf) [Accessed August 2023]

¹²⁹ Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Environment Scotland & AEECoW Good Practice During Windfarm Construction (4th Edition) (2019). Available at: [Guidance - Good practice during Wind Farm construction | NatureScot](https://www.nature.scot/publications/guidance-good-practice-during-wind-farm-construction/pages/2.aspx) [Accessed August 2023]

¹³⁰ NatureScot Assessing the cumulative landscape and visual impact of onshore wind energy developments (2021). Available at: [Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments | NatureScot](https://www.nature.scot/publications/guidance-assessing-the-cumulative-landscape-and-visual-impact-of-onshore-wind-energy-developments/pages/2.aspx) [Accessed August 2023]

¹³¹ NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT), with minor updates 2021) Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation (2019). Available at: [Bats and onshore wind turbines - survey, assessment and mitigation | NatureScot](https://www.nature.scot/publications/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation/pages/2.aspx) [Accessed August 2023]

7.3 Assessment Methodology and Significance Criteria

7.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 7.1**.

Table 7.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
The Scottish Government Energy Consents Unit	Scoping Opinion (June 2022)	The Scottish Ministers recommend that the Company discuss and agree Baseline Fish Surveys with the local District Salmon Fishery Board and Fisheries Trust.	Baseline surveys have been carried out by the Nith District Salmon Fisheries Board (NDSFB) and are detailed in Technical Appendix A7.4: Electrofishing Survey Report .
East Ayrshire Council	Scoping Opinion (28 April 2022)	The Galloway and Southern Ayrshire UNESCO Biosphere is a unique and important designation for South West Scotland. It is suggested that the EIA process should take account of an consider how the proposal supports or otherwise the overall principles of the Biosphere designation.	The Galloway and Southern Ayrshire UNESCO Biosphere has been considered in the assessment and is detailed in Section 7.4.1.4 . Enhancement and connectivity of high focus habitats will be included within Technical Appendix A7.6: Outline Biodiversity Enhancement Management Plan (oBEMP) .
NatureScot	Scoping Opinion (10 May 2022)	In general, any works should take account of protected species that may be present within the proposed development area.	Protected species surveys have been carried out and are detailed in Technical Appendices A7.2: Protected Species Survey and A7.3: Bat Survey Report . Fish are also considered in Technical Appendix A7.4: Electrofishing Survey Report .
SEPA	Scoping Opinion (21 April 2022)	We also understand additional site surveys (including NVC) are planned to reflect an updated site boundary. The outcome of this should be used to inform site design.	Detailed NVC surveys have been carried out (detailed in Technical Appendix A7.1: NVC and Habitats Survey) and were used to inform the design.
Tynron Community Council	Scoping Opinion (undated)	Developments that should be included in the cumulative assessment: - Sanquhar II - Appin Wind Farm - Euchanhead Wind Farm - Lorg Wind Farm - Twentyshilling Hill - Whiteside - Sanquhar Windfarm	Appin Wind Farm is currently at the Scoping stage, and Lorg Wind Farm is outwith the 5 km buffer considered within the cumulative assessment for ecology features, and as such these sites have not been considered within the cumulative assessment in this chapter. The remaining developments are considered in Section 7.6 .
		Do not agree that range of surveys is sufficient and appropriate: the field studies are limited and cannot take account of 'boom and bust' cycles of population or impacts of local extreme weather conditions.	Surveys have all been undertaken in line with best practice guidance, and as agreed with NatureScot through consideration of the Scoping Request. It is noted that interannual variation is not able to be covered by the suite of surveys undertaken, and this limitation is discussed in Section 7.3.7 As such, it is recommended as part of the embedded mitigation that measures such as pre-construction surveys and the presence and supervision of an Ecological Clerk of

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
			Works (ECoW) during the construction phase are included as standard.
		Galloway and Southern Ayrshire Biosphere should be consulted with respect to the ecology assessment.	The Galloway and Southern Ayrshire Biosphere have been consulted (see below).
		Chanlockfoot SSSI has been omitted from table 8.1: Ecological Designated Sites within 5km of the Site Boundary of the Scoping Report.	Chanlockfoot SSSI is designated for upland mixed ash woodland. It is over 6.48 km at its closest point to the Site, and no connectivity pathways for potential significant effects between the Proposed Development and this designated site have been identified.
		Do not agree that there is no potential for connectivity between the Development and North Lowther Uplands SSSI, Upper Nithsdale Woods SAC, Back Wood SSSI and Mennoch Water SSSI: connectivity can include aerial flights (birds, insects, and seeds) and displaced mammals looking for alternative habitats, and which all contribute to the biodiversity and species richness of the habitats, so these designated sites cannot be scoped out of the assessment.	Ornithological effects are included within Chapter 8: Ornithology . Designated sites (non-avian) are included in Section 7.4.1.1 and are scoped out from further assessment in Section 7.5.1 due to a lack of potential significant effects from the Proposed Development on their qualifying features. The results of ecological field survey have been used to assess the potential effects on protected species within the Site and survey area.
Galloway and Southern Ayrshire Biosphere	Consultation Response (13 February 2023)	Don't generally have capacity to get involved in commenting on windfarm developments within the transition area (refer to position statement ¹³²). Always interested in exploring biodiversity offsetting opportunities. For example, in conversation with Vattenfall and others, exploring the viability of strategic implementation of the habitat management plans across the Biosphere.	Noted.
NatureScot	Consultation response to gate check report (1 February 2023)	It is noted that the breeding status of otters using the identified holts is unknown at present. Until this is confirmed, we would recommend that the buffer for breeding otters is planned for.	In line with NatureScot guidance, no works would be undertaken within 200m of the potential holts if a breeding/natal holt is subsequently identified (or the status of the holt is unknown). Pre-construction surveys would be carried out by an ECoW or suitably qualified ecologist to determine the status of previously identified features and if any further protected features have arisen. The procedures outlined within the Species Protection Plan (SPP) (Technical Appendix A7.5: Outline Species Protection Plan) will ensure all reasonable protection

¹³² Galloway and Southern Ayrshire Biosphere (2016). Windfarm Position Statement. <https://www.gsabiosphere.org.uk/wp-content/uploads/2022/06/GSAB-Windfarm-Position-Statement-March-2017.pdf> [Accessed February 2023].

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
			measures are undertaken with regard to protected species present, or potentially present, at the Proposed Development.
		We recognise that there is brief mention, on p34, of benefits that may arise through a proposed habitat management plan. We encourage, however, that the application includes adequate information demonstrating how the proposal will secure overall beneficial effects for biodiversity, in keeping with Policy 3 of NPF4.	An OBEMP is included in Technical Appendix A7.6: oBEMP . The OBEMP details how the Proposed Development would meet significant biodiversity enhancements in line with NPF4.
SEPA	Consultation response to gate check report (2 February 2023)	Section 2.2.4.3 [of gatecheck report] indicates a National Vegetation Survey has been completed and blanket bog, wet modified bog, wet heath and flushes are to be avoided. A 50m buffer has also been applied to watercourses. It is also understood that one section of track at the site entrance will encroach on the 50m watercourse buffer. We acknowledge the reasoning behind this and note that mitigation is to be implemented to address any pollution risk. We have no concerns with this but request the EIAR report any breaches of the 50m buffer and set out any mitigation intended to avoid significant environmental effects in line with our scoping advice.	The results of the National Vegetation Survey are presented in Section 7.4.2.1 , with full details in Technical Appendix A7.1: NVC and Habitats Survey , with predicted effects on habitats discussed in Section 7.5.2 . Noted.
NDSFB	Data Search Request (June 2021)	Fisheries and invasive species information sought from NDSFB with respect to the Site and immediate area.	The information received (21/07/2021) is referred to throughout this Chapter to aid the characterisation of the baseline and help inform the assessment of effects.

7.3.2 Scope of Assessment

This chapter considers the potential effects of construction and operation (including cumulatively) of the Proposed Development upon those ecological features identified during the review of desk-based information and field surveys. Effects, both temporary and permanent, upon the following features are assessed:

- Designated nature conservation sites – effects include direct (i.e., derived from land-take or disturbance to habitats or protected species) and indirect (i.e., habitat fragmentation and modification, including through changes caused by effects to supporting systems such as groundwater or overland flow);
- Terrestrial habitats – effects include direct (i.e., derived from land-take) and indirect (i.e., habitat fragmentation and modification, including through changes caused by effects to supporting systems such as groundwater or overland flow);

- Aquatic habitats – effects are limited to the ecological impacts of changes in water conditions through potential pollution effects (hydrological effects are considered in **Chapter 11: Hydrology and Soils**); and
- Protected species and other notable species – effects considered include direct (i.e., loss of life; loss of key habitat; displacement from key habitat; barrier effects preventing movement to/from key habitats; and general disturbance) and indirect (i.e., loss/changes of/to food resources; population fragmentation; degradation of key habitat e.g., as a result of pollution).

7.3.3 Elements Scoped Out of Assessment

On the basis of the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, generally common and widely distributed habitats or species which do not fall within the following categories were scoped out of the detailed assessment:

- Habitats listed in Annex I to the Habitats Directive, and species listed in Annex II to the Habitats Directive;
- Biodiversity Action Plan (UKBAP) or Scottish Biodiversity List (SBL) Priority Habitats; and
- habitats or species protected by other legislation such as The Wildlife and Countryside Act 1981 (as amended), the Nature Conservation (Scotland) Act 2004 (as amended), or The Protection of Badgers Act 1992.

Further ecological features and effects have been scoped out of the detailed assessment based on the results of the desk-based study and survey work undertaken for the Proposed Development, due to a lack of potential significant effect at a relevant species population or habitat extent scale. Details of ecological features and effects scoped out after further data searches and post-survey are provided in **Section 7.5.1**.

7.3.4 Study Area / Survey Area

The area within which the desk-based research and field surveys were undertaken varies depending on the ecological feature and its search/survey requirements. Details of the extents are described in the relevant sections of **Section 7.4 Baseline Conditions** in this Chapter and associated **Technical Appendix A7.1: NVC and Habitats Survey to A7.4: Electrofishing Survey Report** and their respective Figures. Hereafter in this Chapter, the areas covered by field surveys are termed the 'survey area' and these same areas which are considered as part of the assessment process are then collectively referred to as the 'Study Area'.

7.3.5 Baseline Survey Methodology

7.3.5.1 Desk Study

A desk study was undertaken to collate available ecological information in relation to the Proposed Development and surrounding environment. This comprised a search of available online datasets and desk study resources and consultation with other organisations. The following data sources were considered as part of the determination of scope of baseline surveys and assessment:

- National Biodiversity Network (NBN) Atlas Scotland¹³³ for protected or notable species records within a 5 km buffer of the Proposed Development from the last 15 years (i.e., 2007 and onwards);
- NatureScot Sitelink¹³⁴ for designated site information within 5 km of the Proposed Development;

¹³³ <https://scotland.nbnatlas.org> [Accessed February 2023].

¹³⁴ <https://sitelink.nature.scot/map> [Accessed February 2023].

- Scotland's Environment map¹³⁵ for the Carbon and Peatland Map 2016 and Ancient Woodland Inventory (AWI) sites within 5 km of the Proposed Development;
- Saving Scotland's Red Squirrels website¹³⁶ for local species records and Priority Areas for Red Squirrel Conservation;
- SEPA Water Environment Hub¹³⁷ for watercourse classifications;
- Deer Distribution Survey results by the British Deer Society¹³⁸;
- Baseline information published in the course of other nearby wind development applications; and
- Relevant scientific literature on protected species' distribution, habitats distribution and conservation status etc.

The Nith Catchment Fishery Trust (NCFT) and NDSFB were also consulted to determine whether they hold any fisheries data or information for watercourses or lochans within the catchment of the Site.

7.3.5.2 Field Surveys

The following field surveys were undertaken to further establish the baseline ecological conditions at the Site (plus appropriate buffers where relevant) to inform the assessment, and were undertaken in line with standard methodologies and best practice guidance:

- National Vegetation Classification (NVC) surveys, incorporating Phase 1 habitat characterisation (August 2021, August 2022, October 2022, December 2022, February 2023);
- Protected species surveys (August 2021, August 2022, October 2022, December 2022, February 2023) focusing on badger (*Meles meles*), red squirrel (*Sciurus vulgaris*), water vole (*Arvicola amphibius*), otter (*Lutra lutra*), and pine marten (*Martes martes*);
- Preliminary bat roost assessments (August 2021, August 2022, October 2022, December 2022, February 2023);
- Bat automated activity surveys (May to September 2020);
- Electrofishing surveys (September 2021); and
- Incidental records of other protected species (e.g., newt species), or potential hibernacula (for reptiles), notable species, or invasive non-native species, were also recorded during field surveys.

The full details of survey methods, species-specific legislation and results are provided within **Technical Appendix A7.1: NVC and Habitats Survey to A7.4: Electrofishing Survey Report**.

Surveys for beaver (*Castor fiber*), wildcat (*Felis silvestris*) and great crested newt (*Triturus cristatus*) were scoped out due to species being outwith the known species range and a lack of suitable habitat.

7.3.6 Methodology for the Assessment of Effects

The significance of the potential effects has been assessed for the Proposed Development considering the spatial and temporal magnitude of the potential impacts and the sensitivity of important ecological features (IEFs).

¹³⁵ www.environment.gov.scot/maps/scotlands-environment-map/ [Accessed February 2023]

¹³⁶ <https://scottishsquirrels.org.uk/squirrel-sightings/> [Accessed March 2023].

¹³⁷ www.sepa.org.uk/data-visualisation/water-environment-hub/ [Accessed March 2023].

¹³⁸ www.bds.org.uk/index.php/research/deer-distribution-survey [Accessed February 2023].

The assessment method follows the process set out in The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, CIEEM (2018¹³⁹), and guidance on the implementation of the EU Birds and Habitats Directive (SERAD, 2001¹⁴⁰).

The evaluation for wider countryside interests (i.e., unrelated to any Natura 2000 sites) involves the following process:

- identification of the potential effects of the Proposed Development on ecological features, including both beneficial and adverse;
- considering the likelihood of occurrence of potential effects;
- defining the nature conservation value of the ecological features present;
- establishing the feature's conservation status;
- establishing the magnitude of change associated with the potential effect (both spatial and temporal);
- based on the above information, making a professional judgement as to whether or not the resultant effect is significant in terms of the EIA Regulations;
- if a potential effect is determined to be significant, measures to avoid, reduce, mitigate or compensate for the effect are suggested where required;
- considering opportunities for enhancement where appropriate; and
- confirming residual effects after mitigation, compensation or enhancement are considered.

7.3.6.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or close to the Site or the sensitivity of potentially affected features, will be assessed in line with best practice guidance, legislation, statutory designations and/or professional judgement.

Determination of the level of sensitivity of an Important Ecological Feature (IEF) is based on a combination of the feature's nature conservation value and conservation status.

Nature conservation value is defined on the basis of the geographic context given in **Table 7.2** (which follows CIEEM guidance).

Determination of the level of importance of ecosystems, habitats and species is based on professional judgement and a combination of factors, such as level of protection, rarity, conservation status, population trends, and quality/extent of the feature in the Study Area. Published evaluation criteria (e.g., the Scottish Biodiversity List (SBL)¹⁴¹, JNCC guidelines on selection of biological SSSIs¹⁴²) are used where relevant.

Attributing a value to an ecological feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of an importance level. For example, a Special Area of Conservation (SAC) designated under the Habitats Directive is implicitly of European (International) importance. In the case of species, assigning value is less straightforward as contextual information about distribution and abundance is fundamental, including trends based on historical records. This means that even though a species may be protected through legislation at a national or international level, the relative value of the population on site may be quite different (e.g., the site population may consist of a single transitory animal, which within the context of a thriving

¹³⁹ CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. [Accessed March 2023]

¹⁴⁰ SERAD (2001). European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements. [Accessed March 2023]

¹⁴¹ <https://www.nature.scot/doc/scottish-biodiversity-list> [Accessed March 2023]

¹⁴² JNCC (2019). Guidelines for selection of biological Sites of Special Scientific Interest (SSSI). [Accessed March 2023]

local/regional/national population of a species, is therefore of local or regional value rather than national or international).

As per CIEEM guidance, it is not necessary to carry out detailed assessment on features that are sufficiently widespread, unthreatened, and resilient to effects of the Proposed Development. Ecological features affected by the Proposed Development and deemed to be of at least Local importance are termed IEFs and are taken forward for assessment.

Table 7.2 Approach to Valuing Ecological Features

Value of Feature in Geographical Context	Description
International	An internationally designated site (e.g., SAC).
	Site meeting criteria for international designations or qualifying species of an SAC where there is connectivity.
	Species present in internationally important numbers (>1% of biogeographic populations).
National (UK)	A nationally designated site (SSSI, or a National Nature Reserve (NNR)), or sites meeting the criteria for national designation or qualifying species where there is connectivity.
	Species present in nationally important numbers (>1% UK population).
Regional (Natural Heritage Zone or Local Authority Area)	Species present in regionally important numbers (>1% of Natural Heritage Zone population).
	Areas of habitat falling below criteria for selection as a SSSI (e.g., areas of semi-natural ancient woodland larger than 0.25 ha).
Local	Local Nature Reserves (LNR).
	Areas of semi-natural ancient woodland smaller than 0.25 ha.
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g., species-rich flushes or hedgerows.
Negligible	Usually widespread and common habitats and species that do not meet the above criteria. Features falling below local value are not normally considered in detail in the assessment process.

7.3.6.2 Magnitude of Effect

Effect magnitude refers to changes in the extent and integrity of an ecological feature. A suitable definition of ecological 'integrity' is found within Scottish Executive circular 6/1995 updated by Scottish Executive (2000¹⁴³) which states that "The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified". Although this definition is used specifically regarding European level designated sites (SACs and SPAs), it is applied to wider countryside habitats and species for the purposes of this assessment.

The magnitude of potential effects will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, how the ecological features are likely to respond to the Proposed Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation. This change can occur during construction or operation of the Proposed Development, and effects can be beneficial, adverse or neutral.

Effects are judged in terms of magnitude in space and time. There are five levels of spatial effects and five levels of temporal effects as described in **Table 7.3** and **Table 7.4**.

¹⁴³ Scottish Executive (2000). 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. [Accessed March 2023]

Table 7.3 Definition of Spatial Effect Magnitude upon the IEFs

Magnitude of Effects	Definition
Very High	Would cause the loss of the majority of a feature (>80%) or would be sufficient to damage a feature sufficient to immediately affect its viability.
High	Would have a major effect on the feature or its viability. For example, more than 20% habitat loss or damage.
Moderate	Would have a moderate effect on the feature or its viability. For example, between 10 – 20% habitat loss or damage.
Low	Would have a minor effect upon the feature or its viability. For example, less than 10% habitat loss or damage.
Negligible	Minimal change on a very small scale; effects not dissimilar to those expected within a 'do nothing' scenario.

Table 7.4 Definition of Temporal Effect Magnitude upon the IEFs

Magnitude of Effects	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken here as 26+ years), except where there is likely to be substantial improvement after this period in which case the category Long Term may be more appropriate.
Long term	Between 15 years up to (and including) 25 years.
Medium term	Between 5 years up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.
Negligible	No effect.

7.3.6.3 Cumulative Assessment

NatureScot cumulative assessment guidance¹⁴⁴ is used to inform the cumulative assessment in this Chapter. Cumulative effects require the assessment of effects of the Proposed Development in combination with other developments, projects or activities. In the interests of focusing on the potential for significant effects, this assessment considers the potential for cumulative effects with other onshore wind farm EIA developments. The context in which these effects are considered is heavily dependent on the ecology of the feature assessed. For example, for water voles it may be appropriate to consider effects specific to individual catchments, should the distance between neighbouring catchments be sufficient to assume no movement of animals between them, whereas for blanket bog the region/Natural Heritage Zone (NHZ) may be the relevant spatial scale. Therefore, where it is considered necessary, an assessment of cumulative effects will be made for each feature, appropriate to its ecology.

7.3.6.4 Significance of Effect

The significance of potential effects is determined through a standard method of assessment based on professional judgement and available evidence, considering the sensitivity (nature conservation value and conservation status) of the IEF and the nature and magnitude of effect, in a reasoned way.

A significant effect is an effect that either supports or undermines biodiversity conservation objectives. Significant effects include those which result from impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)¹¹.

Table 7.5 details the significance criteria that have been used in assessing the effects of the Development.

¹⁴⁴ NatureScot (2021). Guidance - Assessing the cumulative landscape and visual impact of onshore wind energy developments (update to 2012 guidance). [Online] Available at: <https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments> [Accessed March 2023]

Table 7.5 Significance Criteria

Significance of Effect	Description
Major	Significant effect, as the effect is likely to result in a long term significant adverse effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitat and species.
Moderate	Significant effect, as the effect is likely to result in a medium term or partially significant adverse effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitats and species.
Minor	The effect is likely to adversely affect the feature at an insignificant level by virtue of its limited duration and/or extent, but there will probably be no effect on the structure and function of defined sites, habitats or ecosystems or on the conservation status of habitats and species. The level of effect would be Minor and Not Significant.
Negligible	No material effect. The effect is assessed to be Not Significant.

7.3.7 Assessment Limitations

Limitations exist regarding the knowledge base on how some species, and the populations to which they belong, react to impacts. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. The ecological surveys undertaken for the Proposed Development have not therefore produced a complete list of plants and animals and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

No notable limitations were experienced with regards to habitats, protected species, bats or fisheries field surveys (see **Technical Appendix A7.1: NVC and Habitats Survey to A7.4: Electrofishing Survey Report** for full details).

Whilst some generic limitations have been identified, it is considered that there is sufficient information to enable a robust assessment of potential effects on ecological features.

7.3.8 Embedded Mitigation

7.3.8.1 Iterative Design Process

As part of the iterative design process for the Proposed Development, ecological constraints identified through baseline survey results were considered to avoid or reduce adverse effects on ecological features where possible (see **Chapter 3: Site Selection and Design**). This involves:

- A minimum 50 m buffer for any infrastructure or construction activity around all watercourses, except where a minimum number of watercourse crossings are required or as a result of other design restrictions. This will minimise effects on associated habitats and species;
- The track length and alignment has been designed to reduce the extent of new track and number of watercourse crossings required, where feasible considering the topography of the Site;
- Avoidance of deeper peatland (>1 m), blanket bog and wet modified bog, and potential high GWDTEs, for the location of turbines and other infrastructure as far as practicable;
- A minimum 30 m buffer for any infrastructure or construction activity (100 m for pile driving and blasting works) around the entrance to any badger sett; and
- A minimum 200 m buffer for any infrastructure or construction activity from any otter holt.

7.3.8.2 Pre-construction & Construction

The assessment in this EIA Report has been undertaken on the basis that all works would be carried out in accordance with industry good practice construction measures, guidance and legislation.

To ensure all reasonable precautions are taken to avoid adverse effects on habitats, protected species and aquatic interests, a suitably qualified Ecological Clerk of Works (ECoW) will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological matters. The ECoW will be required to be present onsite during the construction phase and will carry out monitoring of works and briefings with regards to any ecological sensitivities on the Site to the relevant staff of the Principal Contractor and subcontractors.

A Species Protection Plan (SPP) (outline provided in **Technical Appendix A7.5: Outline Species Protection Plan**) will be implemented during the construction and decommissioning phases. The SPP details measures to safeguard protected species known or likely to be in the area. The SPP includes pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new protected species in the vicinity of the construction works. The results of the pre-construction surveys will be used to update the outline SPP (**Technical Appendix A7.5: Outline Species Protection Plan**) ahead of construction starting. The SPP will remain a live document to be updated as required and in agreement with the ECoW where changes to the distribution and status of protected species and features are recorded.

Any micro-siting of infrastructure will be based on a review of existing ecological data and the completion of pre-construction surveys, to take into consideration the potential for direct encroachment onto protected species features, sensitive habitats or GWDTEs, or indirect alteration of hydrological flows supporting sensitive habitats or GWDTEs. Any micro-siting will also take consideration of any buffer distances on protected features identified, as detailed within the SPP (**Technical Appendix A7.5: Outline Species Protection Plan**).

There would be a contractual management requirement for the successful Principal Contractor to develop and fully implement a comprehensive and site-specific robust Construction Environmental Management Plan (CEMP). This document would detail how the successful Principal Contractor would manage the works in accordance with all commitments and mitigation detailed in the EIA Report, the SPP, statutory consents and authorisations, and industry good practice and guidance for environmental management, including implementation of appropriate pollution prevention (particularly in relation to watercourses; an outline Water Construction Environment Management Plan (oWCEMP) is included in **Technical Appendix A11.2: Outline Water Construction Environmental Management Plan**).

7.3.8.3 Operation

In line with best practice guidance on bats¹⁴⁵ the Proposed Development would utilise the method of reduced rotation speed whilst idling by feathering, at all turbines, to reduce collision risks to bats during the bat active period (April to October). The guidance notes that, "The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%". Given the known presence of high collision risk bat species onsite, this measure will be put in place from the start of the operational period of the Proposed Development and does not result in any loss of output.

7.4 Baseline Conditions

This Section details the results of the desk study and field surveys, providing the ecological baseline for the Site and Study Area, and includes:

¹⁴⁵ NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2019, with minor updates 2021). Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation. (Accessed March 2023)

- statutory nature conservation designated sites (not including those designated for only ornithological or geological features);
- desk study results;
- habitats and vegetation; and
- protected or notable species.

7.4.1 Desk Study

7.4.1.1 Designated Sites

There are no statutory designated sites within the Site. There is one SAC and three SSSIs within 5 km of the Red Line Boundary that contain ecological qualifying interests (non-avian). Details of these sites are listed in **Table 7.6** and shown in **Figure 7.1**.

Table 7.6 Ecological Designated Sites within 5 km of the Site

Site Name	Distance to Site	Qualifying Interests	Status
Upper Nithsdale Woods SAC	2.6 km	Mixed woodland on base-rich soils associated with rocky slopes	Unfavourable Declining 09/11/2009
Back Wood SSSI	2.6 km	Upland oak woodland	Unfavourable Declining 08/10/2009
Mennoch Water SSSI	2.9 km	Fen meadow	Favourable Maintained 27/06/2016
		Upland oak woodland	Favourable Maintained 02/06/2014
North Lowther Uplands SSSI	3.6 km	Upland (habitat) assemblage	Unfavourable Recovering 31/05/2015

Designated sites situated downstream of watercourses associated with the Development but outwith 5 km were also considered from a fisheries perspective. Solway Firth SAC is situated approximately 47 km downstream of the Development at the mouth of the River Nith. River lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*) are qualifying features.

7.4.1.2 Ancient Woodland

One area of ancient woodland (as listed within the AWI) is partially within the Site, and there are numerous areas within 5 km, including some immediately adjacent to the Red Line Boundary (**Figure 7.1**). NPF4, policy 6⁷¹, states that: *'Development proposals will not be supported where they will result in...Any loss of ancient woodlands, ancient and veteran trees, or adverse impact on their ecological condition...'*.

7.4.1.3 Local Biodiversity Action Plan

The Proposed Development falls within the area covered by the Dumfries and Galloway Local Biodiversity Action Plan. The plan aims to conserve and enhance biodiversity at the landscape scale and incorporates Local Habitat Action Plans of which Upland Springs and Flushes, Peatland, Grassland and Heathland, Forest and Farmland habitats can be found within the Site. The plan highlights the threat posed by invasive non-native species (INNS) including sika deer (*Cervus nippon*), grey squirrel (*Sciurus carolinensis*), mink (*Neovison vison*), North American Signal Crayfish (*Pacifastacus leniusculus*), Rhododendron (*Rhododendron ponticum*) and Japanese Knotweed (*Fallopia japonica*).

7.4.1.4 Galloway and South Ayrshire Biosphere

The Proposed Development falls within the Galloway and South Ayrshire Biosphere, a 5268 km² area based on the catchments of rivers flowing out of the Galloway Hills. Rivers, ancient woodlands and peatlands are listed as some of the habitats of interest within the Biosphere. Red squirrel (*Sciurus vulgaris*), water vole (*Arvicola amphibius*), brown trout (*Salmo trutta*), juniper (*Juniperus communis*) and downy willow (*Salix lapponum*) are listed as high focus habitats and species. Blanket bog, upland heathlands, purple moor grass (*Molinia caerulea*) and rush pasture, montane heath and montane scrub, native upland oak woodland, acid grassland and oligotrophic lochs are listed as high focus habitats.

7.4.1.5 Habitats

Terrestrial Habitats

The Site falls within an upland area and contains habitats consistent with this.

The Carbon and Peatland Map 2016 was consulted to determine likely peatland classes present. The map is a predictive tool that provides an indication of the likely presence of peat at a coarse scale. The Carbon and Peatland map has been developed as “a high-level planning tool to promote consistency and clarity in the preparation of spatial frameworks by planning authorities”¹⁴⁶. It identifies areas of “nationally important carbon-rich soils, deep peat and priority peatland habitat”¹⁴⁷ as Class 1 and Class 2 peatlands. Class 1 peatlands are also “likely to be of high conservation value” and Class 2 “of potentially high conservation value and restoration potential”.

According to this predictive tool and map, the Site contains a small amount of Class 1 peatland within the south-eastern area around Corridow Hill, with an area of Class 2 peatland around Whing Head and east and north of Corridow Hill (**Figure 7.2**). The Site is predominantly made up of Class 3¹⁴⁸ and some Class 5¹⁴⁹ soils.

As the Carbon and Peatland Map is a high-level tool, detailed habitat and peat depth surveys have been carried out across the Site to inform siting, design and mitigation and the detailed assessment on peatland and associated habitats. The results of the habitat surveys are discussed below, and the results of the peat depth surveys are presented and discussed in **Chapter 11: Hydrology and Soils** and associated Appendices.

Aquatic Habitats

Watercourses within the Site form tributaries to Euchar Water, a river which has been classified by SEPA as part of their Water Framework Directive (WFD) classification, and was assessed in 2014 as having Good overall condition, High access for fish migration, freedom from invasive species, water flows and levels, and Good water quality and physical condition⁹.

The River Nith, downstream of the confluence with Euchar Water, forms the wider catchment for the Site. The Dumfries-Sanquhar section of the River Nith was assessed in 2014 as having Moderate overall condition, with High freedom from invasive species and water flows and levels, Good access for fish migration, and Moderate water quality and physical condition. The River Nith faces pressure from modification to bed, banks and shores and diffuse source pollution⁹.

¹⁴⁶ <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map> [Accessed March 2023].

¹⁴⁷ Priority peatland habitat is land covered by peat-forming vegetation or vegetation associated with peat formation.

¹⁴⁸ Class 3 - Predominantly peaty soil with some peat soil – Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type.

¹⁴⁹ Class 5 - Soil information takes precedence over vegetation data. No peatland habitat recorded.

7.4.1.6 Protected Species (non-avian)

Data from the NBN Atlas Scotland⁵ obtained as part of the desk-study indicated that the following protected species have been recorded within 5 km of the Site within the last 15 years (10 km used for bats species) (data licences and providers are detailed in **Technical Appendices A7.2: Protected Species Survey and A7.3: Bat Survey Report**):

- Brown hare (*Lepus timidus*);
- Red squirrel;
- Hedgehog (*Erinaceus europaeus*); and
- Bats: brown long-eared (*Plecotus auritus*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Daubenton's (*Myotis daubentonii*), Leisler's (*Nyctalus leisleri*) and Natterer's (*Myotis nattereri*).

Sightings reported to Saving Scotland's Red Squirrels⁸ suggest that both red and grey squirrels can be found in the area surrounding the Site, with sightings of both species recorded in all years since 2010.

A red squirrel sighting was noted within a conifer plantation (Brown Hill) surveyed as part of baseline information for Twentyshilling Hill Wind Farm¹⁵⁰, which lies close to the Site.

Baseline surveys carried out to inform the Twentyshilling Hill Wind Farm application²³, with which the Development shares a portion of access track, noted that the land around the access track had suitability for badger foraging. The River Nith and associated riparian habitats were noted as offering suitability for otter and bat.

Bat species recorded in the course of static bat activity surveys to inform the assessment for Twentyshilling Hill Wind Farm²³ were soprano pipistrelle, common pipistrelle, Daubenton's bat, noctule, *Myotis* sp., *Nyctalus* sp., and brown long-eared bat.

7.4.1.7 Other Species

Deer

Deer are not included in the assessment from a nature conservation perspective but are considered due to potential welfare issues.

The results of the Deer Distribution Survey¹⁰ suggested that red and roe deer may be present in the area around the Site, with both species confirmed as present in 2016, having also been recorded in 2007 and/or 2011.

Fisheries

The Site falls within the River Nith catchment, which is in the jurisdictional area of the NDSFB¹⁵¹. The River Nith supports stocks of Atlantic salmon (*Salmo salar*) and brown/sea trout (*Salmo trutta*). In the vicinity of the Site the NDSFB also note lamprey are present but freshwater pearl mussel (*Margaritifera margaritifera*) are not known to be present. The NDSFB also state the Euchar Water is a difficult tributary for fish to migrate due to a number of difficult barriers to migration; however, despite this, there are fish present from the confluence of the River Nith and Euchar Water all the way up to its headwaters.

The NCFT states that the River Nith acts as a nursery ground for Atlantic salmon, sea trout, sea lamprey and river lamprey, and also supports populations of grayling (*Thymallus thymallus*), non-

¹⁵⁰ Element Power Northern Europe Development Limited (2013). Twentyshilling Hill Wind Farm Environmental Statement. Section 7: Ecology.

¹⁵¹ <https://www.river-nith.com/> [Accessed March 2023]

migratory brown trout, brook lamprey (*Lampetra planeri*), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*) and stickleback (*Gasterosteus aculeatus*)¹⁵².

Invasive Non-Native Species (INNS)

INNS are a threat to biodiversity and there is a legal obligation to control their spread.

As per **Section 7.4.1.6** grey squirrel has been recorded locally.

The NCFT¹⁵³ has reported records of non-native riparian plants within the River Nith catchment; Japanese knotweed (*Fallopia japonica*), giant hogweed (*Heracleum mantegazzianum*), Himalayan balsam (*Impatiens glandulifera*) and American skunk-cabbage (*Lysichiton americanus*).

The NDSFB have also stated mink have been recorded in the vicinity of the Site.

7.4.2 Field Surveys

Details regarding field survey methodologies, survey timings, survey area extents, and detailed results are included within **Technical Appendix A7.1: NVC and Habitats Survey to A7.4: Electrofishing Survey Report**. The following Sections summarise the baseline conditions as identified during these surveys.

7.4.2.1 Habitats

National Vegetation Classification (NVC) and Phase 1

Technical Appendix A7.1: NVC and Habitats Survey Report presents the detailed descriptions of habitats from the surveys. The habitats are shown on **Figures 7.3a-g** which display all data collected during surveys (in some areas the survey area extended beyond the Site boundary due to design iterations)¹⁵⁴.

The habitat extents provided and discussed below relate only to those within the Red Line Boundary (i.e., the habitats Study Area) as these form the baseline conditions and the basis for the assessment of potential effects and habitat loss.

The NVC data collected across the survey and Study Area were cross-referenced to the Phase 1 Habitat Survey Classification¹⁵⁵ to allow a broader characterisation of habitats. The extent of Phase 1 habitat types within the Study Area was calculated using the Site-specific correlation of NVC communities to their respective Phase 1 types (see **Table 7.7** and **Technical Appendix A7.1: NVC and Habitats Survey Report** for details), and their extents mapped within ArcGIS software, including within mosaic areas.

The results of this analysis for the Site (i.e., Study Area) are summarised in order of Phase 1 type in **Table 7.7**. The Phase 1 symbology shading in **Figure 7.3** has been used to broadly characterise stands of vegetation based on the dominant NVC community within a particular area¹⁵⁶.

As shown in **Table 7.7**, the surveys concluded that marshy grassland dominates the Site and Study Area, followed by unimproved acid grassland and wet modified bog. Within and around these areas

¹⁵² <https://www.river-nith.com/the-trust/conservation/> [Accessed March 2023]

¹⁵³ <https://www.river-nith.com/the-trust/invasive-species/> [Accessed December 2022]

¹⁵⁴ The habitats survey area covered 964.39 hectares (ha) as per Figure 7.3, whereas the Site area encompassed by the Red Line Boundary covers 804 ha – the 804 ha constitutes the habitats Study Area within this assessment.

¹⁵⁵ Joint Nature Conservancy Council. (2010). Handbook for phase 1 habitat survey – a technique for environmental audit. JNCC, Peterborough. [Accessed March 2023]

¹⁵⁶ The Phase 1 characterisation has been utilised to allow a broader visual representation of the habitats within the survey area. Polygons or areas where there are mosaic NVC communities have generally been assigned a single Phase 1 classification based on the dominant NVC type (despite some polygons containing multiple Phase 1 types, often in low percentages). Therefore, the Phase 1 characterisation is generally a broader overview, and the NVC data should be referred to for further detail in any specific area.

are patches and pockets of other habitat types such as bracken, semi-natural woodland, improved grassland, and blanket bog.

Table 7.7 Phase 1 Habitat Types within the Site/Study Area

Phase 1 Habitat	Corresponding NVC Types & Other Habitats Recorded	Area (ha)	% of Site / Study Area
A1.1.1 Broadleaved Semi-Natural Woodland	W9 <i>Fraxinus excelsior</i> – <i>Sorbus aucuparia</i> – <i>Mercurialis perennis</i> woodland W11 <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland	3.06	0.38
A1.1.2 Broadleaved Plantation Woodland	BP Broadleaved Plantation (non-NVC type) YBP Young Broadleaved Plantation (non-NVC type) W11(p) ¹⁵⁷ <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Oxalis acetosella</i> woodland W17(p) ¹⁵⁷ <i>Quercus petraea</i> – <i>Betula pubescens</i> – <i>Dicranum majus</i> woodland	3.86	0.48
A1.2.2 Coniferous Plantation Woodland	CP Coniferous Plantation (non-NVC type) YCP Young Coniferous Plantation (non-NVC type)	0.33	0.04
B1.1 Unimproved Acid Grassland	U4 <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland U5 <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland U6 <i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland Cn <i>Carex nigra</i> dominant acid grassland (non-NVC type)	145.90	18.15
B1.2 Semi-Improved Acid Grassland	U4b <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland <i>Holcus lanatus</i> – <i>Trifolium repens</i> sub-community	9.26	1.15
B2.1 Unimproved Neutral Grassland	MG1 <i>Arrhenatherum elatius</i> grassland MG9 <i>Holcus lanatus</i> – <i>Deschampsia cespitosa</i> grassland	0.22	0.03
B4 Improved Grassland	MG6 <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland	16.67	2.07
B5 Marsh/Marshy Grassland	MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush-pasture M23 <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush-pasture M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire M25b <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire <i>Anthoxanthum odoratum</i> sub-community Je <i>Juncus effusus</i> acid grassland community (non-NVC type) Ja <i>Juncus acutiflorus</i> acid grassland community (non-NVC type)	421.17	52.39
C1.1/C1.2 Bracken – Continuous/Scattered	U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community	20.06	2.49
C3.1 Tall Ruderal	OV25 <i>Urtica dioica</i> – <i>Cirsium arvense</i> community OV27 <i>Chamerion angustifolium</i> community	0.10	0.01
D1.1 Dry Dwarf Shrub Heath – Acid	H9 <i>Calluna vulgaris</i> – <i>Deschampsia flexuosa</i> heath	0.06	0.01
D2 Wet Dwarf Shrub Heath	M15 <i>Trichophorum germanicum</i> – <i>Erica tetralix</i> wet heath	16.78	2.09
E1.6.1 Blanket Bog	M3 <i>Eriophorum angustifolium</i> bog pool community M17 <i>Trichophorum germanicum</i> – <i>Eriophorum vaginatum</i> blanket mire	23.20	2.89
E1.7 Wet Modified Bog	M20 <i>Eriophorum vaginatum</i> blanket mire M25a <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire <i>Erica tetralix</i> sub-community	117.07	14.56

¹⁵⁷ The '(p)' denotes planted stands that are broadly referable to the corresponding NVC type, either in planted tree species composition or field layer, or both.

Phase 1 Habitat	Corresponding NVC Types & Other Habitats Recorded	Area (ha)	% of Site / Study Area
E2.1 Acid/Neutral Flush	M4 <i>Carex rostrata</i> - <i>Sphagnum fallax</i> mire M6 <i>Carex echinata</i> - <i>Sphagnum fallax/denticulatum</i> mire	22.62	2.81
E2.2 Basic Flush	M10 <i>Carex dioica</i> - <i>Pinguicula vulgaris</i> mire	<0.001	<0.001
E4 Bare Peat	ExP Exposed Peat (non-NVC type)	0.26	0.03
G2 Running Water	RW Running Water (non-NVC type)	0.28	0.03
J3.6 Buildings	BD Buildings (non-NVC type)	<0.001	<0.001
J4 Bare Ground	BG Bare Ground, Tracks, Hardstandings etc (non-NVC type)	3.07	0.38
Total Area		803.95	100

The NVC communities and non-NVC types recorded within the Site are provided in **Table 7.8** and include proportions of particular habitat types that are found within the Site, including those within mosaic habitats. Full descriptions of the habitats, NVC communities and associated flora of the Site and wider survey area are provided in **Technical Appendix A7.1: NVC and Habitats Survey Report**.

Table 7.8 Summary of NVC Communities Recorded within the Site/Study Area

NVC/Non-NVC Codes Recorded	Site Extent (ha)	% of Site	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat
Mires & Wet Heath					
M3	0.02	<0.01	-	7130 Blanket bogs (examples associated with M17-M20)	Blanket bog
M4	0.15	0.02	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6c, M6d	22.47	2.80	High	-	Upland flushes, fens and swamps
M10a	<0.001	<0.001	High	7230 Alkaline fens	Upland flushes, fens and swamps
M15b, M15d	16.78	2.09	Moderate	4010 Northern Atlantic wet heaths with <i>Erica tetralix</i>	Upland heathland
M17, M17a, M17c	23.19	2.88	-	7130 Blanket bogs	Blanket bog
M20, M20a, M20b	57.23	7.12	-	7130 Blanket bogs	Blanket bog
M23a, M23b	282.34	35.12	High	-	Upland flushes, fens and swamps (applies to M23a only)
M25, M25a, M25b	187.54	23.33	Moderate	-	Blanket bog (where peat depth >0.5m; applies to M25a only)
Dry Heaths					
H9c	0.06	0.01	-	4030 European dry heaths	Upland heathland
Calcifugous Grasslands & Bracken					

NVC/Non-NVC Codes Recorded	Site Extent (ha)	% of Site	Potential GWDTE Status	Annex I Habitat	SBL Priority Habitat
U4, U4a, U4b, U4d	84.06	10.46	-	-	-
U5, U5a	50.31	6.26	-	-	-
U6	17.84	2.22	Moderate	-	-
U20, U20a	20.06	2.49	-	-	-
Mesotrophic Grasslands					
MG1, MG1a	0.12	0.01	-	-	-
MG6	16.67	2.07	-	-	-
MG9	0.10	0.01	Moderate	-	-
MG10a	4.98	0.62	Moderate	-	-
Woodland & Scrub					
W9	0.98	0.12	-	9180 Tilio-Acerion forests	Upland mixed ashwoods
W11, W11(p) ¹⁵⁷	5.9	0.73	-	91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles ¹⁵⁸	Upland oakwoods ¹⁵⁸
W17(p) ¹⁵⁷	0.01	<0.01	-	-	-
Vegetation of Open Habitats					
OV25	<0.001	<0.001	-	-	-
OV27	0.097	0.01	-	-	-
Non-NVC Types					
BG	3.071	0.38	-	-	-
BP & YBP	0.01	0	-	-	-
CP & YCP	0.33	0.04	-	-	-
Cn	1.13	0.14	-	-	-
Je	6.043	0.75	Moderate	-	-
Ja	0.114	0.01	Moderate	-	-
RW	0.280	0.03	-	-	-
TOTAL	804	100			

As detailed in **Table 7.7** and **Table 7.8**, the Site contains a wide variety of habitat types, although many are only present in very small and scattered extents. The only habitat types that have subsequently been scoped-in to the assessment of effects due to their extent and nature conservation value are blanket bog and wet modified bog. Detailed descriptions of these habitat types are included in **Technical Appendix A7.1: NVC and Habitats Survey Report**.

Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

The NVC results were referenced against SEPA guidance¹⁵⁹ to identify those habitats which may be classified, depending on the hydrogeological setting, as being potentially groundwater dependent. Potential GWDTE NVC communities recorded within the survey area are identified in **Table 7.8** (and

¹⁵⁸ Does not apply to W11(p).

¹⁵⁹ SEPA (2017). Land Use Planning System Guidance Note 4 - European Commission, Directorate-General for Environment (2010) and SEPA (2017). Land Use Planning System Guidance Note 31 – Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. . [Accessed March 2023]

Table 6-1 of Technical Appendix A7.1: NVC and Habitats Survey Report) and shown on **Figure 7.4a-g**.

GWDTE sensitivity has been assigned solely on the SEPA listings. However, many of the NVC communities on the list are common habitat types across Scotland and generally of low nature conservation value. Furthermore, depending on several factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependant on groundwater. Because designation as a potential GWDTE is related to groundwater dependency and not nature conservation value, GWDTE status has not been used as criteria to determine a habitat's nature conservation value and similarly does not factor in the identification of IEFs within ecological impact assessments. There is however a requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment in **Chapter 11: Hydrology and Soils**.

Annex I Habitats

Many NVC communities can also correlate with various Annex I habitat types listed under the Habitats Directive. The fact that an NVC community can be attributed to an Annex I type however does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its status can depend on various factors such as quality, extent, species assemblages, geographical setting, and substrates.

NVC survey data and field observations have been compared to JNCC Annex I habitat listings and descriptions¹⁶⁰. Those habitats within the Site which could be considered Annex I habitats are included in **Table 7.8** (and **Table 6-2 of Technical Appendix A7.1: NVC and Habitats Survey Report**).

Scottish Biodiversity List Habitats

The SBL¹⁶¹ is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland: these are termed 'priority habitats'. Some of these priority habitats are quite broad and can correlate to many NVC types.

Relevant SBL priority habitat types and corresponding associated NVC types recorded within the Site are summarised in **Table 7.8** above.

These SBL priority habitats correspond with UK Biodiversity Action Plan (BAP) Priority Habitats¹⁶².

7.4.2.2 Protected Species (non-avian)

This section outlines the results from the protected species surveys. Detailed methodologies, survey timings, and results, including the legal status of each species, are included within **Technical Appendix A7.2: Protected Species Survey** and **Technical Appendix A7.4: Electrofishing Survey Report** and their associated annexes. Results are presented in **Figures 7.5 to 7.10**.

Badger

Signs of badger were recorded within Ulzieside Plantation, which formed part of the survey area at the time of the surveys. Subsequent design iterations mean that these signs are no longer within the Red Line Boundary and are not within 100 m of any proposed infrastructure.

¹⁶⁰ <https://sac.jncc.gov.uk/habitat/> [Accessed December 2022].

¹⁶¹ <https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list> [Accessed December 2022].

¹⁶² <http://jncc.defra.gov.uk/page-5718> [Accessed December 2022].

Bats

This section provides a summary of the field surveys and associated results for bats. Full details are contained within **Technical Appendix A7.3: Bat Activity Analysis**.

Preliminary Bat Roost Assessment

Surveys recorded 23 trees (single or grouped) and four buildings within the survey area that were assessed as having some suitability for roosting bats; ten with high suitability, five moderate and 11 low (**Figure 7.6**).

Seven of these features (all trees) are within the Red Line Boundary for the Proposed Development (six of low potential and one of high). No features with moderate or high suitability for roosting bats were recorded within 200 m plus rotor radius of a proposed wind turbine location, and no features are within 30 m of other proposed new infrastructure. There are six features (five trees and one building) with high suitability for roosting bats and four trees with moderate roosting suitability along the minor public road from Eliock Bridge to the Site entrance at Ulzieside Farm.

Automated Activity Surveys

Static bat activity surveys involved the deployment of 12 detectors onsite between May and September 2020 over a total period of 42 days, covering spring, summer and autumn and up to a maximum of 15 consecutive nights per season. This resulted in 472 associated data recording nights. Anabat locations are detailed on **Figure 7.6**.

Bats were detected on 36 of the 42 survey nights, with 578 bat registrations in total (**Table 7.9**). The surveys recorded three bat species and two genus classifications in total: common pipistrelle, soprano pipistrelle, Natterer's bat, *Nyctalus* spp. and *Myotis* spp. Soprano and common pipistrelles combined accounted for 85.4% (n = 494) of registrations across all surveyed locations (**Table 7.10**).

Table 7.9 Total Number of Bat Passes for Each Species Across All Locations

Species/Species Group	No. of Registrations	Percentage of Total (%) ¹⁶³
Common pipistrelle	295	51
Soprano pipistrelle	199	34.4
<i>Nyctalus</i> spp.	76	13.1
<i>Myotis</i> spp.	2	0.3
Natterer's	6	1
Total	578	99.8

Quantifying Activity

The data from the 2020 static bat activity surveys was analysed using the Ecobat¹⁶⁴ tool (Mammal Society, 2017) to gain a measure of relative bat activity at the Site. The data was then evaluated in accordance with NatureScot et al.18 guidance tables to determine overall Site risk level for each species. The guidance explains that: *"The tool compares data entered by the user with bat survey information collected from similar areas at the same time of year...Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the levels of bat activity recorded at a site across regions in Britain"*. Data from the Site were compared with data within a range of 100 km of the Site and within 30 days of the survey date from all years. The full Ecobat Report is provided in **Annex F of Technical Appendix A7.3: Bat Activity Analysis**.

¹⁶³ The 'Total' percentage may not be exactly 100% due to the rounding of the percentages per species – output taken directly from Ecobat Report – see Annex F of Appendix A7.3.

¹⁶⁴ Mammal Society (2017). Ecobat. Available at: <http://www.mammal.org.uk/science-research/ecostat/>. [Accessed November 2022].

This Ecobat analysis provides a measure of average annual Site activity based on the median (most frequent activity category and representative of the 'typical' bat activity levels in the study area) and maximum (unusually high levels or important peaks of bat activity) percentiles¹⁶⁵. A reference range representing the number of nights for each species that the data was compared to was also generated. In general, a reference range of more than 200 nights is recommended for confidence in the activity level stated by the Ecobat output.

Nyctalus spp. bats were attributed site activity category levels of Low (median) to Moderate-High (maximum) percentiles.

Common and soprano pipistrelle were both attributed site activity category levels of Low-Moderate (median) to High (maximum) percentiles.

Natterer's and *Myotis* spp. bats were both attributed site activity category levels of Low for both the median and maximum percentiles.

The reference ranges for all species were well above the minimum threshold for confidence, with the exception of Natterer's bat (reference range of 83); the attributed activity levels for this species should therefore be treated with caution.

Assessing Potential Risk

As detailed in **Technical Appendix A7.3: Bat Activity Analysis**, the Site risk level is determined to be Low/Lowest, based on having a Medium project size and a Low habitat risk.

As per NatureScot et al. (2021) guidance¹⁸, common pipistrelle, soprano pipistrelle and *Nyctalus* spp. were the only bat species recorded which are deemed to have a high collision risk. All other bat species recorded are categorised as low collision risk and of low population vulnerability in line with the same guidance.

The Ecobat activity levels calculated for the high collision risk species and the Site risk level were used to calculate an overall risk assessment score, which is summarised in **Table 7.10**.

Table 7.10 Risk Assessment Scores Based on Median and Maximum Percentiles for High Collision Risk Species

Species	Risk Assessment Score based on Median Percentile	Risk Assessment Score based on Maximum Percentile
Common pipistrelle	Low (4)	Medium (10)
Soprano pipistrelle	Low (4)	Medium (10)
<i>Nyctalus</i> spp.	Low (2)	Medium (8)

Figures 7.7 to 7.9 further illustrate the results of the median monthly risk assessment scores for high collision risk bat species recorded in the Site at each survey location, and per month¹⁶⁶. As seen in these figures many locations in many of the survey months recorded no activity by high collision risk bat species. However, in locations and months where bat activity was recorded, the Site risk level for common pipistrelle, soprano pipistrelle and *Nyctalus* spp. per month at each location was either 'Low' or 'Medium', with no 'High' risk assessment scores recorded.

August generally appears to be the month with the most activity, and therefore greatest risk, for all high collision risk species; 'Medium' activity was recorded at four locations for common and soprano pipistrelle, and two locations for *Nyctalus* spp. (further detailed in **Technical Appendix A7.3: Bat**

¹⁶⁵ The percentile rank is attributed to one of the following five bat activity categories as defined within relevant guidance: Low (0-20%), Low-Moderate (20-40%), Moderate (40-60%), Moderate-High (60-80%) and High (80-100%).

¹⁶⁶ Risk assessment scores are displayed per month rather than per season due to the format and nature of the Ecobat outputs. It should be noted that in August, only two nights of data were recorded as part of the summer deployment, with the rest of the contiguous recording for the summer deployment taking place in July. Three nights of data were recorded in August as part of the autumn deployment.

Activity Analysis). In August, bats are dispersing from their maternity colonies and may be moving on to mating roosts¹⁶⁷, which may be accountable for the increase in bat movements. Bat activity is mostly focused in the east and south of the Site (**Figures 7.7 – 7.9**).

May also recorded relatively high levels of activity for common and soprano pipistrelles; 'Medium' activity was recorded at three locations for common pipistrelle and four locations for soprano pipistrelle (further detailed in **Technical Appendix A7.3: Bat Activity Analysis**). In May, bats are fully active and feeding, and females start looking for suitable nursery sites and forming maternity colonies⁴⁰, which may be accountable for the levels of bat activity recorded in this month. Activity is mostly focused in the east and south of the Site (**Figures 7.7 – 7.9**).

The location with the highest median percentile recorded for all high collision risk species was Anabat location 11. 'Medium' activity levels were recorded in May (common and soprano pipistrelles), June (common pipistrelle), July (*Nyctalus* spp.) and August (common and soprano pipistrelles). This location lies in the east of the Site, between Cramley Burn and a fenceline which dissects the Site north to south and is in an area of open marshy grassland.

A comparison between bat registrations and the known roost emergence times returned several instances where the timing of the registration indicated the potential proximity of a bat roost. *Nyctalus* spp. activity indicated the potential for nearby roost sites for at all Anabat locations, including some registrations within the maternity roost season (15th June to 30th July). However, when totalling registrations within the maternity roost season only, the maximum number of registrations at any one location was four. Common and soprano pipistrelle registrations indicating the potential for nearby roost sites were recorded at most locations but of these only one registration for each species was within the maternity season.

The low numbers of registrations indicative of potential roosts close to Anabat locations suggest that any roost within the Study Area does not support large numbers of bats. With regard to maternity roosts, the numbers recorded are very low for all high collision risk species, which indicates that the presence of a significant maternity roost close to any Anabat location is unlikely.

Otter

Three potential holts and a potential couch were recorded within the survey area (see **Confidential Annex D to Technical Appendix A7.2: Protected Species Survey** for further details; see also **Figure 7.5C**), in addition to numerous spraints along the Glenlarie Burn, Glen Burn, Glenmaddie Burn and Euchar Water (**Figure 7.5**). The watercourses within the survey area generally had good suitability for otter and offered suitable commuting and foraging opportunities. Several of the watercourses surveyed, including the River Nith and Euchar Water where they run close to the proposed access route, have fast flows, stone/boulder riverbeds and trees and gullies, all of which offer good suitability for otter use, including for shelter.

Pine Marten

One potential pine marten scat was noted within the survey area. There was limited suitable habitat within the Site for this species, although areas of forestry nearby could provide some suitable denning/shelter habitat, with areas within the Site offering potential for hunting/foraging.

Red Squirrel

Potential red squirrel feeding signs were recorded within Ulzieside Plantation (outwith the Red Line Boundary). Areas of woodland along the road between Eliock Bridge and Ulzieside, which is proposed to be the access road for the Proposed Development, was noted to be suitable for red squirrel.

¹⁶⁷ <https://www.bats.org.uk/about-bats/a-year-in-the-life-of-a-bat> [Accessed November 2022].

Reptiles

Several common lizard (*Zootoca vivipara*) sightings were recorded across the south of the survey area, with the tussocky grassland features found across the Site offering suitable habitat for reptile species. A number of potential hibernacula were also noted, which were mostly dry-stone wall features, in addition to some stone circle remains and rock piles.

Water Vole

No signs of water vole were recorded. Some of the watercourses within the survey area were assessed as having suitability for water vole. Moderate suitability for water vole was recorded along Glen Burn and Birch Burn, with some suitability also noted along Cow's Burn and Whing Burn.

Fish

Electrofishing surveys were carried out at nine sites in 2021 (see **Technical Appendix A7.4: Electrofishing Survey Report, Figure 7.10**); eight locations within, around or downstream of the Site and one location on the Euchar Water upstream of the Site, included as a control. Brown trout fry and parr were recorded at the control point (Euchar Water) and at two of the Site locations (Glen Burn and Euchar Water), with parr also recorded at one further sampling location (also on Glen Burn). Atlantic salmon fry and parr were recorded at the two sampling locations furthest downstream, on Euchar Water close to the confluence with the River Nith, and on the River Nith itself. The two sampling locations with Atlantic salmon also recorded both stone loach and minnow, with grayling also recorded at the point on the River Nith. The presence of salmonid fry at some sampled locations indicates successful spawning at the end of 2020 in the vicinity of the survey point. The presence of salmonid parr also indicates successful spawning occurred in 2018 and/or 2019.

Four of the sampled locations, i.e., Glenlarie Burn, Cramley Burn and Glenmaddie Burn, within or around the Site did not have fish and this was attributed to a combination of watercourse gradients and naturally occurring obstructions to fish migration.

7.4.2.3 Other Species & INNS

Four mammal holes were recorded across the survey area (**Figure 7.5**), which were of a size that would be suitable for use by protected species, although no field signs of any protected species were recorded. Such features may be used by other mammal species such as red fox (*Vulpes vulpes*) which are likely to be present in the area. None of these records were within the Red Line Boundary.

No other signs or sightings of notable species or deer were recorded during field surveys.

A single mink scat was noted by Glenlarie Burn, recorded during the protected species surveys (**Technical Appendix A7.2: Protected Species Survey Report**).

7.4.3 The Do-Nothing Scenario

In the absence of the Proposed Development, it is likely that the IEFs would generally remain as they are at present, although numbers and distribution of species may fluctuate naturally. Vegetation and habitat composition and extents in the Site may fluctuate marginally in the long-term in line with increasing or decreasing grazing.

7.5 Assessment of Potential Effects

This section provides an assessment of the likely effects of the Proposed Development on the IEFs identified through the baseline studies. The assessment of effects is based on the project description outlined in Chapter 4: Description of the Proposed Development, and is structured as follows:

- Construction effects;
- Operational effects; and

- Decommissioning effects.

7.5.1 Ecological Features Scoped-out of the Assessment

In addition to those ecological features and effects already scoped-out as detailed within **Section 7.3.3**, with consideration of the additional desk study and baseline data collected, and following the iterative design and embedded mitigation measures described above (**Section 7.3.8**) and project assumptions below (**Section 7.5.3.1**), several potential effects on IEFs can be scoped-out of further assessment based on the professional judgement of the EIA team and experience from other relevant projects and policy guidance or standards. This includes effects from the construction and operational phases of the Proposed Development, as well as cumulative effects. The following paragraphs detail the ecological features and effects that have been scoped-out following further desk studies and Site surveys.

7.5.1.1 Designated Sites and Ancient Woodland

There is no connectivity between the Site and the Upper Nithsdale Woods SAC, or the Back Wood, Mennock Water or North Lowther Uplands SSSIs. The Proposed Development is not hydrologically connected and is sufficiently distant from these sites that no potential effects on the qualifying habitats detailed in **Table 7.6** have been identified and as such the sites can be scoped out of further assessment.

No woodland removal or fragmentation is expected in areas of ancient woodland as a result of the Proposed Development. During construction, there may be an increase in traffic, and therefore an increase in air pollution, along the minor public road from Eliock Bridge to Ulzieside Farm, which passes through woodland listed on the AWI. However, due to the short-term nature of this impact and the small area affected, effects are considered to be negligible. There is some hydrological connectivity between the Proposed Development and several patches of AWI woodland present downstream, along Euchar Water. With embedded mitigation in place (detailed in **Section 7.3.8**), no pollution effects are anticipated. Effects relating to ancient woodland have therefore been scoped out of the assessment.

Whilst hydrologically connected to the Site, the Solway Firth SAC is scoped out of the assessment as it lies approximately 47 km downstream of the Proposed Development. Baseline fisheries surveys did not record any instances of river or sea lamprey species for which the SAC is designated within the Site. It is considered that with the measures described in **Section 7.5.1.3**, no potential effects on the Solway Firth SAC are predicted.

7.5.1.2 Terrestrial Habitats

As per **Section 7.3.3**, habitats that are considered to be of low conservation value and are very common habitat types locally and regionally are scoped out of the assessment. Within the Site/Study Area these include:

- broadleaved and coniferous plantation woodland;
- unimproved and semi-improved acid grassland;
- unimproved neutral grassland;
- improved grassland;
- bracken;
- tall herb and fern (tall ruderal); and
- bare ground.

Marshy grassland is scoped out of the assessment. Marshy grassland covers 421.17 ha (52.39% of the Site) and is characterised by several common and widespread communities overwhelmingly

dominated by either rushes (*Juncus* spp., i.e., M23, MG10, Je and Ja) or purple moor-grass (*Molinia caerulea*, i.e., M25 and M25b); see **Technical Appendix A7.1: NVC and Habitats Survey Report, Table 7.7 and Table 7.8**. M23 is a rush-dominated habitat generally of low ecological value unless particularly species-rich examples are found. The M23 within the Site is generally not species-rich, often consisting of little more than a dense sward of rushes with some grasses and common herbs. The range of marshy grassland communities present on the Site are common habitat types locally, regionally and nationally and the relatively small direct and indirect losses predicted at the Site, as per **Table 7.12** and **Table 7.13** below, are of minor significance. These marshy grassland communities are considered potential GWDTE's in line with guidance³². However, designation as a GWDTE does not infer an intrinsic biodiversity value, and GWDTE status has not been used as criteria to determine conservation value in the ecology assessment. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment (see **Chapter 11: Hydrology and Soils**).

A number of other habitats recorded within the Site/Study Area are of local importance, some due to their listing as Annex I habitats or SBL Priority Habitats (see **Table 7.8**). However, as they occupy such small areas within the Site/Study Area, they are species-poor examples, and/or any direct or indirect effects on the habitat will not occur or will be negligible in magnitude (particularly due to assumptions detailed in **Section 7.3.8.2**) all effects on them are scoped out of the assessment. These habitats are broadleaved semi-natural woodland, wet dwarf shrub heath, dry dwarf shrub heath, acid/neutral flush, basic flush, and running water (see also **Table 7.12** and **Table 7.13** below).

7.5.1.3 Aquatic Habitats and Species

Effects on aquatic habitats including standing water, running water and fisheries interests are scoped out of the assessment. Three of the four main watercourses which cross the Proposed Development contained no fish (Glenlarie Burn, Cramley Burn and Glenmaddie Burn), with the fourth returning brown trout only (Glen Burn), which may be part of a resident population. Atlantic salmon was recorded at two sampling points downstream of the Proposed Development on larger watercourses (i.e., Euchar Water and the River Nith). Whilst there is hydrological connectivity between the Proposed Development and watercourses that are used by migratory salmonids, it is considered that the embedded mitigation measures detailed in **Section 7.3.8** would prevent potential significant effects on fisheries.

To avoid direct or indirect impacts on water quality and hydrogeomorphology a minimum 50 m buffer distance between infrastructure and watercourses has been adhered to where possible (see **Chapter 3: Site Selection and Design**). All turbines and tracks are outside this buffer, except where a watercourse crossing cannot be avoided or other insurmountable design constraints required a breach of this buffer (see **Chapter 11: Hydrology and Soils** for details of breaches in this buffer). The design of permanent and temporary access track water crossings would comply with SEPA good practice guidance to minimise impacts on fish and their habitat. As detailed in **Section 7.3.8**, the embedded mitigation includes that construction work would comply with the WCEMP (see **Technical Appendix A11.2: oWCEMP**) which would be monitored by a suitably qualified ECoW. The WCEMP includes good practice mitigation for effective silt and pollution prevention and undertaking works in accordance with SEPA best practice guidance. With this embedded mitigation in place, water pollution impacts and associated potential effects associated with the Proposed Development on watercourses and aquatic ecology, including fish, are considered unlikely and therefore these pollution impacts are scoped out of further assessment.

Eleven new, or upgrades to existing, watercourse crossings are required within the Site as part of the Proposed Development. The construction of watercourse crossings has the potential to directly impact fish and their spawn due to the physical disturbance involved in construction (e.g., culvert installation). Surveys identified that fish may be present in Glen Burn.

Two watercourse crossings are required on Glen Burn and its tributary. To comply with relevant legislation/guidance, it is assumed that no instream works will occur between October and the end of

May on either of these without further survey and assessment by the ECoW or suitably qualified fisheries consultant in advance of works.

7.5.1.4 Protected Species

Effects on great crested newt, brown hare, mountain hare, badger, pine marten, water vole and red squirrel are scoped out of the assessment due to the absence of field signs or protected features, lack of suitable habitat, limited desk-based or field evidence within the Study Area, and/or lack of potential effects from the Proposed Development.

Effects on otter are scoped out of the assessment. Otter presence was confirmed during surveys in the form of spraints along watercourses within the Site (**Figure 7.5**) with potential holts and a couch also recorded (**Figure 7.5C**) with spraints present that indicate current or recent use by otter. None of the identified potential protected features are within 200 m of any proposed infrastructure. Unmitigated effects on otter during construction would be limited to disturbance and/or indirect effects on habitat or food supply e.g., through watercourse pollution. As outlined in **Section 7.3.8**, a SPP (**Technical Appendix A7.5: Outline Species Protection Plan**) will outline best practice measures for minimising disturbance, including carrying out pre-construction surveys, and pollution prevention measures will be implemented as part of the CEMP during construction to ensure no adverse effects occur on watercourses. Additionally, given this information and the wide-ranging and mobile nature of otter, there would unlikely be any operational effects of the Proposed Development on otter. Thus, any direct or indirect effects on otter arising from the Proposed Development are considered negligible and are not considered further.

Common lizards were recorded during surveys; however, these are mobile species capable of avoiding disturbance except during hibernation and are scoped out of the assessment. The SPP (**Technical Appendix A7.5: Outline Species Protection Plan**) will ensure that all reasonably practicable measures are taken during construction so that provisions of the relevant wildlife legislation are complied with in relation to all protected species, should any evidence be found during pre-construction surveys.

Bats (roosting) are scoped out of the assessment. No key features that could support maternity roosts, significant hibernation roosts and/or swarming sites within 200 m plus rotor radius have been detected. Furthermore, analysis of bat data using Ecobat identified a maximum number of three bat calls during the species-specific emergence time in the maternity roost season (**Technical Appendix A7.3: Bat Activity Analysis**), clarifying that there is unlikely to be a maternity roost in proximity to the Site. No suitable roosting features are within 30m of proposed infrastructure. Features with suitability for roosting bats are present along the minor public road from Eliock Bridge to the Site entrance at Ulzieside Farm, which may experience an increase in traffic during construction. Given the proximity to an existing road in constant use, including by heavy good vehicles (HGV) and large farm machinery, it is assumed any bats potentially using these features would be habituated to a degree of existing vehicular and agricultural disturbance. Furthermore, the SPP (**Technical Appendix A7.5: Outline Species Protection Plan**) includes suitable mitigation measures to minimise disturbance.

Operational and cumulative effects arising from potential collision mortality for low collision risk bat species are scoped out of the assessment (as per NatureScot et al. 202118); these effects on *Myotis* spp. and Natterer's bat are therefore scoped out of the assessment.

Overall, the SPP (**Technical Appendix A7.5: Outline Species Protection Plan**) will ensure that all reasonably practicable measures are taken during construction so that provisions of the relevant wildlife legislation are complied with in relation to all protected species, should any evidence be found during pre-construction surveys.

Effects on all IEFs during operation of the Proposed Development (with the exception of collision risk to high-risk bat species) have been scoped out. Maintenance of the Development will involve vehicular access along the access tracks only, and any maintenance of turbines will be occasional, typically carried out by a small number of maintenance staff inside the turbines during normal working

hours. This is unlikely to result in any operational effects on any species or habitats recorded at and around the Site.

7.5.1.5 Other Species

Effects on deer are scoped out of the assessment. Red and roe deer may be present in the local area, with these species being widespread and common. The extent of woodland within the Site is limited, with no felling proposed. There is no deer fencing around the Proposed Development and therefore deer may use and pass through uninhibited. Any disturbance or displacement to deer from construction activities is not expected to create a deer welfare issue due to the suitability of surrounding land and its availability and accessibility. It is not considered that the Proposed Development will pose a significant barrier to any local movements or migrations, with open land present around the footprint. If, during construction, deer are displaced from the Development, there are still suitable migration routes which would not force deer into areas of risk, across public roads and thereby increasing the potential for road traffic collisions, or towards built-up areas. Displacement of deer to the north of the Site would require deer to cross a single-track and lightly-used road. There is a steep slope and a watercourse between the south of the Site and the public road to the south. As a result of the size and location of the Proposed Development and the extensive suitable habitat and commuting corridors locally, no adverse effects on deer are predicted.

7.5.2 Important Ecological Features

A summary of the Nature Conservation Value of the remaining IEFs identified within the Site and surrounding area (as confirmed through survey results and consultation outlined above) which have been scoped-in to the assessment is given in **Table 7.11** below, together with the justification for inclusion. These comprise blanket bog, wet modified bog, and bats.

Table 7.11 Nature Conservation Value of Scoped-in IEFs

IEF	Nature Conservation Value	Relevant Legislation/Guidance & Justification
Blanket Bog and Wet Modified Bog	Local	The Proposed Development would result in direct and indirect habitat loss for blanket bog and wet modified bog habitats. Blanket bog covers 23.2 ha (2.89%) of the Site/Study Area, whilst wet modified bog covers 117.07 ha (14.56%) (Table 7.8). The blanket bog communities present, including M17 with some infrequent M3, tend to represent areas of relatively undamaged, active and better-quality bog with frequent to abundant <i>Sphagna</i> in the basal layer. Communities representing wet modified bog habitat include M20 and M25a and have a lower relative quality; the M20 appearing to have derived from blanket bog through grazing that has led to the scarcity or absence of <i>Calluna vulgaris</i> in the sward, and the M25 mire potentially derived from alteration of previous mire or wet heath because of grazing, drainage and/or burning. The habitats are associated with SBL blanket bog habitat with some areas also corresponding to Annex 1 type 7130 blanket bog habitat, including M17, M20 and M3 communities. M25 mire can also fall within the blanket bog Annex I type, usually M25a and where the underlying peat depth is greater than 0.5 m and the habitat is wet and contains peat forming species; however, the M25a in the Study Area is not considered to be of Annex I quality (see Technical Appendix A7.1: NVC and Habitats Survey Report for further details). The Site contains small areas of Class 1 and Class 2 peatland from the SNH Carbon and Peatland Map (Figure 7.2). It is recognised that this definition is not solely for nature conservation and so not directly applicable to evaluating the value of a peatland. As per Figure 7.2, all Class 1 and Class 2 peatland areas have been avoided for new infrastructure¹⁶⁸.

¹⁶⁸ The Twentysilling Hill Wind Farm track, to also be utilised by the Development, passes through an area of Class 2 peatland. This track is existing and does not require upgrading for the Development.

IEF	Nature Conservation Value	Relevant Legislation/Guidance & Justification
		Despite some of these communities being associated with Annex I and SBL blanket bog classifications, the habitat within the Site/Study Area is not considered to be Nationally or Regionally important due to its size, fragmented distribution, and quality and anthropogenic effects. Therefore, assigning a Nature Conservation Value higher than Local is not deemed appropriate. In addition, mire habitat of this quality (and greater) is relatively widespread across the local area as well as within Dumfries and Galloway and beyond, which further reduces the relative value of this habitat within the Site.
Bats (high collision risk species: common pipistrelle, soprano pipistrelle, and Nyctalus spp.)	Local	All UK bat species are European Protected Species under the Conservation (Natural habitats & c.) Regulations 1994 (as amended in Scotland) and are listed on Annex II of the Habitats Directive. Nine species are listed on the SBL and eight species are also listed as local priority species in the Dumfries and Galloway BAP¹⁶⁹ (including the three high collision risk species recorded at the Site: common pipistrelle, soprano pipistrelle, and Nyctalus spp.). Common pipistrelle and soprano pipistrelle are considered to have a favourable conservation status in the UK, and Scotland, respectively under Article 17 of the Habitats Directive and are listed as Least Concern (LC) under the IUCN Red List criteria^{170,171}. Nyctalus spp. comprise Leisler's bat (Nyctalus leisleri) and noctule bat (Nyctalus noctule). Both species are considered to have a favourable conservation status at the UK level (no Scotland specific categorisation), with noctule also listed as LC, and Leisler's as Near Threatened (NT), on the IUCN Red List^{170,171}. Research work by Newson et al. (2017)¹⁷² has estimated through spatial modelling that between 16% and 24% of the regional populations of high-risk species (Nyctalus spp. and Nathusius pipistrelle) in southern Scotland overlaps existing and approved wind farms, with 50% of this overlap concentrated at just 10% of wind farms, indicating that there are very localised risk areas for these species. The study used spatial modelling to stratify the region (southern Scotland) according to potential effect on high-risk species by highlighting areas of risk. According to this spatial modelling, the predicted occurrence probability and predicted activity (a proxy for abundance) of Leisler's is distributed in the south and west of the region, with noctule having a predicted occurrence probability and predicted activity to the south and east of the region, with some scattered predicted occurrence to the west. The Development is outwith the main areas of predicted occurrence and predicted activity for both Nyctalus spp., being located on the eastern edge of Leisler's predicted occurrence, and is distant from predicted Nyctalus spp. hotspots¹⁷². Reliable population estimates for Nyctalus spp. in Scotland are currently not available with some currently used population estimates of only a few hundred bats (e.g., Harris et al. 1995)¹⁷³ outdated and based on expert opinion. Actual populations in Scotland, and their distribution range, are now thought to be much larger than previously reported with populations suggested to be in the region of many thousands¹⁷². Bat activity at the Site was generally low with a relatively small total number of bat registrations (Table 7.9) The majority of bat activity was due to common and soprano pipistrelle bats Table 7.9 which are considered to have a

¹⁶⁹ NatureScot (SNH) & Dumfries and Galloway Council. 2009. Dumfries and Galloway Local Biodiversity Action Plan. Available at: [Local Biodiversity Action Plan.pdf \(dumgal.gov.uk\)](https://www.dumgal.gov.uk/local-biodiversity-action-plan.pdf) (Accessed March 2023)

¹⁷⁰ Mathews F, Kubasiewicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018) A Review of the Population and Conservation Status of British Mammals: Technical Summary. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough. [Accessed March 2023]

¹⁷¹ <https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/#regularly-occurring-species-vertebrate-species-mammals-terrestrial> [Accessed March 2023]

¹⁷² Newson, S.E., Evans, H.E., Gillings, S., Jarrett, D. & Wilson, M.W. 2017. A survey of high-risk bat species across southern Scotland. Scottish Natural Heritage Commissioned Report No. 1008. [Accessed March 2023]

¹⁷³ Harris S., Morris, P., Wray, S. & Yalden, D. (1995). A review of British mammals: population estimates and conservation status of British mammals other than cetaceans. JNCC, Peterborough. [Accessed March 2023]

IEF	Nature Conservation Value	Relevant Legislation/Guidance & Justification
		'common' population relative abundance and are considered of 'medium' potential vulnerability¹⁷⁴. Nyctalus spp. are considered to have a 'rarest' population relative abundance in Scotland, and 'high' potential vulnerability, and were the third most frequent species recorded in the Site despite the low number of registrations (i.e., 76, which made up 13.1% of bat passes; Table 7.9). Considering the above information and the low numbers of bats recorded at the Site (see also Section 7.4.1.6 and Technical Appendix A7.3: Bat Activity Analysis)) the Nature Conservation Value across the Site is assessed to be Local for all bat species.

7.5.3 Construction Effects

This Section provides an assessment of the likely effects of the construction of the Proposed Development upon the scoped-in IEFs.

7.5.3.1 Assumptions of the Assessment

The following assumptions are included in the assessment of otherwise unmitigated effects on IEFs:

- The short-term construction period, of approximately 18 months, would include borrow pit creation, construction of access tracks, hardstandings and other ancillary infrastructure, Wind Turbine erection, and site restoration.
- All electrical cabling between the Wind Turbines and the associated infrastructure would be underground in shallow trenches which would be reinstated post-construction and, in all cases, follow the access tracks.
- Any temporary infrastructure areas, and disturbance areas around permanent infrastructure, during construction would be temporary and areas reinstated or restored before the construction phase ends.
- The embedded pre-construction and construction phase mitigation described in **Section 7.3.8** above will be fully applied e.g., the presence of an ECoW, adherence to the SPP and CEMP.

7.5.3.2 Predicted Construction Effects

The most tangible effect during construction of the Proposed Development would be direct habitat loss due to the construction of infrastructure such as new access tracks, turbines, hardstandings, substation and BESS. Much of this infrastructure would be permanent, however the temporary construction compound and borrow pits would be restored at the end of construction.

There may also be some indirect habitat losses to wetland habitats due to drainage effects. For the purpose of this assessment, it is assumed that wetland habitat losses due to indirect drainage effects may extend out to 10 m from infrastructure (i.e., in keeping with standard indirect drainage assumptions within carbon calculator guidance). It is expected that any indirect drainage effects would only impact wetland habitats such as blanket bog, wet modified bog, wet heath, flushes etc. No indirect drainage effects are expected to impact or alter the quality or composition of non-wetland habitats, such as dry heath, bracken, acid grassland etc; as such, only direct habitat loss applies to those habitats.

Table 7.12 details the estimated relative losses expected to occur, by habitat type, for all new permanent infrastructure.

¹⁷⁴ NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2019, with minor updates 2021). *Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation*. (Accessed March 2023)

Temporary habitat losses due to the creation of a temporary construction compound and up to three borrow pits have been calculated separately and are detailed in **Table 7.13**. These have been considered separately to permanent infrastructure as it is possible that not all borrow pit areas will be required or fully utilised and although these areas would be restored at the end of the construction period (and therefore would not show a loss in habitat extent), the habitat type resulting after restoration may not be the same as the original due to changes in topographical or hydrological conditions. In particular, areas of land take for this temporary infrastructure may represent permanent losses for habitat types such as blanket bog/wet modified bog due to the effects on the structure and function of the habitat type, and the complexities and long timescales involved in restoring or re-creating these particular habitat types.

Table 7.12 Estimated Loss of Habitat for Permanent Infrastructure

Phase 1 Habitat Type ¹⁷⁵	Phase 1 Site Extent (ha)	NVC Community Code or Habitat Type ¹⁷⁶	Direct Habitat Loss (ha)	Direct Habitat Loss as a % of Phase 1 Type in Site	Direct & Indirect Habitat Loss (ha)	Direct & Indirect Habitat Loss as a % of Phase 1 Type in Site
A1.1.2 Broadleaved Plantation Woodland*	3.86	W11(p)	0.01	0.18	N/A	N/A
B1.1 Unimproved Acid Grassland*	145.90	U4, U4a, U4d, U5, Cn	1.47	1.19	N/A	1.45
		U6	0.26		0.64	
B2.1 Unimproved Neutral Grassland*	0.22	MG1a	0.03	12.96	N/A	18.18
		MG9	<0.01		0.01	
B4 Improved Grassland*	16.67	MG6	0.26	1.57	N/A	N/A
B5 Marsh/Marshy Grassland*	421.17	M23a, M25, M25b, M23b, MG10a, Je, Ja	4.95	1.17	18.06	4.29
C1.1/C1.2 Bracken – Continuous/Scattered*	20.06	U20	0.05	0.23	N/A	N/A
C3.1 Tall Ruderal*	0.10	OV27	<0.01	8.16	N/A	N/A
E1.6.1 Blanket Bog	23.20	M17, M17c	0.07	0.30	0.32	1.38
E1.7 Wet Modified Bog	117.07	M20, M20a, M20b, M25a	2.39	2.04	6.32	5.40
E2.1 Acid/Neutral Flush*	22.62	M6c, M6d	0.05	0.23	0.22	0.98
J4 Bare Ground*	3.07	BG	2.66	86.68	N/A	N/A

¹⁷⁵ Effects upon habitats with a (*) in **Table 7.12** and **Table 7.13** have been scoped out of the assessment due to the minor nature of habitat loss involved or their low Nature Conservation Value (i.e., not an IEF) as per the sections above.

¹⁷⁶ Only specific habitats, communities or features subject to habitat losses are presented within this table. Any habitats or communities not listed here are not subject to any predicted direct or indirect habitat losses.

Table 7.13 Estimated Loss of Habitat for Temporary Infrastructure

Phase 1 Habitat Type (Code) ¹⁷⁵	Phase 1 Site Extent (ha)	NVC Community Code or Habitat Type	Direct Habitat Loss (ha)	Direct Habitat Loss as a % of Phase 1 Type in Site	Direct & Indirect Habitat Loss (ha)	Direct & Indirect Habitat Loss as a % of Phase 1 Type in Site
A1.1.2 Broadleaved Plantation Woodland*	3.86	W11(p)	0.02	0.54	N/A	N/A
B1.1 Unimproved Acid Grassland*	145.90	U4, U5	1.00	0.75	N/A	0.77
		U6	0.09		0.13	
B1.2 Semi-Improved Acid Grassland*	9.26	U4b	0.01	0.11	N/A	N/A
B5 Marsh/Marshy Grassland*	421.17	M23a, M25b, MG10a, Je	0.76	0.18	1.04	0.25
C1.1/C1.2 Bracken – Continuous/Scattered*	20.06	U20	0.02	0.15	N/A	N/A
E1.6.1 Blanket Bog	23.20	M17, M17c	0.27	1.15	0.42	1.81
E1.7 Wet Modified Bog	117.07	M20a, M25a	0.24	0.20	0.34	0.29

The following Sections assess the effect of these losses for each IEF scoped-in.

Blanket Bog and Wet Modified Bog

Effect: Effects upon wet modified and blanket bog habitats will be direct (through permanent and temporary habitat loss) and indirect (through potential drying effects upon neighbouring bog habitats) occurring from the construction period into the operational period. Direct loss would occur in areas where permanent infrastructure such as access tracks, turbine foundations, and hardstandings are sited on these habitat types. The excavation of these habitat types for temporary infrastructure would also lead to the losses of blanket bog and wet modified bog due to the long-term effect on the ecological and hydrological structure and function of these habitat types. In addition, there may be indirect losses as a result of drainage around infrastructure (around 10 m from infrastructure is assumed⁴⁶) and disruption to hydrological flows.

Nature Conservation Value: Local (as detailed in **Table 7.11**)

Conservation Status: Conservation Status of this habitat as assessed in the 2019 JNCC report by the UK on blanket bog is 'Unfavourable Bad' and 'Stable' at the UK level¹⁷⁷.

Magnitude of Effect: The UK has an estimated 2,182,200 ha of blanket bog⁴⁹ of which around 1,759,000 to 1,800,000 ha is in Scotland¹⁷⁸ (approximately 23% of the land area)¹⁷⁹. The current area of blanket bog in Dumfries & Galloway is expected to be less than 50,000 ha².

Blanket bog covers 23.2 ha (2.89%) of the Study Area, of which the majority is composed of M17 and its sub-communities, the remainder is M3 (**Table 7.8**). The direct habitat loss for blanket bog is predicted to be 0.07 ha due to permanent infrastructure (**Table 7.12**) with up to an additional 0.27 ha due to temporary works areas (**Table 7.13**). This results in a potential total direct loss of 0.34 ha, equivalent to 1.44 % of the blanket bog within the Study Area.

Wet modified bog covers 117.07 ha (14.56%) of the Study Area and is mostly comprised of lower quality M25a (59.84 ha) and M20 and its two sub-communities (57.23 ha). The direct habitat loss for wet modified bog is predicted to be 2.39 ha due to permanent infrastructure (**Table 7.12**) with up to an

¹⁷⁷ <https://jncc.gov.uk/jncc-assets/Art17/H7130-UK-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁷⁸ <https://jncc.gov.uk/jncc-assets/Art17/H7130-SC-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁷⁹ <https://www.nature.scot/landscapes-habitats-and-ecosystems/habitat-types/mountains-heaths-and-bogs/blanket-bog> [Accessed January 2023].

additional 0.24 ha due to the temporary works areas (**Table 7.13**). This results in a potential total direct loss of 2.63 ha, equivalent to 2.25% of the wet modified bog within the Study Area.

For this blanket mire resource as a whole, i.e., combining blanket bog and wet modified bog, direct losses amount to 2.46 ha for permanent infrastructure and 0.5 ha for temporary works areas; a total of 2.97 ha, or 2.12% of the combined resource within the Study Area.

In addition, there may be some indirect losses because of the zone of drainage around infrastructure. The actual distance of the effects of drainage on a peatland is highly variable and depends on various factors such as the type of peatland and its characteristics and properties of the peat; the type, size distribution and frequency of drainage feature; and whether the drainage affects the acrotelm, penetrates the catotelm, or both. Consequently, drainage effects can be restricted to just a few metres around the feature or extend out to tens of metres, or further (e.g., see review within Landry & Rochefort (2012)¹⁸⁰). The hydraulic conductivity of the peatland is one of the key variables which affect the extent of drainage. In general, less decomposed more fibric peatlands (which tend to be found commonly in fen type habitats) generally have a higher hydraulic conductivity and drainage effects can extend to around 50 m, whilst in more decomposed (less fibrous) peat drainage effects may only extend to around 2 m. Blanket bog habitats commonly are associated with more highly decomposed peats (Nayak et al. 2008¹⁸¹). For this assessment, indirect effects are assumed to extend out to 10 m from infrastructure⁴⁶.

If indirect drainage effects are fully realised out to 10 m in all blanket bog and wet modified bog areas, then predicted losses increase for blanket bog to 0.32 ha for permanent infrastructure and up to 0.42 ha for temporary works areas and increase for wet modified bog to 6.32 ha for permanent infrastructure and up to 0.34 ha for temporary works areas. This worst-case scenario of direct and indirect habitat loss for permanent and temporary works areas is a total of 0.74 ha or 3.17 % of the Study Area for blanket bog and 6.67 ha or 5.69 % of the Study Area for wet modified bog. For this blanket mire resource as a whole, i.e., combining blanket bog and wet modified bog, direct and indirect losses for permanent and temporary works areas amount to 7.4 ha, or 5.28 % of the combined resource within the Study Area.

It is considered unlikely that indirect drainage effects of this scale (i.e., out to 10 m either side of infrastructure) would occur or would have such an effect on the habitat as to result in any notable effect on the type of bog present or shifts to a lower conservation value habitat type (such as acid grassland for example). For instance, Stewart & Lance (1991)¹⁸² in their study found that a lowering of the water table next to drains was slight and confined to just a few metres either side of the drain, on sloping ground the uphill zone of drawdown was even narrower. Subtle variations in plant species abundance were noted, with species dependent on high water-tables having a lower cover-abundance near to drains, and species with drier heathland affinities having higher cover than at places farther away. However, there were no wholesale changes in vegetation or the species assemblage; for instance, declines in *Sphagna* cover were highly localised and took nearly 20 years to achieve statistical significance.

Overall, evidence suggests that if some drainage effects materialise locally around infrastructure due to the Proposed Development the most likely effect will not be a major change in overall bog habitat type but rather a potential change in vegetation micro-topography, certain species cover, or abundance that may result in a subtle NVC community or sub-community shift and which may only be apparent in the long term. If severe indirect drying effects are observed long term, then wet modified bog/blanket bog may transition to wet heath (e.g., NVC type M15), dry modified bog, or dry heath.

¹⁸⁰ Landry, J. & Rochefort, L. (2012). The Drainage of Peatlands: Impacts and Rewetting Techniques. Peatland Ecology Research Group, Université Laval, Quebec.

¹⁸¹ Nayak, R.A., Miller, D., Nolan, A., Smith, P., Smith, J. (2008). Calculating carbon savings from wind farms on Scottish peat lands - A New Approach. [Accessed March 2023]

¹⁸² Stewart, A.J.A. & Lance, A.N. (1991). Effects of Moor Draining on the Hydrology and Vegetation of Northern Pennine Blanket Bog. *Journal of Applied Ecology* 28: 1105-1117. [Accessed March 2023]

Wet and dry heaths are still habitats of conservation interest, being Annex I, UKBAP and SBL Priority Habitats also.

When considering the scale of the above habitat losses (i.e., direct and indirect effects for permanent and temporary works areas on up to 5.28% of the combined blanket bog and wet modified bog within the Study Area), and accounting for the relative abundance, distribution and quality of the wet modified bog and blanket bog within the Study Area, an effect magnitude of **Low spatial** and **Long-Term temporal** is appropriate.

Significance of Effect: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude of Effect, the effect significance is considered to be **minor adverse** and **not Significant**.

7.5.4 Operational Effects

This Section provides an assessment of the likely effects of the operation of the Proposed Development upon scoped-in IEFs.

7.5.4.1 Predicted Operational Effects

Habitats

All likely direct and indirect effects on habitats have been considered in the Construction Effects section above.

Although the majority of habitat loss is associated with infrastructure required for the operation of the Development (rather than temporary construction infrastructure), the physical loss of habitat would occur during the construction stage and is therefore considered within **Section 7.5.3**.

Indirect effects on wetland habitats would largely occur during the operational phase as potential drying effects become established. However, for ease and clarity assessing effects on habitats, these are considered within **Section 7.5.3.2**.

Bats

Effect: During the operational phase, there is potential for collision risk upon commuting and foraging bat species, together with the risk that bats may be affected by barotrauma when flying in close proximity to moving turbine blades. For the purposes of this assessment, the potential effects from barotrauma are assumed to be the same as for collision risk. This is due to the lack of published empirical evidence in causes of bat fatalities around wind farms and the difficulties in determining whether bat fatalities are due to strikes (collisions) or barotrauma.

Research undertaken by Exeter University¹⁸³ found that most bat fatalities at UK wind farms have been common pipistrelle, soprano pipistrelle and noctule bats. Further work¹⁸⁴ found that common pipistrelle activity was higher at turbine locations than at control locations in similar habitat, suggesting that this species may be at particular risk. In the same study soprano pipistrelle activity was comparable between sites with no attraction or repulsion by turbines. It is suggested the observed higher levels of activity could be because there are more individual bats around turbines, or because bats spend more time in these locations relative to controls, even if the number of individual bats remains the same; however, it is not possible to distinguish between these possibilities using acoustic bat data.

¹⁸³ DEFRA (2016). Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. University of Exeter. [Accessed March 2023]

¹⁸⁴ Richardson, S.M., Lintott, P.R., Hosken, D.J., Economou, T and Mathews, F. (2021). Peaks in bat activity at turbines and the implications for mitigating the impact of wind energy developments on bats. *Sci Rep.* 11, 3636. [Accessed March 2023]

Because the proposed turbines have a blade tip height of 180 m, they will require red aviation warning lights. A five-year study by Spoelstra et al. (2017)¹⁸⁵ concluded that foraging bats are not attracted to red lighting. The reason for this is that white and green spectrum lights attract foraging insects whilst red lights do not. Based on this, Spoelstra et al. (2017) advised, “Hence, in order to limit the adverse impact of light at night on bats, white and green light should be avoided in or close to natural habitat, but red lights may be used if illumination is needed”. A study by Voight et al. (2018)¹⁸⁶ found evidence of attraction of migratory Soprano pipistrelle to red lighting. Soprano pipistrelles do not migrate in the UK as they do in continental Europe, so this finding is not relevant to the Development. However, the explanation for contrasting findings by Spoelstra et al. (2017)⁵⁷ is that *“migratory bats may be more susceptible to light sources of specific wavelength spectra because vision may play a more dominant role than echolocation during migration. Non-migratory bats might use orientation cues that are more involved during general hunting behaviour, for example, echoes reflected from local landmarks, instead of cues from natural or artificial light sources”*.

Nature Conservation Value: As per **Table 7.11**, all bat species within the Site/Study Area are considered to be of Local value.

Conservation Status: Common pipistrelle are assessed in the 2019 JNCC report as ‘Favourable’ and ‘Improving’ at the UK level¹⁸⁷; soprano pipistrelle, noctule and Leisler’s populations are assessed as ‘Favourable’ and ‘Stable’ at the UK level^{188, 189, 190}. Mathews et al. 2018 also consider all bat species recorded at the Site to have a favourable Conservation Status.

Further details on the Conservation Status of the high collision risk bats species recorded within the Site are provided below. Information on both noctule and Leisler’s bats are presented, however these bats were only recorded to genus level onsite (i.e., *Nyctalus* spp.). The low population estimates for *Nyctalus* spp. in Scotland are outdated and likely underestimated due to under-recording. Both common and soprano pipistrelle are widespread in southern Scotland, with Leisler’s distributed mainly in the south and west of the region and noctule mainly to the south and east of the region, with some scattered predicted occurrence to the west.

Population estimates of common pipistrelle in 2013 were 1,390,000 in the UK and 352,000 in Scotland¹⁹¹. More recently, the 2019 Article 17 of the UK Habitats Directive Reports estimates the population range to be from 1,100,600 to 7,843,000 in the UK and from 285,000 to 2,160,000 in Scotland¹⁹² although best single value estimates are not provided due to the uncertainty around population estimates. Matthews et al. (2018) provided a UK estimate of 3,040,000 for common pipistrelle (with a plausible range of 991,000 – 7,510,000); population estimates for Scotland were not provided in that review.

Population estimates of soprano pipistrelle in 2013 were 774,000 in the UK and 198,000 in Scotland. The 2019 Article 17 of the UK Habitats Directive Reports estimates the population range to be from 2,024,000 to 8,563,000 in the UK and from 512,000 to 2,180,000 in Scotland¹⁹³, although best single value estimates are not provided due to the uncertainty around population estimates. Matthews et al. (2018) provided a UK estimate of 4,670,000 for soprano pipistrelle (with a plausible range of 970,000 – 8,400,000); population estimates for Scotland were not provided in that review.

¹⁸⁵ Spoelstra, K., van Grunsven, R. H. A., Ramakers, J. J. C., Ferguson, K. B., Raap, T., Donners, M., Visser, M. E. (2017). Response of bats to light with different spectra: Light-shy and agile bat presence is affected by white and green, but not red light. *Proceedings Royal Publishing B*, 284, 20170075. <https://doi.org/10.1098/rspb.2017.0075> [Accessed March 2023]

¹⁸⁶ Voigt, C.C., Rehnig, K., Lindecke, O., Pētersons, G. (2018) Migratory bats are attracted by red light but not by warm white light: Implications for the protection of nocturnal migrants. *Ecology and Evolution*. 2018;8:9353–9361. [Accessed March 2023]

¹⁸⁷ <https://jncc.gov.uk/jncc-assets/Art17/S1309-UK-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁸⁸ <https://jncc.gov.uk/jncc-assets/Art17/S5009-UK-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁸⁹ <https://jncc.gov.uk/jncc-assets/Art17/S1331-UK-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁹⁰ <https://jncc.gov.uk/jncc-assets/Art17/S1312-UK-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁹¹ JNCC (2013). Individual Species Reports - 3rd UK Habitats Directive Reporting 2013. [Accessed January 2023].

¹⁹² <https://jncc.gov.uk/jncc-assets/Art17/S1309-SC-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁹³ <https://jncc.gov.uk/jncc-assets/Art17/S5009-SC-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

Population estimates of Leisler's bat in 2013 were 28,000 in the UK and 250¹⁹⁴ in Scotland. There is no recent population estimate available for this species across the UK or Scotland¹⁹⁵ and there is limited accurate data on trends, and population changes, meaning that the detailed population status of this species in the UK and Scotland is currently unknown' however, Newson et al. (2017) in their study stated that the previously used population estimates in Scotland of only a few hundred bats are outdated, with their research indicating actual populations of *Nyctalus* spp. in Scotland, and their distribution range, are much larger than previously reported, with populations suggested to be in the region of many thousands.

Population estimates of noctule bat in 2013 were 50,000 in the UK and 25066 in Scotland. The 2019 Article 17 of the UK Habitats Directive Reports estimates the population range to be from 20,600 to 2,176,000 in the UK with no population value provided for Scotland¹⁹⁶. Matthews *et al.* (2018) did not provide a UK population estimate, countrywide estimates were provided for England (565,000 with a plausible range of 17,700 - 1,872,000) and Wales (91,900 with a plausible range of 2,900 - 304,000); no estimate was provided for Scotland. As for Leisler's above, Newson *et al.* (2017) in their study stated that the previously used population estimates in Scotland of only a few hundred bats are outdated, with their research indicating actual populations of *Nyctalus* spp. in Scotland, and their distribution range, are much larger than previously reported, with populations suggested to be in the region of many thousands.

Magnitude of Effect: Evaluating the vulnerability of a bat population to wind farms is based on three factors; activity level recorded, population vulnerability (determined by collision risk of species and population size) and Site risk level. These factors are multiplied to generate an overall risk assessment score per species of either Low (0 - 4), Moderate (5 - 12) or High (15 - 25) in line with guidance. **Technical Appendix A7.3: Bat Activity Analysis** presents the results of this risk assessment for each high collision risk species and provides detailed results from the Ecobat analysis. **Figures 7.7 to 7.9** also present the spatial and temporal risk categories for high-risk species, based on the results of the monitoring undertaken at locations across the Site in 2020. A summary is provided below to inform the assessment.

Average Site activity levels (median and maximum percentiles) were recorded for the following high collision risk bat species:

- common pipistrelle: Low-Moderate (median) to High (maximum);
- soprano pipistrelle: Low-Moderate (median) to High (maximum); and
- *Nyctalus* spp.: Low (median) to Moderate-High (maximum).

Due to having a 'high' collision risk and a 'common' population abundance rating, common and soprano pipistrelle bats are classified as having 'medium' population vulnerability. With a 'high' collision risk and a 'rarest' population abundance rating, *Nyctalus* spp. are classified as having 'high' population vulnerability.

The evidence in Britain shows that most bat activity is close to habitat features e.g., woodland or wetlands. Foraging habitat quality and connectivity in the Study Area is therefore low with a largely treeless environmental, small, open upland burns and a largely homogenous area of open grazed marshy grassland and moorland habitat present. The Site has thus been categorised as a 'Low/Lowest' (level 2) Site risk to bats due to its 'Medium' project size and 'Low' habitat risk (see **Technical Appendix A7.3: Bat Activity Analysis** and **Section 7.4.2.2**)).

¹⁹⁴ Estimate based on expert opinion with no or minimal sampling, expected to be an underestimate as per Newson, S.E., Evans, H.E., Gillings, S., Jarrett, D. & Wilson, M.W. (2017). A survey of high risk bat species across southern Scotland. Scottish Natural Heritage Commissioned Report No. 1008. [Accessed January 2023].

¹⁹⁵ <https://jncc.gov.uk/jncc-assets/Art17/S1331-SC-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

¹⁹⁶ <https://jncc.gov.uk/jncc-assets/Art17/S1312-SC-Habitats-Directive-Art17-2019.pdf> [Accessed January 2023].

The following overall collision risk assessment score for 'Median' and 'Maximum' percentiles was obtained in 2020 for the undernoted species (**Table 7.10**):

- common pipistrelle: Low (4) (median) to Medium (10) (maximum);
- soprano pipistrelle: Low (4) (median) to Medium (10) (maximum); and
- Nyctalus spp.: Low (2) (median) to Medium (8) (maximum).

Figures 7.7 to 7.9 display the risk assessment categories per month and per anabat based on the median percentile for the Site and Study Area. As can be seen in these figures the risk level varied temporally and spatially between May and September for each species, with August and May generally being the months with the greatest bat activity levels across the Site (**Technical Appendix A7.3: Bat Activity Analysis**). The figures also show there were no 'High' risk locations evident within the Site and Study Area for any high-risk species.

The embedded mitigation described in **Section 7.3.8** with respect to bats, namely reduced rotor speed when idling by feathering, will be implemented throughout operation during the bat active period (April to October), reducing the risk of bat fatalities. The guidance notes that, "The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%". The presence of this mitigation measure has been taken into account when assigning the Significance of Effect.

Further context on each high collision risk species is provided below.

Common pipistrelle: There were no high-risk locations identified for common pipistrelle within the Site in any month during the May to September deployment period. Using the median percentile, locations 3, 4, 7, 10 and 11 were 'medium' risk for one or more months, with May and August being the most frequent months for this to occur (**Figure 7.7**). All other anabat locations and survey months either had no bat activity or activity by common pipistrelle had an overall risk assessment of 'low' (**Figure 7.7**). An effect magnitude of **Low spatial** and **Long-Term** temporal is considered appropriate for common pipistrelle.

Soprano pipistrelle: There were no high-risk locations identified for soprano pipistrelle within the Site in any month during the May to September deployment period. Using the median percentile, locations 4, 7, 9, 10 and 11 were 'medium' for one or more months, with May and August the most frequent months for this to occur (**Figure 7.8**). All other anabat locations and survey months either had no bat activity or activity by soprano pipistrelle had an overall risk assessment of 'low' (**Figure 7.8**). An effect magnitude of **Low spatial** and **Long-Term** temporal is considered appropriate for soprano pipistrelle.

Nyctalus spp.: There were no high-risk locations identified for Nyctalus spp. within the Site in any month during the May to September deployment period. Using the median percentile, locations 1, 3 and 11 had an overall risk of 'medium', with July and August being months in which this occurred (**Figure 7.9**). All other anabat locations and survey months either had no bat activity or the bat activity risk assessments for Nyctalus spp. were 'low'; 'no activity' being the commonest situation (**Figure 7.9**). An effect magnitude of **Low spatial** and **Long-term** temporal is considered appropriate for Nyctalus spp.

All three species were calculated to have an overall collision risk assessment score of Low to Medium (based on median and maximum percentiles respectively). While there may be an effect on individuals, the assessment determines that the effect would be unlikely to occur in sufficient numbers to affect the local populations.

Significance of Effect: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on all high collision risk bats species recorded at the Site is considered **minor adverse** and **not Significant** in the context of the EIA Regulations.

7.5.5 Decommissioning Effects

Due to the distant time frame until their occurrence (> 35 years), decommissioning effects are difficult to predict with confidence. In general decommissioning effects are usually considered for the purposes of assessment to be similar to (or likely less than) those of construction effects in nature and are likely to be of shorter duration. A method statement would be prepared and agreed with the relevant statutory consultees prior to decommissioning of the Proposed Development which would include the need for pre-works surveys.

Decommissioning of the Proposed Development would involve the removal of all infrastructure and restoration of the associated ground. Restoration would seek to return areas to their pre-construction habitat type, or as similar as feasible depending on local substrates, topography, hydrology etc. As a result, decommissioning will not lead to any further direct or indirect habitat losses, rather, it is predicted that due to restoration of upland habitats in these areas, there would be a net beneficial effect.

7.6 Cumulative Effect Assessment

The primary concern regarding the assessment of cumulative effects is to identify situations where effects on habitats or species populations that may be non-significant from individual developments, are judged to be significant when combined with nearby existing or proposed projects that are subject to an EIA process. In the interests of focusing on the potential for similar significant effects, this assessment considers the potential for cumulative effects with other wind farm developments, including those that are operational, under construction, consented or at application stage. Wind farm projects at scoping stage have been scoped out of the cumulative assessment because they generally do not have sufficient information on potential effects to be included, as the baseline survey period is ongoing, or results have not been published. Projects that have been refused or withdrawn have also been scoped out.

Small projects with three or fewer turbines have also been excluded from the cumulative assessment as often these projects are not subject to the same level of detail of assessment, and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IEFs assessed.

The following wind farm developments fall within 5 km of the Proposed Development, and fulfil the criteria outlined in the preceding paragraphs:

- Sanquhar Wind Farm (Operational since 2018): 9 wind turbines;
 - Whiteside Hill Wind Farm (Operational since 2018): 13 wind turbines;
 - Sandy Knowe Wind Farm (Operational since 2022): 24 wind turbines;
 - Twentysilling Hill Wind Farm (Operational since 2022): 9 wind turbines
 - Sanquhar Six Wind Farm (Consented 2016, not built): 6 wind turbines;
 - Sanquhar II Wind Farm (Application): 44 wind turbines;
 - Eucharhead Wind Farm (Application): 21 wind turbines; and
 - Sandy Knowe Wind Farm Extension (Application): 6 wind turbines.
- NatureScot and CIEEM guidance details that developments may be included in the cumulative assessment where they are already constructed, but 'whose full environmental effects are not yet felt and therefore cannot be accounted for in the baseline'. Due to the recent construction of Sanquhar, Whiteside Hill, Sandy Knowe and Twentysilling Hill, these wind farms fall into this category as full effects may not be known (including aspects such as HMPs which are not fully developed).

7.6.1 Predicted Cumulative Construction Effects

Blanket bog and wet modified bog have been scoped-out of the cumulative assessment as it is considered unlikely that any significant ecological cumulative effects at a local or regional level will arise as a consequence of the Proposed Development adding to habitat loss associated with other projects (this applies to both the construction phase and also any limited drainage effects which may continue into the operational phase).

In general, for wind farm developments where peatland and upland habitats are present or affected, mitigation and/or additional restoration/enhancement/creation of peatland and upland habitats is proposed to compensate and offset any effects. Mitigation and enhancement areas also tend to be larger or many orders of magnitude greater than the area of predicted loss. For example, the HMP associated with the application for Sanquhar II Wind Farm highlights two potential areas where bog restoration and enhancement measures are proposed¹⁹⁷, and 23 ha of conifer forest to bog restoration is proposed as part of the Eucharhead Wind Farm EIA¹⁹⁸. The nearby Twentysilling Hill Wind Farm used avoidance by design to result in a non-significant impact being recorded for wet modified bog. In addition to those noted above, blanket bog and upland habitat improvement and restoration is being undertaken, or planned, at multiple sites locally and regionally. Similar habitat enhancement would also be undertaken at the Proposed Development (**Technical Appendix A7.6: oBEMP**).

Therefore, all scoped-in IEFs considered above (i.e., blanket bog and wet modified bog) have been scoped out of the cumulative assessment as it is considered unlikely that any significant residual cumulative effects at a local or regional level will arise as a consequence of the Proposed Development adding to habitat loss associated with other projects. This is due to the small nature of habitat losses associated with the Proposed Development (**Section 7.5.3.2**) and the Applicant's commitment to the delivery of a BEMP for the Proposed Development which would include provisions for the maintenance, restoration and/or enhancement of habitats within the Site and would be used to provide 'significant biodiversity enhancements' which are a requirement of National Planning Framework 4¹⁹⁹. As such, no adverse cumulative effects are predicted.

7.6.2 Predicted Cumulative Operational Effects

Bats may be affected by cumulative wind farm developments because of the distances that some foraging bats travel, and the cumulative risks to bat populations as a result of barotrauma and/or collision with wind turbines during operation. High collision risk species recorded at the Site were common pipistrelle, soprano pipistrelle and *Nyctalus* spp. These species are all considered here to be of Local Nature Conservation Value (**Table 7.11**) and having Favourable Conservation Status (see **Section 7.5.4.1** for further details).

In considering any predicted cumulative effect that may materialise as a result of the addition of the Proposed Development it is important to note the following:

- the now-standard application of embedded mitigation in the form of buffer distances between turbine blade tip and habitat features such as forest edges and wetlands to minimise effects on foraging and commuting bats¹⁸;
- the watercourse buffers that are incorporated into wind farm designs as standard;
- the now-standard adoption of reduced rotor speed when idling, by feathering;
- the minor adverse and non-significant effect of the Proposed Development on these species (**Section 7.5.4.1**); and

¹⁹⁷ Community Windpower (2019). Habitat Management Plan. Sanquhar II Community Wind Farm. (Accessed March 2023)

¹⁹⁸ Scottish Power Renewables (2020). Eucharhead Renewable Energy Development EIA Report. Chapter 8 Ecology. (Accessed March 2023)

¹⁹⁹ Scottish Government (2023). National Planning Framework 4.

- the Low-Medium risk assessment scores for the Proposed Development for all high collision risk species.

With the mitigation for bats already incorporated into the Proposed Development as noted above, and with similar mitigation at other wind farm sites, and further considering their distribution, population size, sensitivity and Conservation Status (as discussed above), cumulative effects on common and soprano pipistrelle and *Nyctalus* spp. are considered to be **Low spatial** and **Long-term temporal** magnitude.

Significance of Effect: Considering the above, cumulative effects on high collision risk bat species are considered to be **minor adverse** and **not Significant** in the context of the EIA Regulations. Any potential cumulative effects can be reduced further, and the level of certainty of a non-significant effect increased, by including the additional bat mitigation measures as detailed in **Section 7.7.1.2** below.

7.7 Mitigation and Residual Effects

7.7.1 Mitigation

7.7.1.1 Construction Phase

General and embedded mitigation measures for habitats and species, such as complying with best practice, micrositing, presence of an ECoW and adherence with a detailed CEMP and SPP are included in **Section 7.3.8**.

No significant construction effects were identified, and no non-standard mitigation is proposed for the Construction Phase. Enhancement and restoration of habitats through the delivery of a BEMP would reduce effects on habitats further. The BEMP will include provisions for the maintenance, restoration and/or enhancement of bog habitats and other upland habitats within the Site, as detailed in the outline BEMP (**Technical Appendix A7.6: oBEMP**). The detailed BEMP will be agreed with the Local Authority and NatureScot in advance of construction and would ensure the Proposed Development secures significant biodiversity enhancements in line with NPF4 Policy 3, through restoring degraded habitats and strengthening nature networks.

7.7.1.2 Operational Phase

Bats are the only IEF scoped-in to the assessment of potential operational effects, and mitigation during operation is detailed in **Section 7.3.8** – this embedded mitigation has been considered as part of the assessment. No significant operational effects were identified, and no non-standard mitigation is proposed.

Creation of woodland and riparian habitat through the delivery of a BEMP, as detailed in **Technical Appendix A7.6: oBEMP**, would create and enhance bat foraging and commuting habitat within the Site.

7.7.1.3 Decommissioning Phase

None proposed.

7.7.1.4 Cumulative

As per **Section 7.7.1.2**.

7.7.2 Residual Effects

No significant effects identified with all scoped-in IEFs remaining as **minor adverse**, or less, and **not Significant** (as per **Sections 7.5.3.2, 7.5.4.1 and 7.6.2**).

7.8 Summary of Effects

Table 7.14 provides a summary of the effects detailed within this chapter.

Table 7.14 Summary of Effects

IEF	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Blanket bog and wet modified bog	Direct and indirect habitat loss	Minor adverse – Not significant	In addition to embedded mitigation, the implementation of a BEMP which includes bog and upland habitat restoration.	Minor adverse – Not significant
Operational Phase				
Common pipistrelle, soprano pipistrelle and Nyctalus spp.	Fatality through barotrauma or collision	Minor adverse – Not significant	In addition to embedded mitigation (i.e., maintenance of a 50 m buffer from turbine blade tip to feature height and feathering whilst idling), proposals for woodland and riparian planting included as part of biodiversity enhancements detailed in the OBEMP (Technical Appendix A7.6: oBEMP) would create and improve bat foraging habitat and corridors.	Minor adverse – Not significant
Decommissioning Phase				
Generally, as for Construction (or less). No further direct or indirect habitat losses; potential net beneficial effect on habitats after Site restoration				
Cumulative				
Common pipistrelle, soprano pipistrelle and Nyctalus spp.	Fatality through barotrauma or collision	Minor adverse – Not significant	Embedded mitigation (i.e., maintenance of a 50 m buffer from turbine blade tip to feature height and feathering whilst idling).	Minor adverse – Not significant

7.9 Statement of Significance

For all IEFs assessed above, the predicted residual levels of significance of effects during the construction, operational and decommissioning phases of the Proposed Development, alone or cumulatively with other projects, are no more than **minor adverse** and therefore **not Significant**.

8. ORNITHOLOGY

8.1 Introduction

This Chapter of the EIA Report evaluates the potential effects of the Cloud Hill Wind Farm as described in Chapter 4 and shown in **Figure 3.2d** (the Proposed Development) on ornithological features. This assessment was undertaken by MacArthur Green.

This Chapter of the EIA Report includes the following elements: Legislation, Policy and Guidance:

- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

This Chapter is supported by the following figures provided in Volume 2a Figures:

- **Figure 8.1** Vantage Points and Viewsheds;
- **Figure 8.2** Survey Areas and Study Areas;
- **Figure 8.3** Ornithological Designated Sites Within 20 km;
- **Figure 8.4** Muirkirk and North Lowther Uplands Special Protection Area (SPA) – Connectivity Distance Review;
- **Figure 8.5** Black Grouse Lek Locations and Activity;
- **Figure 8.6** Flight Activity: Black Grouse;
- **Figure 8.7** Raptor and Owl Activity;
- **Figure 8.8** Flight Activity: Goshawk;
- **Figure 8.9** Flight Activity: Hen Harrier;
- **Figure 8.10** Flight Activity: Merlin;
- **Figure 8.11** Flight Activity: Osprey;
- **Figure 8.12** Flight Activity: Peregrine Falcon;
- **Figure 8.13** Flight Activity: Red Kite;
- **Figure 8.14** Breeding Wader Activity;
- **Figure 8.15** Flight Activity: Curlew;
- **Figure 8.16** Flight Activity: Golden Plover; and
- **Figure 8.17** Flight Activity: Pink-Footed Goose.

This Chapter is supported by the following Technical Appendix documents provided in Volume 3 Technical Appendices:

- Technical Appendix A8.1: Ornithology (including Annexes A – E).

This Chapter is supported by the following confidential information (that will have restricted distribution):

- Technical Appendix A8.2: Confidential Ornithology; and
- Confidential **Figure 8.2.1** Raptor and Owl Nest Locations.

8.2 Legislation, Policy and Guidance

8.2.1 Legislation

European Union (EU) environmental legislation has been considered as part of this ornithological assessment. Of particular relevance is the following:

- EU Directive 2009/147/EC on the Conservation of Wild Birds²⁰⁰ ('Birds Directive');
- EU Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended)²⁰¹ ('Habitats Directive'); and
- EU Environmental Impact Assessment Directive 2014/52/EU²⁰².

The following national legislation, which has been amended as a consequence of EU exit (Scottish Government 2019²⁰³, 2020²⁰⁴), is also considered as part of the ornithology assessment:

- The Wildlife and Countryside Act 1981²⁰⁵ (as amended);
- The Conservation (Natural Habitats &c.) Regulations 1994²⁰⁶ (as amended) (The Habitats Regulations);
- The Nature Conservation (Scotland) Act 2004²⁰⁷ (as amended); and
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017²⁰⁸ (as amended).

8.2.2 Policy

This ornithological assessment considers the relevant aspects of Scottish Planning Policy, Planning Advice Notes and other relevant guidance. Of relevance to ornithology are the following policies:

- UK Post-2010 Biodiversity Framework (2012)²⁰⁹;
- Scottish Biodiversity Strategy: It's in Your Hands (2004)²¹⁰/2020 Challenge for Scotland's Biodiversity (2013)²¹¹;

²⁰⁰ Directive 2009/147/EC of the European Parliament and of the Council. Available at: <https://www.legislation.gov.uk/eudr/2009/147/contents> (accessed February 2023)

²⁰¹ Scottish Government (1992). Council Directive 92/43/EEC. Available at: <https://www.legislation.gov.uk/eudr/1992/43/contents> (accessed February 2023)

²⁰² Scottish Government (2014). Directive 2014/52/EU of the European Parliament and of the Council. Available at: <https://www.legislation.gov.uk/eudr/2014/52> (accessed February 2023)

²⁰³ Scottish Government (2019). The Town and Country Planning and Electricity Works (EU Exit) (Scotland) (Miscellaneous Amendments) Regulations 2019. Available at: <https://www.legislation.gov.uk/ssi/2019/80/introduction/made> (accessed February 2023)

²⁰⁴ Scottish Government (2020). EU Exit: The Habitats Regulations in Scotland. Available at: <https://www.gov.scot/publications/eu-exit-habitats-regulations-scotland-2/> (accessed February 2023)

²⁰⁵ Scottish Government (1981). Wildlife and Countryside Act 1981. Available at: <https://www.legislation.gov.uk/ukpga/1981/69> (accessed February 2023)

²⁰⁶ Scottish Government (1994) The Conservation (Natural Habitats, &c.) Regulations 1994. Available at: <https://www.legislation.gov.uk/uksi/1994/2716/contents> (accessed February 2023)

²⁰⁷ Scottish Government (2004). Nature Conservation (Scotland) Act 2004. Available at: <https://www.legislation.gov.uk/asp/2004/6/contents> (accessed February 2023)

²⁰⁸ Scottish Government (2017). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: <https://www.legislation.gov.uk/ssi/2017/101/contents> (accessed February 2023)

²⁰⁹ JNCC and Defra (on behalf of the Four Countries' Biodiversity Group) (2012). UK Post-2010 Biodiversity Framework. JNCC, Peterborough. (Accessed April 2023)

²¹⁰ Scottish Executive (2004). Scottish Biodiversity: It's In Your Hands. Scottish Executive, Edinburgh.

²¹¹ The Scottish Government (2013). 2020 Challenge for Scotland's Biodiversity. The Scottish Government, Edinburgh.

- Scottish Government (2000)²¹². Planning Advice Note 60: Planning for Natural Heritage;
- Scottish Government (2017)²¹³. Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0;
- National Planning Framework 4 (NPF4) (February 2023)²¹⁴;
- The Scottish Biodiversity List²¹⁵; and
- Scottish Biodiversity Strategy to 2045: Tackling the Nature Emergency in Scotland (2023)²¹⁶; note that this is still in draft form with consultation taking place in Spring 2023.

8.2.3 Guidance

Guidance on the following topics has also been considered:

- Environmental impact assessment: NatureScot (SNH 2016a)²¹⁷, (2018a)²¹⁸, (2018b)²¹⁹ and (2020a)²²⁰, CIEEM (2018)²²¹, SERAD (2000)²²²;
- Designated sites: SNH (2016b)²²³, European Commission (2010)²²⁴;
- Collision modelling: SNH (2000)²²⁵, (2018c)²²⁶, Band et al. (2007)²²⁷;
- Cumulative assessments: SNH (2018d)²²⁸;

²¹² <https://www.gov.scot/publications/pan-60-natural-heritage/> (accessed February 2023)

²¹³ Scottish Government (2017). Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0. Scottish Government, Edinburgh.

²¹⁴ <https://www.gov.scot/publications/national-planning-framework-4/documents/> (accessed March 2023)

²¹⁵ <https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list> (accessed February 2023)

²¹⁶ <https://www.gov.scot/publications/scottish-biodiversity-strategy-2045-tackling-nature-emergency-scotland/> (accessed March 2023)

²¹⁷ Scottish Natural Heritage (2016a). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees. Version 2. (Accessed April 2023)

²¹⁸ Scottish Natural Heritage (2018a). Assessing significance of impacts from onshore windfarms on birds out with designated areas. Version 2. (Accessed April 2023)

²¹⁹ Scottish Natural Heritage (2018b). Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. (Accessed April 2023)

²²⁰ NatureScot (2020a). General pre-application and scoping advice for onshore wind farms. (Accessed April 2023)

²²¹ CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester. (Accessed April 2023)

²²² SERAD (Scottish Executive Rural Affairs Department) (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. (Accessed April 2023)

²²³ Scottish Natural Heritage (2016b). Assessing connectivity with Special Protection Areas (SPAs). Version 3. (Accessed April 2023)

²²⁴ European Commission (2010). Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels. (Accessed April 2023)

²²⁵ Scottish Natural Heritage (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. (Accessed April 2023)

²²⁶ Scottish Natural Heritage (2018c). Avoidance Rates for the onshore SNH Wind Farm Collision Model. Version 2. (Accessed April 2023)

²²⁷ Band, W., Madders, M., and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: Janss, G., de Lucas, M. & Ferrer, M (eds.) Birds and Wind Farms. Quercus, Madrid. 259-275. (Accessed April 2023)

²²⁸ Scottish Natural Heritage (2018d). Assessing the cumulative impacts of onshore wind farms on birds. (Accessed April 2023)

- Bird populations/species specific guidance: Stanbury et al. (2021)²²⁹, SNH (2014)²³⁰, (2017)²³¹ and Pearce-Higgins (2021)²³²; and
- Construction and birds: SNH (2016c)²³³.

8.3 Assessment Methodology and Significance Criteria

8.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 8.1**.

Table 8.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
RSPB Scotland	Scoping 5 May 2022	No comments to make on the questions set out in the ornithological chapter of the scoping report.	None required.
NatureScot	Scoping 10 May 2022	The Muirkirk and North Lowther Uplands SPA and North Lowther Uplands SSSI are approximately 3.6km from the Site and not the 6.5km as stated in 7.4.1. The 6.5km distance might be referring to the distance between approximate turbine locations and the designated sites, however disturbance could occur over all of the site and not just where the turbines are and this calculation should not be used. On the other hand, the Muirkirk Uplands SSSI is approximately 11km from the Site; this needs to be separated out, to highlight this difference. Therefore the Muirkirk and North Lowther Uplands SPA and North Lowther Uplands SSSI should be screened in to any assessment for being within the "Core Range" of Merlin and the "Maximum Range" of Hen Harrier, Golden Plover, Peregrine, and Short-eared Owl. As the surveys have shown that most of these species (excluding SEO) are present within the site boundary these sites cannot be scoped out on distance alone, as connectivity is likely. Scoping Report Q7.1 response: The method and scope of assessment is currently not appropriate. See comment above about scoping in the North Lowther Uplands SSSI and the Muirkirk and North Lowther Uplands	A review of ornithological designated sites in included Section 8.4.1 (including an HRA screening process). However, core foraging ranges are considered to be the most appropriate distance to be used when determining potential connectivity for this site in accordance with the NatureScot guidance (SNH 2016). This states that <i>"In most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests" and that maximum foraging ranges should be considered "In exceptional cases"</i> . There are no exceptional circumstances for the Proposed Development which would suggest that the maximum foraging ranges for hen harrier, merlin, golden plover, peregrine falcon or short-eared owl would be relevant.

²²⁹ Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). Birds of Conservation Concern 5: The population status of birds in the UK, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds* 114: 723-747. (Accessed April 2023)

²³⁰ Scottish Natural Heritage (2014). Assessing impacts to pink-footed and greylag geese from small-scale wind farms in Scotland. (Accessed April 2023)

²³¹ Scottish Natural Heritage (2017). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms (Accessed April 2023)

²³² Pearce-Higgins, J.W. (2021). Climate Change and the UK's Birds. British Trust for Ornithology Report, Thetford, Norfolk. (Accessed April 2023)

²³³ Scottish Natural Heritage (2016c). Dealing with construction and birds. (Accessed April 2023)

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		SPA and the inclusion of all species as no results have been presented to date.	
		Not enough information has been presented within the scoping report to support the statement at the end of 7.5.2 that Black Grouse and Curlew are the only Important Ornithological Features (IOFs) to be scoped into assessment. All species will need to be included until full results are presented. Scoping Report Q7.3 response: The scope of the IOFs cannot be confirmed at this stage as no results have been presented to support the inclusion of only two species (Black Grouse and Curlew), therefore all species should be included within the assessment.	It is acknowledged that the species taken forward for assessment cannot be confirmed prior to the finalised design and this was recognised in Section 7.5.2 of the Scoping Report: "Whilst it is not possible to definitively scope out specific target species from the assessment prior to undertaking CRM [Collision Risk Model], considering the information available regarding the species assemblage and distribution at the [Proposed] Development and on the basis of professional experience, it is considered that black grouse and curlew are likely to be the only species considered as IOFs and therefore scoped into the assessment." The baseline section (Section 8.4) of the EIA Report provides a summary of the presence of each target species recorded during the baseline surveys (including the results of any collision modelling) and clear rationale for each species as to whether they have been scoped in or out of the assessment.
		We recommend the night time assessment takes account of our 'Visual Representation of Wind Farms' guidance, particularly the section turbine lighting.	Noted. Potential lighting effects on birds is considered in the assessment (refer to Section 8.5.6).
		Scoping Report Q7.2 response: As no information has been provided on the number or durations of surveys, we cannot comment fully if the data is sufficient. However the VP locations and also the period of time these surveys have been done does seem appropriate.	All survey data (including timings and weather data) has been supplied in Technical Appendix A8.1: Ornithology (including Annexes A – E).
		Scoping Report Q7.4 response: The consultant should contact RSPB for any Black Grouse lek data they may hold (or other IOFs breeding records they may hold).	RSPB contacted for historical data relating to black grouse within 2 km of the Proposed Development (refer to row at the end of the table for detail).
Tynron Community Council	Scoping	Q7.1 - Do consultees agree that the methodology and scope of the assessment is appropriate? No. The migrating geese and swans are omitted from this assessment, as are golden eagles which have been observed in the area. Black grouse leks in the area were given as a reason for several Sanquhar II turbines not being built here but this is not reflected in this assessment. Skylarks and curlews (BOCC Red List) breed in these hills, one of their rapidly disappearing habitats. They should be included explicitly. Table 7.1 excludes skylarks.	Black grouse and curlew are considered in the assessment (refer to Sections 8.4.3, 8.4.5.1, 8.5 and 8.7). Pink-footed goose were the only wildfowl species recorded during the two-year baseline survey period (refer to Section 8.4.5.5). Peregrine falcon are considered in Section 8.4.4.6 . Following NatureScot assessment, skylark are not scoped in to the assessment (Section 8.3.3). Golden eagle were not recorded during the two-year baseline survey period and the site is considered to be

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		The breeding peregrine falcons at [redacted] should be specifically considered.	unsuitable for breeding and is of limited foraging value given the habitats present)
		Q7.2 - Do consultees agree that the data obtained via field surveys (March 2018 to March 2020), as well as a desk study is sufficient to inform a robust impact assessment? No, for reasons given in 7.1. The data has not been included in the scoping document so no conclusions can be made from this. Also annual atypical variations are not reflected in such a short time span, such as dry or rainy seasons, or prolonged cold weather.	Two full years of surveys were completed as per NatureScot guidance (SNH 2017) ²³⁴ .
		Q7.3 - Do consultees agree that, subject to further information coming to light from the field surveys and desk study, the scope of IOFs, including designated sites, to be included in the assessment is appropriate? Yes, but should not be considered exclusive to these sites only.	Noted.
		Q7.4 - Are there any other relevant consultees who should be contacted, or other sources of information that should be referenced with respect to the ornithology assessment? ▪ Citizen science projects such as I-record, and the NBN database. ▪ Local eco-tourism businesses ▪ Galloway and Southern Ayrshire Biosphere (re rush pasture and grass heath)	The RSPB and local raptor study group were contacted to request any relevant data. (refer to rows below).
Dumfries and Galloway Raptor Study Group (DGRSG)	Data request April 2023	Confidential data regarding nesting Schedule 1 species within 2 km of the Proposed Development.	A high-level summary of the data is provided in the relevant sections of the baseline conditions.
RSPB Scotland	Data request April 2023	Historical black grouse data within 2 km of the Proposed Development.	A high-level summary of the data is provided in the relevant sections of the baseline conditions.

8.3.2 Scope of Assessment

This Chapter considers the potential effects on ornithology associated with the construction, operation and decommissioning of the Proposed Development. Potential effects on ornithology associated with decommissioning of the Proposed Development are considered to be the same as construction, and as such are not addressed separately within this chapter.

The specific objectives of the Chapter are to:

- Describe the ornithological baseline;

²³⁴ NatureScot (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms <https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf> (accessed March 2023)

- Describe the assessment methodology and significance criteria used in completing the assessment;
- Describe the potential significance of unmitigated effects (direct or indirect) on Important Ornithological Features (IOFs);
- Describe the mitigation measures proposed to address likely significant effects; and
- Assess the residual effects remaining following the implementation of mitigation, including cumulatively with other wind farm projects.

8.3.3 Elements Scoped Out of Assessment

No potential effects were scoped out prior to commencement of surveys.

A total of 89 bird species were recorded within their respective survey areas during the ornithological surveys (**Technical Appendix A8.1: Ornithology Annex D**). Following NatureScot (SNH 2018a) recommendations, all species of Low Nature Conservation Importance (NCI) (as defined by **Table 8.2** below) have been scoped out of the assessment.

8.3.4 Study Area / Survey Area

A range of surveys were employed to accurately record baseline ornithological conditions within the Site and appropriate survey buffers. Terms referred to are as follows:

- 'survey area' is defined as the area covered by each field survey type at the time of survey; and
- 'study area' is defined as the area of consideration, based on the likely spatial extent of impacts on each species at the time of assessment and is the area used for any desk-based study (**Figure 8.2**).

The spatial extent of each survey area is listed in **Section 8.3.5** below and detailed in **Technical Appendix A8.1: Ornithology**.

Following the completion of flight activity surveys, a Collision Risk Analysis Area (CRAA) was defined for the purposes of estimating collision rates with wind turbines. The CRAA was created using a 500 m buffer from the proposed turbine locations (shown on **Figure 8.1**). As recommended by NatureScot (SNH 2017), using this buffer area around the turbines accounts for possible inaccuracies in the recording of flightlines by surveyors, and records any species' flight activity that was in proximity to, but not necessarily within the wind farm area at the time of surveys.

8.3.5 Field Surveys and Baseline Survey Methodology

All field surveys were conducted following the recommended NatureScot survey guidance (SNH 2017). Fieldwork within and surrounding the Site was undertaken between March 2018 and March 2020. This covered two full breeding seasons (2018 and 2019) and two full non-breeding seasons (2018/2019 and 2019/2020). The following surveys were undertaken (see **Technical Appendix A8.1: Ornithology** for details):

- Flight activity surveys – March 2018 to March 2020 (see **Figure 8.1** for viewshed coverage);
- Scarce breeding bird surveys (2 km survey area) – spring/summer 2018 and 2019;
- Black grouse surveys (1.5 km survey area) – spring 2018 and 2019;
- Breeding bird surveys (500 m survey area) – spring/summer 2018 and 2019; and
- Winter walkover surveys (500 m survey area) – autumn/winter 2018/2019 and 2019/2020.

8.3.6 Methodology for the Assessment of Effects

8.3.6.1 Outline Assessment Process

This section defines the methods used to assess the significance of effects through the process of an evaluation of the sensitivity of a feature (a combination of NCI and conservation status) and magnitude of impact for each likely effect. The assessment focuses on a 'worst-case' Proposed Development as described in **Chapter 4**.

The evaluation for wider-countryside interests (i.e., interests unrelated to Special Protection Areas (SPAs), but including Sites of Special Scientific Interest (SSSIs) and Ramsar sites) has been made using the following process:

- Identifying the potential impacts associated with the Proposed Development on an ornithological feature;
- Considering the likelihood of occurrence of potential impacts;
- Defining the sensitivity of a feature to impacts via the NCI of the species present and establishing each population's conservation status;
- Establishing the magnitude of the impact (both spatial and temporal);
- Based on the above criteria, making a judgement as to whether or not the resultant effect on an ornithological feature is significant with respect to the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ("EIA Regulations");
- If a potential effect is determined to be significant, suggesting measures to mitigate or compensate the effect in line with the mitigation hierarchy where required; and
- Considering residual effects after mitigation, compensation and identifying the proposed enhancement measures to be implemented as part of the Proposed Development, included as part of the Outline Biodiversity Enhancement Management Plan, included as **Technical Appendix A7.6: oBEMP**.

8.3.6.2 Habitats Regulations Appraisal (HRA) Process

The method for assessing the likely significant effects on a European site (in this context, an SPA) is different from that outlined above for wider-countryside ornithological interests. This is based on the Habitats Directive, which is transposed into domestic legislation by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) Regulation 48 and includes a number of steps to be taken by the competent authority before granting consent (these are referred to here as an HRA). In order of application, the first four are:

- Step 1: consider whether the proposal is directly connected to or necessary for the management of the SPA (Regulation 48(1)(b)).
- if not, Step 2: consider whether the proposal (alone or in combination) is likely to have a significant effect on the SPA (Regulation 48(1)(a)).
- if so, Step 3: make an Appropriate Assessment of the implications for the SPA in view of that SPA's conservation objectives (Regulation 48(1)(a)).
- Step 4: consider whether it can be ascertained that the proposal will not adversely affect the integrity of the SPA ("Integrity Test") having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48(5) and 48(6)).

It can clearly be established that the Proposed Development does not meet the criteria for Step 1. Where likely significant effects have been identified (Step 2), the results of baseline surveys and scientific conclusions presented in this chapter are therefore used to inform the HRA process, and

allow the competent authority, in this case, the Scottish Ministers, to conduct an Appropriate Assessment (Step 3), and to conclude whether any adverse effects on site integrity can be ascertained (Step 4) if required.

8.3.6.3 Assessing the Sensitivity of Features

The sensitivity of ornithological features on or near to the Proposed Development site is assessed in line with best practice guidance, legislation, statutory designations and professional judgement.

Determination of the level of sensitivity of an ornithological feature is based on a combination of the feature's NCI and conservation status. There are three levels of NCI as detailed in **Table 8.2**.

Table 8.2 Determining Factors of a Feature's Nature Conservation Importance (NCI)

Importance	Description
High	Populations receiving protection by an SPA, proposed SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines. Species present in nationally important numbers (>1 % national breeding or wintering population).
Medium	The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). The presence of breeding species listed in Annex I of the Birds Directive (but population does not meet the designation criteria under selection guidelines). The presence of rare, Red-listed breeding species noted on the latest Birds of Conservation Concern (BoCC) Red list (Stanbury et al. 2021). Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the Proposed Development. Species present in regionally important numbers (>1 % regional breeding population).
Low	All other species' populations not covered by the above categories.

Important Ornithological Features (IOFs, as per CIEEM 2018) to be assessed for the purposes of the EIA Report, are taken to be those species of high or medium NCI.

As defined by NatureScot (SNH 2018a), the conservation status of a species is "the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest". Conservation status is considered by NatureScot (SNH 2018a) to be 'favourable' under the following circumstances:

- *"population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats;*
- *the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and*
- *there is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis."*

NatureScot (SNH 2018a) recommends that *"the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status". Thus, "An impact should therefore be judged as of concern where it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status, in Scotland."*

In the case of non-designated sites in Scotland, the relevant regional scale for breeding species is considered to be the appropriate Natural Heritage Zone (NHZ²³⁵) which the Site falls within. The

²³⁵ SNH (2002). Natural Heritage Zones: A National Assessment of Scotland's Landscapes. Scottish Natural Heritage. (Accessed March 2023)

Proposed Development is within NHZ 19 (Western Southern Uplands and Inner Solway). In some cases, other geographical scales may be more appropriate and have more data available, e.g., distinct subpopulations, reintroduced populations or established 'regions' that have formed the basis of national censuses or other long-term monitoring programmes.

For wintering or migratory species, the national UK population or flyway population is considered to be the relevant scale for determining effects on the conservation status, unless there are other more appropriate geographical populations to use for a species.

8.3.6.4 Assessing the Magnitude of Impact

An impact is defined as a change of a particular magnitude to the abundance and/or distribution of a population as a result of the Proposed Development. Impacts can be adverse, neutral or favourable.

In determining the magnitude of impacts, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

The sensitivity of individual species to anthropogenic activities is considered when determining spatial and temporal magnitude of impact and is assessed using guidance described by Bright et al. (2006²³⁶), Hill et al. (1997²³⁷) and Goodship and Furness (2022²³⁸).

Impacts are judged in terms of magnitude in space and time. There are five levels of spatial and temporal impact magnitude as detailed in **Table 8.3** and

Table 8.4 respectively.

Table 8.3 Spatial Magnitude of Impact

Spatial Magnitude	Description
Very high	Total/near total loss of a bird population due to mortality or displacement. Total/near total loss of productivity in a bird population due to disturbance. Guide: >80% of population lost or increase in additive mortality.
High	Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 21-80% of population lost or increase in additive mortality.
Medium	Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 6-20% of population lost or increase in additive mortality.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 1-5% of population lost or increase in additive mortality.
Negligible	Very slight (or no discernible) reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation. Guide: <1% of population lost or increase in additive mortality.

²³⁶ Bright, J. A., Langston, R. H. W., Bullman, R., Evans, R. J., Gardner, S., Pearce-Higgins, J. & Wilson, E. (2006). Bird Sensitivity Map to provide locational guidance for onshore Windfarms in Scotland. Royal Society for the Protection of Birds. (Accessed July 2023)

²³⁷ Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. (1997). Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34:275-288. (Accessed July 2023)

²³⁸ Goodship, N.M. and Furness, R.W. (MacArthur Green) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species. NatureScot Research Report 1283. (Accessed July 2023)

Table 8.4 Temporal Magnitude of Impact

Temporal Magnitude	Description
Permanent	Impacts continuing indefinitely beyond the span of one human generation (taken as approximately 25-30 years), except where there is likely to be substantial improvement after this period. Where this is the case, long-term may be more appropriate.
Long-term	Approximately 15-25 years or longer (see above).
Medium-term	Approximately 5-15 years.
Short-term	Up to approximately 5 years.
Negligible	<12 months.

8.3.6.5 Assessing Cumulative Effects

Cumulative effects are assessed in **Section 8.7** and present information about the potential cumulative impacts of the Proposed Development combined with other projects or activities.

NatureScot (SNH 2018d) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative effects, such as collision risk, may be summed quantitatively, but according to NatureScot (SNH 2018d) *“In practice, however, some effects such as disturbance or barrier effects may need considerable additional research work to assess impacts quantitatively. A more qualitative process may have to be applied until quantitative information becomes available for developments in the area, e.g., from post-construction monitoring or research”*.

The main projects likely to cause similar impacts on ornithological features are other operational wind farm developments, or those under construction, consented, or in the planning process, located within NHZ 19.

8.3.6.6 Criteria for Assessing Significance

The potential significance of effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of impact as detailed in **Table 8.5**. Major and moderate effects are considered ‘significant’ in the context of the EIA Regulations.

Table 8.5 Determining Significance of Effects

Significance of Effect	Definition
Major	The temporal and /or spatial impacts are judged to result in a long-term significant effect on the integrity of a feature.
Moderate	The impact is likely to result in a medium term or potentially significant effect on the integrity of a feature.
Minor	The impact is likely to affect a feature at a notsignificant level by virtue of its limitations in terms of duration or extent, but there will probably be no effect on its integrity.
Negligible	No material impact.

8.3.7 Assessment Limitations

Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to impacts. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

In general, survey effort either met or exceeded the minimum requirements stipulated in NatureScot guidance (SNH 2017) with weather conditions appropriate for the surveys. Surveys were suspended (or additional surveys were undertaken) where weather conditions deteriorated (refer to **Technical Appendix A8.1: Ornithology**).

8.3.8 Embedded Mitigation

Breeding/lekking locations and key foraging areas of target species were taken into consideration from the early stages of the Proposed Development design process, to minimise the risk of disturbance, displacement and collision effects. In summary, the following steps have been taken in the design process to minimise the risk of significant effects on IOFs:

- Avoidance of the recorded peregrine falcon nesting locations by at least 500 m;
- Avoidance of the recorded barn owl roost/nest location by at least 500 m; and
- Avoidance of the black grouse lekking area by at least 500 m.

8.3.9 Project Assumptions

In addition to the above considered during the design process, this Chapter has been prepared on the basis of the assumptions/embedded mitigation listed below.

- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which would be reinstated post-construction and, in most cases, follow the proposed access tracks.
- Any disturbance areas around permanent infrastructure during construction will be temporary and land will be reinstated or restored before the construction period ends. The only excavation in these areas will be for cabling as noted above and otherwise may only be periodically used for side-casting of spoil until reinstatement.
- Borrow pits will be excavated during the construction period and will be reprofiled at the end of the construction period.
- To ensure all reasonable precautions are taken to avoid adverse effects on ornithological interests during construction and decommissioning, the Applicant will appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of construction and decommissioning and they will advise the Applicant and the Principal Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW will be required to be present on Site during the construction and decommissioning periods and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the Site to the relevant staff within the Principal Contractor and subcontractors.
- A Bird Disturbance Management Plan (BDMP) will be implemented during construction of the Development. The BDMP will detail measures to ensure legal compliance and safeguard breeding birds known to be in the area and will include species-specific guidance. The BDMP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction works. The ECoW will oversee the implementation of the above measures.
- Construction of the Proposed Development, including vegetation clearance and construction of the site access tracks, turbine hardstandings, borrow pits and site compound and erection of the turbines is predicted to last for approximately 18 months. The number of bird breeding seasons

potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The main breeding season of most birds at the Site extends from March to August. For the purposes of this assessment, it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect a maximum of up to two breeding seasons. This, therefore, represents a worst-case scenario.

The assessment of potential effects is based on the Proposed Development description outlined in **Chapter 4**. In relation to describing effects on ornithological features, the relevant specifications used to determine the 'worst-case' Proposed Development involve:

- Up to 11 turbines with a maximum tip height of 180 m and a maximum rotor diameter of 150 m. Total generating capacity of the Proposed Development would be in excess of 50 MW.
- The construction period will last for approximately 18 months, comprising a construction programme as described in **Chapter 4 – Description of the Proposed Development** (Description of the Proposed Development). The associated infrastructure will include: wind turbines, turbine foundations, crane hardstanding, borrow pits, met mast, new access tracks, upgrades to existing access tracks, underground cabling, on-site substation and battery energy storage system (BESS) and maintenance building, temporary construction compound and laydown area.
- Existing access roads will be reused where possible.

8.4 Baseline Conditions

The sections below provide information on statutory designations, a summary of target species recorded during flight activity surveys and a summary of results per target species (grouped into species groups) recorded. For each target species recorded it is also determined, based on baseline survey results and/or historic data, whether they can be reasonably scoped out if the assessment at this stage as a result of a lack of likely significant effects at a population level.

8.4.1 Designated Sites

There are no statutory designations with ornithological features within the Site. However, the Muirkirk and North Lowther Uplands SPA (underpinned by the Muirkirk Uplands SSSI (11.7 km, nearest turbine) and North Lowther Uplands SSSI (6.7 km, nearest turbine)) is located approximately 6.7km (nearest turbine) to the north of the Site (**Table 8.6; Figure 8.3**).

Table 8.6 Qualifying Features of the Muirkirk and North Lowther Uplands SPA (underpinned by the Muirkirk Uplands SSSI^ and North Lowther Uplands SSSI*)

Feature	Qualifying Feature Category	Condition	Description	Core Foraging Range (SNH 2016b)
Golden plover, breeding	SPA	June 2015: Unfavourable declining	Breeding population of European importance: estimated minimum of 154 breeding pairs (1999) representing 0.7% of the GB population. Selected as one of the most suitable sites for golden plover in GB.	3 km
Hen harrier, breeding	SPA, SSSI^*	July 2008: Unfavourable declining	Breeding population of European importance: average of 29.2 breeding females (1994-1998) representing 6% of the GB population and more recently an average of 12 breeding pairs (1991-1995) representing 2% of the GB population.	2 km

Feature	Qualifying Feature Category	Condition	Description	Core Foraging Range (SNH 2016b)
Hen harrier, non-breeding	SPA, SSSI [^]	December 2004: Unfavourable declining	Winter on the site in nationally important numbers.	Not provided
Merlin, breeding	SPA	July 2009: Unfavourable no change	Breeding population of European importance: average of nine breeding pairs (1989-1998) representing 0.7% of the GB population. Selected as one of the most suitable sites for merlin in GB.	5 km
Peregrine falcon, breeding	SPA	August 2004: Unfavourable no change	Breeding population of European importance: average of six breeding pairs (1992-1996) representing 0.5% of the GB population. Selected as one of the most suitable sites for peregrine falcon in GB.	2 km
Short-eared owl, breeding	SPA, SSSI [^]	July 1998: Favourable maintained	Breeding population of European importance: average of 26 breeding pairs (1997-1998) representing 3% of the GB population.	2 km
Breeding bird assemblage	SSSI [^]	May 2015: Unfavourable no change	Mosaic of habitats that supports a diverse upland breeding bird community of national importance including: buzzard, curlew, dunlin, red grouse, redshank, ring ouzel, snipe, stonechat, teal, wheatear and whinchat.	N/A

With regards to the distance measurements between the Proposed Development and designated sites (as noted in the NatureScot scoping response, **Table 8.1**), it is confirmed that the distances quoted in the Scoping Report were those from the Muirkirk and North Lowther Uplands SPA to the nearest proposed turbine location. This was considered an appropriate point to measure to from the designated sites to establish potential for foraging connectivity with the Proposed Development as whilst the site boundary does extend further north east from the turbine area, this section only encompasses a pre-existing access track that will be subject to some minor upgrades with localised areas of new tracks, and borrow pit 1 (**Figure 8.4**), and disturbance-displacement effects are considered to be limited.

At its northern most point, the site boundary is 3.6 km from the Muirkirk and North Lowther Uplands SPA and as such would continue to be outwith the core foraging range of hen harrier (2 km), peregrine falcon (2 km), short-eared owl (2 km) and golden plover (3 km) (**Figure 8.4**). The northern section of the pre-existing access track would be within a theoretical core foraging range for merlin (5 km) (**Figure 8.4**), however given the presence of Sanquhar and Kirkconnel villages situated between the site and the Muirkirk and North Lowther Uplands SPA it is considered unlikely that breeding merlin would commute over these villages to forage when there is suitable foraging habitat available within and around the SPA.

Consequently, there is very limited potential for connectivity between the Proposed Development and any of the qualifying features of the Muirkirk and North Lowther Uplands SPA, and the SPA is therefore scoped out of the assessment as no likely significant effects on the SPA are predicted.

8.4.2 Flight Activity Summary

A summary of all target species recorded during flight activity surveys at the Site is presented in **Table 8.7**. This summarises all flights observed during the baseline survey period (March 2018 and March 2020) regardless of the location of the flights in relation to the Development. For further details of the flight activity surveys, refer to **Technical Appendix A8.1: Ornithology**.

A summary of the collision model results is presented in **Table 8.8** (refer to **Technical Appendix A8.1: Ornithology Annex E** for detailed results) and collision modelling was using the Band et al. (2007²³⁹) model. Four species (black grouse, goshawk, hen harrier and merlin) were recorded during flight activity surveys, but no flights were considered to be 'at-risk' (i.e., the flights were outside of the CRAA and associated viewshed and/or were only recorded flying below/above the rotor swept area) and are therefore not included in **Table 8.8**.

Table 8.7 Target Species Recorded During Flight Activity Surveys, March 2018 to March 2020

Species	Total Number of Flights Recorded	Total Number of Birds Recorded	Total Bird Seconds ²⁴⁰ Recorded
Black grouse	2	6	108
Curlew	27	37	1,580
Golden plover	4	81	2,687
Goshawk	1	1	66
Hen harrier	10	10	828
Merlin	3	3	102
Osprey	1	1	180
Peregrine falcon	3	3	113
Pink-footed goose	4	591	41,300
Red kite	7	7	390

Table 8.8 Predicted Collision Rates

Species	Mean Breeding Season	Mean Non-Breeding Season	Mean Annual	Equivalent to One Bird Every X Years
Curlew	0	0.0005	0.0005	2,183
Golden plover	0.0035	0	0.0035	287
Osprey	0	0.0007	0.0007	1,342
Peregrine falcon	0	0.0014	0.0014	717
Pink-footed goose	0.1557	0	0.1557	6.4
Red kite	0.0015	0.0002	0.0017	577

8.4.3 Black Grouse

Black grouse were recorded on five occasions across the survey period (**Figure 8.5**) and were identified to be lekking at one location (four males, one occasion, Lek 1) on the Site in June 2019 (665 m from the nearest turbine, **Figure 8.5**). Historical data provided by the RSPB (2012-2021, no data provided for 2014 or 2020) indicates that lekking black grouse have been present (one to four males) within 2 km of the Proposed Development each year data was provided for. The lek identified by the baseline surveys in 2019 (lek 1) was also active in 2012, 2013 and 2015 (one to four males present)

²³⁹ Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at Windfarms. In: de Lucas, M., Janss, G.F.E. and Ferrer, M. (eds.) Birds and Windfarms: Risk Assessment and Mitigation. Pp. 259-275. Quercus, Madrid.

²⁴⁰ Bird seconds are calculated for each observation as the product of flight duration and number of individuals. This has then been summed to provide the total bird seconds for each species.

and two alternative lek locations were also recorded within 500 m of the Proposed Development (lek A – Mid Rig, 2016 and 2017, one male; lek B - Whiteside, 2016, 2017, 2018, 2019 and 2021, one male). A review of the combined available data for lekking black grouse indicates that there is between one and four males lekking at three interconnected lek areas on the Site between 2012 and 2021.

Flight activity surveys recorded a further two flights (**Table 8.7, Figure 8.6**) which were not identified to be 'at-risk' and therefore no risk of collision is predicted.

Considering the presence of a lek within 750 m of turbines, black grouse is scoped into the assessment.

8.4.4 Raptors and Owls

8.4.4.1 Barn Owl

Barn owl were identified to be roosting at one location within the 2 km survey area (857 m from the nearest turbine and 841 m from the nearest infrastructure, **Confidential Figure 8.2.1**) during the 2018 and 2019 breeding seasons. The roost was not in constant use and no evidence of breeding was recorded (although the roost location was noted to be suitable for nesting).

Considering this species lack of breeding activity and no predicted risk of collision, barn owl is scoped out of the assessment.

8.4.4.2 Goshawk

A single adult goshawk was recorded during the 2019 breeding season (**Figure 8.7**). No evidence of breeding was identified within the 2 km survey area.

Flight activity surveys recorded one flight (**Table 8.7, Figure 8.8**) which was not identified to be 'at-risk' and therefore no risk of collision is predicted.

Considering this species lack of breeding activity and no predicted risk of collision, goshawk is scoped out of the assessment.

8.4.4.3 Hen Harrier

Hen harrier were recorded on two occasions during the survey period (male hunting in April 2018 and a female hunting in June 2018, **Figure 8.7**). No evidence of breeding was identified within the 2 km survey area.

Flight activity surveys recorded ten flights (**Table 8.7, Figure 8.9**) which were not identified to be 'at-risk' and therefore no risk of collision is predicted.

Considering this species lack of breeding activity and no predicted risk of collision, hen harrier is scoped out of the assessment.

8.4.4.4 Merlin

Flight activity surveys recorded three flights (**Figure 8.10**) which were not identified to be 'at-risk' and therefore no risk of collision is predicted.

Merlin were not recorded on any of the walkover surveys and no evidence of breeding was identified within the 2 km survey area.

Considering this species lack of breeding activity and no predicted risk of collision, merlin is scoped out of the assessment.

8.4.4.5 Osprey

Flight activity surveys recorded one flight (**Table 8.7, Figure 8.11**) which was identified to be 'at-risk', predicting a worst-case collision risk of one bird every 1,342 years (**Table 8.8**).

Osprey were not recorded on any of the walkover surveys and no evidence of breeding was identified within the 2 km survey area.

Considering this species lack of breeding activity and negligible predicted risk of collision, osprey is scoped out of the assessment.

8.4.4.6 Peregrine Falcon

Peregrine falcon were recorded on three occasions (**Figure 8.7**) within the 2 km survey area and were identified to be present at two locations (**Confidential Figure 8.2.1**). PE_1 and PE_2 are 1.1 km and 2.8 km from the nearest turbine respectively (and 1.1 km and 2.3 km from the nearest infrastructure respectively). Both locations had adults present in 2018 (however there was no clear indication of breeding) and in 2019 breeding was confirmed at both sites. The DGRSG provided information for PE_2 and confirmed that a pair had occupied this territory each year between 2014 and 2022 with between one and three chicks successfully fledged in all but two of the years.

Flight activity surveys recorded three flights (**Figure 8.12**) of which two were identified to be 'at-risk', predicting a worst-case collision risk of one bird every 717 years (**Table 8.8**).

Considering this species negligible predicted risk of collision, no breeding activity within 1 km of the Proposed Development and no evidence of the Site being used as a core foraging area for either territory, peregrine falcon is scoped out of the assessment.

8.4.4.7 Red Kite

Red kite were recorded on ten occasions during the survey period (all individual adult birds, **Figure 8.7**). No evidence of breeding was identified within the 2 km survey area.

Flight activity surveys recorded seven flights (**Figure 8.13**) of which four were identified to be 'at-risk', predicting a worst-case collision risk of one bird every 577 years (**Table 8.8**).

Considering this species lack of breeding activity and negligible predicted risk of collision, red kite is scoped out of the assessment.

8.4.5 Waders

Table 8.9 contains a summary of target (i.e. those included on the BoCC Red-list, Stanbury et al. 2022) breeding wader activity within the 500 m study area with breeding activity also shown on **Figure 8.14**. Refer to **A8.1: Ornithology** for all wader activity recorded during baseline surveys.

Table 8.9 Breeding Wader Activity, 2018-2019 – Estimated Number of Territories within the 500 m Study Area

Species	2018	2019
Curlew	6-11	5-9
Lapwing	0-1	2-5

8.4.5.1 Curlew

Breeding bird surveys recorded breeding curlew within the 500 m study area both years with an estimated minimum of five and maximum of 11 territories in any one year (**Table 8.9, Figure 8.14**).

Flight activity surveys recorded 27 flights (**Figure 8.15**) of which two were identified to be 'at-risk', predicting a worst-case collision risk of one bird every 2,183 years (**Table 8.8**).

Considering this species breeding activity within the Site, curlew is scoped into the assessment.

8.4.5.2 Lapwing

Breeding bird surveys recorded breeding lapwing within the 500 m study area both years with an estimated maximum of five territories in any one year (**Table 8.9, Figure 8.14**)

Considering this species breeding activity within the Site, lapwing is scoped into the assessment.

8.4.5.3 Golden Plover

Golden plover were heard calling (not seen) on one occasion during the breeding season (July 2018), however no evidence of breeding was located.

Flight activity surveys recorded four flights (**Figure 8.16**) of which two were identified to be 'at-risk', predicting a worst-case collision risk of one bird every 287 years (**Table 8.8**).

Considering this species lack of breeding activity and negligible predicted risk of collision, golden plover is scoped out of the assessment.

8.4.5.4 Woodcock

Breeding bird surveys recorded breeding activity for woodcock in 2018 (one to five territories), however all activity was over 500 m from the Proposed Development (**Figure 8.14**).

Considering this species lack of breeding activity within the Site, woodcock is scoped out of the assessment.

8.4.5.5 Pink-Footed Goose

Flight activity surveys recorded four flights (**Figure 8.17**) of which three were identified to be 'at-risk', predicting a worst-case collision risk of one bird every 6.4 years (**Table 8.8**). NatureScot guidance (SNH 2013a²⁴¹, 2013b²⁴²) on potential wind farm impacts on pink-footed geese states that "*SNH [NatureScot] will now no longer require [Collision Risk Modelling] CRM to be completed for pink-footed geese in support of wind farm applications in the wider countryside, although the process should be followed as usual for assessing impacts on designated site pink-footed goose populations*". Pink-footed geese are not listed as a feature at any designated sites within 20 km of the Site and the pink-footed geese recorded are therefore considered to be part of the wider countryside population and therefore no collision risk modelling is required.

A small flock of three birds in flight was recorded in August 2019 to the north of the Site, however there was no evidence of pink-footed geese foraging on the Site or on the adjacent land and the Site is of limited value for foraging geese.

Considering the NatureScot guidance regarding pink-footed goose avoidance rates and collision risk, and lack of suitable habitat within the Site, pink-footed goose is scoped out of the assessment.

8.5 Assessment of Potential Effects

8.5.1 Summary of Scoped In Important Ornithological Features (IOFs)

An assessment is applied to any scoped-in IOFs of medium or high NCI (**Table 8.2**) that are known to be present within the site or surrounding area (as confirmed through survey results and consultations outlined above). Based on the preceding section, the species considered to be an IOF are black grouse, curlew and lapwing.

²⁴¹ SNH (2013a) Avoidance Rates for Wintering Species of Geese In Scotland At Onshore Wind Farm (Accessed March 2023)

²⁴² SNH (2013b) Geese and wind farms in Scotland: new information. (Accessed March 2023)

Table 8.10 Scoped In Important Ornithological Features (IOFs)

Feature		NCI	Reason for Inclusion
Black grouse		Medium	BoCC Red listed, sensitive to wind farm developments.
Curlew		Medium	BoCC Red listed, sensitive to wind farm developments.
Lapwing		Medium	BoCC Red listed, sensitive to wind farm developments.

The conservation status of these IOFs is detailed in **Table 8.11**.

Table 8.11 Conservation Status of Scoped In IOF's

IOF	Conservation Status	Information
Black grouse	BoCC Red list (HD, BDp1, BDp2, BDMr2)	Black grouse is Red-listed due to an historical decline in the UK between 1800 and 1995, without substantial recent recovery. It also qualifies due to a severe decline in the UK breeding population size of >50 % over 25 years. Breeding numbers in the UK declined by 80 % between 1991 and 2004. Sim et al. (2008²⁴³) estimated there to be 5,078 male black grouse in the UK in 2005, with approximately two-thirds of these occurring in Scotland. However, Forrester et al. (2012²⁴⁴) estimate that in Scotland there are around 3,550 to 5,750 lekking males, representing about 71 % of the British population. In Scotland the breeding range is contracting and numbers are declining, though the rate of decline varies regionally, being higher in south western Scotland (-49 %) compared to north Scotland (-16 %). Evidence suggests that the national and regional populations are in unfavourable conservation status. The NHZ 19 (Western Southern Uplands and Solway) population was estimated by Wilson et al. (2015²⁴⁵) to be 121 (range 71-168) displaying males. The Black grouse conservation strategy for south Scotland (Warren 2016²⁴⁶) considers the west southern Scotland population to be 180 displaying males (2011-2015) across the four connected population regions of Lowther Hills, East Galloway, Galloway Forest Park and Cairnsmore (these have individual estimates of 33, 35, 92 and 20 displaying males respectively).
Curlew	Red List (BDp2, BDMp1, WDMp1, BI)	The most recent national breeding curlew population estimate was 59,000 pairs in 2016 (Woodward et al. 2020²⁴⁷) and there has been a significant long-term decline across Scotland. The continued inclusion of the species on the BoCC Red list suggests that the national and NHZ/regional populations are in unfavourable conservation status. The NHZ 19 population was estimated to be 4,284 (3,851-4,717) pairs in 2005 (Wilson et al. 2015).
Lapwing	Red list (BDp2, ERLOB, BDMp1, WDMp1)	The most recent national breeding lapwing population was estimated to be 98,000 pairs in 2016 (Woodward et al. 2020) and the Scottish population is estimated to be between 71,500 and 105,600 pairs (Forrester et al. 2012).

²⁴³ Sim, I.M.W., Eaton, M.A., Setchfield, R.P., Warren, P.K. and Lindley, P. (2008). Abundance of male black grouse Tetrao tetrix in Britain in 2005, and change since 1995-96. Bird Study 55: 304-313. (Accessed March 2023)

²⁴⁴ Forrester, R.W., Andrews, I.J., McInerney, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds) 2012. The Digital Birds of Scotland. The Scottish Ornithologists' Club, Aberlady. (Accessed March 2023)

²⁴⁵ Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72. Available from: www.swbsg.org (Accessed March 2023)

²⁴⁶ <https://www.gwct.org.uk/media/641731/black-grouse-in-southern-scotland.pdf> (Accessed March 2023)

²⁴⁷ Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D.A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. British Birds 113: 69-104. (Accessed March 2023)

IOF	Conservation Status	Information
		Woodward et al. (2020) have reported a national breeding decline of 59 % across the UK, with Scottish densities highest in Orkney, Shetland and the Outer Hebrides. The NHZ trend is unknown but the regional and national populations are on balance likely to be in unfavourable conservation status

BoCC Red-list criteria (Stanbury et al. 2021)

HD = historical decline in the breeding population.

BDp1/2 = severe breeding population decline over 25 years/longer term.

BoCC Amber-list criteria (Stanbury et al. 2021)

ERLOB = threatened in Europe.

BDMp1 = moderate breeding population decline over 25 years/longer term.

BDMr2 = moderate breeding range decline over 25 years/longer term.

WDMp1 = moderate non-breeding population decline over 25 years/longer term.

BI = breeding international importance

8.5.2 Likely Effects

The ornithological impacts in respect of the scoped in IOFs relating to the Proposed Development are as follows:

- Permanent or temporary direct habitat loss for birds through construction and operation of the Proposed Development;
- Permanent or temporary disturbance-displacement of birds due to construction activities, turbine and substation operation and maintenance, or visitors. This also includes barrier effects to commuting or migrating birds due to the presence of wind turbines;
- Death or injury through collision with wind turbine blades or other types of infrastructure associated with the Proposed Development;
- The influence of turbine aviation lighting on bird behaviour, whether resulting in displacement or attraction; and
- Cumulative effects of the Proposed Development during construction and operation when considering wind farms and other projects.

8.5.3 Construction

The main potential effects of construction activities due to the Proposed Development are the displacement and disruption of breeding, foraging, roosting or lekking birds as a result of noise and general disturbance over a short-term period (either the duration of a particular construction activity within working hours, or the duration of the whole construction period).

Effects on breeding birds would be confined to areas in the locality of temporary construction compounds, turbines, tracks and other infrastructure. Few attempts have been made to quantify the effects of disturbance of birds due to activities of this type, and much of the available information is inconsistent. However, as a broad generalisation, larger bird species such as raptors, or those that feed in flocks in the open tend to be more susceptible to disturbance than small birds living in structurally complex habitats (such as woodland, scrub and hedgerow)²⁴⁸

Direct habitat loss would also occur due to the Proposed Development's construction, which would be both temporary (e.g., construction compounds, borrow pits) and longer term (access tracks, turbines and substation). This has the potential to impact on breeding or foraging individuals. Please refer to Chapter 7: Ecology for habitat loss calculations and assessment.

²⁴⁸ Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. (1997). Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34:275-288. (Accessed March 2023)

8.5.3.1 Black Grouse

Impact: lekking or foraging black grouse may be displaced during construction, either by disturbance or direct habitat loss.

Sensitivity: medium NCI (Table 8.10) with the regional and national populations considered to be of unfavourable conservation status. Consequently, black grouse sensitivity in the context of the Site is considered to be medium-high.

Magnitude of impact: according to an expert review by Goodship and Furness (2022), leks may be actively disturbed at up to 500 m to 750 m from a disturbance source, and NatureScot generally advocates that a buffer of up to 750 m should be applied to avoid all disturbance during the construction phase, based on information in Zwart et al. (2015²⁴⁹). Lek 1 is approximately 665 m from the closest infrastructure associated with the Proposed Development (Figure 8.5), lek A (RSPB data) is adjacent to the closest infrastructure (section of track) associated with the Proposed Development and lek B (RSPB data) is approximately 30 m to the closest infrastructure associated with the Proposed Development. Whilst there will be no direct habitat loss to the lek sites themselves, there will be some small direct loss of breeding or foraging habitats within 750 m of the lek and within the rest of the Site. There was a maximum of four males recorded lekking at Lek 1 in 2019 no evidence in 2018 and one to four males between 2012-2015 from the RSPB data), one male lekking at lek A (2016 and 2017, RSPB data) and one male lekking at lek B (between 2017 and 2021, RSPB data).

Warren (2016)²⁵⁰ estimates the west southern Scotland population to be 180 lekking males () and so, the potential disturbance of four lekking males across the whole Site at any one time would represent around 2.2 % of the biogeographic population.

This worst-case scenario of the temporary loss of up to four lekking males (the maximum Site population) is considered to be of medium spatial and short-term temporal magnitude.

Significance of effect: the unmitigated effect on the regional (west southern Scotland) black grouse population as a result of construction is considered to be minor-moderate adverse and therefore **potentially significant** in the context of the EIA regulations.

8.5.3.2 Curlew

Impact: breeding curlew may be displaced from the Site during construction, either by disturbance or direct habitat loss.

Sensitivity: medium NCI (Table 8.10) with the NHZ and national populations considered to be of unfavourable conservation status. Consequently, curlew sensitivity in the context of the Site is considered to be **medium-high**.

Magnitude of impact: an estimated 6-11 and 5-9 curlew territories in 2018 and 2019 respectively were recorded to be within 500 m of infrastructure (Figure 8.14). The curlew NHZ 19 breeding population is estimated to be 4,284 pairs (Wilson et al. 2015), and the potential (temporary) loss of between 5-11 curlew territories (ranges based on minimum and maximum breeding activity) would result in a loss of 0.11 % to 0.25 % of the breeding population. It should however be noted that it is unlikely that all breeding curlew would be lost from the population during construction as there would be suitable breeding habitat within and surrounding the Site unaffected by construction activities (as construction wouldn't take place across the whole Site during the breeding season), and therefore at least some affected breeding pairs may move to adjacent habitat. It should be noted that the BDMP (and associated pre-construction surveys) and presence of ECoW during the construction period will ensure that there is no disturbance to active nests during construction, however some birds may still

²⁴⁹ Zwart, M. C., P. Robson, S. Rankin, M. J. Whittingham, and P. J. K. McGowan (2015). Using environmental impact assessment and post-construction monitoring data to inform wind energy developments. *Ecosphere* 6(2):26. <http://dx.doi.org/10.1890/ES14-00331.1> (Accessed March 2023)

²⁵⁰ <https://www.gwct.org.uk/media/641731/black-grouse-in-southern-scotland.pdf> [Accessed August 2023]

be displaced prior to breeding as a result of construction. As a worst-case (where breeding would be lost rather than displaced), an impact of **low** and short-term magnitude is predicted.

Significance of effect: the unmitigated effect on the regional curlew population as a result of construction is considered to be **minor adverse** and therefore **not significant** in the context of the EIA regulations.

8.5.3.3 Lapwing

Impact: breeding lapwing may be displaced from the Site during construction, either by disturbance or direct habitat loss.

Sensitivity: medium NCI (Table 8.10) with the NHZ and national populations considered to be of unfavourable conservation status. Consequently, lapwing sensitivity in the context of the Site is considered to be **medium-high**.

Magnitude of impact: an estimated 0-1 and 2-5 lapwing territories in 2018 and 2019 respectively were recorded to be within 500 m of infrastructure (Figure 8.14), with activity restricted to the lower altitude field complex at the northern end of the access track. The NHZ 19 breeding population is unknown but based on the Scottish population of 98,000 pairs presented in Woodward et al. (2020), a minimum of 5,000 pairs are likely to be within NHZ 19. The potential temporary loss of 1-5 lapwing territories would result in a loss of 0.02 % to 0.1 % of the breeding population. It should however be noted that it is unlikely that all breeding lapwing would be lost from the population during construction as there would be suitable breeding habitat within and surrounding the Site unaffected by construction activities (as construction wouldn't take place across the whole Site during the breeding season), and therefore at least some affected breeding pairs may move to adjacent habitat. It should be noted that the BDMP (and associated pre-construction surveys) and presence of ECoW during the construction period will ensure that there is no disturbance to active nests during construction, however some birds may still be displaced prior to nesting as a result of construction. As a worst-case (where breeding would be lost rather than displaced), an impact of **negligible** and short-term magnitude is predicted.

Significance of effect: the unmitigated effect on the regional lapwing population as a result of construction is considered to be minor adverse and therefore **not significant** in the context of the EIA regulations.

8.5.4 Operation – Displacement

The displacement of nesting, foraging or roosting birds from the Proposed Development has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase.

Evidence of displacement away from operational turbines has been found to occur in a number of individual wind farm studies, although the effects vary considerably between sites and species. It is recognised that disturbance may occur due to maintenance or recreational activities throughout the operational phase, although since these are likely to be of shorter duration and smaller extent than construction activities, effects would be lower than those predicted for construction effects.

8.5.4.1 Black Grouse

Impact: wind farm operation may cause some displacement of lekking, breeding and foraging black grouse from areas close to turbines and other infrastructure. It is considered that operational disturbance (e.g., from maintenance activities) has, in general, a lesser effect than construction disturbance (see Section 8.5.3.1) as operational disturbance is generally of shorter duration and smaller extent.

Sensitivity: medium NCI (Table 8.10) with the regional and national populations considered to be of unfavourable conservation status. Consequently, black grouse sensitivity in the context of the Site is considered to be **medium-high**.

Magnitude of impact: according to an expert review by Goodship and Furness (2022), leks may be actively disturbed at between 500 m and 750 m from a disturbance source, and NatureScot has also advocated that a buffer of up to 500 m should be applied to avoid all potential displacement effects during wind farm operation. Evidence from Austria has suggested that leks may be adversely affected by wind farms, although it is not clear what the exact causes may be – potentially a combination of turbine noise, maintenance activities or collisions (Zeiler and Grünsachner-Berger 2009²⁵¹). Early-stage operational monitoring (in 2014 and 2015) at Berry Burn Wind Farm indicated that there were no obvious effects on black grouse behaviour with two different leks recorded within 250 m and 420 m of turbines and black grouse activity recorded across the whole wind farm (droppings and birds) (Nevis 2015²⁵² and 2016²⁵³).

Lek 1 is not located within 500 m of the Proposed Development (841 m from the nearest infrastructure) and consequently there is considered to be no operational displacement to this lek. Leks A and B (RSPB data) are within 500 m of the Proposed Development (approximately 200 m from the nearest proposed turbine) and consequently there is potential for operational displacement for these leks.

Warren (2016²⁵⁴) estimates the west southern Scotland population to be 180 lekking males and so although unlikely, the potential unmitigated displacement of up to two males would represent around 1.1 % of the biogeographic population.

Whilst it is considered that the loss of up to two lekking males from the southern Scotland population (representing 1.1 % of the population) is unlikely given the likely connectivity between lek sites across the Site, the worst-case scenario of the loss of both lekking is considered to be an impact of **low** spatial and long-term temporal magnitude.

Significance of effect: the unmitigated effect on the regional black grouse population as a result of operational displacement is considered to be **minor adverse** and therefore **not significant** in the context of the EIA regulations.

8.5.4.2 Curlew

Impact: nesting or foraging curlew may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

Sensitivity: medium NCI (Table 8.10) with the NHZ and national populations considered to be of unfavourable conservation status. Consequently, curlew sensitivity in the context of the Site is considered to be **medium-high**.

Magnitude of impact: an estimated 6-11 and 5-9 curlew territories in 2018 and 2019 respectively were recorded to be within 500 m of infrastructure (Figure 8.14). The curlew NHZ 19 breeding population is estimated to be 4,284 pairs (Wilson et al. 2015), and the potential permanent loss of between 5-11 curlew territories (ranges based on minimum and maximum breeding activity) would result in a loss of up to 0.25 % of the breeding population. It is considered unlikely that all breeding curlew would be lost from the population as there is additional suitable breeding habitat surrounding infrastructure and it is more likely that at least some curlew that may have bred within or near the Site would be displaced to adjacent habitat. As a worst-case (where breeding birds would be lost rather than displaced), an impact of **low** and long-term magnitude is predicted.

²⁵¹ Zeiler H., V. Grünsachner-Berger (2009). Impact of wind power plants on black grouse, *Lyrurus tetrix* in Alpine Regions. *Folia Zool.* 58(2): 173–182

²⁵² Nevis (June 2015). 2014 Habitat Management Plan Implementation.

²⁵³ Nevis (February 2016). 2015 Habitat Management Plan Implementation.

²⁵⁴ Warren, P. (2016). Black grouse conservation in southern Scotland - Phase 2 Development of a regional strategic conservation plan. Available: [Black grouse conservation in southern Scotland - Phase 2 Development of a regional strategic conservation plan \(gwct.org.uk\)](https://www.gwct.org.uk/black-grouse-conservation-in-southern-scotland-phase-2-development-of-a-regional-strategic-conservation-plan) (Accessed March 2023)

Significance of effect: the unmitigated effect on the regional curlew population as a result of operational displacement is **minor-moderate** adverse and therefore **potentially significant** in the context of the EIA regulations.

8.5.4.3 Lapwing

Impact: nesting or foraging lapwing may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

Sensitivity: medium NCI (**Table 8.10**) with the NHZ and national populations considered to be of unfavourable conservation status. Consequently, lapwing sensitivity in the context of the Site is considered to be medium-high.

Magnitude of impact: an estimated 0-1 and 2-5 lapwing territories in 2018 and 2019 respectively were recorded to be within 500 m of infrastructure (**Figure 8.14**), with activity restricted to the lower altitude field complex at the northern end of the access track. The NHZ 19 breeding population is unknown but based on the Scottish population of 98,000 pairs presented in Woodward et al. (2020), a minimum of 5,000 pairs are likely to be within NHZ 19 and the potential permanent loss of between 1-5 lapwing territories (ranges based on minimum and maximum breeding activity) would result in a loss of up to 0.1 % of the breeding population. It is considered unlikely that all breeding lapwing would be lost from the population as breeding activity was only within 500 m of the access track which during the operational phase will have reduced use in comparison to the construction period. Furthermore, there is additional suitable breeding habitat surrounding the access track and it is more likely that at least some lapwing that may have bred within or near the access track would be displaced to adjacent habitat. As a worst-case (where breeding birds would be lost rather than displaced), an impact of **negligible** and long-term magnitude is predicted.

Significance of effect: the unmitigated effect on the regional lapwing population as a result of operational displacement is considered to be **minor adverse** and therefore **not significant** in the context of the EIA regulations.

8.5.5 Operation – Collision Risk

Birds that utilise the airspace within the Proposed Development at potential collision heights could be at risk of collision with wind turbines. For the CRM methods used see **Appendix A8.1**.

8.5.5.1 All IOFs

Impact: birds flying within the Site may be subject to a collision risk with wind turbines, thereby increasing the annual mortality rate of the population above background levels.

Sensitivity: medium-high.

Magnitude of impact: as shown in **Table 8.8**, the CRM predicts very low (one collision every 1,580 years for curlew) or zero (black grouse and lapwing) collision rates for these species based on 2019-2020 flight activity. From these predictions, it can be reasonably concluded that the magnitude of impact for these IOFs is **negligible**, long-term.

Significance of effect: the unmitigated effects on these IOFs from collision risk is considered to be **negligible** and therefore **not significant** in the context of the EIA Regulations.

8.5.6 Operation – Lighting

As the turbines would be in excess of 150 m to blade tip, they are required to be lit pursuant to Article 222 of the UK Air Navigation Order (ANO) 2016. The Civil Aviation Authority (CAA) Policy Statement 'Lighting of Onshore Wind Turbine Generators in the United Kingdom with a Maximum Blade Tip Height At or In Excess of 150 m Above Ground Level' (CAA, June 2017) modifies the strict application of Article 222 to require only the hub to be lit by 2000 candela steady red lights, with a single set of intermediate steady red lights halfway down the tower at a reduced intensity of 32 candela.

As advised by NatureScot (2020b²⁵⁵), there are potential lighting effects on birds which therefore require consideration within an EIA. Here, the worst-case scenario of steady red lighting on all turbines is the basis of the assessment. However, the type of lighting is subject to ongoing consultation between the Applicant and the relevant regulatory bodies on a reduced site-specific lighting scheme.

8.5.6.1 All IOFs

Impact: effects on IOFs might arise as a consequence of deployment of obstruction lighting on turbines over 150 m to blade tip. Once installed on-site, the Proposed Development turbines would be lit with medium intensity (2000 candela) steady red aviation warning lights, mounted on the nacelle of the turbines and a low-intensity light (32 candela) on the turbine tower at an intermediate level of half the hub height (**Technical Appendix A6.4: Visual Assessment of Visible Aviation**). In addition to lighting on the turbines themselves, any effects of the proposed permanent lighting of the substation and BESS for birds utilising the area for breeding or foraging have been considered.

Lighting could have various effects on birds: they may be attracted to lights and thereby placed at higher risk of collisions, have migration patterns disrupted, show avoidance of lights with a consequent displacement impact, or be subject to increased predation threat. NatureScot (2020b) has identified attraction (phototaxis) as posing the principal threat to birds, in relation to wind turbines.

Sensitivity: Medium-high.

Magnitude of impact: In NatureScot's (2020a) advice on the scope of assessment for turbine lighting, it is identified that an assessment of the possible effects of lighting on birds may be required in the following three situations, where risk is greater:

- (i) wind turbines on or adjacent to a seabird colony that hosts burrow nesting species;
- (ii) wind turbines that are on or adjacent to protected areas that host large concentrations of wintering waterbirds, where such sites are located within open country away from other sources of artificial light; and
- (iii) where wind farms are located on migratory corridors or bottlenecks for nocturnally migrating passerines.

It is clear that the Proposed Development does not fit the first two situations. In the case of migrating species, there is no evidence to suggest that the Site is of any importance as a migration route. The habitats within the Site are generally poor for food or shelter, the topography does not suggest that it would be a significant flight corridor (e.g., such as a natural feature such as a valley), and it is distant from coastal areas which would be of greater importance to continental migrants.

The substation and BESS (infrastructure with some lighting) are situated over 1 km from the black grouse lek (**Figure 8.5**) however it is within an area of curlew breeding activity (**Figure 8.14**). The distance to which any permanent lighting associated with the substation and BESS during the operational phase may result in any adverse effects is uncertain. Curlew may be displaced by permanent lighting associated with the substation, and/or increased predation as a result of continuous lighting.

As such, based on the guidance provided by NatureScot (2020a), it is considered that there is little evidence to indicate that any species would be significantly impacted by lighting requirements of the Proposed Development. An impact of **negligible**, long-term magnitude is therefore predicted for all IOFs.

Significance of effect: in conclusion, the magnitude of impact on IOFs associated with lighting is predicted to be **negligible** and **not significant** in the context of the EIA Regulations.

²⁵⁵ NatureScot (2020b). The Effect of Aviation Obstruction Lighting on Birds at Wind Turbines, Communication Towers and Other Structures. NatureScot Information Note.

8.5.7 Decommissioning

Decommissioning effects for the Proposed Development are difficult to predict with any confidence because of the long timeframe until their occurrence. Decommissioning effects are considered for the purpose of this chapter to be similar in nature to those of construction impacts but are likely to be of shorter duration. The significance of effects predicted in the construction (**Section 8.5.3**) are therefore considered appropriately precautionary for assessing decommissioning effects on IOFs.

8.6 Mitigation and Residual Effects

8.6.1 Construction

The only identified effect during the construction phase (and decommissioning phase) that was considered to be potentially significant for any IOF was disturbance to lekking black grouse (**moderate adverse**). Mitigation during construction for lekking black grouse, in addition to standard procedures within the BDMP, has been considered and is summarised below.

No other significant unmitigated effects were predicted for any IOF, and therefore no specific mitigation other than the standard mitigation already outlined (BDMP, ECoW and pre-construction surveys) is required for curlew or lapwing. These measures will aim to ensure that no breeding activity is disrupted by construction activities.

8.6.1.1 Black Grouse

To avoid a significant disturbance effect occurring during construction, the BDMP will also extend to protection of black grouse leks (as well as nest sites). Specific pre-construction surveys for lekking black grouse will be undertaken during the main black grouse lekking season (March to May, following methodology provided by Gilbert et al.²⁵⁶ and NatureScot²⁵⁷ to provide an up to date understanding of where black grouse are lekking within 750 m of the Proposed Development.

If pre-construction surveys do record lekking black grouse within a disturbance zone (up to 750 m of any proposed works), all construction activities would be prohibited within the disturbance zone until a risk assessment is undertaken. The risk assessment would consider the likelihood and possible implications of the associated construction activities on the lek and set out necessary measures to ensure that no disturbance occurs. Restrictions to construction activity within the disturbance zone would likely be within two hours of dawn during core lekking period of March to May. Any deviations to the proposed timing restrictions and/or extent of any disturbance-free zone would be agreed with NatureScot. Furthermore, to minimise the possibility of disturbance outside these times to any leks within 750 m of access tracks, a maximum speed limit of 15 mph will be enforced, and personnel will remain within vehicles wherever possible. Where possible, gates within 750 m of lek sites will remain open after first arrival, therefore avoiding the need for every subsequent entry to open and close the gate and the associated potential disturbance to the lek due to pedestrian activity.

The ECoW will oversee the implementation of the above measures.

Following the mitigation detailed above, the residual effect for the regional (west southern Scotland) black grouse population as a result of construction disturbance is considered to be **minor adverse** and therefore **not significant** in the context of the EIA regulations.

²⁵⁶ Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods. RSPB, Sandy

²⁵⁷ NatureScot (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms <https://www.nature.scot/sites/default/files/2018-06/Guidance%20Note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20wind%20farms.pdf>

8.6.2 Operation

Potentially significant effects during operation were identified for curlew (minor-moderate adverse). Specific additional mitigation for curlew has been considered and is summarised below.

No significant unmitigated effects were predicted for black grouse or lapwing, and therefore no specific mitigation is required due to **minor adverse** effects, however the aims of the outline Biodiversity Enhancement Management Plan (BEMP), (**Technical Appendix A7.6: oBEMP**) would be to benefit all wader species and black grouse by providing habitat enhancement measures.

8.6.2.1 Curlew

As identified above, nesting or foraging curlew may be at risk of displacement from habitat around turbines or other infrastructure, thereby impacting on productivity or survival rates.

Breeding curlew activity was recorded within 500 m of the substation and BESS. Whilst the distance to which any permanent lighting associated with the substation and BESS during the operational phase may result in any adverse effects is uncertain, efforts will be made to ensure that permanent lighting at the substation and BESS is minimised (e.g., use of reduced intensity lighting, lighting timers, focussed directional lighting to only light key areas, suitably opaque screening), whilst ensuring that these measures would not result in additional impacts (e.g., trees as screening could increase perceived predation threat and result in displacement).

Curlew has been identified as a key ornithological feature in the outline BEMP (**Technical Appendix A7.6: oBEMP**), with Aim 2 (enhance habitats for waders, Management Unit A) specifically determined to deliver focussed habitat enhancement to maintain and increase the breeding curlew population. Whilst the measures proposed would mitigate impacts on curlew, Aim 2 will also ensure enhancement benefits to other breeding waders (including lapwing and golden plover) which fulfils the aims of Policy 3 of NPF4.

Following the mitigation detailed above, the residual effect for curlew during operation of the Proposed Development is **minor adverse** and therefore **not significant** in the context of the EIA regulations.

8.7 Cumulative Effect Assessment

This Section presents information about the potential cumulative effects of the Proposed Development combined with other operational, consented or proposed wind farm projects that are located within the appropriate spatial context on the basis of the species considered.

8.7.1 Methods

NatureScot (SNH 2018b) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative impacts, such as collision risk, may be summed quantitatively, but according to NatureScot *"In practice, however, some effects such as disturbance or barrier effects may need considerable additional research work to assess impacts quantitatively. A more qualitative process may have to be applied until quantitative information becomes available for developments in the area, e.g. from post-construction monitoring or research"* (SNH 2018b).

The main projects likely to cause similar effects to those associated with the Proposed Development are other operational wind farm developments, or those under construction, consented, or in the planning process within NHZ 19 (**Table 8.12**).

Wind farm projects at scoping stage have been scoped out of the cumulative assessment because either they do not have sufficient information on potential effects to be included; because the baseline survey period is ongoing; or because results have not been published. Projects that have been

refused (and no longer capable of appeal) or withdrawn have also been scoped out of the cumulative assessment.

Small wind farm projects with three or fewer turbines have also been scoped out from the cumulative assessment as often these projects are not subject to the same level of detail of ornithological assessment, and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IOFs assessed here. No other renewable or non-renewable projects within NHZ 19 were identified that could have a cumulative effect on the IOFs.

Table 8.12 identifies the wind farm projects in NHZ 19 that have been scoped into the cumulative assessment, and their last known status. This information was obtained from a combination of the last updated version of the NatureScot wind farm database (mid 2019) and an extensive search of the Dumfries and Galloway, East Ayrshire, South Ayrshire, South Lanarkshire Council Planning portals and the Energy Consents Unit planning portal for changes/new projects between 2019 and February 2023. It should be noted that the consented Penbreck and Stranoch will not be included in any cumulative assessments as they have been superseded by the consented Kennoxhead Wind Farm Extension 2 and Stranoch 2.

Table 8.12 Other NHZ 19 Wind Farm Projects

Wind Farm	Status	No. Turbines	EIA Information Available
Afton	Operational	27	ES (variation), Non-technical summary (NTS)
Airies	Operational	14	ES chapter
Andershaw	Operational	11	ES chapter
Arcleloch	Operational	60	ES chapter
Artfield Fell	Operational	15	No information available
Balmurrie Fell (Artfield Fell Extension)	Operational	7	NTS
Bankend Rig	Operational	11	No information available
Blackcraig Hill	Operational	23	NTS
Carscreugh	Operational	18	ES chapter
Clyde	Operational	152	ES chapter
Dalswinton (Pennyland Moor)	Operational	15	ES chapter
Dersalloch	Operational	23	ES chapter, 2006 and 2012 addendum
Dungavel	Operational	13	ES chapter
Galawhistle	Operational	22	ES chapter
Glen App	Operational	11	ES chapter
Glenchamber	Operational	11	No information available
Hare Hill Phase 1	Operational	20	No information available
Hare Hill Phase 2	Operational	35	No information available
Harestanes	Operational	68	ES chapter
Harting Rig / Kype Muir Extension	Operational	18	ES chapter
Kennoxhead	Operational	19	ES chapter
Kilgallioch (Arcleloch Phase 2)	Operational	96	ES chapter and addendum
Kype Muir	Operational	26	ES chapter
Linburn Farm Wind Farm	Operational	2	ES chapter
Mark Hill	Operational	28	Non-technical Summary
Middle Muir	Operational	15	ES chapter
Minnygap	Operational	10	No information available

Wind Farm	Status	No. Turbines	EIA Information Available
Nutberry	Operational	6	ES chapter
Sanquhar Community Windfarm	Operational	9	SEI chapter
Sunnyside	Operational	2	ES
Twentysilling Hill	Operational	9	ES chapter
Wether Hill	Operational	14	ES Technical Appendix and subsequent monitoring reports
Whiteside Hill	Operational	10	NTS
Windy Standard - Phase 1	Operational	36	-
Windy Standard - Phase 2	Operational	30	-
Benbrack	Construction	18	ES chapter
South Kyle	Construction	50	ES chapter
Stranoch 2	Construction	20	ES chapter
Windy Rig	Construction	12	SEI chapter
Arecleoch Extension	Consented	13	EIA Chapter
Bankend Rig II	Consented	3	ES chapter
Chirmorie	Consented	21	ES chapter
Cornharrow	Consented	7	EIA Chapter
Crookedstane	Consented	4	ES chapter
Cumberhead	Consented	11	ES chapter
Enoch Hill	Consented	16	ES chapter
Fell Wind Farm	Consented	9	EIA Chapter
Gass	Consented	9	ES chapter
Glenmuckloch	Consented	8	ES chapter
Hagshaw Hill Repowering	Consented	14	EIA Chapter
Hare Craig	Consented	8	EIA chapter
Knockman Hill	Consented	5	Environmental Report
Lethans	Consented	22	ES chapter
Lion Hill (Crookedstane 2)	Consented	4	ES chapter
Lorg	Consented	9	ES chapter
Margree	Consented	9	EIA Chapter
Mochrum Fell	Consented	8	ES chapter
North Kyle	Consented	54	ES Chapter
Over Hill	Consented	10	ES chapter
Pencloe	Consented	19	ES chapter
Plasgow Wind Cluster	Consented	3	Environmental Report
Polquhairn	Consented	9	ES chapter
Poniel Wind Farm	Consented	3	ES chapter
Sandy Knowe	Consented	24	ES chapter
Sanquhar Six	Consented	6	ES chapter
Troston Loch	Consented	14	EIA Chapter
Windy Standard - Phase 3	Consented	20	ES
Carrick	Application	13	EIA Chapter
Daer	Application	17	EIA Chapter
Euchanhead	Application	21	EIA Chapter
Harestanes South Extension	Application	8	EIA Chapter

Wind Farm	Status	No. Turbines	EIA Information Available
Kilgallioch Extension	Application	11	EIA Chapter
Knockkippen	Application	12	EIA Chapter
Lorg	Application	12	EIA Chapter
Magheuchan Rig	Application	12	No information available
Mid Moile	Application	15	EIA Chapter
Sanquhar II	Application	50	ES Chapter
Scienteuch	Application	9	EIA Chapter
Shepherds' Rig	Application	17	ES chapter
The Drum	Application	8	EIA Chapter

8.7.2 Scope of Assessment

Based on the conclusions of the assessment presented in **Section 8.5**, and the committed mitigation outlined in **Section 8.6**, the following have been scoped out of the cumulative assessment:

- Cumulative collision effects for all IOFs due to low or no predicted collision risk;
- Cumulative construction effects for black grouse, curlew and lapwing – negligible effects considering the proposed mitigation; and
- Cumulative operation effects for lapwing (no breeding pairs affected) and black grouse (negligible effects).

The remaining cumulative effects are considered below:

- Cumulative operational displacement effects for curlew.

8.7.3 Curlew – Operational Displacement

Curlew were recorded at 61 of the 80 project sites within NHZ 19 (**Table 8.13**), however it should be noted that for 11 sites, no information was available that pertained to curlew (marked as 'unknown' in **Table 8.13**). Of these 61 sites where curlew were recorded, 31 were identified to have potential displacement impacts to breeding curlew (with a further five where the predicted impact was unclear in the available information). Of the 31 sites:

- Eleven sites are operational;
- Two sites are under construction;
- Fourteen sites are consented; and
- Four sites are in application.

Combined the operational, consented and under construction sites potentially displace a minimum (due to unavailable data) of 41-49 pairs. The curlew NHZ 19 breeding population is estimated to be 4,284 pairs (Wilson et al. 2015), and the potential permanent loss of between 41-49 curlew territories assuming all consented sites will be built (worst case ranges based on the limited available information), would result in a loss of up to 1.14 % of the breeding population.

Including the Proposed Development there are a further five sites in application that are identified to have potential displacement impacts to breeding curlew that may displace an additional 14-26 pairs assuming that all sites at application stage will be consented (of which, unmitigated the Proposed Development would account for 5-11 pairs). Combined this could result in the unmitigated loss of 55-75 pairs (1.2 % to 1.7% of the breeding population).

Evidence at the operational Fallago Rig Wind Farm (I and II) indicates that curlew are not necessarily displaced from operational turbines, with surveys for the extension (now also operational, Fallago Rig

II) finding that eight of the 16 territories recorded in 2014 were within approximately 500 m of the operational Fallago Rig I turbines, which was consistent with the number recorded in the same area during the baseline surveys in 2005 for Fallago Rig I Wind Farm (data from the Fallago Rig I baseline surveys was also included in the Fallago Rig II assessment).

Considering that worst-case displacement is unlikely to occur and the provision of Habitat Management Plans that would benefit curlew at Kennoxhead, Clyde and extension (and likely other projects) and the Proposed Development to further reduce potential effects, the residual cumulative operational effect for curlew is considered to be low and long-term magnitude, which is classified as minor adverse and is therefore **not significant** in the context of the EIA Regulations.

Table 8.13 Predicted Cumulative Effects within NHZ 19 Relating to Curlew

Wind Farm	Status	Curlew Recorded	Displacement Potential Concluded (pairs)
Afton	Operational	No	N/A
Airies	Operational	Yes	None
Andershaw	Operational	Yes	None
Arecleoch	Operational	Yes	None
Artfield Fell	Operational	Unknown	Unknown
Balmurrie Fell (Artfield Fell Extension)	Operational	Unknown	Unknown
Bankend Rig	Operational	Unknown	Unknown
Blackcraig Hill	Operational	Unknown	Unknown
Carscreugh	Operational	Yes	2-4
Clyde	Operational	Yes	10
Dalswinton (Pennyland Moor)	Operational	Yes	3
Dersalloch	Operational	Yes	4
Dungavel	Operational	Yes	None
Galawhistle	Operational	Yes	2-3
Glen App	Operational	Yes	None
Glenchamber	Operational	Unknown	Unknown
Hare Hill Phase 1	Operational	Unknown	Unknown
Hare Hill Phase 2	Operational	Unknown	Unknown
Harestanes	Operational	No	N/A
Harting Rig / Kype Muir Extension	Operational	Yes	None
Kennoxhead	Operational	Yes	3
Kilgallioch (Arecleoch Phase 2)	Operational	Yes	8
Kype Muir	Operational	Yes	1
Linburn Farm Wind Farm	Operational	Yes	Unknown
Mark Hill	Operational	Unknown	Unknown
Middle Muir	Operational	Yes	Unknown
Minnygap	Operational	Yes	2-3
Nutberry	Operational	Yes	None
Sanquhar Community Windfarm	Operational	Yes	3
Sunnyside	Operational	Yes	None
Twentysilling Hill	Operational	Yes	1-2
Wether Hill	Operational	Yes	Unknown
Whiteside Hill	Operational	Yes	None
Windy Standard - Phase 1	Operational	Unknown	Unknown

Wind Farm	Status	Curlew Recorded	Displacement Potential Concluded (pairs)
Windy Standard - Phase 2	Operational	Unknown	Unknown
Benbrack	Construction	Yes	None
South Kyle	Construction	Yes	1
Stranoch 2	Construction	Yes	1-4
Windy Rig	Construction	No	N/A
Arecleoch Extension	Consented	Yes	None
Bankend Rig II	Consented	Yes	3
Chirmorie	Consented	Yes	1-6
Cornharrow	Consented	Yes	None
Crookedstane	Consented	Yes	3
Cumberhead	Consented	Yes	None
Enoch Hill	Consented	Yes	None
Fell Wind Farm	Consented	No	N/A
Gass	Consented	No	N/A
Glenmuckloch	Consented	Yes	3
Hagshaw Hill Repowering	Consented	Yes	1
Hare Craig	Consented	No	N/A
Knockman Hill	Consented	Yes	0-1
Lethans	Consented	Yes	None
Lion Hill (Crookedstane 2)	Consented	Yes	Unknown
Lorg	Consented	Yes	1
Margree	Consented	Yes	None
Mochrum Fell	Consented	No	N/A
North Kyle	Consented	Yes	1
Over Hill	Consented	Yes	1
Pencloe	Consented	Yes	3
Plascow Wind Cluster	Consented	Yes	2
Polquhairn	Consented	Yes	None
Poniel Wind Farm	Consented	Yes	Unknown
Sandy Knowe	Consented	Yes	2
Sanquhar Six	Consented	Yes	0-1
Troston Loch	Consented	Yes	1-2
Windy Standard - Phase 3	Consented	Yes	None
Carrick	Application	Yes	None
Daer	Application	Yes	2
Euchanhead	Application	Yes	None
Harestanes South Extension	Application	Yes	None
Kilgallioch Extension	Application	Yes	0-2
Knockkippen	Application	Yes	None
Lorg	Application	Yes	3-7
Magheuchan Rig	Application	Unknown	Unknown
Mid Moile	Application	Yes	None
Sanquhar II	Application	Yes	4
Scienteuch	Application	Yes	None
Shepherds' Rig	Application	Yes	None

Wind Farm	Status	Curlew Recorded	Displacement Potential Concluded (pairs)
The Drum	Application	No	N/A

8.8 Summary of Effects

Table 8.14 provides a summary of the effects detailed within this chapter.

Table 8.14 Summary of Effects

Feature	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Black grouse	Lekking or foraging black grouse displaced by construction.	Potentially significant	Specific targeted pre-construction surveys for black grouse to identify up to date lek areas within 750 m of construction activity immediately prior to construction commencing. Extension of the BBPP to include protection of lek sites and specific construction control measures to minimise lek disturbance for any leks within 750 m of the Proposed Development.	Not significant
Curlew	Breeding waders displaced by construction.	Not significant	Pre-construction checks, inclusion in the BBPP, presence of ECoW.	Not significant
Lapwing		Not significant		Not significant
Operational Phase - Displacement				
Black grouse	Lekking or foraging black grouse displaced during the operation of the Proposed Development (either by the infrastructure itself or by maintenance/recreational disturbance).	Not significant	Inclusion as a key species in the BEMP (see, Technical Appendix A7.6: oBEMP) to provide habitat enhancement.	Not significant
Curlew	Nesting or foraging waders may be displaced from foraging habitat, impacting on productivity, fitness and survival rates.	Potentially significant	Inclusion as a key species in the BEMP (see Technical Appendix A7.6: oBEMP) to provide habitat enhancement.	Not significant
Lapwing		Not significant	Mitigation not required but the outline BEMP (Technical Appendix A7.6: oBEMP) aim to improve breeding curlew numbers and productivity will also benefit lapwing.	Not significant
Operational Phase – Collision Risk				
Black grouse	Birds flying within the Site may be subject to a collision risk with wind turbines.	Not significant	No mitigation required	Not significant
Curlew				
Lapwing				
Operational Phase – Lighting				
Black grouse	Artificial lighting associated with the Proposed	Not significant	Consultation between the Applicant and the relevant	Not significant

Feature	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Curlew Lapwing	Development may adversely affect birds using/commuting through the Site.		regulatory bodies on a reduced site-specific turbine lighting scheme. Reduced lighting/directional lighting/screening at the substation and BESS	

8.9 Statement of Significance

For all IOFs taken forward into the assessment, the predicted residual effects during the construction, operation and decommissioning phases of the Proposed Development (alone or cumulatively) are considered to be no more than minor adverse and therefore **not significant** in the context of the EIA regulations. In the longer-term with the implementation of the oBEMP, effects are likely to further reduce in severity and may result in a beneficial net gain for IOFs (and other species present within and around the Proposed Development).

9. ARCHAEOLOGY AND CULTURAL HERITAGE

9.1 Introduction

The cultural heritage of any specific landscape consists of a palimpsest of archaeological sites, historical buildings, Gardens, and Designed Landscapes, Historic Battlefields and other historic environment features (the heritage assets). It also includes assets or places which have the capacity to provide information about past human activity, or which have cultural significance due to intangible associations with literary or artistic work, or historic events.

This Chapter of the EIA Report considers potential significant effects, arising from the construction, operation and decommissioning of Cloud Hill Wind Farm (the Proposed Development), on heritage assets within the Site and surrounding area.

This assessment was undertaken by ERM Ltd.

This chapter includes the following elements:

- Glossary;
- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and
- Statement of Significance.

This Chapter is also supported by the following figures provided in Volume 2a Figures:

- **Figure 9.1.:** Site location and Study Areas;
- **Figure 9.2:** Heritage Assets within 1 km Study Area;
- **Figure 9.3:** Prehistoric Heritage Assets;
- **Figure 9.4:** Post Medieval Heritage Assets;
- **Figure 9.5:** Medieval Heritage Assets;
- **Figure 9.6:** 1888 OS Map;
- **Figure 9.7:** 1937 OS Map;
- **Figure 9.8:** Designated Heritage Assets 5 km Study Area;
- **Figure 9.9:** Designated Heritage Assets between 5 and 15 km with cumulative;
- **Figure 9.10:** Designated Heritage Assets 5-15 km – Northwest;
- **Figure 9.11:** Designated Heritage Assets 5-15 km – Northeast;
- **Figure 9.12:** Designated Heritage Assets 5-15 km – Southeast; and
- **Figure 9.13:** Designated Heritage Assets 5-15 km – Southwest.

The assessments presented in the technical appendices are supported by the following visualisations and wirelines provided in Volume 2c: Visualisations:

- **Figure 6.17:** LVIA VP 1 A76 Sanquhar Castle;

- **Figure 6.19:** LVIA VP3 Kirkconnel;
- **Figure 6.22:** LVIA VP6 Mennock;
- **Figure 9.14:** CH VP3 Wireline from SM681 Kirkbride Kirk, Kirkbride;
- **Figure 9.15:** CH VP4 Wireline from CA326 Sanquhar;
- **Figure 9.16:** CH VP5 Wireline from LB17260 Mennock, Viaduct;
- **Figure 9.17:** CH VP6 Wireline from LB10238 Kirkconnel, Queensberry Arms Hotel;
- **Figure 9.18:** CH VP7 Wireline from MDG11250 Deil's Dyke;
- **Figure 9.19:** CH VP8 Wireline from MDG110 Black Loch / Loch Of Sanquhar;
- **Figure 9.20:** CH VP 9 Wireline from MDG11248 Deil's Dyke;
- **Figure 9.21:** CH VP10 Wireline from MDG13074 Green Hill, Wanlockhead;
- **Figure 9.22:** CH VP11 Wireline from MDG21369 Grieve Hill To Dumfries;
- **Figure 9.23:** CH VP12 Wireline from MDG21444 Glenwharrie;
- **Figure 9.24:** CH VP13 Wirelines from SM13747 St Connel's Church;
- **Figure 9.25:** CH VP14 Wirelines from MDG9425 Shiel Burn / Colt Hill/Black Hill;
- **Figure 9.26:** CH VP1 SM656 Kemps Castle; and
- **Figure 9.27:** CH VP2: SM687 Crichton Peel & Sanquhar Castle.

This chapter is supported by the following Technical Appendices provided in Volume 3:

- Technical Appendix A9.1: Desk-Based Assessment;
- Technical Appendix A9.2: Assessment of Indirect Effects within 5 km of the Proposed Development;
- Technical Appendix A9.3: Setting Sieving Exercise for Designated Assets between 5 and 15 km; and
- Technical Appendix A9.4: Assessment on Indirect Effects between 5 and 15 km.

Table 9.1 Definition of key terms

Term (list in alphabetical order)	Meaning / Definition
Core Study Area	Area used to establish the baseline within the Desk Based Assessment. This is the area within which the Proposed Development may have direct (physical) effects upon known, and unknown, archaeological remains.
Cultural Significance	Relates to the ways in which a heritage asset is valued by both specialists and the wider public. It may derive from factors including the asset's fabric, setting, context and associations. I
Cumulative Impacts	Arises as a result of additive impacts between the Proposed Development and operational developments, developments in construction or those developments going through the planning system and awaiting approval. Cumulative effects are most likely to be Setting Impacts.
Designated Asset	Comprising listed buildings, conservation areas, scheduled monuments, historic marine protection areas, World Heritage Sites, Inventory gardens and designed landscapes and Inventory battlefields. The value of these assets has therefore been established through the designation process.
Direct Physical Impacts	An effect upon features of cultural heritage interest, where sites or potential sites / buried archaeology are in danger of being physically disturbed or destroyed. Direct physical impacts are likely to occur during the construction of the Proposed Development. These are considered permanent and irreversible.

Term (list in alphabetical order)	Meaning / Definition
EIA Significance	Used to describe the relative importance of impacts, generally deduced from a matrix measuring the magnitude of impact against the sensitivity of the receptor.
Indirect Physical Impact	These occur where the fabric is lost or preserved as a result of the proposal even though the asset lies at a remove from the proposal. Examples include damage to walls as a result of vibration from piling operations or blasting, the degradation of waterlogged deposits as a result of dewatering and changes in currents resulting in increased/decreased erosion. Such impacts may result at any stage of development and are likely to be permanent.
Non-designated asset	These are features, buildings or places that provide physical evidence of past human activity identified as being of sufficient value to this and future generations to merit consideration in the planning system. These may occur in isolation or form historic landscapes in combination with other heritage assets, which may in themselves be considered to form heritage assets in their own right.
Setting	The way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced. The setting of a historic asset can incorporate a range of factors, such as: - current landscape or townscape context - views to, from and across or beyond the historic asset or place - key vistas (for instance, a 'frame' of trees, - buildings or natural features that give the historic asset or place a context, whether intentional or not) - the prominence of the historic asset or place in views throughout the surrounding area, bearing in mind that sites need not be visually prominent to have a setting - aesthetic qualities - character of the surrounding landscape - general and specific views including foregrounds and backdrops - views from within an asset outwards over key elements in the surrounding landscape, such as the view from the principal room of a house, or from a roof terrace - relationships with other features, both built and natural - non-visual factors such as historical, artistic, literary, place name, or scenic associations, intellectual relationships (e.g., to a theory, plan or design), or sensory factors - a 'sense of place': the overall experience of an asset which may combine some of the above factors
Sensitivity	The term EIA practitioners use for value used to provide consistency across disciplines throughout the EIA Report.
Setting Impacts	Including changes to the settings of cultural heritage assets, which may affect cultural significance. These are largely visual impacts and are likely to occur as a consequence of the scale of the Proposed Development. They are especially likely to occur on cultural heritage assets located on high ground where their historical significance lies in the wider landscape setting including long-distance views to, and from, the asset. These are considered Direct Impacts by HES.
Value	Reflects the relative importance of the asset as an element of the historic environment and is most commonly categorised as International, National, Regional and Local with corresponding values ranging from very High to Low.

9.2 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment:

9.2.1 Legislation

Heritage legislation of relevance includes:

- The Historic Environment Scotland Act 2014²⁵⁸;
- The Ancient Monuments and Archaeological Areas Act 1979²⁵⁹;
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997²⁶⁰ as amended; and
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended²⁶¹ (hereafter referred to as 'the EIA Regulations').

9.2.2 Policy and Guidance

In addition to the aforementioned legislation, the following is a list of the key heritage policy and guidance:

- Scotland's Fourth National Planning Framework (NPF4)²⁶²;
- Scottish Natural Heritage (now known as NatureScot) and Historic Environment Scotland (HES) EIA Handbook²⁶³;
- Historic Environment Policy for Scotland (HEPS)²⁶⁴;
- Our Place in Time: The Historic Environment Strategy for Scotland²⁶⁵;
- Dumfries and Galloway Council Local Development Plan 2²⁶⁶ (DGLDP2) summarised in Chapter 5 of this EIA Report;
- Planning Advice Note (PAN) PAN 2/2011: Planning and Archaeology²⁶⁷;
- ClfA Standards and Guidance for Desk-Based Assessments²⁶⁸; and
- HES (2016, updated 2020) Managing Change in the Historic Environment Series, specifically 'Managing Change in the Historic Environment: Setting'²⁶⁹.

²⁵⁸ Scottish Government (2014) The Historic Environment Scotland Act [Online] Available at http://www.legislation.gov.uk/asp/2014/19/pdfs/asp_20140019_en.pdf (Accessed 30/05/2023)

²⁵⁹ UK Government (1979) The Ancient Monuments and Archaeological Areas Act [Online] Available at: <https://www.legislation.gov.uk/ukpga/1979/46> (Accessed 30/05/2023)

²⁶⁰ Scottish Government (1997) The Planning (Listed Buildings and Conservation Areas) (Scotland) Act [Online] Available at: <https://www.legislation.gov.uk/ukpga/1997/9/contents> (Accessed 30/05/2023)

²⁶¹ Scottish Government EIA Regulations (2017) [Online] Available at: <https://www.gov.scot/policies/environmental-assessment/environmental-impact-assessment-eia/> (Accessed 30/05/2023)

²⁶² Scottish Government (2022). National Planning Framework 4. Available at: <https://www.gov.scot/publications/national-planning-framework-4-revised-draft/> Accessed 20/01/2023.

²⁶³ SNH and HES (2018) EIA Handbook [Online] Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=6ed33b65-9df1-4a2f-acbb-a8e800a592c0> (Accessed 30/05/2023)

²⁶⁴ HES (2019) Scottish Environment Policy for Scotland [Online] Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7> (Accessed 30/05/2023)

²⁶⁵ Scottish Government (2014) Our Place in Time: The Historic Environment Strategy for Scotland [Online] Available at: <https://www.gov.scot/publications/place-time-historic-environment-strategy-scotland/> (Accessed 17/02/2022)

²⁶⁶ Dumfries and Galloway Council Local Development Plan 2 (2019) <https://www.dumgal.gov.uk/article/16130/ldp2> (Accessed 30/05/2023)

²⁶⁷ The Scottish Government (2011) Planning Advice Note 2/2011 [Online] Available at: <https://www.gov.scot/publications/pan-2-2011-planning-archaeology/> (Accessed 30/05/2023)

²⁶⁸ Chartered Institute for Archaeologists (2020) Standard and Guidance for Historic Environment Desk-Based Assessment, Published December 2014, Updated January 2017, Updated October 2020 [Online] Available at: https://www.archaeologists.net/sites/default/files/ClfAS%26GDBA_4.pdf (Accessed 06/07/2023)

²⁶⁹ HES (2016, updated February 2020) Managing Change in the Historic Environment: Setting [Online] Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=80b7c0a0-584b-4625-b1fd-a60b009c2549> (Accessed 06/07/2023)

9.3 Consultation and Scope

9.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 9.2**.

Table 9.2 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Historic Environment Scotland (HES)	Scoping Response 18.05.2022	HES confirmed that they are content with the Methodology issued at Scoping (March 2022). However, HES stated that assets beyond 10 km may need to be considered based on the ZTV of the Development. HES stated that they believed significant impacts to setting for selected nearby designated heritage assets were possible, with HES providing a list of assets they considered most likely to be at risk: - SM656 - Kemps Castle, fort 320 m SW of Euchar Bridge - SM687 - Crichton Peel & Sanquhar Castle - SM708 - Ryehill, motte - LB40540 High Street, Tolbooth/Town House - LB14413 - Dumfries House - GDL00149 - Dumfries House - LB3886 - Drumlanrig Castle, Outbuildings And Pavilion - Blocks Piers, Balustrades And Quadrant Walls And Garden Urns - GDL00143 - Drumlanrig Castle HES requested additional ZTV information and visualisations from key designated assets as and when they become available. HES welcomed the inclusion of cumulative impacts from nearby existing and proposed windfarms in the forthcoming assessment. HES recommended consultation with the Council archaeologist over non-designated assets to be considered.	Comments from HES were addressed in a subsequent consultation letter issued on 11.01.2022 Assets up to 15 km from the Proposed Development are assessed within Technical Appendix A9.3: Setting Sieving Exercise for Designated Assets between 5 and 15 km and Technical Appendix A9.4: Assessment on Indirect Effects between 5 and 15 km. This consultation letter confirmed the proposed methodology, provided a figure showing the ZTV from the Proposed Development and wireline visualisations from key assets. In addition, a table showing the full list of assets identified for proposed wireline and photographic visualisations was provided. ERM proposed an in-person meeting to discuss any key concerns but this was not taken up by HES.
Tynron Community Council (TCC)	Scoping Response 01.06.2022	TCC confirmed that they were content with the methodology for EIA assessment laid out at Scoping. TCC identified the following 'heritage assets' in need of consideration during the assessment: Tynron Doon Iron Age Fort	The list of assets was considered for inclusion within the assessment. The following assets are not considered relevant to the Cultural Heritage Chapter, being a series of artworks, installations and public footpaths with no heritage significance: - Colt Hill Striding Arch - Crawick Multiverse

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Tynron Conservation Village Allan's Cairn Colt Hill Striding Arch Crawick Multiverse Southern Uplands Way (first official British long-distance coast to coast path)	Southern Uplands Way (first official coast to coast long distance walkway) These assets are discussed within Chapter 6 – Landscape and Visual Impact Assessment of the EIA
Historic Environment Scotland (HES)	Pre-app Consultation Response 16.12.2022	In response to the consultation letter issued on 11.01.2022 HES confirmed that they were content with the list of assets included for visualisations within Table 2 of the consultation letter. HES recommended inclusion of cumulative visualisations in the final EAI Report. With regards to assets listed for assessment – HES noted that Dumfries House (LB14413) and Drumlanrig Castle (LB3886) nor their associated Inventory gardens and designed landscapes (GDL00149 & GDL00143) were included within the figure provided showing the ZTV of the Development. HES have asked for confirmation within the EIA Report as to whether these assets fall wholly or partially out with the ZTV.	Comments on the need for cumulative visualisations taken forward to assessment. Cultural Visualisations CH1-14 and associated LVIA Visualisations include cumulative wind farm developments. The specific assets at Dumfries House and Drumlanrig Castle have been addressed in Technical Appendix A9.3: Setting Sieving Exercise for Designated Assets between 5 and 15 km confirming that they do not fall within the ZTV.
	Gatecheck Response 26.01.23	HES noted they are broadly content that the details given reflect their involvement with, and advice regarding, the EIA process for this development so far. They responded to a consultation from the development team (as above) regarding proposed assets for inclusion and visualisations for the EIA Report and have confirmed they are content with the proposed list of assets and locations for the visualisations for their remit. From the information provided in the gatecheck report they were content that the applicant's approach for the EIA appears appropriate. they considered they were appropriately consulted so far and that the issues raised at scoping stage have been appropriately addressed at this stage.	Noted
Dumfries and Galloway Council (the Council)	Pre-app Consultation Response 24.11.2022 from	In an email response to a consultation letter issued on 14.11.2022 the Council Planning Archaeologist confirmed that he was content	Comments taken forward to assessment. Areas of Archaeological Interest are presented within Figure 9.2 and

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
	Council Planning Archaeologist	with the proposed methodology. With regards to non-designated assets included for assessment of direct (physical) impacts the Council Planning Archaeologist asked Arcus to ensure that polygonised data for Areas of Archaeological Interest were included within the DBA and assessment of Direct (Physical) Impacts. This includes the locally designated Deils Dyke, an asset considered of National Importance by the HER. With regards to non-designated assets to be included within the assessment of indirect effects, the Council Planning Archaeologist noted that MDG75, St Connel's Chapel has recently been designated as a Scheduled Monument and should be assessed as such. It was also noted that the list of designated assets provided within the consultation letter to the Council accounted for national designations but not local ones. In Dumfries and Galloway non-Inventory Designed Landscapes and Archaeologically Sensitive Areas are locally designated with their own specific policies (HE4 and HE6 respectively) within the Local Development Plan and are assessed as of regional significance. Potential setting impacts on the non-Inventory designed landscapes at Eliock (MDG25662) and Craigdarroch (MDG25663) should be assessed within the heritage section of the EIA. The Council Planning Archaeologist additionally provided a list of locally designated assets that could be removed from the assessment of indirect effects. This list included: MDG21369, MDG21444, MDG11248/MDG11249/MDG11250 and MDG102.	taken forward for assessment of Direct (Physical) Impacts. Locally Designated assets and assets pertaining to Policies HE4 and HE6 of the DGLDP2 are discussed within Technical Appendices A9.1-9.4 and included for assessment of Direct (Physical) Impacts and Setting Impacts where relevant.

As part of the scoping exercise and pre-application consultation, several heritage specific viewpoints were selected to represent various locations in the landscape and heritage asset locations. The Cultural Heritage Viewpoint (CHVP) visualisations and the LVIA VPs 1, 3 and 6 form part of this chapter of the EIA Report (**EIAR Vol 2c**) and are detailed in **Section 9.1**.

9.3.2 Elements Scoped into the Assessment

Based on the consultation received from HES, the Council, and key stakeholders to the Scoping Report and throughout the iterative design process the following impacts and receptors are scoped into the assessment:

- Direct (physical) impacts to undesignated assets within the Core Study Area (CSA);
- Direct (physical) impacts to designated assets within the CSA;
- Setting Impacts to all designated heritage assets within the 5 km Study Area;
- Setting Impacts to selected designated heritage assets beyond 5 km (out to 15 km from the CSA, with assets included for setting assessment assets lie within the ZTV, have potential for views of the Proposed Development; and derive part of its cultural significance from long distance views and distant landscape context.
- Setting Impacts on Regionally/Nationally Important non-designated assets identified through consultation with the Council Planning Archaeologist, up to 15 km from CSA, with assets included for setting assessment assets where they lie within the ZTV, have potential for views of the Proposed Development; and derive part of their cultural significance from long distance views and distant landscape context; and
- The cumulative impact of the Proposed Development in conjunction with other wind farm developments within 15 km.

9.4 Assessment Methodology and Significance Criteria

The assessment of potentially significant effects to cultural heritage assets arising from the Proposed Development is achieved, in the first instance by identifying direct (physical) impacts, indirect (physical) impacts and setting impacts to the identified heritage resource within an agreed Study Area.

9.4.1 Study Area / Survey Area

Study Areas were defined following consultation with HES and DGC and the likelihood of potential significant effects upon archaeology and cultural heritage, as summarised in **Table 9.3**.

Table 9.3 Study Areas

Study Area	Impacts	Range	Description
CSA	Direct (physical) impacts Indirect (physical) impacts	The Site RLB as shown on Figure 9.1	Used to establish the baseline within the DBA. Further details are provided in the DBA in Technical Appendix A9.1: Desk-Based Assessment . This is the boundary within which turbines and all associated infrastructure for the Proposed Development will be located. This defines the limit to which direct (physical) impacts to the known, and unknown, archaeological resource will occur.
1 km Study Area	Informing potential for Direct (physical) impacts within the CSA.	1 km radius surrounding the CSA as shown on Figure 9.1	Area used to ensure a full understanding of the archaeological potential for unknown subsurface archaeology to survive within the CSA. Further details are provided in the DBA in Technical Appendix A9.1: Desk-Based Assessment .
5 km Setting Study Area	Setting Impacts	5 km radius from the Site Boundary as shown on Figure 9.8	An assessment was undertaken for all designated heritage assets within 5km of the CSA as detailed in Technical Appendix A9.2: Assessment of Indirect Effects within 5 km of the Proposed Development . Selected Locally Designated Assets of Regional and National Importance, as defined by the Council were also included in this assessment.
5-15 km Setting Study Area	Setting Impacts	15 km radius from the Site Boundary as shown on Figure 9.9	A review was undertaken for all nationally designated heritage assets located between 5- 15 km from the CSA to identify heritage assets that have the potential to undergo a change in setting (see Technical Appendix A9.3: Setting Sieving Exercise for Designated Assets between 5 and 15 km). Selected Regionally/Nationally Important non-designated assets, as defined by the Council also included. The final selection of heritage assets included in the assessment is limited to those which lie within the ZTV, have potential for views of the Proposed Development; and derive part of their cultural significance from long distance views and distant landscape context. The final selection of nationally and locally designated heritage assets assessed for changes to setting is detailed in Technical Appendix A9.3: Setting Sieving Exercise for Designated Assets between 5 and 15 km and Technical Appendix A9.4: Assessment on Indirect Effects between 5 and 15 km .
Cumulative Study Area	Cumulative Impacts	15 km radius from the Site Boundary as shown on Figure 9.9	The Cumulative Study Area identifies a baseline comprising all relevant consented and application wind farms within 15 km of the CSA. From this baseline wind farm developments with a potential to create a significant effect are assessed. All operational and under construction wind farms have been included as part of the baseline situation informing Appendices A9.2 and Technical Appendix A9.4: Assessment on Indirect Effects between 5 and 15 km

9.4.2 Design Parameters

The parameters of the design that will influence the archaeological and cultural heritage assessment in relation to direct (physical) impacts are based on the turbine layout and associated infrastructure as shown in **Figure 9.2** The design parameters set out in **Chapter 4 – Description of the Proposed Development** of this EIA Report, are used for the assessment presented in this Chapter.

As set out in **Chapter 4 - Description of the Proposed Development**, the turbines and associated infrastructure may be micro-sited up to 50 m, where constraints allow. Such relocations have been considered when undertaking this assessment, with mitigation recommended, where appropriate.

Partial screening of the new turbines is currently provided by the Ulzieside Plantation. For the purposes of this assessment, it is assumed that Ulzieside Plantation would be removed prior to construction. However, there is an area of more recent forestry planting to the south of Ulzieside and owing to its recent establishment, it is assumed that this forestry will be present during the 35-year lifespan of the Proposed Development and may gradually come to provide some screening as the planting matures.

9.4.3 *Baseline Survey Methodology*

The DBA included a comprehensive desk-based review of data from the following sources:

- Historic Environment Scotland (HES) Datasets including:
 - Canmore Archaeological Records;
 - Database of World Heritage Sites;
 - Database of Scheduled Monuments;
 - Database of Listed Buildings;
 - Database of Inventoried Garden and Designed Landscapes; and
 - Database of Inventoried Battlefields.
- Aerial photography and LiDAR;
- Cartographic evidence from the Ordnance Survey and historic maps;
- Dumfries and Galloway Historic Environmental Record (HER) consulted May 2022;
- The Statistical Accounts for Scotland;
- The National Records of Scotland;
- Archaeological Data Service (ADS) for heritage data including grey literature reports, archaeological journals, and the Excavation Index for Scotland;
- Regional and national research framework assessments and strategies; and
- Published and grey literature including archaeological journals and monographs.

The DBA is provided in **Appendix A9.1 Desk Based Assessment**. These resources have been collated and examined alongside the results of a walkover survey of the Site, conducted on 24.06.2022, to identify any previously unidentified heritage asset and, where possible, ground truth assets identified during production of the DBA. During the June 2022 site visit, selected heritage assets within 15 km were visited to inform Setting Impacts.

9.4.4 *Methodology for the Assessment of Effects*

The assessment of effects is based on the final layout detailed in **Chapter 4 – Description of the Proposed Development** and **Figure 1.3** this EIA Report. The assessment considers the sensitivity of each cultural heritage feature and the magnitude of any potential change, to conclude whether the effect, in cultural heritage terms, is significant, as required by the EIA Regulations. The assessment conclusions are informed by professional judgement.

9.4.4.1 Sensitivity of Receptors

The value of a heritage asset reflects the relative importance of an asset as described in the designation process²⁷⁰. As a starting point, the value of the cultural heritage assets / receptors has been equated with designation status, as shown in **Table 9.4**.

Table 9.4 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	Heritage Assets valued at an international level, including World Heritage Sites.
High	Heritage Assets valued at an international or national level. These may include Scheduled Monuments, Category A Listed Buildings, Registered Battlefields, Gardens and Designed Landscapes, and nationally important archaeological features and conservation areas (as defined in the Council's HER).
Medium	Heritage Assets valued at a regional level. These may include Category B and some Category C Listed Buildings as well as regionally important archaeological features and conservation areas.
Low	Heritage Assets valued at a local level. These may include Category C Listed Buildings, some conservation areas and non-designated assets of local value.
Negligible	Badly preserved and/or damaged or very common archaeological features and buildings of little or no value at local or any other scale.

As part of determining the value of the cultural asset and sensitivity of it to change, in accordance with the EIA Handbook²⁷¹, the cultural significance of the heritage asset will be described as will the contribution made by setting.

Due to the unique qualities of each heritage asset, the sensitivity of a heritage asset's setting to change is variable and must be determined on a case-by-case basis for each receptor in lines with setting guidance²⁷² and the EIA Handbook²⁷³ as per the following methodology:

- Identification of heritage assets that might be affected by the Proposed Development to include a summary of their cultural significance;
- Definition of the setting of the heritage assets and how this contributes to its cultural significance to determine its sensitivity to change; and
- Assessment of the way in which the Proposed Development may change the setting and affect the cultural significance of the heritage asset (magnitude of impact).

9.4.4.2 Magnitude of Impact

In respect of direct/indirect (physical) impacts, the magnitude of impact is the extent of change to the cultural significance of the asset as a result of the Proposed Development.

In respect of Setting Impacts, the magnitude of impact is the extent of change to the setting of the cultural asset as a result of the Proposed Development.

²⁷⁰ HES (2019) HEPS [Online] Available at: <https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/> (Accessed 04/06/2023)

²⁷¹ Historic Environment Scotland (2018). Environment Impact Assessment Handbook. Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=6ed33b65-9df1-4a2f-acbb-a8e800a592c0>. Accessed 20/01/2023.

²⁷² Historic Environment Scotland (2020). Managing Change in the Historic Environment: Setting. Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=80b7c0a0-584b-4625-b1fd-a60b009c2549>. Accessed 20/01/2023.

²⁷³ Historic Environment Scotland (2018). Environment Impact Assessment Handbook. Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=6ed33b65-9df1-4a2f-acbb-a8e800a592c0>. Accessed 20/01/2023.

Impacts may be beneficial or adverse, and may short term, long term or permanent. In relation to cultural heritage, impacts are generally adverse and are classified, for both direct/indirect (physical) impacts and Setting Impacts. The degree of impact is assigned on the criteria shown in detailed in **Table 9.5**.

Table 9.5 Framework for Determining Magnitude of Impact

Magnitude of Impact	Definition
High	Setting Impacts: Substantial change to setting resulting in an inability to understand, appreciate or experience the heritage asset. A total or near complete loss of cultural significance.
	Direct/Indirect (Physical) Impacts: Substantial change to the fabric of a heritage asset resulting in near complete physical loss of the asset or ability to understand said asset. A total or near complete loss of cultural significance.
Medium	Setting Impacts: Appreciable change to setting resulting in a loss of understanding, appreciation or experience of the heritage asset. A notable depreciation of cultural significance.
	Direct/Indirect (Physical) Impacts: Appreciable change to the fabric of a heritage asset resulting in moderate physical loss of the asset or ability to understand said asset, resulting in an erosion cultural significance.
Low	Setting Impacts: Slight change to setting resulting in a minor loss of understanding, appreciation or experience of the heritage asset. A minor depreciation of cultural significance.
	Direct/Indirect (Physical) Impacts: Minor change to the fabric of a heritage asset resulting in some slight physical loss of the asset or ability to understand said asset, resulting in a slight loss of cultural significance.
Negligible / None	Setting Impacts: Changes to setting that leave significance unchanged or do not affect the understanding, appreciation, or experience of the heritage asset.
	Direct/Indirect (Physical) Impacts: Barely distinguishable adverse change from baseline conditions that are thought to have no long-term effect on the historic value of a resource.

For purposes of assessing setting impacts, distance to the Proposed Development is considered the initial determinant in the degree of magnitude of any change that might be caused. Simple intervisibility with the Proposed Development is not necessarily considered to be harmful, unless this affects the cultural significance of the heritage asset so as to diminish its understanding, appreciation or experience. Where considered appropriate, consideration has been given to the effect that the Proposed Development will have on the settings of historical assets in views towards and across the asset when moving through the landscape, as well as in views towards the Proposed Development from the asset.

9.4.4.3 Significance of Effect

The significance of the potential effect is broadly determined by correlating the sensitivity of the asset against the magnitude of the expected impact as detailed in **Table 9.6**, with the final statement on the significance of effect informed by professional judgement.

Table 9.6 Framework for Assessment of the Significance of Effects

Magnitude of Impact	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Major/Moderate	Moderate/Minor	Minor
Medium	Major	Moderate/Moderate	Moderate/Minor	Minor	Minor/Negligible
Low	Moderate	Moderate/Minor	Minor	Minor/Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table.

9.4.5 Cumulative Effects

A cumulative effect is considered to be an additional effect, over and above the baseline, upon the cultural significance of an asset arising from the Proposed Development in combination with other consented or developments in planning likely to affect the cultural heritage environment. Operational and under construction wind farms have been included as part of the baseline condition for assessing setting impacts of the Proposed Development, with operational and under construction wind farms included within **Technical Appendices A9.2 Setting Assessment 5km and A9.4 Setting Assessment 5 – 15 km** and associated visualisations in **Volume 3**. A list of operational windfarms is presented within **Table 9.7** below.

Table 9.7 Operational Wind Farms within 15 km Study Area

Name / Status	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km
Whiteside Hill	Operational	10	121.2	0.54
Sanquhar	Operational	9	126.5	2.32
Twentyshilling	Operational	9	140	3.49
Sandy Knowe	Operational	24	125	4.75
Hare Hill Extension	Operational	35	91	6.29
Sunnyside Farm	Operational	2	62	6.32
Hare Hill	Operational	20	62.5	7.50
Afton	Operational	25	120	9.56
Wether Hill	Operational	14	91	10.96
Windy Standard I	Operational	36	53.5	11.01
Windy Rig	Operational	12	125	11.18
High Park Farm	Operational	1	75	11.80
Windy Standard II	Operational	30	119.5	12.62

The size of the cumulative wind farms is of relevance to the Cumulative Landscape and Visual Impact Assessment (CLVIA), in terms of the number and size of the turbines. In respect of the cumulative context, the strongest influences will arise from those wind farms in close proximity to the Proposed Development. The larger the development, generally the higher the likelihood of a significant cumulative effect. Turbines of less than 50 m are not included within the assessment as they have a limited influence as part of the cumulative context. Wind farms considered as part of the cumulative assessment are detailed in **Table 9.8**.

Table 9.8 Wind Farms within 15 km Cumulative Study Area

Name / Status	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km
Sanquhar "Six" Community WF	Consented	6	130	4.31
Lorg	Consented	9	149.9	5.79
Glenmuckloch	Consented	8	149.9	10.01
Cornharrow	Consented	8	149.9	10.60
Lethans Resub	Consented	22	220	10.62
Pencloe Forest Resub	Consented	19	149.9	11.19
Windy Standard III	Consented	20	177.5	13.99
Penbreck	Consented	9	145	14.06
Troston Loch	Consented	14	149.9	14.80
Shepherds Rig	Application	17	149.9	13.62
Sanquhar II	Application	44	200 (2T@149)	1.69
Euchanhead	Application	21	230	4.54
Sandy Knowe Extension	Application	6	149.9	5.73
Cornharrow Variation	Application	7	180	10.60
Lethans Extension	Application	10	251	11.03
Penbreck Resub (Kennoxhead Phase 2)	Application	8	220	14.87

Cumulative Wind Farms

For the purposes of the assessment of cumulative effects, only wind farm developments (in planning or consented) within a 15 km Study Area are considered for the potential to create a significant effect.

The potential for a significant cumulative effect is considered likely to occur only within the area where the ZTVs for each wind farm development would overlap, i.e., where each is theoretically simultaneously visible. The wind farms considered in the cumulative assessment are assessed in **Section 9.9**. Developments in Scoping have not been considered as there is limited information on the proposed layout of these wind farms at this stage.

Further detail on cumulative effects on Landscape can be found in **Chapter 6 – Landscape and Visual Impact Assessment (LVIA)** of the EIA Report. This shows that there are nine consented and a further seven wind farms in planning within 15 km of the Proposed Development.

Locations of sites considered as part of the LVIA cumulative assessment are shown in **Figure 6.12** of **Chapter 6**. Cumulative ZTVs that show the visibility of the cumulative site, or group of sites, along with the visibility of the Proposed Development have been run for all of the operational, under construction, consented and application wind farms that are considered relevant in the cumulative assessment, as shown on **Figures 6.13a to 6.13k**. These show the extent to which each wind farm would be visible in conjunction with visibility of the Proposed Development and are referred to in the following detailed assessments.

9.4.6 Assessment Limitations

This assessment comprises a desk-based review of information taken from the HES datasets and data from the HER, as well as a variety of secondary sources. Whilst this information is assumed to be accurate, it does not constitute a complete record of the historic environment. A site walkover was

also undertaken to assess the CSA for additional previously unknown assets. The combined desk-based review and walkover does not preclude the potential for hitherto unidentified archaeological remains or deposits to be encountered within the Site.

The setting site visits were undertaken from publicly accessible areas only, with setting visits undertaken for nearby proxy locations, where access to specific assets could not be achieved.

9.4.7 *Embedded Mitigation*

Minimising and avoiding direct/indirect (physical) impacts, setting impacts and cumulative impacts on heritage assets and archaeological features were important drivers of the design process, as detailed in **Chapter 3 – Site Selection and Design**.

With regards to direct/indirect (physical) impacts, the final layout of the Proposed Development as shown in **Figure 9.1** has taken into account the consultation responses received from the Council's Archaeologist in relation to and has sought to minimise the direct (physical) impact on cultural heritage receptors, notably upon the Deil's Dyke (MDG12828), a site labelled as of 'Archaeologically Sensitive Area' within the HER data and locally designated asset of National Importance that crosses the Site.

In relation to setting impacts, the number of proposed turbines has been reduced through the iterative design process from the Scoping Layout of 14 turbines to 11 at Design Freeze. The closest turbines to the settlement of Sanquhar (CA326, SM687), Kemps Castle Fort (SM SM656) and Cairn Hill (MDG43) were removed. The result of this design refinement was to reduce proximity and overbearance of turbines to heritage assets located to the north and north-east of the Site. A summary of the key design changes relative to heritage constraints are summarised below with full details of consultation in **Table 9.1** and design evolution in **Chapter 3 – Site Selection and Design**:

- Removal of three turbines positioned in proximity to heritage assets to the east and north of the Proposed Development;
- Relocation of remaining turbines to reduce the extent of landscape and visual effects;
- Relocation of turbines to increase the transitional distance between the upland and lowland zones, also increasing the distance between turbines and key infrastructure inclusive of substation and BESS and Deil's Dyke (MDG12838), a likely Late Prehistoric landscape feature demarcating the split between upland and lowland zones;
- On-site non-designated cultural heritage assets identified through consultation with DGC, walkover survey and production of DBA (**Technical Appendices A9.1 Desk Based Assessment**). Direct (physical) impacts to known heritage assets within the CSA avoided where possible through movement of turbines and associated infrastructure, within the confines of constraints identified by other disciplines and topography.

A full assessment of any remaining direct (physical) impacts through construction is provided in **Section 9.6** below.

9.5 *Baseline Conditions*

9.5.1 *Core Study Area and 1 km DBA Study Area Baseline*

Full detail of the baseline conditions for Proposed Development site can be found within **Technical Appendices A9.1 Desk Based Assessment**, which includes a brief description of the landform and use within the CSA as well as a detailed baseline of known heritage assets within the CSA and 1 km Study Area presented by period. The DBA also provides a description of the archaeological potential of the CSA for previously unknown heritage assets to exist. A summary of the baseline conditions presented in the Archaeological DBA is provided below.

9.5.2 Core Study Area

There are no Designated Assets recorded within the CSA.

The desk-based data collection exercise has identified a total of five non-designated assets recorded within regional and national datasets. Of these, the extent of MDG12838, Deil's Dyke, an Iron Age earthwork, is described as an 'Archaeologically Sensitive Area' within Policy HE4 of the DGLDP2. The remaining four assets date to the Post-Medieval and Modern period.

Table 9.9 Non-Designated Assets identified from regional and national datasets within the Core Study Area

Reference	Name	Period
MDG12838	Deil's Dyke	Iron Age/Medieval
MDG27293	Corridow Hill	Post-medieval
MDG27295	Welltrees Tappin	Post-medieval
MDG16989	Great Craighedhu	Post-medieval
MDG27361	Corridow Hill, landscape monitoring point	Modern

A further 30 heritage assets (DGCHM1 – DGCHM21 and HM1-2, HM5-6, HM8 and HM10-13) have been identified from a regional review of historic mapping and aerial photography, namely Roy's Lowland Survey of Scotland, 1752-1755 and the First Edition Ordnance Survey Map. The walkover survey undertaken as part of the DBA identified a single additional asset within the CSA (WS1). With the exception of Deil's Dyke, the assets within the CSA are typically Medieval to Post-Medieval in date and consist of sheep folds, enclosures, footbridges across burns, quarry sites and water management infrastructure associated with the farmstead and mill at Ulzieside. The location of all assets within the CSA is presented within **Figure 9.2**.

9.5.3 1 km Study Area

Within the 1 km Study Area there are a total of 25 Designated Assets made up of 2 Scheduled Monuments; 1 Conservation Area at Sanquhar and 22 Listed Buildings in and around the settlement of Sanquhar.

Table 9.10 Designated Assets within the 1 km Study Area

Designation	Main Reference	LB Category	Name	Period
Scheduled Monument	SM656		Kemps Castle, fort 320m SW of Euchar Bridge	Late Prehistoric
Scheduled Monument	SM687		Crichton Peel & Sanquhar Castle	Medieval
Conservation Area	CA326		Sanquhar Conservation Area	Post-medieval
Listed Building	17258	C	Euchar Bridge	Post-medieval
Listed Building	40536	B	Blackaddie Bridge	Post-medieval
Listed Building	40537	B	Sanquhar, 2 Church Road	Post-medieval
Listed Building	40540	A	Sanquhar, High Street, Tolbooth	Post-medieval
Listed Building	40541	C	Sanquhar, 1, 3 High Street, Nithsdale hotel	Post-medieval
Listed Building	40542	C	Sanquhar, 5, 7 High Street	Post-medieval
Listed Building	40543	C	Sanquhar, 11, 13 High Street	Post-medieval
Listed Building	40544	C	Sanquhar, 27, 29 High Street	Post-medieval
Listed Building	40545	C	Sanquhar, 31, 33 High Street	Post-medieval
Listed Building	40546	C	Sanquhar, 35, 37 High Street	Post-medieval
Listed Building	40547	B	Sanquhar, 39, 41 High Street, Post Office	Post-medieval
Listed Building	40548	B	Sanquhar, 63 High Street, Bank of Scotland	Post-medieval
Listed Building	40549	B	Sanquhar, 71, 73 High Street	Post-medieval
Listed Building	40550	C	Sanquhar, High Street, Monument	Post-medieval
Listed Building	40553	C	Sanquhar, 14-24 High Street	Post-medieval
Listed Building	40554	B	Sanquhar, 26 High Street, Royal Bank of Scotland	Post-medieval
Listed Building	40555	C	Sanquhar, 28-36 High Street	Post-medieval
Listed Building	40556	C	Sanquhar, 38, 40 High Street	Post-medieval
Listed Building	40557	B	Sanquhar, 74, 76 High Street	Post-medieval
Listed Building	40558	B	Sanquhar, 78 - 88 High Street	Post-medieval
Listed Building	40559	C	Sanquhar, 100-102 High Street, Council Offices	Post-medieval
Listed Building	40560	C	Sanquhar, 104-106 High Street, Library and House	Post-medieval

The closest of these assets to the CSA is the Scheduled Monument at Kemps Castle (SM656), a likely Iron Age Fort located on the Euchar Water within 100 m of the northern access track beside the farmstead at Ulzieside. No World Heritage Sites, Gardens and Design Landscapes, or Registered Battlefields are recorded within the CSA or 1 km Study Area. The remaining assets are located north of River Nith in and associated with the settlement at Sanquhar. There are a further 102 non-designated assets within the 1 km study area that are recorded within regional and national datasets. There are eight Prehistoric assets taking in isolated find spots as well as the previously mentioned Deils' Dyke, Kemp's Castle and a series of settlement sites to the north of the CSA along the River Nith Valley. In terms of funerary monuments, a cairn is recorded on the summit of Cairn Hill to the west of the CSA and a potential barrow is recorded within the River Nith Valley. The majority of these assets relate to Medieval and Post-Medieval settlement and rural economy, taking in the settlement at Sanquhar, farmsteads and associated field systems, mills and industrial sites.

A further 35 heritage assets (DGCHM22 – DGCHM52 and HM3-4, HM7 and HM9) have been identified from a review of regional historic mapping and aerial photography, namely Roy's Lowland Survey of Scotland, 1752-1755 and the First Edition Ordnance Survey Map. The walkover survey

undertaken as part of the DBA identified four additional assets within the 1 km Study Area (WS2-5) but sitting outside the CSA. With the exception of Deil's Dyke, these assets are typically Medieval to Post-Medieval in date and consist of sheep folds, enclosures, footbridges across burns, quarry sites and 19th century industrial machinery. The location of all assets within the 1 km Study Area is presented within **Figure 9.2**.

9.5.3.1 Potential for previously unknown heritage assets within the CSA

The upland portion of the CSA, where the turbines are proposed, is generally considered to have a low potential for unknown archaeological remains to be present. The greatest potential for previously unknown assets to be identified will be in the lowland areas to the north of Deil's Dyke. Deil's Dyke runs from west to east through the CSA. This earthwork likely dates to the Iron Age and is generally thought to have served as a landscape marker, separating upland and lowland zones. To the north of Deil's Dyke, the land drops off into lowland zones with a greater focus on agriculture and associated farmsteads from the Iron Age to the Post-medieval period. To the south of Deil's Dyke, land was used for rough pasture from the Iron Age and extraction/quarrying throughout the Medieval and Post-medieval period.

Prehistoric assets may be present to the north of Deil's Dyke, associated with the Iron Age Fort, Kemp's Castle. Kemp's Castle is located within 75 m of the CSA beside Ulzieside, however associated buried archaeology may extend into the CSA.

There is considered to be a generally high potential for archaeological remains to be present around the farmstead of Ulzieside and by the Euchar Water, along the route of the proposed access track to the proposed Development Site. Medieval and Post-Medieval settlement was generally concentrated along the lower elevations and burns, as indicated by dispersed farmsteads and enclosures along the valleys and watercourses with upland areas used for rough grazing. Medieval and Post-medieval assets associated with milling and the farmstead at Ulzieside are likely to survive within the CSA. Findspots associated with a purported Dragoons marching camp may also survive, although these are likely to be limited to isolated findspots of metal items such as military equipment/ammunition. Sections of rig cultivation and quarry sites are also likely to be present around Deil's Dyke and at lower elevations to the north.

9.5.4 5km Setting Study Area

All nationally designated assets within 5 km were considered for setting impacts and are assessed within **Technical Appendix A9.2 Setting Assessment 5km** (see **Figure 9.2.1**; **Figure 9.8**). The total of designated assets within 5 km includes:

- 4 Scheduled Monuments;
- 1 Conservation Area; and
- 45 Listed Buildings (of which there is 1 Category A Listed building, 23 Category B and 21 Category C).

In addition to the assets above, the 5 km Study Area contains 30 assets the Council have characterised as being of Regional or National Significance, covered by policies HE4 (Archaeologically Sensitive Areas) and HE6 (Gardens and Designed Landscapes) of the Council's Local Development Plan 2 (DGLDP2) adopted 3 October 2019.

Of these 30 DGC assets, 13 were taken forward for assessment. Of the two listed buildings at Eliock (MDG25662) and Craigdarroch (MDG25663), fall almost exclusively outwith the ZTV of the Proposed Development and have therefore not been included for assessment.

Two heritage assets categorised as 'Promoted Sites' within the HER data are included within the 5 km Study Area, these being MDG4377 and Allan's Cairn (Canmore ID 44674). MDG4377 is an existing Scheduled Monument and has been assessed as a nationally designated asset. Allan's Cairn was taken forward for assessment.

The full list of assets assessed for changes to setting within the 5 km Setting Study Area is presented within **Table 9.15** below and shown on **Figure 9.8**.

9.5.5 5-15km Setting Study Area and Selected Heritage Assets for Consideration of Changes to Setting

Between 5 and 15 km from the CSA there are 244 Nationally Designated Assets. As detailed within **Technical Appendices A9.3 Setting Sieving Exercise for Designated Assets between 5 and 15 km** and shown on **Figure 9.3.1**:

- 28 Scheduled Monuments;
- 7 Conservation Areas;
- 207 Listed Buildings; and
- 2 Gardens and Designed Landscapes.

Between 5 and 15 km from the CSA there are a further 21 Regionally Designated Assets of 'National Significance'.

The ZTV indicates that the greatest potential intervisibility between heritage assets and the Proposed Development is focused to the north-west and north-east of the CSA, with a small sliver of upland visible to the south-east as shown on **Figures 9.10 to 9.13**.

The final selection of heritage assets included in the assessment was based on criteria set out within **Appendix A9.3 Setting Sieving Exercise for Designated Assets between 5 and 15 km** and **Section 9.4.2** above, namely that assets included for setting assessment lie within the ZTV, have potential for views of the Proposed Development; and derive part of their cultural significance from long distance views and distant landscape context.

Based on the sieving exercise outlined within Appendix A9.3, 227 nationally designated heritage assets (26 scheduled monuments, 199 listed buildings, two Gardens and Designed Landscapes), six regionally designated conservations area and 19 Locally Designated Assets have been sieved out of consideration for changes to setting that affects cultural significance. All remaining assets within the 15 km Study Area have been included for the setting appraisal. The final selection includes 13 Nationally Designated heritage assets (two scheduled monuments, 11 Listed Buildings) as well as one regionally designated Conservation Area and two Locally Designated Assets of 'National Significance'.

The full list of assets assessed for changes to setting within the 5-15 km Setting Study Area is presented within **Table 9.15** and shown on **Figures 9.10 to 9.13**.

9.6 Assessment of Potential Effects

9.6.1 Construction Effects

9.6.1.1 Direct/Indirect (Physical) Impacts

Direct (physical) impacts are only likely to occur as a result of construction within the footprint of the Proposed Development.

These effects are restricted to ground disturbance associated with:

- Turbines and foundations: 11 turbines, each with a tip height of up to 180 m. Each turbine may require a small transformer located at its base. Each turbine will have a foundation with an approximate diameter of approximately 25 m.
- Crane Hardstanding: Crane hardstanding will be required adjacent to each turbine; this will consist of an area of approximately 3,000 m² at each turbine. In addition to the main

hardstanding area, there will be additional flattened areas for crane assembly and turbine blade storage; however, these will be temporary and not constitute hardstanding.

- Access tracks: Access track to serve the construction and operation of the wind farm with width approximately five metres, this will consist of a combination of upgraded track and newly construction track. Upgraded tracks will utilise tracks currently used to move farm machinery. New tracks will be constructed of a graded stone or floated, as appropriate for the ground conditions.
- Electrical Infrastructure: A substation and control building will be located east of T9. The substation and control building will be located within a compound measuring approximately 65 x 45 m, which will also include any external electrical infrastructure and vehicle parking. A BESS will be located south of the substation, covering an area of approximately 140 m x 75 m. Underground cabling, laid where possible alongside the access tracks, will link the turbine transformers to the onsite substation.
- Temporary Construction Compound: A temporary construction compound will be required during the construction of the Proposed Development, forming an area of hardstanding providing space for temporary welfare, parking, lay down areas and potentially concrete batching; this will measure approximately 100 m x 50 m.
- Borrow Pits: Up to three onsite borrow pits are proposed.
- Met Mast: A permanent Met Mast will be located at OS grid reference 273700, 605500.
- Watercourse crossings: Access tracks will require eleven new or upgraded watercourse crossings. The locations of watercourse crossings are detailed in full in **Chapter 11** of the EIA Report: Hydrology and Soils. The type and design of each watercourse crossing will be dependent on the stream morphology, peak flows, local topography and ecological requirements, and will be chosen so as to avoid or minimise potential environmental effects. It is currently anticipated that the crossings will all be culverts, however this would be confirmed at the detailed design stage. The type and design of each watercourse crossing will be dependent on the stream morphology, peak flows, local topography and ecological requirements, and will be chosen so as to avoid or minimise potential environmental effects. It is currently anticipated that the crossings will all be culverts, however this would be confirmed at the detailed design stage.

The location of all new infrastructure associated with the Proposed Development and how this relates to the position of known assets is detailed within **Figure 9.2**. As detailed in **Section 9.5**, and **Table 9.10**, there are 5 non-designated assets recorded within HER data provided by the Council. In addition, a further 30 heritage assets (DGCHM1 – DGCHM21 and HM1-2, HM5-6, HM8 and HM10-13) have been identified from a regional review of historic mapping and aerial photography, namely Roy's Lowland Survey of Scotland, 1752-1755 and the First Edition Ordnance Survey Map. The walkover survey, undertaken as part of the DBA, identified a single additional asset within the CSA (WS1).

Of the known assets recorded within the CSA, 11 are located within 50 m of turbine locations and key associated infrastructure, based on the final layout shown in **Figure 9.2**. This is within micro-siting and, as such, they are considered to be at risk of direct (physical) impacts during the construction phase of the Proposed Development. These assets are all located on or to the south of Deil's Dyke, an asset which forms a historic marker between upland and lowland zones.

Table 9.11 and **Table 9.12** provides a full list of the 11 known assets located within 50 m of construction.

Table 9.11 Assets located within 50m of proposed new infrastructure

Reference	Name	Period	NGR		Associated infrastructure
DGCHM14	Named well	Post-medieval	277419	608861	New Access Track (Ulzieside)
DGCHM20	Rig cultivation	Medieval/Post-medieval	276603	607707	Borrow Pit

Asset DGCHM14 is a low value asset with the potential to undergo a high (adverse) magnitude of impact as a result of construction associated with new access tracks. Without suitable mitigation put in place this would result in a moderate (adverse) effect to cultural significance, which is significant in terms of EIA regulations.

DGCHM20 is low value Heritage asset with the potential to undergo a low (adverse) magnitude of impact as a result if construction associated with a borrow pit. Without suitable mitigation put in place this would result in a negligible (adverse) effect to cultural significance, which is not significant in terms of EIA regulations.

Table 9.12 lists assets that have the potential of direct (physical) impacts from the upgrading of existing access tracks only.

Table 9.12 Assets located within 50m of existing access track upgrades

Reference	Name	Period	NGR		Associated infrastructure
MGD59	Dragoon's Meadow Military Camp	Post-medieval	277070	608430	Existing Access Track
HM1	Mill Lead	Post-medieval	277353	608727	HM1
HM2	Gravel Pit	Post-medieval	277079	608392	Existing Access Track
DGCHM3	Sheepfold	Post-medieval	276892	608148	Existing Access Track
DGCHM16	Sheep pen	Post-medieval	276699	608082	Existing Access Track
DGCHM17	Rig cultivation	Post-medieval	276699	608082	Existing Access Track
HM6	Footbridge	Post-medieval	276577	607879	Existing Access Track
DGCHM18	Field system, rig	Medieval/Post-medieval	276518	607903	Existing Access Track
MDG12838	Deil's Dyke	Iron Age/Medieval	277222	607016	Existing Access Track

All assets identified in **Table 9.12** have the potential to be subject to disturbed during construction with the potential for the complete or partial loss of the asset. The magnitude of impact and effects to cultural significance to all low value assets is summarised in **Table 9.13** below. The magnitude of impact to these low value assets ranges from low (adverse) to high (adverse), without suitable mitigation being out in place, with effects to cultural significance ranging from (negligible (adverse) to moderate (adverse). Moderate effects are significant in terms of EIA regulations.

Table 9.13 Summary of effects associated with access track upgrades

Reference	Name	Sensitivity	Magnitude of Impact	Effect
MGD59	Dragoon's Meadow Military Camp	Low	Low	Negligible
HM1	Mill Lead	Low	Low	Negligible
HM2	Gravel Pit	Low	High	Moderate
DGCHM3	Sheepfold	Low	Low	Negligible
DGCHM16	Sheep pen	Low	Low	Negligible
DGCHM17	Rig cultivation	Low	Low	Negligible
HM6	Footbridge	Low	High	Moderate
DGCHM18	Field system, rig	Low	Low	Negligible

Deil's Dyke (MDG12838) is considered of National Importance. At the present time no works are envisaged to the existing access track where it crosses Deil's Dyke. However, as track widening works cannot be discounted at the time of writing there is a risk of a potential direct effect to this asset due to ground disturbance during construction where it crosses the feature. This disturbance would be localised to a small section where it crosses the asset (measuring up to 5 m wide) of the total 7 km length of the asset. Should works be required, and taken in its totality, there will be a low (adverse) magnitude of impact to Deil's Dyke unless suitable mitigation is put in place. This impact would result in a minor (adverse) effect to cultural significance, which is not significant in terms of EIA regulations.

The CSA also retains a potential for the preservation of previously unknown buried archaeology. This potential is greatest between the northern limit of the CSA and the location of Deil's Dyke beside the Ulzieside Plantation; that is the section of the Proposed Development constituting upgraded access tracks only. The upland turbine locations are believed to hold a low potential for previously unknown buried archaeology. The DBA has identified a high potential for Late Prehistoric assets associated with Iron Age occupation around Kemps Castle (SM656) located on the Euchar Water, 160m to the west of the farmstead at Ulzieside. Deil's Dyke also likely dates to the Late Prehistoric Period and may have associated remains around its visible above ground extents. A series of Medieval to Post-Medieval assets are located between Ulzieside and Deil's Dyke with a high potential for previously unknown features below ground in this area of the Site. The effect to currently unidentified heritage assets cannot be predicted as the sensitivity/value of any asset cannot be known at this time and the magnitude of impact would depend on the location of these assets in relation construction activity. Given the ground-breaking works associated with the Proposed Development any such impacts could range between a low to high magnitude.

Outside of the CSA, the only potential assets which are at risk of direct/indirect (physical) impacts through construction are historic structures situated along proposed transport route of goods to the Development site. The current proposed Transport route of goods to the Development site is via Eliock Bridge, crossing the River Nith near Menzies and approaching the Site from the east. Along this route, there are two historic bridges recorded, Eliock Bridge (LB17255) and Back Burn Road Bridge (LB17251). These are both medium value assets. Any direct/indirect (physical) impact would likely produce a medium (adverse) magnitude of impact resulting from strikes to the fabric or vibration to the bridge as heavy goods pass over these assets. Without suitable mitigation put in place this would result in a minor (adverse) effect to cultural significance.

Mitigation is proposed in **Section 9.7** to reduce the potential magnitude of impact and ensure preservation by record for any unavoidable construction impacts that cannot be avoided through micro-siting.

9.6.1.2 Setting Impacts

Construction activities are short term in nature and therefore have only a temporary impact to setting which would not result in a significant effect to cultural significance. As such, setting impacts are discussed within Operational Effects below.

9.6.2 Operational Effects

9.6.2.1 Direct/Indirect (Physical) Impacts

As the footprint of the Proposed Development during operation will not increase from the construction footprint, there are no additional direct/indirect (physical) impacts during the operational phase of the Proposed Development beyond those considered during construction.

9.6.2.2 Setting Impacts

The assessment of setting impacts considers changes to setting to nationally designated and locally designated heritage assets within the CSA, 5 km Setting Study Area, and selected designated assets beyond 5 km out to 15 km.

The selection criteria for assessment is presented in **Technical Appendix A9.3 Setting Sieving Exercise for Designated Assets between 5 and 15 km**, with the setting assessment text presented in **Technical Appendices A9.2 Setting Assessment 5km and A 9.4 Setting Assessment 5 -15 km**.

9.6.2.3 Setting Impacts: Within 5 km

All designated assets within 5 km were considered for assessment. Technical Appendix A9.2 identified 50 nationally designated assets within the 5 km Setting Study Area consisting of:

- 4 Scheduled Monuments;
- 1 Conservation Area; and
- 45 Listed Buildings (of which there is 1 Category A Listed building, 23 Category B and 21 Category C).

In addition to Nationally Designated assets, Dumfries and Galloway Council have a series of locally designated assets, covered by policies HE4 (Archaeologically Sensitive Areas) and HE6 (Gardens and Designed Landscapes) of the Dumfries and Galloway Council Local Development Plan 2 (DGLDP2). Thirty locally designated assets were considered within this setting assessment.

Of the two locally designated Gardens and Designed Landscapes (MDG25662 and MDG25663), the Designed Landscapes and their associated Listed Buildings fall almost exclusively outwith the ZTV of the Proposed Development and have therefore not been included for assessment. The associated Listed Building for MDG25662 has been grouped with other listed buildings and assessed as a nationally designated asset.

Two heritage assets categorised as 'Promoted Sites' within the HER data are included within the 5 km Setting Study Area, these being MDG4377 and Allan's Cairn (Canmore ID 44674). MDG4377 is an existing Scheduled Monument and has therefore been assessed as a nationally designated asset. Allan's Cairn (Canmore ID 44674) is thus the only asset within the Promoted Site category assessed here.

A total of 50 nationally designated assets, 18 regionally designated assets and single Promoted Site from within the 5 km Setting Study Area were thus taken forward to assessment.

Following assessment, 11 high value assets were identified as likely to undergo (adverse) low impacts to setting, resulting in a **minor** (adverse) effect to cultural significance that are **not significant** in terms of EIA regulations. A further 42 medium value assets were identified as likely to undergo

(adverse) low or negligible impacts to setting, resulting in **negligible** (adverse) effect to cultural significance that are **not significant** in terms of EIA regulations. The remaining 16 assets had no impact to setting with no effect to cultural significance.

A summary of effects to assets of cultural significance is provided within **Table 9.14** below.

Table 9.14 Summary table of effects for assets within the 5 km Setting Study Area

Asset type	Designation Reference	LB Category	Name	Sensitivity	Magnitude of Impact	Significance of Effect
Scheduled Monument	SM656	N/A	Kemp's Castle, Iron Age fort 320m SW of Euchan Bridge	High	Low	Minor
Scheduled Monument	SM687	N/A	Crichton Peel & Sanquhar Castle	High	Low	Minor
Scheduled Monument	SM708	N/A	Ryehill, motte	High	Low	Minor
Scheduled Monument	SM679	N/A	Orchard, cross socket	High	None	None
Conservation Area	CA326	N/A	Sanquhar Conservation Area	Medium	Low	Negligible
Listed Building	LB10291	B	Crawick New Bridge	Medium	Negligible	Negligible
Listed Building	LB40537	B	Sanquhar, 2 Church Road	Medium	Low	Negligible
Listed Building	LB40538	B	Sanquhar, Church Road, St Bride's Church	Medium	Low	Negligible
Listed Building	LB40539	B	Crawick New Bridge	Medium	Low	Negligible
Listed Building	LB40541	C	Sanquhar, 1, 3 High Street, Nithsdale Hotel	Medium	Low	Negligible
Listed Building	LB40542	C	Sanquhar, 5-7 High Street	Medium	Low	Negligible
Listed Building	LB40543	C	Sanquhar, 11, 13 High Street	Medium	Low	Negligible
Listed Building	LB40544	C	Sanquhar, 27, 29 High Street	Medium	Low	Negligible
Listed Building	LB40545	C	Sanquhar, 31, 33 High Street	Medium	Low	Negligible
Listed Building	LB40546	C	Sanquhar, 35, 37 High Street	Medium	Low	Negligible
Listed Building	LB40547	B	Sanquhar, 39, 41 High Street, Post Office	Medium	Low	Negligible
Listed Building	LB40548	B	Sanquhar, 63 High Street, Bank Of Scotland	Medium	Low	Negligible
Listed Building	LB40549	B	Sanquhar, 73 High Street	Medium	Low	Negligible
Listed Building	LB40550	C	Sanquhar, High Street, Monument	Medium	Low	Negligible
Listed Building	LB40551	B	Sanquhar, St Ninian's Church	Medium	Low	Negligible
Listed Building	LB40552	C	Sanquhar, High Street, St Ninian's Manse	Medium	Low	Negligible
Listed Building	LB40553	C	Sanquhar, 14-24 High Street	Medium	Low	Negligible
Listed Building	LB40554	B	Sanquhar, 26 High Street, Royal Bank of Scotland	Medium	Low	Negligible
Listed Building	LB40555	C	Sanquhar, 28-36 High Street	Medium	Low	Negligible
Listed Building	LB40556	C	Sanquhar, 38, 40 High Street	Medium	Low	Negligible
Listed Building	LB40557	B	Sanquhar, 74-76 High Street	Medium	Low	Negligible

Asset type	Designation Reference	LB Category	Name	Sensitivity	Magnitude of Impact	Significance of Effect
Listed Building	LB40558	B	Sanquhar, 78-86 High Street	Medium	Low	Negligible
Listed Building	LB40559	C	Sanquhar, 100-102 High Street, Council Offices, 88 High Street	Medium	Low	Negligible
Listed Building	LB40560	C	Sanquhar, 104 High Street	Medium	Low	Negligible
Listed Building	LB40561	B	Sanquhar, Laurie's Wynd, Crichton School and Schoolhouse	Medium	Low	Negligible
Listed Building	LB40562	B	Sanquhar, Laurie's Wynd, Crichton School and Schoolhouse	Medium	Low	Negligible
Listed Building	LB40563	B	Sanquhar, Queensberry Square, School	Medium	Low	Negligible
Listed Building	LB40564	C	Sanquhar, St Mary's Street, E.U. Congregational Church	Medium	Low	Negligible
Listed Building	LB40540	A	High Street, Tolbooth/Town House	High	Low	Minor
Listed Building	LB40536	B	Blackaddie Bridge	Medium	Low	Negligible
Listed Building	LB17258	C	Euchan Bridge	Low	None	None
Listed Building	LB40565	B	Sanquhar, Sanquhar House and walled garden	Medium	Low	Negligible
Listed Building	LB40566	C	Sanquhar, Leven Road, Sanquhar Station and Stationmaster's House	Medium	Negligible	Negligible
Listed Building	LB17260	B	Sanquhar, Mennock, Viaduct	Medium	Negligible	Negligible
Listed Building	LB17251	C	Back Burn Road Bridge	Medium	None	None
Listed Building	LB17253	C	Craigdarroch Farmhouse	Medium	None	None
Listed Building	LB17255	B	Mennock, Eliock Bridge	Medium	None	None
Listed Building	LB17256	B	Eliock House	Medium	None	None
Listed Building	LB17257	C	Eliock House Bridge	Medium	None	None
Listed Building	LB10291	B	Crawick, Bridge	Medium	Low	Negligible
Listed Building	LB17254	B	Crawick, Viaduct	Medium	Negligible	Negligible
Listed Building	LB10276	B	The Holm	Medium	None	None
Listed Building	LB10241	B	Tower	Medium	Low	Negligible
Listed Building	LB10278	C	Kirkconnel, Kelloside	Medium	None	None
Listed Building	LB17259	B	Kello Bridge	Medium	None	None
Listed Building	LB10290	C	Carco	Medium	None	None
Locally designated of 'National Significance'	MDG12828	N/A	Deil's Dyke	High	Low	Minor

Asset type	Designation Reference	LB Category	Name	Sensitivity	Magnitude of Impact	Significance of Effect
Locally designated of 'National Significance'	MDG43	N/A	Cairn Hill: Cairn	High	Low	Minor
Locally designated of 'National Significance'	MDG55	N/A	Euchan Foot: ring ditch	High	Low	Minor
Locally designated of 'National Significance'	MDG56	N/A	Euchan Foot: ring ditch	High	Low	Minor
Locally designated of 'National Significance'	MDG60	N/A	Sanquhar: deer park	High	Low	Minor
Locally designated of 'National Significance'	MDG102	N/A	Sean Caer / Sanquhar	High	Low	Minor
Locally designated of 'National Significance'	MDG110	N/A	Black Loch / Loch of Sanquhar	High	Low	Minor
Locally designated of 'National Significance'	MDG161	N/A	Glengenny	High	None	None
Locally designated of 'National Significance'	MDG40	N/A	Twenty Shilling Burn / Deil's Dyke	High	None	None
Locally designated of 'National Significance'	MDG44	N/A	The Rig	High	None	No Impact
Locally designated of 'National Significance'	MDG47	N/A	Twenty Shilling Burn	High	None	None
Locally designated of 'Regional Significance'	MDG27583	N/A	Sanquhar, war memorial	Medium	Negligible	Negligible
Locally designated of 'Regional Significance'	MDG105	N/A	Sanquhar, fortlet	Medium	Low	Negligible
Locally designated of 'Regional Significance'	MDG116	N/A	Bankhead, fortlet	Medium	Low	Negligible
Locally designated of 'Regional Significance'	MDG123	N/A	Tower Plantation, linear and ring ditch	Medium	Low	Negligible

Asset type	Designation Reference	LB Category	Name	Sensitivity	Magnitude of Impact	Significance of Effect
Locally designated of 'Regional Significance'	MDG13383	N/A	Mill Knowe, prehistoric settlement	Medium	Low	Negligible
Locally designated of 'Regional Significance'	MDG241	N/A	Lochside, Cairn	Medium	Low	Negligible
Promoted Site	Canmore ID 44674	-	Allan's Cairn	Medium	None	None

9.6.2.4 *Setting Impacts – within 5 km to 15 km*

Technical Appendix A9.3 Setting Sieving Exercise for Designated Assets between 5 and 15 km identified 244 Nationally Designated Assets (28 Scheduled Monuments; 7 Conservation Areas, 207 Listed Buildings; and 2 Gardens and Designed Landscapes between 5 and 15 km from the CSA. A further 21 locally designated Assets of 'National Significance' were recorded.

Following sieving, the final selection of assets assessed for setting impacts within **Technical Appendix A9.4 Setting Assessment 5 -15 km** includes 13 nationally designated heritage assets (two scheduled monuments, 11 Listed Buildings) as well as one regionally designated Conservation Area and two locally designated assets of 'National Significance'.

Following assessment, 4 high value assets were identified as likely to undergo (adverse) low impacts to setting, resulting in a **minor** (adverse) effect to cultural significance that is **not significant** in terms of EIA regulations. A further 2 medium value assets were identified as likely to undergo (adverse) negligible impacts to setting, resulting in **negligible** (adverse) effect to cultural significance that is **not significant** in terms of EIA regulations. The remaining 10 assets had no impact to setting with no effect to cultural significance. A full summary of the heritage assets assessed is provided in **Table 9.15** below.

Table 9.15 Summary table of effects for assets assessed within 5-15 km

Asset type	Designation Reference	LB Category	Name	Sensitivity	Magnitude of Impact	Significance of Effect
Scheduled Monument	SM681		Kirkbride Kirk, Kirkbride	High	Negligible	Minor
Listed Building	LB3877	B	Kirkbride Churchyard, Excluding Scheduled Monument No 681, 'Kirkbride Kirk', Kirkbride	Medium	Negligible	Negligible
Scheduled Monument	SM13747		St Connel's Church and graveyard	High	Negligible	Minor
Locally Designated Asset of 'National Significance'	MDG21369		Grieve Hill to Dumfries	High	Negligible	Minor
Locally Designated Asset of 'National Significance'	MDG9425		Shiel Burn / Colt Hill / Black hill	High	Negligible	Minor
Conservation Area	CA496		Durisdeer Conservation Area	High	None	None
Listed Building	LB3856	A	Durisdeer Village Durisdeer Parish Church, Queensberry Mausoleum, former school/vestry and churchyard	High	None	None
Listed Building	LB3870	C	Rose Cottage Durisdeer	Medium	None	None
Listed Building	LB3858	B	Durisdeer Village Glenview Mr Henson	Medium	None	None
Listed Building	LB3859	C	Durisdeer Village Hope Cottage	Low	None	None
Listed Building	LB3880	B	Coshogle farmhouse and steading	Medium	None	None
Listed Building	LB10237	B	Kirkconnel Village, Kirkconnel Parish Church & churchyard	Medium	Negligible	Negligible
Listed Building	LB10238	B	Kirkconnel Village, Queensberry Hotel	Medium	None	None
Listed Building	LB13345	B	Kirkconnel village, old church house (former manse)	Medium	None	None
Listed Building	LB10239	C	Kirkland farmhouse	Low	None	No Impact
Listed Building	LB10240	B	The Knowe farmhouse and steading	Medium	None	None

9.6.3 Potential Decommissioning Effects

Decommissioning of the Proposed Development will involve similar processes to the construction but involve the dismantling and removal of the majority of the above ground infrastructure of the Proposed Development. As mitigation will have been undertaken at construction, no additional direct/indirect (physical) impacts are likely from the decommissioning phase of the Development. Any effects arising from this phase are therefore considered to be **not significant** in terms of the EIA Regulations.

9.7 Mitigation and Residual Effects

9.7.1 Pre-Construction

Where direct/indirect (physical) impacts are likely to occur to known assets, these should in the first instance be mitigated by design, micro-siting infrastructure away from known heritage assets where this is possible. Prior to construction commencing, it is proposed for a further walkover survey of the Site be undertaken, with the final fixed position of all infrastructure visited to assess these locations for any previously unidentified heritage resource. Should the survey identify new assets, consultation with the Council would be undertaken to determine an appropriate and proportionate mitigation strategy.

Where direct/indirect (physical) impacts cannot be avoided then a combined programme of archaeological evaluation/open area excavation and/or watching brief is recommended to reduce the magnitude of impact through a process of 'preservation by record'.

Pre-construction archaeological trial trenching is proposed to further assess the potential for previously unknown buried archaeology on a section of new access track around Ulzieside Farm, within the locale of the Late Prehistoric Fort of Kemp's Castle. This area has a high potential for Late Prehistoric through to Post-Medieval below ground archaeology.

At the present time no works are envisaged to the existing access track where it crosses Deil's Dyke. However, as track widening works cannot be discounted at the time of writing there is a risk of a potential direct effect to Deil's Dyke. Where access works are required that could adversely affect the asset the Applicant shall prepare a Method Statement for agreement with the Council prior to commencement of works. The Method Statement shall detail the requirements for a floated track design over the asset in order to minimise ground disturbance, and the requirement for a watching brief throughout these works.

9.7.2 Construction

A programme of watching brief is proposed for any improvements to existing access track between the Ulzieside Farm and Ulzieside Plantation, inclusive of any works within 50 m of Deil's Dyke. Any new ground being broken along this section of the Site will require archaeological monitoring (see **Table 9.16** for more details).

A further programme of watching brief is recommended in upland areas, to the south of Deil's Dyke to ground truth the low potential of the upland area, identified within the DBA. The scope of this watching brief would be limited to all turbine locations and areas of associated hardstanding.

Where heritage assets located during pre-construction surveys are within 50 m of the Proposed Development (and so within "micrositing" distance), assets will be demarcated to physically protect those assets in-situ.

Where works are required to the track as it crosses Deil's Dyke a watching brief shall be undertaken in line with the Method Statement agreed with the Council.

The scope of proposed archaeological works required to further evaluate known/ potential for buried archaeological remains and mitigate the loss of heritage assets during construction is proposed below in **Table 9.16**.

Table 9.16 Summary of proposed mitigation during construction phase

Phase	Scope of Works	Related Infrastructure	Related Asset	Rationale
Pre-Construction	Walkover survey of final infrastructure locations	All infrastructure		Identification of additional heritage assets not previously identified and ground truthing of previously identified assets.
	Trial Trench evaluation	New access tracks around Ulzieside Farmstead	DGCHM14 Area of High Late Iron Age potential Area of High Post-Medieval potential	Proposed new access track close to known Late Iron Age occupation.
	Method Statement	Access Track widening at Deil's Dyke	Deil's Dyke (MDG12838)	To minimise potential for an adverse effect to the asset
Construction	Watching Brief	Improvements to existing access tracks. Access track improvements between Ulzieside farmstead and Deil's Dyke Borrow Pit	MGD59 HM1 HM2 DGCHM3 DGCHM16 DGCHM17 HM6 DGCHM18 MDG12838 Area of Late Iron Age potential around Deil's Dyke (MDG12838). Area of medium to high Medieval and Post-Medieval potential.	To record assets within the footprint of and situated close to norther access track.
	Watching Brief	Turbine locations and hardstanding	n/a	To ground truth low potential in upland areas.
	Watching Brief	Access Track widening at Deil's Dyke	Deil's Dyke (MDG12838)	To minimise potential for an adverse effect to the asset
	Demarcation of assets within 50m of the Proposed Development	All infrastructure		To protect and preserve cultural heritage features in-situ.

At present, it is not thought likely that the transport of materials to the Development site during construction would cause any direct-indirect (physical) impact to the two listed bridges identified within **Section 9.5** around Eliock. However, should it become apparent that transport of materials to the Development site has the potential to directly/indirectly impact these assets then additional mitigation will be required, including potentially a programme of historic building recording for the bridges.

The final scope of archaeological works associated with the construction phase will need formal agreement with the Council following planning consent for the Proposed Development. Following consultation with the archaeological advisor to the Council and a final scope of archaeological works being agreed, an archaeological Written Scheme of Investigation (WSI) will be produced and

submitted to the Council, detailing the agreed scope of works required to discharge any planning conditions relating to archaeology attached to planning consent.

Following the above programme of mitigation, residual effects are assessed as being a negligible magnitude of impact on receptors of between low and high sensitivity leading to effects of between **negligible** and **minor** significance, this being **not significant** in terms of the EIA Regulations.

9.7.3 Operation

No Significant changes to setting have been identified for heritage assets within the Proposed Development, or within the 5 km and Study Area and beyond. All recorded setting impacts were of (adverse) minor, negligible or of no effect to cultural significance, with full details in Technical **Appendices A9.3 Setting Sieving Exercise for Designated Assets between 5 and 15 km and A9.4 Setting Assessment 5 -15 km.**

The residual effects are the same as assessed earlier in **Section 9.7**. All setting impacts to cultural heritage assets will continue throughout the operational phase of the Development and are long-term but reversible upon decommissioning.

9.8 Cumulative Effect Assessment

A cumulative impact is considered to be an additional effect, over and above the baseline, upon the cultural significance of an asset arising from the Proposed Development in combination with other consented or developments in planning likely to affect the cultural heritage environment. **Table 9.8** within **Section 9.4.5** details the wind farms within the 15km study area selected for consideration of cumulative effects, and these are assessed below.

9.8.1 Lorg, Cornharrow, Cornharrow Variation, Troston Loch

Lorg is a consented 9 turbine wind farm with a tip height of 149.9 m located approximately 5.8 km south-west of the Proposed Development, on and around Benbrack/Colt Hill above and to the east of the Water of Ken. Cornharrow is a consented 8 turbine wind farm with a tip height of 149.9 m located approximately 10.6 km south-west of the Proposed Development. Troston Loch is a consented 14 turbine wind farm with a tip height of 149.9 m located approximately 14.8 km south-west of the Proposed Development. The Cornharrow Variation is currently in application and consists of 7 turbines with a maximum blade tip height of 180 m, located 10.6 km south of the Proposed Development.

These wind farms are located within a wider landscape of operational turbines sited to the west and south-west of the Proposed Development.

The uplands to south-west of the Proposed Development contain only two High value asset, MDG9425 (Shiel Burn / Colt Hill/Black Hill road) and a locally 'Promoted Site' Canmore ID 44674 (Allans Cairn). Lorg is located in and around MDG9425 and would be of such overbearance to this asset that any visibility of the Proposed Development would be of no consequence. Allans cairn is located north of Lorg but would fall within its ZTV (LVIA **Figure 6.13i**). Local screening and vegetation largely blocks views of the Proposed Development and so there would be no cumulative impact arising from the interaction of Lorg and the Proposed Development.

The Cornharrow, Cornharrow Variation and Troston Loch wind farms are located well south of these assets and does not feature in shared views from any heritage assets south of the Proposed Development.

The cumulative ZTV for Lorg and the Proposed Development suggests that key clusters of assets north-west to north-east of the Proposed Development, taking in settlements at New Cumnock, Kirkconnel, Sanquhar and the length of the River Nith valley have no overlapping visibility. The uplands north of the River Nith valley may share some intervisibility but contain no heritage assets within the shared ZTV.

Given the above any cumulative effects associated with Lorg, Cornharrow, Cornharrow Variation or Troston Loch would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.8.2 *Sanquhar Six WF*

Sanquhar Six Wind Farm, is a consented 6 turbine wind farm with a tip height of 130 m located approximately 4.31 km north-west of the Proposed Development nestled amongst the operational windfarms of Whiteside Hill, Sandy Hill, Sanquhar, Hare Hill and Hare Hill Extension wind farms. This cluster of turbines sit in the uplands above and south of the River Nith valley and are prominent in distant upland views of assets located along the length of the north-west to south-east aligned river, including Kirkconnel, Sanquhar and their associated heritage assets. The introduction of the Sanquhar Six Wind Farm into this upland landscape containing a baseline environment of numerous turbines would not create significant (adverse) impact to setting for heritage assets within and along the River Nith valley. When introduced into this baseline landscape the Proposed Development did not in of itself create a sufficient magnitude of impact to the setting of the assets within and along the River Nith valley to create significant effect. The interaction of the Sanquhar Six Wind Farm and the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance. It should also be noted that should Sanquhar II be consented, this development would supersede Sanquhar Six as the proposed turbines will be incorporated into the Sanquhar II development (**Section 12.3.3.3, Chapter 12 – Noise**).

Given the above any cumulative effects associated with Sanquhar "Six" Wind Farm would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.8.3 *Euchanhead and Sanquhar II*

Euchnahead and Sanquhar II are a pair of wind farms currently in application and awaiting a decision on consent. Euchnahead Wind Farm would consist of 21 turbines measuring 230 m in height, located 4.5 km south-west of the Proposed Development, on and around Colt Hill. Sanquhar II would consist of 44 turbines measuring up to 200 m in height, located 1.69 km west of the Proposed Development on and around Corse Hill.

The cumulative ZTV for Euchanhead, Sanquhar II and the Proposed Development suggest overlapping visibility north, north-east and north-west of the Proposed Development, along the Euchan Water Valley, the length of the River Nith Valley and associated settlements at Kirkconnel and Sanquhar. Along the Euchan Water, the key asset of note is SM656 Kemps Castle Fort at Ulzieside.

The addition of the Euchanhead and Sanquhar II Wind Farms into a baseline containing the operational TwentyShilling, Whiteside Hill, Sandy Hill, Sanquhar Hare Hill and Hare Hill Extension wind farms would significantly increase the density of turbines in views south into the upland landscape from Kirkconnel and Sanquhar and around the River Nith Valley. The introduction of the Proposed Development, in addition to these two new wind farms would create a west to east aligned arm of turbines running across the uplands south of the Euchan Water valley taking in Sanquhar II, Whiteside Hill and the Proposed Development, with the Proposed Development sitting on the eastern end of this arm.

SM656 is located on the north-eastern limit of the Euchan Water as it meets the River Nith, with the Nith River Valley defining its setting. The distant uplands to the south of the River Nith Valley are not considered key to the setting of any of these assets around Sanquhar and Kirkconnel and do not make up key views, which are focused on the River valley itself. There are no historic associations between these assets and the uplands south of the River Nith.

The introduction of the Euchnahead and Sanquhar II into this upland landscape containing a baseline environment of numerous turbines would not create sufficient (adverse) impact to setting to generate significant effects to heritage assets within and along the River Nith valley. Whilst within long distance views, a relationship to the distant uplands south of the River Nith is not integral to their setting. When

introduced into this baseline landscape the Proposed Development did not in of itself create a sufficient magnitude of impact to the setting of the assets within and along the River Nith valley to create significant effect. The interaction of the Euchnahead and Sanquhar II and the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance.

Given the above there any cumulative effects associated with Euchnahead and Sanquhar II would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.8.4 *Sandy Knowe Extension*

The Sandy Knowe Extension is currently in application and awaiting a decision on consent. The wind farm consists of 6 turbines with a tip height of 149.9 m located approximately 5.73 km north-west of the Proposed Development to the north of the operational windfarms of Whiteside Hill, Sandy Hill, Sanquhar, Hare Hill and Hare Hill Extension. This cluster of turbines sit in the uplands above and south of the River Nith valley and are prominent in distant upland views of assets located along the length of the north-west to south-east aligned river, including Kirkconnel, Sanquhar and their associated heritage assets. The introduction of the Sandy Knowe Extension into this upland landscape containing a baseline environment of numerous turbines would not create sufficient (adverse) impact to setting to create significant effects to heritage assets within and along the River Nith valley. Whilst within long distance views, a relationship to the distant uplands south of the River Nith is not integral to their setting. When introduced into this baseline landscape the Proposed Development did not in of itself create a sufficient magnitude of impact to the setting of the assets within and along the River Nith valley to create significant effect. The interaction of the Sandy Knowe Extension and the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance.

Given the above any cumulative effects associated with Sandy Knowe Extension would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.8.5 *Glenmuckloch, Lethans Resub, Lethans Extension*

Glenmuckloch and Lethans Resub are a pair of consented wind farms located just over 10 km north-west of the Proposed Development within a part of landscape that did not previously contain large numbers of turbines, with 30 new turbines introduced as a result of planning consent. Glenmuckloch consist of 8 turbines with a maximum blade height of 149.9 m. Lethans Resub consists of 22 turbines with a blade height of 220 m.

Lethans Extension is currently in application and consists of 10 turbines with a maximum blade tip height of 251 m, located 11.03 km north-west of the Proposed Development.

The vast majority of the turbines associated with these wind farms fall outwith the ZTV of the Proposed Development in the uplands well north of the River Nith valley and the bulk of associated heritage assets within the 5-15 km Setting Study Area. Assets that are within the Setting Study area and within the ZTV of the Proposed Development are located south-east of the Glenmuckloch, Lethans Resub and Lethans Extension and as such these turbines and the Proposed Development are 180 degrees apart and do not appear within shared views.

When introduced into this baseline landscape the Proposed Development did not in of itself create a sufficient magnitude of impact to the setting of the assets within and along the River Nith valley to create significant effect. The interaction of the Glenmuckloch, Lethans Resub and Lethans Extension and the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance.

Given the above any cumulative effects associated with Glenmuckloch, Lethans Resub and Lethans Extension would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.8.6 Pencloe Forest Resub, Windy Standard III, Shepherds Rig

Pencloe Forest Resub, Windy Standard III, are a pair of consented wind farms located south-west of the Proposed Development within a baseline landscape of operational wind farms including Wether Hill, Afton, Windy Rig and Windy Standard I. Shepherds Rig is in application and sits within this same baseline landscape.

Pencloe Forest Resub consists of 19 turbines with a maximum blade tip height of 149.9 m, located 11.19 km south-west of the Proposed Development. Windy Standard III consists of 20 turbines with a maximum blade tip height of 177.5 m, located 13.99 km south-west of the Proposed Development. Windy Standard III consists of 20 turbines with a maximum blade tip height of 177.5 m, located 13.99 km south-west of the Proposed Development. Shepherds Rig consists of 17 turbines with a maximum blade tip height of 149.9 m, located 13.62 km south-west of the Proposed Development.

No heritage assets within this part of the landscape fall within the ZTV of the Proposed Development and there is therefore no potential for cumulative effects.

9.8.7 Penbreck and Penbreck Resub

Penbreck is a consented wind farm consisting of 9 turbines with a maximum blade tip height of 145 m, located 14.06 km north of the Proposed Development. Penbreck Resub is an application consisting of turbines with a maximum blade tip height of 220 m, located nearly 15 km north of the Proposed Development. These wind farms are located within a baseline landscape free of operational turbines.

Only a single heritage asset within this part of the landscape fall within the ZTV of the Proposed Development. SM4275 (Cairn Kinny) is located c. 15 km north of the closest turbines of the Proposed Development and c. 2.5 km east and north-east of the Penbreck and Penbreck Resub windfarms.

The Proposed Development in of itself did not create a sufficient magnitude of impact to the setting of SM4275 to create a significant effect. The Penbreck and Penbreck Resub wind farms would introduce turbines of much greater proximity and overbearance to the landscape around SM4257 with the Proposed Development seen in the very distant landscape within a baseline upland landscape containing numerous other wind farm developments. The interaction of the Penbreck and Penbreck Resub and the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance.

Given the above any cumulative effects associated with Penbreck and Penbreck Resub would be less than moderate. This is **not significant** in terms of the EIA Regulations.

9.9 Summary of Effects

Table 9.17 provides a summary of the effects detailed within this chapter.

Table 9.17 Summary of Effects

Receptor	Potential Impact	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Known archaeology	Direct (physical) impacts are likely at two assets DGCHM14, DGCHM20, recorded within 50 m of new infrastructure. Direct (physical) impacts are likely at further assets, MGD59, HM2, DGCHM3, DGCHM16, DGCHM17, HM6, DGCHM18, MDG12838, recorded on or adjacent	Significant without mitigation	Targeted watching brief (See Table 9.17)	Not significant

Receptor	Potential Impact	Significance of Effect	Mitigation Proposed	Residual Effect
	to sections of existing access track, which may undergo improvements.			
Unknown (buried) archaeological remains.	Direct (physical) impacts associated with: New access tracks around Ulzieside Farmstead are within an area of High archaeological potential for the Late Prehistoric and Post-Medieval periods. The Site between Ulzieside Farmstead and Ulzieside Plantation retains a Moderate to High potential for Late Prehistoric and Post-Medieval periods. The Site south of Ulzieside Plantation is considered to have a low potential for previously unknown buried archaeological remains.	Significant without mitigation	Pre-construction Walkover survey of final infrastructure locations Trial trench evaluation on New access tracks around Ulzieside Farmstead Targeted watching brief (See Table 9.17)	Not significant
Operational Phase				
Nationally and Locally Designated Heritage Assets Setting Impacts	No 'Significant' effects have been identified during the Setting Assessment. For all heritage asset, any changes to setting that affect cultural significance are minor, negligible or have no effect.	Not Significant	No mitigation is proposed other than that undertaken during the iterative design process.	Not Significant
Cumulative				
Sanquhar "Six" Community WF	No cumulative significant effects.	Not Significant	None	Not Significant
Lorg	No cumulative significant effects.	Not Significant	None	Not Significant
Glenmuckloch	No cumulative significant effects.	Not Significant	None	Not Significant
Cornharrow	No cumulative significant effects.	Not Significant	None	Not Significant
Lethans Resub	No cumulative significant effects.	Not Significant	None	Not Significant
Pencloe Forest Resub	No cumulative significant effects.	Not Significant	None	Not Significant
Windy Standard III	No cumulative significant effects.	Not Significant	None	Not Significant
Penbreck	No cumulative significant effects.	Not Significant	None	Not Significant
Troston Loch	No cumulative significant effects.	Not Significant	None	Not Significant

Receptor	Potential Impact	Significance of Effect	Mitigation Proposed	Residual Effect
Shepherds Rig	No cumulative significant effects.	Not Significant	None	Not Significant
Sanquhar II	No cumulative significant effects.	Not Significant	None	Not Significant
Euchanhead	No cumulative significant effects.	Not Significant	None	Not Significant
Sandy Knowe Extension	No cumulative significant effects.	Not Significant	None	Not Significant
Cornharrow Variation	No cumulative significant effects.	Not Significant	None	Not Significant
Lethans Extension	No cumulative significant effects.	Not Significant	None	Not Significant
Penbreck Resub (Kennoxhead Phase 2)	No cumulative significant effects.	Not Significant	None	Not Significant

9.10 Statement of Significance

Effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of 'major' or 'moderate' significance.

Up to 11 known assets, all located between Ulzieside Farm and the Ulzieside Plantation, may be subject to direct/indirect (physical) impacts during construction of new access tracks, borrow pits and upgrades to existing access tracks. All assets, with the exception of Deil's Dyke (MDG12838), a Late Prehistoric earthwork demarcating the boundary between upland and lowland zones, are of local value. The magnitude of impact to these low value assets ranges from low (adverse) to high (adverse), without suitable mitigation being put in place, with effects to cultural significance ranging from (negligible (adverse) to moderate (adverse). Deil's Dyke (MDG12838) is considered of National Importance and could be subject to localised ground disturbance (measuring up to 5 m wide) across the total 7 km length of the asset should works to the track be required. Taken in its totality there will be a low (adverse) magnitude of impact to Deil's Dyke unless suitable mitigation is put in place to avoid direct (physical) impacts. Without mitigation, this impact would result in a minor (adverse) effect to cultural significance.

The DBA identified the area around Deil's Dyke and the lowland zone to the north as being of High to Medium potential for previously unknown buried archaeological remains to be present, most likely to date from the Late Prehistoric, Medieval and Post-Medieval periods. These assets are most likely to be of low to medium value, although the possibility that that previously unknown high value features may survive cannot be completely ruled out. The effect to currently unidentified heritage assets cannot be predicted as the sensitivity/value of any asset cannot be known at this time and the magnitude of impact would depend on the location of these assets in relation construction activity. Given the ground-breaking works associated with the Proposed Development any such impacts could range between a low to high magnitude with the possibility for moderate (adverse) effects without suitable mitigation being put in place.

Where direct/indirect (physical) impacts are likely to occur to known assets, these should in the first instance be mitigated by design, micro-siting infrastructure away from known heritage assets where this is possible. Prior to construction commencing, it is proposed for a further walkover survey of the Development site be undertaken, with the final fixed position of all infrastructure visited to assess these locations for any previously unidentified heritage assets. Should the survey identify new assets, consultation with the Council would be undertaken to determine an appropriate and proportionate mitigation strategy.

Where heritage assets are within 50m of the Proposed Development (and so within “micro siting” distance), assets will be demarcated to physically protect those assets in-situ.

Where direct/indirect (physical) impacts cannot be avoided then a combined programme of archaeological evaluation/open area excavation and/or watching brief is recommended to offset any disturbance of assets through a process of ‘preservation by record’. Pre-construction archaeological trial trenching is proposed to further assess the potential for previously unknown buried archaeology on a section of new access track around Ulzieside Farm, within the locale of the Late Prehistoric Fort of Kemp’s Castle. This area has a high potential for Late Prehistoric through to Post-Medieval below ground archaeology. A programme of watching brief is proposed for any improvements to existing access track between the Ulzieside Farm and Ulzieside Plantation, inclusive of any works within 50 m of Deil’s Dyke. Any new ground being broken along this section of the Site will require archaeological monitoring. A further programme of watching brief is recommended in upland areas, to the south of Deil’s Dyke to ground truth the low potential of the upland area, identified within the DBA. The scope of this watching brief would be limited to turbine locations and areas of associated hardstanding. Should works be required to the track as it crosses Deil’s Dyke a Method Statement shall be agreed with the Council in advance of works commencing. During works a floated track design would be used and installed under a watching brief.

Through the introduction of suitable mitigation, as outlined above direct (physical) impacts and effects to cultural significance would be reduced to **not significant** in terms of EIA regulations.

There is considered to be no significant setting impacts upon nationally or locally designated assets within the CSA, 5 km Study Area or beyond.

The interaction of consented wind farm developments and those in planning, with the Proposed Development would not create additional setting impacts of sufficient magnitude to create moderate (adverse) effects to cultural significance.

Given the above all cumulative effects would be less than **moderate** and **not significant**.

10. GEOLOGY AND PEAT

10.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on the Geology and Peat resource and provides a preliminary geological assessment of the baseline conditions while considering peat instability and management. This assessment was undertaken by ERM Limited.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in **Volume 3: Technical Appendices**:

- Technical Appendix A10.1: Peat Slide Risk Assessment (PSRA);
- Technical Appendix A10.2: Outline Peat Management Plan (oPMP); and
- Technical Appendix A10.3: Borrow Pit Assessment (BPA).

This chapter is supported by the following figures in **Volume 2a: EIA Figures excluding LVIA**:

- **Figure 10.1:** Bedrock Geology;
- **Figure 10.2:** Superficial Soils;
- **Figure 10.3:** National Soils Map of Scotland;
- **Figure 10.4:** Extract from Carbon and Peatland Map 2016; and
- **Figure 10.5:** Interpolated Peat Depths.

10.2 Legislation, Policy and Guidance

This chapter is written with consideration given to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (The EIA Regulations)²⁷⁴ which establishes in broad terms what is to be considered when determining the effects of development proposals on Geology and Peat.

Consideration was also given to the National Planning Framework 4 (NPF4)²⁷⁵ and sets out the Scottish Government's policy on how nationally important land use planning matters should be addressed. Policy 5 within this document details the approach to Soils, and includes the following key points relating to developments on peatlands:

“Development proposals on peatland, carbon rich soils and priority peatland habitat will only be supported for:

- *Essential infrastructure and there is a specific locational need and no other suitable site;*
- *The generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;*
- *Small-scale development directly linked to a rural business, farm or croft;*
- *Supporting a fragile community in a rural or island area; or*
- *Restoration of peatland habitats.*

Where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site-specific assessment will be required to identify:

- *the baseline depth, habitat condition, quality and stability of carbon rich soils;*

²⁷⁴ The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations) <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 03/04/23)

²⁷⁵ The Scottish Government (2023) National Planning Framework 4 [Online] Available at: National Planning Framework 4 (www.gov.scot) (Accessed 22/03/2023)

- *the likely effects of the development on peatland, including on soil disturbance;*
- *the likely net effects of the development on climate emissions and loss of carbon; and*
- *This assessment should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration.”*

In addition to the EIA Regulations and NPF4, the following guidance, legislation and information sources have been considered in carrying out this assessment:

- NatureScot (NS) (formerly Scottish Natural Heritage (SNH)) (2019) 4th Edition, Good Practice During Wind Farm Construction²⁷⁶;
- The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments – Best Practice Guide for Proposed Electricity Generation Developments²⁷⁷;
- Scottish Government, SNH, SEPA (2017) Peatland Guidance on Development on Peatland, on-line-version-only²⁷⁸;
- SEPA (2012) Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste²⁷⁹;
- SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat²⁸⁰;
- The Scottish Government (2009) The Scottish Soil Framework²⁸¹;
- The Scottish Office (1996) Planning Advice Note PAN 50 - Controlling the Environmental Effects of Surface Mineral Workings²⁸²; and
- The Construction Industry Research and Information Association (CIRIA) (2015) Environmental Good Practice on Site (C741)²⁸³.

10.3 Assessment Methodology and Significance Criteria

10.3.1 Scoping Responses and Consultations

Scoping responses and consultations relating to geology and peat are included in **Table 10.1**.

²⁷⁶ SNH (2019) Good practice during windfarm construction, 4th Edition [Online] Available at: <https://www.nature.scot/guidance-good-practice-during-wind-farm-construction> (Accessed 03/04/2023)

²⁷⁷ The Scottish Government (2017) Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments Guidance [Online] Available at: <http://www.gov.scot/Resource/0051/00517176.pdf> (Accessed 03/04/2023)

²⁷⁸ Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, on-line version only Available at: [Guidance+on+developments+on+peatland+-+peatland+survey+-+2017.pdf \(www.gov.scot\)](http://www.gov.scot/Resource/0051/00517176.pdf) (Accessed 03/04/2023)

²⁷⁹ SEPA (2012) Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste [Online] Available at: [Guidance+on+the+assessment+of+peat+volumes%2C+reuse+of+excavated+peat%2C+and+the+minimisation+of+waste.pdf \(www.gov.scot\)](http://www.gov.scot/Resource/0051/00517176.pdf) (Accessed 03/04/2023)

²⁸⁰ SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat [Online] Available at: [wst-q-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf \(sepa.org.uk\)](http://www.sepa.org.uk/wst-q-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf) (Accessed 03/04/2023)

²⁸¹ The Scottish Government (2009) The Scottish Soil Framework [Online] Available at: <http://www.gov.scot/Publications/2009/05/20145602/0> (Accessed 03/04/2023)

²⁸² The Scottish Office (1996) Planning Advice Note PAN 50 - Controlling the Environmental Effects of Surface Mineral Workings [Online] Available at: [0026467.pdf \(www.gov.scot\)](http://www.gov.scot/Resource/0051/00517176.pdf) (Accessed 03/04/2023)

²⁸³ The Construction Industry Research and Information Association (CIRIA) (2015) Environmental Good Practice on Site Guide (C741), CIRIA: London. (Accessed 03/04/2023)

Table 10.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Tynron Community Council	Response to Scoping Application, 01/07/2022	Agreement with proposed methodology and scope of assessment, provided that they will be constantly reviewed and updated based on new circumstances and evidence. Agreement that a PSRA for the Development would be of use.	The methodology and scope of assessment will be under continuous review throughout the EIA process. The risk of peat instability is assessed in Technical Appendix A10.1: PSRA .
NatureScot	Response to Scoping Application, 10/05/2022	The Development must avoid or minimise impacts on areas of peat deeper than 0.5 m.	Staged peat depth surveys were carried out, these informed the iterative design of the Site layout. Figure 10.5: Peat Depth Interpolation outlines the areas of deep peat in relation to the infrastructure layout.
	Response to Gatecheck Report 01/02/2023	Figure 5 of the Gatecheck report shows that only some of the upgraded existing track has been sampled for peat depth (north of the site, near Shielling Knowe). It would be helpful to clarify on the map and report why this is the case.	This portion of the track has been probed at bends where the track is likely to require widening. The remainder of the existing track was not probed as no widening would be required. A short section of new proposed track in the northern Site area has not been subject to intensive probing, however Phase 1 probing in the area records no peat. Furthermore, aerial imagery and site observations confirm that the area comprises arable grassland currently used for sheep grazing. Therefore, no further probing is deemed necessary.
		It is stated that no extensive areas of deep peat were identified - the Peat Phase 2 survey has identified areas of peat >1m, and a wider peat survey will show if these are part of a larger hydrological unit. The NVC survey data in the EIA, in combination with the peat depth map, will allow for potential impacts to be identified.	The peat depths have been assessed in the geomorphological map as to whether they form part of a larger hydrological unit. This can be viewed in Technical Appendix A10.1: PSRA Figure 10.1.2 .
SEPA	Response to request for scoping opinion, 21/04/2022	SEPA are generally satisfied but cannot comment fully on the infrastructure layout due to the lack of a supporting survey. SEPA has no specific questions regarding the Development but does offer the following general guidance. The planning submission must: Demonstrate how the layout has been designed to minimise disturbance of peat and consequential release of CO ₂ . Outline mitigation measures to prevent the oxidation of peat through construction activities, storage of peat or re-use.	Peat depth surveys have been carried out across the Site. These are discussed in Section 10.4.4 of this chapter and also in Technical Appendix A10.2: oPMP . Figure 10.5: Peat Depth Interpolation outlines the areas of deep peat on site in relation to the infrastructure layout. Technical Appendix A10.2: oPMP contains a table detailing the volumes of peat to be excavated and re-used on site. It also details the excavation, storage and re-use of peat and the mitigation methods proposed to prevent oxidation. Further details on the carbon balance of the Proposed Development are outlined in Chapter 15 – Climate Change and Carbon Balance .

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Scottish Government Energy Consents Unit		There is often less environmental impact from localised storage rather than large central storage areas. Include a detailed map of peat depths with the Site infrastructure overlain to demonstrate how the layout avoids deep peat. Include a table detailing the volumes of acrotelmic, catotelmic and amorphous peat which will be excavated and re-used. A full Peat Management Plan must be considered, depending on volumes of peat present.	
		Scottish Planning Policy states that “Borrow pits should only be permitted if there are significant environmental or economic benefits compared to obtaining material from local quarries, they are time-limited, tied to a particular project and appropriate reclamation measures are in place.” Maps should be provided that show the location, size, depths and dimensions for each borrow pit as well as a detailed breakdown of the volumes of soil and rock excavated.	The justification for the use of borrow pits and their location within the Site are detailed in Technical Appendix 10.3: BPA. Volumes of material to be excavated from each borrow pit, as well as their dimensions, are outlined in the BPA. Although SPP is no longer in place, the Applicant is committed to achieving this principle regardless.
	Response to Gatecheck Report 02/02/2023	We welcome the applicants confirmation in Table A1 – Scoping Consultee Comments and Responses that the site design has been informed by Phase 1 and Phase 2 Peat probing surveys, a hydrological survey and private water supply inspections. This confirms ‘infrastructure has avoided deep peat (>1 m) and the number of watercourse crossings have been minimised where possible’. This approach is in line with our scoping advice offered on 21 April 2022.	The pre-application process and design iterations have been completed in order to avoid deep peat.
	Scoping Opinion under the EIA regulations, June 2022	We welcome early sight of the peat probe information (Figure 5 – Peat Phase 2) and are satisfied this demonstrates that turbines and infrastructure have been arranged to avoid deeper areas of peat. However, there may still be opportunities to reduce the volumes of peat impacted by the development by adjustments to the site design and adopting measures such as floating roads e.g. along the track in the central southern portion of the site.	Floating track has been proposed in the southern central portion of the Site between turbines 3 and 4, as presented in Technical Appendix A10.2: oPMP Figure 10.2.4.
		Where there is a demonstratable requirement for a peat landslide hazard risk assessment, the assessment should be undertaken as part of the EIA process.	The risk of peat instability is assessed in Technical Appendix A10.1: PSRA.

10.3.2 Scope of Assessment

The key considerations for the assessment of potential effects on the geology and peat within the Site as a result of the Proposed Development are:

- Potential for peat destabilisation and peat slide risk;
- Potential effects relating to peat disturbance and the subsequent effects from excavated peat and peat management;
- Potential for compaction of superficial soils; and
- Potential for loss of important geological minerals.

These risks are assessed in the form of:

- PSRA;
- oPMP; and
- Assessment of effects following the engineering design of Site layout, which is detailed in **Chapter 3 – Site Selection and Design**.

The key sensitive receptors in the assessment are:

- Highly sensitive soils present on site (deep peat and blanket bog);
- Areas where geological or geomorphological features considered to be of national importance (e.g., Geological SSSIs) are contained.; and
- Areas containing receptors of regionally important economic mineral deposits.

10.3.3 Elements Scoped Out of Assessment

A cumulative assessment for the soils, geology and peat has been scoped out as the effects of the Proposed Development on the soils, geology and peat are minimised with the design of the development, and furthermore peat is reused in the development itself as discussed in **Technical Appendix A10.2 oPMP** and in **Technical Appendix A7.6 oBEMP**. Due to the onsite design measures, limited peat onsite and the overall minor impact on peat from the Proposed Development itself, there is no prospect of significant cumulative effects occurring on geology, soils or peat.

All of the effects on soils, geology and peat occur within the Site. There are no cumulative developments that will take place on the Site itself that would interact with the development. Beyond the Site there is also no impact on soils, geology, and peat as all of the excavated material will be reinstated within the Site boundary. Therefore, the cumulative effects have been scoped out of the assessment.

10.3.4 Study Area / Survey Area

The Proposed Development is approximately 4.5 km South-West of Sanquhar, Dumfries and Galloway, while the entrance to the Site is 0.5 km South-West of the town. The Proposed Development is centred at NGR 274802, 606254, its extent and location can be seen in **Figures 1.1, 1.2 and 1.3** of this EIA Report. The operational Whiteside Hill Wind Farm is located 0.54 km to the west of the nearest turbine and the operational Twentyshilling Hill Wind Farm is approximately 3.49 km to the south-east of the nearest turbine. The study area is the area within the red line boundary and is the focus of the field surveys discussed in **Section 10.3.6** of this chapter.

The Site topography is complex, with elevations ranging from 470 m Above Ordnance Datum (AOD) in the South-East to 150 m AOD in the North-East. There are a number of notable hilltops and watercourses present within the Site boundary, including:

Hilltops:

- Corridow Hill (470 m AOD);
- Mid Rig (437 m AOD);
- Cloud Hill (440 m AOD); and
- Whing Head (456 m AOD).

Watercourses:

- Whing Burn;
- Glenmaddie Burn;
- Glen Burn; and
- Glenlarie Burn.

The land within the Site boundary consists predominantly of open moorland with some land used for pastoral grazing, there are forestry plantations in several areas adjacent to the Site.

10.3.5 Design Parameters

The parameters of the design that will influence the assessment of geology and peat in relation to effects arising from the Proposed Development have been based on the infrastructure layout. As outlined in **Chapter 4 – Description of the Proposed Development**, turbines and their associated infrastructure may be micro-sited up to 50 m, where constraints allow. The potential for the relocation of infrastructure has been considered in the undertaking of this assessment and mitigation recommended, where appropriate.

10.3.6 Baseline Survey Methodology

The study of geology and peat has included the study of published information relating to the current ground conditions, this is detailed in **Section 10.4** of this Chapter.

The data sources used to assess the baseline conditions of the Site are:

- BGS “GeoIndex Onshore”²⁸⁴ ; and
- Scotland’s Soils, National Soils of Scotland, Scotland’s Environment website²⁸⁵.

The desk-based study of the baseline conditions was supported by various site walkover surveys and ecology assessments detailed in **Chapter 7 – Ecology of this EIA Report**.

The purpose of the baseline survey is to identify sensitive receptors present within the Site. Soil types are of high sensitivity where they are categorised as peat soils of high moisture content, such as those found in blanket bog.

The methodology employed for the PSRA is in accordance with Scottish Government guidance on peat landslide hazard risk assessments. Using experience from other wind farm projects and through consultation with SEPA, the assessment evaluates the effects on geology and peat affected either directly or indirectly by construction or operation of the Proposed Development.

10.3.6.1 Stage One Peat Probing

Initial phase one peat probing was carried out in May 2022 by Arcus (an ERM Group Company) in accordance with Scottish Government guidance in the form of a 100 m x 100 m grid covering the whole Site. The information gathered informed the preliminary Site layout design.

²⁸⁴ BGS – GeoIndex Onshore [online] Available at: GeoIndex - British Geological Survey (bgs.ac.uk) (Accessed 03/04/2023)

²⁸⁵ Scotland’s Environment, National Soil Map of Scotland. Available at: https://map.environment.gov.scot/Soil_maps/?layer=1 (Accessed 03/04/2023)

10.3.6.2 Stage Two Peat Probing

Stage 2 peat probing was carried between October and November 2022. Probes were taken at 25 m centres on the proposed track with 25 m offsets along the track. A 10 m x 10 m crosshair was completed at the turbine centre points and at the centre points and corner points of the hardstandings.

It should be noted that the oPMP and PSRA were undertaken using the findings of all phases of peat probing with greater focus on the stage 2 probe data, as this was specifically targeting the proposed infrastructure locations. Details of these assessments are included in **Technical Appendices A10.1: PSRA and A10.2: oPMP**.

The entire section of access track to the Proposed Development was not probed as the road is existing, instead the internal bends in the road were probed in order to gain an idea of the peat depth in the event track widening is required during construction. The remainder of the existing track was not probed as no further widening will be required. A short section of new proposed track in the northern Site area has not been subject to intensive probing, however Phase 1 probing in the area records no peat. Furthermore, aerial imagery and site observations confirm that the area comprises arable grassland currently used for sheep grazing. Therefore, no further probing is deemed necessary.

10.3.7 Methodology for the Assessment of Effects

The assessment of effects is based on the final design of the Proposed Development detailed in **Chapter 4 – Description of the Proposed Development** of this EIA Report. The significance of the potential effects of the Proposed Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect.

10.3.7.1 Sensitivity of Receptors

The sensitivity of a receiving environment is defined as its ability to absorb an effect without noticeable change and can be classified as either high, medium or low. The receptor classification is determined by a series of factors, including: the nature and extent of peat, associated habitats, soil characteristics, geology and land use. Peat soils of high moisture content, such as those found in blanket bog, are considered to be highly sensitive receptors.

Table 10.2 details the different classifications of receptor sensitivity that are used to inform the assessment of the geology and peat present at the Site, assessing whether the effects would be significant under the EIA regulations.

Table 10.2 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	▪ The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance; and ▪ Very deep peat, where peat depths are > 3.0 m.
High	▪ Soil type and associated land use are highly sensitive (e.g. peat/blanket bog); ▪ Class 1 or 2 priority peatland, carbon-rich and peaty soils cover >20% of the development area. ▪ Deep peat (> 1.0 m) is present in area of blanket bog. ▪ Nationally important carbon rich soils are present. ▪ Areas containing geological or geomorphological features considered to be of national importance (e.g. geological SSSIs); and ▪ Receptor contains areas of regionally important economic mineral deposits.
Medium	▪ Soil type and associated land use are moderately sensitive (e.g. commercial forestry); ▪ Class 1 or 2 priority peatland, carbon-rich and peaty soils cover < 20% of the Proposed Development Area. ▪ Class 3 and 5 peatland areas, carbon rich and peaty soils. ▪ Deep peat (> 1.0 m) is present out with blanket bog. ▪ Receptor contains areas of locally important economic mineral deposits; and ▪ Areas containing geological features of designated regional importance including Regionally Important Geological/geomorphological Sites (RIGS), considered worthy of protection for their historic or aesthetic importance.
Low	▪ Geological features or geology not protected and not considered worthy of specific protection. ▪ Soil type and associated land use not sensitive to change in hydrological regime (e.g. grazing); and ▪ Receptor contains Class -2, -1, 0, and 4 non-peatland areas, with no carbon-rich and/or peaty soils.
Negligible	▪ The receptor is resistant to change and is of little environmental value.

10.3.7.2 *Magnitude of Impact*

The magnitude of impact on geology and peat will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

The criteria for assessing the magnitude of an effect are presented in **Table 10.3**.

Table 10.3 Framework for Determining Magnitude of Impact

Magnitude of Impact	Definition
High	- Major or total loss of or alteration to peatland resource such that post development characteristics or quality will be fundamentally or irreversibly changed; - Long term/permanent change to human or environmental health; - Catastrophic failure of site infrastructure due to ground instability; - Long term/permanent change to baseline resource; and - Major or total loss of a geological site or mineral deposit, where the value of the site would be severely affected.
Medium	- Loss of, or alteration to the baseline resource such that post development characteristics or quality will be partially changed; - Mid-term/permanent change to human or environmental health; - Ground failure that requires remediation but does not cause catastrophic failure of site infrastructure; - Mid-term/permanent change to baseline resource; and - Partial loss of a geological site or mineral deposit, with major effects to the settings, or where the value of the site would be affected.
Low	- Small loss of soils or peatland, or where soils will be disturbed but the value not impacted; - Short-term change to human or environmental health; - Ground settlement/subsidence that does not adversely affect site infrastructure or require remedial action; - Short-term change to baseline resource; and - Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.
Negligible	- Minimal or no change to soils or peatland deposits; - Minimal or no change to human or environmental health; - Minimal or no change to ground stability; - A very slight change from the baseline conditions. The change is barely distinguishable, and approximates to the 'no-change' situation; and - Minimal or no change to a geological site or mineral deposit.

10.3.7.3 Significance of Effect

The sensitivity of the receptor and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects on the geology and peat resource as a result of the Proposed Development. **Table 10.4** summarises guideline criteria for assessing the significance of effects.

Table 10.4 Framework for Assessment of the Significance of Effects

Magnitude of Impact	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table.

10.3.8 Assessment Limitations

At the time of preparing this assessment a detailed ground investigation within the Site has not been undertaken. As such, the following assessment is based on information obtained through desk-based research and peat depth surveys described in this chapter.

10.3.9 Embedded Mitigation

Embedded mitigation comprises best practice methods and works outlined in the publication 'Good Practice During Wind Farm Construction'²⁸⁶. These are established and effective measures to which the applicant will be committed through the duration of the Proposed Development.

Mitigation has been embedded within the design of the Site layout. Infrastructure should avoid key environmental constraints including the deepest areas of peat (i.e. no turbines should be sited in peat > 1.0 m in depth) or limit the impacts on deep peat where possible. All 11 of the turbines are located in areas with peat depths averaging less than 1.0 m. Where access tracks are located in areas of peat deeper than 1.0 m, floating access tracks have been proposed to minimise the impacts on deep peat.

The Site layout design was presented through pre-application consultation to SEPA to illustrate how the Site layout had considered the avoidance of deep peat where possible and how infrastructure sited in peat greater than 1.0 m was located within the shallowest peat possible. This consultation also illustrated the key constraints, such as watercourse buffers and GWDTEs.

Embedded mitigation measures are set out within the WCMP (provided as **Technical Appendix A11.2 oWCMP**) and as detailed in **Chapter 4 – Description of the Proposed Development** and **Chapter 3 – Site Selection and Design**, which sets embedded development design mitigation relating to this Proposed Development. They comprise good practice methods and works that are established and effective measures to which the Applicant will be committed through the planning consent. Some of the embedded mitigation measures that apply to this proposed development include:

- The avoidance of deep peat (depths greater than 1.0 m) within the design;
- The limitation of excavation of deep peat (such as the use of floating access tracks) where deep peat cannot be avoided; and
- The protection of peat by reusing peat on Site.

Further details on hydrology constraints are included in **Chapter 11 – Hydrology and Hydrogeology**.

10.4 Baseline Conditions

10.4.1 Topography and Land Use

The topography of the Site is undulant, with the highest areas in the South of the Site, which are approximately 470 m AOD, whereas the lowest points are approximately 150 m AOD in the North-East of the Site. There are steep slopes in the South, most notably at Cloud Hill and Whing Head, and also in the North, where part of the Site is in a valley sloping down towards Euchar Water.

There are a number of watercourses within the Site boundary, including: Whing Burn, Glenmaddie Burn, Glen Burn and Glenlarie Burn, these watercourses fall into the River Nith catchment area. The land at the Site generally consists of open moors with some land used for livestock grazing, the North-East of the Site was formerly used for coal mining.

The Site falls within the Coal Authority's Coal Mining Reporting Area however, this is only a small area located near the Site's entrance. As a result of this a Coal Mining Report was obtained from the Coal Authority. This report indicated a proven outcrop on the Site boundary on the northernmost portion of

²⁸⁶ SNH (2019) Good practice during windfarm construction, 4th Edition [Online] Available at: <https://www.nature.scot/guidance-good-practice-during-wind-farm-construction> (Accessed 03/04/2023)

the Site boundary. There is however no history of mining this outcrop and therefore there is considered to be no risk from coal mining on the Site.

10.4.2 Geology

The assessment of geology needs to consider the impacts from the Proposed Development on the geology as a receptor, with the worst-case scenario being a type of rock which is of international importance and the magnitude of change whereby worst-case scenario is a major or total loss of a geological site or mineral deposit, where the value of the Site would be severely affected.

The data presented in this section of the report is based on large scale mapping (1:50,000 scale), which may not be fully representative of the localised geology. Further site investigations were carried out and are detailed in **Section 10.4.4** where the findings of the field surveys are recorded, providing greater detail on the geology and peat at the Site.

10.4.2.1 Bedrock Geology

Published mapping by the BGS provides information on the soils and geology present at the Site location. The bedrock geology is identified as being a Kirkcolm formation – Wacke, a sedimentary bedrock, in the West of the Site; whereas the Eastern area of the Site is underlain by a Scottish Lower Coal Measures formation, also a sedimentary formation. The South of the Site sits upon a combination of different sedimentary and igneous rock formations, including Moffat Shale, Portpatrick – Wacke and Crawford Group – Chert.

Further geological information is detailed by BGS GeoIndex, a reverse or thrust fault at rockhead which extends through the Site is identified. A coal seam near the Site boundary is also identified, this is described as a high-risk area for development by The Coal Authority²⁸⁷. Much of the Site is situated in a “Coal Mining Reporting Area” and the possibility of abandoned mineshafts cannot be ruled out. However, there is no recorded past mineworking or possible shallow mineworking located within the Site boundary.

Bedrock is defined by the BGS as the main mass of rocks forming the Earth. It can be concealed beneath superficial soils and water, or visible at the surface as an outcrop. Typically, bedrocks are solid rocks that have formed over a vast amount of time. The bedrock geology at the Site is presented in **Figure 10.1**. An assessment of effects on geology are discussed in **Section 10.5**

10.4.3 Soils and Peat

The assessment of soils needs to consider the impacts of the Proposed Development on the soils as a receptor, worst case scenario being that the receptor has little or no ability to absorb change without fundamentally altering its present character, Class 1 or 2 priority peatland is present or carbon-rich and peaty soils cover > 20% of the Site.

In terms of the magnitude of change, the worst-case scenario is long term/permanent change to baseline resource where the value of the Site would be severely affected and/or major or total loss or alteration to peatland resource such that post-development characteristics or quality will be fundamentally or irreversibly changed.

10.4.3.1 Superficial Soils

Information of the superficial soils present at the Site is also provided by BGS, Glacial Till is identified as the soil type covering the majority of the Site area. There are also areas of Glaciofluvial and Alluvial deposits, identified as being Sand, Silt and Gravel, throughout North-eastern areas of the Site.

Superficial soils are described by the BGS as the youngest geological deposits that rest upon the much older bedrock; however, a layer of surface soil is generally present overlying superficial soils,

²⁸⁷ BGS – The Coal Authority [online] Available at: Interactive Map Viewer | Coal Authority (bgs.ac.uk) (Accessed 03/04/2023)

typically a thickness of 0.1 m to 0.2 m and with a higher organic content than the underlying superficial soils.

The superficial soils present at the Site are displayed in **Figure 10.2**.

10.4.3.2 National Soils of Scotland

The following information is a summary of the information on soil units within Scotland's Soils, Scotland's Environment website.

According to the National Soil Map of Scotland, the majority of the Site falls under the soil classification "mineral gleys." A small area of the Site is described as "peaty gleys" and another area as "brown soils." These terms are defined as:

Gleys: "Soils that are periodically or permanently waterlogged. They are typically greyish with greenish or blueish tinges and often have a blotchy appearance."

Peat: "An accumulation of partially decomposed organic material, usually formed in waterlogged conditions. Peat soils have an organic layer more than 50 cm deep from the soil surface which has an organic matter content of more than 60 %."

Brown Soils: "Moderately acid soils with brown mineral topsoils and brown or yellowish subsoils."

The National Soils of Scotland Map extract of the Site is shown in **Figure 10.3**.

10.4.3.3 Carbon-Rich Soils, Deep Peat and Priority Peatland Habitats

The carbon and Peatland Map 2016²⁸⁸ indicates that Class 3 peatland is present across a majority of the Site. Mineral soils are present across the north and north east of the Site while Class 1 and Class 2 peatland is recorded in the south eastern sector of the Site, however this is out with all areas of proposed development. Isolated pockets of Class 5 peat are recorded sporadically within central and southern areas of the Site.

The different classifications of carbon-rich soils and peatland importance categories are defined as:

- Class 1 - Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value;
- Class 2 - Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential;
- Class 3 - Dominant vegetation cover is not priority peatland habitat but is associated with wet and acidic type. Occasional peatland habitats can be found. Most soils are carbon-rich soils, with some areas of deep peat;
- Class 4 - Area unlikely to be associated with peatland habitats or wet and acidic type. Area unlikely to include carbon-rich soils;
- Class 5 - Soil information takes precedence over vegetation data. No peatland habitat recorded. May also include areas of bare soil. Soils are carbon-rich and deep peat;
- Mineral soil - Peatland habitats are not typically found on such soils (Class 0);
- Unknown soil type – information to be updated when new data are released (Class -1); and
- Non-soil (e.g. loch, built up area, rock and scree) (Class -2).

An extract from the Carbon and Peatland Map is shown in **Figure 10.4**.

²⁸⁸ Scotland's Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 03/04/2023)

10.4.4 Peat

Peat is a sedimentary material, dark brown or black in colour, comprising of partially remains of plants and organic materials preserved in anaerobic conditions, essentially within a waterlogged environment. There are two principal types of peat:

- Acrotelm: The upper layer which is quite fibrous and contains plant roots. Acrotelmic peat is relatively dry, generally lying above the groundwater table and has some tensile strength; and
- Catotelm: The lower layer of peat which is highly amorphous and has a very high water content. Catotelmic peat generally lies below the groundwater table and has a very low tensile strength.

These types of peat are discussed in greater depth in **Technical Appendix A10.2: oPMP** and further details of baseline peatland habitats are also included in **Chapter 7 – Ecology**.

Deep peat is defined as being a surface layer of peat soil greater than 1.0 m deep by the Scottish Government (Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2017).

Peat depth surveys were carried out to determine the extent and depth of the peat present at the Site, these are summarised in **Section 10.4.4.1** and the details are included in **Technical Appendix A10.2: oPMP**. The oPMP provides Site-specific peat depth information which informed the design of the layout of the Proposed Development and the subsequent assessment of effects.

10.4.4.1 Peat Depth Survey Data

The desk-based assessment recorded the potential presence of peat and peaty soils in line with NatureScot data described above. The results of peat probing indicated that peat depths were generally shallow throughout the Site, with 73.5% of probes recording depths of between 0 and 0.5 m and 92.9% no greater than 1.0 m. However, a small concentration of probes along a section of proposed track in the central southern portion of the Site recorded peat depths of up to 5.0 m. The average peat depth across the Site was recorded as 0.48 m.

Table 10.5 below shows the range of peat depths measured across the Site.

Table 10.5 Peat Depth Ranges Across the Site

Peat Depth Range (m)	Nº of Peat Probes	Percentage of Total (%)
0.00 - 0.50	917	73.54
0.51 - 1.00	241	19.33
1.01 - 1.50	43	3.45
1.51 - 2.00	24	1.92
2.01 - 2.50	14	1.12
2.51 - 3.00	6	<1.0
3.01 - 3.50	0	0
3.51 - 4.00	0	0
4.01 - 4.50	1	<1.0
4.51 - 5.00	1	<1.0
Total	1,247	

A summary of the peat depths at each of the turbines is included in **Table 10.6** below. There are no turbines located in areas with the average peat depths being greater than 1 m.

Table 10.6 Average Peat Depths at Turbines

Turbine	Average Peat Depth within 50 m of turbine (m)
T1	0.66
T2	0.31
T3	0.31
T4	0.51
T5	0.40
T6	0.73
T7	0.33
T8	0.71
T9	0.26
T10	0.06
T11	0.49

10.5 Assessment of Potential Effects

The effect of the Proposed Development on geology and peat has been considered for the duration of the construction, operational and decommissioning phases. Effects occurring during construction are considered to be short term effects, whereas those resulting from the operational development are considered to be long term. The effects occurring during decommissioning of the Proposed Development will be similar to the effects occurring during the construction of the Proposed Development.

10.5.1 Potential Construction Effects – Peat and Soils

10.5.1.1 Disturbance of Deep Peat

SEPA states in its regulatory position statement that developments should aim to minimise the excavation and disturbance to peat in order to reduce the amount of waste peat and soils produced during construction²⁸⁹.

Construction activities including excavation of track alignments, turbine foundations and crane hardstandings can lead to the disturbance of peat. Aside from the main construction activities, other considerations included the formation of borrow pits and temporary storage of peat on Site. These elements are discussed further in **Technical Appendix A10.2: oPMP**.

All of the turbines are located in areas where the peat depths are less than 1 m. There are two areas where the peat beneath the access tracks is deeper than 2 m:

- There is one area with peat in excess of 4.5 m, which is located on a flat area of track between two hills, between turbines 3 and 4. From the site walkover it was noted the soils in this area are waterlogged. This area is located on NGR 273506, 605073.
- There is a second area of peat with depths greater than 2 m located at the access track leading to turbine 11. This area is located on NGR 274688, 606060.

Floating tracks have been proposed in areas of peat greater than 1 m in depth in order to avoid disturbing the peat in these areas.

Further information on peat excavation is included within **Technical Appendix A10.2: oPMP**, which details the volumes estimated for excavated materials, re-use possibilities and mitigation measures

²⁸⁹ SEPA (2017) Developments on Peat and Off-Site Uses of Waste Peat [Online] Available at: [wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf](https://www.sepa.org.uk/wst-g-052-developments-on-peat-and-off-site-uses-of-waste-peat.pdf) (sepa.org.uk) (Accessed 03/04/2023)

proposed to limit the effects on deep peat wherever possible. An illustration of the areas of deep peat on site can be seen in **Figure 10.5**.

On this basis, disturbance to peat is classified as Medium sensitivity, and a low magnitude of change, therefore, the Proposed Development will result in a potential Minor effect that would be not significant, in accordance with the EIA Regulations.

10.5.1.2 *Peat Stability*

Peat instability generally results from a combination of different contributing factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where slope gradients are sufficiently steep to result in a peat slide.

Peat slide potential is increased by any construction activity where surface vegetation is removed and where peat or other soils are excavated from either the bedding surface of the underlying rock or the formation level within underlying soils.

Peat slides have the potential to affect surface water systems through soil inundation, leading to sedimentation. Soils and sensitive habitats can also be affected when slip materials slide onto areas of sensitive habitat or cause damage to local surrounding surface soils. This can lead to drainage patterns being disturbed and adverse effects on water quality. Receptors identified on site are:

- The site infrastructure;
- Minor and major watercourses;
- Sensitive habitat; and
- Roads and tracks.

There are several areas on the Site with steep slopes (slopes in excess of 8 degrees), the southern portion of the Site is located on three steep hills which the access tracks cross. None of the turbines are located on steep slopes.

There are four watercourses located on the Site as discussed in **Section 10.3.4**, with several areas that have very wet soil, which could impact the stability of the peat on the Site.

There is vegetation coverage on the Site, the removal of which could result in peat instability. Further information on the vegetation on Site can be found in **Chapter 7 – Ecology**.

On this basis, the impact on receptors from potential for peat slide is classified as Medium sensitivity, with a low magnitude of change, therefore, the Proposed Development will result in a potential **minor** effect that would be in the absence of mitigation, the Proposed Development will result in a potential **minor** effect that would be **not significant** in accordance with the EIA regulations.

10.5.1.3 *Loss and Compaction of Peat and Soils*

The design process has sought to avoid the disturbance of deep peat where possible and peat depths are generally thin across the majority of the Site. Nonetheless, the construction of turbine hardstands, access tracks and movement of construction traffic, in the absence of construction good practice, could lead to the compaction of soil. This can reduce soil permeability, potentially leading to increased run-off and increased erosion. The effects of compaction could result in a significant increase in runoff from existing conditions found on the Site.

In relation to the avoidance of deep peat, investigations have recorded a pocket of very deep peat in southern area of the Site between turbine 3 and turbine 4 located at NGR 273506, 605073. This pocket of deep peat was noted beneath proposed access track. In order to mitigate the compaction and disturbance of this peat pocket, the use of floating track between turbines 3 and 4 are proposed.

Whilst the impact of change is a small loss of soils or peatland, or where soils will be disturbed, the site layout design has sought to avoid deep peat where possible, therefore any loss or compaction of peat soils will be Low.

On this basis, given the generally shallow peat depths recorded at proposed infrastructure other than the very localised impacts on deep peat; loss and compaction of peat and soils is classified as medium sensitivity, with a low magnitude of change, therefore, the Proposed Development will result in a potential **minor** effect and **not significant**, in accordance with the EIA Regulations.

10.5.1.4 *Impact on Geology*

There are three proposed borrow pits located within the Site. These borrow pits will be used for producing aggregate for the construction activities. More information on the proposed borrow pits can be found in **Technical Appendix A10.3: Preliminary BPA**.

Excavation of rock is not anticipated during the construction of any other infrastructure or the cable network; however, in the event that further rock extraction is required it is considered that this will be minimal in comparison to the borrow pit and would not result in any loss or impact on a regional geological resource. Further, borrow pit one, the northern most borrow pit, is an existing borrow pit.

The borrow pits will have the greatest impact on the geology of the Site as the borrow pits focus specifically on rock extraction. The remainder of the Site Infrastructure will not significantly impact the geology of the Site as foundations are not expected to be at depths where significant amounts of rock will be removed. The borrow pits will aim to extract rock from the Site and is therefore the only portion of Site Infrastructure taken into account upon the assessment on the geology.

On this basis, impact on geology is classified as Low receptor sensitivity, and a low magnitude of change, therefore, the Proposed Development will result in a potential **negligible** effect and **not significant**, in accordance with the EIA Regulations.

10.5.2 *Operational Phase*

Peatland restoration is proposed as part of **Technical Appendix A7.4: Biodiversity Enhancement Management Plan** for the Proposed Development, which is likely to continue from the construction phase into the operational phase. Following consent, further surveys will be required to finalise the extent of restoration, as well as the methods to be used to achieve it. It is anticipated however, that the final Bog Restoration Area (BRA) is likely to comprise of the borrow pit areas as well as drain blocking and hagg reprofiling throughout the Site.

Peatland restoration has many benefits including absorbing atmospheric pollutants such as CO₂, improving water quality and increasing biodiversity; furthermore, damaged bogs emit carbon dioxide and other greenhouse gases, which contribute to climate change. Through the peatland restoration proposed at the Site, this will enhance some of the current areas where peatland has been damaged by natural erosion activities such as water erosion or the movement of livestock and animals.

With adoption of best practice measures as outlined in the **Technical Appendix A10.2: oPMP** there would be minimal or no impacts upon peat and soils during the operational phase, and significant effects are not anticipated.

On this basis, during operation, effects on the receptors during operational phase is classified as Medium sensitivity, with a negligible magnitude of change. Therefore, the Proposed Development will result in a potential **negligible** effect and is **not significant**, in accordance with the EIA Regulations.

10.5.3 *Decommissioning Phase*

During decommissioning, turbine foundations will be broken out to 0.5 m below ground-level. All cables will be cut off below ground level, de-energised and left in the ground. Access tracks will be removed with stone returned to the on-site borrow pits, with the land reinstated and/or restored as required. If the landowner wishes to retain any tracks, they will obtain planning permission from the

Dumfries and Galloway planning authority. No stone will be removed from the Site. This approach is less environmentally damaging than seeking to remove foundations, cables, and roads entirely. It should be noted that the restored areas of peatland would be retained following decommissioning of the infrastructure.

Decommissioning activities would be less intrusive with infrastructure partially left in place, with the land reinstated or restored with minimal requirement for further disturbance of peat, therefore no significant effects are anticipated.

On this basis, effects on the receptors during decommissioning phase is classified as Medium sensitivity, with a negligible magnitude of change, therefore, the Proposed Development will result in a potential Negligible effect and will be **not significant**, in accordance with the EIA Regulations.

10.6 Mitigation and Residual Effects

10.6.1 Mitigation Measures

Mitigation in relation to peat disturbance is initiated through embedded mitigation in design and adopting best practices during construction.

In addition, **Chapter 7 – Ecology** outlines habitat management procedures and details the peat restoration proposals as part of the application to reinstate and enhance parts of the land under control of the Applicant, and proportionally compensate for the localised disturbance being caused to deep peat. Further details of the habitat management measures proposed are included in the **Technical Appendix A10.2 oPMP**.

Mitigation proposed states that infrastructure associated with turbines which encroach deep peat could be micrositied (if required) out with these areas in order to reduce the overall effect on peat disturbance, stability and loss of soils. Micrositing limits are discussed in **Chapter 4 – Description of the Proposed Development**.

Management of existing drainage will be undertaken to allow flow, preventing new tracks acting as a hydrological barrier, as well as dewatering works within a 250 m buffer of wetland habitat communities. Further mitigation will form part of the Biodiversity Enhancement Management Plan to block ditches in a restoration scheme for some areas of sensitive peatlands across the site. Further details are provided in **Chapter 7 – Ecology, Technical Appendix A7.4: BEMP**.

Intrusive site investigations will be undertaken prior to construction at turbine locations located within areas of peat to further delineate and characterise the peat to ensure that turbines are in the most appropriate locations and allow for accurate micrositing where required.

Slope stability monitoring will occur during pre-construction and construction phases of work, including for both peat stability and non-peat related stability. These would focus on locations highlighted as being of risk in **A10.1: PSRA**.

Best practice measures for managing excavated peat and peaty soils are detailed in **Technical Appendix A10.2: oPMP**.

10.6.2 Residual Effects

Following the implementation of mitigation measures as detailed in **Section 10.6.1**, residual effects associated with peat stability and peat and soil losses will all be minor or negligible.

The disturbance of peat as a receptor is minor, although with the implementation of the specified mitigation including habitat management measures to restore peatland and make improvements to drainage would more than compensate for any peat losses, and therefore disturbance to peat is **not significant** in terms of the EIA Regulations.

10.7 Cumulative Effect Assessment

Cumulative effects on soils, peat, and geology resources have been scoped out of the EIAR as discussed in **Section 10.3.3**.

10.8 Summary of Effects

Table 10.7 provides a summary of the effects detailed within this Chapter.

Table 10.7 Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Peat	Disturbance of Deep Peat	Minor	Micrositing turbines and tracks in areas of deep peat. The use of floating tracks in areas where deep peat is located in areas of proposed access tracks. Best Practice Measures for avoiding peat and the management of peat and peaty soils. Specific mitigation measures for areas where there is the greatest potential risk to deep peat are outlined in Technical Appendix A10.2: Outline Peat Management Plan .	Negligible
Peat	Peat Stability	Minor	Construction on steep slopes with deep peat deposits will be avoided, loading of deep peat will be minimised. Slope stability monitoring will occur during the construction phase of work where necessary. Where possible micro-siting of turbines within micro-siting buffer to further reduce any risk of peat instability should be undertaken following detailed design. Best Practice Measures for avoiding peat and the management of peat and peaty soils.	Negligible
Soils	Loss and Compaction of Peat and Soils	Minor	Avoiding construction on peat deposits. Minimising the loading of soils. Reuse of peat that is removed from in situ conditions to other areas within the proposed development.	Negligible
Geology	Impact on Solid Geology	Negligible	Restoring borrow pits after use.	Negligible
Operational Phase				
Peat, Soils and Geology	Disturbance, Loss and Stability	Negligible	Best Practice Measures for avoiding peat and management of peat and peaty soils will be adopted throughout the peat land restoration during operational phase	Negligible
Decommissioning Phase				
Peat, Soils and Geology	Disturbance, Loss and stability	Negligible	Best Practice Measures for avoiding peat and management of peat and peaty soils will be adopted throughout the decommissioning phase	Negligible

10.9 Statement of Significance

This Chapter has assessed the likely significance of effects relating to the Proposed Development on Geology, Soils and Peat. The Proposed Development has been assessed as having the potential to result in minor effects which are **not significant**.

Given that only effects of moderate significance or greater are considered significant in terms of the EIA Regulations, the potential effects on Geology, Soils and Peat are **not significant**.

11. HYDROLOGY AND HYDROGEOLOGY

11.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on the Hydrology and Hydrogeology resource. This assessment was undertaken by ERM Ltd.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in Volume 3: Technical Appendices:

- Technical Appendix A11.1: Private Water Supply Risk Assessment (PWSRA); and
- Technical Appendix A11.2: Draft Water Construction Environmental Management Plan (WCEMP).

This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Scoping Responses and Consultation;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and
- Statement of Significance.

This Chapter is also supported by the following figures in **Volume 2a: EIA Figures Excluding LVIA**:

- **Figure 11.1:** Hydrological Study Areas;
- **Figure 11.2:** Hydrological Catchments;
- **Figure 11.3:** Hydrological Features;
- **Figure 11.4:** Watercourse Crossings; and
- **Figure 11.5:** Groundwater Dependent Terrestrial Ecosystems.

11.2 Legislation, Policy and Guidance

This chapter is prepared in accordance with The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (The EIA Regulations)²⁹⁰ in respect of hydrology and hydrogeology. The following legislation, guidance and information sources have been considered in undertaking this assessment.

²⁹⁰ The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations) <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 24/05/2023)

11.2.1.1 Legislative Background

The Water Framework Directive (WFD) (2000/60/EC)²⁹¹ establishes a framework for the protection, improvement and sustainable use of all water environments. It is transposed in Scotland by the Water Environment and Water Services (Scotland) Act 2003²⁹² and subsidiary Regulations.

Other relevant legislation includes:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations)²⁹³;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017²⁹⁴; The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013²⁹⁵;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as Amended (CAR)²⁹⁶;
- The Water Quality (Scotland) Regulations 2010²⁹⁷;
- The Private Water Supplies (Scotland) Regulations 2006²⁹⁸.
- The Conservation (Natural Habitats, &c.) Regulations 1994, as Amended²⁹⁹.

11.2.1.2 National Planning Framework, Local Planning Policy and Guidance

The Scottish Planning Policy ('SPP')³⁰⁰ was superseded by National Planning Framework 4 ('NPF4')³⁰¹ in February 2023. NPF4 aims to address Scotland's national spatial and thematic planning policies in one place, with a focus on protecting and restoring the natural environment. The relevant national and local planning policies are addressed in the **Chapter 5 – Planning and Energy Policy** and the **Planning Statement** accompanying this EIA Report.

11.2.1.3 Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs)

Pollution Prevention Guidelines (PPGs) and the replacement series Guidance for Pollution Prevention (GPPs) give advice on statutory responsibilities and good environmental practice³⁰². Each PPG and GPP addresses a specific industrial sector or activity. The Scottish Environment Protection Agency

²⁹¹ European Commission (2000) The Water Framework Directive (2000/60/EC) [Online] Available at: http://ec.europa.eu/environment/water/water-framework/index_en.html (Accessed 24/05/2023)

²⁹² Scottish Government (2003) The Water Environment and Water Services (Scotland) Act 2003 [Online] Available at: <http://www.legislation.gov.uk/asp/2003/3/contents> (Accessed 24/05/2023)

²⁹³ Scottish Government. (2017) The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations). Available at <https://www.legislation.gov.uk/ssi/2017/101/made>. (Accessed 24/05/2023).

²⁹⁴ Scottish Government (2017) the Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017 [Online] Available at: <https://www.legislation.gov.uk/ssi/2017/282/note/made> (Accessed 24/05/2023)

²⁹⁵ Scottish Government (2013) The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013 [Online] Available at: <http://www.legislation.gov.uk/ssi/2013/29/introduction/made> (Accessed 24/05/2023)

²⁹⁶ Scottish Government (2021) The Water Environment (Controlled Activities) (Scotland) Regulations 2011, Amended 2021 [Online] Available at: <https://www.legislation.gov.uk/ssi/2021/412/contents/made> (Accessed 24/05/2023)

²⁹⁷ Scottish Government (2010) The Water Quality (Scotland) Regulations 2010 [Online] Available at: <https://www.legislation.gov.uk/ssi/2010/95/contents/made> (Accessed 24/05/2023)

²⁹⁸ Scottish Government (2006) The Private Water Supplies (Scotland) Regulations 2006 [Online] Available at: <http://www.legislation.gov.uk/ssi/2006/209/contents/made> (Accessed 24/05/2023)

²⁹⁹ UK Government (1994) The Conservation (Natural Habitats, &c.) Regulations 1994 [Online] Available at: The Conservation (Natural Habitats, &c.) Regulations 1994 (legislation.gov.uk) (Accessed 26/06/2023)

³⁰⁰ UK Government (2014) Scottish Planning Policy [Online] Available at: <https://www.gov.scot/publications/scottish-planning-policy/> (Accessed: 24/05/2023).

³⁰¹ Scottish Government (2023) National Planning Framework 4 [Online] Available at: <https://www.gov.scot/publications/national-planning-framework-4/> (Accessed 24/05/2023).

³⁰² NetRegs (n.d.) Guidance for Pollution Prevention (GPPs) - Full List [Online]. Available at: <https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/> (Accessed 24/05/2023)

(SEPA) and Northern Ireland Environment Agency (NIEA) partnership NetRegs are in the process of replacing the PPGs with GPPs. The following guidance are of relevance principally to surface water, however as surface water has the potential to affect groundwater, they are also of relevance to the assessment of groundwater:

- GPP1 (2021): Understanding your environmental responsibilities – good environmental practices: GPP1 Version 1.2;
- GPP2 (2021): Above ground oil storage tank: GPP 2, Version 1.2;
- GPP4 (2021): Treatment and disposal of wastewater where there is no connection to the public foul sewer, GPP 4 Version 1.2;
- GPP5 (2018): Works and maintenance in or near water;
- PPG6 (2012): Working at construction and demolition sites;
- GPP8 (2021): Safe storage and disposal of used oils: GPP 8, Version 1.2;
- PPG18 (2000): Managing fire water and major spillages;
- GPP21 (2021): Pollution incident response planning; and
- GPP22 (2018): Dealing with spills.

11.2.1.4 Other Guidance

- The Scottish Government (2001), PAN 61: Planning and Sustainable Urban Drainage Systems³⁰³;
- SEPA (2010), Land Use Planning System Guidance Note 2, Version 8 (LUPS-GU2)³⁰⁴;
- SEPA (2010), Engineering in the water environment: good practice guide: River crossings³⁰⁵;
- SEPA (2015), Culverting of watercourses: Policy Statement and Supporting Guidance³⁰⁶;
- SEPA (2017), Land Use Planning System Guidance Note 31, Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3, (LUPS-GU31)³⁰⁷;
- SEPA (2019), Climate change allowances for flood risk assessment in land use planning (LUPS-CC1)³⁰⁸;
- SEPA (2002), Managing River Habitats for Fisheries³⁰⁹;

³⁰³ The Scottish Government (2001) PAN61 Planning and Sustainable Urban Drainage Systems [Online] Available at: <https://www.gov.scot/publications/pan-61-sustainable-urban-drainage-systems/> (Accessed: 24/05/2023)

³⁰⁴ SEPA (2010) Land Use Planning System Guidance Note 2, Planning advice on Sustainable Drainage Systems (SUDS), Version 8 [Online] Available at: <https://www.sepa.org.uk/media/143195/lups-gu2-planning-guidance-on-sustainable-drainage-systems-suds.pdf> (Accessed: 24/05/2023)

³⁰⁵ SEPA (2010) Engineering in the water environment good practice guide: River Crossings, WAT-SG-25 [Online] Available at: <http://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/> (Accessed 24/05/2023)

³⁰⁶ SEPA (2015) Culverting of watercourses: position statement and supporting guidance WAT-PS-06-02, Version 2.0 [Online] Available at: https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf (Accessed: 24/05/2023)

³⁰⁷ SEPA (2017) Land Use Planning System Guidance Note 31. Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3 [Online] Available at: <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> (Accessed: 24/05/2023)

³⁰⁸ SEPA (2023) Climate Change Allowances for Flood Risk Assessment in Land Use Planning (LUPS-CC1) [Online] Available at: <https://www.sepa.org.uk/media/594168/climate-change-guidance.pdf> (Accessed 24/05/2023)

³⁰⁹ SEPA (2002) Managing River Habitats for Fisheries: a guide to best practice [Online] Available at: https://www.sepa.org.uk/media/151323/managing_river_habitats_fisheries.pdf (Accessed: 24/05/2023)

- Scottish Government (2011), The Water Environment (Controlled Activities) (Scotland) Regulations 2011³¹⁰;
- SEPA (2022), CAR - A Practical Guide, Version 9³¹¹;
- SEPA (2009), River Basin Management Plan³¹²;
- NatureScot (2019), Good Practice During Wind Farm Construction³¹³;
- The Construction Industry Research and Information Association (CIRIA) (2015), Environmental Good Practice on Site (C741)³¹⁴;
- CIRIA (2001), Control of Water Pollution from Construction Sites (C532)³¹⁵;
- CIRIA (2015), The SuDS Manual (C753)³¹⁶;
- CIRIA (2006), Control of Water Pollution from Linear Construction Projects (C648)³¹⁷;
- CIRIA (2017), Guidance on the Construction of SuDS (C768);
- SEPA WAT-RM-08 Regulatory Method: SuDS³¹⁸;
- SEPA WAT-SG-75 Sector-specific Guidance – Construction Sites³¹⁹; and
- Water Assessment and Drainage Guide (WADAG)³²⁰.

11.3 Assessment Methodology and Significance Criteria

11.3.1 Scoping and Consultation Responses

Throughout the scoping exercises, and subsequently during the ongoing EIA process, relevant organisations were contacted with regards to the Proposed Development. **Table 11.1** outlines the consultation responses received in relation to Hydrology and Hydrogeology.

³¹⁰ Scottish Government (2011) the Water Environment (Controlled Activities) (Scotland) Regulations 2011 [Online] Available at: http://www.legislation.gov.uk/ssi/2011/209/pdfs/ssi_20110209_en.pdf (Accessed 24/05/2023)

³¹¹ SEPA (2022) Controlled Activities Regulations - A Practical Guide, Version 9.2 [Online] Available at: https://www.sepa.org.uk/media/34761/car_a_practical_guide.pdf (Accessed 24/05/2023)

³¹² SEPA (2009) River Basin Management Plan [Online] Available at: http://www.sepa.org.uk/water/river_basin_planning.aspx (Accessed 24/05/2023)

³¹³ NatureScot (2019) Good Practice During Wind Farm Construction [Online] Available at: <https://www.nature.scot/guidance-good-practice-during-wind-farm-construction> (Accessed: 24/05/2023)

³¹⁴ CIRIA (2015) Environmental Good Practice on Site [Online] Available at: https://www.ciria.org/Training/Training_courses/Environmental_good_practice_on_site.aspx (Accessed 24/05/2023)

³¹⁵ CIRIA (2001), Control of Water Pollution from Construction Sites (C532) [Online] Available at: <https://www.ciria.org/ProductExcerpts/C532.aspx> (Accessed 24/05/2023)

³¹⁶ CIRIA (2015) The SuDS Manual (C753) [Online] Available at: https://www.ciria.org/ProductExcerpts/tbyb_c753.aspx (Accessed 24/05/2023)

³¹⁷ CIRIA (2006) C648: Control of water pollution from linear construction projects: Technical Guidance [Online] Available at: <https://www.ciria.org/ProductExcerpts/C648.aspx> (Accessed: 24/05/2023)

³¹⁸ SEPA (2019) WAT-RM-08: Regulatory Method Sustainable Drainage Systems (SUDS or SUD Systems) v6.4 [Online] Available at: <https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/> (Accessed: 24/05/2023)

³¹⁹ SEPA (2018) WAT-SG-75 Supporting Guidance Sector Specific Guidance: Construction Sites [Online] Available at: <https://www.sepa.org.uk/regulations/water/pollution-control/pollution-control-guidance/> (Accessed: 24/05/2023)

³²⁰ SEPA (n.d.) Water Assessment and Drainage Assessment Guide [Online] Available at: https://www.sepa.org.uk/media/163472/water_assessment_and_drainage_assessment_guide.pdf (Accessed: 24/05/2023)

Table 11.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
SEPA	Scoping Response dated 21/04/2022	To avoid delay and potential objection, the information outlined below and relevant issues in the attached appendix must be submitted in support of the application. a) Map and assessment of all engineering works within and near the water environment including buffers, details of any flood risk assessment and details of any related applications made under the Controlled Activities Regulations (CAR). With relation to flood risk, if, having considered the site and potential for flood risk, it appears that the only apparent issue could relate to design of watercourse crossing, then provided crossings are designed to accommodate the 1 in 200-year event and other infrastructure is located well away from watercourses it is unlikely that there will be a need for detailed information on flood risk	Flood risk screening has been carried out in Section 11.4.6 to confirm infrastructure is not situated in areas at risk of flooding except for watercourse crossings. New watercourse crossings will be designed to the 1 in 200-year event and to withstand extreme weather conditions brought about by climate change.
		b) Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers.	A map of GWDTEs with appropriate buffers has been provided as Figure 11.5 .
		c) Map and assessment of impacts upon groundwater abstractions and buffers. Where there are no abstractions within 250 m of excavations then this should be confirmed in the EIA Report.	An assessment of all PWS including groundwater abstractions has been carried out in Technical Appendix A11.1: PWSRA and a map has been provided as Figure 11.3 .
		i) Map of proposed wastewater drainage layout j) Map of proposed surface water drainage layout k) Map of proposed water abstractions including details of the proposed operating regime	Maps of proposed drainage layouts and water abstractions / regimes will be provided prior to construction. These are provided in accordance with the approved CEMP to allow infrastructure locations to be finalised within micro-siting allowance during detailed design.
		The site layout must be designed to avoid impacts upon the water environment. Where activities such as watercourse crossings, watercourse diversions or other engineering activities in or impacting on the water environment cannot be avoided then the submission must include justification of this and a map showing: a) All proposed temporary or permanent infrastructure overlain with all lochs and watercourses. b) A minimum buffer of 50m around each loch or watercourse. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the	The Proposed Development has been designed to avoid the water environment where possible and minimise the number of watercourse crossings. A 50 m buffer around water features has been implemented as embedded mitigation. Where this buffer has been breached suitable mitigation has been detailed in Section 11.5.1.1 . Outline mitigation and best practice measures are discussed within Technical Appendix A11.2: oWCEMP . This document outlines principles that will be adopted during construction and included within the detailed drainage layout which is to be provided pre-construction once infrastructure locations are finalised within micro-siting allowances.

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
		location, dimensions of the loch or watercourse and drawings of what is proposed in terms of engineering works. c) Detailed layout of all proposed mitigation including all cut off drains, location, number and size of settlement ponds.	
		If water abstractions or dewatering are proposed, a table of volumes and timings of groundwater abstractions and related mitigation measures must be provided.	This will be provided prior to construction by the Principal Contractor during development of the detailed design. This is required to be provided pre-construction to finalise micro-siting allowances and after the final ground investigation has been carried out.
		GWDTE are protected under the Water Framework Directive and therefore the layout and design of the development must avoid impact on such areas. The following information must be included in the submission: a) A map demonstrating that all GWDTE are out with a 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions. If micro-siting is to be considered as a mitigation measure the distance of survey needs to be extended by the proposed maximum extent of micro-siting. The survey needs to extend beyond the site boundary where the distances require it.	A map of GWDTEs and buffer distances has been provided as Figure 11.5 .
		b) If the minimum buffers above cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected.	Mitigation for indirect effects to GWDTEs has been provided in Technical Appendix A11.2: oWCEMP .
		Excavations and other construction works can disrupt groundwater flow and impact on existing groundwater abstractions. The submission must include: a) A map demonstrating that all existing groundwater abstractions are outwith a 100m radius of all excavations shallower than 1m and outwith 250m of all excavations deeper than 1m and proposed groundwater abstractions.	An assessment of all PWS including groundwater abstractions has been carried out in Technical Appendix A11.1: PWSRA and a map has been provided as Figure 11.3 .
		The following information should also be submitted for each borrow pit: a) A map showing any stocks of rock, overburden, soils and temporary and permanent infrastructure including tracks, buildings, oil storage, pipes and drainage, overlain with all lochs and watercourses to a distance of 250 metres. You need to demonstrate that a site-specific proportionate buffer can be	As part of design embedded mitigation, a 50 m buffer of watercourses has been implemented. Any breaches of this buffer have been identified and discussed within Section 11.5.1.1 . Breaches in the 250 m buffer area to waterbodies requested by SEPA have been detailed in Section 11.5.1.1 . Where this breach occurs, mitigation is outlined in Section

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
		achieved. On this map, a site-specific buffer must be drawn around each loch or watercourse proportionate to the depth of excavations and at least 10m from access tracks. If this minimum buffer cannot be achieved each breach must be numbered on a plan with an associated photograph of the location, dimensions of the loch or watercourse, drawings of what is proposed in terms of engineering works.	11.5.1.1. and an indicative mitigation layout is provided in Technical Appendix A11.2 oWCEMP .
		b) A ground investigation report giving existing seasonally highest water table including sections showing the maximum area, depth and profile of working in relation to the water table.	Detailed geotechnical ground investigations will be carried out post-consent, as is recognised practice with onshore wind development.
		c) A site map showing cut-off drains, silt management devices and settlement lagoons to manage surface water and dewatering discharge. Cut-off drains must be installed to maximise diversion of water from entering quarry works.	Maps of proposed drainage and mitigations layouts and water abstractions / regimes will be provided prior to construction by the principal contractor.. These are be provided at construction to allow infrastructure locations to be finalised within micro-siting allowance during detailed design.
		d) A site map showing proposed water abstractions with details of the volumes and timings of abstractions.	As noted above, maps of proposed drainage layouts and water abstractions / regimes will be provided prior to construction by the principal contractor. These are be provided at construction to allow infrastructure locations to be finalised within micro-siting allowance during detailed design.
		A site map showing the location of pollution prevention measures such as spill kits, oil interceptors, drainage associated with welfare facilities, recycling and bin storage and vehicle washing areas. The drawing notes should include a commitment to check these daily.	A pollution prevention plan and emergency procedures will be provided at a later date prior to construction.
		A schedule of mitigation supported by the above site-specific maps and plans must be submitted. These must include reference to best practice pollution prevention and construction techniques (for example, limiting the maximum area to be stripped of soils at any one time) and regulatory requirements. They should set out the daily responsibilities of ECOWs, how site inspections will be recorded and acted upon and proposals for a planning monitoring enforcement officer.	Good construction practices and pollution prevention measures have been detailed in the WCEMP provided as As noted above, maps of proposed drainage layouts and water abstractions / regimes will be provided prior to construction by the principal contractor. These are be provided at construction to allow infrastructure locations to be finalised within micro-siting allowance during detailed design. A11.2 oWCEMP.
NatureScot	Scoping response dated 10/05/2022	We advise that a Pollution Prevention Plan be put in place, particularly to manage the risk of sedimentation and chemical pollution to the watercourses on and around the proposed development site.	Pollution prevention measures have been detailed in A11.2 oWCEMP .

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
Dumfries & Galloway Council – Flood Risk Management Team	Scoping response dated 24/05/2022. The same response was also provided within the wider Dumfries and Galloway Council Scoping response received on 21/02/2023.	All proposed watercourse crossings/bridges, that form part of the development should be hydrologically assessed to ensure there will be no capacity issues in extreme weather events, i.e. 1 in 200 year design peak flow.	Watercourse crossings have been designed to accommodate a 1 in 200-year event. event and to withstand extreme weather conditions brought about by climate change.
Scottish Water	Scoping response dated 22/04/2022	Scottish Water records indicate that there is live infrastructure in the proximity of your development area that may impact on existing Scottish Water assets. A review of our records indicates that there are no Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive, in the area that may be affected by the proposed activity. For reasons of sustainability and to protect our customers from potential future sewer flooding, Scottish Water will not accept any surface water connections into our combined sewer system.	Noted.
Dumfries and Galloway Council – Environmental Health Office (EHO)	Dumfries and Galloway Council – Environmental Health Office (EHO)	The EHO provided information on all registered Private Water Supplies (PWS) within and just outside of the 2 km study area. The EHO also provided a list of properties which were not registered as PWS but would likely be served by PWS and suggested that the applicant verify this information.	This information was used to inform on the private water supply risk assessment, provided as Technical Appendix TA 11.1 PWSRA . This assessment utilised the information on registered and non-registered PWS to begin an assessment. This information was followed up with a desk-based assessment and PWS inspections.
SEPA	Gatecheck response dated 02/02/2023	SEPA welcomes the confirmation that a hydrological survey and private water supply inspections have been carried out. Additionally, SEPA states that the applicant's gatecheck response confirms that watercourse crossings have been minimised where possible and that a 50 m watercourse buffer has been implemented which is in line with scoping advice. SEPA notes that the 50 m buffer has been breached at the Site entrance and will require mitigation to address pollution risk. SEPA do not have concerns with this but ask that any	Noted. Areas where infrastructure is located within, the 50 m watercourse buffer are identified within Section 11.5.1.1 and specific mitigation for these breaches is detailed in Technical Appendix TA 11.2: WCEMP .

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
		breaches in the 50 m watercourse buffer are reported within the EIAR and suitable mitigation is implemented to address these breaches.	
Marine Scotland Science (MSS)	MSS Checklist – submitted to MSS 12/01/2023	MSS standard EIA checklist requirements: ▪ A description and results of the site characterisation surveys for fish (including fully quantitative electrofishing surveys) and water quality including the location of the electrofishing and fish habitat survey sites and water quality sampling sites on the map outlining the proposed turbines and associated infrastructure. ▪ An outline of the potential impacts on fish populations and water quality within and downstream of the proposed development area. ▪ Any potential cumulative impacts on the water quality and fish populations associated with adjacent (operational and consented) developments. ▪ Any proposed site-specific mitigation measures as outlined in MSS generic scoping guidelines and the joint publication “Good Practice during Wind Farm Construction”. ▪ Full details of proposed monitoring programmes using guidelines issued by MSS and accompanied by a map outlining the proposed sampling and control sites in addition to the location of all turbines and associated infrastructure. ▪ A decommissioning and restoration plan outlining proposed mitigation/monitoring for water quality and fish populations. Developers should specifically discuss and assess potential impacts and appropriate mitigation measures associated with the following: ▪ The presence of a large density of watercourses.	Water quality has not been carried out as part of this assessment. Instead, characterisation of surface hydrology in relation to infrastructure has been completed through means of a desktop study followed up by a hydrological walkover to inspect onsite watercourses. An assessment of potential impacts to surface hydrology has been carried out in Section 11.5. A cumulative assessment on downstream hydrological receptors has been carried out in Section 11.6. A Water Construction Environmental Management Plan has been produced to outline embedded mitigation and best practice measures to protect the water environment. These principles will be adopted during detailed design. This document also proposes specific mitigation for areas which breach the 50 m watercourse buffer. An outline water quality monitoring programme has been discussed in Technical Appendix A11.2: oWCEMP. It is proposed that a detailed water quality monitoring plan including sampling locations, methodology is provided post consent via condition. Proposed mitigation for water quality and an outline water monitoring programme is provided in Technical Appendix A11.2: oWCEMP. Onsite surface hydrology are identified and discussed within Section 11.4 and the potential impact to these receptors are discussed in Section 11.5. Appropriate embedded mitigation is outline in Technical Appendix A11.2: oWCEMP.
Tynron Community Council (TCC)	Scoping response dated	The extensive network of small streams and the potential for the disruption of water supplies by the destruction of peat deposits could have a large impact on PWS and water supplies for farm animals in excess of the proposed 2km limit. Section 10.2 states that ‘Beyond 2 km it is considered that potential for hydrological connectivity with PWS is limited’ – i.e. by its own admission not impossible. Given the longevity of this proposal and the potential for cumulative impacts with adjacent wind farms (consented and in planning) this 2 km limit is inadequate. Local residents have also found that the historical data held on	A PWS study area of 2 km was proposed within the scoping report methodology, of which the applicant received no objections from SEPA or Scottish Water. A Private Water Supply Risk Assessment (PWSRA) has been carried out as Technical Appendix A11.1 PWSRA which provides a methodology of assessment, consultation information and PWS inspection information which was used to inform on initial PWS data provided by the Council.

Consultee	Type and Date	Summary of Consultation Response	Applicant's Response
		PWS by SEPA and D&GC can be inaccurate, therefore this data should be further investigated.	

11.3.2 Scope of Assessment

The key issues for the assessment of potential hydrological effects relating to the Proposed Development include short-term (construction) and long-term (operation and decommissioning) effects.

Short-term effects arising from the construction phase such as:

- Chemical pollution (including accidental pollution) of surface water, near-surface water and groundwater as a result of construction works;
- Chemical pollution as a result of battery fires from the substation and battery energy storage system (BESS) compound;
- Erosion and sedimentation of surface water, near-surface water and groundwater as a result of construction works;
- Increased risk of erosion and sedimentation of surface water, near-surface water and groundwater in areas of cutting earthworks at trackside, crane hardstanding and borrow pits;
- Impediments to watercourse and near-surface water flow from turbine foundations, watercourse crossings and shallow excavation works, including changes in soil and peat interflow patterns;
- Increased run-off and flood risk from increased areas of hardstanding including access tracks;
- Potential effects on private water supplies (PWS) in terms of water quantity, quality and continuity;
- Potential effects on the hydrological function of Groundwater Dependent Terrestrial Ecosystems (GWDTEs); and
- Potential effects on Designated Sites in terms of decrease in condition of qualifying interests.

Long-term effects arising from the operational phase such as:

- Increased run-off and flood risk from increased hardstanding including permanent access tracks;
- Alterations to natural flow pathways from runoff from areas of hardstanding, with potential effects on the hydrological function of GWDTEs;
- Chemical pollution as a result of battery fires from the substation and BESS compound; and
- Chemical pollution as a result of minor spills from maintenance vehicles.

Long-term effects arising from decommissioning, similar to the construction period, such as:

- Chemical pollution (including accidental pollution) of surface water, near-surface water and groundwater as a result of construction works;
- Chemical pollution from removal of battery energy storage system (BESS) compound;
- Erosion and sedimentation of surface water, near-surface water and groundwater as a result of construction works;
- Impediments to watercourse and near-surface water flow from excavation of turbine foundations and shallow excavation works, including changes in soil and peat interflow patterns;
- Potential effects on the hydrological function of GWDTEs; and
- Potential effects on Designated Sites in terms of decrease in condition of qualifying interests.

The key sensitive receptors are considered to be:

- Euchar Water and associated tributaries;
- Scaur Water and associated tributaries;

- River Nith;
- Upper Nithsdale groundwater body;
- Hydrological function of potential GWDTEs; and
- Quantity, quality, and continuity of Public and PWS.

Effects during construction, operation and decommissioning have been assessed, as well as potential cumulative effects.

11.3.3 Elements Scoped out of Assessment

The following effects are scoped out of assessment as agreed at scoping:

- The migration of pollutants from contaminated land is scoped out of the assessment as the Site has not previously been developed and it is unlikely contaminated land will be encountered.
- Statutory designated receptors not hydrologically connected to the Proposed Development, are scoped out as there is no potential for effects on these receptors.
- There is limited potential for pollution and sedimentation effects on the water environment at distances greater than 10 km and that receptors beyond this distance are scoped out.

11.3.4 Study Area

The hydrology and hydrogeology study area (the Core Study Area) is defined by the indicative developable area and is shown in **Figure 11.1**. A study area of 2 km from the Core Study Area has been defined to assess the potential effects on PWS (the PWS Study Area), and a wider study area of 10 km from the Core Study Area to assess potential effects on the downstream water environment (the Wider Study Area). All study areas are shown in **Figure 11.1**.

Per **Section 11.3.3**, impacts beyond the Wider Study Area are scoped out of further consideration.

11.3.5 Survey Methodology

A desk-based assessment, consultation, and site walkover have been conducted to inform the hydrology and hydrogeology assessment.

11.3.6 Desk-Based Assessment

The desk-based assessment includes:

- Identification of watercourses, surface water catchments and springs;
- Identification of underlying hydrogeology and connectivity to the Proposed Development;
- Assessment of topography and slope to inform drainage patterns;
- Collation of data provided through consultation, including details on public and private water supply sources;
- Assessment of flood risk data and mapping; and
- Assessment of potential for the presence of GWDTEs.
- The following sources of information were used to inform the desk-based assessment:
 - The Ordnance Survey (OS) 1:50,000 (Digital);
 - OS 1:25,000 Map (Digital);

- National River Flow Archive (NRFA)³²¹;
- SEPA Flood Map 2019³²²;
- Meteorological Office Rainfall Data³²³;
- Scotland's Environment web-based maps³²⁴; and
- The British Geological Survey (BGS) GeoIndex onshore geology viewer³²⁵.

11.3.7 Consultation

In addition to Scoping consultation outlined in **Section 11.3**, the following consultees were contacted to inform the hydrology and hydrogeology assessment:

- The Council Environmental Health Office (EHO) via email to obtain information on registered PWS within the PWS Study Area; and
- Residents and owners of properties within 2 km of the Site which are identified as being supplied or potentially supplied by a PWS to obtain information on the source and supply of the PWS.

Further information on this consultation is provided in **Section 11.4.7**.

11.3.8 Site Visits

A site walkover was undertaken on the 17th and 18th May 2022 to visually inspect surface water features, obtain an understanding of the local topography and drainage patterns and to ground-truth the information reviewed and collated in the desk-based assessment.

A site visit was conducted on 19th October 2022 to inspect PWS which required further assessment, namely Glenglass Cottage, Glenmaddie, Old Barr, Euchar Cottage, Euchar House, and Sheil.

Ecology surveys, including habitats surveys, as well as peat probing have also been conducted across the Site. The results of these surveys are discussed in **Chapter 7 – Ecology** and **Chapter 10 – Geology and Soils** respectively.

11.3.9 Assessment Methodology

The significance of the potential effects of the Proposed Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect.

The assessment follows the systematic approach outlined in **Sections 11.3.9 to 11.3.12**.

The methodology outlined in **Sections 11.3.10 to 11.3.12** has been developed by ERM Ltd. in consultation with SEPA, NatureScot (formerly SNH), Marine Scotland and the Scottish Government. The assessment is based on a source-pathway-receptor methodology, where the sensitivity of the receptors and the magnitude of potential change upon those receptors identified within the study areas outlined in **Section 11.3.4**.

11.3.10 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, will be assessed in line with best

³²¹ Centre for Ecology and Hydrology (undated) National River Flow Archive [Online] Available at: <http://nrfa.ceh.ac.uk/> (Accessed 19/04/2022)

³²² SEPA (n.d.) Flood Maps [Online] Available at: <http://map.sepa.org.uk/floodmap/map.htm> (Accessed 19/04/2022)

³²³ Met Office (2019) Climate Data [Online] Available at: <http://www.metoffice.gov.uk/public/weather/climate> (Accessed 19/04/2022)

³²⁴ Scotland's Environment (n.d.) [Online] Available at: <https://www.environment.gov.scot/> (Accessed: 19/04/2022)

³²⁵ BGS (2019) GeoIndex Onshore [Online] Available at: <https://mapapps2.bgs.ac.uk/geoindex/home.html> (Accessed 19/04/2022)

practice guidance, legislation, statutory designations and / or professional judgement. **Table 11.2** details the framework for determining the sensitivity of receptors.

Table 11.2 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	A large, medium or small waterbody with a SEPA water quality classification of 'High'. The hydrological receptor and downstream environment has no capacity to attenuate natural fluctuations in hydrochemistry and cannot absorb further changes without fundamentally altering its baseline characteristics / natural processes. Local groundwater constitutes a valuable resource because of its high quality and yield. Aquifer classified by the British Geological Survey (BGS) as 'highly productive aquifer' and is of regional importance. Statutorily designated nature conservation sites dependent on groundwater. The hydrological receptor will support abstractions for public water supply or private water abstractions for the production of mass-produced food and drinks. The hydrological receptor will support abstractions for any public water supply, or private water abstractions which supply more than 25 people and / or 100 livestock (at any given point in the year) and/ or is used for the mass-production of food and drinks. Groundwater dependent terrestrial ecosystems (GWDTEs) which are classified by SEPA as "highly groundwater dependent" and have no (<1 %) functional impairment by man-made influence (such as drainage or forestry). The hydrological receptor is of high environmental importance or is designated as European or international importance, such as a Special Area of Conservation (SAC), Special Protections Areas (SPA), a Site of Special Scientific Interest (SSSI) or Wetland of International Importance (Ramsar). The receptor acts as an active floodplain or other flood defence, in accordance with NPF4 2023.
High	A large, medium, or small waterbody with a SEPA water quality classification of 'Good'. The hydrological receptor and downstream environment has limited capacity to attenuate natural fluctuations in hydrochemistry and cannot absorb further changes without fundamentally altering its baseline characteristics / natural processes. Aquifer of local importance. Groundwater body is classified by the BGS as a 'moderately productive aquifer', with moderate yield from secondary fractures and near-surface weathering. Exploitation of local groundwater is not far-reaching. Local areas of nature conservation known to be sensitive to groundwater effects. The hydrological receptor supports abstractions for private water supply for up to 25 people and / or 100 livestock (at any given point in the year). GWDTEs which are classified by SEPA as "highly groundwater dependent" have minor (1 - 25 %) functional impairment by man-made influence (such as drainage or forestry). The hydrological receptor is designated as national environmental importance, such as a Site of Special Scientific Interest (SSSI) and National Nature Reserves (NNR). The receptor is located within a flood risk area, as defined in NPF4 2023.
Medium	A large, medium or small waterbody with a SEPA water quality classification of 'Moderate'. The hydrological receptor and downstream environment will have moderate capacity to attenuate natural fluctuations in hydrochemistry but cannot absorb certain changes without fundamentally altering its baseline characteristics / natural processes. Aquifer of limited value (less than local) and is classified by the BGS as a 'low productivity aquifer' as water quality does not allow potable or other quality sensitive uses. Exploitation of local groundwater is not far-reaching. Local areas of nature conservation known to be sensitive to groundwater effects. GWDTEs/ wetlands which are classified by SEPA as "highly groundwater dependent" but have moderate (25 % - 50 %) functional impairment by man-made influence (such as drainage or forestry). GWDTEs which are classified by SEPA as "moderately groundwater dependent" have no functional impairment by man-made influence (such as drainage or forestry). The hydrological receptor does not act as an active floodplain or other flood defence but is considered to provide some degree of natural flood management (e.g., peat soils). The hydrological receptor is of local environmental importance (such as Local Nature Reserves (LNR)).
Low	A large, medium, or small waterbody with a SEPA water quality classification of 'Poor' or 'Bad'.

Sensitivity of Receptor	Definition
	The hydrological receptor and downstream environment will have capacity to attenuate natural fluctuations in hydrochemistry but can absorb any changes without fundamentally altering its baseline characteristics / natural processes. Poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. Changes to groundwater not expected to affect local ecology. The hydrological receptor does not support abstractions for public water supply or private water abstractions. GWDTEs which are classified by SEPA as “highly groundwater dependent” but have major (>50%) functional impairment by man-made influence (such as drainage or forestry). GWDTEs which are classified by SEPA as “moderately groundwater dependent” but have functional impairment by man-made influence (such as drainage or forestry). GWDTEs which are classified by SEPA as “highly or moderately groundwater dependent” but are ombrotrophic. The hydrological receptor does not act as an active floodplain or other flood defence. The hydrological receptor is not of regional, national or international environmental importance. The hydrological receptor is not designated for supporting freshwater ecological interest.
Negligible	The receptor is resistant to change and is of little environmental value.

11.3.11 Magnitude of Change

The magnitude of potential change will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

The criteria for assessing the magnitude of change are presented in **Table 11.3**.

Table 11.3 Framework for Determining Magnitude of Change

Magnitude of Change	Definition
High	A short or long-term major shift in hydrochemistry or hydrological conditions sufficient to adversely change the ecology of the receptor. This change will equate to a downgrading of a SEPA water quality classification by two classes e.g., from ‘High’ to ‘Moderate’. A sufficient material increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with SPP). A major loss of (greater than 50 % of study area) or total loss of highly dependent and high value GWDTE, or where there will be complete hydrological severance which will fundamentally affect the integrity of the feature. A major permanent or long-term adverse change to groundwater quality or available yield. The yield of existing supplies may be lost or major long-term or short-term reduction in quantity and/ or deterioration in quality. Changes to groundwater quality or water table level that will adversely alter local ecology or will lead to a groundwater flooding issue.
Medium	A short or long term non-fundamental change to the hydrochemistry or hydrological environment, resulting in a change in ecological status. This change will equate to a downgrading of a SEPA water quality classification by one class e.g., from ‘High’ to ‘Good.’ A moderate increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water A loss of part (approximately 10 % to 50 % of study area) of a moderately dependent and moderate value GWDTE – significant hydrological severance affects the integrity of the feature, but it could still function. Changes to the local groundwater regime that may slightly affect the use of the receptor. The yield of existing supplies may be reduced or quality slightly deteriorated. Fundamental adverse changes to local habitats may occur, resulting in impaired functionality.

Magnitude of Change	Definition
Low	A detectable non-detrimental change to the baseline hydrochemistry or hydrological environment. This change will not result in a downgrading of the SEPA water quality classification. A marginal increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water A detectable but non-material effect on the receptor (up to 5 %) or a moderate effect on its integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected. A detectable effect on a GWDTE (loss of between 5 % - 10 % of study area) or a minor effect on a GWDTE's integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected. Changes to groundwater quality, levels or yields do not represent a risk to existing baseline conditions or ecology.
Negligible	No perceptible changes to the baseline hydrochemistry or hydrological environment. No change to the SEPA water quality classification. No increase in the probability of flooding onsite and offsite. A slight or negligible change from baseline condition of geological resources. Change hardly discernible, approximating to a 'no change' in geological condition. Minimal detectable effect on a GWDTE (between to 0.1 % - 5 % of study area) or no discernible effect on its integrity as a feature or its functionality.

11.3.12 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted change will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects.

Table 11.4 summarises guideline criteria for assessing the significance of effects.

Table 11.4 Framework for Assessment of the Significance of Effects

Magnitude of Change	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table.

11.3.13 Assessment Limitations

If there was no response from the property occupant via mail or from the site visit a conservative approach was taken and the property was assumed to have a PWS and included in the risk assessment, which is detailed in **Technical Appendix A11.1: PWSRA**. The consultation methodology is present in **Section 11.3.7**.

11.3.14 Embedded Mitigation

The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Proposed Development:

- 50 m watercourse buffers for construction works except for watercourse crossings, a small area of the site entrance access track and borrow pit one search area. Encroachments on this buffer are identified and discussed in **Section 11.5.1.1**;

- Good practice methods and works for protection of hydrological receptors as outlined in the **Appendix A11.2: oWCCEMP**;
- The requirement for access tracks crossing watercourses was minimised, where possible, during the design stage (see **Chapter 3**);
- A detailed Construction Environmental Management Plan (CEMP) shall be prepared by the Applicants appointed Principal Contractor, which shall include mitigation outlined below; and
- A Pollution Prevention Plan (PPP) shall be prepared by the Applicant's appointed Principal Contractor which details measures to prevent pollution of the water environment and support the Applicants forthcoming application for a Construction Site License from SEPA.

11.4 Baseline Conditions

11.4.1 Topography and Land Use

The Proposed Development area rises from approximately 140m above ordnance datum (AOD) at the north-eastern boundary of the Site to 220 m AOD at Bitchburn Shoulder at the south-western boundary of the Site. This results in a topography which generally slopes from south to north. From west to east across the Site, the topography presents as several valleys. As such, water drains into Euchar Water, which in turn drains into River Nith, north-east of the Site.

The Proposed Development is in open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. The Site is adjacent to several forestry plantations including Ulzieside Plantation, Mains Plantation and Brown Hill.

11.4.2 Climate

The National River Flow Archive (NRFA) reports Average Annual Rainfall (AAR 1961 – 1990) at the River Nith at Hall Bridge gauging station, approximately 9.95 km north-west of the Core Study Area, as 1,512 millimetres (mm).

As monthly long-term climate data is not freely available from the NRFA, long term average rainfall data (1991 to 2020) obtained by the Meteorological Office³²⁶ at the Glenlee station, located approximately 27.5 km south-west of the closest turbine location. This is the closest observing station to the Site and presented in **Table 11.5**.

Table 11.5 Mean monthly rainfall data (1991 – 2020), Camps Reservoir, Biggar

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	211.68	162.59	137.28	99.05	90.15	96.04	101.65	128.27	127.22	195.92	206.56	224.2

11.4.3 Surface Hydrology

The Site lies within an upland area south-west of Sanquhar, comprising grassland with isolated areas of woodland outside of the eastern and northern site boundary. The Site generally slopes north with the topographic high of Cloud Hill, Whing Head and Corridow Hill to the south of the Site forming a catchment boundary between Euchar Water to the north and Scaur Water to the south. The Site lies nearly entirely within the catchment of Euchar Water, which has an overall SEPA waterbody

³²⁶ Met Office (n.d.) UK Climate Averages [Online] Available at: <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcv12y3xn> (Accessed: 05/04/2023)

classification of "Good"³²⁷. This watercourse continues to flow north-east before intersecting with the River Nith which has an over SEPA classification of "Moderate". A small area within the south-east of the site lies within the wider Scaur Water catchment.

Across the Site, there are four main Watercourses which drain into Euchar Water. Within the west of the Site, Glenlarie flows from south to north and has tributaries from both the east and west. East of Glenlarie Burn, Glen Burn flows parallel to Glenlarie from south to north before discharging into Euchar Water. This watercourse has tributaries which flow from eastern, western, and southern slopes.

Within the centre of the Site, Glenmaddie Burn flows north-east before discharging into Euchar water. This watercourse has two tributaries including Cow Burn and Cramley Burn. To the east of the Site, Whing Burn flows south to north across the Site before also discharging into Euchar Water. To the south of this watercourse, tributaries include Thorter Burn and McTurk's Gutter, and to the north, tributaries include Tongue Burn and Standard Gutter. Onsite watercourses and surface water catchments are shown on **Figure 11.2**.

11.4.4 Hydrogeology

The groundwater units underlying the Site are identified by Scotland's Environment mapping service as the Upper Nithsdale groundwater body³²⁸. These units have an overall SEPA classification of 'Poor'.

BGS 1:50,000 digital mapping and the BGS GeoIndex³²⁹ mapper shows the bedrock aquifer underlying the north of the Site to consist of sedimentary rock cycles of the Scottish Lower Coal Measures Formation, while the north-western aspect of the Site is underlain by Wacke of the Kirkcolm Formation. A large thrust fault runs through the Site from south-west to north-east. Along this fault line, the underlying bedrock geology consists of Chert and basaltic-rock of the Crawford Group as well as mudstone of the Moffat Shale Group. To the south and south-east of the fault line, the bedrock geology consists of wacke of the Portpatrick Formation. Across the Site intrusions of microdioritic-rock and microgranodiorite of the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite are present as well as microgabbro of the Mull Dyke Swarm and wacke of the Glenwharfen Formation. Most of the bedrock underlying the Site are classified as a "low productivity aquifer" in which "flow is virtually all through fractures and other discontinuities". There is a small area to the north-east of the Site which is underlain by a "moderately productive aquifer".

The bedrock groundwater units to the north-east of the Site are overlain by deposits of alluvium and glaciofluvial deposits. Across the northern and central aspects of the Site, superficial deposits of till are common, however, much of the central and southern aspects of the Site are not mapped. There are intermittent superficial deposits of peat within the Site boundary which are concentrated to the south-eastern boundary of the Site. Additional information regarding peat is provided in **Chapter 10 – Geology and Peat** and in **Technical Appendix A10.1 PSRA** and **A10.2 oPMP**.

11.4.5 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

GWDTEs are specifically protected under the Water Framework Directive and are sensitive receptors to the pressures that are potentially caused by the Proposed Development.

³²⁷ SEPA (2018) Classification Hub [online]. Available at: <https://www.sepa.org.uk/data-visualisation/water-environment-hub/> (Accessed on 05/04/2023)

³²⁸ SEPA (undated) Groundwater classification [Online] Available at: <https://map.environment.gov.scot/sewebmap/> (Accessed: 05/04/2023)

³²⁹ BGS (undated) BGS GeoIndex [online] Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.68526809.996502206.1647511070-786556653.1647511070 (Accessed 05/04/2023)

In accordance with SEPA guidance³³⁰, a Phase 1 Habitat Survey was undertaken in May 2021 by Macarthur Green. Additionally, an updated survey was undertaken in February 2023 to identify wetland habitats occurring within the Core Study Area. Wetland habitats were identified in line with the criteria outlined in 'A Functional Wetland Typology for Scotland' (SNIFFER, 2009³³¹). Where wetland habitats were identified, a further detailed habitat assessment was undertaken, with identification of National Vegetation Classification (NVC) communities. The survey methods employed for this assessment are outlined in **Chapter 7 – Ecology** and the report from the NVC surveyor attached in **Technical Appendix A7.1: NVC and Habitats Survey**.

In accordance with SEPA guidance LUPS-GU31, a 250 m buffer was placed around excavations more than 1 m in depth and a 100 m buffer was placed around excavations less than 1 m in depth. These buffer areas indicate the potential zone of influence the Proposed Development may have on GWDTEs. Within these buffer areas ten Phase 1 habitats were identified, and a total of 13 NVC communities were recorded within the buffer areas.

For the purpose of this assessment, the baseline survey for GWDTEs was carried through to the use of a 250 m buffer of the Core Study Area to allow for the potential impacts of turbine excavations in proximity to the Core Study Area boundary to be assessed.

The NVC communities that have the potential to be moderately or highly groundwater dependent based on the SEPA guidance are outlined in **Table 11.6**. The site-specific assessment of potential GWDTEs is detailed in **Table 11.7** and indicates which potential GWDTEs are likely to be truly groundwater dependent.

Table 11.6 Potential GWDTE Communities

Phase 1 Habitat	Recorded NVC Community	SEPA Groundwater Dependency Potential (LUPS-GU31)	Location within the Core Study Area
E1.7 Wet Modified Bog	M25 - <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire	Moderate	Most commonly occurs as they dominant NVC community in a mosaic with U20a, U4, M15b, M23a and M20a. This community is found most commonly within the central area of the Site particularly on flat upland areas or on upper slopes.
	M20 – <i>Eriophorum vaginatum</i> – Blanket mire	Low	While M20 has a low groundwater dependency potential, it occurs within this Site as a mosaic with M25a, M23a and M6d which have moderate – high potential groundwater dependency. These habitats are found in central locations within the site, on gentle slopes. They are situated

³³⁰ SEPA (2017) Land Use Planning System Guidance Note 31.

Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3 [Online] Available at: <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> (Accessed: 24/05/2023)

³³¹ SNIFFER (2009) WFD95 A Functional Wetland Typology for Scotland Field Report 2009 [Online] Available at: <https://www.sniffer.org.uk/wfd95-a-functional-wetland-typology-for-scotland> (Accessed: 24/05/2023)

Phase 1 Habitat	Recorded NVC Community	SEPA Groundwater Dependency Potential (LUPS-GU31)	Location within the Core Study Area
B5 Marsh/Marshy Grassland	M23 - Juncus effusus/acutiflorus - Galium palustre rush-pasture	High	Found throughout the Site and commonly is found as mosaic in conjunction with MG10, U20, M6, M25 and U4. This community is generally found gentle to moderate slopes, ponding locations and along watercourses.
	M25 - Molinia caerulea - Potentilla erecta mire	Moderate	This community is often found as a mosaic with U4, M23, M15, U6, U5, M20 and M6. Habitats are found throughout the Site but are concentrated to the south and south-west where upper slopes are more common. This habitat is generally situated on upper slopes and flat upland areas but is occasionally present near watercourses.
	MG10 - Holcus lanatus - Juncus effusus rush-pasture	Moderate -	Occurs as a sole community but also appears as a mosaic with U4, M25 and MG6. Generally situated on gentles slopes / ridges.
B1.1. Unimproved Acid Grassland	M25 - Molinia caerulea - Potentilla erecta mire	Moderate	Present within the Site as a marsh / marshy grassland mosaic in conjunction with U5 and U4. Present to the north of the site in flat upland areas or gentle slopes.
	M23 - Juncus effusus/acutiflorus - Galium palustre rush-pasture	High	Present in one location in a mosaic with U4 and M25. Situated on a moderate upper slope.
	U6 - Juncus squarrosus - Festuca ovina grassland U5 - Nardus stricta – Galium saxatile grassland U4 – Festuca ovina – Agrostis capillaris – Gallium saxatile grassland	Low	Scattered through the Site and generally appear as mosaics with M23, M25, M20 and MG10. Generally found in flat areas or on gentle upland slopes. Largely, do not appear in conjunction with watercourses.
C1.2 Scattered Bracken Mosaic	U20 – Pteridium aquilinum – Galium saxatile community	Low	Occurs as a mosaic with M25, M23 and U20. Located low on a moderate slope in

Phase 1 Habitat	Recorded NVC Community	SEPA Groundwater Dependency Potential (LUPS-GU31)	Location within the Core Study Area
			proximity to a watercourse.
C1.1. Continuous Bracken	U20 - Pteridium aquilinum – Galium saxatile community	Low	Found as a mosaic with M25, M23, U4 and U5. Only found on moderate slopes.
D2 Wet Dwarf Shrub Heath	M15 - Scirpus cespitosus - Erica tetralix wet heath	Moderate	Across this site this occurs as both solely as an M15 community and as a mosaic with M23 and M25. This community is present in central and southern locations within the site, appearing moderate slopes, in proximity to watercourses.
B4 Improved Grassland	MG6 - Lolium perenne - Cynosurus cristatus grassland	Low	Only found in the north-east area of the Site near the site entrance which is used for agricultural activities.
A1.1.1 Broad-Leaved Semi-Natural Woodland	W11 – Quercus petraea – Betula pubescens – Oxalis acetosella woodland	Low	One small area located outside of the site boundary has been recorded to the north of the Site on the banks of Euchar Water.
E1.6.1 Blanket Bog	M17 – Trichophorum germanicum – Eriophorum vaginatum blanket mire	Low	Occurs as a mosaic with M25 which has a potential groundwater dependency of moderate.
E2.1 Acid Neutral Flush	M6 - Carex echinata - Sphagnum recurvum mire	High	Present as small to moderate sized areas throughout the Site but concentrated to the south-east of the Proposed Development on gentle-moderate upland slopes.

Table 11.7 Site-specific Groundwater Dependency

Recorded Habitat / NVC communities within the Site	Site-specific Groundwater Dependency	Reason
Acid Neutral Flush - M6c/d	High	Presence of M6 communities indicates a diffuse source of groundwater discharge. Vegetation not associated with obvious surface water features which indicates a dependency on groundwater.
Acid Neutral Flush - M6c/d	Low	A small number of M6 communities located to the south-east of the Site are underlain by peat deposits in excess of 0.5 m. Peatland habitats are considered to be rain-fed and therefore the M6 communities are likely reliant on the near-surface water collected in peatland. Additionally, aerial imagery shows that Thorter Burn extends further upslope indicating that some of these communities are present along this watercourse.

Recorded Habitat / NVC communities within the Site	Site-specific Groundwater Dependency	Reason
Blanket Bog – M17	Low	Located at the foot of an escarpment, a potential area of pooling surface water. Habitat underlain by an area of deep peat which indicates this habitat is ombrogenous.
Broad-leaved Semi-natural Woodland – W11	Low	Located in an area which has undergone significant artificial modification. Habitat associated with watercourse which indicates it is not groundwater dependent.
Continuous Bracken – U20a / M25a	Low	Habitats located either on upper slopes away from the likely emergence of groundwater or are downslope of a rain-fed mire habitat such as blanket bog. This indicates the habitats are more likely dependent on surface water.
Improved grassland – MG6	Low	Located in an area which has undergone significant artificial modification. Habitat associated with watercourse which indicates it is not groundwater dependent.
Marsh / Marshy Grassland – M25 / M23/ M6d	High	M5 and M23 in association with M6 indicate there is potential for the diffuse emergence of groundwater. These habitats also have limited association with surface water features, generally located above surface water features. This may indicate these habitats are highly dependent on groundwater.
Marsh Marshy Grassland – M25 M23	Moderate	Location of habitat is not associated with surface water features and the topographical location indicates that it is not fed by an ombrogenous system. Therefore, there is potential for this habitat to be partially dependent on groundwater. Additionally, Habitat ID 39, 40 and 43 have the potential to be groundwater fed but are located near an area of deep peat, therefore these habitats are likely to be only moderately groundwater dependent, rather than highly dependent.
Marsh Marshy Grassland – M25 / M23/ M6 /MG10	Low	Other Marsh / Marshy Grassland habitats have limited potential to be groundwater dependent, generally due to association with surface water features or association of habitats likely to be rain fed. To the north-east of the site, there is a significant association of habitats with Whining Burn and its tributaries. Additionally, there is significant artificial infrastructure such as access track which surface water is likely to accumulate. This area is also downslope of plantation forestry where surface water is likely to accumulate due to artificial drainage. To the east of the existing access track are several M23/M25 communities. These communities are largely underlain by artificial drainage which compromises the integrity of potential GWDTEs and indicates the community is partially surface water fed. Through the central and south-west areas of the site, there are deep deposits of peat (> 0.5m) which are rain-fed habitats and have low permeability during wet periods. Habitats within these areas and downslope of these areas are likely to be fed the near surface water because of the low permeability peat. Throughout the main site area are large dendritic features leading to larger watercourses. Habitats associated within these features are likely surface water fed due to the accumulation of surface water. Other habitats which are located on upper slopes or flat areas at the top of valleys are above the likely emergence of groundwater, which indicates they are more likely ombrogenous
Scattered Bracken – U20/ M25	Low	Located downslope of an area of deep peat and blanket bog indicating an association with a rain-fed system.
Unimproved Grassland –	Low	Largely located on upper slopes and flat areas likely above the emergence of groundwater or associated with dendritic structures.

Recorded Habitat / NVC communities within the Site	Site-specific Groundwater Dependency	Reason
U4/U5/U6 – M23/25 Mosaic		Moderate sized areas of unimproved grassland are situated within the centre of the Site, particularly along the existing access track and its artificial drainage channels. These channels will collect surface water and this indicates the communities in this area are surface water fed. Areas to the north of the site are generally underlain by artificial drainage channels and some are downslope of forestry.
Unimproved Grassland / Marsh/Marshy Grassland – U4 / M25 (Poly ID B018)	Moderate	Located on a gentle slope above potential ponding locations or association with surface water features. Topographical location may indicate an association with groundwater but may also indicate partially being rain-fed.
Unimproved Grassland / Marsh/Marshy Grassland – U4, M23 / M25 / MG10	Low	Habitat locations are generally on upper slopes and flat areas that are more likely to be rain-fed rather than associated with the emergence of groundwater.
Wet Dwarf Shrub Heath – M15	Low	Downslope of areas of deep peat which indicate an association with an ombrogenous system. Areas of this habitat type to the north of the Site, south of the existing access tracks are situated between a dendritic structure of watercourses. Additionally, this area is in proximity to a fence line and an agricultural track, places which are likely to accumulate surface water.
Wet Modified Bog – M25	Low	The majority of habitats located within the central areas of the site are considered to be ombrogenous as they are largely situated in areas of deep peat or immediately downslope of these areas. Additionally, for some habitats there is an association with surface water features such as ponding locations or watercourses. To the south and south-west of the site, habitats are either underlain by deep peat or are situated on flat upper areas, unlikely to be fed by groundwater. Areas to the north-east and south east of the site are in association with artificial infrastructure and watercourses which indicates an association with surface water.

As detailed in **Table 11.7**, the majority of potential GWDTE communities have been identified as being ombrotrophic in nature, indicating that they are rain-fed communities.

Communities identified as having a high groundwater dependency include:

- Acid Neutral Flush (ID 19, 28 and 66)
- Marsh / Marshy Grassland (ID 67, 107, 81, 165 and 280)

Communities identified as having a moderate dependency on groundwater include:

- Marsh / Marshy Grassland (ID 39, 40, 43, 96, 166, 176, 182)
- Unimproved Grassland / Marsh/Marshy Grassland (ID 36)

The potential impacts from the Proposed Development will be further assessed in **Section 11.5.2.7**.

11.4.6 Flood Risk

The Indicative River and Coastal Flood Map (Scotland)³³² produced by SEPA shows areas of Scotland with a 0.5 % (1:200) or greater chance of flooding. These areas are classified into areas of river, surface water and coastal flooding with a risk rating of low to high applied.

³³² SEPA (2021) SEPA Flood Maps [Online] Available at: <https://map.sepa.org.uk/floodmaps> (Accessed 05/04/2023)

The preliminary review of SEPA's flood extent map shows areas along the banks of the Euchar Water as having a medium-high risk of annual flooding from River flooding. This extends to the northern aspect of the Whing Burn. There are few very small areas which shows as having a medium to high risk of pluvial (rain-fed) flooding events. As the areas in which these flood events take place are very small and isolated, it is likely these areas are a result of slight depressions in topography and do not indicate widespread flooding. Overall, the Site is not at risk from annual flooding and widespread flooding across the Site is not indicated.

A 50 m buffer (except track crossings) will be placed around watercourses and waterbodies onsite, therefore turbines or electrically sensitive equipment will not be located within these areas of potential flood risk. As such, a stand-alone Flood Risk Assessment (FRA) will not be required for the Proposed Development.

11.4.7 Public and Private Water Supplies

11.4.7.1 Public Water Supplies

A scoping response from Scottish Water was received on 22nd April 2022. Scottish Water stated that the Proposed Development is not situated in a location which is hydrologically connected to any Scottish Water drinking water catchments or water abstraction sources, which are designated as Drinking Water Protected Areas under the Water Framework Directive. Therefore, public water supplies has been scoped out of further assessment.

11.4.7.2 Private Water Supplies

A request for private water supply data was sent to the Environmental Health Office (EHO) on 5th April 2022, to which a response was received on 18th May 2022. This consultation identified seven PWS within the 2 km PWS study area which have a registered PWS or are likely to be served by a PWS. Through consultation with landowners, the Applicant identified one additional property which may be served by a PWS.

While resident consultation through a survey letter and a site visit was carried out, limited information was obtained for several of the potential PWS. A full assessment of PWS was able to be carried out and is set out in full in **Technical Appendix A11.1 PWSRA**, a summary of which is shown in **Table 11.8**. The assessment found that all potential PWS are hydrologically disconnected from the Proposed Development and therefore, potential impacts to PWS can be scoped out of further assessment.

Table 11.8 PWS Identified within the 2 km PWS Study Area

Property	Grid Reference	Distance from Project	Source Type	Comment
Glenglass Cottage	270864 606372	1.9 km west of the Site	Source not located	Unoccupied and owned by Scottish Power. On inspection there was no evidence of a working PWS. PWS scoped out of further assessment.
Glenmaddie	274233 607191	0.15 km north and downslope of the Site	The location of the source from coordinates provided by EHO indicates a groundwater source, potentially a spring source.	During the site visit, a potential spring intake was noted approximately 250 m south of the property. While this is downslope of the Proposed Development, the closest infrastructure is approximately 865m upslope and is not hydrologically connected from the source. As this distance significantly exceeds the 250 m buffer proposed by SEPA guidance for groundwater

Property	Grid Reference	Distance from Project	Source Type	Comment
				abstractions, there is no hydrological connection. PWS scoped into further assessment
Polgown	271915 603829	1.1 km south-west and downslope of the Site	Unknown	This property is in a separate hydrological catchment and is more than 250 m from Proposed Development infrastructure. PWS scoped out of further assessment.
Old Barr	276281 608515	0.4 km north and downslope of the Site	N/A	Property confirmed to be on mains supply during consultation. PWS scoped out of further assessment.
Euchan Cottage	275718 608137	0.85 km north and downslope of the Site	Unknown	As discussed in the PWSRA, the source of this PWS is highly likely to be hydrologically disconnected by Euchan Water and intervening distance between the source and Proposed Development. PWS scoped into further assessment.
Euchan House	277075 609217	0.45 km north-west of the Site access tracks	Unknown	As discussed in the PWSRA, the source of this PWS is highly likely to be hydrologically disconnected by Euchan Water. PWS scoped into further assessment.
Sheil	274527 604069	1.18 km south of the Site access tracks	Unknown	As discussed in the PWSRA, the source of this PWS is highly likely to be hydrologically disconnected by Scaur Water and intervening distance between PWS and the Proposed Development. PWS scoped into further assessment.
Cairnhill	276588 608155	11 meters north and downslope of the Site	N/A	This property is confirmed to be connected to a Scottish Water mains supply. PWS scoped out of further assessment.

11.4.8 Designated Hydrological Receptors

Review of NatureScot (formerly Scottish Natural Heritage) GIS datasets available through the Scotland's Environment mapping service was used to identify statutory designated sites related to the water environment within the Wider Study Area.

Statutory designations include those of international importance e.g., Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Wetlands of International Importance (Ramsar), national importance such as Site of Special Scientific Interest (SSSIs) and National Nature Reserves (NNR) and of local importance, Local Nature Reserves (LNR).

Statutory designated sites within the Wider Study Area and their hydrological connectivity to the Proposed Development are detailed in **Table 11.9**.

Table 11.9 Designated Hydrological Receptors within Wider Study Area

Designated Receptor	Distance from Closest Section of Site Boundary	Qualifying Interest	Hydrological Connection to Site
Upper Nithsdale Woods SAC ³³³	2.68 km north of Site	Mixed woodland on base-rich soils associated with rocky slopes	Hydrologically disconnected by the River Nith.
Back Wood SSSI ³³⁴		Semi-natural broad-leaved woodland	
Menck Water SSSI ³³⁵	2.96 km east of Site	Wet meadow and species rich grassland	
Upper Nithsdale Woods SAC ³³⁶		Mixed woodland on base-rich soils associated with rocky slopes	
Muirkirk and North Lowther Uplands SPA ³³⁷	3.6 km north of Site	Hen harrier, Short-eared Owl, Merlin, Peregrine and Golden Plover	Hydrologically disconnected by the River Nith.
Polhote and Polneul Burns SSSI ³³⁸	4.94 km north-west of Site	Geological stratigraphy: Upper Carboniferous (Namurian (part)-Westphalian)	Hydrologically disconnected by topography.
Chanlockfoot SSSI ³³⁹	6.71 km south-east of Site 7.6 km north-west of Site	Ash hazel woodland	Hydrologically disconnected by topography.
Lagrae Burn SSSI ³⁴⁰		Upper Carboniferous sediments	

As all designated hydrological receptors within the wider study area have been identified and stated to be hydrologically disconnected from the Proposed Development, potential impacts to designated receptors have been scoped out of further assessment.

11.4.9 Sensitivity of Receptors

The sensitivities of the identified receptors, and potential effects from the construction of the Proposed Development, are outlined in **Table 11.10**.

³³³ NatureScot (2021) Upper Nithsdale Woods SAC [online] Available at: <https://sitelink.nature.scot/site/8405> (Accessed 05/04/2023)

³³⁴ NatureScot (2021) Back Wood SSSI [online] Available at: <https://sitelink.nature.scot/site/112> (Accessed 05/04/2023)

³³⁵ NatureScot (2021) Menck Water SSSI [online] Available at: <https://sitelink.nature.scot/site/1147> (Accessed 05/04/2023)

³³⁶ NatureScot (2021) Upper Nithsdale Woods SAC [online] Available at: <https://sitelink.nature.scot/site/8405> (Accessed 05/04/2023)

³³⁷ NatureScot (2021) Muirkirk and North Lowther Uplands SPA [online] Available at: <https://sitelink.nature.scot/site/8616> (Accessed 05/04/2023)

³³⁸ NatureScot (2021) Polhote and Polneul Burns SSSI [online] Available at: <https://sitelink.nature.scot/site/1298> (Accessed 05/04/2023)

³³⁹ NatureScot (2021) Chanlockfoot SSSI [online] Available at: <https://sitelink.nature.scot/site/355> (Accessed 05/04/2023)

³⁴⁰ NatureScot (2021) Lagrae Burn SSSI [online] Available at: <https://sitelink.nature.scot/site/898> (Accessed 05/04/2023)

Table 11.10 Sensitivity of Receptors

Receptor	Potential Effects	Sensitivity	Sensitivity Description
Surface hydrology	Increased run-off, erosion and sedimentation, stream flow impediments and pollution as a result of construction groundworks and chemical handling and storage.	High	A large, medium or small waterbody with a SEPA water quality classification of 'Good'.
Groundwater & near surface water	Diversion of near-surface flow as a result of track construction and the installation of turbine foundations / hardstanding. Pollution as a result of erosion and sedimentation from construction activities and uncontained spills from chemical handling and storage.	Medium	Groundwater body is classified as 'low productivity aquifer'.
GWDTE (highly groundwater dependent)	Pollution as a result of track construction and uncontained spills from chemical handling / storage. Drying out or changes to groundwater interflow patterns from impediments to flow as a result of construction.	Very High	GWDTEs which are classified by SEPA as "highly groundwater dependent" and have no functional impairment by man-made influence (such as drainage or forestry).
GWDTE (moderately groundwater dependent)	Pollution as a result of track construction and uncontained spills from chemical handling / storage. Drying out or changes to groundwater interflow patterns from impediments to flow as a result of construction.	Medium	GWDTEs which are classified by SEPA as "moderately groundwater dependent" and have no functional impairment by man-made influence (such as drainage or forestry).

11.5 Assessment of Potential Effects

The effect of the Proposed Development on hydrological receptors has been considered for the construction, operation, and decommissioning phases of the Proposed Development. Effects occurring during construction and decommissioning are considered to be short term effects, with those occurring because of the operational phase of the Proposed Development being considered as long-term effects.

11.5.1 Embedded Mitigation

The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Proposed Development:

- 50 m watercourse buffers for construction works except for watercourse crossings, a small area of the site entrance access track and borrow pit one search area;
- Good practice methods and works for protection of hydrological receptors as outlined in the **Technical Appendix A11.2: oWCEMP**; and
- The requirement for access tracks crossing watercourses has been minimised, where possible, during the design stage. A watercourse crossing inventory has been provided within **Technical Appendix A11.2 oWCEMP**.

As noted above, the number of watercourse crossings have been minimised within the Proposed Development design. The Proposed Development utilises existing access track which make up a significant portion of the onsite access tracks. The only portion of the existing track which will require new track installation is at WC03. This has been designed to avoid significant cut and fill works and additional upgrade of WC04 and WC05. A watercourse crossing inventory has been provided within

Technical Appendix A11.2 oWCEMP. The following best practice guidelines will be followed to mitigate impacts:

- SEPA WAT-SG-29: Temporary Construction Methods³⁴¹;
- Forest and Water Guidelines³⁴²;
- SEPA WAT-SG-25 River Crossing – Good Practice Guide³⁴³;
- SEPA WAT-PS-06-02: Culverting watercourses³⁴⁴; and
- CIRIA C689: Culvert design and operation guide³⁴⁵.

A WCEMP has been prepared to accompany the EIA Report and form part of the embedded Proposed Development design. The WCEMP comprises methods and works that are established and effective measures to which the Applicant will be committed through the Proposed Development consent. Accordingly, the assessment of significance of effects of the Proposed Development are considered with the inclusion of **Technical Appendix A11.2 oWCEMP** as standard mitigation procedure.

The WCEMP describes water management measures to control surface water run-off and drain hardstandings and other structures during the construction and operation of the Proposed Development. The WCEMP will form part of a Pollution Prevention Plan (PPP) to be prepared and implemented by the Applicant's Principal Contractor prior to the commencement of the construction of the Proposed Development. Measures outlined in the WCEMP and PPP will be based on good construction practice outlined in the guidance documents in **Section 11.2**. The WCEMP and PPP shall be agreed with SEPA prior to the construction phase as part of the Construction Site License and approved by the Planning Authority as part of the pre commencement package of planning conditions.

A 50 m watercourse buffer zone in conjunction with the measures set out in the WCEMP is implemented for the Proposed Development infrastructure, with the exception of watercourse crossings, a small section of the site entrance access track and the borrow pit one search area. This buffer is sufficient to avoid potential effects on the hydrological and hydrogeological resource, as its effectiveness has been demonstrated on several wind farm construction sites for which ERM Ltd. has provided technical advice for.

Although the WCEMP is draft and will evolve to take account of consultee feedback and detailed design, there is sufficient confidence in the effectiveness of the measures set out in the WCEMP for them to be treated as part of the Proposed Development for the purposes of this assessment. Measures and procedures outlined in the WCEMP will be adopted and incorporated into a single working document to be agreed with statutory consultees and the planning authority following consent by way of an appropriately worded planning condition.

Conclusions, therefore, state whether the residual significance will be major, moderate, minor, or negligible, once appropriate mitigation (beyond that specified in the WCEMP) has been implemented. This assessment relies on professional judgment to ensure that the effects are appropriately assessed.

³⁴¹ SEPA (2009) WAT-SG-29: Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods First Edition [Online] Available at: https://www.sepa.org.uk/media/150997/wat_sg_29.pdf (Accessed: 25/07/2022).

³⁴² Forestry Commission (2011) Forest and Water Guidelines, 5th Edition, Forestry Commission [Online] Available at: <https://www.confor.org.uk/media/246145/forest-and-water-guidelines.pdf> (Accessed: 10/03/2022).

³⁴³ SEPA (2010) WAT-SG-25 Engineering in the water environment: good practice guide. River Crossings. [Online] Available at: <https://www.sepa.org.uk/media/151036/wat-sg-25.pdf> (Accessed: 10/03/2022).

³⁴⁴ SEPA (2015) WAT-PS-06-02: Culverting of Water courses - Position Statement and Supporting Guidance [online] Available at: www.sepa.org.uk/media/150919/wat_ps_06_02.pdf (Accessed: 24/05/2023).

³⁴⁵ CIRIA (2010) C689: Culvert design and operation guide [Online] Available at: https://www.ciria.org/Resources/Free_publications/C689.aspx?WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91 (Accessed: 25/05/2023)

11.5.1.1 Watercourses; Embedded Mitigation

As shown on **Figure 11.4**, there are fifteen watercourse crossings to be utilised as part of the Proposed Development. Of these crossings, seven are existing crossings of which only WC02 is likely to require upgrading. These will be upgraded in line with best practice guidance as indicated within **Technical Appendix A11.2 oWCEMP**. WC04, WC05, WC06, WC07, WC08 and WC09 will not require upgrading. As such, only silt mitigation such as silt netting will be required to mitigate the increased sediment transport because of increased site traffic. The other eight new watercourse crossings will be constructed using best practice guidance identified within **Technical Appendix A11.2 oWCEMP**.

One section of the new track proposed is within 50 m of a watercourse. At the site entrance, new track is necessary to accommodate the abnormal vehicle loads required to construct the Proposed Development and to avoid disruption to a local business situated near the Site entrance. Additionally, this will avoid disruption to existing farming operations, which requires the existing tracks to be accessible for tending to livestock. The track itself would be circa 25 m from the watercourse at its nearest point, however new drainage and ditches will be constructed for both the construction and operational phases of the Proposed Development to mitigate any pollution risk. Good construction practice to be utilised in the installation of these drainage ditches is detailed in **Technical Appendix A11.2 oWCEMP**.

It is noted that borrow pit one, the northern most borrow pit, is an existing borrow pit and located in proximity to the existing access track approximately 1.4 km south-west of the site entrance (see **Figure 11.4**). Borrow pit one is located upslope of the existing access track and encroaches on the 50 m buffer placed around watercourses. It is 19.4 m downslope of a tributary of Whining Burn at the closest point. The borrow pit is an existing abandoned quarry as shown in **Technical Appendix A10.3: Preliminary Borrow Pit Assessment**. The existing access track has trackside drainage and acts as a barrier to the confluence of watercourses downslope. New cut-off ditches will be installed between the borrow pit and watercourses to mitigate all pollution risk including chemical pollution and sedimentation. Good construction practice for this is detailed in **Technical Appendix A11.2 oWCEMP**, as is good construction practice for the management of drained surface water. A detailed drainage layout will be provided prior to construction.

Borrow pits 2 and 3 are out with the minimum 50 m watercourse SEPA watercourse buffer, however all potential borrow pit locations are located within 250 m of a watercourse. Mitigation detailed in **Technical Appendix A11.2 oWCEMP Section 3.7** including cut-off ditches will ensure borrow pits are disconnected from nearby watercourses and minimise the risk of pollution. A mitigation layout for borrow pits is provided in **Technical Appendix A11.2 oWCEMP**.

11.5.2 Potential Construction Effects

The nature and magnitude of effects that could result from construction activities, as described in **Chapter 4 – Description of the Proposed Development**, are assessed in the following paragraphs, which includes:

- Borrow pits for the construction of the Proposed Development;
- Construction of BESS and substation;
- Construction of new and upgrading access tracks, turbines, and associated infrastructure, met mast, hardstanding and temporary construction compounds for the Proposed Development; and
- Earthworks cut at trackside and crane hardstanding in areas of undesirable topography to facilitate Proposed Development.

11.5.2.1 Chemical Pollution

This aspect of the management of construction is primarily a risk management issue. The effects assessed are those that would be expected should the risk be realised. Should the Proposed

Development proceed as described in **Chapter 4 – Description of the Proposed Development** i.e., with no spills, there would be no effects.

Potential risks include the spillage or leakage of chemicals, fresh concrete, foul water, fuel or oil, during use or storage onsite. These pollutants have the potential to adversely affect soils, subsurface water quality, peat, surface water quality, and groundwater, and hence effects on the biodiversity of receiving watercourses.

If concrete batching is required, it will be undertaken in a designated area. The Contractor will develop a method statement to address the on-site batching of concrete, transport and pouring of liquid concrete at the wind turbine foundations. The method statement should make specific reference to the SEPA Guidelines for 'Prevention of Pollution from Civil Engineering Contracts: Special Requirements'³⁴⁶.

Surface Hydrology

Watercourses could be at risk from a pollution incident during construction. All surface watercourses and surface water bodies are of High sensitivity.

A 50m buffer distance has been adopted between proposed construction works and watercourses to reduce the potential for chemical pollutants to be transferred to the water environment. This excludes watercourse crossings and the exceptions as discussed previously at **Section 11.5.1.1**.

A BESS facility is planned to the south of the substation compound, as shown in **Figure 11.3**. The main risk of chemical pollution is in the event of an onsite battery fire. This will therefore only become a risk when the BESS facility is live. The batteries will be brought onto site prior to being installed and connected. During this period the risk of pollution is minimised as described in **Technical Appendix A11.2 oWCEMP**.

If the batteries are connected during the construction period, the emergency response plan will be followed, as described in **Technical Appendix A11.2 oWCEMP**, in the event of an onsite battery fire. An automatic fire suppression system with a shut-off mechanism to prevent spread of polluted water will be in place which is detailed in the site drainage plan. This system would include a valve and bunded area from which contaminated water can be pumped out and removed from the Proposed Development, if necessary.

Best practice embedded construction methods as outlined in **Technical Appendix A11.2 oWCEMP** including use of impermeable membranes and bunding of the construction compound will safeguard water quality.

Effects on watercourses, of High sensitivity, due to chemical pollution will be of Negligible magnitude and therefore (in accordance with **Table 11.4**) will be **minor**. This is **not significant** in terms of the EIA Regulations.

Groundwater, Near Surface Water, Bedrock, and PWS

Pollutants encountering bedrock also have the potential to indirectly alter the quality of the groundwater resource. pH and chemical alterations to groundwater are difficult to rectify due to the fractured nature of the rock and the lengthy attenuation and dispersal of chemicals. As noted previously, the underlying hydrogeology consists of a "low productivity aquifer" where "nearly all flow of groundwater is in the near surface weathered zone and secondary fractures. There is large thrust fault onsite which spans the length of the Site, north-east to south-west, approximately 5 km through the Site. Further geological information is provided in **Section 10.4.21**. Three turbines (T6, T5 and T9) are located along this thrust fault and a small portion of the proposed new access tracks crosses this fault line.

³⁴⁶ SEPA (2006) Prevention of Pollution from Civil Engineering Contracts: Special Requirements, Version 2 June 2006. [Online] Available at: https://www.sepa.org.uk/media/152220/wat_sq_31.pdf (Accessed 08/05/23)

Best practice embedded construction methods described within **Technical Appendix A11.2 oWCEMP**, will effectively limit the uncontained release of chemicals to minor fugitive releases. Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The construction compound will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a capacity of 110 % of the stored liquid containers (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater (more information is provided in **Sections 3.3.1 and 3.3.2 of Technical Appendix A11.2 oWCEMP**) There is therefore a low potential for pollutants to encounter groundwater resulting in a negligible magnitude of effect.

Given the Medium sensitivity of groundwater and Negligible magnitude of effect, the significance of the effect associated with chemical pollution is **Negligible** for groundwater. This is considered to be **not significant** in terms of the EIA Regulations.

GWDTEs

GWDTE communities located within 100 m of excavations less than 1 m in depth and within 250 m of excavations greater than 1m in depth are at risk from a pollution incident during construction. There are fifteen communities within the buffer areas identified (**Figure 11.2**) that are at risk. Embedded best practice construction measures, stated in the above Groundwater and Near Surface Water and Bedrock section, and summarised in **Sections 3.3.1 and 3.3.2 of Technical Appendix A11.2 oWCEMP**, will be in place to ensure that any release of chemicals to surface water run-off, groundwater, and near-surface water would be limited. The water quality monitoring programme is described in **Section 3.9 of Technical Appendix A11.2 oWCEMP**.

As outlined in **Section 11.5.2.7**, wetland habitats with High groundwater dependency are defined as Very High sensitivity, while habitats with Moderate groundwater dependency are defined as Medium sensitivity. The magnitude of direct and indirect effects is **negligible**, based on findings in **Section 11.5.2.7**. As such, there will be a predicted effect of **negligible** significance on the hydrological function of Very High sensitivity GWDTEs and **negligible** significance on Moderate sensitivity GWDTEs. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.2.2 Erosion and Sedimentation

Erosion and sedimentation can occur from earthworks, excavations, ground disturbance and overburden stockpiling. Sediment entering watercourses has the potential to affect water quality, ecology, and flood storage capacity.

Areas particularly at risk of erosion and sedimentation are in areas of large earthworks. As deep cuttings are required in some areas due to topography, larger volumes of deposits will require to be excavated and transported. This will also leave behind a larger area of exposed ground and larger stockpiles required to hold deposits. This will likely increase sediment wash off into watercourses surrounding these areas.

The mitigation measures outlined in **Technical Appendix A11.2 oWCEMP** will be implemented in respect of areas of earthworks cutting, such as turbine foundations, borrow pits and certain sections of access tracks. Regular visual inspections will be carried out regularly by the Ecological Clerk of Works (ECoW).

Surface Hydrology

Given the overland distance between construction areas and watercourses, any silt or other materials carried by overland flow because of construction are likely to be caught in vegetation and existing drainage ditches (in the absence of intervening best practice measures) before reaching watercourses.

Best practice embedded construction measures, such as check dams, silt traps and settlement lagoons, will effectively prevent sediment entering the watercourse as described in **Technical Appendix A11.2 oWCEMP**.

Other Sustainable Drainage System (SuDS) measures, such as the use of settlement ponds, swales, and interception bunds, will effectively prevent sediment entering watercourses via drainage ditches adjacent to access tracks. As such, there will be limited potential for sediment or erosion effects on watercourses in the Site, including the hydrology and water quality of onsite watercourses. These measures are further detailed in **Technical Appendix A11.2 oWCEMP**. The water quality monitoring programme is described in **Section 3.9 of the Technical Appendix A11.2 oWCEMP**.

Given the High sensitivity of the watercourses and Negligible magnitude of change, the significance of effects associated with erosion and sedimentation is **Minor**. This is considered to be **not significant** in terms of the EIA Regulations.

Groundwater and Near Surface Water and PWS

Sediment also has the potential to change near surface water flow in superficial geology deposits and peaty soil characteristics by creating a physical barrier within naturally occurring drainage micropores. Sediment entering near-surface water in superficial deposits also has the potential to impact on groundwater quality within bedrock deposits / fissures.

Measures described in **Technical Appendix A11.2 oWCEMP**, such as impermeable ground membrane layers and bunded areas, will effectively prevent sediment entering sub-surface water in superficial deposits (and groundwater) and peat. Additionally, a water quality monitoring programme will be in place during the construction phase and for three months post-construction. For these reasons, the magnitude of this effect will be Negligible. Given the Medium sensitivity of groundwater and Negligible magnitude of effect, the significance of the effect associated with erosion and sedimentation **Negligible** for groundwater. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.2.3 Impediments to Flow

The access tracks will require fifteen watercourse crossings across all sections of the Proposed Development, as shown in **Figure 11.4**. Eight of these will require new installations and it is likely only the existing WC02 may require upgrading. The water crossing assessment has been carried out on the basis that WC06, WC07, WC08 and WC09 would be upgraded, although it is expected that they will not require upgrading. An indicative culvert design is shown in **Figure 4.11**. The Proposed Development has been designed, as detailed in **Chapter 4 – Description of the Proposed Development**, to minimise the number of watercourse crossings.

The minimisation of the number of proposed watercourse crossings and the re-use of the existing watercourse crossing locations reduces one of the main activities that could give rise to impediment of flows. The indicative watercourse crossing design is outlined in **Chapter 4 – Description of the Proposed Development**, detailed design will be carried out at the construction phase and will be agreed with SEPA.

The effects on watercourses of High sensitivity are of Negligible magnitude and, therefore of **minor** significance. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.2.4 Changes in Groundwater Interflow Patterns

Groundwater and Near Surface Water and PWS

Some wind turbine base excavations may need temporary sub-surface water controls, such as physical cut-offs or de-watering. These temporarily divert flows away from the excavation, and temporarily lower the local water table and sub-surface water levels. Localised temporary changes to groundwater and near surface water interflow patterns may therefore arise. Turbine foundations and

crane hardstanding also have the potential to change sub-surface water flow by creating physical barriers within naturally occurring drainage macropores in superficial deposits.

Areas particularly at risk of changes in flow patterns are in areas of large earthworks. As deep cuttings are required in some areas due to topography to facilitate the Proposed Development. Large volumes of deposits will be excavated and transported.

Larger areas of earthworks cutting are located at the three proposed on site Borrow Pits, Substation, BESS, Construction Compound, and crane hardstandings. These areas will be visually inspected regularly by the ECoW and mitigation measures outlined in **Technical Appendix A11.2 oWCEMP** implemented.

The detailed site drainage design will consider any severance of saturated areas to ensure hydrological connectivity is maintained, in accordance with SEPA / SNH 'Good practice during wind farm construction' as shown in **Technical Appendix A11.2 oWCEMP**. Other than wind turbine bases no impediments to near-surface water flow will be created which would result in changes to flow patterns.

Consequently, effects on Groundwater (Medium sensitivity receptor) is considered to be of Negligible magnitude and therefore **negligible**. This is **not significant** in terms of the EIA Regulations.

11.5.2.5 *Increase in Runoff and Flood Risk*

Increase in Runoff

The increase in hardstanding area associated with construction and operation of the Proposed Development could increase the volume and rate of localised surface run-off, although a large proportion of the proposed infrastructure hardstanding, including access tracks and crane hardstanding, would be permeable. The relatively impermeable nature of the areas of peat soils onsite and mixed permeability of the underlying bedrock means that, in the baseline scenario, there will be relatively low infiltration and relatively high run-off rates during wet periods, and hence the addition of the Proposed Development would have minimal effect on the existing run-off scenario.

Measures, including SuDS measures, to attenuate run-off and intercept sediment prior to run-off entering watercourses are described as part of embedded best practice in **Section 2 of TA11.2** and form a part of the Proposed Development.

For these reasons, the effect on watercourses of High sensitivity are of Negligible magnitude, and therefore **minor**. This is considered to be **not significant** in terms of the EIA Regulations.

Flood Risk

No turbines, borrow pits, substation, construction compounds, or BESS are located within areas described as having a 0.5% or greater annual risk of flooding.

The only proposed infrastructure overlying an area of fluvial flood risk is at WC03 which will be designed to 1:200-year flood risk plus climate change. While an indicative culvert design is shown in **Figure 4.11**, crossings will be designed on case-by-case basis to ensure the most suitable crossing is installed.

The design of the Proposed Development layout has incorporated a buffer zone between watercourses and infrastructure of 50 m, meaning any overtopping of minor watercourses is unlikely to reach infrastructure.

As such, the Proposed Development is not considered to be at risk of flooding and is unlikely to contribute to the displacement of pluvial flood water.

For these reasons, the effect on watercourses of High sensitivity is of Negligible magnitude, and therefore **minor**. This is **not significant** in terms of the EIA Regulations.

11.5.2.6 Contamination from BESS

As summarised in **Chapter 4 – Description of the Proposed Development**, the BESS would be contained within sealed units with respective inverters. The risk of onsite BESS is a battery fire, which could result in an environmental incident. The hydrological environment could be affected through water contaminated by cooling the batteries not being contained and being hydrologically connected to the Euchar Water.

Measures implemented to minimise fire risk and the risk of contamination to surface water receptors are detailed in the **Technical Appendix A11.2 oWCEMP**. These include an automatic fire suppression system with a shut-off mechanism to prevent spread of polluted water. This system would include a valve and bunded area from which contaminated water can be pumped out and removed from the Proposed Development, if necessary.

Prior to construction, measures to mitigate effects in the event of a battery fire should be outlined in the site drainage plan and emergency response plan.

As a result, the magnitude and significance of effects associated with contamination from BESS are assessed as being **minor**. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.2.7 Effects on the Hydrological Function of Wetland Habitats

Wetland habitats supporting NVC communities are present within the Site. The majority of the communities that according to SEPA guidance had a groundwater dependency of High or Moderate were determined to have a lower site-specific groundwater dependency in **Section 11.4.5**.

According to SEPA Guidance LUPS-31, groundwater dependent communities may be affected if they are within 100 m radius of all excavations less than 1 m in depth and within 250 m of the footprint of the proposed turbines and borrow pits where excavations may reach up to 3 m in depth with potential for direct impact (i.e., habitat loss) to wetland habitats in these areas.

Table 11.11 Potential for impact from the Proposed Development on Wetland habitat communities

Community Number	NVC	Potential for impact from the Proposed Development
19	M6d	19 is located within the footprint of the crane hardstanding at T3 and associated earthworks. It is also located downslope of the turbine within the buffer area. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area
28	M6c	28 is located 57 m east of the new access track between T3 and T6. Additionally, it is located 186 m downslope of T3. There will be no direct loss, however, the GWDTE is located downslope of tracks, excavations, and a turbine. It may be indirectly affected by chemical pollution, sediment pollution, change in groundwater interflow patterns and dewatering works at the turbine and excavation.
66	M6c	66 is located 174 m downslope of the new access track between T4 and T5. It is also located 103 m from T6, however it is disconnected by Rashy Grain There will be no direct loss, however, the GWDTEs could be indirectly affected by dewatering works at the access track excavations.
39, 40, 43	M23a, M25	43 is partially located within the footprint of T4 and the associate crane pad and access track. 39 and 40 are located 95 m downslope of T4 and associated infrastructure. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
67	M23a, M25, M6c/d	A small area of 67 is located within the footprint of the access track between T4 and T5 while the majority of the habitat is immediately downslope of this infrastructure.

Community Number	NVC	Potential for impact from the Proposed Development
		Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
96	M25, U4, U5, U6	96 is partially located within the footprint of the crane hardstanding and access track of T10 and within the buffer areas for this infrastructure. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
107	M23a, M6c	107 is located 15 m upslope of T5 and the associated crane pad. There will be no direct loss to the GWDTE, however, it may be indirectly affected by dewatering works at the downslope excavations and turbine.
165	M23a/ M25, M6d	165 is partially located within the footprint of the access track between T5 and T10, however lies outside of the footprint of T5 and T10. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
166	M25, U6	166 is partially located within the footprint of the access track and auxiliary crane hardstanding for T5 and is located immediately upslope and downslope of the access track. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
176, 182	M25a/b, M15b	176 and 182 are located 100m upslope of the T7 and the associated access track. There will be no direct loss to the GWDTE, however, it may be indirectly affected by dewatering works at the downslope excavations and turbine.
36	U4, M25b	A small area of this habitat is located within the footprint of the access track between T4 and T3. The remainder of this habitat lies within the buffer areas immediately upslope of this infrastructure. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.
280	M23a, M25b, U4	280 is partially located within the footprint of the crane hardstanding of T9 and immediately downslope of this location. Therefore, there will be direct loss of habitats from infrastructure and indirect effects on those habitats within the buffer area.

Ten of the communities are located directly within the Proposed Development infrastructure footprint and therefore there will direct loss of habitat as a result within GWDTEs 19, 39, 40, 43, 67, 96, 165, 166, 36 and 280. These polygons will also be indirectly affected by the Proposed Development. Polygons 28, 66, 107, 176 and 182 are situated within the buffer areas and are therefore likely to be indirectly affected by the Proposed Development. Indirect impacts of disturbance to surrounding wetland habitats can include:

- Disruption of near-surface water through superficial deposits through construction of cut and fill access tracks by installation of aggregation causing a physical blockage to water flow in micro and macropores within the communities, where the access track runs perpendicular to natural flow;
- Disruption of near-surface water through superficial deposits by turbine foundations and crane hardstanding creating physical barriers;
- Temporary diverting of sub-surface flows through turbine dewatering works, temporarily lowering the local water table and sub-surface water levels downslope; and
- Temporary localised lowering of the water levels within the soil layers downslope of the access track and turbine foundations immediately after construction, due to a reduction in the quantity of near-surface water into this area.

Good practice design and construction measures outlined in **Technical Appendix A11.2 oWCEMP** will minimise potential indirect effects of the Proposed Development on wetland habitats, including those not determined to be groundwater dependent. The embedded design measures outlined in **Technical Appendix A11.2 oWCEMP** will further minimise the indirect effects on wetland habitats.

Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow. These sections will be spanned with plastic pipes or drainage matting to ensure hydraulic conductivity under the road and reduce water flow over the road surface during heavy precipitation.

Additionally, the following design measures will ensure that effects on wetland habitats are minimised where dewatering will take place:

- A PPP is implemented to ensure good practice working methods are followed throughout construction works.
- Turbine foundations are constructed in holes in the ground that will be de-watered, and hence water flow is typically into the foundation area. This will prevent concrete leaching into groundwater or surface water in the event of shutter collapse.
- All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system.
- If required turbine foundations may be dewatered, temporarily lowering water levels in the superficial deposits and near-surface groundwater. The dewatering process would involve the treatment of any extracted water to remove any sediment and redistributing the water onto a vegetated surface in proximity to the excavation, considering the location of GWDTEs within the wider area. This process would not involve any net loss of water from the hydrological system and would ensure that the water being treated is of the same (or similar) quality to what was extracted. Hence, there would not be an unacceptable effect on groundwater or near-surface water supplying GWDTEs.

Any dewatering for the construction of turbine foundations or for excavations are relatively localised and temporary in nature (during construction phase), with shallow groundwater levels anticipated to recover and flow to adjust around turbines on completion.

The estimated direct habitat loss, as a percentage of Phase 1 Type in Site, for GWDTEs from Permanent Infrastructure is (see **Table 7.12, Chapter 7 – Ecology**):

- B5 Marsh/Marshy Grassland (M23a, M25, M25b, M23b, MG10a) 1.17 %.
- E1.6.1 Blanket Bog (M17, M17c) 0.3 %.
- E1.7 Wet Modified Bog (M20, M20a, M20b, M25a) 2.04 %.
- E2.1 Acid/Neutral Flush (M6c, M6d) 0.23 %.

The estimated direct habitat loss, as a percentage of Phase 1 Type in Site, for GWDTEs from Temporary Infrastructure is (see **Table 7.12, Chapter 7 – Ecology**):

- B5 Marsh/Marshy Grassland (M23a, M25, M25b, M23b, MG10a) 0.18 %.
- E1.6.1 Blanket Bog (M17, M17c) 1.15 %.
- E1.7 Wet Modified Bog (M20, M20a, M20b, M25a) 0.24 %.

In accordance with **Table 11.13** the above losses will have a “Minimal detectable effect on a GWDTE” which will have “no discernible effect on its integrity as a feature or its functionality”. Therefore, the magnitude of impact is Negligible.

In accordance with **Table 11.2**, wetland habitats with High groundwater dependency are defined as Very High sensitivity, while habitats with Moderate groundwater dependency are defined as Medium sensitivity. The magnitude of direct and indirect effects is considered to be Negligible as described as change is hardly discernible, approximating to a ‘Minimal detectable effect on a GWDTE’ in accordance with **Table 11.3**. As such, there will be an effect of **negligible** predicted significance on the hydrological function of highly dependent GWDTEs and **negligible** predicted significance on

moderately dependent GWDTEs. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.3 Potential Operational Effects

Potential effects associated with the operation of the Proposed Development are:

- Increased run-off rates and volume from increased hardstanding, resulting in increased flood risk;
- Alterations to natural flow pathways from runoff from areas of hardstanding, with potential effects on the hydrological function of GWDTEs;
- Risk of chemical pollution because of battery fires from the substation and BESS compound; and
- Risk of a chemical pollution event from minor spills from maintenance vehicles.

The nature of these effects has been discussed in relation to the construction phase. As there would be substantially less activity during operation, and as there is unlikely to be any significant ground disturbance during operation, the magnitude of these effects is similarly reduced. The magnitude of effects of the risk of a battery fire is the same as during operation and are as previously discussed for during construction.

There will be a minor reduction in the potential for increased surface water run-off during the operational phase due to the reduction in hardstanding areas used during the construction phase, such as the removal of the construction compounds.

Other than wind turbine bases no impediments to near-surface water flow will be created which would result in changes to flow patterns during the operational phase, any changes during construction will continue through operation, as the majority of infrastructure will remain in place. Alterations to natural flow pathways will be reduced through adopting good practice design and construction, as set out in the **Technical Appendix A11.2 oWCEMP**, such as cross drainage, use of shallow drainage ditches and prevention of blockages.

As a result, the magnitude and significance of all effects associated with operation of the Proposed Development are assessed as being **minor**. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.4 Potential Decommissioning Effects

Potential effects of decommissioning the Proposed Development are similar in nature to those during construction, however, these effects would be substantially lesser in magnitude than during construction and would be controlled by a PPP which would be incorporated into full. Construction Environmental Management Plans (CEMP) finalised prior to decommissioning. Potential effects associated with decommissioning include:

- Risk of chemical pollution (including accidental pollution) from minor spills from onsite vehicles and plant;
- Risk of chemical pollution event from removal of BESS compound;
- Increased erosion and sedimentation of surface water, near-surface water and groundwater as a result of decommissioning works;
- Increased impediments to watercourse and near-surface water flow from shallow excavation works;
- Potential effects on the hydrological function of GWDTEs; and
- Potential effects on Designated Sites in terms of decrease in condition of qualifying interests.

It is therefore considered that decommissioning activities would be less intrusive and therefore no significant effects are anticipated. The magnitude and significance of all effects on hydrological

receptors associated with decommissioning are assessed as being **minor**. This is considered to be **not significant** in terms of the EIA Regulations.

11.5.5 Mitigation and Residual Effects

Embedded mitigation measures and construction good practice measures are included in **Technical Appendix A11.2 oWCEMP**. The embedded mitigation and construction good practice measures are based on experience of providing detailed site design for several wind farm developments across Scotland, in consultation with SEPA.

With the embedded mitigation measures described in **Technical Appendix A11.2 oWCEMP**, all identified potential effects have been assessed as being of no greater than **minor** and **not significant**. The embedded mitigation measures proposed are established measures that are widely used in construction projects and which the Applicant and its contractors are well used to undertaking. Given the levels of certainty in the success of application of the mitigation measures and their effectiveness, it is appropriate that the mitigation measures are taken into account and assumed to be fully effective in the determination of this application.

Therefore, no additional mitigation measures have been proposed in addition to embedded measures. Residual effects are therefore the same as effects assessed in **Section 11.5** for all phases of the Proposed Development. These are therefore considered to be **not significant** in terms of the EIA Regulations.

11.6 Cumulative Effect Assessment

A cumulative effect is an additional effect on hydrological resources (within the same hydrological catchment) arising from the Proposed Development in addition to the combination of other developments likely to affect the hydrological environment.

At distances greater than 10 km, it is considered that schemes are unlikely to contribute to a cumulative hydrological effect due to attenuation and dilution over distance of potentially polluting chemicals. Therefore, for the purposes of the assessment of potential cumulative effects on the immediate catchment and hydrological regime, only proposed developments, which require large scale construction / excavation, within approximately 10 km of the Proposed Development have been considered.

Operational wind farms and other large-scale developments are unlikely to contribute to pollution and sedimentation effects due to the absence of excavation and presence of plant during the operational period and are therefore scoped out of the assessment.

11.6.1 Cumulative Developments within 10 km (in planning, consented or under construction)

The following developments have been identified within 10 km of the Proposed Development.

- Sanquhar II (in planning) approx. 1.69 km west of the Proposed Development. Located within the River Nith and Afton Water catchments.
- Eucharhead (in planning) approx. 4.54 km west of the Proposed Development. Located within the River Nith and Afton Water catchments.
- Sanquhar "Six" Wind Farm (application consented) approx. 4.31 km east of the Proposed Development. Located within the River Nith and Afton Water catchments.
- Sandy Knowe Extension (in planning) approx. 5.73 km north-west of the Proposed Development. Located within the River Nith catchment.
- Lorg (application consented) approx. 5.79 km south-west of the Proposed Development.

- Glenmuckloch (application consented) approx. 10.01 km north-west of the Proposed Development. Located within the River Nith catchment.
- It should be noted that should Sanquhar II be consented, this development will supersede Sanquhar Six as the proposed turbines will be incorporated into the Sanquhar II development.

11.6.2 Predicted Cumulative Effects

The greatest potential for cumulative effects arises when the construction phase of another development overlaps with the construction phase of the Proposed Development. Cumulative effects are considered to have the potential to be significant only where such an overlap may exist, as activities that could be potentially detrimental to the hydrological environment are greatly reduced during the operational phase of developments (e.g., excavation works, concrete pouring etc.).

The developments, Sanquhar II, Eucharhead, Sanquhar "Six" Wind Farm, Sandy Knowe, Sandy Knowe Extension, Lorg, and Glenmuckloch, all share a common downstream hydrological receptor (River Nith). The date of construction phases for these wind farms are unknown which means there is potential for the construction phases to coincide. Given their respective locations, the primary cumulative impact is likely to be an increase in flow rates associated with increased run-off from new hardstanding areas of the farm developments.

11.6.3 Construction Phase

The increase in flow rates is of negligible magnitude for the Proposed Development. It is likely that for cumulative applications submitted, CEMPs have been committed to being developed with appropriate water management and mitigation measures to be implemented during construction. These will be similar to those described in the WCEMP for the Proposed Development, including a requirement for a Construction Site Licence, as these are in line with standard practice as required by SEPA. Given this, the magnitude of cumulative impacts during the construction phase will be **negligible** and, therefore, of **negligible**. This is considered to be **not significant** in terms of the EIA Regulations.

11.6.4 Operational Phase

It is anticipated that there will be a minor reduction in the potential for increase in flow rates during the operational phase of the listed wind farm developments, when compared to the construction phase, due to the reduction in overall hardstanding areas post-construction. Therefore, the magnitude of cumulative effects during the operational phase will be negligible, and the significance of these effects will also be **negligible**. This is considered to be **not significant** in terms of the EIA Regulations.

11.6.5 Residual Cumulative Effects

No significant residual cumulative effects are predicted.

11.7 Summary of Effects

Table 11.12 provides a summary of the effects detailed within this chapter.

Table 11.12 Summary of Effects

Receptor	Potential Effect	Significance of Effect	Additional Mitigation Proposed	Residual Significance
Construction Phase				
Surface hydrology (watercourses)	Chemical Pollution	Minor	None	Minor
	Erosion and Sedimentation	Minor	None	Minor
	Impediments to Flow	Minor	None	Minor

Receptor	Potential Effect	Significance of Effect	Additional Mitigation Proposed	Residual Significance
	Increase in Run-off from increase in hardstanding	Minor	None	Minor
	Acidification of watercourses	Minor	None	Minor
	Contamination from battery fire	Minor	None	Minor
Hydrogeology (groundwater)	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Acidification of watercourses	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
GWDTEs (High dependency)	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
GWDTEs (Moderate dependency)	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
PWS	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Acidification of watercourses	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
Operational Phase				
Surface hydrology (watercourses)	Increase in Run-off from permanent hardstanding	Minor	None	Minor
	Changes in flow and drainage patterns	Minor	None	Minor
	Chemical pollution	Minor	None	Minor
	Contamination from battery fire	Minor	None	Minor
Hydrogeology (groundwater)	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible

Receptor	Potential Effect	Significance of Effect	Additional Mitigation Proposed	Residual Significance
	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
GWDTEs (High Dependency)	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
GWDTEs (Moderate Dependency)	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
PWS	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
	Chemical pollution	Negligible	None	Negligible
	Contamination from battery fire	Negligible	None	Negligible
Decommissioning Phase				
Surface hydrology (watercourses)	Chemical Pollution	Minor	None	Minor
	Erosion and Sedimentation	Minor	None	Minor
	Impediments to Flow	Minor	None	Minor
Hydrogeology (groundwater)	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
GWDTEs (High dependency)	Chemical pollution	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
GWDTEs (Moderate dependency)	Chemical pollution	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
PWS	Chemical pollution	Negligible	None	Negligible
	Erosion and Sedimentation	Negligible	None	Negligible
	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible

At this stage of the application, all construction measures and mitigation put in place is considered to be embedded mitigation / best practice measures. Embedded mitigation and best practice principles are outlined within **Technical Appendix A 11.2 WCEMP**, however embedded mitigation specific to each potential effect is summarised in **Table 11.13**.

Table 11.13 Summary of Embedded Mitigation Measures

Potential Impact	Proposed Mitigation
Hydrology and Hydrogeology	
Chemical Pollution	Implementation of 50 m watercourse buffer as a design parameter. Inclusion of elements of SuDS design where appropriate including pre-earthworks drainage such as cut-off ditches, interception bunds, swales and retention ponds. Where appropriate, inclusion of drainage ditches, sumps and culverts. Safe storage of chemicals in a bunded area out with the catchment of designated receptors. Designated areas for vehicle storage, wheel washing, cement mixing. Pollution incident / spill response plan. Onsite facilities for the treatment of water and procedures for the transportation offsite for water which cannot be treated. Authorisation from SEPA and the landowner for the safe discharge of water from the Proposed Development. Regular inspection from the onsite ECoW to ensure close monitoring of significant areas of earthworks and to oversee proper storage and handling of chemicals. Impermeable ground membrane layers and bunded areas to ensure no contamination of groundwater. Implementation of a water quality monitoring programme to be agreed with SEPA prior to construction.
Erosion and Sedimentation	Implementation of 50 m watercourse buffer as a design parameter. Inclusion of elements of SuDS design where appropriate including pre-earthworks drainage such as cut-off ditches, interception bunds, swales, and retention ponds. Where appropriate, inclusion of drainage ditches, sumps, and culverts. Adoption of silt mitigation measures such as silt matting or fencing at appropriate locations such as outfalls or between earthworks and waterbodies. Where appropriate, inclusion of check dams and settlement lagoons to allow sediment to settle and be retained in artificial drainage features. Authorisation from SEPA and the landowner for the safe discharge of water from the Proposed Development. Regular inspection from the onsite ECoW to ensure that silt traps are emptied and areas of significant or sensitive construction are closely monitored. Impermeable ground membrane layers and bunded areas to ensure no contamination of groundwater. Implementation of a water quality monitoring programme to be agreed with SEPA prior to construction.
Impediments to Flow	Minimisation of new watercourse crossing through the Proposed Development design. Site drainage design will avoid any severance of saturated areas to ensure hydrological connectivity is maintained. Water from dewatering activities is generally treated by settlement lagoons and will be discharged onto vegetated surfaces, ensuring no net loss of water from the hydrological system. Ensure that any clearing of vegetation or forestry felling done carried out in line with best practice and that brush and trees are stockpiles away from watercourses. Prior to construction detailed crossing designs including the appropriate allowance for climate change will be agreed with SEPA. Intrusive ground investigation should be carried out in areas of deep excavation to understand and limit impact to groundwater levels through dewatering. Flush areas, depressions or zones which may concentrate water flow, will be identified in advance of construction and a suitable drainage design shall be developed to address each location, to ensure hydraulic connectivity. If de-watering is required sub-surface water controls such as physical cut-offs or de-watering will be implemented and subject to discharge consent obtained from SEPA
Increase in Runoff	Replanting of vegetation and forestry as a 1:1 minimum ratio to ensure no long-term increase in surface water runoff. Adoption of SuDS measures to adequately drain water from areas of hardstanding. Cut-off ditches, check dams and drainage, will control surface water flows to ensure surface water is not rapidly transferred to natural watercourses.
Acidification of Watercourses	Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains. Brush will not be stockpiled within 50 m of a watercourse.

Potential Impact	Proposed Mitigation
Hydrology and Hydrogeology	
	Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20. Brash mats will be used for vehicle trafficking to protect bare soils. Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation. Silt matting if used to be checked daily and replaced as required. Implementation of a water quality monitoring programme to be agreed with SEPA prior to construction.
Contamination from Battery Fire	Procure BESS components and use construction techniques which comply with all relevant legislation. Designing the Proposed Development to contain and restrict the spread of fire using fire-resistant materials, and adequate separation between elements of the BESS. Ensuring that Scottish Fire and Rescue Service (SFRS) recommendations and requirements are addressed to enable an adequate emergency response to a fire. Work with SFRS to develop their Tactical Response Plan in case of an incident. As part of the design, all enclosures will include adequate Heating Ventilation or Air Conditioning (HVAC) installations. The BESS compound will also include a gas-based extinguishing fire suppression system. A minimum of two types of automatic fire detection system will be installed which will allow very early warning. A sprinkler system will be installed within BESS containers. As a result of water being used as part of the cooling system in the emergency response to a battery fire, contaminated water will be produced. The area surrounding the compound will also be bunded so any contaminated water will be captured and hydrologically disconnected from surface and groundwater receptors. Implementation of a water quality monitoring programme to be agreed with SEPA prior to construction.

11.8 Statement of Significance

This Chapter has assessed the likely significance of effects of the Proposed Development on hydrology and hydrogeology resources. The Proposed Development has been assessed as having the potential to result in **negligible/minor** effects which are **not significant**.

Given that only effects of moderate significance or greater are considered significant in terms of the EIA Regulations, the potential effects on hydrology and hydrogeology are considered to be **not significant**.

12. NOISE

12.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on the acoustic environment. This assessment was undertaken by ERM Ltd.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in **Volume 3: Technical Appendices**:

- Technical Appendix A12.1: Cumulative Turbine Noise Emission Data; and
- Technical Appendix A12.2: Background Noise Survey Record Sheets.

This Chapter of the EIA Report is supported by the following figures provided in **Volume 2: EIA Report Figures Excluding LVIA**:

- **Figure 12.1:** Cumulative Noise Contour Plot (Incl. Sanquhar II);
- **Figure 12.2:** Cumulative Noise Contour Plot (Excl. Sanquhar II); and
- **Figure 12.3:** Noise Contour Plot.

12.2 Legislation, Policy and Guidance

12.2.1 Construction Noise

The following guidance, legislation and information sources have been considered in relation to construction noise:

- The Control of Pollution Act 1974 (CoPA 1974)³⁴⁷;
- The Environmental Protection Act 1990 (EPA 1990)³⁴⁸; and
- British Standard BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites³⁴⁹.

12.2.1.1 The Control of Pollution Act 1974

CoPA 1974 provides Local Authorities with powers to control noise and vibration from construction sites.

Section 60 of the CoPA 1974 enables a Local Authority to serve a notice to persons carrying out construction work of its requirements for the control of site noise. This may specify:

- Plant or machinery that is or is not to be used;
- The hours during which construction work may be carried out;
- The level of noise or vibration that may be emitted; and
- Provide for changes in circumstances.

Section 61 of the CoPA 1974 allows for those carrying out construction work to apply to the Local Authority in advance for consent to carry out the works.

³⁴⁷ UK Government (1974) The control of Pollution Act 1974, available at: <http://www.legislation.gov.uk/ukpga/1974/40> (accessed 05/04/2023)

³⁴⁸ UK Government (1990) The Environmental Protection Act 1990. Available at: <http://www.legislation.gov.uk/ukpga/1990/43/contents> (accessed 05/04/2023)

³⁴⁹ BS 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites – Part 1: Noise and Part 2: Vibration. (accessed 05/04/2023)

12.2.1.2 *The Environmental Protection Act 1990*

The EPA 1990 specifies mandatory powers available to Local Authorities in respect of any noise that either constitutes or is likely to cause a statutory nuisance, which is also defined in the CoPA 1974. A duty is imposed on Local Authorities to carry out inspections to identify statutory nuisances, and to serve abatement notices against these. Procedures are also specified with regard to complaints from persons affected by a statutory nuisance.

12.2.1.3 *BS 5228:2009+A1:2014*

Guidance relevant to the effects of noise and vibration during construction and decommissioning is provided by BS 5228:2009+A1:2014 ('BS 5228'). This standard:

- Is published in two parts: Part 1 – Noise; and Part 2 - Vibration;
- Refers to the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on construction and open sites;
- Recommends procedures for noise and vibration control in respect of construction operations;
- Stresses the importance of community relations, and states that early establishment and maintenance of these relations throughout site operations will go some way towards allaying people's concerns;
- Provides recommendations regarding the supervision, planning, preparation and execution of works, emphasising the need to consider noise at every stage of the operation;
- Describes methods of controlling noise at source and its spread; and
- Includes a discussion of noise control targets and example criteria for the assessment of the significance of noise effects.

12.2.2 *Operational Noise*

The following guidance, legislation and information sources have been considered in the assessment of operational noise:

- The Scottish Government's planning information on onshore wind turbines³⁵⁰;
- Planning Advice Note 1/2011 (PAN 1/2011): Planning and Noise³⁵¹;
- ETSU-R-97: The Assessment and Rating of Noise from Wind Farms³⁵²; and
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise³⁵³.

12.2.2.1 *Scottish Government Planning Information on Onshore Wind*

The Scottish Government's web-based information provides advice to local authorities on the planning issues associated with wind farm development. With respect to noise from wind farms, it recommends the use of ETSU-R-97: The Assessment and Rating of Noise from Wind Farms and the Institute of Acoustics' (IOA) Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise.

³⁵⁰ Scottish Government (2014) Onshore Wind Turbines. Available at: <https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/> (Accessed 08/05/23)

³⁵¹ Scottish Government. (2011). PAN 1/2011: Planning and Noise (Accessed 08/05/23)

³⁵² ETSU for the DTI (1996) ETSU-R-97 The Assessment and Rating of Noise from Wind Turbines (Accessed 08/05/23)

³⁵³ IOA, (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. (Accessed 08/05/23)

It goes on to refer to PAN 1/2011 as providing advice on the role of the planning system in helping to prevent and limit the adverse effects of noise, and states that the associated Technical Advice Note (TAN) Assessment of Noise provides guidance which may assist in the technical evaluation of noise assessment.

12.2.2.2 PAN 1/2011: Planning and Noise

PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. It promotes the principles of good acoustic design and the appropriate location of new potentially noisy development. The associated TAN Assessment of Noise offers advice on the assessment of noise impact and includes details of the legislation, technical standards and codes of practice appropriate to specific noise issues.

Appendix 1 of the TAN Assessment of Noise describes the use of ETSU R 97 in the assessment of wind turbine noise.

12.2.2.3 ETSU-R-97

ETSU-R-97 provides a framework for the assessment and rating of noise from wind turbine installations. It is the standard for wind farm developments in the UK, and the methodology has therefore been adopted for the present assessment.

Both background noise and noise from wind turbines typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines.

ETSU-R-97 specifies the use of the $L_{A90,10min}$ descriptor for both background and wind turbine noise. Therefore, unless otherwise specified, all references to noise levels within this Chapter relate to this descriptor. Similarly, all wind speeds referred to relate to a height of 10 metres (m) Above Ground Level (AGL) at the location of the Proposed Development, standardised in accordance with current good practice guidance.

The document recommends the application of external noise limits at the nearest noise-sensitive properties, to protect outside amenity and prevent sleep disturbance inside dwellings. These limits take the form of a 5 dB margin above the prevailing background noise level, except where background noise levels are lower than certain thresholds, where fixed lower limits apply. Separate limits apply for quiet daytime and night-time periods, as outlined below. The limits apply to the cumulative effects of all wind turbines that affect a particular location.

During daytime, the guidance specifies limits designed to protect the amenity of residents whilst within the external amenity areas of their properties. The limits are based on the prevailing background noise level for 'quiet daytime' periods, defined in ETSU-R-97 as:

- 18:00 – 23:00 every day;
- 13:00 – 18:00 on Saturday; and
- 07:00 – 18:00 on Sundays.

ETSU-R-97 recommends that the fixed lower noise limit for daytime should be set within the range 35 to 40 dB, $L_{A90,10min}$, with choice of value dependent on the following factors:

- i) The number of dwellings in the neighbourhood of the Proposed Development;
- ii) The effect of the noise limits on the number of kilo Watt hours (kWh) generated; and
- iii) The duration and level of exposure.

Different standards apply at night, where potential sleep disturbance is the primary concern rather than the requirement to protect outdoor amenity. Night-time is considered to be all periods between

23:00 and 07:00. A limit of 43 dB(A) is recommended at night at wind speeds or locations where the prevailing wind speed related night-time background noise level is lower than 38 dB(A). At other times, the limit of 5 dB above the prevailing wind speed-related background noise level applies. The value of night-time fixed lower limit was selected in order to ensure that internal noise levels remained below those considered to have the potential to cause sleep disturbance, taking account of the attenuation of noise when passing from outdoors to indoors, and making allowance for the presence of open windows.

Where the occupier of the property has a financial interest in the Proposed Development, ETSU R 97 states that the fixed lower noise limit for both daytime and night-time can be increased to 45 dB(A) and that “...consideration should be given to increasing the permissible margin above background”.

A ‘simplified criterion’ is also described which is applicable where there are large separation distances between the proposed turbines and nearest noise-sensitive receptors. In such cases, a fixed limit of 35 dB, $L_{A90,10min}$ applies, without reference to background noise levels.

12.2.2.4 A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

The Institute of Acoustics’ (IOA) Good Practice Guide (the GPG) was published in May 2013 and has been endorsed by the Scottish and UK Governments as current industry best practice³⁵⁴. The GPG is supported by a suite of six Supplementary Guidance Notes (SGNs), published in 2014. The GPG presents current good practice in the application of ETSU R-97 assessment methodology for wind turbine developments at the various stages of the assessment process. The recommendations provided in the GPG have been followed throughout this assessment.

The GPG provides advice on the assessment of cumulative noise impact, detailing a number of possible cumulative scenarios and recommended approaches. Advice is also provided with regard to the geographical scope of a cumulative noise assessment, to determine the area within which a cumulative noise assessment is necessary.

Where a new noise source is introduced to a given scenario with a noise level which is predicted to be 10 dB or more below the existing level, the increase in the total noise level is considered to be negligible. On this basis, the necessary extents of a cumulative noise assessment can be determined. Paragraph 5.1.4 of the GPG states:

“If the proposed wind farm produces noise levels within 10 dB of any existing wind farm(s) at the same receptor location, then a cumulative noise impact assessment is necessary”.

As noted in ETSU-R-97, noise from existing wind turbines should not form part of the background noise level from which noise limits for new wind energy developments are derived.

12.2.2.5 Low-Frequency Noise and Infrasound Studies

A study³⁵⁵, published in 2006 by acoustic consultants Hayes McKenzie on the behalf of the Department of Trade and Industry (DTI), investigated low frequency noise from wind farms. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines, but that complaints attributed to low frequency noise were in fact, possibly due to a phenomenon known as Amplitude Modulation (AM).

Further, in February 2013, the Environmental Protection Authority of South Australia published the results of a study into infrasound levels near wind farms³⁵⁶. This study measured infrasound levels at

³⁵⁴ Onshore wind: policy statement 2022 [online]. Available at: <https://www.gov.scot/publications/onshore-wind-policy-statement-2022/pages/4/> (accessed 28/06/2023)

³⁵⁵ The measurement of low frequency noise at three UK wind farms, Hayes McKenzie, The Department for Trade and Industry, URN 06/1412, 2006. (accessed 28/06/2023)

³⁵⁶ Environment Protection authority (2013) Infrasound levels near wind farms and in other environments [online] Available at: http://www.epa.sa.gov.au/xstd_files/Noise/Report/infrasound.pdf (accessed 05/04/2023)

urban locations, rural locations with wind turbines close by, and rural locations with no wind turbines in the vicinity. It found that infrasound levels near wind farms are comparable to levels away from wind farms in both urban and rural locations. Infrasound levels were also measured during organised shutdowns of the wind farms; the results showed that there was no noticeable difference in infrasound levels whether the turbines were active or inactive.

Bowdler et al. (2009)³⁵⁷ concludes that:

"...there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from wind farms generally has adverse effects on wind farm neighbours".

12.2.2.6 Research into Amplitude Modulation

A study³⁵⁸ was carried out on behalf of the Department for Business, Enterprise and Regulatory Reform (BERR) by the University of Salford, which investigated the incidence of noise complaints associated with wind farms and whether these were associated with AM. This report defined AM as aerodynamic noise from wind turbines with a greater degree of fluctuation than normal at blade passing frequency. Its aims were to ascertain the prevalence of AM on UK wind farm sites, to try to gain a better understanding of the likely causes, and to establish whether further research into AM is required.

The study concluded that AM has occurred at only a small number of wind farms in the UK (4 of 133), and only for between 7% and 15% of the time. It also states that, at the time of writing, the causes of AM were not well understood and that prediction of the effect was not currently possible.

This research was updated in 2013 by an in-depth study undertaken by Renewable UK³⁵⁹, which identified that many of the previously suggested causes of AM have little or no association to the occurrence of AM in practice. The generation of AM is based upon the interaction of a number of factors, the combination and contributions of which are unique to each site. With the current knowledge, it is not possible to predict whether any particular site is more or less likely to give rise to AM, and the incidence of AM occurring at any particular site remains low, as identified in the University of Salford study.

In 2016, the IOA proposed a measurement technique³⁶⁰ to quantify the level of AM present in any particular sample of wind farm noise. This technique is supported by the Department of Business, Energy & Industrial Strategy (BEIS, formerly The Department of Energy & Climate Change) who have published guidance³⁶¹, which follows on from the conclusions of the IOA study in order to define an appropriate assessment method for AM, including a penalty scheme and a draft planning condition. This draft planning condition has not yet been validated, nor endorsed by the Scottish, nor wider UK government. More recently, BEIS commissioned WSP to review the guidance available for assessment of onshore wind turbines, with the latest revision issued in May 2023³⁶². Whilst the review made recommendations relating to the assessment of AM, as with the previous BEIS guidance, it has not yet been validated nor endorsed by the Scottish, nor the IOA Noise Working Group. The recommendations are at odds with the GPG which has been endorsed by the Scottish Government as industry best practice. In response to **Chapter 12 – Noise** of the Scoping Report which set out the

³⁵⁷ Bowdler et al. (2009). Prediction and Assessment of Wind Turbine Noise: Agreement about relevant factors for noise assessment from wind energy projects. Acoustic Bulletin, Vol 34 No2 March/April 2009, Institute of Acoustics (accessed 16/06/2023)

³⁵⁸ Research into aerodynamic modulation of wind turbine noise'. Report by University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235, July 2007. (accessed 16/06/2023)

³⁵⁹ Renewable UK, 2013: Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects (accessed 16/06/2023)

³⁶⁰ Institute of Acoustics, (2016) A Method for Rating Amplitude Modulation in Wind Turbine Noise (accessed 16/06/2023)

³⁶¹ BEIS, (2016), Review of the evidence on the response to amplitude modulation from wind turbines. (accessed 16/06/2023)

³⁶² WSP, (2023), A REVIEW OF NOISE GUIDANCE FOR ONSHORE WIND TURBINES. Available here: Report for BEIS: A review of noise guidance for onshore wind turbines | WSP (accessed 16/06/2023)

assessment as following standards ETSU-R-97 and the GPG, Scottish Ministers made the following comment (paragraph 3.16 of the Scoping Opinion):

“...the assessment should be carried out in line with relevant legislation and standards as detailed in chapter 12 of the scoping report. The noise assessment report should be formatted as per Table 6.1 of the IOA ‘A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise.’”

As such, Section 7.2.1 of the GPG therefore remains current in this assessment, stating:

"The evidence in relation to 'Excess' or 'Other' Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM".

It is therefore not considered necessary to carry out a specific assessment of AM.

12.2.2.7 Vibration

Research undertaken by Snow³⁶³ found that levels of ground-borne vibration 100 m from the nearest wind turbine were significantly below criteria for 'critical working areas' given by British Standard BS 6472:1992 Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz) and were lower than limits specified for residential premises by an even greater margin.

Ground-borne vibration from wind turbines can be detected using sophisticated instruments several kilometres (km) from the wind farm site as reported by Keele University³⁶⁴. This report clearly shows that, although detectable using highly sensitive instruments, the magnitude of the vibration is orders of magnitude below the human level of perception and does not pose any risk to human health.

As a result, ground-borne vibration from operation of wind turbines is scoped out and is not addressed further in this assessment.

12.3 Assessment Methodology and Significance Criteria

12.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 12.1**.

Table 12.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Dumfries and Galloway Council ('the Council')	Email 8th June 2022	No objections to the noise assessment methodology outlined in scoping report.	The assessment has been carried out in accordance with the methodology outlined in the Scoping Report.
Tynron Community Council ('TCC')	Response to scoping report, 6th June 2022	TCC noted the following developments in terms of cumulative effects: Proposed developments: - Sanquhar II Wind Farm - Appin Wind Farm - Euchanhead Wind Farm - Lorg Wind Farm Existing Wind Farms: - Twentysilling Hill Wind Farm - Whiteside Wind Farm	A final update to the cumulative search was conducted on the 30 th November 2022, which is the proposed cut-off date for including any new developments. The developments highlighted by TCC have all been included in the detailed cumulative assessment process, with the exception of Appin and Lorg Wind Farms; these developments are located outwith

³⁶³ ETSU (1997), Low Frequency Noise and Vibrations Measurement at a Modern Wind Farm, prepared by D J Snow. (Accessed 07/07/2023)

³⁶⁴ Microseismic and infrasound monitoring of low frequency noise and vibrations from wind farms: recommendations on the siting of wind farms in the vicinity of Eskdalemuir, Scotland". Keele University, 2005 (Accessed 07/07/2023)

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Sanquhar Wind Farm	the 5 km search area (at distances of 6 km and 7 km respectively). As such, there is no reasonable prospect of a cumulative effect arising from these developments. Notwithstanding the above, a number of other wind farms not referenced by TCC have been identified within the search area and have therefore been assessed: Hare Hill (plus Extension), and Sandy Knowe (plus Extension). See Section 12.3.3 for further details.
		The increasing number of windfarms in the area, particularly of a size, scale and longevity not previously experienced, are leading to increased cumulative impact of noise not just on homes but sensitive outdoor receptors such as the Southern Upland Way, which bisects the proposed windfarm footprint. Whiteside windfarm has already a significant noise impact in the area, particularly with the wind in certain directions. The former owners of Polgown found the noise from this windfarm unacceptable at times, impacting on their ability to sleep. The cumulative impact of this with Cloud Hill can only increase the impact of noise on our peaceful hills and glens. The Cloud Hill EIA needs to thoroughly investigate the impact of noise from Cloud Hill both on its own merits, and with the potential cumulative impacts of other proposed and consented developments, particularly for residential and farm properties in Scaur Glen. Therefore, we are very concerned that it is suggested that Low frequency noise and infrasound should be scoped out of this EIA, particularly with the increasing evidence of adverse impacts on health. The historical studies quoted by Arcus, namely Hayes McKenzie (2006), Bowdler (2009) and the Environmental Protection Authority of South Australia (2013) are now out of date, especially given the height of turbines, their potential cumulative impacts density, and their numbers. Low frequency noise is increasingly being reported in the scientific literature as creating mental and physical health issues, eg Chiu et al; Nature, 8 September 2021; Effects of low-frequency noise from wind turbines on heart rate variability in healthy individuals.	Noise due to the Proposed Development has been assessed both on its own merits, and in combination with all relevant cumulative developments, following a conservative approach as described in the GPG. The assessment (as outlined in Section 12.3.3) has been carried out in full accordance with Scottish and UK planning policy, legislation and best practice as agreed with technical consultees, including the Council's EHO.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Therefore, low-frequency noise and infrasound should NOT be scoped out of the EIA, based purely on support from old literature.	
		Also, the claim that 'By virtue of the large separation distances and low number of residential receptors in the locality, construction noise impacts are anticipated to be minimal, and will therefore be scoped out of the assessment' ignores the topography of the area, with long hill crests and valleys which provide an extensive echo chamber for noise. Increasing windfarm constructions may also interfere with the operation of the seismology stations at Eskdalemuir as the site is within the designated radius of concern. Construction noise should therefore be factored into the EIA.	Construction noise and vibration is addressed in Section 12.3.2 . The Proposed Development is not within 50 km of Eskdalemuir Seismic Monitoring Station therefore it will not impact the station or require an allocation of seismic noise budget. As such, this is scoped out of the assessment and is not considered further.

12.3.2 Construction Noise and Vibration Assessment Methodology

As discussed in the Scoping Report, due to the large separation distance between the Proposed Development and nearby noise receptors (over 800 m from the closest Proposed Development infrastructure to the closest receptor), the effect of construction noise and vibration on the surrounding receptors is expected to be negligible. As such, and with agreement from the Council in their scoping response, no further assessment of construction noise is considered necessary and is scoped out.

In accordance with best practice guidance outlined in BS 5228 the measures detailed in **Section 12.6.1** will be adopted.

12.3.2.1 Vibration

Ground-borne vibration is rapidly attenuated with distance; given the separation distances from construction activities to receptors, as noted above, there is no reasonable prospect of significant vibration effects from construction activities, and this has not been considered further in this Chapter. Notwithstanding this, in the event that stone is required to be extracted from borrow pits by blasting, such effects will be managed through a Scheme of Blasting, as described in **Section 12.6.1**.

12.3.2.2 Construction Traffic Noise on Public Roads

Noise from construction traffic on public roads has been assessed on the basis of the change in traffic noise levels due to the addition of traffic associated with construction of the Proposed Development. Baseline traffic flows for each location have been sourced from **Chapter 13 – Access, Traffic and Transportation**. The percentage increases in traffic have then been used together with the number of vehicles, proportion of HGVs and likely speed (based on the type of road) to calculate the likely change in traffic noise level due to construction traffic for each month of the construction programme, using the method described in Calculation of Road Traffic Noise (CRTN)³⁶⁵.

³⁶⁵ Calculation of Road Traffic Noise, Department of the Environment, 1988. (Accessed 05/07/2023)

12.3.2.3 Construction Traffic Noise Significance Criteria

The magnitude of effects, in terms of the predicted change in traffic noise levels on public roads, expressed as LA10,18hour in accordance with CRTN, and based on criteria defined in DMRB³⁶⁶ are defined as follows:

- Negligible: change of less than 1 dB;
- Minor: change of 1 to 3 dB;
- Moderate: change of 3 to 5 dB; and
- Major: change of 5 dB or more.

Effects of Moderate or Major magnitude are considered to be significant in terms of the EIA Regulations³⁶⁷. Negligible or Minor effects are considered to be not significant in terms of the EIA Regulations.

The methodology in CRTN requires that predicted traffic flows are more than 1000 vehicles per day. Where traffic flows are predicted to be less than 1000 vehicles per day, an alternative method for assessing the impact of traffic noise is required. For these cases, noise levels due to traffic are calculated at 10 m distance from the road using the methodology and assessment criteria outlined in BS 5228 with resulting noise levels above 65 dB(A) considered to be significant.

12.3.3 Operational Wind Turbine Noise Assessment Methodology

The operational noise assessment process comprises:

- i) Identification of potential receptors (typically residential dwellings);
- ii) Measurement of prevailing, wind speed dependant background noise levels at nearby receptors;
- iii) Establishment of limits for acceptable levels of wind turbine noise, based on the measured background noise levels and appropriate fixed lower limits;
- iv) Prediction of the likely levels of wind turbine noise received at each receptor; and
- v) Comparison of the predicted levels with the noise limits.

The method of measuring background noise is described in ETSU-R-97, supported by the GPG. In brief, it involves continuous measurement of both background noise levels at a representative number of receptors, and wind speeds on the proposed development site for a period of at least one week. The resulting data is then sorted into quiet daytime and night-time periods and the relationship between wind speed and background noise established for each location.

12.3.3.1 Selection of Wind Turbine Fixed Lower Noise Limits

As discussed at **Section 12.2.2.3**, the noise limits described in ETSU-R-97 are a combination of a 5 dB margin above the prevailing wind speed-dependent background noise level and fixed lower limits, applicable where background noise levels are low. These limits apply to all noise immissions including cumulative effects. The daytime fixed lower noise limit is defined as a value within the range 35 to 40 dB, LA90,10min, with the value chosen dependent on the following three factors:

- The number of affected properties;
- The effect on the number of kilowatt-hours produced; and
- The duration and level of exposure.

³⁶⁶ Design Manual for Roads and Bridges, Highways Agency / Transport Scotland, Volume II Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 HD 213/11, Noise and Vibration – Revision 1, November 2011, Table 3.1 – Classification of Magnitude of Noise Impacts in the Short Term (Accessed 07/07/2023)

³⁶⁷ Scottish Government (2017) Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended. (Accessed 07/07/2023)

As agreed with the Council during consultation, fixed lower limits of 40 dB, L_{A90} during daytime periods and 43 dB, L_{A90} during night-time periods are appropriate for the assessment of cumulative noise effects in this case. It should also be noted that these fixed lower limits have previously been applied to a number of the key cumulative developments in the locality (Sanquhar II Wind Farm).

When determining the resulting daytime apportioned limits, consideration of the 35 dB $L_{A90,10min}$, or 5 dB above background (the most stringent under ETSU R-97 methodology), limit for the proposed Development in isolation should be made. As such, the resulting daytime apportioned limits have therefore been further corrected to ensure they do not exceed this limit. Further detail is provided in **Section 12.4.3.3**.

For receptors where the occupant is financially involved with the Development, a higher fixed lower limit of 45 dB for daytime and night-time periods applies, in line with the guidance provided in section 3.2.10 of the GPG. The property known as Glenmaddie is the only receptor classed as being financially involved for the purposes of this assessment.

12.3.3.2 Noise Predictions

Noise predictions have been made using SoundPLAN software (v8.2), which implements the ISO 9613-2³⁶⁸ methodology and takes account of the specific data and parameters recommended in the GPG, as summarised below:

- The turbine sound power levels should be stated and these should include an appropriate allowance for measurement uncertainty. If the data provided contains no allowance for measurement uncertainty, or uncertainties are not stated, an additional 2 dB should be included;
- Atmospheric absorption should be calculated based on conditions of 10°C and 70% relative humidity;
- The ground factor assumed should be $G = 0.5$ (mixed ground) except in urban areas or where noise propagates across large bodies of water, where $G = 0$ (hard ground) should be assumed;
- A receiver height of 4.0 m should be assumed;
- Barrier attenuation should not be included, unless there is no line of sight from the receptor, in which case a 2 dB barrier effect may be included;
- An additional 3 dB should be added to noise immission levels at properties located across a valley or with a heavily concave ground between the receptor location and the wind turbine(s)³⁶⁹; and
- The predicted noise levels ($L_{Aeq,t}$) should be converted to the required $L_{A90,10min}$ by subtracting 2 dB.

ISO 9613-2 provides a prediction of noise levels likely to occur under worst-case conditions; those favourable to the propagation of sound, i.e., down-wind or under a moderate, ground-based temperature inversion as often occurs at night (often referred to as stable atmospheric conditions). The specific measures recommended in the GPG have been shown to provide good correlation with levels of wind turbine noise measured at operational wind farms^{370, 371}.

³⁶⁸ ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation. (Accessed 07/07/2023)

³⁶⁹ Equation to determine concave ground as presented in Section 4.3.9 of the GPG. (Accessed 07/07/2023)

³⁷⁰ Bullmore et al. (2009). Wind Farm Noise Predictions and Comparison with Measurements, Third International Meeting on Wind Turbine Noise, Aalborg, Denmark 17 – 19 June 2009. (Accessed 07/07/2023)

³⁷¹ Cooper & Evans (2013). Effects of different meteorological conditions on wind turbine noise. (Accessed 07/07/2023)

12.3.3.3 Cumulative Noise Assessment

ETSU-R-97 states that the assessment should take account of the effect of noise from all wind turbines that may affect a particular receptor. A screening exercise was conducted to identify any wind turbines either operational, consented, or proposed (i.e., the subject of a current planning application)³⁷², considered to have the potential to result in cumulative noise impacts when assessed in conjunction with the Proposed Development. For the purposes of the noise assessment, cumulative developments within 5 km of the Proposed Development have been identified (the distance at which other developments are considered to have the potential to result in cumulative noise impacts).

The identified cumulative developments are:

- Whiteside Hill (planning ref. 06/P/0351) Operational;
- Twentysilling Hill (planning ref. 18/0206/FUL) Operational;
- Eucharhead (planning ref. 20/0002/S36) Application;
- Sanquhar (planning ref. 10/P/3/0182) Operational;
- Sanquhar Six Wind Farm (planning ref. 15/P/3/0166) Consented;
- Sanquhar II Wind Farm (planning ref. 19/0490/S36) In Planning;
- Sandy Knowe incl. variation (planning ref. 15/P/3/0279) Operational;
- Sandy Knowe Extension (planning ref. ECU00003274); In Planning;
- Hare Hill (planning ref. 94/0097/DPP) Operational; and
- Hare Hill Extension (Planning ref. 18/0015/EIASCR) Operational.

The relevant data applied in this assessment for the cumulative wind farms is detailed in **Technical Appendix A12.1: Cumulative Turbine Noise Emission Data**.

The GPG states that cumulative assessment is required in areas where the predicted cumulative noise level (including the Proposed Development) is greater than 35 dB(A), and the difference in predicted noise levels between the Proposed Development and other wind energy developments is less than 10 dB. **Figure 12.2** shows the areas in which the predicted cumulative noise levels are 35 dB or greater and where noise from the Proposed Development is predicted to be within 10 dB of the other cumulative wind farms. A cumulative assessment is therefore required for receptors within the regions where these areas overlap. As Sanquhar II Wind Farm is at planning stage at the time of this assessment, two cumulative scenarios are assessed: with and without Sanquhar II Wind Farm. It should be noted that should Sanquhar II be consented, this development will supersede Sanquhar Six as the proposed turbines will be incorporated into the Sanquhar II development.

Cumulative noise effects have been assessed through the derivation of apportioned noise limits (see **Section 12.3.3.3**). The result is the remaining noise budget available to the Development.

The method of predicting wind farm noise levels is described in the GPG as discussed in **Section 12.2.2.4**. This method has been applied to all operational noise predictions within this Chapter of the EIA Report.

12.3.4 Wind Turbine Noise Significance Criteria

The acceptable limits for wind turbine operational noise are clearly defined in ETSU-R-97. Therefore, this assessment determines whether the calculated immission levels at nearby noise-sensitive properties lie below the noise limits derived in accordance with ETSU-R-97. Where the noise immission levels at noise-sensitive receptors are shown to be below the derived noise limits, the effect is considered to be not significant in terms of The EIA Regulations.

³⁷² Status of wind farms is as of January 2022.

As such, the approach to assessment followed in other technical chapters within this EIA Report is not applicable to the effects of wind turbine noise, and effects are not considered in terms of their magnitude and the sensitivity of receptors as these factors are implicit in the limits defined by ETSU-R-97.

12.3.5 Operational Noise Assessment Methodology Other than Wind Turbines

Other sources of operational noise are limited to the on-site substation and BESS compound. The BESS is anticipated to comprise a number of containerised modules, with the primary noise source being the air conditioning units used to regulate the temperature of the storage system, along with electrical plant such as inverters and transformers. Based upon ERM's substantial experience of BESS facilities, they emit relatively low levels of noise.

Both the substation and BESS compound will be located adjacent to each other and positioned a substantial distance (a minimum of 1,300 m) from the nearest residential dwelling. Typical noise emitting elements associated with such facilities (such as PCS inverter units) of sound pressure levels of 70 dB(A) at 10 m, result in sound pressure levels lower than 25 dB(A) at 500 m. As there are no Noise Sensitive Receptors (NSRs) within this distance from the compounds, noise from operation of these elements is therefore not considered further.

12.3.6 Decommissioning

The noise produced during decommissioning of the Proposed Development is likely to be of a similar nature to that during construction, although the duration of decommissioning will be shorter than that of construction. It is assumed that the separation distances from works associated with decommissioning of the Proposed Development will not be any closer to noise-sensitive receptors than those for construction. As such, the assessment of decommissioning noise is also scoped out and not considered further in this assessment.

12.3.7 Elements Scoped Out of Assessment

The following elements have been scoped out of the assessment for the reasons described in the previous sections of this Chapter:

- Decommissioning noise;
- Low-frequency noise;
- Infrasound;
- Amplitude Modulation;
- Vibration; and
- BESS and substation operational noise

12.3.8 Study Area

The Study Area for the operational noise assessment has been defined in accordance with the GPG, is shown in **Figures 12.1 and 12.2**. It comprises the area where noise levels from the Proposed Development are predicted to be within 10 dB of, or 10 dB greater than, those from other relevant wind energy developments and the predicted cumulative wind farm noise level is at least 35 dB, $LA_{90,10min}$. The operational noise Study Area is therefore the area shaded orange which is also located within the 35 dB, $LA_{90,10min}$ noise contour.

12.3.9 Design Parameters

The GPG notes that most sites at the planning stage will not have selected a preferred turbine, therefore a candidate turbine representative of a range of turbines should be selected to provide appropriate source noise levels. Once noise levels have been predicted at the potentially affected

properties, compliance with noise limits can be assessed and design advice provided if compliance with the limits is considered unlikely.

The Vestas V150 turbine with a hub height of 105 m has been selected as the candidate turbine for this assessment. This assessment assumes the turbines are fitted with the Serrated Trailing Edge (STE) blades as standard and operate at full power (Mode 0) at all times. The manufacturer's data is provided at hub height and has been adjusted to a standardised 10 m height; the manufacturer's data excludes any margin for uncertainty, and as such an additional 2 dB has been included in the sound power levels in this assessment, as detailed in **Table 12.2**, in accordance with the GPG.

Table 12.2 Manufacturer's Noise Emission Data³⁷³ – Vestas V150 5.6 MW 105 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB(A)									
Sound Power Level, dB LWA, Mode 0	92.8	96.6	101.0	103.8	104.4	104.9	104.9	104.9	104.9	104.9
Sound Power Level, dB, LWA, inc. 2 dB allowance for uncertainty	94.8	98.6	103.0	105.8	106.4	106.9	106.9	106.9	106.9	106.9

The octave-band frequency spectrum at the wind speed for which the maximum sound power level is achieved (8 ms⁻¹ @ 10 m) is detailed in **Table 12.3**.

Table 12.3 Octave-band Spectra³⁷⁴

	Standardised 10 m Wind Speed, ms ⁻¹							
	63	125	250	500	1000	2000	4000	8000
	Sound Power Level, dB(A)							
Sound Power Level, dB, LWA	85.8	93.5	98.3	100.0	98.9	94.8	87.7	77.6
Sound Power Level, dB, LWA, Scaled to 106.9 dB(A)	87.8	95.5	100.0	102.0	100.9	96.8	89.7	79.6

³⁷³ Vestas (2019), Performance Specification EnVentus™ V150-5.6MW, DMS no.: 0081-5059_V03. (accessed 07/07/2023)

³⁷⁴ Vestas (2019), Performance Specification EnVentus™ V150-5.6MW, DMS no.: 0081-5059_V03. (accessed 07/07/2023)

12.3.10 Methodology for the Assessment of Effects

12.3.11 Assessment Limitations

Baseline noise monitoring locations were selected to provide a conservative representation of the background noise levels in the local area and corrected to account for the influence of existing wind turbines, following advice contained within the GPG.

Background noise measurements were obtained during the baseline noise survey for the full range of wind speeds required by the GPG for both daytime and night-time periods after exclusions were taken into account.

Wind speeds were measured at a hub height of 105 m and standardised to a height of 10 m in accordance with the GPG.

It is therefore concluded that no notable assessment limitations exist.

12.3.12 Embedded Mitigation

Operational noise was an important factor in the design of the turbine layout. Each layout iteration was modelled to determine its noise impact, and the effects on the energy output of the Proposed Development on any noise mitigation measured that may be required. Through this iterative process, the layout design was optimised to ensure that the Proposed Development could operate efficiently within appropriate noise limits.

12.4 Baseline Conditions

12.4.1 Receptor Identification

Potential noise-sensitive receptors have been identified using Ordnance Survey (OS) MasterMap AddressBase, a database which combines the locations of buildings and other features from large-scale digital mapping with the Royal Mail's address database, along with aerial photography and site visits. Of the identified receptors located within the Study Area, a representative selection has been assessed taking into account any topographical features such as valleys. Providing the assessed receptors are shown to be compliant with the requirements of ETSU-R-97, receptors located further from the Proposed Development and not subject to topographical features such as valleys would also comply. It is noted that the SUW, a marked walking route, is located near the Development. Public paths are "occupied" transiently and for short periods. As such, the SUW is not considered an NSR.

12.4.2 Baseline Noise Survey

Two properties were identified (see **Figure 12.3**) for the purposes of baseline noise monitoring as presented in **Table 12.6** and agreed in consultation with the Council's EHO. Background noise monitoring was carried out at these locations, in accordance with ETSU-R-97 and the GPG. The following specific measures ensured this compliance:

- Type 1³⁷⁵ measuring equipment (Rion NL-31) was used, which was calibrated at the start of the survey and at each site visit. No significant calibration drift occurred (i.e., no more than 0.5 dB);
- Noise monitoring equipment was equipped with specially-designed, dual-layer windshields manufactured by Rion, which have been confirmed by the supplier as being suitable for use in elevated wind speeds and meeting the requirements of the GPG;
- Measurements were performed at a height of 1.4 m AGL, in free-field conditions, i.e., a minimum of 3.5 m from any reflective surface other than the ground;
- Background noise levels were recorded at continuous 10-minute intervals, as $L_{A90,10min}$;

³⁷⁵ As defined in BS EN 06651:1994 Specification for Sound Level Meters

- During the survey, wind speeds were measured using LiDAR remote sensing equipment. Measurements were taken at hub height of 105 m, and used to calculate standardised 10 m wind speeds, following the procedure described in the GPG;
- A logging rain gauge was deployed at each location;
- Any periods of elevated background noise levels which were not considered representative of the location were identified and excluded from analysis; and
- The GPG recommends at least 200 valid data points in each quiet daytime and night-time period for each monitoring location, after exclusions are taken into account. This was exceeded at all monitoring locations.

Survey record sheets and calibration certificates for noise and wind monitoring equipment used during the survey are included in **Technical Appendix A12.2: Background Noise Survey Record Sheets**.

Noise monitoring commenced at both locations on the 17th June 2022, however upon servicing the equipment on the 7th July 2022 it was apparent the sound level meter at Glenmaddie had encountered a technical fault. Sufficient data was found to have been obtained at Euchan Cottage so the equipment was relocated to Glenmaddie and the survey restarted on 7th July 2022. Monitoring at Glenmaddie continued until 28th July 2022 to capture sufficient data in accordance with the GPG.

Table 12.4 details the baseline noise monitoring locations. Further detail is provided in **Technical Appendix A12.2: Background Noise Survey Record Sheets**.

Table 12.4 Baseline Noise Monitoring Locations

Location Name	Easting	Northing	Description of Location
Glenmaddie	274233	607191	Open space adjacent to the residence
Euchan Cottage	275702	608126	Edge of residential amenity space

The background noise data were analysed according to the following process:

- Synchronisation of measured noise level ($L_{A90,10min}$), 10 m standardised wind speed, wind direction and rainfall data, correcting for differences in the timestamp averaging period (i.e., start or end of the 10-minute period) and daylight savings time (GMT/BST) for each;
- Exclusion of any 10-minute periods where rainfall was recorded, (including the preceding 10-minute period), and any other atypical periods judged to have been affected by rainfall (referred to in **Charts 12.1 to 12.6** 'additional exclusions');
- Elimination of any periods where the sound level meters recorded 'over-range' measurements as these are likely to be associated with short-duration, high intensity noise events or sources, such as machinery which may not be typical of the background noise environment;
- Exclusion of any data points which were considered 'outliers' relative to the overall dataset, located above the resulting trendline;
- Sorting of data into 'quiet daytime' and night-time periods, as defined in ETSU-R-97;
- Preparation of an X-Y scatter plot of measured noise levels against standardised 10 m wind speed for quiet daytime and night-time periods;
- Application of a polynomial trendline to the plot, using Microsoft Excel's 'Trendline' function. In all cases, the use of third order polynomial trendlines was considered most appropriate; and
- Determination of the prevailing background noise levels from the trendline curves.

12.4.3 Background Noise Levels

Charts 12.1 to 12.4 detail the results of the background noise data analysis for each location, for quiet daytime and night periods, as defined in ETSU-R-97.

Chart 12.1 Quiet Daytime – Glenmaddie

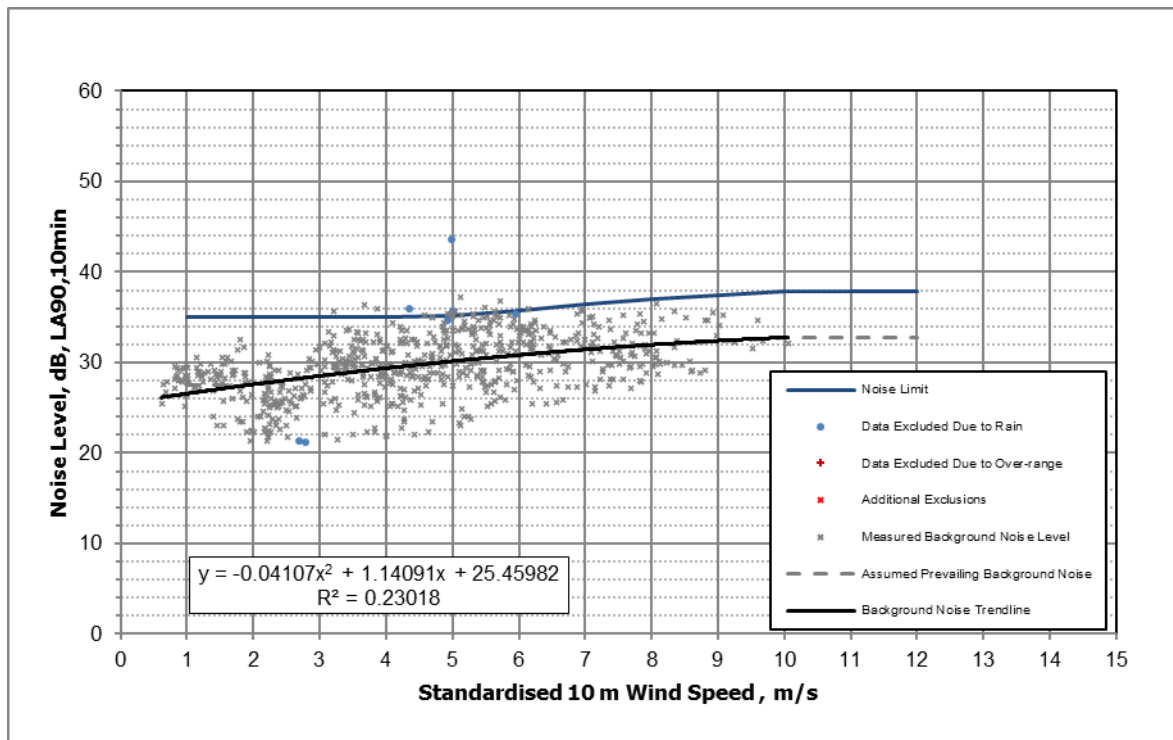


Chart 12.2 Night-time – Glenmaddie

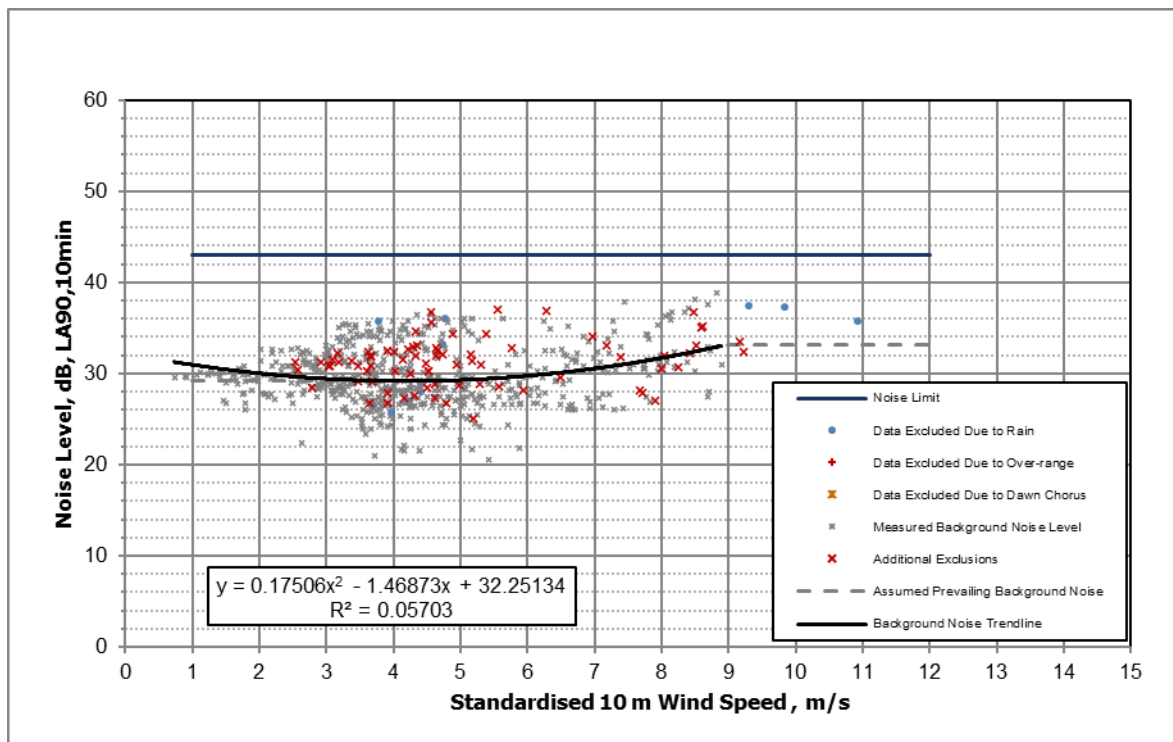


Chart 12.3 Quiet Daytime – Euchan Cottage

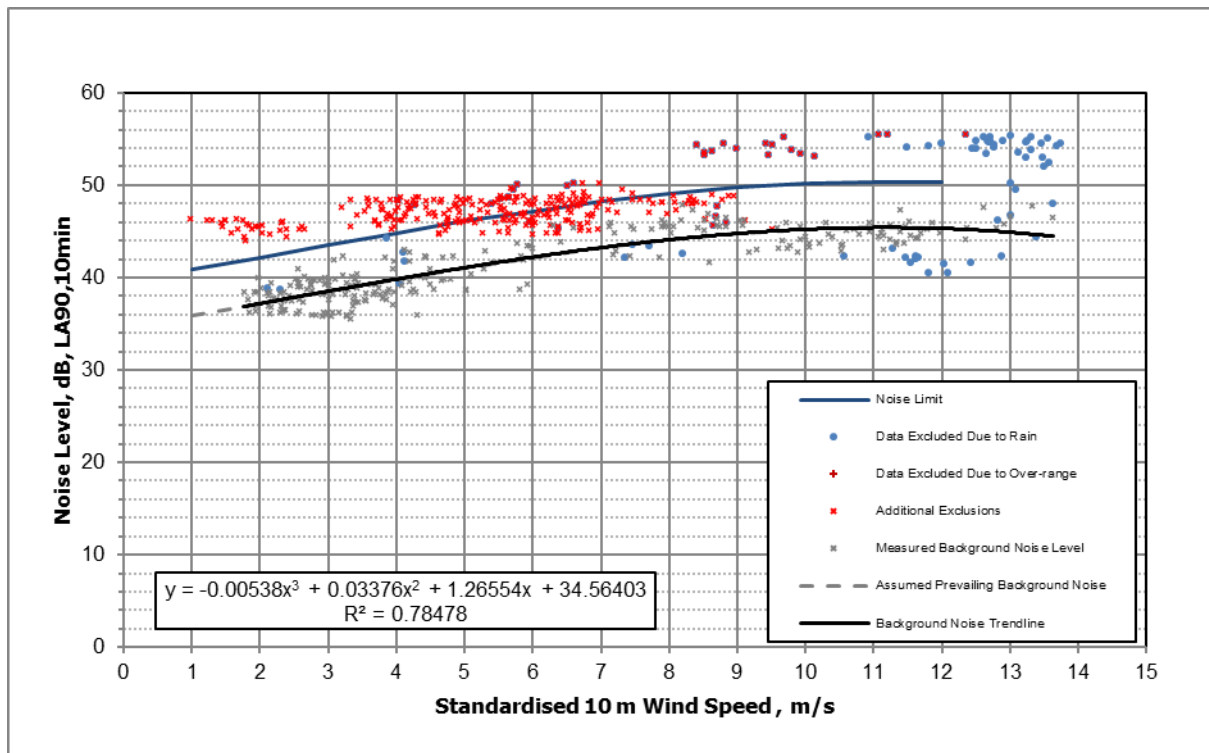
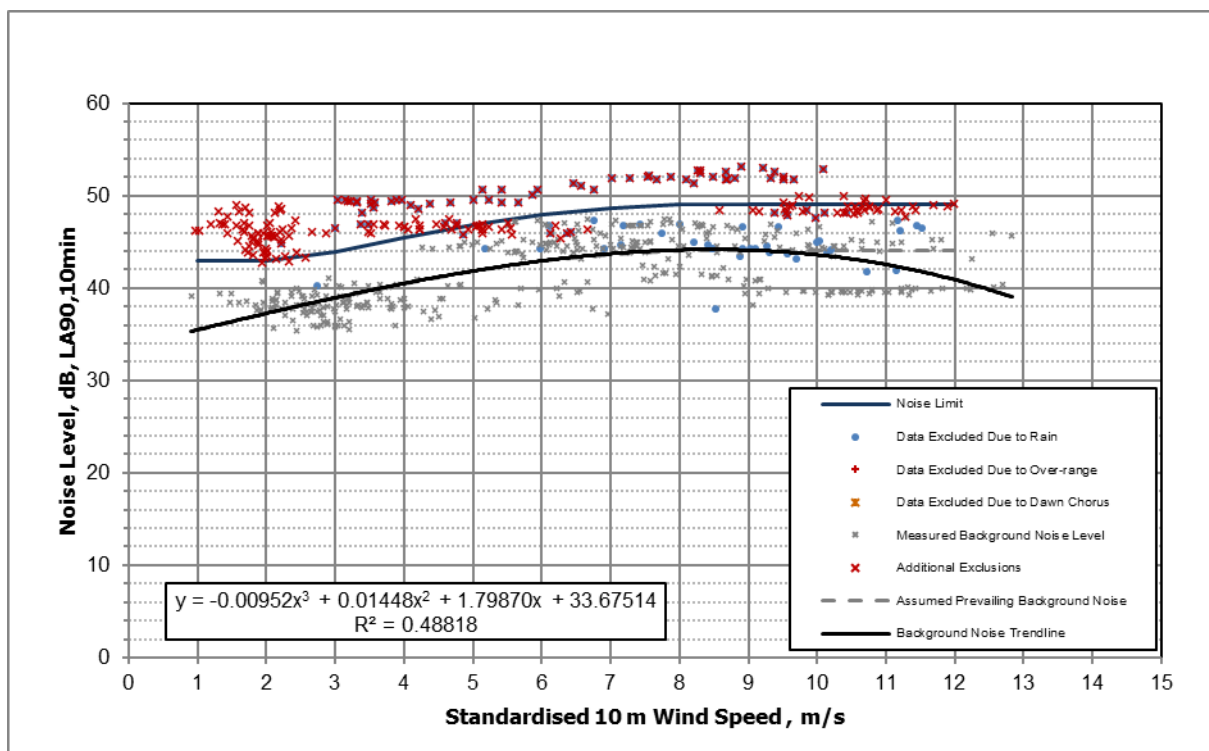


Chart 12.4 Night-time – Euchan Cottage



In accordance with GPG advice, where the prevailing background noise curve was found to increase at lower wind speeds, the prevailing background noise level has been fixed at the minimum level. Conversely, where insufficient data was available to determine the background noise level at higher wind speeds (i.e., fewer than 5 data points within each wind speed bin), the prevailing background

noise level has been capped at the level for which sufficient data was available, as a conservative approach.

In addition to the two monitoring locations described above, it was agreed with the Council that baseline noise levels at Shiel and Polgown would be taken from the submitted Sanquhar II EIA (ECU Ref: EC00002070). It should be noted that as stated in the Sanquhar II EIA-R, if the Sanquhar II development is consented then Sheil and Polgown will be no longer be inhabited and as such are not noise sensitive receptors under this scenario.

During initial modelling carried out for scoping, it was found that predicted noise levels at Barmoor Cottages will be less than 30 dB(A) $L_{A90,10min}$, however it is located in close proximity to the cumulative 35 dB(A) $L_{A90,10min}$ contour (see **Figure 12.2**). As agreed with the Council during consultation it was agreed that given the 40 dB(A) $L_{A90,10min}$ cumulative fixed lower limit, that a baseline survey would not be required at this location.

12.4.3.1 Correction for Operational Turbines

It is a key principle of the ETSU-R-97 methodology that noise from operational wind turbines should not be regarded as a component of background noise. Therefore, in order to ensure all contributions from existing wind turbines were fully excluded, the existing level of wind turbine noise at each noise monitoring location was predicted through modelling and used to correct the measured background levels.

Wind turbine noise levels at the time of the baseline monitoring (i.e., noise due to the operational developments listed in **Section 12.3.3.3**) were calculated in accordance with the GPG, following the procedure described in **Section 12.2.2.4**. Details of the noise emission data for the operational wind farms are presented in **Technical Appendix A12.1: Cumulative Turbine Noise Emission Data**.

For certain locations and wind speeds, it was found that due to the inherent conservatism in the GPG modelling parameters, predicted noise levels were in excess of the measured background noise level, or sufficiently close to the measured levels that a logarithmic subtraction could not be performed accurately (i.e., within 3 dB as advised in SGN 5 of the GPG). In such instances, the corrected background level was assumed to be 3 dB below the measured background level, on the assumption that the level of wind turbine noise is equal to the level of background noise. This approach is supported by the fact that no wind turbine noise was audible at any monitoring location during site visits (see **Technical Appendix A12.2: Background Noise Survey Record Sheets**), suggesting that in practice, the level of existing wind turbine noise is similar to or below the level of background noise. In all other cases, the predicted noise level was logarithmically subtracted from the measured level.

Table 12.5 details this process for the datasets captured at each survey location, for daytime and night-time periods. The corrected background noise levels, highlighted in bold, were then used to derive the ETSU-R-97 limits, as presented in **Table 12.7**.

Table 12.5 Prevailing Background Noise Levels

	Standardised 10 m Wind Speed, ms-1									
	3	4	5	6	7	8	9	10	11	12
	Prevailing Background Noise Level, dB, LA90,10min									
Glenmaddie										
Quiet Daytime										
Measured Background Level	28.5	29.4	30.1	30.8	31.4	32.0	32.4	32.8	32.8	32.8
Existing Turbine Noise Level	27.2	31.4	35.8	38.4	39.7	39.7	39.8	39.8	39.8	39.8

	Standardised 10 m Wind Speed, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Prevailing Background Noise Level, dB, L _{A90,10min}									
Corrected Background Level	25.5	26.4	27.1	27.8	28.4	29.0	29.4	29.8	29.8	29.8
Night-time										
Measured Background Level	29.2	29.2	29.3	29.7	30.5	31.7	33.2	33.2	33.2	33.2
Existing Turbine Noise Level	27.2	31.4	35.8	38.4	39.7	39.7	39.8	39.8	39.8	39.8
Corrected Background Level	26.2	26.2	26.3	26.7	27.5	28.7	30.2	30.2	30.2	30.2
Euchan Cottage										
Quiet Daytime										
Measured Background Level	38.5	39.8	41.1	42.2	43.2	44.1	44.8	45.2	45.4	45.4
Existing Turbine Noise Level	26.0	30.9	35.1	38.2	40.2	40.5	40.6	40.6	40.6	40.6
Corrected Background Level	38.3	39.2	39.8	40.0	40.2	41.6	42.7	43.4	43.7	43.7
Night-time										
Measured Background Level	38.9	40.5	41.8	42.9	43.7	44.1	44.1	44.1	44.1	44.1
Existing Turbine Noise Level	26.0	30.9	35.1	38.2	40.2	40.5	40.6	40.6	40.6	40.6
Corrected Background Level	38.7	40.0	40.8	41.2	41.1	41.6	41.6	41.6	41.6	41.6

12.4.3.2 Assessed Receptors

The assessed receptors are a representative selection of those located within the Study Area identified in **Figure 12.2**, and as described in **Section 12.3.8**. For each of these receptors, **Table 12.6** details the source of the respective background noise levels, from which the cumulative noise limits are derived, along with the Financial Involvement of the resident(s).

Table 12.6 Assessed Receptors

Receptor Name	Easting	Northing	Source of Background Noise Data	Financially Involved with the Development?
Barmoor Cottages	275716	609316	N/A –	No
Euchan Cottage	275702	608126	Euchan Cottage	No
Euchan Filter Station House	272966	607071	Euchan Cottage	No
Glenmaddie	274233	607191	Glenmaddie	Yes
Shiel	274527	604069	Sanquhar 2 EIAR	No
Polgown	271884	603852	Sanquhar 2 EIAR	No

12.4.3.3 Cumulative Noise Limits

Table 12.7 details the corresponding ETSU-R-97 cumulative noise limits. It is from these limits that apportioned noise limits applicable to the Proposed Development are derived.

Table 12.7 Cumulative Noise Limits

Receptor Name	Standardised 10 m Wind Speed, ms-1									
	3	4	5	6	7	8	9	10	11	12
	Cumulative Noise Limit, dB, LA90,10min									
Daytime										
Barmoor Cottages	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Euchan Cottage	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Euchan Filter Station House	43.3	44.2	44.8	45.0	45.2	46.6	47.7	48.4	48.7	48.7
Glenmaddie	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Shiel	40.0	40.0	40.0	40.0	40.0	41.0	43.0	44.0	45.0	46.0
Polgown	40.0	40.0	40.0	40.0	41.0	43.0	45.0	47.0	48.0	50.0
Night-time										
Barmoor Cottages	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Euchan Cottage	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Euchan Filter Station House	43.7	45.0	45.8	46.2	46.1	46.6	46.6	46.6	46.6	46.6
Glenmaddie	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Shiel	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0	46.0	48.0
Polgown	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.0	46.0	47.0

12.5 Assessment of Potential Effects

12.5.1 Construction Traffic Noise

Table 12.8 and **Table 12.9** provide the results for the estimated worst-case increase in traffic flows for each location for both days where there are no concrete deliveries, and where concrete deliveries will take place. The resulting magnitude of effect as described in **Section 12.3.2.3** is also included.

Table 12.8 Predicted Construction Traffic Noise Effects – Non-concrete Day

Location	Change in Traffic Noise Level, dB	Magnitude of Effect
A76, North of Cumnock	0.4	Negligible
A70, West of Ochiltree	0.4	Negligible
A76, West of New Cumnock	0.5	Negligible
A76 East of New Cumnock	1.0	Minor
A76 Kirkconnel	0.6	Negligible
A76 South of Sanquhar,	0.9	Minor
A76 Thornhill,	0.7	Negligible
Blackaddie Road	Baseline flows <1000, see below	
U540N	Baseline flows <1000, see below	

It can be seen from **Table 12.8** that the predicted change in the level of road traffic noise during construction of the Proposed Development is less than 3 dB in all cases with effects being **negligible** or **minor**. As such, construction traffic noise effects are **not significant** in terms of the EIA Regulations.

Table 12.9 Predicted Construction Traffic Noise Effects – Concrete Day

Location	Change in Traffic Noise Level, dB	Magnitude of Effect
A76, North of Cumnock	1.3	Minor
A70, West of Ochiltree	1.5	Minor
A76, West of New Cumnock	1.7	Minor
A76 East of New Cumnock	3.1	Moderate
A76 Kirkconnel	2.2	Minor
A76 South of Sanquhar,	2.9	Minor
A76 Thornhill,	2.4	Minor
Blackaddie Road	Baseline flows <1000, see below	
U540N	Baseline flows <1000, see below	

As detailed in **Chapter 13 – Access, Transport and Traffic**, the traffic flows during non-concrete and concrete days at all locations are predicted to be higher than 1000 vehicles/day with exception of the junctions at Blackaddie Road and U540N. The CRTN calculation method cannot be used where traffic flows are lower than 1000 vehicles/day so it is therefore not appropriate to assess effects at Blackaddie Road and U540N, in terms of the change in traffic noise level. Noise levels due to traffic at these locations has therefore been calculated at 10 m from the road using the BS 5228 methodology and assessed using criteria described in BS 5228.

Table 12.10 and **Table 12.11** detail the results of this process for peak month periods with and without concrete deliveries.

Table 12.10 Predicted Construction Traffic Noise Effects – Non-concrete Day

Location	Predicted Noise Level, dB, LAeq

Blackaddie Road	59.4
U540N	55.7

Table 12.11 Predicted Construction Traffic Noise Effects – Concrete Day

Location	Predicted Noise Level, dB, LAeq
Blackaddie Road	61.6
U540N	59.8

It can be seen from **Table 12.8 to Table 12.11** that on non-concrete days:

- The predicted change in noise levels at all locations with a predicted flow of more than 1000 vehicles/day is negligible or minor; and
- The predicted noise level at the locations with predicted flows of less than 1000 vehicles/day (Blackaddie Road and U540N) is below 65 dB(A).

On Days where there would be deliveries of concrete:

- The predicted change in noise levels at all locations with a predicted flow of more than 1000 vehicles/day is minor with exception of A76 East of Cumnock which is predicted to be moderate; and
- The predicted noise level at the locations with predicted flows of less than 1000 vehicles/day (Blackaddie Road and U540N) is below 65 dB(A).

Effects on days without concrete deliveries, and days with concrete deliveries would therefore be **not significant** in terms of the EIA Regulations with exception of the A76 East of Cumnock which is predicted to be **significant** on concrete days. Mitigation for this effect is discussed in **Section 12.6.1**.

12.5.2 Operational Noise

12.5.2.1 Calculation of Apportioned Noise Limits

The cumulative developments included in this assessment are detailed in **Section 12.3.3.3**. When assessing cumulative noise levels, consideration should be given to any noise limits or other noise-related planning conditions applicable to each development. Where there is no reasonable prospect of a cumulative development producing noise levels up to its consented (or proposed) limits, the GPG recommends that predicted noise levels should be used along with an additional safety margin. This approach prevents the sterilisation of an area in which existing wind turbine noise levels are substantially lower than the ETSU-R-97 limits, enabling further appropriate development to be considered. An additional safety margin of 2 dB has therefore been applied to the noise emissions of each cumulative development, on top of the required addition for uncertainty (typically a further 2 dB). Where this additional safety margin results in predicted noise levels greater than the applicable noise limit at a given wind speed, noise emission levels have been set such that the limit is just met at that wind speed.

Details of the noise emission data for each cumulative development are presented in **Technical Appendix A12.1: Cumulative Turbine Noise Emission Data**, detailing the required adjustments in each instance.

Table 12.12 and **Table 12.13** detail the predicted ‘adjusted’ cumulative noise levels (excluding noise due to the Development) for each of the assessed receptors identified in **Table 12.6**. As discussed in **Section 12.3.3.3**, given that the Sanquhar II development is currently undetermined, two cumulative scenarios have been considered including contribution from Sanquhar II (**Table 12.9**) and excluding Sanquhar II (**Table 12.13**; 3). As discussed in **Section 12.3.3.3**, the consented Sanquhar Six development is included in the scenario where Sanquhar II is not consented and excluded in the

scenario where Sanquhar II is consented. This is due to the inclusion of the proposed Sanquhar Six turbines in the Sanquhar II development.

As detailed in the EIAR for Sanquhar II, it is noted that should the Sanquhar II development be consented, Shiel and Polgown will become permanently uninhabited. Therefore, and as agreed through consultation with the Council, these properties are excluded from assessment of this scenario.

It should be borne in mind that as the noise assessment follows GPG advice with regard to cumulative noise effects, the noise levels presented in these tables are a theoretical worst case; a number of conservative assumptions have been made as detailed in the previous Sections of this Chapter, such as the assumption that each receptor is directly downwind of all turbines simultaneously, which cannot occur in practice.

Table 12.12 Predicted Cumulative Noise Levels – incl. Sanquhar II

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Noise Level, dB, L _{A90,10min}									
Barmoor Cottages	18.2	25.0	28.3	31.4	33.5	33.9	33.6	34.3	34.3	34.3
Euchan Cottage	17.4	24.0	27.2	30.2	32.3	32.7	32.6	33.1	33.1	33.1
Euchan Filter Station House	24.3	30.7	34.4	37.8	40.3	40.7	40.9	41.1	41.1	41.1
Glenmaddie	21.2	27.1	30.5	33.7	35.9	36.3	36.3	36.7	36.7	36.7

Table 12.13 Predicted Cumulative Noise Levels – excl. Sanquhar II

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Noise Level, dB, L _{A90,10min}									
Barmoor Cottages	16.2	23.5	27.3	30.8	32.9	33.3	32.8	33.7	33.7	33.7
Euchan Cottage	14.8	21.9	25.8	29.2	31.5	31.9	31.6	32.3	32.3	32.3
Euchan Filter Station House	22.0	28.8	32.7	36.3	39.0	39.5	39.4	39.7	39.7	39.7
Glenmaddie	19.0	25.1	29.0	32.5	35.0	35.3	35.1	35.6	35.6	35.6
Shiel	16.6	22.8	26.8	30.2	32.6	33.0	32.9	33.2	33.2	33.2
Polgown	19.5	29.5	33.4	36.8	39.8	40.3	40.4	40.5	40.5	40.5

12.5.2.2 Apportioned Noise Limits

Cumulative noise effects have been assessed through the derivation of apportioned noise limits. Apportioned noise limits are created by logarithmically subtracting the cumulative noise levels (i.e., excluding noise due to the Proposed Development), from the cumulative noise limits. The result is the remaining noise budget available to the Proposed Development. Should no additional noise budget be available at a given property, limits at that property for noise due to the Proposed Development are set 10 dB below the cumulative noise limit, ensuring that any contribution to cumulative noise due to the Proposed Development is negligible.

As noted in **Section 12.3.3.3**, the daytime apportioned noise limits have not been considered to be a simply portion of a cumulative noise limit based upon a daytime fixed lower limit of 40 dB; as such, and as a final step, the daytime apportioned limits have been corrected down to ensure they do not exceed the limit for the Proposed Development in isolation of 35 dB LA90,10min, or 5 dB above background (the most stringent under ETSU-R-97 methodology), taking account of the financially involved status of Glenmaddie.

The resulting apportioned limits applicable to the Proposed Development in isolation are presented in **Table 12.14** and **Table 12.15**, based upon the two cumulative scenarios described in **Section 12.5.2.1**. These limits may be presented in the planning conditions of any consent for the Development and will ensure the Proposed Development's compliance with ETSU-R-97 when considered both individually and cumulatively, regardless of the outcome of the Sanquhar II application process.

Table 12.14 Noise Limits Applicable to the Proposed Development in Isolation – incl. Sanquhar II

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Noise Level, dB, L _{A90,10min}									
Daytime										
Barmoor Cottages	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Euchan Cottage	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Euchan Filter Station House	43.2	44.0	44.4	44.1	43.6	45.3	46.6	47.5	47.8	47.8
Glenmaddie	45.0	44.9	44.8	44.7	44.4	44.4	44.4	44.3	44.3	44.3
Night-time										
Barmoor Cottages	43.0	42.9	42.9	42.7	42.5	42.4	42.5	42.4	42.4	42.4
Euchan Cottage	43.0	42.9	42.9	42.8	42.6	42.6	42.6	42.5	42.5	42.5
Euchan Filter Station House	43.7	44.8	45.5	45.5	44.8	45.4	45.2	45.1	45.1	45.1
Glenmaddie	45.0	44.9	44.8	44.7	44.4	44.4	44.4	44.3	44.3	44.3

**Table 12.15 Noise Limits Applicable to the Proposed Development in Isolation
– excl. Sanquhar II**

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Noise Level, dB, L _{A90,10min}									
Daytime										
Barmoor Cottages	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Euchan Cottage	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Euchan Filter Station House	43.2	44.1	44.5	44.4	44.1	45.7	47.0	47.7	48.1	48.1
Glenmaddie	45.0	45.0	44.9	44.7	44.6	44.5	44.5	44.5	44.5	44.5
Shiel	35.0	35.0	35.0	37.0	39.1	40.3	42.6	43.6	44.7	45.8
Polgown	35.0	36.0	38.0	37.2	34.8	39.7	43.2	45.9	47.1	49.5
Night-time										
Barmoor Cottages	43.0	43.0	42.9	42.7	42.6	42.5	42.6	42.5	42.5	42.5
Euchan Cottage	43.0	43.0	42.9	42.8	42.7	42.6	42.7	42.6	42.6	42.6
Euchan Filter Station House	43.7	44.9	45.6	45.7	45.2	45.7	45.6	45.6	45.6	45.6
Glenmaddie	45.0	45.0	44.9	44.7	44.6	44.5	44.5	44.5	44.5	44.5
Shiel	43.0	43.0	42.9	42.8	42.6	42.6	42.6	44.7	45.8	47.9
Polgown	43.0	42.8	42.5	41.8	40.2	39.7	39.5	41.4	44.6	45.9

12.5.2.3 Predicted Noise Levels due to the Proposed Development

Table 12.16 details the predicted noise emission levels due to the operation of the Development, following the methodology described in **Section 12.3.3.2**, and using the noise immission data presented in **Section 12.3.9**. It is of note that predicted noise levels are theoretical worst-case, based upon the assumption that each receptor is directly downwind of all turbines simultaneously, which cannot occur in practice.

Table 12.16 Predicted Operational Noise Levels due to the Development

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB, L _{A90,10min}									
Barmoor Cottages	15.8	19.8	24.3	26.7	27.6	27.6	27.6	27.6	27.6	27.6
Euchan Cottage	18.0	22.0	26.5	28.9	29.8	29.8	29.8	29.8	29.8	29.8
Euchan Filter Station House	23.9	27.9	32.4	34.8	35.7	35.7	35.7	35.7	35.7	35.7
Glenmaddie	26.6	30.6	35.1	37.5	38.4	38.4	38.4	38.4	38.4	38.4
Shiel	24.8	28.8	33.3	35.7	36.6	36.6	36.6	36.6	36.6	36.6
Polgown	21.9	25.9	30.4	32.8	33.7	33.7	33.7	33.7	33.7	33.7

Table 12.17 details the difference (margin) between predicted noise immission levels (6) and the apportioned noise limits (4) for the assessed receptors assuming Sanquhar II is consented. As noted in **Section 12.5.2.1**, Shiel and Polgown will not be inhabited in this scenario and are therefore not noise-sensitive receptors. A negative margin indicates that the predicted noise level is below the derived noise limit.

Table 12.17 Margin between Predicted Development Turbine Noise and Apportioned Noised Limits – Assuming Sanquhar II Consented

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Margin, dB									
Daytime										
Barmoor Cottages	-19.2	-15.2	-10.7	-8.3	-7.4	-7.4	-7.4	-7.4	-7.4	-7.4
Euchan Cottage	-17.0	-13.0	-8.5	-6.1	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2
Euchan Filter Station House	-19.3	-16.1	-12.0	-9.3	-7.9	-9.6	-10.9	-11.8	-12.1	-12.1
Glenmaddie (Financially Involved)	-18.4	-14.3	-9.7	-7.2	-6.0	-6.0	-6.0	-5.9	-5.9	-5.9
Night-time										
Barmoor Cottages	-27.2	-23.1	-18.6	-16.0	-14.9	-14.8	-14.9	-14.8	-14.8	-14.8
Euchan Cottage	-25.0	-20.9	-16.4	-13.9	-12.8	-12.8	-12.8	-12.7	-12.7	-12.7

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Margin, dB									
Euchan Filter Station House	-19.8	-16.9	-13.1	-10.7	-9.1	-9.7	-9.5	-9.4	-9.4	-9.4
Glenmaddie (Financially Involved)	-18.4	-14.3	-9.7	-7.2	-6.0	-6.0	-6.0	-5.9	-5.9	-5.9

Table 12.18 details the difference (margin) between predicted noise immission levels (6) and the apportioned noise limits (3) for the assessed receptors assuming Sanquhar II is not consented. Again, a negative margin indicates that the predicted noise level is below the derived noise limit.

Table 12.18 Margin between Predicted Development Turbine Noise and Apportioned Noised Limits – Assuming Sanquhar II Not Consented

Receptor	Standardised Wind Speed at 10 m AGL, ms ⁻¹									
	3	4	5	6	7	8	9	10	11	12
	Margin, dB									
Daytime										
Barmoor Cottages	-19.2	-15.2	-10.7	-8.3	-7.4	-7.4	-7.4	-7.4	-7.4	-7.4
Euchan Cottage	-17.0	-13.0	-8.5	-6.1	-5.2	-5.2	-5.2	-5.2	-5.2	-5.2
Euchan Filter Station House	-19.3	-16.2	-12.1	-9.6	-8.4	-10.0	-11.3	-12.0	-12.4	-12.4
Glenmaddie	-18.4	-14.4	-9.8	-7.2	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Shiel	-10.2	-6.2	-1.7	-1.3	-2.5	-3.7	-6.0	-7.0	-8.1	-9.2
Polgown	-13.1	-10.1	-7.6	-4.4	-1.1	-6.0	-9.5	-12.2	-13.4	-15.8
Night-time										
Barmoor Cottages	-27.2	-23.2	-18.6	-16.0	-15.0	-14.9	-15.0	-14.9	-14.9	-14.9
Euchan Cottage	-25.0	-21.0	-16.4	-13.9	-12.9	-12.8	-12.9	-12.8	-12.8	-12.8
Euchan Filter Station House	-19.8	-17.0	-13.2	-10.9	-9.5	-10.0	-9.9	-9.9	-9.9	-9.9
Glenmaddie	-18.4	-14.4	-9.8	-7.2	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1
Shiel	-18.2	-14.2	-9.6	-7.1	-6.0	-5.9	-6.0	-8.1	-9.2	-11.3
Polgown	-21.1	-16.9	-12.1	-9.0	-6.5	-6.0	-5.8	-7.7	-10.9	-12.2

As **Table 12.17** and **Table 12.18** show, worst-case noise levels due to the Development do not result in any exceedances of the apportioned limits at any wind speed in either scenario. The Proposed Development is therefore able to operate in compliance with the requirements of ETSU-R-97 and as such will not require any mitigation.

12.6 Mitigation and Residual Effects

12.6.1 Construction Noise and Vibration

Where practicable, the use of on-site concrete batching and use of borrow pits should be considered in order to reduce traffic numbers and therefore noise. Where this is not practicable, information should be provided to residents and communities located along the A76 regarding the dates and times of concrete deliveries. Information may be provided in a variety of means such as: the Development website, local newspapers, posters, signage and direct mailing. Distributing construction traffic along different routes to minimise increases in HGV traffic numbers along any one route should also be considered. The above mitigation measures, in addition to the short duration of the concrete deliveries at any one time (less than one month), will reduce the impact of construction traffic noise to **not significant**.

Whilst no noise and vibration impacts from non-traffic related construction and decommissioning of the Proposed Development are anticipated, the good practice measures detailed below will be implemented ensure no effects arise during these operations, and will be required of all contractors:

- Construction operations shall be limited to times agreed with the Council;
- Deliveries of turbine components, plant and materials by HGV to Site shall only take place within times agreed with the Council;
- The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as advocated in BS 5228-1:2009;
- Where practicable, the work programme will be phased, which would help to reduce the combined effects arising from several noisy operations;
- Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens;
- All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions;
- Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g., abnormal load movement; and
- Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g. generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, $L_{Aeq,night}$ shall not be exceeded at the nearest noise-sensitive receptors.

In the event that stone is required to be extracted from borrow pits by blasting, the following process would be employed to ensure that the effects of blasting noise and vibration on nearby properties are adequately controlled:

- Compliance with planning conditions specifying limits to vibration resulting from blasting, restrictions on times of blasting, and a requirement for vibration monitoring;
- Preparation of a Scheme of Blasting, which will be submitted to the Council for approval prior to the commencement of any blasting;
- Any blasting on-site would only take place between the hours of 10:00 to 16:00 on Monday to Friday inclusive and 10:00 to 12:00 on Saturdays, with no blasting taking place on a Sunday unless otherwise approved in advance in writing by the Council; and
- Provision of information on blasting to neighbouring residents.

Application of the above measures to manage construction noise will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant legislation.

12.6.2 Operational Noise

The Development is able to operate in compliance with the requirements of ETSU-R-97 without additional mitigation. Residual effects are the same as the operational effects.

12.7 Cumulative Effect Assessment

In accordance with ETSU-R-97 and the GPG, cumulative operational noise effects are inherent within the assessment of operational noise effects and are not significant in terms of the EIA Regulations.

12.8 Summary of Effects

An assessment of potential noise effects associated with the Proposed Development has been carried out.

Construction noise will be limited in duration and confined to working hours as specified by the Council and therefore can be adequately controlled through the application of good practice measures and secured by planning condition. This will ensure that any noise from during construction will be adequately controlled with no significant effects subject to implementation of the mitigation measures for construction traffic.

Operational noise has been assessed in accordance with ETSU-R-97 and in line with current best practice (i.e., the GPG). It has been shown that the Proposed Development would comply with the requirements of ETSU-R-97 at all receptor locations.

The cumulative effects of the Proposed Development in conjunction with nearby wind energy developments either operational, consented or the subject of a current planning application were taken into consideration in the above assessment, in accordance with ETSU-R-97 and the GPG.

Noise during decommissioning will be of a similar nature to that of construction and will be managed through best practice or other guidance or legislation relevant at the time.

12.9 Statement of Significance

The application of best practice and mitigation measures where applicable will ensure that any noise from construction works will be adequately controlled such that construction noise effects are **not significant**.

Construction traffic noise effects have been found to be **not significant** in terms of the EIA Regulations with exception of effects on concrete delivery days which have been found to be **significant** at one location: A76 East of New Cumnock. Mitigation is recommended in the form of on-site batching where possible and/or provision of information to residents and communities along the A76 East of New Cumnock as well as the distribution of traffic along different routes where possible. The effect of construction traffic noise is therefore considered **not significant**.

The effect of operational noise has been assessed using the methodology described in ETSU-R-97 and the GPG and found to be within the apportioned limits and as such are acceptable. The effect of operational noise is therefore **not significant**.

Noise during decommissioning will be managed to ensure compliance with best practice, legislation and guidelines current at the time in order to ensure that effects are **not significant**.

13. ACCESS, TRAFFIC AND TRANSPORTATION

13.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on the Access, Traffic & Transport resource. Vehicle movements to the Development Site (the Site) will likely consist of abnormal load vehicles (for the delivery of turbine components), heavy goods vehicles (HGV), light goods vehicles (LGV) and cars. This assessment was undertaken by ERM Ltd.

This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in **Volume 3: Technical Appendices**:

- Technical Appendix A13.1: Abnormal Load Route Assessment (ALRA); and
- Technical Appendix A13.2: Construction Development Programme.

This Chapter of the EIA Report is also supported by the following figures provided in **Volume 2a: EIA Figures excluding LVIA**:

- **Figure 13.1:** Abnormal Load Route to Site;
- **Figure 13.2:** General Construction Traffic Route to Site;
- **Figure 13.3:** Traffic Count Locations;
- **Figure 13.4a, b and c:** Road Traffic Collision (RTC) Assessment; and
- **Figure 13.5:** Site Access Junction

This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Future Baseline Scenarios;
- Anticipated Construction Development Traffic;
- Assessment of Potential Effects;
- Cumulative Effect Assessment;
- Mitigation and Residual Effects;
- Summary of Effects; and
- Statement of Significance.

13.2 Legislation, Policy, and Guidance

The following guidance, legislation and information sources outlined in **Table 13.1** below have been considered in carrying out this assessment:

Table 13.1 Legislation, Policy, and Guidance

Author	Title	Policy
The Scottish Government	The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ³⁷⁶ ('the EIA Regulations')	This provide the legal framework for the assessment of the likely significant environmental impacts of the Proposed Development.
The Scottish Government	National Planning Framework 4 (2023) ³⁷⁷	This provides a statement of the Scottish Government's policy on nationally important land use planning matters. In terms of transport, development proposals should consider the impact on road traffic and on adjacent trunk roads including construction.
The Scottish Government	National Transport Strategy ³⁷⁸	This document provides an overview of the Scottish National Transport Strategy 2, which discusses sustainable freight movements.
The Scottish Government	Planning Advice Note 75 (PAN 75) – Planning for Transport ³⁷⁹	Provides guidance on sustainable transport planning in the context of new and existing development. The document also indicates that all planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail is to be proportionate to the complexity and scale of impact of the development.
Institute of Environmental Management and Assessment (IEMA, 1993)	Guidelines for the Environmental Assessment of Road Traffic ³⁸⁰	Sets out guidelines for determining the appropriate and significance of traffic effects as a result of a proposed development. The document focuses on the assessment of potential environmental effects associated with road traffic.
Dumfries and Galloway Council	Adopted Local Development Plan 2 (2019) Adopted Guidelines for the Environmental Assessment of Road Traffic ³⁸¹	This document provides the planning framework and guides the future use and development of land in towns, villages, and the rural area. In terms of transport, developments should consider accessibility issues early on and incorporate appropriate on and/or off-site mitigation measures, where required provided through developer contributions where necessary.

13.3 Assessment Methodology and Significance Criteria

13.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 13.2**.

³⁷⁶ The Scottish Government (2017) The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 10/02/2023)

³⁷⁷ The Scottish Government (2023) National Planning Framework 4 [Online] Available at: [National Planning Framework 4 \(www.gov.scot\)](https://www.gov.scot/publications/national-planning-framework-4/pages/1/) (Accessed 09/05/2023)

³⁷⁸ The Scottish Government (2020) – Scottish National Transport Strategy 2 [Online] Available at: <https://www.transport.gov.scot/publication/national-transport-strategy-2/> (Accessed 09/05/2023)

³⁷⁹ The Scottish Executive (2005). Planning Advice Note, PAN 75, Planning for Transport. Available at: <https://www.gov.scot/binaries/content/documents/govscot/publications/publication/2005/08/planning-advice-note-pan-75-planning-transport/documents/0016795-pdf/0016795-pdf/govscot%3Adocument>. (Accessed on 09/05/2023)

³⁸⁰ Institute of Environmental Assessment – Guidelines for the Environmental Assessment of Road Traffic

³⁸¹ Dumfries and Galloway Adopted Local Development Plan 2 (2019) Available at ([Local Plan 2](#)) (Accessed 07/07/2023)

Table 13.2 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Dumfries and Galloway Council ('the Council')	Scoping Response 21/02/2023	1. Confirmation of access route arrangements and detailed proposals for any site accesses will require to be submitted as part of any future application.	This is included as Figure 13.5
		2. It would be appropriate that any future application identify the full extent of any proposed off-site road accommodation and mitigation works on public roads including passing place provision, carriageway strengthening, widening and alterations to road boundaries all along any proposed access routes necessary to permit construction traffic and the passage of component delivery vehicles (if this requires land out with the public road boundary a separate planning application may be required in respect of these works) and the potential impacts on utility services lying within the public road boundary.	Noted. The Applicant would seek to engage in dialogue with the Council to address this particular matter separately. Assessment of physical condition of roads is beyond the scope of the EIA and this work, if required, will be undertaken post consent, and is secured through an appropriately worded condition of consent.
		3. It would be appropriate that any future submission/Environmental Statement include reference to a Traffic Management Plan (to be agreed in writing with the Police and the Roads Authority prior to any works commencing on site) that should include a programme of projected traffic movements associated with the project by programme month and vehicle type, details of all proposed mitigation measures, agreed and excluded access routes by vehicle type, enforcement measures (driver code of conduct and disciplinary action) and details of measures that will be implemented to ensure that no stacking of delivery vehicles occur on any part of the public road network.	Noted. The structure of the outline Traffic Management Plan is included in Section 13.9 of this EIA Report and will be finalised post consent. It is requested that the detailed TMP to be undertaken post consent is secured through an appropriately worded condition of consent.
		4. Any future submission/ES should include worst-case (100%) details of tonnages and vehicle movements so that the potential impact of importing aggregate from elsewhere via the public road network be assessed.	Noted. This Chapter of the EIA Report considers any potential effects of increased traffic (worst case) on both trunk and Council maintained roads and adjacent communities along the delivery routes.
		5. Routes leading to the site may cross several bridges/structures, some of which may be unsuitable for heavy HGVs and	Noted. The Applicant would seek to engage in dialogue with the Council and Transport Scotland to address this particular matter

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		larger AILs, and that have limitations on safe axle loadings and/or restricted parapet widths. Where a proposed access route crosses bridges and culverts, the applicant will require to get approvals and safe axle loadings (in respect of those structures) from the Engineering Services (Bridges and Structures) unit. Any alterations to bridges or any other affected structures would require Approval in Principle from the and Structures unit.	separately. Assessment of physical condition of roads and structural integrity of bridges etc. is beyond the scope of the EIA and it is requested that this work, if required, is undertaken post consent, and is secured through an appropriately worded condition of consent.
Transport Scotland	Scoping Response 24/05/2022	1. Transport Scotland is satisfied with the methodology being adopted in assessing the potential environmental impacts and are content that no further assessment is required if the above thresholds are not exceeded. It is noted that any potential impacts associated with both the operational and decommissioning phases of the development are to be scoped out of the forthcoming EIAR. We would consider this to be acceptable in this instance.	No action required.
		2. A full Abnormal Loads Assessment report should be provided with the EIAR. Swept path analysis should be undertaken and details provided with regard to any required changes to street furniture or structures along the route	An initial ALRA which considers the suitability of roads for the transport of larger wind turbine components has been undertaken and included in Technical Appendix A13.1: ALRA of the EIA Report. However, a final ALRA will be undertaken for the final selected turbine and route in advance of deliveries commencing. A meeting was held on the 10 June 2022 with Transport Scotland to discuss swept path vehicle movements from the A76 at Eliock Bridge. Access from the A76 on C125N was agreed as being acceptable to Transport Scotland.

13.3.2 Scope of Assessment

This assessment considers access, traffic, and transportation effects of the Proposed Development during the construction, operational, and decommissioning phases for the following:

- Traffic generation;
- Accidents and safety;
- Driver delay;
- Pedestrian amenity/delay;
- Severance; and

- Hazardous loads.

13.3.3 Elements Scoped Out of Assessment

As outlined in the Scoping Report and Scoping Opinion³⁸², a number of effects have been scoped out of the assessment and summarised below.

13.3.3.1 Operational Traffic

Traffic associated with operation of the Proposed Development is limited to maintenance and is expected to be insignificant in comparison to traffic generated during construction. General maintenance and site monitoring visits will likely be undertaken by car and LGVs and can be expected to be in the region of three visits per day on average. The effect of operational traffic is expected to be minimal and negligible in terms of existing traffic flow levels on routes within the vicinity of the Proposed Development. Assessment of operational traffic has therefore been scoped out of this assessment.

13.3.3.2 Decommissioning Effects

Traffic associated with decommissioning of the Proposed Development will be less than that experienced during construction, this is due to all below ground infrastructure being left in-situ. It is not possible to accurately forecast baseline traffic flow levels 40 years into the future. For the above reasons, prior to decommissioning of the Proposed Development, a traffic assessment should be undertaken, and appropriate traffic management procedures agreed with the relevant authorities at the time. As the construction phase represents a worst-case assessment, the decommissioning phase has been scoped out of this assessment.

13.3.3.3 Visual Effects

The movements of Abnormally Loaded Vehicles (ALVs) could be considered visually intrusive. This effect would be short-term and would only occur during the movement of abnormal loads. The movements of HGVs are not considered visually intrusive as it is an everyday occurrence. Any likely significant environmental effects relating to visual effects due to the Proposed Development is considered in within Volume 1 Chapter 6: Landscape and Visual Assessment of this EIA Report. The assessment of visual effects has therefore been scoped out of this assessment.

13.3.3.4 Hazardous Loads

Fuel will be regularly transported to the Site over the duration of construction of the Proposed Development. All fuel will be transported by suitably qualified contractors, and all regulations for the transportation and storage of hazardous substances will be observed. No other hazardous substances in significant quantities are expected to be transported to Site. Therefore, the assessment of on the impact of transporting hazardous loads during the construction phase is scoped out of the assessment.

13.3.3.5 Noise and Vibration

Environmental impacts arising from HGV movements will include vibration, noise, and road safety risks, however these will be temporary during the construction phase and when the Site is operational would have a negligible impact. Furthermore, ground-borne vibration resulting from HGV and ALV movements is generally only likely to be significant where vehicles traverse discontinuities, such as rough surfaces (including potholes) or speed-humps. Therefore, assessment of noise and vibration has been scoped out of this assessment.

³⁸² Available on the Scottish Governments Energy Consents Unit portal (<https://www.energyconsents.scot/>) under reference ECU00003461. (Accessed on 10/02/2023)

13.3.3.6 Air Quality

Current guidance³⁸³ on matters relating to air quality advises that significant impacts to local air quality may be found in the following cases:

- Where the road alignment will change by 5 m or more; or
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic flow (AADT) or more; or
- Heavy Duty Vehicle flows will increase by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or
- Peak hour speed will change by 20 km/hr or more.

Given the assessment of the expected volume of construction traffic, none of the above criteria have been met or exceeded. In addition, due to the temporary nature of the increase in vehicles using the proposed access route, any effects on local air quality will be short term and reversible. Therefore, the assessment of the impact of construction traffic on air quality has been scoped out of this assessment.

13.3.4 Study Area

The Proposed Development is located approximately 4.5 kilometres (km) south-west of Sanquhar. It is adjacent to the operational Whiteside Hill Wind Farm, and 3.4 km north-west of the operational Twentysilling Hill Wind Farm from the nearest turbine. The Site and the Proposed Development are wholly located within the administrative boundary of the Council.

The Study Area has been defined by the public road network in the vicinity of the Proposed Development and potential delivery corridors to be used during construction by ALVs and by general construction traffic, including HGVs and staff. These take into account the local strategic / trunk road network, sources of labour and the potential sources of construction materials, specifically stone and concrete from local quarries.

Access to the Site will be taken off the C125N (From U540N At Braefoot Cottage To C128N At Nithbank Cottage, near Ulzieside Farm) to the northwest of the Site (Grid Ref NGR 277588, 608644) as shown on **Figure 13.5: Site Access Junction**. The following Ports of Entry (PoE) have been identified as being capable of receiving turbine components: King George V (Glasgow), Rosyth or a northern English port.

The standard approach for an assessment such as this is to assess the impact on routes from the nearest major trunk road (in this case the A76(T)), therefore this assessment will primarily focus on the effect of construction traffic on roads between the A76 and the Site. Whilst all ALVs will originate from PoE the origin of general construction traffic is not currently known and is likely to be distributed throughout the region.

Two approach corridors are considered in this assessment:

- Firstly, wind turbine components will be transported as abnormal loads from an appropriate PoE; and
- The second corridor assumes the general approach route for all other construction vehicles associated with construction of the Proposed Development.

The routes are outlined in the following sections.

³⁸³ Design Manual for Road and Bridges – LA 105 Air Quality [Online] Available at: <https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90?inline=true>. (Accessed on 10/02/2023)

13.3.4.1 Abnormal Load Route

Two proposed abnormal load access routes for the delivery of components have been considered, a likely/preferred route from the south and an alternative route from the north, with the final route yet to be finalised.

Preferred Route - Southern Route

- Depending on the final PoE, traffic would eventually exit the A74(M) at Junction 22 and take the A75 eastbound towards Cuckoo Bridge Roundabout in Dumfries;
- Take the 5th exit onto the A76(T) and continue northwest bound towards Sanquhar;
- Exit the A76(T) at Eliock Bridge onto the C125N (From U540N At Braefoot Cottage To C128N At Nithbank Cottage); and
- Immediately turn right and continue on the C125N (From U540N At Braefoot Cottage To C128N At Nithbank Cottage) towards the site entrance near Ulzieside Farm.

Alternative Route - Northern Route

The PoE for the Northern Route is King George V Dock. Traffic would exit onto M8(T) westbound then to the M77(T) heading southwest towards Kilmarnock. The route then joins the A76(T) heading southeast through Cumnock and New Cumnock into Sanquhar and then turning into Blackaddie Road. Traffic would continue in a southeast direction on the C125N towards the site entrance near Ulzieside Farm.

An ALRA covering most of the preferred Southern Route has been undertaken and is contained within **Technical Appendix A13.1: ALRA** of this EIA Report.

The ALRA for the Northern Route cannot be finalised, due to known pinch points along the route where the delivery of turbine components would require the use of specialist haulage equipment in the form of a 'Blade Lift Adapter' to overcome the identified constraints. In the unlikely event that the Northern Route becomes the preferred option, a final abnormal loads assessment complete with swept path plans for pinch points along the route will be undertaken for the final selected turbine in advance of deliveries commencing. The assessment would include details of how the blade lifter would be utilised to navigate the identified pinch points.

13.3.4.2 General Approach for Construction Vehicles

Construction vehicles will approach the Site using the following route:

- Traffic would be approaching from the A76 north westbound and /or A76(T) south eastbound towards Sanquhar;
- Turn into Blackaddie Road;
- Continue Blackaddie Road southbound for approximately 600 m; and
- Turn left onto the C125N (From U540N At Braefoot Cottage To C128N At Nithbank Cottage) and continue for approximately 900 m; and
- Turn right into the site entrance junction, near Ulzieside Farm.

This route is illustrated on **Figure 13.2**.

13.3.5 Baseline Survey Methodology

Baseline traffic flow conditions were gathered from publicly available traffic counts published by the Department for Transport (DfT)³⁸⁴ located on the construction traffic route as detailed in **Section 13.3.4** and shown in **Figure 13.3**. The baseline traffic flows would inform the analysis to determine the impact of the Proposed Development proposals on the road network.

Traffic growth between the published DfT counts, and the anticipated commencement of construction of the Proposed Development (2027) was estimated by applying traffic growth factors from the National Trip End Model (NTEM) forecasts using the Trip End Model Presentation Program (TEMPro³⁸⁵) for the Scotland geographical area. The above method is an industry standard method for the determination of traffic growth factors.

Baseline traffic conditions were established via desk study and review of online mapping resources. Traffic flow capacity was estimated using information contained in the Design Manual for Roads and Bridges (DMRB) – Volume 15³⁸⁶. It is acknowledged that this document has been withdrawn, however the quoted traffic flow capacities remain the most up to date available reference source and are useful within the framework of this assessment.

13.3.6 Methodology for the Assessment of Effects

The magnitude of the change in increase in traffic flow is a function of the existing traffic volumes on routes and the percentage increase in flow as a result of the Proposed Development.

An initial screening exercise was undertaken to identify routes where an adverse effect could potentially occur. The Institute of Environmental Management and Assessment (IEMA 1993) Guidelines³⁸⁷ suggest two broad principles:

- Rule 1 – include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows (or HGVs) are predicted to increase by 10% or more.

Where the predicted increase in traffic flow is lower than these thresholds, the significance of the effects can be considered to be low and not significant with no further detailed assessments warranted. Consequently, where the predicted increase in traffic flow is greater than these thresholds, the potential effects are considered to be significant and are assessed in greater detail.

The IEMA (1993) guidelines are intended for the assessment of environmental effects of road traffic associated with major new developments giving rise to traffic generation, as opposed to short-term construction. In the absence of alternative guidance and as the traffic generation during the operational phase is very low, these guidelines have been applied to assess the short-term construction phase of the Proposed Development.

Where existing traffic levels are generally low (e.g., rural roads and some unclassified roads), any increase in traffic flow may result in a predicted increase that would be higher than the IEMA (1993) guideline thresholds. In these situations, it is important to consider any increase in terms of overall traffic flow in relation to the capacity of the road, before making a conclusion on whether the effect is significant as defined under the EIA Regulations.

³⁸⁴ UK Government (2021) Road Traffic Statistics [Online] Available at: <https://roadtraffic.dft.gov.uk/#/6/55.254/-6.053/basemap-regions-countpoints> (Accessed 10/02/23)

³⁸⁵ Department for Transport - Trip End Model Presentation Program (TEMPro) Software Version 8.0 (November 2022) using NTEM Dataset 8.0 Core Scenario.

³⁸⁶ Standards for Highways (2013) Volume 15, Economic Assessment of Road Schemes in Scotland, DMRB. Available at: <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol15/index.htm>. Accessed 10/02/2023.

³⁸⁷ Institute of Environmental Management and Assessment (1993). Guidelines for the Environmental Assessment of Road Traffic. Institute of Environmental Management and Assessment.

Any change in traffic flow which is greater than the thresholds set out in the IEMA (1993) guidelines would be subject to further analysis. The magnitude of potential impacts will be identified through consideration of receptor sensitivity against the degree of predicted change to baseline conditions, the duration and reversibility of this change and professional judgement.

13.3.6.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement. **Table 13.3** details the framework for determining the sensitivity of receptors.

Table 13.3 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has no ability to absorb change without profoundly altering its present character, is of high strategic value, or of national importance. For example: - Routes with existing high traffic levels which are at or very close to exceeding capacity; - Receptors such as populated urban areas where existing traffic levels are high and there is no capacity to absorb additional traffic flow on adjacent routes; - Strategic nationally important routes with no capacity to absorb additional traffic flow; - At severe/fatal accident hotspots where an increase in traffic flow is likely to increase the likelihood or severity of accidents; - A route with very poor pedestrian facilities and a high traffic flow level where an increase in traffic is likely to decrease pedestrian amenity severely; - At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to severely increase severance; - A receptor where due to the presence of noise and vibration inducing road surfaces (e.g. cattle grids or cobbles) close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition is likely to severely affect the perception of noise and vibration due to traffic; and - At a location where pedestrian crossing facilities are informal and where a significant change in traffic flow level might induce severe pedestrian crossing delay also where children/elderly people might frequently cross an informal crossing.
High	The receptor has little ability to absorb change without fundamentally altering its present character, is of high strategic value, or of national importance. For example: - Routes with existing high traffic levels which have little additional traffic flow capacity; - Receptors such as populated urban areas where existing traffic levels are high and there is little capacity to absorb additional traffic flow on adjacent routes; - Strategic nationally important routes with little capacity to absorb additional traffic flow; - At severe accident hotspots where an increase in traffic flow may increase the likelihood or severity of accidents; - A route with poor pedestrian facilities and a high traffic flow level where an increase in traffic is likely to decrease pedestrian amenity significantly; - At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to significantly increase severance; - A receptor where due to the presence of noise and vibration inducing road surfaces (e.g. cattle grids or cobbles) close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition may significantly affect the perception of noise and vibration due to traffic; - At a location where pedestrian crossing facilities are informal and where a significant change in traffic flow level might induce significant pedestrian crossing delay also where children/elderly people might regularly cross an informal or priority crossing.
Medium	Areas where the transport network has moderate capacity to change, without significantly altering its state. For example: - Routes with existing moderate traffic levels which have some additional traffic flow capacity; - Receptors such as populated urban areas where existing traffic levels are moderate and there is some capacity to absorb additional traffic flow on adjacent routes; - Receptors such as rural roads where existing traffic levels are moderate and there is some capacity to absorb additional traffic flow on adjacent routes; - Strategic nationally important routes with some capacity to absorb additional traffic flow;

Sensitivity of Receptor	Definition
	- At slight accident hotspots where an increase in traffic flow may increase the likelihood or severity of accidents; - A route with moderate pedestrian facilities where an increase in traffic is may decrease pedestrian amenity; - At a settlement which is bisected by a major route where a significant change in traffic flow or composition is likely to moderately increase severance; - A receptor where due to the presence a road close to a residential property or similarly sensitive receptor, a change in traffic flow or traffic composition may moderately affect the perception of noise and vibration due to traffic; and - At a location where pedestrian crossing facilities are informal or substandard and where a significant change in traffic flow level might induce a moderate pedestrian crossing delay.
Low	Areas where the transport network is tolerant to change without detriment to its state, for example: - Routes with existing low traffic levels which have additional traffic flow capacity; - Receptors such as populated urban areas where existing traffic levels are low and there is capacity to absorb additional traffic flow on adjacent routes; - Receptors such as rural roads where existing traffic levels are low and there is capacity to absorb additional traffic flow on adjacent routes; - Strategic nationally important routes with capacity to absorb additional traffic flow; - On routes with a low level of historical accident data where a change in traffic flow or composition would have a low effect on the likelihood or severity of accidents; - A route with formal pedestrian facilities where an increase in traffic would have a low effect on pedestrian amenity; - A settlement which is bisected by a road, but where the effect of increased traffic or change in composition would have a low effect on severance; - A receptor which is not highly sensitive to changes in noise level (e.g. a school) or where receptors are set back from the road and therefore their sensitivity to changes in noise as a result of changes in traffic flow or composition are low; and - A location where pedestrian crossing facilities are formal but priority, or pedestrian flows are sufficiently low that changes to traffic flow or composition are unlikely to cause a significant pedestrian delay.
Negligible	Areas where the transport network is highly tolerant to change without detriment to its state, for example: - Routes with existing very low traffic levels which have a lot of additional traffic flow capacity; - Receptors such as populated urban areas where existing traffic levels are very low and there is a lot of capacity to absorb additional traffic flow on adjacent routes; - Receptors such as rural roads where existing traffic levels are very low and there is a lot of capacity to absorb additional traffic flow on adjacent routes; - Strategic nationally important routes with a lot of capacity to absorb additional traffic flow; - On routes with a very low level of historical accident data where a change in traffic flow or composition would have a negligible effect on the likelihood or severity of accidents; - A route with formal pedestrian facilities where an increase in traffic would have a negligible effect on pedestrian amenity; - A settlement which is not bisected by a road or where the effect of increased traffic or change in composition would have a negligible effect on severance; - A receptor which is negligibly sensitive to changes in noise level (e.g., a sports stadium) or where receptors are set very far back from the road and therefore their sensitivity to changes in noise as a result of changes in traffic flow or composition are negligible; and - A location where pedestrian crossing facilities are formal and controlled, or pedestrian flows are negligible (i.e., where there are no footways) such that changes to traffic flow would not result in a change to pedestrian delay.

13.3.6.2 Magnitude of Change

The magnitude of potential change is a function of the existing volumes of traffic and has been identified through consideration of the Proposed Development, the percentage increase and degree of change to baseline conditions predicted as a result of the Project, the duration and reversibility of an effect and professional judgement, best practice guidance (IEMA 1993), and legislation.

The magnitude of impact or potential change has been identified using the framework presented in **Table 13.4**.

Table 13.4 Framework for Determining Magnitude of Change

Type of Impact	Magnitude of Change			
	Negligible	Low	Medium	High
Severance	Change in total traffic flow of <30%	Change in total traffic flow of 30% to 60%	Change in total traffic flow of 60% to 90%	Change in total traffic flow of >90%
Pedestrian Amenity	Change in traffic flow (or HGV component) <50%	Change in traffic flow (or HGV component) of 50% to 100%	Change in traffic flow (or HGV component) of 100% to 150%	Change in traffic flow (or HGV component) of 150%
Fear and Intimidation	Change in total traffic flow of <30%	Change in total traffic flow of 30% to 60%	Change in total traffic flow of 60% to 90%	Change in total traffic flow of >90%
Road Safety	Magnitude of impact derived using professional judgment informed by the frequency and severity of collisions within the study area and the forecast increase in traffic			
Driver Delay	Magnitude of impact derived using professional judgment informed by the increase in vehicle delay and whether a junction is at, or close to capacity.			

13.3.6.3 Significance of Effect

The sensitivity of the receptor and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. **Table 13.5** summarises guideline criteria for assessing the significance of effects.

Table 13.5 Framework for Assessment of the Significance of Effects

Magnitude of Change	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

13.3.7 Assumptions

13.3.7.1 Baseline Traffic

Baseline traffic flow conditions was gathered from publicly available traffic counts published by the DfT at locations on the proposed transport routes detailed in **Section 13.3.4** of this report. **Figure 13.3** shows the traffic count locations along the abnormal load and general construction traffic routes respectively.

Some of the traffic count locations along both routes provide an estimated flow based upon the last manual or automatic traffic counts and the application of traffic growth factors by the DfT, as detailed in **Table 13.6**.

Table 13.6 Traffic Count Data

Traffic Count Methods				
Ref.	Location	Year	Count Type	Last Manual Count
1	A76, North of Cumnock DfT Point ID: 80522	2021	Public ATC	N/A
2	A70, West of Ochiltree DfT Point ID: 80519	2021	Estimated	2008
3	A76 West of New Cumnock DfT Point ID: 80520	2021	Estimated	2017
4	A76 East of New Cumnock DfT Point ID: 30752	2021	Public ATC	N/A
5	A76 Kirkconnel DfT Point ID: 50747	2021	Public ATC	N/A
6	A76 South of Sanquhar, DfT Point ID: 30753	2021	Public ATC	N/A
7	A76 Thornhill, DfT Point ID: 10748	2021	Estimated	2015
8	Blackaddie Road	2020	Projected	N/A
9	C125N near Eliock Bridge, DfT Point ID: 812097	2019	Manual Count	N/A

It is possible that due to traffic values being estimated at locations 2, 3 and 7, there are minor differences between the assessed and actual baseline traffic flows at these locations. This does not have any material change to the outcome of the assessment.

13.3.7.2 Material Import Requirements

To present a worst-case scenario it will be assumed that concrete will be transported along the entirety of the route specified in **Section 13.3.4.2**, however this is unlikely to be the case as two quarries (Barr Quarries located on the A70, west of Ochiltree and Barburgh Mill Quarry, south of Thornhill) (**Figure 13.2**), are capable of producing all aggregate and concrete required for the Proposed Development, details of which would be agreed at a later date. Other quarries within the locality are also being explored. There is also the option of on-site concrete batching, it is however, assumed that all concrete will be transported to the Site and therefore the assessment considers the worst-case scenario.

It has also been assumed that all stone material (including finely graded surface dressing) required for the formation of the internal access tracks and hardstanding areas will be imported to Site instead of being sourced from on-site borrow pits. However, it should be noted that on-site borrow pits have been identified and it is estimated in **Table 3.1 of Technical Appendix A10.3 Preliminary BPA** of the EIA Report that up to 80% of the required stone volume can be sourced from these borrow pits (excepts a small percentage of stone would be imported for surface dressing), therefore, in excess of the amount required to construct access tracks and hardstanding areas. However, it has been assumed that all stone material required for the formation of the internal access tracks and hardstanding areas will be transported to the Site and therefore the assessment considers the worst-case scenario.

13.3.7.3 Impact Assessment

A worst-case scenario has been assumed in which all traffic associated with the Proposed Development will pass each traffic count location identified in the study. Whilst all HGV traffic will use the defined route to site, no specific routes will apply for light traffic (i.e., cars and vans) and therefore their choice of route will be determined by their origin and is likely to be distributed across a variety of routes. The effect of increased traffic on the identified route is therefore likely to be lower than estimated in this assessment.

13.4 Baseline Conditions

13.4.1 Baseline Traffic Flow

Table 13.7 summarises the data collected from the traffic count data at a number of locations on the proposed transport routes detailed in **Section 13.3.4**. Traffic count locations are shown on **Figure 13.3**.

Table 13.7 Existing Average Annual Daily Flow (AADF) 2021

Ref	Road	Location	Total AADF	HGV AADF	%HGV
1	A76	A76, North of Cumnock DfT Point ID: 80522	7395	852	11.5%
2	A70	A70, West of Ochiltree	6037	990	16.4%
3	A76	A76 West of New Cumnock DfT Point ID: 80520	5196	867	16.7%
4	A76	A76 East of New Cumnock DfT Point ID: 30752	2612	544	20.8%
5	A76	A76 Kirkconnel DfT Point ID: 50747	3754	728	19.4%
6	A76	A76 South of Sanquhar, DfT Point ID: 30753	2839	375	13.2%
7	A76	A76 Thornhill, DfT Point ID: 10748	3450	448	13.0%
8	C	Blackaddie Road	300	7	2.3%
9	C	C125N near Eliock Bridge, DfT Point ID: 812097	36	3	8.3%

13.4.2 Road Capacity

Typical capacity values for a variety of road types are provided within the Design Manual for Roads and Bridges (DMRB) – Volume 15³⁸⁸. It is acknowledged that this document has been withdrawn, however the quoted traffic flow capacities remain the most up to date available reference source and are useful within the framework of this assessment. Capacity is defined as the maximum sustainable flow of traffic passing in one hour under favourable road and traffic conditions and depends on the road type, speed limit and width. **Table 13.8** gives the estimated capacity of each of the roads within the Study Area.

Table 13.8 Theoretical Road Capacities

Road	Type	Capacity (veh/hour/direction)	Two-Way Hourly Flow (veh/hour)	Two – Way Daily Flow (veh/day)
A76	Rural – Typical Single 7.3 m	1,200	2,400	57,600
A70	Rural – Typical Single 7.3 m	1,200	2,400	57,600
Blackaddie Road	Rural – Poor Single 5.5 m	800	1,600	38,400
C125N near Eliock Bridge	Rural – Poor Single 4 m	140	280	6,720

13.4.3 Sensitive Receptors

As per (IEMA 1993) Guidelines, particular groups of locations which may be sensitive to changes in traffic conditions should be identified. The Guidelines suggest, for example, that people, home,

³⁸⁸ Standards for Highways (2013) Volume 15, Economic Assessment of Road Schemes in Scotland, DMRB. Available at: <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol15/index.htm>. Accessed 10/02/2023.

schools, and the elderly may be sensitive to changes in traffic conditions. A desktop search was undertaken for the route to site within the Study Area.

A number of receptors of medium or high sensitivity to changes in traffic have been identified within the Study Area and are detailed in **Table 13.9**. These receptors are either located on proposed delivery routes or located within close proximity and require access through the proposed delivery routes.

Table 13.9 Sensitive Receptors

Route	Receptor	Sensitivity	Justification
A76, New Cumnock	New Cumnock	High	There are a number of commercial and residential properties which front directly onto the A76 as it passes through New Cumnock. The town centre includes shops, services, and has formal pedestrian crossing points on it. Users may be required to use/cross the route when accessing the service. However, this route is a major transport corridor constructed to accommodate significant HGV traffic and so a certain level of traffic should be expected.
A76, New Cumnock	New Cumnock Primary and Nursery School, New Cumnock Community Centre, and Evangelical Church,	High	These facilities are located in New Cumnock and near the proposed general construction traffic route. Users may walk on or cross the route on their journey to these facilities. However, this is a major road and transport corridor and has a number of formal pedestrian crossing points on it.
A76, Kirkconnel	Kirkconnel	High	There are a number of commercial and residential properties which front directly onto the A76 as it passes through New Kirkconnel. The town centre includes shops, services, and has formal pedestrian crossing points on it and footways on either side of the carriageway. Users may be required to use/cross the route when accessing the service. However, this route is a major transport corridor constructed to accommodate significant HGV traffic and so a certain level of traffic should be expected.
A76, Sanquhar	Sanquhar	High	There are a number of commercial and residential properties which front directly onto the A76 as it passes through Sanquhar. The town centre includes shops, services, and has formal pedestrian crossing points on it and footways on either side of the carriageway. Users may be required to use/cross the route when accessing the service. However, this route is a major transport corridor constructed to accommodate significant HGV traffic and so a certain level of traffic should be expected.
A76, Mennock	Residential Properties on or near the delivery route	Medium	Few residential properties located directly on the proposed delivery route who require unrestricted use of the route in order to access their property. This is an A-class road designed to accommodate significant HGV traffic.
A76, Carronbridge	Residential Properties on or near the delivery route	Medium	Few residential properties located directly on the proposed delivery route who require unrestricted use of the route in order to access their property. This is an A-class road designed to accommodate significant HGV traffic.
A76, Thornhill	Thornhill	High	There are a number of commercial and residential properties which front directly onto the A76 as it passes through Thornhill. The town centre includes

Route	Receptor	Sensitivity	Justification
			shops, services and has formal pedestrian crossing points on it and footways on either side of the carriageway. Users may be required to use/cross the route when accessing the service. However, this route is a major transport corridor constructed to accommodate significant HGV traffic and so a certain level of traffic should be expected.
Blackaddie Road	Residential/Commercial Properties and recreational facilities on or near the delivery route	High	There are a number of commercial, residential properties, and a playground which from directly onto Blackaddie Road who require unrestricted use of the route in order to access these facilities.
C125N	Road users	High	This is a single-track road with no passing places and footways. providing access to isolated properties. However, a section of this road is part of the Promoted Path Southern Upland Way. This receptor may be highly sensitive to changes in HGV traffic.

13.4.4 Road Traffic Collision Assessment

An analysis of all 'Slight', 'Serious' and Fatal' reported road traffic collisions (RTCs) within the last five years on the surrounding network (mainly key junction) was undertaken using data from Crashmaps³⁸⁹.

Collisions are categorised according to the severity of injuries sustained by those involved:

- 'Slight' RTCs are defined as a collision in which nobody is fatally or seriously injured, but at least one person is slightly injured.
- 'Serious' RTCs are defined as those which result in hospitalisation of one or more of the parties involved.
- 'Fatal' RTCs results in the death of one or more persons at the scene of the collision or within 30 days of the incident.

A total of 74 RTCs were on the A70 and A76(T) within the study area and a breakdown of the severity of these accidents over the study period is provided in **Table 13.10** below. It should be noted that no RTCs were recorded along the minor roads which make up the Study Area. For ease of this RTC assessment, the Study Area has been split into 3 sections.

Table 13.10 Accident Summary

Year	Total Accidents	SEVERITY		
		SLIGHT	SERIOUS	FATAL
2017	16	14	1	1
2018	22	17	4	1
2019	15	10	5	0
2020	9	5	4	0
2021	12	5	6	1
Total	74	51	20	3

Further detailed analysis is provided below whiles the locations of each of the identified RTCs are noted on **Figures 13.4a to Figures 13.4c**.

³⁸⁹ AGILYSIS (2019) CrashMap. UK Road Safety Map. Available at: www.crashmap.co.uk. (Accessed 10/05/2023)

13.4.4.1 Study Area 1: A70 Between the A76 and Ochiltree

A total of 15 RTCs were found along the A70 from its connection to the A76(T) and Ochiltree, of which ten of these RTCs were classified as 'Slight' and five were classed as 'Serious' in severity as shown on **Figure 13.4a**.

Having reviewed the collision data provided, it was noted that majority RTCs located in this area occurred at a time when a vehicle was in the process of changing lanes or making a turn, therefore it is likely that the cause of these collisions can be attributed to driver error, rather than the layout or design of the highway.

13.4.4.2 Study Area 2: A76 Between Auchinleck and Sanquhar

A total of 30 RTCs were found along the A76 between Auchinleck to Sanquhar, nineteen of these RTCs were classified as 'Slight', eight were classified as 'Serious' and three were classified as 'Fatal' in severity as shown on **Figure 13.4b**.

Having reviewed the collision data provided for the five-year study period, it was noted that the majority of the collisions that occurred could be attributed to driver error and a lack of awareness of other road users, rather than the highway design. No clear trends or strongly identifiable hotspots were apparent within the data.

13.4.4.3 Study Area 3: A76 From Sanquhar to Barburgh Mills

A total of 29 RTCs were found on the A76(T) between Sanquhar and the hamlet of Barburgh Mills, of which twenty-two were classified as 'Slight' and seven were classed as 'Serious' in severity as shown on **Figure 13.4c**.

Five 'Slight' RTCs were recorded between Menzies and Ardoch, of which three were found to be single vehicle collisions, while another involved a pedal cyclist colliding with a vehicle.

Eight RTCs were found on the series of 'S' bends on the A76(T) between Ardoch and Enterkinfoot. These collisions are broken down into five 'Slight' RTCs and three 'Serious' RTCs and seven of the RTCs found on this series of bends were noted to be single vehicle collisions. The A76(T) in this location is a good standard single carriageway road, with adequate warning signage warning drivers of the dangers of increased speed on 'S' bends and also the risk of overturning HGVs, therefore it has been assumed that the likely cause of these single vehicle collisions was driver decision error. The final RTC recorded at this location was noted to be a rear end shunt involving two HGVs and can also be attributed to driver error.

Five RTCs were recorded from the series of bends described above to the village of Thornhill on the A76(T), of which two were classed as 'Slight' and three were classed as 'Serious' in severity. Upon review of the data provided it has been noted that three of these RTCs were rear end shunt collisions and can likely be attributed to driver error.

A further eleven RTCs were recorded throughout the remainder of the study area from the village of Thornhill on the A76(T), of which nine were classified as 'Slight' and two were classified as 'Serious' in severity. Upon review of the data provided it has been noted that three of these RTCs were rear end shunt collisions, while a further five collisions involving just a single vehicle and these collisions can likely be attributed to driver error.

In summary, the review of collisions within the study area is considered to show that causation factors are similar to what would be expected given the nature of the road layout, with no clear trends or strongly identifiable hotspots with the data and no RTCs identified at the proposed site entrance location on the C125N.

The routes identified in the study have therefore been categorised as having 'medium' sensitivity to accidents. This assessment was made using the professional judgement of the authors whilst

comparing these routes to other examples. Whilst several RTCs were noted within the study it was noted that these roads are busy, and that as stated above no clear hotspots can be identified.

13.5 Future Baseline Scenarios

13.5.1 Traffic Flow

Background traffic growth will occur on the local road network irrespective of whether or not the Proposed Development is constructed.

A traffic growth factor was calculated for the relevant geographic area as from TEMPRO and applied to the baseline traffic flow information collected for each route to give the estimated traffic flow for the year construction is expected to commence (2027). **Table 13.11** indicates the projected baseline traffic flow at each of the locations for the anticipated year of construction.

Table 13.11 Projected Baseline Traffic Flow (2027)

Ref	Road	Location	Growth Factor	Project AADF	HGV AADF	% HGV
1	A76	A76, North of Cumnock DfT Point ID: 80522	1.0115	7,480	862	12%
2	A70	A70, West of Ochiltree	1.0115	6,106	1,001	16%
3	A76	A76 West of New Cumnock DfT Point ID: 80520	1.0115	5,256	877	17%
4	A76	A76 East of New Cumnock DfT Point ID: 30752	1.0115	2,642	550	21%
5	A76	A76 Kirkconnel DfT Point ID: 50747	1.0115	3,797	736	19%
6	A76	A76 South of Sanquhar, DfT Point ID: 30753	1.0115	2,872	379	13%
7	A76	A76 Thornhill, DfT Point ID: 10748	1.0115	3,490	453	13%
8	C	Blackaddie Road	1.0114	303	7	2%
9	C	C125N	1.0112	36	3	8%

13.6 Anticipated Construction Development Traffic

An indicative programme of anticipated construction traffic associated with the Proposed Development is provided in **Technical Appendix A13.2: Construction Development Program**. Construction is expected to run for a total of 18 months. The following sub-sections provide detail for each element of work, and it should be read in conjunction with **Technical Appendix A13.2: Construction Development Program**. A summary of all predicted construction traffic is provided at the end of this section.

13.6.1 Site Mobilisation and Demobilisation

HGV and other vehicle movements will be required during Site mobilisation. This will comprise the erection of welfare facilities, delivery of construction site vehicles and importation of plant and equipment. The majority of these movements will be as HGVs and low loaders which will deliver and then depart the Site empty.

During site demobilisation, the majority of this equipment will be removed from Site. Vehicle movements for demobilisation will result from empty HGVs and low loaders travelling to Site and then departing loaded. **Table 13.12** indicates the anticipated number of vehicle movements associated with site mobilisation and demobilisation.

Table 13.12 Anticipated Vehicle Movements – Site Mobilisation / Demobilisation

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
On-site vehicles	Car/LGV**	1, 18	32	16
Construction Compound	HGV Low Loader	1, 18	120*	60*
Overall			152	76

*Includes transporter vehicle leaving and then returning to site during demobilisation

**Self-propelled vehicles which arrive in one month and depart in another

13.6.2 Access Track and Hardstanding Construction

This assessment assumes, all stone required for formation of on-site access tracks, crane pads and hardstandings will be imported to the Site. Commercial agreements on the source of this aggregate have not been reached at the time of writing this EIA Report, so a number of potential options will be considered. If required to be imported, the most likely source of this material is Barr Quarries located on the A70, west of Ochiltree and Barburgh Mill Quarry, south of Thornhill). These are the closest quarries to the Site however the final quarry location would be confirmed prior to construction.

There is an existing access track off the C125N near Ulzieside leading into the Site. For the purposes of this assessment, it has been assumed that all tracks will be constructed as new tracks. This approach represents a worst-case scenario in terms of material import requirements.

Therefore, and conservatively, the total length of access tracks required for the Proposed Development is estimated at 10,000 m. Tracks will be of an average width of 5.0 m, therefore the total surface area of tracks is approximately 50,000 m². In addition, some areas of widened track for ALV movements as well as bellmouth junctions are required, resulting in an additional 3,300 m² surface area being required.

Additionally:

- Four turning heads will be constructed which each have a surface area of 2,500 m² resulting in a total surface area of 10,000 m²;
- Eleven crane pads will require to be constructed, each has a surface area of 2,166 m², resulting a total surface area of 23,826 m²;
- Temporary Construction Compound with a total surface area of 5,000 m² will be constructed;
- The BESS compound will be constructed on an area of hardstanding which is approximately 7,690 m²; and
- The substation will be constructed on an area of hardstanding which is approximately 3,161 m².

Therefore, the volume of material required for a 0.45 m surface layer across all tracks and hardstandings is estimated to be 50,849 m³. Aggregate will be transported by HGV dumpers which have a capacity of 9 m³, therefore 5,650 vehicle loads will be required which will result in 11,300 vehicle movements.

That notwithstanding, the majority of aggregate required can be won from the on-site borrow pits except for the top 0.15 m layer of fine grade material which will be imported to Site. In line with the conclusions as set out within the Borrow Pit Assessment (**Technical Appendix A10.3: Preliminary BPA**), the borrow pits search area is anticipated to deliver approximately 152,799 m³ of aggregate. This assessment therefore assumes a worst-case scenario where construction material required for all access tracks, hardstandings and turning heads will be imported to the Site.

In addition to the aggregate itself, an excavator and roller will be required on-site to process the aggregate and construct the tracks and hardstandings. Both the excavator and roller will be transported to site via HGV low-loader which will result in an additional two deliveries, or four HGV movements, at the commencement of this phase of works and a further 2 deliveries, or 4 HGV movements, at the end of this phase.

Other miscellaneous deliveries will be required throughout this phase for drainage materials, and geotextiles for example. This is estimated to result in an additional 2 deliveries per month, or 10 deliveries in total or 20 HGV vehicle movements over the 5-month period for this element of works.

Table 13.13 sets out the anticipated number of vehicle movements associated with access track and hardstanding construction.

Table 13.13 Anticipated Vehicle Movements - Access Track and Hardstanding Construction

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Plant	HGV Low Loader (Excavators/Rollers)	2, 6	8	4
Miscellaneous	HGV	2-6	20	4
Material Deliveries	HGV	2-6	11,300	2,260
Overall			11,328	2,268

13.6.3 Control Building and Substation Compound Construction, including BESS

Material for construction of the substation and battery compound hardstanding has been accounted for in **Section 13.6.2**. This section will therefore consider above ground material only.

Concrete will be required to be imported for construction of the substation building. This is assumed to require 10 HGV concrete wagon loads, resulting in 20 movements. An additional 35 HGV loads have been assumed for the delivery of the control building electrical components and switchgear BESS containers and inverters, resulting in a further 70 HGV movements.

Two external transformers will require to be delivered by ALV due to their weight. Following delivery of components, the ALVs will retract to the size of an HGV for the return journey. This will result in four vehicle movements, 2 ALV movements and 2 HGV movements. Two escort vehicles are assumed to accompany each ALV resulting in eight vehicle movements.

Table 13.14 indicates the number of vehicle movements associated with substation construction.

Table 13.14 Anticipated Vehicle Movements - Substation Construction

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Electrical Components and Switchgear Delivery, BESS Delivery	HGV	7-9	40	14
Transformer Delivery	ALV	7	2	2
	HGV	7	2	2
	Escort Car/Van	7	8	8
Concrete for Control Building	HGV Concrete Wagon	7-9	20	7
Overall			72	33

13.6.4 Electrical Cabling Delivery

Electrical cabling for wind farm power distribution will require to be delivered and will constitute 36 HGV movements over the period of delivery. **Table 13.15** indicates the number of vehicle movements associated with electrical cabling delivery.

Table 13.15 Anticipated Vehicle Movements - Electrical Cabling Delivery

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Electrical Cabling Delivery	HGV	11-14	36	9

13.6.5 Turbine Foundation Construction

Each turbine foundation will require up to 1,250 m³ of concrete. In order to assess the worst-case scenario, it has been assumed that the aggregate won from the on-site borrow pit will not be suitable for concrete batching, therefore all aggregate will be imported. Therefore, in the event that borrow pit aggregate proves suitable for concrete the number of vehicles associated with this phase of works would be reduced.

Assuming a volumetric capacity of 8 m³ per concrete wagon, approximately 157 ready-mix HGV loads would be required to supply the required concrete for each foundation, resulting in 314 vehicle movements per foundation or 3,454 movements in total for foundation pouring.

If required, concrete delivery would occur over a 9-month period, however, each foundation is required to be poured over a continuous (approximately) 10-hour period. Foundations would be poured on non-consecutive days during this period of works with 11 days of foundation pouring required to deliver concrete for the 11 turbines. Therefore, on concrete pouring days, 314 HGV vehicle movements will be experienced in addition to the deliveries experienced for other concurrent elements of work.

It is acknowledged that potentially two pours may occur in the same month as detailed in **Technical Appendix A13.2: Construction Development Program**. However, these will be programmed not to occur on consecutive days during any monthly period.

In addition to concrete, steel rebar will have to be imported. It is assumed that up to 4 HGV loads per turbine will be required, therefore 44 loads will be required for the 11 turbines resulting in 88 vehicle movements. Rebar will be delivered prior to the commencement of foundation pouring and would be spread throughout the concrete delivery period.

Additional miscellaneous items will be required to be delivered to support the foundation construction phase. These include shuttering, geotextiles, and equipment. It is assumed that the majority of these deliveries would occur in month 4, and the further deliveries that are required during the pouring phase would be timed to avoid pouring days so as to lower the peak traffic flow. An allowance for 40 miscellaneous deliveries during this phase of works has been made, this would result in up to 80 two-way HGV movements. **Table 13.16** indicates the anticipated number of two-way vehicle movements associated with turbine foundation construction.

Table 13.16 Anticipated Vehicle Movements - Turbine Foundation Construction

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Concrete Delivery	Ready Mix HGV	6-14	3,454	628 ⁺
Rebar Delivery	HGV	6-12	88	15
Miscellaneous	HGV	6-12	80	13
Overall			3,622	628

+Maximum of 2 foundation pours in any month assumed.

13.6.6 Crane Delivery

A large crawler or track mounted crane of approximately 1,000 tonne capacity will be required for turbine erection along with an additional 400 tonne pilot crane. The crawler crane will be transported in component form and assembled on the Site. This will require approximately 52 HGV movements to be undertaken prior to the commencement of turbine delivery. The pilot crane will be self-propelled although will constitute an ALV due to its weight.

The crane will remain on-site for the duration of the turbine assembly phase. **Table 13.17** indicates the number of vehicle movements associated with crane delivery.

Table 13.17 Anticipated Vehicle Movements - Crane Delivery

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Crawler Crane	HGV	12,17	52	26
	Abnormal Load Vehicle**	12,17	2	1
	Escort Car/Van	12,17	8	4
Overall			62	31

**Self-propelled vehicles which arrive in one month and depart in another

13.6.7 Turbine Delivery

Turbines will be delivered as separate components, the majority of which will require transportation via ALV. The towers will be transported in three separate sections and each blade will be transported individually. Five further abnormal load vehicles will be required to transport the nacelle and hub. Therefore, it is assumed 121 ALV deliveries will be required for 11 turbines. Following delivery of components, the ALVs will retract to the size of a standard HGV for the return journey resulting in 242 vehicle movements.

Following delivery of components, the ALVs will retract to the size of a standard HGV for the return journey. Two escort vehicles are likely to be required to accompany each ALV which will result in a worst-case of 484 additional vehicle movements. In practice, this figure may be reduced where ALVs approach the Site in convoy and fewer escort vehicles per ALV are required.

24 HGV vehicle movements will be required for the delivery of turbine accessories and ancillary equipment. **Table 13.18** indicates the number of vehicle movements that are expected for turbine delivery.

Table 13.18 Anticipated Vehicle Movements - Turbine Delivery

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Turbine Components	ALV	13-16	121	30
	Escort Car or Van	13-16	484	121
	HGV	13-16	121	30
Ancillary Equipment	HGV	13-16	24	6
Overall			750	188

13.6.8 Fuel Delivery

Fuel will require regular delivery to the Site regularly throughout the construction period and is expected to total 1 HGV fuel tanker delivery per week, resulting in 2 vehicle movements per week or 8 vehicle movements per month from site mobilisation, totalling 144 vehicle movements over the duration of construction. **Table 13.19** indicates the number of vehicle movements associated with fuel delivery.

Table 13.19 Anticipated Vehicle Movements – Fuel Delivery

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Fuel Delivery	HGV Fuel Tanker	1–18	144	8

13.6.9 Construction Personnel and Staff

It is estimated that during the peak period of construction, approximately 60 staff will be required onsite per day, and this would reduce to around 35 staff during the non-peak period. For the purposes of this assessment, the most recent available Scottish private vehicle occupancy³⁹⁰ rate of 1.57 people per vehicle was used, equating to 39 vehicles during the peak period and 22 vehicles during the non-peak period. This equates to 78 movements per day during the peak period and 44 movements per day during the non-peak period.

Assuming 26 workdays per month, this will result in 2,028 movements per month during the peak period and 1,144 movements per month during the non-peak. A total of 31,200 vehicle trips for staff over the course of the Development's construction.

Staff will be encouraged to car share, so it is anticipated that the figure for car or van movements is likely to be considerably lower than the above estimates in practice.

Table 13.20 indicates the number of vehicle movements associated with staff.

Table 13.20 Anticipated Vehicle Movements – Staff

Operation	Vehicle Type	Construction Months	Total Movements	Maximum Monthly Movements
Staff	Car or Minibus	1-18	31,200	2,028

³⁹⁰ The Scottish Government (2020) Transport and Travel in Scotland 2020 [Online] Available at: <https://www.transport.gov.scot/media/50980/transport-and-travel-in-scotland-2020-results-from-the-scottish-household-survey-pdf-version.pdf/> (Accessed 10/02/2023)

13.6.10 Summary

Table 13.21 provides a summary of all deliveries expected throughout duration of construction.

Table 13.21 Anticipated Vehicle Movements – Summary

Operation	Vehicle Type	Construction Months	Total	Max Monthly
Site Mobilisation/Demobilisation				
Site Mobilisation/ Demobilisation	Car or Minibus	1,18	32	16
Site Mobilisation/ Demobilisation	HGV	1,18	120*	60*
Subtotal			152	76
Access Track and Hardstanding Construction				
Plant	HGV Low Loader (Excavators/Rollers)	2,6	8	4
Miscellaneous	HGV	2-6	20	4
Material Deliveries	HGV	2-6	11,300	2,260
Subtotal			11,328	2,268
Turbine Foundation Construction				
Concrete Delivery	HGV Concrete Wagon	6-14	3,454	628+
Rebar	HGV Low-Loader	6-12	88	15
Miscellaneous	HGV	6-12	80	13
Subtotal			3,622	628
Control Building Substation and Battery Storage				
Electrical Components and Switchgear Delivery, BESS Delivery	HGV	7-9	40	14
Transformer Delivery	ALV	7	2	2
	HGV	7	2	2
	Escort Car/Van	7	8	8
Concrete for Control Building	HGV Concrete Wagon	7-9	20	7
Subtotal			72	33
Electrical Cabling Delivery				
Electrical Cabling Delivery	HGV	11-14	36	9
Subtotal			36	9
Crane Delivery				
Crawler Crane	HGV	12,17	52	26
	Abnormal Load Vehicle**	12,17	2	1
	Escort Car/Van	12,17	8	4
Subtotal			62	31
Turbine Delivery				
Turbine Components	ALV	13-16	121	30
	Escort Car or Van	13-16	484	121
	HGV	13-16	121	30

Operation	Vehicle Type	Construction Months	Total	Max Monthly
Ancillary Equipment	HGV	13-16	24	6
Subtotal			750	188
Fuel Delivery				
Fuel Delivery	HGV Fuel Tanker	1–18	144	8
Subtotal			144	8
Staff				
Staff	Car or Minibus	1-18	31,200	2,028
Subtotal			31,200	2,028
Totals			Total	Max Monthly
Total HGV and Abnormal Load Movements			15,634	2,928
Total Car and Van Movements			31,732	2,149
Overall Total			47,366	4,642***

* Includes transporter vehicle leaving and then returning to site during demobilisation

**Self-propelled vehicles which arrive in one month and depart in another

***Total flow in peak month

+Assumes two pours per month

13.7 Assessment of Potential Effects

13.7.1 Traffic Generation

A detailed breakdown of the distribution of vehicle movements in each month and by element of work, throughout the construction period of the Proposed Development, is included in **Technical Appendix A13.2: Construction Development Program**. The peak month from a traffic perspective was identified and used to predict the traffic increase along the construction traffic route. A worst-case scenario was assumed in which all predicted traffic passes each location within the study area.

Due to the nature of foundation pouring, i.e., all concrete for one pour will be delivered within a single day, it is not appropriate to distribute this traffic across the month. Instead, a calculation of the traffic flow increases on the 11 non-consecutive days of concrete pouring, and on days during the peak month with no concrete pouring, has been made.

From inspection, the peak month for vehicle flow is expected to be Month 6 where 4,328 vehicle movements (excluding concrete delivery) per month are predicted. Assuming a 26-day working month, 168 vehicle movements per day are predicted on non-concrete pouring days while 482 vehicle movements per day are expected on concrete pouring days.

Table 13.22 details the anticipated vehicle flow in the peak month on days with no concrete deliveries and the percentage increase above the predicted baseline at each point within the Study Area. For the purposes of this assessment, 26 working days per month has been assumed for all daily traffic calculations.

Table 13.22 Predicted Peak Month Average Daily Traffic (Non- Concrete Delivery) General Construction Traffic Route

Traffic Count Location/Link	Total Vehicle Movements			HGV Movements Only*		
	2027 Baseline	Baseline + Development	Increase (%)	2027 Baseline	Baseline + Development	Increase (%)
A76, North of Cumnock	7,480	7,647	2%	862	950	10%
A70, West of Ochiltree	6,106	6,273	3%	1,001	1,090	9%
A76, West of New Cumnock	5,256	5,422	3%	877	965	10%
A76 East of New Cumnock	2,642	2,808	6%	550	639	16%
A76 Kirkconnel	3,797	3,964	4%	736	825	12%
A76 South of Sanquhar,	2,872	3,038	6%	379	468	23%
A76 Thornhill,	3,490	3,656	5%	453	542	20%
Blackaddie Road	303	470	55%	7	96	1249%
U540N	36	203	457%	3	91	2916%

*For the purposes of this estimation abnormal load vehicles are included in HGV.

Table 13.23 details the anticipated vehicle flow in the peak month on days where concrete deliveries will take place; this will occur on a maximum of 11 non-consecutive days over the nine-month period of this phase or works. Therefore, it is anticipated there would be two concrete pouring days in some months between months six and fourteen.

Table 13.23 Predicted Peak Month Average Daily Traffic (During Concrete Delivery) General Construction Traffic Route

Traffic Count Location/Link	Total Vehicle Movements			HGV Movements Only*		
	2027 Baseline	Baseline + Development	Increase (%)	2027 Baseline	Baseline + Development	Increase (%)
A76, North of Cumnock	7,480	7,961	6%	862	1,264	47%
A70, West of Ochiltree	6,106	6,587	8%	1,001	1,404	40%
A76, West of New Cumnock	5,256	5,736	9%	877	1,279	46%
A76 East of New Cumnock	2,642	3,122	18%	550	953	73%
A76 Kirkconnel	3,797	4,278	13%	736	1,139	55%
A76 South of Sanquhar,	2,872	3,352	17%	379	782	106%
A76 Thornhill,	3,490	3,970	14%	453	856	89%
Blackaddie Road	303	784	158%	7	410	5685%
U540N	36	517	1320%	3	405	13267%

*For the purposes of this estimation abnormal load vehicles are included in HGV.

As detailed in the assessment methodology, a screening exercise was undertaken in order to determine which locations warrant detailed assessment.

Table 13.22 and **Table 13.23** above shows that the daily percentage increases in traffic (and HGV component) from the temporary construction traffic on non-concrete delivery days are all under the Rule 1 threshold at all count locations within the Study Area with the exception of Blackaddie Road and the C125N where the threshold is exceeded and further assessment is required. This increase is primarily due to the very low number existing vehicles using these roads.

On concrete delivery days, HGV traffic is predicted to exceed the lower 10% threshold at all count locations within the Study Area and therefore further assessment is required.

As detailed in **Table 13.18**, the theoretical road capacity for both the A76(T) and A70 is 1,200 vehicles per hour per direction or 57,600 vehicle movements per day (VMPD). The total number of vehicle movements, including baseline and predicted increase in construction traffic, is 168 vehicles per day during non-concrete delivery days and 482 vehicles per day on concrete delivery days.

Given that the A70 and A76(T) will remain significantly below its theoretical capacity during the identified period and the period of concrete pouring comprises a small number of days during construction, the effect of construction on traffic generation the A70 and A76(T) will result in a negligible magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on this route is **minor** and **not significant** in the terms of the EIA Regulations.

With regards to Blackaddie Road and the C125N roads, the theoretical capacities of these roads are 800 and 140 vehicles per hour per direction or 38,400 and 6,720 VMPD respectively. The absolute flow levels expected during the peak period is 482 VPD (on concrete delivery days), therefore it is clear that Blackaddie Road will remain significantly below its theoretical capacity, the effect of construction on traffic generation Blackaddie Road will result in a **negligible** magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on this route is **minor** and **not significant** in the terms of the EIA Regulations. For the C125N, given the nature of the road, the effect of construction on traffic generation Blackaddie Road will result in a negligible magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on this route is **moderate** and **significant** in the terms of the EIA Regulations.

In accordance with the EIA Regulations, **Section 13.9** of this Chapter details mitigation measures which are to be adopted to reduce this effect.

13.7.1.1 *Impact of Abnormal Load Vehicles*

It is acknowledged that for the purposes of this estimation, ALV are included in HGVs values calculated in this Section to present a worst-case scenario. However, in practice the maximum number of ALV movements per day is not likely to exceed 2-3 vehicles, which will travel in convoy with two escort vehicles. In the worst-case scenario this would be three ALV movements with a total of six escort vehicles which would cause minimal impact in baseline traffic receptors. These increases result in a **negligible** magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic due to abnormal load movement on the A76(T) is **minor** and **not significant** in the terms of the EIA Regulations.

That notwithstanding, temporary improvement works on minor roads approaching the Site including temporary widening and other road improvement measures, together with detailed consideration of vehicle swept paths, loadings, structural assessments (where required) would be required to facilitate the movement of abnormal loads. It is requested that this work is undertaken post consent and is secured through an appropriately worded condition of consent.

13.7.2 *Severance*

Severance occurs in a community when a major road separates people from places and other people. Severance occurs from difficulty of crossing a road or where the road itself creates a physical barrier.

Severance can be caused to pedestrians and motorists. Both the A70 and the A76(T) pass through settlements and therefore have the potential to be affected by severance.

With respect to locations on the A70 and the A76(T), guidance set out in **Section 13.3.6.2** of this report identifies that increases in total traffic volumes of less than 30% could result in a negligible impact upon severance.

It is acknowledged that HGV traffic at locations on the A70 and A76(T) (which presents the worst case) is predicted to increase between 30% and 90% on concrete delivery days which may be considered as significant, however, professional judgment must be applied. With the A76(T) and A70 being major road (A Class Roads) routes serving these settlements, it is likely that temporary increases in HGV traffic are not uncommon. It should be noted these increases would only occur during the concrete delivery days (as a worse case, 11 non consecutive days out of a total of circa 450 days) and would likely be within the existing daily variation in traffic flow on the route. Outside this phase of works, HGV levels (and total traffic) are not predicted to exceed the threshold of significance at all locations, therefore the change in traffic is temporary, fully reversible and would only occur during construction hours.

Therefore, when considering the link sensitivity and magnitude of impact, the effect of construction on severance on locations on the A70 and A76(T) results in a negligible magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on severance is **minor** and **not significant** in terms of the EIA Regulations. That notwithstanding in order to sufficiently minimise any adverse effect on Severance on the A76(T), a number of measures are proposed in **Section 13.9** as part the outline Construction Traffic Management Plan (CTMP) which would be adopted in a full version post consent.

With respect to Blackaddie Road and the C125N, it is evident that the change in total traffic (or HGV component) associated with the Proposed Development is greater than 100% (high) at these locations. Whilst the overall effect at these locations results in a major effect (significant), professional judgement must be applied. These increases are primarily due to the extremely low number of existing vehicles using these roads and particularly the C125N and as detailed in **Table 13.8**, these roads would operate well within their theoretical link capacity with the additional vehicle movements associated (including on concrete delivery days). Given the extremely low baseline flows, the magnitude of change can be reduced to a medium magnitude of change on a receptor of high sensitivity, thus, the effect of increased traffic on severance at these two locations is **moderate** and **significant** in terms of the EIA Regulations.

In accordance with the EIA Regulations, **Section 13.9** of this Chapter details mitigation measures which are to be adopted to reduce this effect.

13.7.3 Pedestrian Amenity

Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition, pavement width and separation between vehicles and pedestrians or cyclist. Guidance set out in **Section 13.3.6.2** of this report identifies that doubling or halving of the total traffic or HGV traffic volumes could lead to perceptible change upon pedestrian or cyclist amenity.

With respect to locations on the A70 and the A76, it is evident that the change in total traffic (or HGV component) associated with the Proposed Development is less than 50% (negligible) at all the locations with the exception of four count locations on the A76 where the change in traffic is between 50% and 100% (low). The link sensitivity is classed as high and whilst the overall effect at these locations results in a **moderate effect (significant)**, professional judgement must be applied. The A76 and A70 does not have pedestrian footways, except where they pass through settlements where footways, pedestrian guard rails and crossing points are available. Secondly, it should be noted these increases would only occur during the concrete delivery days (11 non consecutive days out of a total

of circa 450 days) and outside this phase of works, the predicted change in total traffic (or HGV component) is less than 50%.

Therefore, when considering the link sensitivity and magnitude of impact, the effect of construction on pedestrian amenity on locations on the A70 and A76 results in a **negligible** magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on pedestrian amenity is **minor** and **not significant** in terms of the EIA Regulations.

With respect to Blackaddie Road and the C125N, it is evident that the change in total traffic (or HGV component) associated with the Proposed Development is greater than 150% (high) at these locations. Whilst the overall effect at these locations results in a major effect (significant), there is a need for professional judgement to be applied. These increases are primarily due to the very low number of existing vehicles using Blackaddie Road and the C125N and as detailed in **Table 13.8**, these roads would operate well within their theoretical link capacity with the additional vehicle movements associated (including on concrete delivery days).

In addition to the above, the following circumstances have been considered:

- On non-concrete delivery days, total traffic on Blackaddie Road is less than 50% (negligible), therefore the overall magnitude of change can be reduced to low.
- Only a very short section of the C125N is proposed for use by general construction, and therefore the overall magnitude change can be reduced to low.

Considering the above, the magnitude of change can be reduced to low, thus, the effect of increased traffic on pedestrian amenity at these two locations is **moderate** and **significant** in terms of the EIA Regulations.

In accordance with the EIA Regulations, **Section 13.9** of this Chapter details mitigation measures which are to be adopted to reduce the significance of this effect.

13.7.4 Driver Delay

Delays mostly occur at junctions that operate close to capacity due to increase in traffic flows particularly during peak periods or the passage of slower moving vehicles such as HGVs. No sensitive junctions in terms of capacity constraints have been identified and all roads within the Study Area are operating below capacity and are predicted to continue to do so during construction of the Proposed Development. The effect of general increase in traffic on driver delay results in a negligible magnitude of change on a receptor of high sensitivity. Thus, the effect of increased traffic on driver delay is **minor** and **not significant** in terms of the EIA Regulations.

Some driver delay can be expected to occur on routes due to the slow movement of ALVs between the port of delivery and the Site. Where safe to do so ALVs will occasionally stop to allow traffic to pass if necessary. A total of 121 ALVs associated with turbine delivery, two associated with the crane delivery and two associated with transformer delivery for the substation are anticipated. These are all one-way movements as the return journeys constitute standard HGV trips. These will be distributed throughout the duration of specific elements of works.

Due to the overall limited number of loads across the construction programme and the short-term nature of this phase of works, which will be managed with communication with the local community which is to form part of the CTMP as best practice, the anticipated effect of abnormal loads on driver delay results in a negligible magnitude of change on a receptor of high sensitivity. Thus, the effect of abnormal loads on driver delay is **minor** and **not significant** in EIA terms.

13.7.5 Accidents and Safety

For the assessment of effects on accidents and safety, the receptor is the safety of the road network. As detailed in **Section 13.4.4**, no RTC hotspots were identified within the study area within the last 5 years. The sensitivity of the receptor to changes in accidents is 'medium'.

A temporary 11-day increase in HGV traffic flow above the threshold of significance is not sufficient to affect a change in the likelihood of accidents. As the proportion of HGVs will increase during those 11 days there would be a slight increase in the severity of accidents as HGVs have a higher mass. In addition, any ALV movements will be carried out under escort and outside of peak hours, the risk of RTCs during these movements would be negligible, hence the overall magnitude of effect is 'low'.

The temporary increase in overall traffic and HGVs for the duration of the construction of the Development will not result in an adverse effect in respect to accidents and safety. Therefore, the effect of construction on accidents and safety results in a low magnitude of change on a receptor of medium sensitivity. Thus, the effect of increased traffic on accidents and safety is **minor** and **not significant** in terms of the EIA Regulations.

13.8 Cumulative Effect Assessment

Cumulative traffic effects can only occur where the construction phase of a nearby development, which shares a common route to site for construction traffic, overlaps with that of the Proposed Development. Proposed developments which have the potential to result in cumulative traffic and transport effects should they be consented are:

- Sanquhar 'Six' Wind Farm (6 turbines);
- Sanquhar II Wind Farm (44 turbines);
- Glenmuckloch Wind Farm (8 turbines);
- Sandy Knowe Extension Wind Farm (6 turbines);
- Lethan Wind Farm (22 turbines);
- Extension to Lethan Wind Farm (10 turbines); and
- Eucharhead Wind Farm (21 turbines).

In order to assess the cumulative effect of the possible simultaneous construction on the local road network, the peak traffic period for the above developments has been combined to give an overall peak traffic estimate. The assessed peak traffic flow levels for each development have been taken from their respective EIA Reports or Transport Statements.

Traffic relating to the delivery of concrete during foundation pours has not been included as it is assumed that these events will be timed to ensure they do not coincide. It is unlikely that the local capacity for concrete production could accommodate several pours coinciding in any case.

Table 13.24 indicates the anticipated total traffic (including baseline) and the percentage increase above baseline in the worst-case cumulative scenario.

Table 13.24 Predicted Peak Month Average Daily Traffic (Non-Concrete Delivery) General Construction Traffic Route

Traffic Count Location/Link	Total Vehicle Movements			HGV Movements Only*		
	2027 Baseline	Baseline + Development	Increase (%)	2027 Baseline	Baseline + Development	Increase (%)
A76, North of Cumnock	7,480	8,248	10%	862	1,305	51%
A70, West of Ochiltree	6,106	6,875	13%	1,001	1,444	44%
A76, West of New Cumnock	5,256	6,024	15%	877	1,320	50%
A76 East of New Cumnock	2,642	3,224	22%	550	868	58%
A76 Kirkconnel	3,797	4,379	15%	736	1,054	43%
A76 South of Sanquhar,	2,872	3,453	20%	379	697	84%
A76 Thornhill,	3,490	4,071	17%	453	771	70%
Blackaddie Road	303	494	63%	7	116	1532%

As indicated in **Table 13.24**, the addition of all construction traffic from the identified cumulative developments results in a worst-case increase of 22% for overall flow and 82% for HGV traffic at traffic count locations on the A76(T). The C125N will not be affected by cumulative traffic while the Blackaddie Road would only be affected by construction traffic associated Eucharhead Wind Farm.

It is unlikely that the peak construction period associated with another wind farm development in the area would overlap with the peak construction period of the Proposed Development as the applications are at different stages in the planning process and each development has varying lengths of construction period as well as grid connection dates.

The high traffic generating activities, such as the importation of stone and concrete, only occur over a few months of the whole construction period for each development. It is unlikely that the local capacity for concrete and stone production could supply several developments at once, therefore, high traffic generating activities would naturally be staggered.

Furthermore, implementation of a Construction Traffic Management Plan (CTMP) for each development would ensure that there are open lines of communication with the Council, other local authorities where committed developments are located, Police Scotland, Transport Scotland, other stakeholders, and wind farm developers to monitor the progress of the construction stages.

This process would flag whether construction HGV traffic is reaching unacceptable levels and would ensure that action is taken accordingly to minimise effects. For these reasons the impact is expected to be significantly lower than stated in **Table 13.24**.

It should be noted that the A76(T) (where the greatest overlap of traffic increase could occur) is a good standard trunk road with a high level of residual capacity. The A76(T) is currently well used by HGVs, and it is considered that the road can suitably accommodate short term and temporary spikes in traffic flow.

Therefore, the impact on traffic and transport due to cumulative effects results in a negligible magnitude of change on a receptor of high sensitivity. Thus, the cumulative effect upon receptors along the route is **minor** and **not significant** in the terms of the EIA Regulations.

13.9 Mitigation and Residual Effects

13.9.1 Mitigation Measures

Significant effects as a result of increased levels of HGVs were identified in **Section 13.7.2 and 13.7.3** relating to:

- Traffic generation on the C125N;
- Severance on Blackaddie Road; and
- Pedestrian Amenity on Blackaddie Road and the C125N.

It should be noted that the high percentage increase in total traffic levels and HGV levels along this road links is due to the low baseline traffic levels. Nevertheless, in accordance with the EIA Regulations, mitigation is required to address these potential significant effects.

It is proposed to prepare and implement a comprehensive CTMP which is intended to mitigate the identified effects associated with the construction of the Proposed Development. The measures will form part of the CTMP which would be agreed with the Council and finalised post consent, however the below sets out the core principles that will be included in the CTMP:

- As far as reasonably possible, deliveries should be scheduled outside of school opening and closing times;
- All contractors will be provided with an induction pack containing information on delivery routes and any restrictions on routes including the presence of schools and other amenities within the Study Area;
- Drivers to be reminded of the presence of 20mph temporary speed restrictions on the main roads outside of these schools and that a strict adherence to these speed limits is expected of all wind farm personnel;
- Communications with local communities should be undertaken for planned activities such as turbine deliveries and concrete delivery days;
- Drivers of all delivery vehicles will be made aware of the approved route to the Site and any restrictions. Drivers of HGVs and other vehicles will be made aware that only the approved route is to be used and that access from non-approved routes is prohibited.
- Prior to the commencement of construction, the Principal Contractor will install temporary construction phase signage on the approved route to Site to warn people of construction activities and associated construction vehicles. Pedestrian and road user safety will be enhanced via the installation of signage and the maintenance of sight lines;
- The Principal Contractor will develop a logistics plan highlighting the access point for the Proposed Development, loading bay, pedestrian / vehicular segregation, welfare, storage, security and material handling that would be enforced following full Proposed Development Area establishment;
- A banksman and/or controlled convoy system would be used to improve the safety and efficiency of transport once they leave the A76(T) and join Blackaddie Road and the C125N;
- To ensure that deliveries do not arrive in a convoy, the proposed construction material 'lay down' areas will allow for a staggered delivery schedule throughout the day, avoiding peak and unsociable hours (i.e., before 06:00 and after 22:00);
- An integral part of the progress meetings held with all trade contractors is the delivery schedule pro-forma. All contractors will be required to give details of proposed timing of material deliveries to the Site. At this stage, they would be given a specific area for delivery;

- Under no circumstances will HGVs be allowed to lay-up in surrounding roads. All personnel in the team will be in contact with each other and with Site management, who in turn will have mobile and telephone contact with the subcontractors; and
- Roads will be maintained in a clean and safe condition. A wheel washing facility would be installed on-site during the construction period in order to reduce mud and debris being deposited onto the local road network.

The Council may require that a road condition survey to be undertaken on the access routes used during the construction phase as a condition of granting consent to the Proposed Development. This will be undertaken prior to the start of the construction phase to record the existing road conditions. The survey area and methodology will be agreed with the Council following confirmation of the construction access routes. Any deterioration in road condition, which is agreed as attributable to construction traffic associated with the Proposed Development will be restored to at least the same standard upon completion of construction. This process will ensure that there are no significant residual adverse effects on the condition of the local road network as a result of the movement of construction vehicles.

An initial ALRA has been undertaken to identify areas where remedial works will be required to permit the safe transportation of larger wind turbine components to the Site. However, a final ALRA will be undertaken for the final selected turbine and route in advance of deliveries commencing.

In addition to the above, upgrades to the C125N and Blackaddie Road would be required in specific areas. Upgrades are likely to take the form of additional passing places, verge strengthening, carriageway widening etc to ensure the safe movement of light vehicle traffic and reduce conflict with existing road users. These would be agreed with Dumfries and Galloway Council prior to construction and be delivered through a road opening permit for temporary construction with works restored following the construction of the Proposed Development.

13.9.2 Residual Effects

It is considered that if the above mitigation measures are implemented through the CTMP for the duration of construction, the effect on pedestrian amenity and severance at the sensitive receptors identified will be reduced to **minor** and therefore considered as **not significant** in terms of the EIA Regulations.

13.10 Summary of Effects

Table 13.25 provides a summary of the effects detailed within this chapter.

Table 13.25 Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Construction Phase				
Road network	Traffic Generation	Moderate	The CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Minor, Not Significant
Road network	Accidents and Safety	Negligible	The CTMP which would be agreed in consultation with the Council and finalised post consent will include measures to enhance existing road safety conditions during the construction phase.	Negligible, Not Significant
Non-motorised Users	Pedestrian Amenity	Moderate	The CTMP which would be agreed in consultation with the Council and	Minor, Not Significant

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
			finalised post consent will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased pedestrian activity.	
Road network	Driver Delay	Minor	The CTMP will set out a phasing and timing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Minor, Not Significant
Settlements along route	Severance	Moderate	The CTMP will set out a phasing, timing, and routing strategy for construction traffic movements. Where necessary construction traffic movements will be reduced during periods of increased baseline traffic.	Minor, Not Significant
Road network and Settlements along route	Noise and Vibration	Minor	N/A	Minor, Not Significant
Road Users and Settlements along route (Abnormal Load Movements)	Combined effect of the above	Minor	Advance warning signs will be posted prior to abnormal load movements. Abnormal load movements will be scheduled to avoid periods of increased baseline traffic as well as school opening and closing periods. All abnormal load movements will be fully escorted to warn on-coming vehicles and advise other road users	Minor, Not Significant

13.11 Statement of Significance

Effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of 'major' or 'moderate' significance. A moderate effect was identified for severance and pedestrian amenity at sensitive receptors on the C125N and Blackaddie Road. Mitigation measures were identified in **Section 13.9** of this EIA Chapter and the residual effects following implementation of these mitigation measures are predicted to be minor and thus **not significant** in terms of the EIA regulations.

It should be noted that the impacts and effects of the Proposed Development has been undertaken on the basis that 100% of stone requirements and concrete are imported to the Site. However, as outlined previously, a significant percentage of the aggregate required would be extracted from on-site borrow pits and opportunities exists for concrete to be batched on-site. Therefore, the temporary increase in construction traffic is lower than assessed.

14. SOCIO-ECONOMICS, TOURISM, RECREATION AND LAND USE

14.1 Introduction

This Chapter of the EIA Report evaluates the effects of the Cloud Hill Wind Farm (the Proposed Development) on the socio-economic, recreation and tourism resources. This assessment was undertaken by ERM Ltd.

This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and
- Statement of Significance.

This Chapter of the EIA is supported by Figure(s) in **Volume 2a: EIA Figures Excluding LVIA**:

- **Figure 14.1:** Recreational Routes Map;
- **Figure 14.2:** Recreational and Tourist Receptor Map; and
- **Figure 14.3:** Southern Upland Way within the Site Boundary.

This Chapter of the EIA is also supported by the following Technical Appendices in **Volume 3: Technical Appendices**:

- Technical Appendix A14.1: Access Management Plan; and
- Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use.

14.2 Legislation, Policy and Guidance

The following legislation, policy and guidance have been considered in carrying out this assessment:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended³⁹¹;
- The Countryside (Scotland) Act 1967³⁹²;
- Land Reform (Scotland) Act 2016³⁹³;
- National Planning Framework 4 (NPF4) (2023)³⁹⁴;

³⁹¹ Scottish Government (2017) The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 10/03/2023)

³⁹² Scottish Government (1981) The Countryside (Scotland) Act 1967 [Online] Available at: Countryside (Scotland) Act 1967 ([legislation.gov.uk](https://www.legislation.gov.uk)) (Accessed on 10/03/2023)

³⁹³ Scottish Government (2003) Land Reform (Scotland) Act 2016 [Online] Available at: Land Reform (Scotland) Act 2016 ([legislation.gov.uk](https://www.legislation.gov.uk)) (Accessed on: 10/03/2023)

³⁹⁴ Scottish Government (2023) National Planning Framework 4 (NPF4) [Online] Available at: National Planning Framework 4 - gov.scot (www.gov.scot) (Accessed on: 10/03/2023)

- Scotland's National Strategy for Economic Transformation (2022)³⁹⁵;
- Build Back Better: Our Plan for Growth (2023)³⁹⁶;
- Onshore Wind: Policy Statement 2022³⁹⁷;
- Dumfries and Galloway Council (2019) Local Development Plan 2³⁹⁸;
- East Ayrshire Council (2023) Proposed Local Development Plan 2³⁹⁹;

14.2.1 Legislation

14.2.1.1 *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended*

The EIA Regulations establish in broad terms what is to be considered when determining the effects of development proposals on socio-economics, tourism and recreation; however, no specific methods to assess these criteria are detailed.

14.2.1.2 *The Countryside Act (Scotland) 1967*

The Countryside Act (Scotland) 1967 gives local authorities the power to protect and manage public rights of way to ensure that they remain open and free from obstruction.

14.2.1.3 *Land Reform Act (Scotland) 2003*

Every local authority within Scotland is required to draw up a system of core paths within their local area that gives the public reasonable access to their outdoor area, and these are protected under the Land Reform Act (Scotland) 2003. This act protects the use of core paths for pedestrians, cyclists and equestrians.

14.2.2 National Policy

14.2.2.1 *National Planning Framework 4 (NPF4)*

NPF4's spatial strategy aims to develop sustainable places in an attempt to reduce the impacts of climate change. This includes decarbonizing industry, reducing community inequalities and creating a more circular economy, all of which will allow Scotland to play their part in achieving the United Nation's Sustainable Development Goals. Within this, six national developments support the delivery of sustainable places, one of which is strategic renewable electricity generation and transmission structure which will aim to:

"Support electricity generation and associated grid infrastructure throughout Scotland, providing employment and opportunities for community benefit, helping to reduce emissions and improve security of supply."

Under Policy 11(e)(iii), NPF4 addresses that renewable energy developments will only be supported by the Scottish Government when the project's design and mitigation strategy show consideration of

³⁹⁵ Scottish Government (2022) Scotland's National Strategy for Economic Transformation [Online] Available at: Scotland's National Strategy for Economic Transformation - Delivery Plans October 2022 - gov.scot (www.gov.scot) (Accessed on 10/03/2023)

³⁹⁶ UK Government (2023) Build Back Better: Our Plan for Growth [Online] Available at: Build Back Better - our plan for growth (publishing.service.gov.uk) (Accessed on 03/07/2023)

³⁹⁷ Scottish Government (2022) Onshore Wind: Policy Statement 2022 [Online] available at: Onshore wind: policy statement 2022 - gov.scot (www.gov.scot) (Accessed on 10/03/2023)

³⁹⁸ Dumfries and Galloway Council (2019) Local Development Plan 2 [Online] Available at: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637771647699370000 (Accessed on 10/03/2023)

³⁹⁹ East Ayrshire Council (2023) Local Development Plan 2 [Online] Available at: LDP2-Volume-1 (east-ayrshire.gov.uk) (Accessed on 10/03/23)

any impacts to public access. Policy 11(c) also addresses that renewable energy developments will only be supported where they:

‘maximise net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.’

Full discussion of all relevant policies in NPF4 for the Proposed Development can be found in **Chapter 5: Planning and Energy Policy**. The Proposed Development’s compliance with NPF4 can be found in the Planning Statement.

14.2.2.2 Scotland’s Economic Strategy

Scotland’s Economic Strategy sets out how the Scottish Government will provide support for businesses and individuals to grow in an economically sustainable way by boosting competitiveness and tackling inequality. As part of these objectives, the Scottish Government aims to direct investment towards opportunities for employment, business, leisure and tourism opportunities, whilst providing planning policies to facilitate this.

The document identifies four strategic priorities which are critical to economic growth:

- Investing in our people, infrastructure and assets in a sustainable way;
- Fostering a culture of innovation;
- Promoting inclusive growth; and
- Internationalisation.

Within these strategic priorities, the Scottish Government identifies that key sectors, such as tourism, have the ability to lead the way in achieving a ‘just transition’ through their industries, e.g. sustainable tourism.

14.2.2.3 Build Back Better: Our Plan for Growth

The UK is striving towards clean economic growth by supporting the development and deployment of a range of renewable technologies, old and new. This will be done through £12 billion of funding towards projects in the Ten Point Plan for a Green Industrial Revolution which will create new opportunities from economic growth and employment across the country.

14.2.2.4 Onshore Wind: Policy Statement 2022

The Scottish Government state that they have long-term ambitions for land-use across Scotland to ‘build a stronger, more resilient wellbeing economy’. It was identified that the renewable energy sector, in particular onshore wind, will be prioritised for land use to meet ‘Net Zero’ objectives and that the Scottish Government will support this prioritisation where possible:

“Our statutory and environmental consultees will continue to play a crucial role in assessing this balance for all onshore wind planning applications. The onshore wind sector must continue to build on their positive relationship with the statutory bodies, engaging as early in their considerations as possible, and building upon the existing collaborative approach through the design and development of sites.”

14.2.3 Local Policy

14.2.3.1 Dumfries and Galloway Local Development Plan 2

Dumfries and Galloway Council aim to develop and expand the range of renewable energy resources across the area and recognise the contribution the renewable sector bring to the local economy:

“Significant investment in the network is anticipated during the plan period, which the Council supports in principle in appropriate locations.”

“A new and increasingly significant part of the area’s economy is generation of renewable energy.”

Under ‘Policy IN1: Renewable Energy’ and ‘Policy IN2: Onshore Wind’ the Council state their commitment to approving renewable energy schemes in accordance with a range of criteria that protect the environment and communities, including:

“Impacts on tourism, recreation interests and public access.”

“Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.”

14.2.3.2 East Ayrshire Council Local Development Plan 2

East Ayrshire Council support all forms of renewable energy and note that they operate the UK’s largest windfarm, Whitelee. Further, their Ayrshire Growth Deal CoRE Project aims to put East Ayrshire at the forefront of renewable energy research and deployment.

“The LDP supports all forms of renewable energy and aims to ensure East Ayrshire plays its part in tackling the climate emergency and reducing greenhouse gas emissions.”

Under ‘Policy RE1: Renewable Energy’ East Ayrshire Council agree to support all forms renewable energy, whether they are part of old or new schemes, if they meet the following criteria:

“Impacts on tourism and recreation, including public access and long-distance walking and cycling routes.”

“Net economic impact, including employment, training and business and supply chain opportunities.”

14.2.4 Guidance

14.2.4.1 Energy Trends UK, October to December 2022 and 2022

The Department for Energy Security and Net Zero provided the report Energy Trends UK, October to December 2022 and 2022⁴⁰⁰ to provide an overview of socio-economic trends in the UK’s energy supply. In 2022, a similar record high to that seen in 2020 was observed. During 2022, renewables’ share of energy generation was 41.4%, an increase of 1.8% from 2021, largely due to wind (onshore and offshore) reaching new, record high levels of generation (24.6%). Whilst previous record high levels in 2020 were largely due to favourable weather conditions, the increased renewable energy generation in 2022 was driven by new capacity, highlighting the importance of increasing our renewable energy capacity in the UK.

14.2.4.2 The Onshore Wind Energy Prospectus 2021

RenewableUK published The Onshore Wind Industry Prospectus in October 2021⁴⁰¹. This report provides a useful insight into the steps each country within the UK needs to take to reach Net Zero Targets, with a specific focus on the benefits of onshore wind farms. It is estimated that around 80% of the onshore wind energy needed to meet the 30GW by 2030 target can be provided by Scotland, which will create an additional 17,000 jobs and £27.8 billion in Gross Value Added (GVA) for the economy. Of these new jobs, an estimated 50.3% of these will be within Ayrshire (including East Ayrshire), Lanarkshire and Greater Glasgow. It was also stated that 43% of the supply chain for the UK could be provided by Scotland due to the high proportion of developers, civil contractors, and wind farm support services.

⁴⁰⁰ Department for Energy Security and Net Zero (2023) Energy Trends UK, October to December 2022 and 2022 [Online] Available at: Energy Trends March 2023 (publishing.service.gov.uk) (Accessed on 20/04/2023)

⁴⁰¹ RenewableUK (2021) The Onshore Wind Industry Prospectus [Online] Available at: onshore_wind_prospectus_fina.pdf (ymaws.com) (Accessed on 13/03/23)

14.2.4.3 Onshore Wind: Economic Impacts in 2014

RenewableUK were commissioned by BiGGAR Economics to write Onshore Wind: Economic Impacts in 2014⁴⁰². It is stated that a typical UK wind farm will invest £2.97 million per MW over its development, construction and operation and maintenance stages where 47% is spent, and 27% is retained, in the local economy. In these three stages, construction and operations and maintenance of the site will generate the most money for the local economy. This information informs the socio-economic assessment (presented further in **Technical Appendix A14.2: Assessment Methodology for Socio-Economics, Tourism, Recreation and Land Use** as it provides an empirical way of calculating the economic contribution of an individual wind farm to the regional and national economy.

14.2.4.4 Economic Benefits from Onshore Wind Farms

BVG Associates' study, Economic Benefits from Onshore Wind Farms (2017)⁴⁰³, focusses on eight onshore wind farms located in the South-West of Scotland and calculated that the majority of project expenditure tends to go towards three key areas within the local economy:

- Local suppliers working on the wind farms;
- Accommodation for the employees working on the wind farms; and
- Expenditure from community payments, rent and rates.

The study estimated that a total of £1,276 million GVA, and £297 million local value added (LVA), will be generated over the lifetime of the eight projects within the UK. The full-time equivalent years employment (FTE) is estimated to be 31,118 over the lifetime of the projects, with 7,768 estimated to be within the local area. Community benefit funds (CBFs) are estimated to be £2.5 million a year, which would generate £59 million over 25 years. It would also provide 9,300 FTE years from CBFs, which would give additional local area earnings of £213 million, at £23,000 per year.

14.2.4.5 Quantifying Benefits of Onshore Wind to the UK

Vivid Economics issued Quantifying Benefits of Onshore Wind to the UK in 2019⁴⁰⁴ to outline the socio-economic benefits that can be achieved by deploying 35GW of onshore wind by the 2035. These include:

- 7% reduction in electricity costs, saving households £50 per year;
- £360 million in export annually by 2035;
- 14,000 direct jobs and 17,000 indirect jobs; and
- Productivity uplift throughout the UK.

14.2.4.6 Scotland Outlook 2030

Scotland Outlook 2030⁴⁰⁵ provides a collaborative approach from Scottish Tourism Alliance, The Scottish Government, the Highlands and Islands Enterprise, Scottish Enterprise, Skills Development Scotland and VisitScotland on tourism strategies from 2020 to 2030. Following the declaration of a climate emergency, the Scottish Government is moving away from increasing the numbers of tourists, to increasing the value of tourism through a more sustainable approach. In turn, Scotland's move towards sustainable tourism will play its part in contributing to their net-zero ambitions.

⁴⁰² RenewableUK (2015) Onshore Wind: Economic Impacts in 2014 [Online] Available at: onshore_economic_benefits_re.pdf (ymaws.com) (Accessed on 10/03/2023)

⁴⁰³ BVG Associates (2017) Economic Benefits from onshore wind farms [Online] Available at: BVGA-18510-Economic-impact-onshore-wind-report-r3.pdf (bvgassociates.com)(Accessed on 10/03/2023)

⁴⁰⁴ Vivid Economics (2019) Quantifying the Benefits of onshore wind to the UK [Online] Available at: Quantifying benefits of onshore wind to the UQuank (vivedeconomics.com) (Accessed on 10/03/2023)

⁴⁰⁵ Scottish Tourism Alliance (2020) Scotland Outlook 2030 [Online] Available at: Scotland-Outlook-2030.pdf (scottishtourismalliance.co.uk) (Accessed on 21/04/2023)

14.2.4.7 *Wind Farms and Tourism Trends in Scotland*

In *Wind Farms and Tourism Trends in Scotland* (2021)⁴⁰⁶, BiGGAR Economics examined the trends on local tourism within a 15km radius around 28 wind farms constructed in Scotland between 2009 and 2015. They found that for most cases, sustainable tourism appeared to perform better in areas surrounding wind farms compared to tourism at the level of the local authority area. This analysis found no overall pattern or relationship between onshore wind development and tourism, suggesting that there was no detrimental impact on the tourism sector. As such, this research concluded that tourists are not deterred by the development of onshore wind farms, even at a local level.

14.2.4.8 *Wind Turbines and Horses – Guidance for Planners and Developers*

British Horse Society's (2015) *Wind Turbines and Horses – Guidance for Planners and Developers*⁴⁰⁷ discusses the BHS supports the Scottish Government's Renewable Energy Strategies. It also discusses that the note serves as a guidance for planners and to ensure that the safety implications for horse riders and carriage drivers are considered of throughout the planning process. They state that many horses are unfamiliar with turbines; however, the BHS believe that a gradual familiarisation with turbines will create a positive opportunity for horse riders. For example, according to the BHS's 2021 report 'Equestrian Access through Wind Farms in Scotland'⁴⁰⁸ the BHS operate training days at Whitelee Wind Farm, where horse riding takes place on a daily basis. This site has assigned rangers to assist with horse riding on site, as well as providing a website with up-to-date weather conditions so that equestrians can plan their activities.

The BHS state that '200m or three times the blade tip height (whichever is greater)' the overall height of any Proposed Development's turbines should serve as a reasonable separation distance between equestrians and wind turbines; however, each assessment would be considered on a case-by-case basis as many independent factors are likely to be involved.

14.2.4.9 *Wind Farms and Tourism in Scotland: A Review with Focus on Mountaineering and Landscape*

Mountaineering Scotland stated in *Wind Farms and Tourism in Scotland: A Review with Focus on Mountaineering and Landscape* (2017) that most tourism is unaffected by the presence of wind farms. They state that most tourism is driven by attractions, business trips, friends and/or family and events. In some cases, wind turbines may be viewed as a novelty if tourists come from a part of the world where they are uncommon. Despite this, it is acknowledged that some individuals may be discouraged to visit certain areas due to wind farms. The factors that tend to influence this are:

- Visitor type;
- Landscape type and/or character; and
- The nature of the local tourism offer and market.

14.2.4.10 *Economic Impacts of Wind Farms on Scottish Tourism*

In 2007, Glasgow Caledonian University were commissioned by the Scottish Government to assess the economic impact of onshore wind farms on tourism⁴⁰⁹. This research found that three-quarters of tourist felt that onshore wind had a positive or neutral impact on the landscape. It also found that

⁴⁰⁶ BiGGAR Economics (2021) *Wind Farm and Tourism Trends in Scotland: Evidence from 44 Wind Farms* [Online] Available at: <https://biggareconomics.co.uk/wp-content/uploads/2021/11/BiGGAR-Economics-Wind-Farms-and-Tourism-2021.pdf> (Accessed 10/03/2023)

⁴⁰⁷ British Horse Society (2015) *Wind Turbines and Horses – Guidance for Planners and Developers* [Online] Available at: [Layout 1 \(bhs.org.uk\)](https://www.bhs.org.uk/layout1) (Accessed on 10/03/2023)

⁴⁰⁸ British Horse Society (2021) *Equestrian Access through Wind Farms in Scotland* [Online] Available at: [equestrian-access-through-windfarms-in-scotland-factsheet-2021.pdf](https://www.bhs.org.uk/equestrian-access-through-windfarms-in-scotland-factsheet-2021.pdf) (bhs.org.uk) (Accessed on 21/04/2023)

⁴⁰⁹ Scottish Government (2007) *Economic Impact of Wind Farms on Scottish Tourism* [Online] Available at: [Key Findings - Economic impacts of wind farms on Scottish tourism: research findings - gov.scot \(www.gov.scot\)](https://www.gov.scot/Key-Findings-Economic-impacts-of-wind-farms-on-Scottish-tourism-research-findings) (Accessed on 03/07/2023)

between 93-99% of tourists would return to an area, regardless of the presence of wind turbines. The study found that tourism revenue by 2015 would be 0.18%, or £7.6 million, lower than it would have been without the presence of wind farms (according to 2007 economic; however, it was concluded that this effect would be offset or reinforced by other economic or environmental impacts that wind farms would create.

To minimise any potential, adverse impacts on tourism, it is recommended that:

- The number of tourists travelling past the development to somewhere else;
- The views from accommodation in the area;
- The relative scale of the tourism impact (e.g. local, regional or national)
- The potential positive impacts associated with the development; and
- The view of tourist organisations, such as Visit Scotland, be taken into account.

14.3 Assessment Methodology and Significance Criteria

14.3.1 Scoping Responses and Consultations

A scoping exercise was undertaken and submitted to the Dumfries and Galloway Council in March 2022. Consultation for this section of the EIA Report was undertaken with the following organisations (Table 14.1).

Table 14.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
East Ayrshire Council	Scoping Response 28/04/2022	Two VPs within East Ayrshire are noted to be representative of any the impacts walkers would experience on recreational routes. East Ayrshire Council also highlighted the presence of the Galloway and Southern Ayrshire UNESCO Biosphere as an important tourist attraction.	These VPs have been used to identify any impacts of the Proposed Development on recreational users, see Section 14.5.2 . This chapter considers impacts on the Galloway and Southern Ayrshire UNESCO Biosphere Zone. These have also been assessed in Section 14.5.2 .
Scotways	Scoping Response 24/05/2022	Highlighted that the following paths are affected by the Site: DN23, Sanquhar to Stroanpatrick Path [HP368], and St John's Town of Dalry to Sanquhar [HT84] (all part of the SUW). In this case DN23, the SUW, crosses the Site and the Society would expect a larger minimum separation distance. It however appears that at least one of the proposed turbines lie in close proximity to this route. ScotWays is likely to object to any proposal where the above principle is not followed, including where a micro-siting allowance could lead to turbine encroachment upon a route because it has been insufficiently buffered. It is recommended that the applicant may wish to approach the relevant authority's access team for their input when drawing	An assessment has been undertaken on the predicted access impacts on Core Paths and recreational routes in Section 14.5.2 . An Access Management Plan (Technical Appendix A14.1: AMP) has been prepared in conjunction with this application to give an overview of appropriate mitigation measures that will ensure the safe recreational use of the SUW during the construction and operational period. The AMP only considers the SUW as the only core path that crosses the Site boundary and experience direct impacts. Should the Proposed Development be granted consent, a full AMP will be submitted to, and approved by the Council. The AMP as approved shall be implemented in full, unless

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		up their Access Management Plan for their Proposed Development.	otherwise approved in writing with the Council. When preparing the AMP (Technical Appendix A14.1: AMP), requests for input were made to the Council Access Officer, Southern Upland Way Rangers and the Southern Upland Way Partnership and no response or comments were issued. If consent is issued for the Proposed Development, a full AMP will be created in conjunction with the Council's Principal Contractor, Access Officer and Southern Upland Way Rangers.
VisitScotland	Scoping Response 05/05/2022	Strongly recommend any potential detrimental impact of the proposed development on tourism - whether visually, environmentally and economically - be identified and considered in full. This includes when taking decisions over turbine height and number. VisitScotland strongly agree with Scottish Government advice, which states that the importance of tourism in impact statements should not be diminished and that an independent tourism impact assessment should be carried out. This assessment should be geographically sensitive and consider the potential impact on any tourism offerings in the vicinity. VisitScotland recommended utilising the Scottish Government's 2008 study 'Economic impacts of wind farms on Scottish tourism: research findings'. VisitScotland urged that consideration of their specific concerns be taken into account.	A review of the Scottish Government's 'Economic impacts of wind farms on Scottish tourism: research findings' has been carried out in Section 14.2 . The most up-to-date guidance from both Scottish Government and VisitScotland, Scotland Outlook 2030, has been taken into account for the purposes of this assessment as noted in Section 14.2 . An assessment of individual tourist receptors has been carried out in Section 14.5.2 .
British Horse Society (BHS)	Scoping Response 03/05/2022	Stated their willingness to work with the team on an ongoing basis to ensure horses and riders get as good a deal as they can out of any proposed improvements. They are happy to be contacted in the future regarding the Development. The BHS quoted research conducted by BHS and SRUC which shows horses to be a major rural economic driver.	Reference has been made to BHS reports when considering potential recreational and socio-economic 'British Horse Society (2015) Wind Turbines and Horses – Guidance for Planners and Developers'.

14.3.2 Methodology

This chapter of the EIA Report considers the magnitude of effect on socio-economics, tourism, recreation and land use. The key considerations for each section of this chapter are set out in **Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism,**

Recreation and Land Use. An overview of each assessment's methodology is presented below in **Sections 14.3.2.1 – 14.3.2.3.**

14.3.2.1 *Socio-economics*

The socio-economic assessment criteria relates to the economic and employment effects that the Proposed Development is likely to create within the socio-economic study area (as defined in **Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use**). These effects are defined in terms of Full-Time Equivalent (FTE) jobs, Full-Time Equivalent (FTE) years and GVA generated by the Proposed Development. The assessment aims to predict the likely effects (beneficial, adverse or neutral) arising from the Proposed Development. Socio-economic effects are divided into:

- Direct effects: for example, employment opportunities in the construction, operation and maintenance and decommissioning of the Proposed Development. The nature and scale of the economic effects would depend on the total cost and the sources of the materials and labour. Other direct effects include a community benefit fund and the payment of business rates payable to the local authority throughout the operational phase of the Proposed Development;
- Indirect effects: such as employment opportunities created down the supply chain by those companies providing services to the Proposed Development during construction, operation and decommissioning; and
- Induced effects: for instance, employment created by the additional spend of wages into the local economy and the purchasing of basic materials, equipment and office space for staff.

The socio-economic assessment will involve a quantitative desk-based assessment to determine the sensitivity, magnitude of impact and significance of effect in line with the EIA regulations, by utilising the framework outlined in **Section 14.3.4**. Direct impacts will be estimated using RenewableUK (2015) study, Onshore Wind: Economic Impacts in 2014 which utilised 20 case studies from across the UK to develop a framework for calculating the project spend per annum, employment opportunities, and GVA contributions of a given onshore wind farm development⁴¹⁰. Numbers taken from the RenewableUK study have been amended to reflect 2023 market values by utilising annual data on business turnover from the Office of National Statistics⁴¹¹. Induced and indirect impacts will then be calculated from these results using Standard Industrial Classifications (SIC) and Supply, Use and Output Tables from the Scottish Government^{412, 413}.

The BESS unit, will not be included for the purposes of this quantitative assessment as the BESS may ultimately not be constructed with the rest of the Proposed Development. Should the BESS be constructed, it is anticipated that there will be beneficial socio-economic impact during the construction and operational phases that will have beneficial impacts on employment and GVA at a local, national and UK study area. Assuming the BESS is not constructed, this assessment therefore represents an appropriate 'worst case' scenario of socio-economic impacts.

Further details on the methodology used for the assessment of socio-economics effects can be found in **Section 14.1.4.1 of Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use.**

⁴¹⁰ RenewableUK (2015) Onshore Wind: Economic Impacts in 2014 [Online] Available at: onshore_economic_benefits_re.pdf (ymaws.com) (Accessed on 10/03/2023)

⁴¹¹ Office for National Statistics (2022) Non-financial business economy, UK regional results: Sections A to S, Scotland, 2008 to 2020 [Online] Available at: Non-financial business economy, UK regional results: Sections A to S - Office for National Statistics (accessed on: 03/07/2023)

⁴¹² Scottish Government (2012) Standard industrial classifications (SIC): information [Online] Available at: Standard industrial classification (SIC): information - gov.scot (www.gov.scot) (accessed on 20/04/2023)

⁴¹³ Scottish Government (2022) Supply, Use and Output Tables [Online] Available at: > Multipliers - Supply, Use and Input-Output Tables - gov.scot (www.gov.scot) 9Access on 04/04/2023)

14.3.2.2 *Tourism and Recreation*

Tourism and recreation can be affected when the Proposed Development leads to a potential change in tourist or recreational habits/activities. Factors which might lead to change in recreational behaviour include:

- Loss, closure, or diversion of routes;
- Obstructing access routes or enhancing access;
- Reduction or enhancement of amenity value; and
- Changes in setting and context of the recreational resource.

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, recreational facilities and accommodation. Effects on tourism and recreation can be beneficial, adverse or neutral.

A qualitative, desk-based assessment will be undertaken to determine the sensitivity, magnitude of impact and significance of effect in line with the EIA regulations, by utilising the framework outlined in **Section 14.3.4** for determining the significance of effect.

Further details on the methodology used for the assessment of socio-economics effects can be found in **Section 14.1.4.2 of Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use**.

14.3.2.3 *Land Use*

The land use assessment criteria relates to the change in land use which occurs within the Site boundary. Land use is the anthropogenic management and occupation of the environment and what the land is used for, both presently and in the future. Developments can affect the ability of the land to be effectively used for its current purpose and also affect the potential use in the future. This can result from direct loss of land to new infrastructure, which is therefore no longer available for the current land-use; and disruption to existing land use operations occurring as a result of the construction and operational activities of a new development (e.g. access restrictions).

A qualitative, desk-based assessment will be undertaken to determine the sensitivity, magnitude of impact and significance of effect in line with the EIA regulations, by utilising the framework outlined in **Section 14.3.4** for determining the significance of effect.

Further details on the methodology used for the assessment of socio-economics effects can be found in **Section 14.1.4.3 of Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use**.

14.3.3 *Study Areas*

The study areas in this assessment are receptor specific and detailed in **Section 14.1.3. of Technical Appendix A14.2: Assessment Methodology for Socio-economics, Tourism, Recreation and Land Use**.

14.3.4 *Assessing the Significance of Effects*

14.3.4.1 *Sensitivity of Receptors*

The sensitivity of receptors considers their ability to adapt to changes brought about by the Proposed Development. This will be assessed in line with best practice guidance, legislation and statutory designations. **Table 14.2** details the framework for determining the sensitivity of each receptor.

Table 14.2 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The asset is of very high socio-economic, tourism, recreation or land use value. It is of importance at an International level and has little or no capacity to absorb change without fundamentally altering its present character. For example, it is a destination in its own right which will attract a substantial proportion of visitors and/or possesses priority in UK policy.
High	The asset is of high socio-economic, tourism, recreation or land use value. It is of importance at a International/UK level and has little capacity to absorb change without fundamentally altering its present character. For example, it is a destination in its own right which will attract a high number of visitors and/or possesses priority in UK policy.
Medium	The asset is of moderate socio-economic, tourism, recreation or land use value. It is of importance at a UK/national level and has some capacity to absorb change without fundamentally altering its present character. For example, it is a destination in its own right will attract a moderate number of visitors and/or possesses priority in Scottish policy.
Low	The asset is of moderate socio-economic, tourism, recreation or land use value. It is of importance at a national/local level and has capacity to absorb change without fundamentally altering its present character. For example, it is an incidental destination for current visitors which attracts a small number of visitors and/or possesses priority in local Council policy.
Negligible	The receptor is resistant to change and is of little socio-economic, tourism, recreation or land use value.

14.3.4.2 Magnitude of Impact

The magnitude of impact will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development and the duration and reversibility of the impact.

The criteria for assessing the magnitude of an effect are presented in **Table 14.3**.

Table 14.3 Framework for Determining Magnitude of Impact

Magnitude of Impact	Definition
High	Total loss or major alteration (beneficial or adverse) of the socio-economic, land use, recreation, or tourism assets/receptors.
Medium	Loss of, or alteration to (beneficial or adverse), one of more key elements of the socio-economic, land use, recreation, or tourism asset's baseline value.
Low	Slight alteration (beneficial or adverse) of the socio-economic, land use, recreation, or tourism asset/receptors.
Negligible	Barely perceptible alteration (beneficial or adverse) of the socio-economic, land use, recreation, or tourism asset/receptors.

14.3.4.3 Significance of Effect

The sensitivity of the asset and the magnitude of impact will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects.

Table 14.4 summarises guideline criteria for assessing the significance of effects.

Table 14.4 Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are shaded in light grey in the above table. Effects can be beneficial, adverse or neutral and these are specified where applicable in **Section 14.5: Assessment of Potential Effects**.

14.3.5 Assessment Limitations

Data has been collated from published sources, as referenced in **Section 14.3.4**, to reflect the current socio-economic, tourism and recreational baseline in study areas; however, no surveys specific to this assessment have been carried out. Other technical assessments presented within this EIA Report have considered the significance of effect on a number of tourist and/or recreational receptors in this assessment and, where appropriate, the findings of these chapters have been drawn upon to inform the assessment of wider effects. These chapters include **Chapter 6 – Landscape and Visual Impact Assessment**, **Chapter 9 – Heritage and Archaeology**, **Chapter 12 – Noise** and **Chapter 13 – Traffic and Transport**.

Tourism baseline figures have been taken from the latest available information prior to the current COVID-19 situation/economic crisis. As such, tourism baseline data may not be wholly representative of tourist behaviours in the aftermath of COVID-19; however, these numbers are estimated to be more accurate than tourism data from during the pandemic.

As well as this, GVA and employment multipliers from the Scottish Government were based on 2019 data. This was the most up-to-date date available and it is not possible to amend the multiplier values to account for 2023 market values; however, as all other data has been amended to reflect 2023 market values, this may slightly skew some of the conclusions drawn. In ERM's professional judgement, this assessment will still be able to reflect the most likely economic and employment outcomes for the Proposed Development, as every attempt has been made to use the most up-to-date and publicly available data.

Further, baseline data for different areas and/or assessments may come from different dates. Where possible, the most up-to-date and reflective data will be used; however, this may skew some of the comparisons made. Again, in ERM's professional judgement, this assessment provides the most up-to-date and reflective baseline account for socio-economics, tourism, recreation and land use based on publicly available data.

Whilst efforts have been made to ensure that the key tourism and recreation facilities in the area have been identified, it is possible that there are a number of small attractions that will not have been identified through the data collection process.

14.4 Baseline

14.4.1 Baseline Conditions

Local, Scottish and UK data has been derived from NOMIS Official Labour Market Statistics, which is a database providing up to date census data for Council areas around the UK^{414, 415}.

14.4.2 Population

In 2021, the population of Dumfries and Galloway was estimated to be 148,800, accounting for 2.7% of the total population of Scotland, which stood at just under 5.5 million (5,479,900). In the same year, East Ayrshire's total population was estimated at 122,000, which represented a slightly smaller proportion of Scotland's total population, 2.2%. Together, the two Council areas represented just under five percent (4.9%) of Scotland's total population.

14.4.3 Employment

In 2021, 58% of Dumfries and Galloway's population were of working age, aged between the ages of 16 and 64 (86,300). In comparison, East Ayrshire's working age population in 2021 was slightly higher at 62% (75,700); however, both working age populations fell slightly below both the Scottish (63.8%) average. In 2021, 72.0% (62,700) were economically active in Dumfries and Galloway and 74.7% (57,100) were economically active in East Ayrshire, which again fell short of the Scottish (77.2%) average.

Between 2021 and 2022, the largest reasons for economic inactivity in both regions was long-term sickness, at 39.2% in Dumfries and Galloway and 36.4% in East Ayrshire, which was higher than the Scottish (31.9%) and GB (25.5%) averages as a reason for economic inactivity. For Dumfries and Galloway, reasons for economic inactivity were closely followed by retirement (20.8%), being a student (15.2%), looking after family/home (13.5%) or for other reasons (9.4%). For East Ayrshire, this was closely followed by looking after family/home (21.6%), retirement (14.0%) and for other reasons (10.9%).

In 2022, the average, gross weekly pay for full-time workers in Dumfries and Galloway was £586.40 and £638.60 for East Ayrshire. East Ayrshire's average gross weekly pay is only slightly less than the Scottish (£640.30) and GB (£642.20) averages; however, Dumfries and Galloway's average, gross weekly pay falls £53.90 below the Scottish average and £55.80 below the GB average.

In 2021, the most prominent employment sectors in Dumfries and Galloway were human health and social work activities (18.5%), wholesale and retail trade, repair of motor vehicles and motorcycles (16.7%) and manufacturing (11%). This was mirrored by East Ayrshire's prominent employment sectors which were health and social work activities (25.0%), wholesale and retail trade, repair of motor vehicles and motorcycles (15.0%) and accommodation and food service activities; administrative and support services activities; public administration and defences and compulsory social security; and education which all represented 7.5% of employment sectors.

These were broadly in line with the most prominent employment sectors in Scotland which were human health and social work activities (15.9%), wholesale and retail trade, repair of motor vehicles and motorcycles (14.4%) and education (8.7%), as well as GB's most prominent employment sectors which were human health and social work activities (14.4%), wholesale and retail trade, repair of motor vehicles and motorcycles (13.7%) and professional, scientific and technical activities as well as public administration and defence and compulsory social security at 8.9%.

⁴¹⁴ NOMIS (2023) Labour Market Profile – Dumfries and Galloway [Online] Available at: Labour Market Profile - Nomis - Official Census and Labour Market Statistics (nomisweb.co.uk) (Accessed on: 10/03/2023)

⁴¹⁵ NOMIS (2023) Labour Market Profile – East Ayrshire [Online] Available at: Labour Market Profile - Nomis - Official Census and Labour Market Statistics (nomisweb.co.uk) (Accessed on: 10/03/2023)

Of importance to this assessment are the numbers of people employed in sectors that could potentially benefit from the construction and operation of the Proposed Development. These sectors are electricity, gas, steam and air condition supply; construction; and accommodation and food service activities. **Table 14.5** sets out the proportion of each local council area who are employed by these sectors in comparison to the Scottish and GB averages.

Table 14.5 Employment sectors who are estimated to benefit from the Proposed Development

	Dumfries & Galloway (%)	East Ayrshire (%)	Scotland (%)	Great Britain (%)
Electricity, Gas, Steam & Air Condition Supply	0.5	0.4	0.7	0.4
Construction	5.6	6.2	6.1	4.9
Accommodation & Food Service Activities	8.3	7.5	8.0	8.9

As seen in **Table 14.5**, Electricity, Gas Steam and Air Conditioning sectors employ less than the Scottish average; however, for construction, East Ayrshire employs more than the Scottish and GB averages and for accommodation and food service activities, Dumfries and Galloway employs more than the Scottish averages. As a result, there are likely to be less local-based employment opportunities in this sector throughout the construction and operational phases of the Proposed Development as work may need to be acquired from further afield in Scotland and GB. Despite this, there appears to be a larger than average workforce across construction and accommodation and food service activities in the study area, which should reflect positively in the local socio-economic context.

14.4.4 Deprivation

The Scottish Index of Multiple Deprivation (SIMD) is used to identify areas of deprivation across Scotland. This is done by ranking relative measures of deprivation across 6,976 data zones, from most deprived (ranked '1') to least deprived (ranked '6,976'), across seven different domains; income, employment, education, health, access to services, crime and housing⁴¹⁶. These data zones are then split into deciles, from the most deprived 10 % (1), to the least deprived 10 % (10)⁴¹⁷.

At a local level, Mid and Upper Nithsdale has an overall rank of 2946 and a decile of 5, meaning that it sits within the most deprived half of Scotland (deciles 1 – 5). Despite this, Mid and Upper Nithsdale sits at the upper end of this spectrum, being just below the cusp of the least deprived areas in Scotland (deciles 6 – 10), and sitting far away from deciles 1 and 2, which represent the most deprived 20% of Scotland. The least deprived domains are income, employment, health, access and education all have a decile of 5. Crime and housing have the highest deciles, 6.

At a regional level, Dumfries and Galloway has an overall rank of 3375 and a decile of 5, similar to that of Mid and Upper Nithsdale; however, it has a slightly higher rank than Mid or Upper Nithsdale. This means that Mid and Upper Nithsdale is slightly less deprived than the regional area of Dumfries and Galloway that it sits within. Within its overall decile rank, Dumfries and Galloway's most deprived domains are access, crime, employment, and income all with deciles of 5. The least deprived domain is housing which has a decile of 7. East Ayrshire has an overall rank of 2759 and a decile of 4, meaning that it is slightly more deprived than Dumfries and Galloway; however, it still sits well above the most deprived areas in Scotland – bottom 20 % (deciles 1 and 2). The most deprived domains are

⁴¹⁶ Scottish Government (2020) Scottish Indices of Multiple Deprivation 2020 - Rank [Online] Available at: Scottish Index of Multiple Deprivation 2020v2 - ranks - gov.scot (www.gov.scot) (Accessed on 10/03/2023)

⁴¹⁷ Scottish Government (2020) Scottish Indices of Multiple Deprivation 2020 – SIMD Rank to Quintile, Decile and Vigintile [Online] Available at: SIMD rank to quintile, decile, and vigintile - gov.scot (www.gov.scot) (Accessed on 10/03/2023)

access and health with deciles of 4. The least deprived domain in East Ayrshire is housing which has a decile of 6.

14.4.5 Significance of Socio-Economics

As socio-economic impacts will be considered at three different levels – local (Council area), National (Scotland) and UK level – the overall sensitivity of socio-economics as a resource has to be combined with these three study area sensitivities. Both the UK and Scottish economies are of importance at a national/regional level and the local economy (Council) only has a low sensitivity, as it is important at a National/local level. To predict the greatest level of impact, adverse or beneficial, in the case that mitigation should be required, the receptor with the highest sensitivity has been chosen to be representative of socio-economics as a whole. Therefore, the sensitivity of these receptors is considered to be moderate.

14.4.6 Land Use

The predominant land use within the Site consists of open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. The Site is adjacent to a number of forestry plantations including Ulzieside Plantation, Mains Plantation and Brown Hill. The Site covers an area of 804 ha (hectares).

The topography of the Site and immediate vicinity is relatively complex, as shown on **Figure 1.2**. The elevation of the Site ranges from 470 metres (m) Above Ordnance Datum (AOD) in the south-east of the Site and falls to around 150 m AOD in the north-east of the Site. There are a number of notable hilltops and ridges across the Site including Corridow Hill (470 meters (m) Above Ordnance Datum (AOD)), Mid Rig (437 AOD), Cloud Hill (451 AOD), and Whing Head (473 AOD). The hills are dissected by a number of watercourses within the Site. These include Whing Burn, Glenmaddie Burn, Glen Burn, and Glenlarie Burn. Watercourses within the Site are assessed within this Chapter as part of the land-use resource as recreational receptors only. **Chapter 12 – Hydrology and Soils** provides an assessment of the watercourses in a hydrology context.

There is an area of forestry adjacent to the Site to the east, Ulzieside Plantation, although there is no established forestry within the Site; however, there has been recent re-planting adjacent to the Ulzieside Plantation which sits within the Site boundary.

There is one Core Path that passes through the Site, right of way DN23, as recorded in the National Catalogue of Rights of Way (CROW). This Core Path forms part of the SUW and is also promoted by the Heritage Paths project as the '*Sanquhar to Stroanpatrick Path* [HP368]', as well as being catalogued in ScotWay's book *Scottish Hill Tracks* as route number 83 *St John's Town of Dalry to Sanquhar* [HT84]. This is assessed in detail for the construction and operation phases of the Proposed Development within **Section 14.5.3**.

There are no residential properties or public roads located within the Site.

14.4.7 Recreation and Tourism Baseline

Tourism is a key element in the socio-economic, environmental, and cultural welfare of Scotland. In 2019, around 17.5 million overnight trips were taken in Scotland (UK and international visitors) for which visitor expenditure totalled around £5.9 billion⁴¹⁸. These figures represent substantial increases on 2018 figures; in 2018, around 15.5 million overnight trips were taken in Scotland, for which visitor

⁴¹⁸ VisitScotland (2020) Key Facts on Tourism in Scotland 2019 [Online] Available at: <https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/key-facts-on-tourism-in-scotland-2019.pdf> (Accessed 10/03/2023)

expenditure totalled around £5.1 billion⁴¹⁹. In 2021, VisitScotland found that the top reasons for visiting Scotland were⁴²⁰:

- To get away and have a change of environment (53%);
- To connect with nature and be outdoors (51%);
- To revisit somewhere that had provided good experiences in the past (38%); and
- Not being too far overseas after the pandemic (38%).

Due to the format of available data, tourism and recreational data has been provided in the context of Dumfries and Galloway and Ayrshire and Arran (including East Ayrshire).

Data from VisitScotland shows that between 2017 and 2019, Dumfries and Galloway saw an annual average of 5.7 million (5,721,000) day visitors and 735,000 overnight visits, which had increased by 7% from the previous period (2016-2018)⁴²¹. Day tourism during this period brought in an average expenditure of £239 million per year, while overnight tourism expenditure accounted for £148 million per year. This average expenditure had decreased by 1% from the previous period.

Data from VisitScotland shows that between 2017 and 2019, Ayrshire and Arran saw an annual average of 10.5 million (10,448,000) day visitors and 742,000 overnight visits, which had decreased by 2% from the previous period (2016-2018)⁴²². Day tourism during this period brought in an average expenditure of £415 million per year, while overnight tourism expenditure accounted for £189 million per year. This average expenditure had increased by 1% from the previous period.

The most popular activities undertaken by domestic day visitors in Dumfries and Galloway was visiting family for leisure (900,000), going for a meal (800,000), and going for a drink (800,000). In Ayrshire and Arran, the most popular activities were going for a meal in a restaurant, café, hotel, pub, etc (1.9 million), going for a drink in a pub, club, hotel, etc (1.4 million) and visiting a beach (1.3 million).

The Site is located within a rural setting with recreation opportunity based around the natural environment such as walking, golf, and fishing. As such, there are a number of tourist and recreational facilities within 10km of the Proposed Development, which can be found in **Figure 14.2**. These are listed in **Table 14.6**.

Table 14.6 Recreational Activities and Tourist Attractions within 10km of the Proposed Development

Recreational / Tourist Receptor	Approximate Distance from nearest turbine location	Brief Description of Receptor
Dumfries and Galloway UNESCO Biosphere Zone	The Dumfries and Galloway UNESCO Biosphere Zone sits across the entire Dumfries and Galloway Council area, covering a total 5,268km ² of Southwest Scotland; therefore, it sits 0m from the nearest turbines as it sits across the entire tourism and recreational	The Dumfries and Galloway UNESCO Biosphere Zone is a site for sustainable development, which aims to develop interdisciplinary approaches to managing changes in social and ecological systems, including conflict prevention and management of biodiversity. It also aims to develop sustainable communities through nature, employment, tourism and education so that they can align with the United Nation's Sustainable Development Goals (UN SDGs).

⁴¹⁹ VisitScotland (2019) Key Facts on Tourism in Scotland 2018 [Online] Available at: <https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/key-facts-on-tourism-in-scotland-2018-v2.pdf> (Accessed 10/03/2023)

⁴²⁰ VisitScotland (2021) Emotional Benefits of the Tourism and the Role of Travel in the Pandemic Recovery [Online] Available at: [the-emotional-benefits-of-tourism-and-the-role-of-travel-in-the-pandemic-recovery.pdf](https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/emotional-benefits-of-tourism-and-the-role-of-travel-in-the-pandemic-recovery.pdf) (Accessed on 24/04/2023)

⁴²¹ Visit Scotland (2021) Insight Department: Dumfries and Galloway Factsheet 2019 [Online] Available at: [dumfries-and-galloway-factsheet-2019.pdf](https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/dumfries-and-galloway-factsheet-2019.pdf) (Accessed 10/03/2023)

⁴²² Visit Scotland (2021) Insight Department: Ayrshire and Arran Factsheet 2019 [Online] Available at: [ayrshire-and-arran-factsheet-2019.pdf](https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/ayrshire-and-arran-factsheet-2019.pdf) (Accessed 10/03/2023)

Recreational / Tourist Receptor	Approximate Distance from nearest turbine location	Brief Description of Receptor
	study area that is in Dumfries and Galloway.	Due to the size of the UNESCO Biosphere, the Core Area is considered to be of most importance as this is where research is conducted. The Core Area of the UNESCO Biosphere Zone is Silver Flowe wetlands and Cairnsmore of Fleet which both sit outwith the tourism and recreation study area. The rest of biosphere zone is home to historic industries (fishing, forestry and farming), micro-businesses and SMEs and small-town communities. This receptor is of international status.
Euchan Falls (Receptor 1 – Figure 14.2)	3.8km north-east of T9	Euchan Falls is part of the 'Euchan Glen' short walk, which partially follows path ROYS/112/1 and part of the SUW (Figure 14.1). This receptor is of local status.
Sanquhar Golf Club (Receptor 2 – Figure 14.2)	4.0km north-east of T9	Sanquhar Golf Club is a local golf club in Sanquhar. It has one course with nine holes. This receptor is of local/regional status.
River Nith (Receptor 3 – Figure 14.2)	4.4km north-east of T9	River Nith is a river that flows through south-west Scotland. It is popular with local angling association in the area such as the Upper Nithsdale Angling Association. The stretch of River that is assessed for the purposes of this assessment is the area that passes within the 10km study area. This can be identified by using Figure 14.2 . This receptor is of local status.
Lorimer Park (Receptor 4 – Figure 14.2)	4.9km north-east of T9	Lorimer Park is a park and protected green space in Sanquhar. This receptor is of local status.
Sanquhar Castle (Receptor 5 – Figure 14.2)	5.0km north-east of T9	Sanquhar Castle is a 13th century castle; however, it is now mostly ruins. Walkers on core path ROYS/111/1, Sanquhar Circular, which passes by the ruins (as noted in Section 6.9.2, Chapter 6 – LVIA). This receptor is of local status.
Hillview Leisure Centre (Receptor 6 – Figure 14.2)	5.2km north of T9	Hillview Leisure Centre is a leisure centre with a fitness suite, spin studio, games hall and outdoor multi-use games area. This receptor is of local status.
Clark's Little Ark (Petting Zoo) (Receptor 7 – Figure 14.2)	5.5km north-east of T9	Clark's Little Ark is a free, petting zoo consisting of farmyard animals. This receptor is of local status.
Crawick Multiverse (Receptor 8 – Figure 14.2)	5.8km north-east of T9	Crawick Multiverse is a land art installation, which is popular with tourist and recreation users. Crawick Multiverse often hosts live music and other events. It is part of the UNESCO Biosphere zone. This receptor is of local/regional status and attracts a moderate number of recreational users/tourists.

14.4.7.1 Recreational Routes, Including Core Paths

There are 15 recognised recreational routes, paths, and trails located within the Study Area, including Core Paths, Heritage Paths, and Scottish Hill Tracks. Core Paths are key routes designated by local authorities, such as Dumfries and Galloway and East Ayrshire Council, that make up part of the wider path network to provide public access throughout their local areas.

The SUW is the only Core Path that runs through the Site (**Figure 14.3**), while the other 14 are within 10km of the Proposed Development. A full list of the routes and Core Paths within the Study Areas is provided in **Table 14.7** below. These can also be found in **Figure 14.1**.

Table 14.7 Identified Recreational Routes within 10km of the Proposed Development

Route Name	Status of Route	Council Area	Recreational Route Number	Approximate Distance from Nearest Turbine
Southern Upland Way	National	Dumfries and Galloway and East Ayrshire	UNNO/504/16	200m south of T3 and 200m south-east of T8
Southern Upland Way	National	Dumfries and Galloway	UNNO/504/15	4.5km southwest of T1
Southern Upland Way	National	Dumfries and Galloway	UNNO/504/14	9km southwest of T1
Euchan Fall	Local	Dumfries and Galloway	ROYS/112/1	2.9km north-east of T9
Sanquhar Castle Circular	Local	Dumfries and Galloway	ROYS/111/1	4.5km north-east of T9
Sanquhar Town Walk	Local	Dumfries and Galloway	ROYS/114/1	4.6km north-east of T9
Bogg To Auchentaggart Moor	Local	Dumfries and Galloway	ROYS/108/1	7km north-east of T9
Bogg To Auchentaggart Moor	Local	Dumfries and Galloway	ROYS/108/2	7.7km north-east of T9
Sodjers Bridge Walk	Local	Dumfries and Galloway	ROYS/109/1	6.4km north-east of T9
Sodjers Bridge Walk	Local	Dumfries and Galloway	ROYS/109/2	6.2km north-east of T9
Mossholm To Wanlock Water (Via Cogshead)	Local	Dumfries and Galloway	ROYS/110/2	8.6km north-east of T9
Eliock Grange Walk	Local	Dumfries and Galloway	ROYS/113/1	5.2km east of T8
Kelloholm To Kirkconnel (Via River)	Local	Dumfries and Galloway	KIRD/86/1 & KIRD/86/2	4.6km north of T9
Bank Hill to Graystone Hill	Local	Dumfries and Galloway	ROYS/443/1	4.5km west of T2
Bank Hill to Graystone Hill	Local	Dumfries and Galloway	ROYS/443/2	3.4km west of T2
Bank Hill to Graystone Hill	Local	Dumfries and Galloway	ROYS/443/3	2.3km west of T2
Lorg Trail	Local	Dumfries and Galloway	CARS/215/1	5.7km south-west of T1
Lorg Trail	Local	Dumfries and Galloway	CARS/215/2	5.2km south-west of T1
Lorg Trail	Local	Dumfries and Galloway	CARS/215/2	5.3km south-west of T1
Lorg Trail	Local	Dumfries and Galloway	CARS/215/4	6km south-west of T1
Guildhall Bridge Kirkconnel	Local	Dumfries and Galloway	KIRD/87/1	6km north of T10
Kirkconnel to Mynwhir Hill	Local	Dumfries and Galloway	KIRD/84/1	3.9km west of T2
Kirkconnel to Mynwhir Hill	Local	Dumfries and Galloway	KIRD/84/2	4.4km northwest of T10
Kirkconnel to Mynwhir Hill	Local	Dumfries and Galloway	KIRD/84/3	4.6km north of T10
Corlae	Local	Dumfries and Galloway	CARS/188/1	8km south-west of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	GLEN/51/1	8.1km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	GLEN/51/2	8.1km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	GLEN/51/3	8km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	GLEN/51/4	7km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	GLEN/51/6	6.7km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	TYNR/51/7	5.3km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	TYNE/51/8	5km south of T1
Benbuie to Troston Hill	Local	Dumfries and Galloway	TYNR/51/9	5km south of T1

Route Name	Status of Route	Council Area	Recreational Route Number	Approximate Distance from Nearest Turbine
Benbuie to Troston Hill	Local	Dumfries and Galloway	TYNR/51/10	5.7km south of T1
Burnmouth Bridge To Drumlanrig	Local	Dumfries and Galloway	CARR/40/1	9.1km east of T8

There is also one cycle route, 9.6km west from T1: Cycle Route C10 – Coalfield Cycle Route.

14.4.7.2 Local Accommodation

There are a number of accommodation businesses near to the Proposed Development, both within the nearest settlement of Sanquhar and in the surrounding rural areas. **Table 14.8** presents local accommodation options close to the Site; this information has been gathered through a search of available online information, and it is acknowledged that there may be additional accommodation available.

Table 14.8 Local Accommodation within Study Area

Accommodation Name	Address	Approximate Distance from nearest turbine location
Euchan Bridge Cottage	Euchan Bridge Cottage, Sanquhar DG4 6LA	4.2km northeast of T9
Shiel Cottage	Thornhill, DG3 4NL	1.3km south of T7
Newark Farm Bed & Breakfast	Sanquhar, DG4 6HN	5.1km northeast of T9
Barbour J & J	Newark Farm, Sanquhar DG4 6HN	5.2km northeast of T9
Kenny @ Rena's	43 Castle Ave, Sanquhar DG4 6AW	4.9km north-east of T9
Timber Lodge B&B	The Bungalow, Mennock, Sanquhar DG4 6HS	4.9km north-east of T9
Glendyne Hotel	23 High St, Sanquhar DG4 6DJ	5.1km north-east of T9
The Nithsdale Hotel	1 High St, Sanquhar DG4 6DJ	5.1km north-east of T9
Blackaddie Country House Hotel	Blackaddie Rd, Sanquhar DG4 6JJ	4.6km north-east of T9
Sunnyside Lodges	Sunnyside Farm, Sanquhar DG4 6JP	5.8km north of T9
Lochside Farm and Holiday Cottages	Unnamed Road, Sanquhar	6.3km north-east of T9
River Cottage	26 Birkburn Rd, Kelloholm, Sanquhar DG4 6SR	5.2 km north-east of T9

This list of accommodation providers is not exhaustive but gives a robust overview of what is available in the study area. Further, should Sanquhar II – a nearby onshore wind development going through the planning process – be awarded consent, Sheil Cottage is included, however, it would no longer be inhabited as a residential property, as it would be owned by the wind farm, and would not be sensitive receptor under this scenario (**Section 12.4.2, Chapter 12 – Noise**).

14.5 Assessment of Potential Effects

14.5.1 Socio-economics

The assessment below has been carried out by utilising the methodology detailed in **Technical Appendix A14.2: Assessment Methodology for Socio-Economics, Tourism, Recreation and Land Use**.

As discussed in **Technical Appendix A14.2: Assessment Methodology for Socio-Economics, Tourism, Recreation and Land Use**, direct impacts are calculated for the local, national and UK study areas; however, indirect and induced impacts are only calculated for the local study area as it

was agreed that socio-economic data which accumulated into local area would be of most relevance to the assessment.

The sensitivity of the local study area (LSA), which is key to this assessment, is considered to be **low**. This is due to the fact that the employment and economic contributions made by the LSA to the Scottish and UK economy will be small and of low socio-economic importance. There is also capacity for the LSA to absorb change without fundamentally altering its present socio-economic character.

14.5.1.1 Construction Phase

Table 14.9 shows the estimated project spend for the Capital Expenditure (CAPEX) phase based on 11 turbines, each with a generating capacity of approximately 5.6MW, and a total generating capacity of approximately 61.6MW. It shows that within Dumfries and Galloway and East Ayrshire, just over £11.4 million is estimated to be spent. As well as this just over, £34.6 million is anticipated to be spent within Scotland (inclusive of local project spend).

Table 14.9 Estimated Project Spend during the CAPEX Phase⁴²³

	Percentage of Spend (%)	Weighted Spend per MW (£)	Estimated Project Spend (£)
Dumfries and Galloway/East Ayrshire	12	185,709	11,439,674
Scotland	36	562,609	34,656,714
UK	47	718,592	44,265,267

Table 14.10 shows the estimated employment opportunities and GVA contributions to the local, national and UK economy. For the CAPEX Phase, this assumes a turnover per employee of £139,855 and a GVA turnover rate of 0.457.

Table 14.10 Estimated Job Creation and GVA during the CAPEX phase⁴²⁴

	Project Spend	Estimated Jobs	Estimated GVA
Dumfries and Galloway/East Ayrshire	11,439,674	82	5,227,931
Scotland	34,656,714	248	15,838,118
UK	44,265,267	317	20,229,227

Table 14.10 shows that within Dumfries and Galloway and East Ayrshire, 82 direct jobs are estimated to be created during the construction phase of the Proposed Development. Within the local authority areas, there would be an anticipated GVA contribution of just over £5.2 million. There would be 248 direct jobs created within Scotland, inclusive of the 82 direct jobs in Dumfries and Galloway and East Ayrshire, and a GVA contribution of just over £15.8 million to the national economy.

By applying a 10% discount factor, total direct jobs are estimated to be 74. For 18 months construction, the estimated FTE job years within the local socio-economic study area is estimated to be 111 FTE job years. After applying leakage (diversion of funds such as taxes – full definition in A14.2), the estimated GVA for the construction phase is just under £4.5 million (£4,478,809).

By applying the Type I and Type II Scottish Government multipliers to the numbers calculated in **Table 14.10**, the indirect and induced impacts for the CAPEX phase can be calculated. These are as follows:

- 22 indirect and 22 induced FTE jobs;
- 33 indirect and 33 induced FTE job years; and

⁴²³ ERM calculations based on RenewableUK outputs.

⁴²⁴ ERM calculations based on RenewableUK outputs.

- £1.6 million indirect and £1.6 million induced GVA.

Further, by applying the 2021 BiGGAR Economics assumptions (that only 22% of indirect impacts and 47% of induced impacts will be felt locally), the more realistic indirect and induced CAPEX impacts within the local area are⁴²⁵:

- 5 indirect and 10 induced FTE jobs;
- 7 indirect and 16 induced FTE job years; and
- £345,043 indirect and £737,138 in induced GVA.

Overall, this means that within the local area (Dumfries and Galloway and East Ayrshire), during the CAPEX phase, there will be an estimated:

- A total net employment impact of 89 FTE jobs (74 direct, 5 indirect and 10 induced FTE jobs);
- A total net employment impact of 134 FTE job years (111 direct, 7 indirect and 16 induced); and
- A total net economic impact of just under £5.6 million (£4.5 million direct, £345,043 indirect and £737,128 in induced GVA).

Although it cannot be quantified at this time, it is anticipated that there will be beneficial socio-economic impacts from the BESS facility during the construction phase that will have beneficial impacts on employment and GVA at a local, national and UK study area.

This creates a medium impact on socio-economics, as there is a moderate alteration to the socio-economic baseline through direct, indirect and induced GVA and employment opportunities. Combined with the medium sensitivity of socio-economics at the local, national and UK level, a **moderate (significant), beneficial** magnitude of effect is predicted for socio-economics during the CAPEX phase, which is **significant** in the context of the EIA Regulations.

14.5.1.2 Operational Phase

Table 14.11 shows the estimated project spend for the Operational Expenditure (OPEX) phase based on 11 turbines, each with a generating capacity of approximately 5.6MW, and a total generating capacity of approximately 61.6MW. **Table 14.11** shows that within Dumfries and Galloway and East Ayrshire, just over £1.8 million is estimated to be spent and just under £2.5 million is anticipated to be spent within Scotland (inclusive of local project spend).

Table 14.11 Estimated Project Spend per annum during the OPEX Phase⁴²⁶

	Percentage of Spend (%)	Weighted Spend per MW (£)	Estimated Project Spend (£)
Dumfries and Galloway/East Ayrshire	42	29,577	1,821,943
Scotland	58	40,524	2,496,278
UK	87	60,916	3,752,426

Table 14.12 outlines the anticipated employment opportunities and GVA based on the methodology in **Section 14.1.4.1 of A14.2**. For the OPEX Phase, this assumes a turnover per employee of £133,576 and a GVA turnover rate of 0.451.

⁴²⁵ BiGGAR Economics (2021) Case Study of Crossdykes Wind Farm [Online] Available at: Volume 3 - Appendix 14A Case Study of Crossdykes Wind Farm (1).pdf (Accessed on 24/04/2023)

⁴²⁶ ERM calculations based on RenewableUK outputs.

Table 14.12 Estimated Job Creation and GVA during the OPEX phase⁴²⁷

	Project Spend	Estimated Jobs	Estimated GVA
Dumfries and Galloway/East Ayrshire	1,821,943	14	821,696
Scotland	2,496,278	19	1,125,821
UK	3,752,426	28	1,692,344

Table 14.12 shows that within Dumfries and Galloway and East Ayrshire, an estimated 14 jobs would be created during the OPEX phase as well as a GVA contribution of £821,696. As well as this, there would be 19 jobs created within Scotland, inclusive of the 14 jobs in the local, socio-economic study area, as well as a contribution of just over £1.1 million in the form of GVA.

By applying a 10% discount factor, total direct jobs are estimated to be 13. For 35 years of operation, the local employment in FTE job years within the local, socio-economic study area is estimated to be 455 FTE job years. Although there are estimated to be 13 local jobs per annum, this could be continuous work over the 35-year period for 13 employees. After applying leakage, the estimated GVA for the 35 operational phase is just over £14.3 million (£14,336,156).

By applying the Type I and Type II Scottish Government multipliers to the numbers calculated in

Table 14.12 **Table 14.12** the indirect and induced impacts for the OPEX phase can be calculated. These are as follows:

- 8 indirect and 3 induced FTE jobs per annum, which may be 8 indirect and 3 induced jobs for 35 years;
- 280 indirect and 105 induced FTE job years; and
- £5.7 indirect and £4.3 million induced GVA.

Further, by applying the 2021 BiGGAR Economics assumptions (that only 22% of indirect impacts and 47% of induced impacts will be felt locally), the more realistic indirect and induced CAPEX impacts within the local area are⁴²⁸:

- 2 indirect and 1 induced FTE jobs, which may be 2 indirect and 1 induced jobs for 35 years;
- 70 indirect and 35 induced FTE job years; and
- £1.2 million indirect GVA and £2.0 million in induced GVA.
- Overall, this means that within the local authority areas (Dumfries and Galloway and East Ayrshire), during the OPEX phase, there will be an estimated:
- A total net employment impact of 16 FTE jobs (13 direct, 2 indirect and 1 induced FTE jobs)
- A total net employment impact of 560 FTE job years (455 direct, 70 indirect and 35 induced); and
- A total net economic impact of just over £17.6 million (£14.3 million direct, £1.2 million indirect and £2.0 million in induced GVA).

Although it cannot be quantified at this time, it is anticipated that there will be beneficial socio-economic impacts from the BESS facility during the operational phase that will have beneficial impacts on employment and GVA at a local, national and UK study area.

This creates a medium magnitude impact on socio-economics, as there is a moderate alteration to the socio-economic baseline through direct, indirect and induced GVA and employment opportunities.

⁴²⁷ ERM calculations based on RenewableUK outputs.

⁴²⁸ BiGGAR Economics (2021) Case Study of Crossdykes Wind Farm [Online] Available at: Volume 3 - Appendix 14A Case Study of Crossdykes Wind Farm (1).pdf (Accessed on 24/04/2023)

Combined with the medium sensitivity of socio-economics at the local, national and UK level, a **moderate (significant), beneficial** effect is predicted for socio-economics during the OPEX phase, which is **significant** in the context of the EIA Regulations.

14.5.1.3 Decommissioning Phase

There is a lack of data surrounding the potential impacts upon socio-economics during the decommissioning phase of wind farms; however, any decommissioning phase impacts as a result of the Proposed Development are anticipated to be similar to construction phase impacts. The significance of effect for each socio-economic receptor during the decommissioning phase is anticipated to be the same as the anticipated significance of effect during the construction phase; however, specific economic or employment projections cannot be calculated due to a lack of evidence at this point in time.

14.5.1.4 Community Benefits

Should the Proposed Development be granted consent, the Applicant is committed to offering the following benefits for local communities:

- 'Meet the buyer days' to encourage local-based companies to tender for employment opportunities;
- Creating a community benefit fund (CBF) equivalent to £5,000 per installed MW per annum, index linked for the operational lifetime of the project, in line with Scottish Government recommendations⁴²⁹. The Proposed Development would generate £308,000 towards a CBF each year and just under £10.8 million over its operational lifetime. The Applicant is in discussion with local community councils to discuss how best this fund be utilised;
- Utilising local accommodation, providers during the construction and operation phases where necessary, to ensure that the local community benefits from the increased demand in accommodation from workers;

Utilising local shops, restaurants and bars during the construction and operational phases where necessary, to ensure that the local community benefits from the increased demand for amenities from workers.

The following community benefit offerings would have a medium, beneficial impacts throughout the operational phase of the Proposed Development. Although there will be more benefits created for the local community, the sensitivity of the local economy is low, which creates a slight alteration in baseline conditions. This creates a **minor, beneficial** effect, which is **not significant** in terms of the EIA Regulations.

14.5.1.5 Conclusions in Respect of Socio Economics

The Proposed Development would consist of 11 wind turbines and BESS with a generating capacity greater than 50MW. **Section 14.5.1.1, Section 14.5.1.2 and Section 14.5.1.3** have shown that the Proposed Development will provide a range of beneficial economic opportunities at a local, national and UK level. Of particular interest to this assessment is those which will benefit the local authority areas – Dumfries and Galloway and East Ayrshire.

By combining the results from **Section 14.5.1.1 and 14.5.1.2**, it is estimated that during the CAPEX and OPEX phases of the Proposed Development the following direct, indirect and induced impacts will be created through the supply chain for the local Council areas (Dumfries and Galloway and East Ayrshire):

⁴²⁹ Scottish Government (2022) Onshore Wind: Policy Statement 2022 [Online] Available at: Chapter 4: Benefits to Local Communities and Financial Mechanisms - Onshore wind: policy statement 2022 - gov.scot (www.gov.scot) (Accessed on 04/07/2023)

- A total net employment impact of 105 FTE jobs (87 direct, 7 indirect and 11 induced);
- A total net employment impact of 694 FTE job years (566 direct, 77 indirect and 51 induced); and
- A total net economic impact of just under £23.2 million (£18.8 million direct, £1.6 million indirect and £2.8 induced).

It is predicted that the decommissioning phase will also contribute direct, indirect and induced GVA and employment opportunities; however, these cannot be quantified at this time.

To conclude, there will be a **moderate (significant), beneficial** effect on socio-economics during the construction and operational phases of the Proposed Development which is **significant** in terms of the EIA Regulations. As these effects are beneficial in nature, no mitigation is proposed.

14.5.2 Tourism and Recreation

As a significant receptor, the SUW is assessed below, in **Section 14.5.2.1** below. All other tourist and recreational receptors are assessed in **Table 14.13**, for the construction phase, and **Table 14.14**, for the operational phase. **Table 14.13** and **Table 14.14** give a summary of the sensitivity, magnitude of impact and significance of effect for each receptor at its given phase of the Proposed Development. **Figure 14.1, 14.2 and 14.3** provide useful context for this assessment.

14.5.2.1 The Southern Upland Way

Construction Phase

The significance of effect on the SUW during the construction phase of the Proposed Development is anticipated to be **moderate**. The receptor is of medium sensitivity as the core path is of importance at both a national and local level. The magnitude of impact is anticipated to be medium as although the SUW is a 345km long-distance route, users of this route will experience both direct and indirect impacts during this time. Direct impacts will occur within the 4.97km segment (UNNO/504/16) of the SUW contained within the Site boundary (**Figure 14.3**). These direct impacts will be the presence of safeguarding (signage) on the SUW which will introduce new features to the route representing a physical change from baseline conditions. Visual impacts will also have the potential create indirect impacts. The potential impact of noise on the SUW has been scoped of this assessment, due to the transient nature of the receptor, in accordance with **Chapter 12 – Noise**. It is important to note that these direct impacts are localised to the segment of the SUW within the Site boundary; therefore, the moderate significance of effect is also localised to within the Site boundary. Outside of the Site boundary, only indirect visual impacts will occur which would be **not significant** due to the limited impacts during construction.

The SUW is a 345km route stretching from the west to the east coast of Scotland. When passing close to the Site, recreational users will have the potential to experience views of construction activities. **Section 6.9.8, Chapter 6 – LVIA** helped to inform the visual impact portion of the SUW assessment, as it was concluded that views of ground level construction – including construction of access tracks, borrow pits, crane pads and foundations – as well as the emerging turbines and construction cranes (**Section 6.9.8, Chapter 6 – LVIA**) would be visible from the SUW at VP7: SUW, East of Sanquhar. When assessing the SUW as a recreational feature, LVIA impacts are just one part of the assessment, that informs the impact on amenity value for users; therefore, the significance concluded in each assessment may vary. Further, the assessment of the SUW as a recreational feature considers the entire SUW, and the experience had by users as they move along the route, rather than from one specific viewpoint. Given that users will be moving along the path, and views will be experienced from all directions (360 degrees), construction activities will only be visible when travelling towards, and looking in the direction of, the Proposed Development.

As a Core Path the SUW will remain accessible within the Site boundary during the construction phase; however, for health and safety reasons, the 4.97km segment within the Site boundary will be temporarily safeguarded due to the proximity of the SUW to the Proposed Development – 200m south

of T3 and 200m south-east of T8. The safe management of this route will be achieved through an Access Management Plan (AMP) which will minimise disruption whilst ensuring the safety of recreational users. For the purposes of this assessment, an Access Management Plan has been prepared (**Technical Appendix A14.1: AMP**) to accompany this chapter and give an overview of appropriate mitigation measures for the construction period (and operational/ decommissioning periods, where deemed necessary). Further detail on the AMP is provided in **Section 14.6.2 and Technical Appendix A14.1: AMP**.

Operational Phase

The significance of effect on the SUW during the operational phase of the Proposed Development is anticipated to be minor. The receptor is of moderate tourism and recreational value and is of importance at a national and local level. The magnitude of impact is anticipated to be low as users of this route will only experience indirect visual impacts during this time. No direct impacts are predicted and the SUW will remain open, and accessible, throughout the 35-year operational period.

Section 6.9.8, Chapter 6 – LVIA concluded that there would be a moderate, significant impact from VP 7. This has helped to inform the visual impact portion of the SUW assessment, as it was concluded that much of the Proposed Development would be visible and that **Figure 6.23** (Volume 2c – Visualisations) highlights that all rotors and hubs of the proposed turbines would be visible above the skyline, while the bases of some towers would be screened by the long hill ridges adjoining the Upper Nithsdale Valley. Further, **Figure 14.1** highlights that according to the zone of theoretical visibility (ZTV), 9-11 turbines are visible along most of the SUW that travels north from the Proposed Development through Sanquhar. It should be noted that the ZTV does not take account of vegetation, forestry or the built environment which can significantly reduce the area and extent of actual visibility, so the town of Sanquhar will screen, or partially screen, some views of the Proposed Development whilst moving along the path. The south-western portion of the SUW on **Figure 14.1** has more limited visibility, with a maximum of 6-9 turbines theoretically visible.

When assessing the SUW as a recreational feature, LVIA impacts are just one part of the assessment, that informs the impact on amenity value for users; therefore, the significance concluded in each assessment may vary. Further, the assessment of the SUW as a recreational feature considers the entire SUW, and the experience had by users as they move along the route, rather than from one specific viewpoint. Given that users will be moving along the path, and views will be experienced from all directions (360 degrees), construction activities will only be visible when travelling towards, and looking in the direction of, the Proposed Development. No operational noise is anticipated in line with the Proposed Development. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (**Section 12.3.2, Chapter 12 – Noise**).

At times of extreme winter weather there is a potential risk of ice throw / fall from turbines. Ice throw can develop on turbine blades, towers and nacelles under certain climatic conditions. This may result in ice falling or being thrown from the turbine as a result of particular circumstances such as turbine movement or vibration, temperature rise or strong winds. In south-west Scotland, potential icing conditions are anticipated to be 2-7 days per year (light icing). If these climatic conditions are experienced along with other factors, such as those listed above, there is a potential risk of ice throw. The risk to public safety during the operational phase is considered to be very low due to the few likely occurrences of these conditions along with the particular circumstances that can cause ice throw. The maximum potential distance of ice falling from turbines can be approximated using the formula $1.5 \times (\text{rotor diameter} + \text{hub height})$. For the Proposed Development, the maximum distance from the turbine where ice could be expected to fall is calculated to be 382.5m which could allow ice to be thrown from T1, T3, T4, T7 and T8 to theoretically reach the SUW; however, the risk of ice throw is considered to be extremely low even within the theoretical maximum distance.

14.5.3 Tourism and Recreation Assessment of Effects

Table 14.13 details the construction phase assessment of effects and **Table 14.14** details the operation phase assessment of effects.

Table 14.13 Construction Phase Assessment of Effects

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
Heritage Paths	Low	Medium	Minor	The significance of effect on heritage paths during the construction phase of the Proposed Development is anticipated to be minor. These heritage paths are of low tourism and recreational value and are of importance at a local level; however, the magnitude of impact is anticipated to be medium as both heritage routes, DN23, Sanquhar to Stroanpatrick Path [HP368] and St John's Town of Dalry to Sanquhar [HT84], follow sections of the SUW long-distance path, including Section UNNO/504/16 that crosses the Site. As a result, these heritage paths will also experience direct and indirect impacts as a result of the construction of the Proposed Development. A discussion of the impacts on heritage paths is assumed to be the same to that represented in the above discussion of the SUW; therefore, this discussion will not be repeated. As such, Technical Appendix A14.1: AMP will also be applicable these heritage paths to ensure their safe and continuous operation throughout the construction phase. Despite this, the significance of effect on heritage paths is anticipated to be minor due to the low sensitivity of the receptor.
Core Paths	Low	Negligible	Negligible	The significance of effect on core paths (except the SUW which is assessed separately) during the construction phase of the Proposed Development are anticipated to be negligible as there will be no direct impacts to core paths. During the construction phase, all core paths will remain open and accessible to the general public with no diversion or re-routing. Figure 14.1 shows that core paths to the north of the Proposed Development, around Sanquhar and Kelloholm, may experience some views of construction; however, given that they will be moving along the core path, and views will be experienced from all directions (360 degrees), construction activities will only be visible when travelling towards, and looking in the direction of, the Proposed Development. It is likely that some of this theoretical visibility will be screened by the surrounding forestry and the towns of Sanquhar/Kelloholm, which will minimise any type of visual impact. Core paths to the south-east of the Site will experience little visibility of construction activities and most theoretical visibility will be screened by the surrounding forestry. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise).
Cycle Paths	Low	Negligible	Negligible	The significance of effect on cycle paths during the construction period of the Proposed Development is anticipated to be negligible. There are no national cycle routes within 10km of the Proposed Development and only one local cycle path C10 - Coalfield Cycle Route, 9.6km west of T1. As a result, there will be no impacts to cycle paths during the construction phase and recreational use will be able to continue. Figure 14.1 highlights that no views of the Proposed Development's construction will be visible from the cycle path and no noise from construction is expected to be audible at this distance. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise).

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
Euchan Falls	Low	Negligible	Negligible	The significance of effect on Euchan Falls during the construction phase of the Proposed Development is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that there will be limited visibility of the Development's construction due to the surrounding topography. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Sanquhar Golf Club	Low	Negligible	Negligible	The significance of effect on Sanquhar Golf Club during the construction phase is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that views of the construction will be visible on the course; however, these views will not be constant when moving through the course and will only be visible when travelling towards, and looking in the direction of, the Proposed Development. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12: Noise) .
River Nith	Low	Low	Negligible	There is expected to be a negligible effect on the River Nith as a result of the construction phase of the Proposed Development. Figure 14.2 shows that some views of the Proposed Development's construction will be visible when facing south-west/west; however, these views will not be constant along the stretch of the River Nith. The most prominent theoretical views of the Proposed Development's construction will be from Sanquhar and Kelloholm; however, much of these views will be screened, or partially screened, by the surrounding towns and areas of scattered forestry. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise). The increased traffic levels on the C125N, especially where the C125N crosses the River Nith at Eliock Bridge, has the potential to cause disruption to the amenity value of users of the River Nith; however, with appropriate mitigation in place, as detailed in Section 13.9.1 of Chapter 13 – Access, Traffic and transportation, these effects will not be significant. Local communities will be communicated with, and made aware of planned activities such as turbine deliveries on concrete days, so that users of the River Nith can plan their trips around these movements. Further, the River Nith is an 113km river, and there will be other available locations to carry out recreational activities, such as fishing, that will not be disturbed by the visual and noise impacts of construction traffic. The construction phase is only temporary and these impacts will only last for a very short period of time.
Lorimer Park	Negligible	Negligible	Negligible	The significance of effect the Lorimer Park is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that some views of construction are anticipated when looking south-west towards the Proposed Development; however, much of these are expected to be screened by the surrounding settlement. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
				working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Sanquhar Castle	Low	Negligible	Negligible	The significance of effect the Sanquhar Castle is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Construction activities will be visible from this location (Figure 14.2); however, much of the ground level construction work will be screened by surrounding landform and forestry (Section 6.9.2, Chapter 6 – LVIA). Views of construction activity will not be constant when moving around the castle and its surrounding landscape, only being visible when looking west. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Hillview Leisure Centre	Negligible	Negligible	Negligible	There is expected to be a negligible effect on the Hillview Leisure Centre as a result of the construction phase of the Proposed Development. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that limited views of the Development's construction will be visible when entering and exiting the facility; however, this is not expected to impact on the appreciation of the facility. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Clark's Little Ark (Petting Zoo)	Low	Negligible	Negligible	There is expected to be a negligible effect on Clarks Little Ark as a result of the construction phase of the Proposed Development. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that views of construction activity will be perceivable from the petting zoo; however, much of this will be screened, or partially screened, by the surrounding town of Sanquhar. Further, whilst moving around between fields/barns views of construction will only be visible when travelling in the direction of, and looking towards, the Proposed Development. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Crawick Multiverse	Low	Negligible	Negligible	The significance of effect the Crawick Multiverse is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the construction phase. Figure 14.2 shows that views of construction will be visible from this location; however, views whilst moving around Crawick Multiverse, views of construction will only be visible when travelling in the direction of, and looking towards, the Proposed Development. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Tourist Accommodation	Low	Negligible	Negligible	It is anticipated that the significance of effect on tourist accommodation will be negligible. There will be no direct impacts to tourist accommodation, and all providers will remain open to the public throughout the

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
				construction phase. Most accommodation providers are located between 5km and 6km from the Proposed Development and have the potential to experience visual impacts of construction activities if they have windows facing the Proposed Development and when exiting and entering the accommodation. Shiel is the closest property to the Proposed Development, located 1.3km south of T7 and will have the potential to experience more significant impacts. Section 6.9.6, Chapter 6 – LVIA , highlights that although a number of turbines are screened by the surrounding topography, the proximity of Sheil to the Proposed Development means that views of construction will be prominent; however, views will only be experienced from windows facing north-east and when entering and exiting Sheil. Further, should Sanquhar II – a nearby onshore wind development going through the planning process – be awarded consent, Sheil would no longer be an inhabited property and would not be sensitive receptor under this scenario. During the construction phase, accommodation will be needed for some on-site workers. Attempts will be made to utilise local accommodation providers, which is anticipated to have a beneficial impact on the local economy. Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12 – Noise) .
Dumfries and Galloway UNESCO Biosphere Zone	Low	Negligible	Negligible	It is anticipated that the significance of effect on the Dumfries and Galloway UNESCO Biosphere Zone during the construction phase will be negligible. As detailed in Figure 14.2 , the Biosphere Zone sits across the entire study area within the council area due to the Biosphere's large footprint (5,268 km ²); however, the core area of the UNESCO Biosphere Zone sits outwith the tourism and recreation study area – Silver Flowe wetlands and Cairnsmore of Fleet. The only direct impact within this study area is the SUW, which has been previously assessed in this table (Table 14.17). No other direct impacts will occur and all other areas within the UNESCO Biosphere Zone will remain open to the public. The UNESCO Biosphere Zone supports employment for local communities, and the construction phase of the Proposed Development creates direct, indirect and induced employment opportunities for the Council (Section 14.5.1.1). Best practice and mitigation measures will be utilised where applicable, such as limiting construction noise to working hour in agreement with the local Council(s), in a controlled environment so that construction noise levels are not significant (Section 12.8, Chapter 12: Noise) .

Table 14.14 Operational Phase Assessment of Effects

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
Heritage Paths	Low	Medium	Minor	The significance of effect on heritage paths during the operational phase of the Proposed Development is anticipated to be minor. These heritage paths are of low tourism and recreational value and are of importance at a local level. The magnitude of impact is anticipated to be medium as both heritage routes, DN23, Sanquhar to Stroanpatrick Path [HP368] and St John's Town of Dalry to Sanquhar [HT84], are sections within the SUW long-distance path. As a result, these heritage paths will also experience the same indirect impacts as the SUW during the operational phase of the Proposed Development.

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
				A discussion of the impacts on heritage paths is assumed to be the same to that represented in the above discussion of the SUW; therefore, this discussion will not be repeated. As such, the draft AMP will also be applicable these heritage paths to ensure their safe and continuous operation throughout the operational phase. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise). Despite this, the significance of effect on heritage paths is anticipated to be minor due to the low sensitivity of the receptor.
Core Paths	Low	Negligible	Negligible	The significance of effect on core paths during the operational phase of the Proposed Development are anticipated to be negligible as there will be no direct impacts to core paths. During the operational phase, all core paths will remain open and accessible to the general public. Figure 14.1 shows that core paths to the north of the Proposed Development, around Sanquhar and Kelloholm, may experience some views of the Proposed Development; however, given that they will be moving along the core path, and views will be experienced from all directions (360 degrees), the Proposed Development will only be visible when travelling towards, and looking in the direction of, it. Some of this theoretical visibility will be screened by the surrounding forestry and the towns of Sanquhar/Kelloholm, which will minimise any type of visual impact. Core paths to the south-east of the Site will experience little visibility of the Proposed Development and most theoretical visibility will be screened by the surrounding forestry. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Cycle Paths	Low	Negligible	Negligible	The significance of effect on cycle paths during the operational period of the Proposed Development is anticipated to be negligible. There are no national cycle routes within 10km of the Proposed Development and only one local cycle path C10 - Coalfield Cycle Route, 9.6km west of T1. As a result, there will be no impacts to cycle paths during the construction phase and recreational use will be able to continue. Figure 14.1 highlights that no views of the Proposed Development will be visible from the cycle path and no noise from construction is expected to be audible at this distance. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.9, Chapter 12 – Noise).
Euchan Falls	Low	Negligible	Negligible	The significance of effect on Euchan Falls during the operational phase of the Proposed Development is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that there will be limited visibility of the Development due to the surrounding topography. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Sanquhar Golf Club	Low	Negligible	Negligible	The significance of effect on Sanquhar Golf Club during the operational phase is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that views of the Proposed will be visible on the course; however, these views will not be constant when moving through the course and will only be visible when

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
				travelling towards, and looking in the direction of, the Proposed Development. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise)
River Nith	Low	Negligible	Negligible	There is expected to be a negligible effect on the River Nith during the operational phase of the Proposed Development. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that some views of the Proposed Development will be visible when facing south-west/west; however, these views will not be constant along the entire length of the River Nith. The most prominent theoretical views of the Proposed Development will be from Sanquhar and Kelloholm; however, much of these views will be screened, or partially screened, by the surrounding towns and areas of scattered forestry. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Lorimer Park	Negligible	Negligible	Negligible	The significance of effect the Lorimer Park is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that some views of construction are anticipated when looking south-west towards the Proposed Development; however, much of these are expected to be screened by the surrounding settlement. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Sanquhar Castle	Low	Negligible	Negligible	The significance of effect the Sanquhar Castle is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. The Proposed Development will be visible from this location (Figure 14.2); however, much of the ground level construction work will be screened by surrounding landform and forestry (Section 6.9.2 and Figure 6.17, Chapter 6 – LVIA). Views of construction activity will not be constant when moving around the castle and its surrounding landscape, only being visible when looking west. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Hillview Leisure Centre	Negligible	Negligible	Negligible	There is expected to be a negligible effect on the Hillview Leisure Centre during the operational phase of the Proposed Development. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that limited views of the Proposed Development construction will be visible when entering and exiting the facility; however, this is not expected to impact on the appreciation of the facility. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Clark's Little Ark (Petting Zoo)	Low	Low	Negligible	There is expected to be a negligible effect on Clarks Little Ark during the operational phase of the Proposed Development. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that views of the Proposed Development will be perceivable from the petting zoo; however, much of this will be screened, or partially screened, by the surrounding town of Sanquhar. Further, whilst moving around between fields/barns views of the Proposed

Receptor	Sensitivity	Magnitude of Impact	Significance of Effect	Discussion
				Development will only be visible when travelling in the direction of, and looking towards, it. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Crawick Multiverse	Low	Negligible	Negligible	The significance of effect the Crawick Multiverse is anticipated to be negligible. There will be no direct impacts to this receptor, and it will remain open to the public throughout the operational phase. Figure 14.2 shows that views of construction will be visible from this location; however, views whilst moving around Crawick Multiverse, views of the Proposed Development will only be visible when travelling in the direction of, and looking towards, it. Further, as agreed with the Council, the effect of construction noise and vibration on the surrounding receptors is expected to be negligible and has been scoped out (Section 12.3.2, Chapter 12 – Noise).
Tourist Accommodation	Low	Negligible	Negligible	It is anticipated that the significance of effect on tourist accommodation will be negligible. There will be no direct impacts to tourist accommodation providers, and they will remain open to the public throughout the operational phase. Most accommodation providers are located between 5km and 6km from the Proposed Development, meaning that they will not experience shadow flicker impacts or noise levels in exceedance of the appointed ETSU-R-97 requirements (Section 16.1.3.2, Chapter 16 – Other Issues; Section 12.5.2.3, Chapter 12 – Noise). Some visual impacts may be experienced from these properties if they have windows facing the Proposed Development and when exiting and entering the accommodation. Shiel is the closest property to the Proposed Development, located 1.3km south of T7, and will have the potential to experience more significant impacts. Figure 6.21f , from Chapter 6: LVIA, shows the visual impact experience by this accommodation provider from the front garden. Although a number of turbines are screened by the surrounding topography, the proximity of Shiel to the Proposed Development means that views are more prominent (Section 6.9.6, Chapter 6 – LVIA). Views will only be experienced from windows facing north-east and when entering and exiting Shiel. As discussed in Section 16.1.5.2 and Section 16.1.6 of Chapter 16 – Other Issues , there would be no shadow flicker effects at this property. Further, should Sanquhar II – a nearby onshore wind development going through the planning process – be awarded consent, Shiel would no longer be inhabited and would not be sensitive receptor under this scenario. Occasionally during the operational phase, accommodation will be needed for some on-site workers. Attempts will be made to utilise local accommodation providers, which is anticipated to have a beneficial impact on the local economy.
Dumfries and Galloway UNESCO Biosphere Zone	Low	Negligible	Negligible	It is anticipated that the significance of effect on the Dumfries and Galloway UNESCO Biosphere Zone during the operational phase will be negligible. As detailed in Figure 14.2 , the Biosphere Zone sits across the entire study area within the Council's area due to the Biosphere's large footprint (5,268 km ²); however, the core area of the UNESCO Biosphere Zone sits outwith the tourism and recreation study area – Silver Flowe wetlands and Cairnsmore of Fleet. The UNESCO Biosphere Zone supports employment for local communities, and the operational phase of the Proposed Development creates direct, indirect and induced employment opportunities for the Council (Section 14.5.1.2).

14.5.4 Decommissioning Phase Assessment of Effects

Any potential adverse and beneficial decommissioning phase effects on tourism and recreation are anticipated to be of a similar nature to those identified during the construction phase; therefore, the construction phase impacts can be seen as a 'worst-case scenario' for any potential impacts at the decommissioning phase.

As discussed above in **Table 14.14**, there is the intention to promote use of tracks for recreation during the operational period.

14.5.4.1 Conclusions

Table 14.13 and **Table 14.14** have shown that the SUW is predicted to have a **moderate (significant), adverse** effect during the construction phase which is significant in terms of the EIA Regulations; therefore, mitigation is proposed to reduce the significance of effect in **Section 14.6.2**. Further detail is provided in **Technical Appendix A14.1: AMP**. As decommissioning effects are predicted to be of a similar nature as those predicted during the construction phase, similar mitigation to that proposed for the users of the SUW during the construction phase are likely to be utilised, as described in **Section 14.6.4**.

No other significant effects were predicted on any our tourism or recreational resources during the construction, operational or decommissioning phases.

14.5.5 Land Use

14.5.5.1 Construction Phase Assessment of Effects

The predominant land use within the Site consists of open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. Ongoing agricultural activities within the Site, and the surrounding area, such as the grazing of livestock may be temporarily affected during the construction phase of the Proposed Development.

The agricultural (grazing) land-use is considered to be a low sensitivity receptor. Although the SUW runs through the Site, it is not assessed within land use and the impacts on this series of long-distance core paths, and its impact on recreation users, is discussed in **Section 14.5.3**.

The impact of the construction phase is therefore considered negligible and not significant in terms of the EIA Regulations. As stated throughout this Section, the effects of the construction phase of the Proposed Development will not have a significant effect on land-use receptors in accordance with the EIA Regulations.

14.5.5.2 Operational Phase Assessment of Effects

The operational phase of the Proposed Development will result in a loss of land which would otherwise continue to be used as open moorland comprising of rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east.

From the total area within the Site of 804 ha, it is anticipated that the overall land-take following restoration of temporary infrastructure, as a result of the Proposed Development will be 17.1 ha, equating to around 2.1% of the land within the Site.

This is of low sensitivity due to the existing agricultural grazing land-use within the Site which will continue to be utilised for grazing during the operational phase of the Proposed Development. Given the grazing activities will be able to continue, the land-take on a low sensitivity receptor creates a long-term, negligible effect on land-use, which is considered to be not significant in terms of the EIA Regulations.

14.5.5.3 Decommissioning Phase Assessment of Effects

The operational lifespan of the Proposed Development will be 35 years. Following this, an application may be submitted to retain or replace the turbines, or they will require to be decommissioned. It is anticipated that there will be no additional land use effects associated with the decommissioning of the Proposed Development.

Disruption to land-use during decommissioning will be similar to that during construction, with a temporary cessation of agricultural activities in the vicinity of the Site while activities to remove the turbines are undertaken. It is expected that decommissioning would take approximately 6 months to complete. The magnitude of effect would therefore be negligible. Decommissioning will have an effect of short-term, negligible significance on land-use, which is a low sensitivity receptor, which is considered to be not significant in terms of the EIA Regulations.

It is expected that decommissioning will involve the removal of the turbine foundations and associated hardstanding and demolition and removal of the substation, BESS and control building compound. The land will be reinstated, which will reduce the permanent land-take for the Proposed Development. It is assumed that any proposed mitigation planting will be agreed with the landowner within a comprehensive restoration plan setting out the specific methods of re-instatement. There will no permanent land take following decommissioning. This presents a minor, beneficial effect on land-use, which is considered to be not significant in terms of the EIA Regulations.

The land-use is a low sensitivity receptor and the magnitude of effect is expected to be low. The effects of the Proposed Development on land-use receptors are considered to be negligible and not significant in terms of the EIA Regulations.

14.6 Mitigation and Residual Effects

14.6.1 Embedded Mitigation

Measures to avoid or reduce potential effects on land, socio economics and tourism receptors have been incorporated into the design of the Proposed Development ('embedded mitigation'). This includes 'mitigation by design' whereby aspects of the Proposed Development have been subject to design re iteration to avoid or reduce effects. Embedded mitigation is taken into consideration when undertaking the assessment of significant effects. If significant effects are predicted further mitigation is detailed.

14.6.1.1 Mitigation by Design

A critical design consideration has been the reduction in number of turbines and their locations. Despite the evidence presented in **Section 14.2.4.7** which suggests there is no negative relationship between onshore wind farm developments and tourism, tourism receptors were considered a part of the iterative design process, particularly in respect of the SUW, by minimising interaction with the route. For example, initial layouts showed turbines located on the southern side of the SUW; however, these were subsequently moved to the northern side of the SUW to reduce the visibility in the Scaur Water valley to the south of the Proposed Development. Further detail on this is presented in **Chapter 3 – Site Selection and Design Evolution** and **Chapter 6 – Landscape and Visual Impact Assessment (LVIA)**.

Further, **Technical Appendix A14.1: AMP** has been fed into the design process to reduce the potential for any adverse impacts on recreational users of the SUW. Should the Proposed Development be granted consent, a full AMP will be submitted to, and approved by the Council.

14.6.2 Construction Phase

Section 14.5.1.1 highlighted that direct, indirect and induced GVA and employment opportunities would be created by the construction of the Proposed Development. The applicant is also committed to 'meet the buyer days' to encourage local-based companies to tender for employment opportunities,

as well as utilising local accommodation providers, shops, restaurants and bars during the construction phase where necessary. Combined, this creates a **moderate (significant), beneficial** magnitude of effect is predicted for socio-economics during the CAPEX phase, which is significant in the context of the EIA Regulations. As the effects of socio-economics are beneficial, no mitigation is proposed.

Table 14.14 highlighted that the only tourist and recreational receptor with a significant magnitude of effect is the SUW, which has anticipated to have a **moderate (significant), adverse** magnitude of effect during the construction phase. The potential impacts on the SUW are detailed in **Section 14.5.2.1**. The below mitigation is proposed, to reduce the effect of the construction phase of recreational users. It is best read in conjunction with **Technical Appendix A14.1: AMP**.

- Notification of the timings, nature and duration of construction works, as well as their impacts on the utilisation of the SUW at this time. This will be communicated in advance to community councils as well as through relevant platforms such as Scotways/Council/project website or by placing posters in public buildings like Sanquhar Library;
- Communicating with residents, businesses and third-parties in close proximity to the SUW by letter advising of working hours and timetables;
- Advance signage on public roads, the SUW and CDM locations (as displayed in **Figure 14.1.1, Technical Appendix A14.1: AMP**) to warn people of works that could interfere with their route/warn them of potential unexpected vehicle movements;
- Erection of signage, as shown in **Plate 14.1.1, Technical Appendix A14.1: AMP**, along the SUW during construction works, at locations similar to those displayed in (**Figure 14.1.1, Technical Appendix A14.1: AMP**) which will include regular updates on the programme;
- Installation of fencing or rope barriers to guide recreational users safely along the recognised route of the SUW rather than along the construction access track. This would also be managed by the onsite contractors; and
- Potential for areas of the SUW which fall within the site in close proximity to construction traffic to have some localised, temporary delays for walkers (at maximum a matter of 15 minutes). This will be managed by onsite contractors and would occur on the occasion that traffic loads are coming into, or leaving, the Site.

Further detail on the access management of the SUW during the construction phase can be found in **Section 4.1, Technical Appendix A14.1: AMP**.

It is assumed that with the following mitigation in place that the significance of effect on the SUW is reduced to **minor (not significant), adverse** magnitude of effect which is not significant in the context of the EIA Regulations.

No adverse, significant effects have been predicted for land use, therefore no mitigation is required.

14.6.3 Operational Phase

Section 14.5.1.2 highlighted that direct, indirect and induced GVA and employment opportunities would be created by the operation of the Proposed Development. The applicant is also committed to creating a community benefit fund (CBF) equivalent to £5,000 per installed MW per annum, index linked for the operational lifetime of the project, in line with Scottish Government recommendations which would generate £308,000 towards a CBF each year, and just under £10.8 million over its operational lifetime⁴³⁰. Local accommodation providers, shops, restaurants and bars would be utilised during the operational phase where necessary. Combined, this creates a **moderate, beneficial** magnitude of effect is predicted for socio-economics during the OPEX phase, which is significant in

⁴³⁰ Scottish Government (2022) Onshore Wind: Policy Statement 2022 [Online] Available at: Chapter 4: Benefits to Local Communities and Financial Mechanisms - Onshore wind: policy statement 2022 - gov.scot (www.gov.scot) (Accessed on 04/07/2023)

the context of the EIA Regulations. As the effects of socio-economics are beneficial, no mitigation is proposed.

Table 14.14 highlighted that no tourist and recreational receptors would have a significant magnitude of effect during the operational phase; however, although the risk of ice throw is considered to be very low, mitigation is still proposed in order to ensure the safety of recreational users and operational personnel on the SUW. These measures have been created in line with guidance from NatureScot and the Scottish Government, as well as best practice from similar wind farm applications^{431, 432}. It is best read in conjunction with **Technical Appendix A14.1: AMP**.

- Specific training for service crews regarding the potential for ice throw;
- Monitoring of ice risk conditions by site maintenance personnel; and
- Warning signage at access points to the Site to notify the public of the risk of ice fall from turbines. This warning signage will be similar to that shown in **Plate 14.1.3, Technical Appendix A14.1: AMP**. Warning signage will also be placed on/near turbine towers that pass the SUW and are theoretically within ice throw distance (T1, T3, T4, T7 and T8, as discussed in detail within **Table 14.14**). This will advise members of the public to stand back from the turbines and to take care when nearby and in-line with turbine blades, under icy conditions.

Further, in order to offset some of the construction impacts on the Southern Way, the following offsetting measures have been proposed in line with the Scottish Government's mitigation matrix in NPF4. It is best read in conjunction with **Technical Appendix A14.1: AMP**.

- Erection of up to 5 display boards along the route within the site, consisting of:
 - Details regarding the Proposed Development and its wind energy contribution to net zero, as well as an image of the cumulative developments along the SUW and their combined generating capacities/impact towards net zero;
 - History of the SUW and maps showing connectivity of the route with nearby rights of way (x3); and
 - History of the Royal Burgh of Sanquhar and notable events.
- Replacing/upgrading of 1 no. stile on site (if agreed as required by the Council Access Officer and Southern Upland Way Rangers);
- Erection of 4 no. waymarkers highlighting the SUW route through the site;
- Upgrading the SUW footpath within the Site (if agreed as required by the Council Access Officer and Southern Upland Way Rangers);
- Installation of 3 no. benches/resting areas along the route within the site; and
- Re-instatement of borrow pits to allow appropriate vegetation cover to be reintroduced into the landscape that would fit in with the existing topography (**see Technical Appendix A10.3: Preliminary BPA**).

Further detail on the access management of the SUW during the construction phase can be found in **Section 4.1, Technical Appendix A14.1: AMP**.

No adverse, significant effects have been predicted for land use, therefore no mitigation is required.

⁴³¹ NatureScot (2019) Good Practice During Wind Farm Construction [Online] Available at: Guidance - Good practice during Wind Farm construction | NatureScot (accessed on 19/06/2023)

⁴³² Scottish Government (2014) Onshore Wind Turbines: Planning Advice [Online] Available at: Onshore wind turbines: planning advice - gov.scot (www.gov.scot) (Accessed on 19/06/2023)

14.6.4 Decommissioning Phase

There is a lack of data surrounding the potential impacts upon socio-economics during the decommissioning phase of wind farms; however, any decommissioning phase impacts as a result of the Proposed Development are anticipated to be similar to construction phase impacts. As a result, the significance of effect for each socio-economic receptor during the decommissioning phase is anticipated to be the same as the anticipated significance of effect during the construction phase; however, specific economic or employment projections cannot be calculated due to a lack of evidence at this point in time.

Any potential adverse and beneficial decommissioning phase effects on tourism and recreation are anticipated to be of a similar nature to those identified during the construction phase; therefore, the construction phase impacts can be seen as a 'worst-case scenario' for any potential impacts at the decommissioning phase.

As discussed above in **Table 14.14**, there is the intention to upgrade access tracks for recreational use during the operational period; however, these will be decommissioned with the Proposed Development, except for existing access tracks that were upgraded as part of this application.

No adverse, significant effects have been predicted for land use, therefore no mitigation is required.

14.7 Summary of Effects

After mitigation, there are no adverse, significant effects for socio-economics, land use, tourism or recreation. **Section 14.6.2 – 14.6.4** demonstrate the relevant mitigation and proposed offsetting measures that will be achieved through an AMP for the SUW which has been submitted as part of this application to demonstrate the proposed mitigation and offsetting measures (**Technical Appendix A14.1: AMP**).

14.8 Cumulative Impacts

The appropriate scale for considering cumulative development depends on the nature of the potential effect. For Land Use, this depends on the sensitivity of the receptor. For socio-economics, tourism and recreation, cumulative developments within a 10km radius are considered for each category of potential effect. Although there are a number of operational, consented or in planning wind farms within both the local authority areas, it is likely that, those within 10km of the Proposed Development are assessed on that basis and are listed in **Table 14.5** below.

Table 14.15 List of Cumulative Developments within 10km of the Proposed Development

Name / Status	Status	Number of turbines	Blade Tip Height in m	Minimum distance in km from nearest turbine
Whiteside Hill	Operational	10	121.2	0.54
Sanquhar	Operational	9	126.5	2.32
Twentysilling	Operational	9	140	3.49
Sandy Knowe	Operational	24	125	4.75
Hare Hill Extension	Operational	35	91	6.29
Sunnyside Farm	Operational	2	62	6.32
Hare Hill	Operational	20	62.5	7.50
Afton	Operational	25	120	9.56
Glenmuckloch Energy Park	Operational	2	46.1	9.84
Sanquhar "Six" WF	Consented	6	130	4.31
Lorg	Consented	9	149.9	5.79
Sanquhar II	Application	44	200 (2T@149)	1.69
Euchanhead	Application	21	230	4.54
Sandy Knowe Extension	Application	6	149.9	5.73

The greater the generating capacity of consented and constructed developments in the area, the more likely it is that the local area can benefit from supply chain opportunities. Additionally, it is likely that operations and maintenance operations of the Development will be based locally as there would be enough opportunities locally to employ full time local employees and companies.

14.8.1 Land Use

The Site predominately comprises of open moorland comprising rough grasses, with fields of semi-improved pasture occurring across the lower hills to the east. The cumulative effects of wind farms during construction, operation and decommissioning are considered to be of negligible magnitude for land use, especially where receptors have a low sensitivity. In this case, impacts are mostly located in poor agricultural quality upland areas which will have a resultant negligible effect, and therefore, not significant in terms of the EIA Regulations.

14.8.2 Socio-economics

Local socio-economic effects have been defined as at the scale of the Dumfries and Galloway and East Ayrshire. The beneficial socio-economic effects associated with the Proposed Development would be increased and prolonged as a result of the construction and operation of cumulative wind farm developments, benefiting the local, national and UK market. The greater the generating capacity of consented and constructed developments in the area, the more likely it is that the local area can benefit from supply chain opportunities. Additionally, it is likely that operations and maintenance operations from the developments will be based locally as there would be enough opportunities locally to employ full time local employees and companies.

Should all of the schemes identified within 10km (shown in **Table 14.15**) be constructed, there would be a major (significant), beneficial cumulative effect on direct employment and the economy. It is out with scope of this assessment to quantify/calculate the likely direct effects of these schemes; however, the likely cumulative impact of this is considered to be major (significant), beneficial. The socio-economic resource itself has a medium sensitivity, as it is of significance at a UK, national and local level. With the employment and economic contributions of all the wind farms listed in **Table 14.9**, should they gain consent, a high impact would be felt as there would be a major change in baseline

socio-economic conditions that would be felt at a UK, national and local level throughout the supply chain.

Further, within the local area, there are also multiple community benefit funds (CBFs) in operation. All of the operational developments, listed in **Table 14.15**, have community benefit funds in operation which can be utilised by local community groups to enhance their local area. It is out with scope of this assessment to quantify/calculate the likely direct effects of these schemes; however, the likely cumulative impact of these CBFs operating within a 10km is considered to be moderate (significant), beneficial. The socio-economic resource itself has a low sensitivity, as it is of significance at a local level. With the cumulative CBF contributions of all the operational wind farms listed in **Table 14.15**, as well as the potential CBFs from those who are yet to gain consent, a high impact would be felt as there would be a major change in baseline socio-economic conditions.

14.8.3 Tourism and Recreation

There are a number of nearby developments, listed in **Table 14.15**, with the potential to cause significant effects on tourist and recreational receptors. As the only receptor with a significant magnitude of effect is respect of the Proposed Development, the SUW is the only recreational and tourist receptor considered for the purposes of a cumulative assessment.

The SUW has a number of wind farm developments surrounding the route within 10km of the Proposed Development which are considered in this assessment. Those in closest proximity are Whiteside Hill, Sanquhar, Sanquhar II, Twentyshilling, Eucharhead, Lorg, Sunnyside Farm and Afton (distances from the Proposed Development noted in **Table 14.15**). The cumulative impact of these surrounding wind farms means that the Proposed Development will align more easily into the existing landscape that surrounds the SUW, which limits the magnitude of change experienced by users of the SUW attributable to the Proposed Development. Further, the Proposed Development would appear in front of Whiteside Hill Wind Farm, which would allow the Proposed Development to appear as an extension to it. Although, this would noticeably increase the number of wind turbines within a small proportion of the view, while not increasing the overall horizontal extent containing wind farm development (**Section 6.9.8, Chapter 6 – LVIA; VP7, VP18, VP19, Volume 2c: Visualisations**).

For the SUW the LVIA findings in **Section 6.11.6, Chapter 6 – LVIA** conclude that there will be a medium-high to medium within 5 km of the Site, a medium-low, within remaining areas and no change in areas without visibility of the Proposed Development. When assessing the cumulative impact on the SUW as a recreational feature, LVIA impacts are just one part of the assessment, that informs the impact on amenity value for users; therefore, the significance concluded in each assessment may vary. Further, the assessment of the SUW as a recreational feature considers the experience had by users as they move along the route, rather than from one specific viewpoint.

Since the construction of wind farms along the entire length of the SUW, there has been no decrease in the amount of users. In 2005, it was estimated that 1,000 people used the SUW for long distance walking which has remained the same since last recorded in 2019^{433, 434}. Since the introduction of the operational wind farms listed in **Table 14.15**, it can be seen that the number of users has not diminished. It is noted that the proximity of the SUW to the Proposed Development, 200m from T3 (200m south) and T8 (200m south-east) has the potential to cause direct and indirect impacts that may reduce visitor numbers.

There is no evidence to suggest that the presence of the Proposed Wind Farm would have an impact on the numbers of walkers using the SUW in the 10km radius considered for this cumulative assessment. Therefore, the addition of the Proposed Development will create a negligible (not significant) cumulative effect on tourism and recreation on the SUW.

⁴³³ Southern Upland Way Partnership (2005) Southern Upland Way User Survey [Online] Available at: SUW SUMMARY DOC.pdf (sup.org.uk) (Accessed on 11/05/2023)

⁴³⁴ DG Trails (2019) Western Section Route Development Plan [Online] Available at: SUW SUMMARY DOC.pdf (sup.org.uk) (Accessed on 11/05/2023).

14.9 Statement of Significance

This assessment has considered the effects of the Proposed Development on the socio-economics of the local council areas and nationally, land use, and tourism and recreation during the construction and operational phases. In this assessment, the following aspects have been assessed:

- The project spend, direct employment opportunities and direct GVA contributions per annum at a local, regional and UK scale;
- The local direct, indirect and induced employment;
- The local direct, indirect and induced GVA;
- Impacts on land use; and
- Impacts on tourist and recreational receptors.

This chapter has also discussed the community benefits the Applicant is committed to offering to increase the local offering for the local community. This includes a community benefit fund (CBF) equivalent to £5,000 per installed MW per annum, index linked for the operational lifetime of the project, in line with Scottish Government recommendations which would generate £308,000 towards a CBF each year, and just under £10.8 million over its operational lifetime.

The significance of effect during the construction and operational phase of the Proposed Development on socio-economics is **moderate (significant), beneficial** in the context of the EIA Regulations; however, no mitigation measures have been proposed as predicted effects are beneficial. The socio-economic effects during the decommissioning phase are estimated to be of a similar nature to those predicted during the construction phase.

A **moderate (significant), adverse** effect is predicted on the SUW during the construction phase of the Proposed Development which is significant in line with the EIA Regulations. It is anticipated that with the proposed mitigation in **Section 14.6.2** and **Technical Appendix A14.1: AMP**, that the significance of effect on the SUW will be reduced to a **minor (not significant), adverse** impact, which is not significant in the context of the EIA Regulations. Further, offsetting measure are proposed during the operational phase in line with Scottish Government NPF4's mitigation matrix, as detailed in **Section 14.6.3** and **Technical Appendix A14.1: AMP**.

There will be a no other significant effects on other tourist and recreational receptors, or land use, during the construction, operational and decommissioning phases of the Proposed Development in line with the EIA Regulations.

15. CLIMATE CHANGE

15.1 Introduction

This Chapter of the EIA Report evaluates the effects of Cloud Hill Wind Farm (the Proposed Development) on the changing climate and carbon balance resource, and presents a Climate Change Impact Assessment (CCIA). This assessment was undertaken by ERM Ltd.

This Chapter of the EIA Report is supported by the following Technical Appendix, provided in **Volume 3: EIA Report Technical Appendices**:

- Technical Appendix A15.1: Carbon Calculations

This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

15.2 Legislation, Policy and Guidance

The following guidance, legislation and information sources have been considered in carrying out this assessment:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended⁴³⁵;
- The Institute of Environmental Association (2015) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation⁴³⁶;
- IEMA (2017) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance⁴³⁷;
- Scottish Government (2017) The Future of Scotland: Scottish Energy Strategy (2017)⁴³⁸;
- Scottish Government (2022) Onshore Wind: Policy Statement⁴³⁹;

⁴³⁵ Scottish Government (2017) The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: <https://www.legislation.gov.uk/ssi/2017/101/contents/made> (Accessed 30/05/2023)

⁴³⁶ IEMA (2015) IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation [Online] Available at: IEMA - IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020) (Accessed 24/02/2023)

⁴³⁷ IEMA (2017) IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance' [Online] Available at: [assessing-greenhouse-gas-emissions-and-evaluating-their-significance](https://www.iema.net/assessing-greenhouse-gas-emissions-and-evaluating-their-significance) (iema.net) (Accessed 24/02/2023)

⁴³⁸ Scottish Government (2022) Onshore Wind: Policy Statement 2022 [Online] Available at: [Onshore wind: policy statement 2022 - gov.scot](https://www.gov.scot/publications/onshore-wind-policy-statement-9781788515283/) (www.gov.scot) (Accessed 30/05/2023)

⁴³⁹ Scottish Government (2017) Onshore Wind: Policy Statement [Online] Available at: <https://www.gov.scot/publications/onshore-wind-policy-statement-9781788515283/> (Accessed 24/02/2023)

- European Commission Guidance (2013) Integrating Climate Change and Biodiversity into Environmental Impact Assessment⁴⁴⁰;
- HM Government (2012) UK Climate Change Risk Assessment Government Report⁴⁴¹;
- The Scottish Government (2014) Scottish Climate Change Adoption Programme⁴⁴²;
- The Scottish Government (2018) Climate Change Plan: Third Report on Proposals and Policies 2018-2031⁴⁴³;
- Scottish Government (2019) Climate Change (Emissions Reduction Targets) (Scotland) Act 2019⁴⁴⁴;
- National Audit Office (2020) Achieving Net Zero⁴⁴⁵;
- The Committee on Climate Change (CCC) (2020) Reducing UK Emissions: 2020 Progress Report⁴⁴⁶;
- HM Government (2020) the Energy White Paper – Powering our Net Zero Future⁴⁴⁷; and
- Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018–2032⁴⁴⁸

15.3 Assessment Methodology and Significance Criteria

15.3.1 Scoping Responses and Consultations

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 15.1**.

Table 15.1 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
SEPA	Scoping Response, 21 st April 2022	The site should be designed to avoid sensitive receptors (i.e. peat, GWDTE, water features, private water supplies) and incorporate appropriate buffer distances.	Mitigation through design has avoided sensitive receptors, as detailed in Section 3.4.2 of Chapter 3 – Site Selection and Design .
Scottish Forestry	Scoping Response, 28 th April 2022	Noted that the scheme is broadly situated on open ground with little impact on forestry, although there is	This has been noted and no felling is proposed in line with the Proposed Development.

⁴⁴⁰ European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013) [Online] Available at: Law and Governance Policy - Library (europa.eu) (Accessed 24/02/2023)

⁴⁴¹ HM Government (2012). UK Climate Change Risk Assessment: Government Report [online]. Available at: <https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report> (Accessed 24/02/2023)

⁴⁴² Scottish Government (2014). Scottish Climate Change Adaption Programme (SCCAP) [online]. Available at: Scottish Climate Change Adaptation Programme (SCCAP) - gov.scot (www.gov.scot) (Accessed 24/02/2023)

⁴⁴³ Scottish Government (2018) Climate Change Plan: Third Report on Proposals and Policies 2018 – 2031 (RPP3) [Online] Available at: <https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018-9781788516488/> (Accessed 24/02/2023)

⁴⁴⁴ Scottish Government (2019) Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 [Online] Available at: <http://www.legislation.gov.uk/asp/2019/15/enacted> (Accessed 24/02/2023)

⁴⁴⁵ National Audit Office (2020) Achieving Net Zero [Online] Available at: <https://www.nao.org.uk/wp-content/uploads/2020/12/Achieving-net-zero.pdf> (Accessed 24/02/2023)

⁴⁴⁶ The CCC (2020) Reducing UK emissions: 2020 Progress Report to Parliament [Online] Available at: <https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/#key-findings> (Accessed 24/02/2023)

⁴⁴⁷ HM Government (2020) The Energy White Paper - Powering our Net Zero Future [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf (Accessed 24/02/2023)

⁴⁴⁸ Scottish Government (2020) Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update [Online] Available at: <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/pages/0/> (Accessed 24/02/2023)

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		one section adjacent to Ulzieside Plantation where there has been some recent planting.	
Tyron Community Council (TCC)	Scoping Response	Request to include: - Scottish Government Planning Policy, with particular regards to rural depopulation and supporting rural jobs and businesses; - Scottish Biodiversity Targets, with regards to species losses in the area; - Scottish Government Policy on peat preservation and restoration, with particular regard to climate change mitigation; and - Relevant and up-to-date, scientific discourse to mitigate against biodiversity loss and climate change.	Responses to requests are as follows: - Onshore Wind: Policy Statement (2022) has been included as the most up-to-date planning policy from the Scottish Government. Rural depopulation and supporting rural jobs and businesses are assessed in Section 14.4 and Section 14.5.1, Chapter 14 – Socio-Economics, Tourism, Recreation and Land Use. - Scottish Government's Scottish Biodiversity Strategy to 2045 (2022) and Dumfries and Galloway Council's Local Biodiversity Action Plan (2009) have been used to identify regional and national biodiversity strategies and protected species in Section 7.2.1 and Section 7.2.3 Chapter 7 – Ecology. Appendix A7.6 oBEMP, provides a detailed overview of biodiversity enhancement measurements. - A variety of Scottish Government policy has been utilised in have been utilised to identify measures for peat restoration with particular regard to climate change mitigation in Section 10.2, Chapter 10 – Geology and Peat A10.2 provides an in-depth analysis of peat mitigation measures. - Both JNCC and DEFRA (2012) UK Post-2010 Biodiversity Framework Scottish Government (2022) and Scottish Biodiversity Strategy to 2045 Tackling the Nature Emergency in Scotland in Section 7.2.2 of Chapter 7 – ecology have been utilised to provide up-to-date, scientific biodiversity mitigation techniques. - Up-to-date, scientific discourse to mitigate against climate change has been provided in Section 15.4 of Chapter 15 – Climate Change.

15.3.2 Scope of Assessment

The key issues for the assessment of potential climate change effects relating to the Proposed Development.

- Effects of the Proposed Development on climate change;

- Effects of climate change on the Proposed Development; and
- Effects of climate change on assessments made in other topics of the Proposed Development's EIA Report.

The construction and decommissioning stages of the Proposed Development are not considered to be vulnerable to climate change and have been scoped out of further consideration.

15.3.3 Elements Scoped Out of Assessment

The assessment of the influence of the Proposed Development on climate change focusses on the overall balance of greenhouse gas (GHG) emissions as climate change is directly linked to these emissions. An assessment of the vulnerability of the Proposed Development to climate change has been scoped out of assessment, on the basis that none of the identified climate change trends could affect the Proposed Development, with the exception of increased windstorms. Any risk to the turbines from windstorms can be mitigated by installing braking mechanisms on the turbines, which would allow them to be operated only under specific wind speeds. Should severe windstorms be experienced, the turbines would be shut down. Additionally, flooding is not expected to pose a significant risk to the operation of the wind farm.

In relation to effects on other environmental receptors, a qualitative review has been undertaken in this EIA Report to ascertain whether projected climate change will modify future baseline conditions in the absence of the Proposed Development sufficiently to change the results of the assessments undertaken in other chapters. The assessments are not repeated and should be read in conjunction with the technical chapters.

Of the technical assessments included within this EIA Report, receptors within ecology, ornithology, hydrology and geology and peat have been identified as having a potential for the baseline to be modified as a result of climate change. Effects of climate change on ecology, ornithology and hydrology are included in this chapter, with all other technical areas scoped out of further consideration as baseline receptors are unlikely to be affected by the climate changes forecast during the operational phase of the Development.

15.3.4 Study Area

The Study Area considered for the purposes of this assessment consists of all infrastructure proposed within the Site. The assessment will consider the forecast climate changes over the planned operational phases of the Proposed Development i.e., until approximately 2063⁴⁴⁹. Information on climate trends and projections at the Scottish and local scale are utilised.

The Study Area for the assessment of the influence of the Proposed Development on climate change considers GHG emissions (current levels and targets) within the Scottish and UK spatial scale. Reference is made to the global context and appropriate.

For the environmental receptors sensitive to the Proposed Development, the Study Areas used are those defined within the respective technical chapters, specifically:

- Chapter 7: Ecology, **Section 7.3.4**;
- Chapter 8: Ornithology, **Section 8.3.4**; and
- Chapter 10: Peat and Ground Conditions, **Section 10.3.4**.

15.3.5 Design Parameters

The design of the Proposed Development is a balance of technical, resource and environmental considerations. Those of relevance for the assessments in this Chapter include:

⁴⁴⁹ Assuming the site is fully operational by 2028 and s36 consent is granted for an operational life of 35 years.

- Installed capacity and capacity factor – for calculation of carbon balance;
- Turbine spacing in relation to prevailing wind direction – for effects on generation, turbulence, vulnerability to damage with potential changes to wind speed, direction and storminess;
- Amount and layout of new track and infrastructure, including excavations – for calculation of carbon balance;
- Buffers to watercourses – for assessing vulnerability to flooding due to changes in precipitation events; and
- Construction Management commitments particularly in relation to minimisation of disturbance and re-use of peat, and potential for flooding (as embedded in the outline Water Construction Management Plan (WCEMP), Draft Peat Management Plan (DPMP), etc.) – for assessing potential emissions and vulnerability to flooding.

15.3.6 Baseline Survey Methodology

Climate trends and projections are published by the Met Office through the UK Climate Projections website⁴⁵⁰. The UKCP18 became available in November 2018, and was most recently updated in September 2019. The UKCP18 provides the most up to date assessment of how the climate of the UK may change over this century.

UKCP18 uses scenarios for future greenhouse gas emissions called Representative Concentration Pathways (RCPs). The four RCPs attempt to capture a range of potential alternative futures and outcomes linked to global temperature increases and include a wide variety of assumptions on socioeconomic development and commitment to emissions reductions. The sensitivity of the scenario responses is much more pronounced in the second half of the 21st Century, where the responses diverge more rapidly than in the first half of the century. The four RCPs are as follows:

- RCP2.6: assumes an increase in global mean surface temperature of 1.6°C (0.9-2.3) by 2081-2100 (no change scenario);
- RCP4.5: assumes an increase in global mean surface temperature of 2.4°C (1.7-3.2) by 2081-2100 (low emissions scenario);
- RCP6.0: assumes an increase in global mean surface temperature of 2.8°C (2.0-3.7) by 2081-2100 (medium emissions scenario); and
- RCP8.5: assumes an increase in global mean surface temperature of 4.3°C (3.2-5.4) by 2081-2100 (high emissions scenario).

Over the 35-year anticipated lifetime of the Proposed Development, the choice of scenario is therefore not fundamental to the assessment but, where appropriate, the medium emissions scenario RCP6.0 is utilised as the future baseline. Reflecting the Paris Climate Agreement⁴⁵¹, in which most countries including the UK pledged to reduce emissions by 2030 and allows for some increase in emissions.

Projections are reported for 20-year time periods through to 2100. The 2020-2039 and 2040-2059 periods provide the closest projections to the operational phase of the Proposed Development. For the purpose of this CCIA, where appropriate, the 2040-2059 time period is used as the impacts of climate change are anticipated to be more evident with time.

Projected climatic changes at the 50% probability level (central estimate) are utilised, unless otherwise indicated. This is the level where there is as much evidence pointing to a lower outcome as

⁴⁵⁰ Met Office (2019) UK Climate Predictions [Online] Available at: Climate change projections over land - Met Office (Accessed 24/02/2023)

⁴⁵¹ United Nations (2016) Framework Convention on Climate Change. Adoption of the Paris Agreement, 21st Conference of the Parties, Paris [Online] Available at: <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf> (Accessed 24/02/2023)

a higher one. There is substantial evidence that the actual climatic change outcome will be in the 10th to 90th percentile range and this is also utilised for limited assessment parameters⁴⁵².

15.3.6.1 *Vulnerability of the Proposed Development to Climate Change*

This section of the CCIA identifies aspects of the Proposed Development which are potentially vulnerable to the effects of climate change. Where identified, these vulnerabilities can then be mitigated through embedded mitigation or the application of other measures.

Taking into account the nature and location of the Proposed Development, the following climate related parameters are considered to have the potential to impact upon the operation of the Proposed Development:

- Wind (speed, direction and gustiness);
- Temperature; and
- Precipitation.

15.3.6.2 *Influence of the Proposed Development on Climate Change*

This section of the CCIA seeks to quantify the effect of the Proposed Development on climate change.

In Scotland, applications submitted under Section 36 of the Electricity Act 1989 are required to undertake the carbon balance assessment using the Scottish Government's carbon calculator tool. This has been completed for the Proposed Development (**Reference Number: VUWS-TR24-YG37**). The carbon assessment methodology used is consistent with that published by the Rural and Environment Research and Analysis Directorate of the Scottish Government entitled 'Calculating carbon savings from wind farms on Scottish peat lands – a new approach'⁴⁵³. This publication sets out the approach and assumptions that should be used to estimate potential carbon losses and savings from wind farms on Scottish peatlands. The carbon balance assessment is included as a **Technical Appendix A15.1: Carbon Calculations**

The calculation evaluates the balance of total carbon savings and carbon losses over the life of the Proposed Development. The potential carbon savings and carbon costs associated with wind farms are as follows:

- Carbon emission savings due to generation (based on displacing emissions from different power sources);
- Lifetime costs associated with manufacture of turbines and construction;
- Loss of carbon from backup power generation;
- Loss of carbon-fixing potential of peatland;
- Loss and/or saving of carbon stored in peatland (by peat removal or changes in drainage);
- Loss and/or saving of carbon-fixing potential as a result of forestry clearance; and
- Carbon gains due to proposed habitat improvements such as bog restoration.

The calculation of the carbon balance of a proposed wind farm provides a mechanism by which the carbon costs of a wind farm development can be weighed against the carbon savings attributable to the wind farm during its lifetime. This calculation is summarised as the length of time (in years) it will take the carbon savings to amount to the carbon costs and is referred to as the 'payback period'. This

⁴⁵² Lowe et al (2018) UKCP18 Science Overview Report (Page 13) (Accessed 25/04/2023)

⁴⁵³ Nayak et al (2008) Calculating carbon savings from wind farms on Scottish peat lands: a new approach (Scottish Government) [Online] Available at: <https://www.gov.scot/publications/calculating-carbon-savings-wind-farms-scottish-peat-lands-new-approach/pages/13/> (Accessed 24/02/2023)

information can then inform decision makers of the viability of a wind farm development in terms of overall carbon savings.

Calculations are provided for expected, best case and worst-case scenarios of Development. The expected scenario is based on the layout of 11 turbines and candidate turbine described in **Chapter 4 – Description of the Proposed Development**. The final turbine and BESS capacity will be confirmed prior to construction and is likely to be at least 50MW as conservative worst-case. Realistically, installed capacity is anticipated to be approximately 61.6MW however this may increase further pending available turbine technology at time of procurement.

The other scenarios are based on varying assumptions regarding wind energy capacity factor, characteristics of peatland and the Proposed Development's land-take. The data sources and assumptions used in the carbon balance assessment are detailed in **Technical Appendix A15.1: Carbon Calculations**. The assessment was informed by an iterative peat probing process, as described in **Chapter 10 – Peat and Ground Conditions**.

15.3.6.3 *Effects on Environmental Receptors Sensitive to Climate Change*

This section of the CCIA identifies where climate change has the potential to significantly impact the findings of assessments undertaken and reported elsewhere in this EIA Report. Reference is made to the specific assessment chapters, where the baseline conditions and sensitivity of receptors are discussed, assessments are not repeated.

15.3.7 *Methodology for the Assessment of Effects*

To determine whether effects are significant under the EIA Regulations, it is appropriate to consider the sensitivity (vulnerability and susceptibility) of the receptor and the magnitude of the impact, taking into account uncertainty. This is based on the professional judgement of the assessor.

15.3.7.1 *Sensitivity of Receptors*

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

Table 15.2 details the framework for determining the sensitivity of receptors.

Table 15.2 Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor is of very high environmental value, or of international importance.
High	The receptor is of high environmental value, or of national importance.
Medium	The receptor is of environmental value, or is of regional importance.
Low	The receptor is of low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

15.3.7.2 *Magnitude of Impact*

The magnitude of potential impact will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an impact and professional judgement, best practice guidance and legislation.

The criteria for assessing the magnitude of impact are presented in **Table 15.3**.

Table 15.3 Framework for Determining Magnitude of Impact

Magnitude of Impact	Definition
High	A major, fundamental alteration in carbon emissions and savings which reduces the impacts of climate change.
Medium	A moderate, partial alteration in carbon emissions and savings which reduces the impacts of climate change.
Low	A slight, detectable alteration in carbon emissions and savings which reduces the impacts of climate change.
Negligible	A barely distinguishable change in carbon emissions and savings which reduces the impacts of climate change.

15.3.7.3 Significance of Effect

The sensitivity of the asset and the magnitude of impact will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects.

The IEMA guidelines for CCIA state the following with regards to the assessment of significance:

“Once the sensitivity and magnitude have been determined, these should be combined to reach an overall judgement on the significance of the likely environmental effect. As there is no legislative definition of ‘significance’, the conclusion of whether an effect is significant/the level of significance is down to the CCAR [Climate Change Adaption and Resilience] Coordinator in conjunction with the EIA Coordinator. An explanation of the outcomes of the assessment should be clearly set out.

Appropriate criteria for sensitivity, magnitude and significance for the climate resilience assessment should be developed on a project-by-project basis by the CCAR Coordinator in conjunction with the EIA Coordinator, and should take into account the aims/purpose of the project.”

Table 15.4 outlines the framework for the assessment of significance of effects.

Table 15.4 Framework for Assessment of the Significance of Effects

Magnitude of Impact	Sensitivity of Resource or Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

Effects predicted to be of major or moderate significance are considered to be ‘significant’ in the context of the EIA Regulations and are shaded in light grey in the above table.

15.3.8 Assessment Limitations

The climate change projections are based on global models for a range of GHG emissions scenarios and generally consider regional responses to climate change rather than local responses. This is based on best scientific knowledge at this time and judgements on datasets and future socioeconomic drivers.

Downscaling adds another level of uncertainty. There may be more detail, but the uncertainty of the science may be higher. As understanding of the climate system and ability to model it improves it is likely that future projections will be refined.

The probabilities presented and the estimated ranges are based on a set of modelling, statistical and dataset choices with expert judgement playing an important role. However, as some potential influences on future climate are not yet known some choices may change as the science develops⁴⁵⁴.

Specifically, in relation to wind, the UKCP18 Wind Fact sheet⁴⁵⁵ states that local variations due to the land surface are hard to model, particularly in very exposed or sheltered locations. This can be particularly relevant in high wind speed situations where local gusts can result from small scale weather events such as thunderstorms.

15.3.9 Embedded Mitigation

As detailed in **Chapter 3 – Site Selection and Design**, the Proposed Development has been driven by the key objective of capturing the maximum energy possible, while balancing environmental and technical constraints. The design choices made as a consequence of the key constraints are considered to be mitigation which is ‘embedded’ in the design; the following are most relevant for the CCIA:

- Proposed Development infrastructure built to withstand strong windspeeds and to harness energy;
- Turbine spacing (3 x 5 rotor distance) sufficient to reduce turbulence effects on turbines downwind;
- Turbines are located to maximise energy generation while minimising environmental impacts;
- The Proposed Development design aims to minimise environmental impacts e.g., through use of existing track layout;
- Turbines, and associated infrastructure, have not been sited in areas of deep peat to minimise peat disturbance;
- Implementation of a final CEMP, PMP etc. (to be agreed with the LPA and selected consultees by condition prior to construction) during construction to minimise environmental impacts and peat disturbance; and
- 50m buffers from watercourses incorporated in layout design, protecting water quality and also protecting Proposed Development infrastructure from flooding.

15.4 Baseline Conditions

The State of the UK Climate 2019⁴⁵⁶ provides the latest report on observed climate data for UK. Key findings are as follows:

- The decade 2010 – 2019 was on average 0.3°C warmer than the 1981 – 2010 average and 0.9°C warmer than 1961 – 1990. The ten warmest years on record have occurred since 2002;
- The decade 2010 – 2019 has been on average 1% wetter than 1981 – 2010 and 5% wetter than 1961 – 1990 for the UK overall. Six of the ten wettest years for the UK in a series from 1862 have occurred since 1998;
- In the context of seasonal changes, for the most recent decade (2010 – 2019):
 - UK summers have been on average 11% wetter (number of days with rain) than 1981 – 2010 and 13% wetter than 1961 – 1990;

⁴⁵⁴ Lowe et al (2018) UKCP18 Science Overview Report (Accessed 27/04/2023)

⁴⁵⁵ UKCP18 (2019) Factsheet: Wind [Online]. Available at:
https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-wind_march21.pdf
(Accessed 27/04/2023)

⁴⁵⁶ International Journal of Climatology, volume 39, Issue S1 (July 2020) ed. Radan Huth. Wiley (Accessed 27/04/2023)

- UK winters have been on average 4 % wetter (number of days with rain) than 1981 – 2010 and 12 % wetter than 1961 – 1990; and
- In the UK, there is no strong evidence for trends in storminess as determined by maximum gust speeds over the last five decades.

Climate Projections show that the trends over the 21st century in the UK are towards warmer and wetter winters and hotter, drier summers, with an increase in frequency and intensity of extremes.

The climate parameters considered most relevant to the assessments referenced within this section are wind speed, temperature and precipitation.

15.4.1 Wind Speed

The global projections over the UK show an increase in near surface (10 metre height) wind speeds over the UK in the second half of the 21st century, in the winter season when higher wind speeds are generally experienced. The increase is modest when compared to inter-annual variability. This would be accompanied by an increase in frequency of winter storms over the UK⁴⁵⁷. There are no significant changes forecast in the wind speeds over the first part of the century.

These projections are in line with earlier findings by Pryor and Barthelmie (2010)⁴⁵⁸ who concluded that in the near-term (i.e. until the 2050s) there will be no detectable significant change in the wind resource of northern Europe.

15.4.2 Temperature

For period 2041 – 2060 projected changes to UK annual mean temperature (compared to 1981 – 2000) is projected at + 1.5°C (50% probability) for RCP8.5 (unmitigated scenario). Results for the 10th to 90th percentile range are between + 0.7°C to + 2.5°C⁴⁵⁹. Key observations are that:

- Both winters and summers will be warmer, with greater increases in temperature during the summer;
- In summer, there is a pronounced north/south divide with greater increases in maximum summer temperatures over southern UK compared to Scotland; and
- During winter the north/south divide is less obvious, but there is evidence of more enhanced warming across Scotland.

15.4.3 Precipitation

Rainfall patterns over the UK are not uniform and vary on regional and seasonal scales, which will continue in the future. Future changes are uncertain but point to wetter winters and drier summers in general. Northern Scotland is associated with greatest increased precipitation in winters⁴⁶⁰.

Over the UK, the changes to precipitation projected for 2041 – 2060 (compared to 1981 – 2000) for RCP8.5 (unmitigated scenario) are:

- Winter precipitation – increase of 7 %. Results for the 10th to 90th percentile range are between - 5 % and + 21 %;
- Summer precipitation – decrease of 15 %. Results for the 10th to 90th percentile range are between - 31 % and + 0 %.

⁴⁵⁷ UKCP18 (2018) Factsheet: Wind. (Accessed 19/04/2023)

⁴⁵⁸ Pryor, S.C. and Barthelmie, R. J. (2010) Climate Change Impact on Wind Energy: A Review. Renewable and Sustainable Energy Review, 14(1): 430-437 (Accessed 27/04/2023)

⁴⁵⁹ Lowe et al (2018) UKCP18 Science Overview Report (Table 2.2, Page 16) (Accessed 27/04/2023)

⁴⁶⁰ Lowe et al (2018) UKCP18 Science Overview Report (Accessed 27/04/2023)

15.4.4 Legislation, Policy and Guidance

15.4.4.1 The Paris Agreement

The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C⁴⁶¹. Since then, frameworks and agreements have been put in place to try and achieve these measures. As stated in the Global Carbon Budget 2018, “when it comes to rises in global average temperature, every fraction of a degree matters” and a substantial reduction in greenhouse gas emissions is imperative to avoid irreversible damage caused by the impacts of climate change, “when it comes to rises in global average temperature, every fraction of a degree matters”⁴⁶².

15.4.4.2 Conference of the Parties 2026 (COP26)

In 2022, the UN Climate Change Conference (COP26) brought together 120 world leaders and over 40,000 registered participants including part delegates, observers and media representative to discuss the science, solutions and motivations for climate change⁴⁶³. The outcome of this was the ‘Glasgow Climate Pact’⁴⁶⁴ which identified new building blocks that countries could use to implement the details set out in the Paris Agreement such as:

- Recognising the emergency – reaffirming countries commitment to limiting the increase in global average temperature to well below 2°C above pre-industrial levels, with efforts to limit it to 1.5°C;
- Accelerating action – reducing carbon dioxide emissions by 45 % to reach net-zero by mid-century;
- Moving away from fossil fuels – actively calling for a phase down of coal power and a phase out of inefficient fossil fuel subsidies;
- Delivering on climate finance – reaffirming the pledge for all developed countries to deliver \$100 billion US dollars a year to developing countries;
- Stepping up support for adaptation – doubling financial aid for developing countries to build resilience to the impacts of climate change;
- Focusing on loss and action – strengthening the Santiago network that connects developing countries with providers of technical assistance, knowledge and resources. The ‘Glasgow Dialogue’ was also launched to ‘avert, minimise and address’ the adverse impact of climate change; and
- Completing the Paris rulebook – countries reached agreement on the remaining issues of the ‘Paris rulebook’ which details the practical implementation of the Paris Agreement.

15.4.4.3 Onshore Wind: Policy Statement (2022)

The Onshore Wind Policy Statement was published on the 21st of December 2022 and details the Scottish Government’s ambition to deploy 20 GW of onshore wind by 2030⁴⁶⁵. In the face of a climate emergency, the Scottish Government want to accelerate their transition towards a Net Zero through a just transition that provides opportunities and benefits for all. Scotland has been identified as an

⁴⁶¹ UN Climate Change (2015) the Paris Agreement [Online] Available at: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (Accessed 19/04/2023)

⁴⁶² Figueres, C., C. Le Quéré, G. P. Peters, G. Whiteman, A. Mahindra, D. Guan, et al. (2018) Carbon Budget 2018: Emissions are still rising: ramp up the cuts, Nature, vol 564, 27-30. (Accessed 19/04/2023)

⁴⁶³ UN Climate Change (2022) COP26: Together for Our Future [Online] Available at: COP26: Together for our planet | United Nations (Accessed on 31/05/2023)

⁴⁶⁴ Glasgow Climate Pact [Online] Available at: [cma3_auv_2_cover decision \(unfccc.int\)](https://unfccc.int/news/cma3_auv_2_cover_decision) (Accessed on 31/05/2023)

⁴⁶⁵ Scottish Government (2022) Onshore Wind: Policy Statement [Online] Available at: Onshore wind: policy statement 2022 - gov.scot (www.gov.scot) (Access on 31/05/2023)

industry leader in onshore wind and with 9GW already operational, Scotland has the capacity to provide a cheap and reliable source of zero-carbon electricity that can be deployed quickly; however, the Scottish Government recognise that this must be done in alignment with our natural, cultural, economic and social environment.

15.4.4.4 IPCC Special Report

The 2018 IPCC Special Report⁴⁶⁶ highlighted that to limit global warming to below 1.5°C by the end of the century, emissions would need to decline by approximately 45% by 2030 and reach net zero around 2050. This is the temperature rise when a variety of increasingly severe effects are considered to occur and the IPCC identifies that rapid and far-reaching transitions are required in all sectors including energy. Action is required immediately to reduce emissions by 50% by 2030. Figures from the Global Carbon Project however report that global CO₂ emissions from fossil fuels and industry have increased every decade from an average of 11.4 gigatonnes of equivalent carbon dioxide (GtCO₂) in the 1960s to an average of 34.7 GtCO₂ during 2009 – 2018. Emissions in 2018 reached a new record high of 36.6 GtCO₂. Though global emissions in 2019 have been projected to increase by an additional 6 %, which is a slower growth than in the past two years.

15.4.4.5 The Climate Change Act (Emissions Reduction Targets) (Scotland) Act 2019

The Climate Change Act (Emissions Reduction Targets) (Scotland) Act 2019 amends the Climate Change (Scotland) Act 2009, was introduced to Parliament in May 2018⁴⁶⁷. The Bill was passed in September 2019 and received Royal Assent in October 2019. Following the Committee on Climate Change recommendation, the Act was amended to set a new target to cut Scottish greenhouse gas emissions to net zero by 2045, five years ahead of the target date set for the whole of the UK, with interim targets now set to cut emissions by 75% and 90% by 2030 and 2040 respectively (in relation to 1990 levels).

15.4.4.6 Climate Ready Scotland: Climate Change Adaptation Programme 2019-2024

The second Scottish Climate Change Adaptation Programme 2019 – 2024 was published in September 2019 and sets out the Scottish Government's policies and proposals for climate change adaptation, building on the 1st five-year programme⁴⁶⁸. This plan has 7 different outcomes that identify ways Scotland can tackle the intricate environmental, social and economic aspects of climate change to achieve net zero targets.

15.4.4.7 Progress in Adapting to Climate Change

In March 2023, The Committee on Climate Change (CCC) published the 2023 report to Parliament, assessing progress in reducing UK emissions over the past year⁴⁶⁹. The report highlights that a limited number of steps have been taken since the second National Adaption Programme (NAP2) was set out to support the transition to a net-zero economy and improve the UK's resilience to the impacts of climate change. Much still remains to be done as the impacts from extreme weather all over the UK in the past year highlight the urgency with which we must adapt to our changing climate. The report

⁴⁶⁶ Intergovernmental Panel on Climate Change (IPCC) (2018) Global Warming of 1.5oC: Summary for Policymakers [Online] Available at: <https://www.ipcc.ch/sr15/> (Accessed 19/04/2023)

⁴⁶⁷ Scottish Government (2019) The Climate Change Act (Emissions Reduction Targets) (Scotland) Act 2019 [Online] Available at: Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([legislation.gov.uk](https://www.legislation.gov.uk)) (Accessed on 31/05/2023)

⁴⁶⁸ Climate Ready Scotland: climate change adaptation programme 2019-2024 [Online] Available at: Climate Ready Scotland: climate change adaptation programme 2019-2024 - gov.scot (www.gov.scot) (Accessed on 31/05/2023)

⁴⁶⁹ The Climate Change Committee (2023) Progress in Adapting to Climate Change [Online] Available at: WEB-Progress-in-adapting-to-climate-change-2023-Report-to-Parliament.pdf ([theccc.org.uk](https://www.theccc.org.uk)) (Accessed on 31/05/2023)

indicates that the next National Adaption Programme (NAP3) must be much more ambitious and provide effective and measurable adaption measures.

15.4.4.8 National Planning Framework 4 (NPF4)

The National Planning Framework 4 (NPF4) replaces NPF3 and Scottish Planning Policy and provides a national, spatial strategy for Scotland since the Scottish Government declared a climate emergency in 2019⁴⁷⁰. This guidance sets out how planning can be tailored to make Scotland's places become more sustainable, liveable and productive places that play a key role in delivering the United Nation's Sustainable Development Goals. The Scottish Government believe that this spatial strategy will play a key role in achieving net-zero goals, whilst playing a critical role in delivering the National Strategy for Economic Transformation and in community wealth building.

15.4.4.9 Dumfries and Galloway Council Climate Emergency Declaration

In 2019, the Council declared a climate emergency as the impact of climate change across the world has become more focused and proven⁴⁷¹. In the wake of the Climate Change (Emissions Reduction) (Scotland) Bill and the Scottish Government's net zero by 2045 emission targets, the Council took action and developed a 12 point plan to oversee the implementation of climate commitments. These include:

- Reviewing policy and practice across all council directorates and departments to identify ways that carbon reduction measures can be tackled further and faster;
- Embedding climate change considerations into all policy and practice risk assessments to ensure there is a continuous focus on the implications of all action on the environment; and
- Embracing innovative measures and respond as a priority to technological advances which can reduce Dumfries and Galloway's impact on climate change.

15.5 Vulnerability of the Proposed Development to Climate Change

15.5.1 Wind

As energy content of the wind varies with the cube of the average wind speed⁴⁷², small increases in wind speed can result in large increases in wind power. There is a higher risk of damage from strong winds; winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for infrastructure.

Wind turbines are designed to capture wind energy and built to withstand extreme conditions associated with exposed locations. However, wind energy developments could potentially be sensitive to significant changes in variables, including atmospheric circulation and land cover changes as well as changes in the frequency of extreme events (e.g. storms), which could damage wind turbines or alter their efficiency.

Over the lifetime of the Proposed Development, UKCP18 states that there are no compelling trends in storminess (as a result of maximum gust speeds) over the last four decades and for wind speed change there is little long-term trend evident. Therefore, the natural variability which exists in wind speed, and subsequently storms, will have a negligible magnitude of impact on energy projections and on the efficient operation of the Proposed Development.

⁴⁷⁰ Scottish Government (2023) National Planning Framework 4 (NPF4) [Online] Available at: National Planning Framework 4 - gov.scot (www.gov.scot) (Accessed on 31/05/2023)

⁴⁷¹ Dumfries and Galloway Council (2019) Dumfries and Galloway Council Climate Emergency Declaration [Online] Available at: Climate Emergency Declaration - appendix 1.pdf (moderngov.co.uk) (Accessed on 31/05/2023)

⁴⁷² Energy Savings Trust (2019) Wind Turbine: Measuring Wind Speed [Online] Available at: https://www.energysavingtrust.org.uk/sites/default/files/reports/wind%20turbine_measuring%20wind%20speed.pdf (Accessed 19/04/2023)

Given the negligible magnitude of the impact and the medium sensitivity of the Proposed Development as a receptor, the effect is assessed as negligible, and **not significant** in terms of the EIA Regulations.

15.5.2 Precipitation

The risk from increased precipitation is the potential for flooding, particularly if it is associated with extreme events. For the Proposed Development this increases the risk for potential destruction/disruption of infrastructure, e.g., loss of watercourse crossing, flooding to control building. Buffers from watercourses are embedded in the turbine locations and hardstandings of the Proposed Development, where access tracks or watercourse crossing are required, these are designed in lined with best practice with a CEMP implemented during construction. As such, the Proposed Development has low sensitivity to increase in precipitation.

UKCP18 show that over the winter season precipitation in this area of Scotland is projected to increase by up to 30 % at the medium estimate. Given the embedded mitigation, the magnitude of impact on the operation of the Proposed Development is assessed as low and the overall effect is minor and therefore, **not significant**.

15.6 Assessment of Potential Effects

As a large energy asset of generation in excess of 50 MW, the Proposed Development is seen as an asset of regional importance with moderate environmental value, per **Table 15.2**. As such, the Proposed Development is classed as having medium sensitivity for the following assessments.

15.6.1.1 Carbon Savings

Every unit of electricity produced by a wind farm development displaces a unit of electricity which would otherwise have been produced by a conventional (coal or gas) power station, and therefore presents carbon savings.

The electricity produced from the wind farm is assumed to substitute energy production by entirely coal-fired generation, or a mix of fossil fuels, or the national grid mix of energy generation. A renewable energy development would have a maximum potential to save carbon emissions when substituting coal fired generation, which is a possibility if coal is at the bottom of the cost merit order of generation; however, it is not appropriate to define the electricity source for which this renewable electricity project would substitute, due to uncertainty in future grid mix. For this reason, carbon emission savings are calculated for each scenario in the carbon calculator (**Technical Appendix A15.1: Carbon Calculations**).

The potential annual carbon emission savings for the Proposed Development are provided in **Table 15.5**. Based on an expected capacity factor of 38.6%, generated from a specific yield assessment carried out by Brightwind which was informed by available information from nearby sites. It is expected the Proposed Development would result in the production of approximately 208,292 MWh annually, equating to 7,290,212 MWh over the operational life of the Proposed Development. The projected change in wind speeds as a result of climate change over the operational phase of the Proposed Development is considered to be non-material for the purposes of this assessment.

Based on the anticipated generating capacity, the Homes Powered Equivalent for the Proposed Development has been calculated as 59,359.3 homes⁴⁷³.

⁴⁷³ Based on RenewablesUK methodology available at: [https://www.renewableuk.com/page/UKWEDEexplained/Statistics-Explained.htm#:~:text=Homes%20Powered%20Equivalent%20\(p.a.\)&text=RenewableUK%20calculates%20homes%20powered%20as,electricity%20consumption%20expressed%20in%20MWh](https://www.renewableuk.com/page/UKWEDEexplained/Statistics-Explained.htm#:~:text=Homes%20Powered%20Equivalent%20(p.a.)&text=RenewableUK%20calculates%20homes%20powered%20as,electricity%20consumption%20expressed%20in%20MWh). (accessed 20/08/2023).

Table 15.5 Carbon Saving for the Proposed Development (Expected Scenario)

Type of Electricity Generation	Expected CO ₂ Saving (t CO ₂ yr-1)
Coal fired electricity generation	208,708
Grid mix electricity generation	40,279
Fossil fuel mix electricity generation	89,982
Energy Output	Expected Energy Output (MWh)
Energy output from Wind Farm Over Lifetime	7,290,212

15.6.1.2 Carbon Losses

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 excavation of peat for construction and drainage effects.

Organic soils (peatlands) in Scotland act as carbon sinks, whereby they absorb carbon dioxide then they release it due to land use change, such as forestry. Wind farm developments on peatlands may result in adverse impacts on these habitats if not appropriately considered during scheme design and development. Changes to the peatland habitat through development could result in a significant effect on its ability to store carbon, potentially resulting in reduced net carbon benefits of the Development.

A peat depth survey was undertaken across the Site where it was established that the average peat depth within the Site is 0.48 m and that there were no areas of deep peat. The design process sought to avoid disturbance to deposits of deep peat; with the deepest average peat depth within a 50 m radius of the turbines was 0.78 m of peat around T4. Existing and floating tracks are predicted to be used where possible to minimise the disturbance to peat and peaty soils and cable trenches will follow the on-site access tracks.

Carbon losses for the expected scenario are summarised in **Table 15.6**.

Table 15.6 Carbon Losses for the Proposed Development (Expected Scenario)

Losses	Carbon Losses (tCO ₂) Expected Value	Carbon Losses (tCO ₂) Minimum Value	Carbon Losses (tCO ₂) Maximum Value
Losses due to turbine life (e.g., manufacture, construction, decommissioning)	56,758	56,758	56,758
Losses due to back-up	40,795	40,795	40,795
Losses due to reduced carbon fixing potential	1,902	557	9,424
Losses from soil organic matter	15,583	-6,888	80,264
Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC) leaching	2,469	0	18,559
Losses due to felling forestry	0	0	0
TOTAL LOSSES	117,507	91,222	205,800

15.6.1.3 Payback Period

The carbon payback period is a measurement/indicator to help assess a proposal. The shorter the payback the greater benefit the Proposed Development will have in displacing emissions associated with electricity generated by burning fossil fuels.

The payback period is calculated taking the total carbon cost (carbon losses) associated with the Proposed Development and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements.

The estimated expected payback period for the Proposed Development is 3.3 years compared to grid-mix electricity generation. In comparison, fossil fuel mix estimates an expected payback period of 1.5 years and coal-fired estimates 0.6 years. **Table 15.7** below goes into further detail regarding the carbon payback period for the Proposed Development.

Table 15.7 Estimated Payback in Years for each Scenario used in the Carbon Calculator

Generation Source	Counterfactual emission factors (2021) (t CO ₂ MWh ⁻¹)	Carbon Payback Period (years)		
		Expected Value	Minimum Value 0% Balancing Capacity	Maximum Value 5% Balancing Capacity
Coal-fired plant	0.6	0.6	0.1	1.0
Grid-mix	0.25358	3.3	0.5	5.1
Fossil fuel-mix	0.45	1.5	0.2	2.3

The CO₂ emission savings for the operational lifetime of the Development (currently predicted as 35 years) would provide a net benefit with regards to reducing the impacts of climate change. This is considered to create a low magnitude of impact i.e., a slight, detectable alteration in carbon emissions and savings which reduces the impacts of climate change.

Given the challenge and international urgency of climate change, climate is considered to have very high sensitivity to changes in GHG emissions. As a result, the Proposed Development is therefore estimated to have a moderate, beneficial environmental effect, that is **significant** under the EIA regulations.

15.6.1.4 Effects of Future Climate Change Scenario on Environmental receptors Sensitive to Climate Change

The potential for environmental receptors to be impacted by the Proposed Development is assessed in **Chapters 6-16** of this EIA Report. Of these ecological, ornithological and hydrological receptors are the most sensitive to climate change and are discussed further in **Table 15.8** below.

Table 15.8 Climate Change Effects on the most Sensitive Environmental Receptors

EIA Report Chapter	Receptor	Climate Change Effect	Effect on Receptor
7	Ecology – Habitats, Protected Species	Temperature – up to + 2°C Shift to wetter winters and dryer summers Negligible change in wind speeds	While changes in temperature could affect the composition and growth rates of plant communities and invertebrates, and hence protected species and habitats, the uncertainties are high and it is not clear that the effect of the Proposed Development on those receptors would alter substantially as a result
8	Ornithology	Temperature – up to + 2°C Shift to wetter winters and dryer summers Negligible change in wind speeds	A rise in temperature has the potential to impact on habitats which in turn may affect the behaviour of bird interests. As noted above uncertainties are high and the type and significance of effects identified from the Proposed Development are not anticipated to alter as a result.
11	Hydrology and Hydrogeology	Shift to wetter winters and drier summers	Limited change to future baseline and to the identified effects of the Proposed Development.

Given the relatively limited magnitude of impact in climate parameters predicted over the operational lifetime of the Proposed Development, negligible changes to baseline conditions for environmental receptors are anticipated. This is incorporated into the relevant assessments undertaken in this EIA Report.

No additional significant effects will occur as a result of climate change during the operational phase of the Proposed Development.

15.7 Mitigation and Residual Effects

The Proposed Development will have a beneficial effect due to the CO₂ emission savings for the operational lifetime and beyond resulting in a net benefit of the Proposed Development to reducing climate change. Any adverse effects as a result of the Proposed Development are of such limited, and negligible nature, that they are not significant in terms of the EIA Regulations. As such, no mitigation is required under the EIA Regulations other than that already embedded into the Proposed Development and recommended as best practice.

An iterative design approach was taken for the layout of the Proposed Development to avoid siting turbines and hardstanding in proximity to watercourses as well as infrastructure in deep peat, where possible, to minimise disturbance of peat soils and associated carbon losses. Further micro-siting will be informed by detailed pre-construction ground investigations.

Prior to construction, a detailed Construction Environmental Management Plan (CEMP), Water Construction Environmental Management Plan (WCEMP) and Peat Management Plan (PMP), superseding any outline versions of these documents that has been included for the purposes of this Application, will be produced to satisfy the Local Planning Authority and their selected consultees under condition of consent to minimise potential for any adverse effect on peat, and/or the water environment. During construction these plans will be implemented and monitored by an Environmental Clerk of Works (ECOW).

Other mitigation measures will include the management of wind turbines to maintain operational efficiency during their lifetime. Maintenance plans for wind turbines would be developed to maximise turbine output and efficiency. Key performance indicators to monitor and track operational efficiency would be developed.

15.8 Cumulative Effect Assessment

The Scottish and UK Governments have set ambitious targets for reducing GHG emissions by 2045 and 2050 respectively. The Proposed Development, in conjunction with other renewable energy developments, will contribute to Scotland and the UK's aims to reduce carbon emissions and achieve meet its ambitious greenhouse gas emissions targets.

Following a record high in 2020, DUKES 2022 detailed that renewable energy generation in 2021 fell by 9.3 % due to less favourable weather conditions; however, it was still the second highest year on record. Renewables share of electricity generation was also impacted for the same reasons falling from 43.2 % in 2020, to 39.6 % in 2021; however, this still represented the second highest share of total UK electricity generation⁴⁷⁴. Despite this, the capacity of onshore wind continues to grow, as onshore wind's overall share of renewable energy capacity increased to 26.8 % in 2022⁴⁷⁵. With more favourable weather conditions, it is anticipated that onshore wind can continue to make a positive impact on Scotland to reduce carbon emissions in line with legislation, policy and guidance.

The Proposed Development will contribute at least 50MW of installed capacity which will contribute to increasing renewable energy generation capacity within Scotland the UK.

The cumulative effect of the Proposed Development with other UK renewables generation is considered to be a fundamental change in the climate effects of UK energy supply and contribute to the UK's legally binding emission reduction targets. For example, the Proposed Development will aid in the cumulative implementation of 20GW of onshore wind by 2030, as previously discussed in **Section 15.4.4.3**, which represents a major, beneficial effect that is **significant** under the EIA Regulations.

15.9 Summary of Effects

Table 15.9 provides a summary of the effects detailed within this chapter.

Table 15.9 Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Vulnerability of Development to Climate Change				
Wind Turbines	Changes in the frequency of extreme events (e.g., storms), which could damage wind turbines or alter their efficiency.	Negligible No Significant Effects	None	None
Wind Turbines	Wind energy developments are sensitive to cold weather events and ice forming on blades.	Negligible, no significant effects.	Embedded mitigation in that when icing does occur, the turbine's own vibration sensors are likely to detect the imbalance and inhibit the operation of the machines.	None

⁴⁷⁴ DUKES (2022) Chapter 6: Renewable sources of energy [Online] Available at: DUKES 2022 (publishing.service.gov.uk) (Accessed 31/05/2023)

⁴⁷⁵ National Grid (2023) How much of the UK's energy is renewable? [Online] Available at: How much of the UK's energy is renewable? | Renewable energy in the UK | National Grid Group (Accessed 28/02/2023)

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Potential destruction/disruption of infrastructure	The risk from increased precipitation is the potential for flooding impacts to infrastructure. E.g., loss of watercourse crossing, flooding to control building.	Minor, no significant effects.	Embedded mitigation through watercourse buffers for turbine locations and hardstandings. Access tracks and watercourse crossings are designed in line with best practice, with a CEMP implemented during construction.	None
Influence of the Development on Climate Change				
Climate - average temperature predictions as linked to GHG emissions.	Reduction in GHG emissions through offsetting of existing conventional generation.	Moderate (Proposed Development) and major (cumulative) significant effect.	None Embedded mitigation has reduced payback period and maximise beneficial impact.	Significant contribution cumulatively to regional emissions and renewable energy generation targets.
Effects on Environmental Receptors				
Environmental Receptors assessed in individual chapters of EIA Report.	Change to future baseline of receptors and assessment results.	Negligible, little change over time period to baseline condition of receptors.	None Mitigation as identified in individual assessment chapters	None

15.10 Statement of Significance

The Proposed Development will have significant, beneficial effect on carbon savings as well as a significant, beneficial effect on carbon savings when considered cumulatively with Scottish renewable energy deployment. When considering the Proposed Development is isolation, and cumulatively, it has a significant, beneficial effect on climate change in terms of the EIA Regulations.

No additional significant effects to those already identified within the EIA Report will occur as a result of climate change during the operational phase of the Proposed Development.

16. OTHER ISSUES

This Chapter of the EIA Report evaluates the effects of Cloud Hill Wind Farm (the Proposed Development) on any remaining topics that are within the scope of the EIA.

Wind Business Review contributed to the Radar Assessment respectively. This is included as Technical Appendix to this chapter (**Technical Appendix A16.1: Cloud Hill Aviation Screening Assessment**) provided in **Volume 3: Technical Appendices**. The remaining topic assessments were carried out by ERM Ltd.

The topics included within this Chapter include:

- Shadow Flicker;
- Telecommunications, Television Reception and Utilities; and
- Aviation.

This Chapter is supported by **Figure 16.1: Shadow Flicker Casting Area** provided in **Volume 2a: Figures excluding LVIA**.

16.1 Shadow Flicker

16.1.1 Introduction

This Section evaluates the effects of shadow flicker from the Proposed Development on nearby receptors. Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. Shadow flicker is an effect that can occur when the shadow of a blade passes over a small opening (such as window), briefly reducing the intensity of light within the room, and causing flickering to be perceived. Shadow flicker effects only occur inside buildings where the blade casts a shadow across an entire window opening. The likelihood and duration of the effects depends on a range of factors including:

- The direction;
- The distance and aspect of residential dwellings in relation to the turbines;
- The turbine height and rotor diameter;
- The topography between residential dwellings and turbines;
- The time day and year; and
- The local weather conditions.

16.1.2 Legislation, Policy and Guidance

- Scottish Government Onshore Wind Turbines: Planning Advice (2014)⁴⁷⁶;
- LUC Review of Light and Shadow Effects from Wind Turbines in Scotland (2017)⁴⁷⁷;
- DCLG Planning Practice Guidance for Renewable and Low Carbon Energy (2013)⁴⁷⁸;
- Dumfries and Galloway Council Local Development Plan 2 (2019)⁴⁷⁹;

⁴⁷⁶ Scottish Government (2014) Onshore Wind Turbines: Planning Advice [Online] Available at: <https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/> (Accessed 19/04/2023)

⁴⁷⁷ LUC (2017) Review of Light and Shadow Effects from Wind Turbines in Scotland [Online] Available at: <https://www.climatexchange.org.uk/research/projects/review-of-light-and-shadow-effects-from-wind-turbines-in-scotland/> (Accessed 19/04/2023)

⁴⁷⁸ DCLG (2013) Planning Practice Guidance for Renewable and Low Carbon Energy [Online] Available at: Title (parliament.uk) (Accessed 14/02/2023)

⁴⁷⁹ Dumfries and Galloway Council (2019) Adopted Local Development Plan 2 [Online] Available at: Adopted Local Development Plan 2 (dumgal.gov.uk) (Accessed 09/02/2023)

- Dumfries and Galloway Council Local Development Plan 2 Supplementary Guidance, Wind Energy Development: Development Management Considerations (2019)⁴⁸⁰.

16.1.2.1 Onshore Wind Turbines: Planning Advice

'Onshore Wind Turbines; Planning Advice' (2014) provides information for consideration surrounding shadow flicker. It states that:

"Developers should provide calculations to quantify the effect... 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."

16.1.2.2 Review of Light and Shadow Effects from Wind Turbines in Scotland

'A Review of Light and Shadow Effects from Wind Turbines (2017)' was commissioned by ClimateXChange to outline how light and shadow flicker effects are considered in the Scottish development planning processes.

This document includes a review of current UK guidance, along with a review of how this is applied through the selection and review of case studies.

The review provides several recommendations regarding the content of guidance on shadow flicker. These include:

- Guidance should not include reference to the occurrence of shadow flicker throw 'within 130 degrees of north';
- Guidance should exclude reference to the 10 rotor diameter distance; and
- There is a need for guidance on the thresholds of exposure to shadow flicker in Scotland.

It should be noted that since the publication of this review (2017), shadow flicker guidance in Scotland has not changed, and as such, the guidance in the Scottish Government Onshore Wind Turbines: Planning Advice remains extant.

16.1.2.3 Planning Practice Guidance for Renewable and Low Carbon Energy

Planning Practice for Guidance for Renewable and Low Carbon Energy (2013) provides information for consideration surrounding shadow flicker. It states:

"Only properties within 130 degrees either side of north, relative to the turbines can be affected at these latitudes in the UK – turbines do not cast long shadows on their southern side."

It also advises that if shadow flicker has potential to occur, it can be mitigated can be secured through the following conditions:

"Individual turbines can be controlled to avoid shadow flicker at a specific property or group of properties on sunny days, for specific times of the day and on specific days of the year."

16.1.2.4 Dumfries and Galloway Council (2019) Local Development Plan 2

In the Council's Local Development Plan (2019), 'Policy IN1: Renewable Energy' and 'Policy IN2: Wind Energy', states that shadow flicker should be considered as part of renewable energy development proposals, specifically onshore wind.

⁴⁸⁰ Dumfries and Galloway Council (2020) Wind_Energy_SG_Final_PDF_February_2020_Version.pdf (dumgal.gov.uk) (Accessed 09/02/2023)

16.1.2.5 *Dumfries and Galloway Council Local Development Plan 2 Supplementary Guidance, Wind Energy Development: Development Management Considerations*

This supplementary guidance from 2019 expands on the works of 'Policy IN1: Renewable Energy' and 'Policy IN2: Wind Energy' in the Dumfries and Galloway Local Development Plan 2. It states that consideration should be given to the impact of shadow flicker during both the design and EIA assessment process, to prevent and mitigate any potential significant effects. It advises:

"Maintaining a separation distance of at least 10 times the turbine rotor blade diameter from sensitive uses/receptors can help reduce the effects but this may need to be extended depending on specific locational circumstances."

16.1.3 *Assessment Methodology and Significance Criteria*

16.1.3.1 *Scoping Responses and Consultation*

Consultation for this EIA Report was undertaken at Scoping; however, no commentary on the methodology was made with regards to shadow flicker.

16.1.3.2 *Study Area*

Properties with the potential to be affected by shadow flicker as a result of the Proposed Development have been identified using Geographical Information Systems (GIS).

Shadow flicker is known to occur beyond 10 rotor diameters, as reflected in the Review of Light and Shadow Flicker Effects from Wind Turbines in Scotland; however, the intensity of shadows decreases as the distance to the turbines increases.

As detailed under 'Policy IN1: Renewable Energy' and 'Policy IN2: Wind Energy' of the 'Dumfries and Galloway Local Development Plan 2 Supplementary Guidance, Wind Energy Development: Development Management Conditions', a shadow flicker assessment must be undertaken on properties within 10 rotor diameters of the Proposed Development. The Proposed Development incorporates a rotor diameter of approximately 150 m, therefore this assessment is based on a 1.5km study area (the Study Area) and is shown in **Figure 16.1: Shadow Flicker Casting Area**.

16.1.3.3 *Baseline Survey Methodology*

The assessment of shadow flicker is a desk-based assessment. Ordnance Survey (OS) AddressBase data, OS maps, technical site visits (such as noise and landscape and visual) and available online aerial photography was used to search for any permanent dwellings in the Study Area.

16.1.3.4 *Methodology for the Assessment of Effects*

A recognised computer software package⁴⁸¹ was used to calculate theoretical specific times and durations of shadow flicker effects at each property.

This software creates a mathematical model of the Development and its surroundings, based on:

- Turbine locations, hub height and rotor diameter;
- Topography (obtained from Terrain 50 elevation data);
- Latitude and longitude of the Site (used in calculating the position of the sun in relation to time of day and year); and
- Location of residential dwellings within 1.5 km of the Development turbines.

⁴⁸¹ Resoft WindFarm 4.2.1.7

A cut-off distance of 1.5 km from each turbine was employed during this calculation in accordance with the guidance described in **Section 16.1.3.2**.

Certain worst-case assumptions are made in the calculation, including:

- Weather conditions are such that shadows are always cast during each day of the year, i.e. bright sunshine every day;
- The turbine rotor will always be facing directly towards the property and that the property has a window directly facing the turbines, maximising the size of the shadow and hence the frequency and duration of the effect;
- The turbines will always be rotating; and
- There will not be intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect.

The following assumptions have been made for all potential receptors in order to identify all potential effects as a worst case:

- All windows have been assumed to measure 1 m by 1 m (for larger windows the intensity of the effect would be reduced), to be situated at a height of 3 m above ground level, to the window's centre (representing an average of ground and first floor levels that may be typically 1.5 m and 4.5 m, respectively);
- Each property is located at the grid reference given in **Table 16.2** (as per details from OS AddressBase data); and
- Windows facing towards each of the cardinal compass point directions (North, South, East and West) have been modelled in order to identify effects from all possible directions. In practice, not all of these directions face the Proposed Development, and the buildings may not have windows on each facade.

For much of a given year, weather conditions will be such that shadow would not be cast or would be weak and thus would not give rise to shadow flicker effects.

The weather station at Glenlee, approximately 27.5 km southwest of the nearest turbine, noted that bright sunshine occurred for around 28 % of daylight hours from January 1991 to December 2020⁴⁸². Of this time, some would be in non-windy conditions when the turbine blades would not be rotating. In windy conditions, the wind direction may not have been aligned with the direction of the sun, such that shadows were not being cast as widely as in the worst-case. In practice, other factors such as the potential for screening by vegetation or intervening structures will also reduce or prevent flicker incidence even further, as compared to the theoretical maximum period or the likely period of effect suggested by the calculations. The actual potential impact is therefore likely to be only a fraction of the theoretical maximum.

16.1.3.5 Significance Criteria

No formal guidance is available regarding what levels of shadow flicker may be considered acceptable in the UK; however, 'Wind Energy Development Guidelines' published by the Northern Ireland Department of the Environment, Heritage and Local Government (2006)⁴⁸³ states that:

"It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day."

⁴⁸² Bright sunshine of 28% based on data from Glenlee where an annual average of 1,150 sunshine hours was measured, and where daylight hours are assumed to be half of all hours throughout the year. Available at: Glenlee (Dumfries and Galloway) UK climate averages - Met Office (Accessed 22/02/2023).

⁴⁸³ Department of the Environment, Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', 2009 (Accessed 19/04/2023)

This assessment predicts the potential maximum effects that occur, and a likely maximum duration for effects once prevailing weather conditions are taken into account. The Northern Irish guidance threshold has been adopted for all residential receptors as a measure of assessing the significant of calculated shadow flicker effects.

Mitigation is proposed to minimise or remove calculated effects, if levels of shadow flicker are deemed to be unacceptable in practice.

16.1.3.6 Assessment Limitations

The assumptions made in the assessment process, outlined in **Section 16.1.3.4**, are considered to be conservative and likely to make the assessment results worst case.

16.1.4 Baseline Conditions

Table 16.1 details the receptors within the 1.5 km study area, as shown in **Figure 16.1**. Glenmaddie is also a financially involved (FI) property.

Table 16.1 Receptors within the 1.5 km Shadow Flicker Study Area

Property Name	Easting	Northing	Turbine (m)
Glenmaddie	274256	607296	0.97km (T9) north
Glenglass Cottage	272957	607113	1.15km (T10) northwest
Shiel	274527	604069	1.31 km (T7) south
Polgown	271874	603862	1.24 km (T1) southwest

16.1.5 Assessment of Potential Effects

16.1.5.1 Construction Phase

Shadow flicker is a phenomenon that only occurs once the turbines are installed and operational and thus no shadow flicker effects are anticipated during the construction phase of the Proposed Development.

16.1.5.2 Operational Phase

details the theoretical maximum hours of shadow flicker per annum at each potential receptor, based on the worst-case assumptions. It also shows the calculation of the calculated potential likely number of hours of shadow flicker per annum, assuming 28 % per annum bright sunshine based on local conditions.

A conservative approach has been taken, whereby the screening effects provided by trees or other buildings have not been taken into account, nor has any account been taken of which building facades actually do have windows (it has been assumed that all facades have windows). This will reduce or eliminate flicker from occurring in practice. The degree of effects will depend on the precise position of windows facing the proposed turbines and the precise location of screening, which itself may change over time as vegetation grows or is removed. In addition, the atmospheric conditions will further reduce the actual effects arising.

The theoretical maximum number of hours per annum, as shown in **Table 16.2**, is for all windows and accounts for any overlap where effects may be experienced at different windows or from different turbines simultaneously. Where a dash has used, no shadow flicker effects are calculated to occur.

Table 16.2 Shadow Flicker Assessment Locations

Name	Window Orientation	Days per Year	Maximum Minutes per Day	Theoretical Maximum Hours per annum	Likely Hours per Annum ⁴⁸⁴
Glenmaddie	North	-	-	-	-
	East	56	36.6	28.6	8.1
	South	56	64.8	52.1	14.6
	West	56	30	23.3	6.5
Glenglass Cottage	North	-	-	-	-
	East	70	33	33.0	9.2
	South	70	33	33.7	9.4
	West	-	-	-	-
Shiel	North	-	-	-	-
	South	-	-	-	-
	East	-	-	-	-
	West	-	-	-	-
Polgown	North	-	-	-	-
	East	-	-	-	-
	South	-	-	-	-
	West	-	-	-	-

It has been calculated that theoretical shadow flicker could potentially occur at two of the four assessed properties. Glenmaddie has been calculated to have the highest shadow flicker effects, (as shown in **Table 16.2**). Based on the theoretical maximum hours per annum, shadow flicker effects are calculated as being possible for up to a theoretical maximum of 52.1 hours per annum and 64.8 minutes per day from any windows facing south. Similarly, Glenglass Cottage has been calculated to experience effects above the guidance thresholds from any windows facing east or south. Shiel and Polgown are expected to have no shadow flicker effects.

Based on weather conditions required to facilitate shadow flicker occurring for only 28% of the time, the likely number of hours per year where shadow flicker could potentially occur is reduced to 14.6 hours per annum at Glenmaddie. The shadow flicker at Glenglass Cottage is also reduced to below the guidance threshold, to 9.2 hours per annum from any windows facing east or 9.4 hours per annum from any windows facing south.

As **Table 16.2** shows, shadow flicker effects at Glenmaddie and Glenglass Cottage do not exceed the 30 hours per annum. As the modelling is conservative and does not take into account wind direction, screening, daily varied cloud cover etc, the maximum minutes per day figures for both properties are likely to be an overestimation. As such, in practice it is likely the maximum minutes per day at each property will be reduced from those identified in this chapter. Regardless, assuming a worst-case, shadow flicker impacts due to the Proposed Development are **not significant** in terms of the EIA Regulations.

16.1.6 Cumulative Effect Assessment

There are a number of cumulative wind farm sites that have the potential to cause shadow flicker effects on the receptors identified in **Table 16.2**. These are Whiteside Hill, Sanquhar II and Eucharhead, which are located within 1.5 km of the assessed properties in **Table 16.2**. As such, cumulative modelling has been undertaken cumulative calculation in shown in **Table 16.3**.

⁴⁸⁴ Assumes 28% bright sunshine.

Table 16.3 Potential Cumulative Shadow Flicker Assessment Locations

Name	Window Orientation	Days per Year	Maximum Minutes per Day	Theoretical Maximum Hours per annum	Likely Hours per Annum ⁴⁸⁵
Glenmaddie	North	-	-	-	-
	East	56	36.6	28.6	8.1
	South	56	64.8	52.1	14.6
	West	56	30	23.3	6.5
Glenglass Cottage	North	-	-	-	-
	East	70	40.8	33.6	9.2
	South	70	40.8	33.7	9.4
	West	-	-	-	-
Shiel	North	-	-	-	-
	East	-	-	-	-
	South	-	-	-	-
	West	-	-	-	-
Polgown	North	-	-	-	-
	East	86	33	34.2	9.6
	South	86	33	34.2	9.6
	West	-	-	-	-

As can be seen from comparing **Table 16.2** and **Table 16.3**, Polgown is the only assessed property with any changes to the shadow flicker effects with the addition of cumulative windfarms within 1.5 km of all assessed properties. For Polgown, shadow flicker effects are calculated as being possible for up to a theoretical maximum of 34.2 hours per annum and 33 minutes per day from any windows facing east or south, which exceeds the guidance threshold; however, based on weather conditions required to facilitate shadow flicker occurring for only 28 % of the time, the likely number of hours per year where shadow flicker could potentially occur is reduced to 9.6 hours per annum for Polgown.

As **Table 16.3** shows, cumulative shadow flicker effects at Polgown does not exceed the 30 hours per annum. As the modelling is conservative and does not take into account wind direction, screening, daily varied cloud cover etc, the maximum minutes per day figures for Polgown are also likely to be an overestimation. As these are overestimations, and although unlikely to be experienced in practice, mitigation measures as detailed in **Section 16.1.7** can be applied should complaints be received. As such, in practice it is likely the maximum minutes per day at each property will be reduced.

Therefore, it can be concluded that cumulative shadow flicker impacts due to the Proposed Development are **not significant** in terms of the EIA Regulations.

16.1.7 Mitigation and Residual Effects

Given that there are potential, theoretical shadow flicker effects at the three of the four assessed properties, mitigation measures have been recommended to reduce effects to below the recommended threshold (i.e. below 30 minutes per day or 30 hours per annum).

A conservative approach has been taken, whereby the screening effects provided by trees or other buildings have not been taken into account, and it has been assumed that there are windows on all sides of the receptor. Screening, or the absence of windows may reduce or eliminate flicker from occurring in practice.

Several forms of shadow flicker mitigation are available, including:

⁴⁸⁵ Assumes 28% bright sunshine.

- Control at Property: the provision of blinds, shutters, or curtains to affected properties.
- Control on Pathway: for example, screening via planting close to an affected property; and
- Control at Source: for example, shutdown of turbines at times when effects occur.

In practice, Control at Property and Control on Property would only be possible with the cooperation of the residents. As a financially involved property, Glenmaddie can be assumed to be forthcoming on this basis; however, as the remaining properties are not financially involved, this cannot be assumed.

Control at Source is a preferable method for mitigating shadow flicker for this reason should effects be experienced. This involves shutting the turbine down at times that flicker is likely to occur. These times can be pre-calculated and programmed into the shutdown calendar of the Proposed Development's SCADA system (Supervisory Control and Data Acquisition system which is the central computerised monitoring system), although this does not take account of weather conditions occurring at specific times, resulting in excessive shutdowns. Photocells can be installed that determine whether ambient light levels are sufficient for distinct shadows (and therefore shadow flicker) to be generated to prevent unnecessary shutdowns.

Alternatively, a shadow flicker protection system can be incorporated into the SCADA system. This calculates the locations of shadows in real time, determines whether these coincide with the pre-programmed locations and takes into account ambient lighting before triggering shutdowns. These systems provide greater flexibility than shutdown calendars as it allows for new locations to be programmed.

In the event of a shadow flicker complaint received by the site operator or the Council, an appropriate investigation confirms occurrence as a result of the Proposed Development, then measures such as those outlined above will be used to prevent re-occurrence and protect residential amenity.

Shadow flicker effects have been assessed as being over the guidance threshold at two receptors located within the Study Area of the proposed turbine locations; however, in practice, the duration of shadow flicker effects are likely to be below the criteria. Should complaints be received, the application of the above measures will ensure that these effects are not significant, and any other shadow flicker effects on receptors are minimised or removed entirely.

16.1.8 Summary of Effects

An assessment of potential shadow flicker effects associated with the Proposed Development has been carried out as per the Scottish Government and local guidance from both the Council. The theoretical maximum and likely hours of shadow flicker occurrence per year have been calculated for properties located within 10 rotor diameters, or 1.5 km, of the turbines.

During the operational phase, it has been found that two properties are expected to experience shadow flicker effects. Glenglass Cottage and Glenmaddie, which is financially involved, have been calculated to exceed the threshold of 30 minutes per day; however, as the modelling is conservative and does not take into account other factors such as wind direction, screening and daily varied cloud cover, the maximum minutes per day figures for these residential properties are likely to be an overestimation. Should complaints be received, the mitigation measures detailed in **Section 16.1.7** can be implemented to address shadow flicker. Thus, shadow flicker, due to the Proposed Development is **not significant**.

In practice, if residential amenity at any further properties is found to be unacceptably affected by shadow flicker, mitigation measures will be implemented to reduce the effects or remove flicker effects entirely.

16.1.9 Statement of Significance

No shadow flicker effects will occur during construction or decommissioning.

The effect of shadow flicker has been assessed using appropriate guidance in respect of the operational period.

Following mitigation, if required, the Proposed Development will not have significant adverse shadow flicker effects on any residential properties and is deemed **not significant** in terms of the EIA regulations.

16.2 Aviation

16.2.1 Introduction

Wind turbines have the ability to reflect radio waves and therefore have the potential to interfere with radar systems by potentially generating unwanted returns on Primary Surveillance Radar (PSR). In addition, wind turbines can present a physical obstruction at, or close to, an aerodrome or other aviation activity site, such as areas of low flying.

The general approach to wind farm development is to avoid adverse effects on aviation infrastructure where possible and to find appropriate technical mitigation solutions where this cannot be achieved. Policy guidance and extant regulations in respect of the potential interference effects of wind turbines on air traffic control (ATC) radars are highlighted in civil and military publications. Furthermore, there are airfield physical safeguarding and telecommunication and navigational infrastructure safeguarding requirements.

16.2.2 Legislation, Policy and Guidance

There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK as shown below:

- Civil Aviation Publication (CAP) 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines Version 6, Feb 2016 (CAA, 2016)⁴⁸⁶;
- CAP 168 Licensing of Aerodromes, Version 11 March 2019 (CAA 2019)⁴⁸⁷;
- CAP 670 ATS Safety Requirements Version 3 June 2019 (CAA 2019)⁴⁸⁸;
- CAP 774 UK Flight Information Services, Ed 4 December 2021 (CAA 2021)⁴⁸⁹;
- CAP 738 Safeguarding of Aerodromes Version 3 Dec 2006 (CAA 2020)⁴⁹⁰;
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes Ed 1 July 2010 (CAA 2010)⁴⁹¹;
- CAP 493 Manual of Air Traffic Services Part 1 Version 9 April 2021 (CAA 2021)⁴⁹²;

⁴⁸⁶ Civil Aviation Publication (2016) CAP 764: CAA Policy and Guidelines on Wind Turbines [online] Available at: <https://publicapps.caa.co.uk/docs/33/CAP764%20Issue6%20FINAL%20Feb.pdf> (Accessed 10/04/2023)

⁴⁸⁷ Civil Aviation Publication (2019) CAP 168: Licensing of Aerodromes [online] Available at: https://publicapps.caa.co.uk/docs/33/CAP%20168%20Issue11_Licensing%20of%20Aerodromes%2013032019.pdf (Accessed 19/04/2023)

⁴⁸⁸ Civil Aviation Publication (2019) CAP 670: Air Traffic Services Safety Requirements [online] Available at: [https://publicapps.caa.co.uk/docs/33/CAP670%20Issue3%20Am%201%202019\(p\).pdf](https://publicapps.caa.co.uk/docs/33/CAP670%20Issue3%20Am%201%202019(p).pdf) (Accessed 19/04/2023)

⁴⁸⁹ Civil Aviation Publication (2021) CAP 774: UK Flight Information Services [online] Available at: https://publicapps.caa.co.uk/docs/33/CAP774_UK%20FIS_Edition%204.pdf (Accessed 19/04/2023)

⁴⁹⁰ Civil Aviation Publication (2020) CAP 738: Safeguarding of Aerodromes [online] Available at: <https://publicapps.caa.co.uk/docs/33/CAP738%20Issue%203.pdf> (Accessed 19/04/2023)

⁴⁹¹ Civil Aviation Publication (2010) CAP 793: Safe Operating Practices at Unlicensed Aerodromes [online] Available at: <https://publicapps.caa.co.uk/docs/33/CAP793.pdf> (Accessed 19/04/2023)

⁴⁹² Civil Aviation Publication (2021) CAP 493: Manual of Air Traffic Services – Part 1 [online] Available at: [https://publicapps.caa.co.uk/docs/33/CAP493%20Edition%209%20Corrigendum%20%20\(May%202021\).pdf](https://publicapps.caa.co.uk/docs/33/CAP493%20Edition%209%20Corrigendum%20%20(May%202021).pdf) (Accessed 19/04/2023)

- CAP 393 Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 Version 6 February 2021(CAA 2021)⁴⁹³;
- CAP 660 Parachuting Ed 5 March 2020 (CAA 2020)⁴⁹⁴;
- Military Aviation Authority Regulatory Article 2330 (Low Flying) (MOD MAA 2019)⁴⁹⁵;
- UK Aeronautical Information Publications (AIP) (NATS 2021)⁴⁹⁶;
- CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level⁴⁹⁷;
- CAA Policy Statement: Lighting of En-Route Obstacles and Onshore Wind Turbines 01 April 2010 (CAA 2010)⁴⁹⁸; and
- Wind Energy and Aviation Interests Interim Guidelines⁴⁹⁹.

The proposed turbines, at 180m to blade tip, would require lighting under Article 222 of the Air Navigation Order (ANO, 2016), which requires that 'en-route obstacles' at or above 150m above ground level are lit with visible lighting to assist their detection by aircraft. This would constitute 2000 candela (cd) lighting on the highest practical point e.g. the turbine nacelle.

Air Navigation Order 2016 (CAP393) Article 223 (8) states that "If visibility in all directions from every wind turbine generator in a group is more than 5 km the light intensity for any light required by this article to be fitted to any generator in the group and displayed may be reduced to not less than 10 % of the minimum peak intensity specified for a light of this type." This allows the minimum intensities identified above to be dimmed to 10 % of their values if meteorological conditions permit. For example, the 2,000 cd minimum intensity may be dimmed to 10 %, or 200 cd, if visibility is greater than 5 km, in moderate to excellent or 'clear' visibility.

In addition, the CAA requires low intensity lights to be fitted at the intermediate level on the turbine tower (CAA, 2017).

16.2.3 Assessment Methodology and Significance Criteria

The search for aviation assets included all assets across Scotland to ensure all potentially affected assets were identified. If the Proposed Development is found to have any adverse impacts on stakeholders' operations, for example the safeguarding of a civilian airport, or if the Proposed Development is found to be located within an area of high priority military aviation activities, this would be considered a significant effect and mitigation would be required.

⁴⁹³ Civil Aviation Publication (2021) CAP 393: Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 [online] Available at: <https://publicapps.caa.co.uk/docs/33/CAP393%20Regulations%20made%20under%20powers%20in%20the%20Civil%20Aviation%20Act%201982%20and%20the%20Air%20Navigation%20Order%202016.pdf> (Accessed 13/01/2022)

⁴⁹⁴ Civil Aviation Publication (2020) CAP 660: Parachuting [online] Available at: <https://publicapps.caa.co.uk/docs/33/CAP%20660%20Parachuting%20March%202020.pdf> (Accessed 13/01/2022)

⁴⁹⁵ Military Aviation Authority (2021) RA 2330 - Low Flying [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/996200/RA2330_Issue_5.pdf (Accessed 13/01/2022)

⁴⁹⁶ NATS (2021) Aeronautical Information Publication [online] Available at: <https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/> (Accessed 13/01/2022)

⁴⁹⁷ Civil Aviation Publication (2017) Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level [Online] Available at: https://publicapps.caa.co.uk/docs/33/DAP01062017_LightingWindTurbinesOnshoreAbove150mAGL.pdf (Accessed 18/01/2022)

⁴⁹⁸ Civil Aviation Publication (2010) Policy Statement: Lighting of En-Route Obstacles and Onshore Wind Turbines [online] Available at: https://publicapps.caa.co.uk/docs/33/DAP_LightingEnRouteObstaclesAndWindTurbines.pdf (Accessed 13/01/2022)

⁴⁹⁹ Wind Energy, Defence and Civil Aviation Interests Working Group (2002) Wind Energy and Aviation Interests Interim Guidelines [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48101/file17828.pdf (Accessed 07/04/2021)

16.2.3.1 Overview and Study Area

The assessment of effects of the Proposed Development is based upon the guidance laid down in CAA Publication CAP 764 Policy and Guidelines on Wind Turbines Version 6 (Dated February 2016) with the consultation criteria for aviation stakeholders defined in Chapter 4 of CAP 764.

CAP 764 states the distances from various types of airfields where consultation should take place. These distances include:

- Airfield with a surveillance radar – 30 km;
- Non-radar licensed aerodrome with a runway of more than 1,100 m – 17 km;
- Non-radar licensed aerodrome with a runway of less than 1,100 m – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 metres – 4 km;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders which may result in a study area being modified as required based on specific airspace and operational considerations.

The assessment considers effects on both civil and military aviation receptors.

As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes to determine whether a proposed development will breach obstacle clearance criteria.

16.2.3.2 Desk Study

The radar calculation results shown in this section have been produced using a number of analysis tools:

- ATDI HTZ communications v23.1.0 x64 radio network analysis tool;
- Global Mapper v21.1.1 Geographic Information System data processing utility; and
- ZWCAD+ 2015 SP2 Pro v2015.05.26(27086) Computer Aided Design software.

Radar line of site (RLoS) is determined from a radar propagation model: the ATDI HTZ communications v23.1.0 x64 radio network analysis tool, using 3D Digital Terrain Model (DTM) data with 10 m horizontal resolution. Radar data is entered into the model and RLoS to the turbines from the radar is calculated. By using a DTM, no account is taken of possible further shielding of the turbines due to the presence of structures or vegetation that may lie between the radars and the turbines. Thus, the RLoS assessments are worst-case results. The principal sources of adverse wind farm effects for Primary Surveillance Radars (PSR) are the turbine blades, so RLoS is calculated for the maximum tip heights of the turbines, i.e., 180 m Above Ground Level (AGL).

Site surveys were not required for the evaluation of aviation impacts at the Proposed Development and have not been undertaken for this assessment.

16.2.3.3 Significance Criteria

Should the construction and operation of the Proposed Development materially cause disturbance to any aviation users or affect the operation of any of the various radar systems, such as through degradation of signal quality to the extent that it warrants an objection from the radar operator, this would be considered a significant effect for the purposes of the EIA Regulations.

16.2.4 Scoping Responses and Consultations

Consultation with relevant aviation stakeholders is a routine part of wind farm development and the consultation process that is required to be undertaken is also laid down in CAP 764 (for civil aviation issues) and the Wind Energy and Aviation Interests Interim Guidelines (for both civil and military consultation).

Consultation for this EIA Report topic was undertaken with the organisations shown in **Table 16.4**.

Table 16.4 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Defence Infrastructure Operation	Scoping Response, 12 th of May 2022	The MOD are concerned about the presence of turbines within the area due to it being within a Tactical Training Area 20T (TTA 20T). These concerns are because the turbines present a collision risk to fixed wing aircrafts which may operate as low as 100 feet or 30.5 m above ground during training exercises. The MOD requests the development is fitted with MOD accredited aviation safety lighting in accordance with the requirements of the Air Navigation Order 2016. Additionally, MOD safeguarding wishes to be consulted and notified about the progression of this proposal and any other subsequent applications relating to it. This is to enable the MOD to determine if the developments will detrimentally impact defence interests or not.	Technical aviation specialist was engaged with during the EIA process to ascertain the best solution(s) to issues raised. These issues have been addressed in Section 16.2.6.4 . MOD will be consulted and notified if there are any changes to turbine layout.
Glasgow Airport	Scoping Response, 28 th April 2022	The Site is located out with obstacle limitations surfaces and radar consultation zone for Glasgow Airport. The Proposed Development is within the instrument flight procedure area; however, at this location only Proposed Developments over 300 m AGL require assessments. The Airport will only confirm their position once the turbine details are finalised and they have been consulted on a full planning application, if necessary. If so, they will carry out a full safeguarding impact assessment and will consider their position in light of potential operational impacts and cumulative effects.	The Proposed Development sits out with their consultation zone. This is confirmed in Section 16.2.6.1 .
Glasgow Prestwick Airport	Scoping Response, 5 th May 2022	GPA identified potential effects on a number of its receptors that will require further assessment and consideration, including: - Instrument Flight Procedures (IFPs); - Runway 30 Instrument Landing System (ILS); - Secondary Surveillance Radar (SSR) and Ground to Air Communications; - Communications, Navigation and Surveillance Systems (CNS) - A full Air Traffic Control Assessment is required.	Technical aviation specialist was engaged with during the EIA process to ascertain the best solution(s) to issues raised. IFP assessments and line of sight modelling (to assess effects on the PSR) have been commissioned directly with Glasgow Prestwick Airport. These were

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Should an Aircraft Detection Lighting Schedule (ADLS) be proposed, GPA should be consulted. A line-of-sight analysis should be carried out on the final layout.	completed confirming no issue. These issues have been addressed in Section 16.2.6.1 and Section 16.2.6.2 .
NATS	Scoping Response, 21 st April 2022	NATS objects to the proposal as it conflicts with their safeguarding criteria. Section 4.1 of the TOPA - the terrain screening available will not adequately attenuate the signal, and therefore this development is likely to cause false primary plots to be generated (on the Lowther RADAR). A reduction in the RADAR's probability of detection, for real aircraft, is also anticipated. Section 4.1.2 of the TOPA - Prestwick Centre ATC has determined that the anticipated impact on their use of RADAR is unacceptable. No impact anticipated on Military ATC, Navigation Aids or radio communication infrastructure.	Technical aviation specialist was engaged with during the EIA process to ascertain the best solution(s) to issues raised. These issues have been addressed in Section 16.2.6.3 .

16.2.5 Baseline Conditions

The location of the Proposed Development in an aviation context is shown in **A15.1: Radar Assessment**.

The closest radar equipped civilian airport to the Proposed Development is Glasgow Prestwick Airport, approximately 42 km to the northeast of the Site and is also the closest licensed aerodrome. Glasgow Airport is located approximately 66 km northwest of the nearest turbine.

The Proposed Development is located in an area relatively remote from military aviation infrastructure. There are no military airfields in the region, the closest is Lanark Racecourse located 39.7 km northeast of the nearest turbine. The former RAF Leuchars, now an army base, is located 135 km northeast of the nearest turbine in which the MOD continue to safeguard radar there.

Military low flying areas are of regional scale and the MOD have set out priority levels of military flying zones as follows:

- 'Green level priority - Area with no military low flying concerns';
- 'Blue level priority - Low priority military low flying areas; less likely to raise concerns';
- 'Amber level priority - Regular military low flying area where mitigation may be necessary to resolve concerns'; and
- 'Red level priority - High priority military low flying area likely to raise considerable and significant concerns.'

The Proposed Development lies within a 'red' level priority zone which is likely to raise concerns with MoD.

The Proposed Development is located within Tactical Training Area (TTA) 20T. These areas cover the south of Scotland, including South Lanarkshire, Scottish Borders and Dumfries and Galloway amongst others. TTA 20T is considered by the MoD to be of key importance for military low flying training.

The NATS online self-assessment maps indicate that the Site is within an area where turbines may interfere with the primary surveillance radar of NERL which covers heights of 20 m to 200 m. The

closest NERL facility to the Proposed Development is Lowther Hill PSR with the closest turbine located approximately 15.2 km to the east of the facility.

The Proposed Development is located out with the 50 km consultation zone for the Eskdalemuir Seismic Station which should not be a consideration for the Proposed Development.

The Met Office safeguards its network of radars using a European methodology known as OPERA (Operational Programme on the Exchange of Radar data). In general, they will object to any turbine within 5 km in line of sight and will examine the impact of any turbines within 20 km. Where a site is within 20 km, the Met Office will undertake an operational assessment based on three main criteria, having determined if there is a technical effect on the radar. In this case the closest Met Office radar is at Holehead approximately 77 km to the north of the nearest turbine and therefore well beyond 20 km. Given this distance, no impacts are expected and impacts on Met office Radars have been scoped out of further assessment.

An online search for private airfields has been conducted and none were identified within consultation distance. The closest identified is Stonehill Farm Airstrip, approximately 17 km to the northeast of the nearest turbine⁵⁰⁰. As this runway of this airstrip is less than 800 m and the airstrip is greater than 3 km from the Development, consultation is not required. Not all private strips are listed in publications or marked on charts.

Given the baseline receptors surrounding the site, further consideration is given to:

- Licensed aerodromes;
- National Air Traffic Facilities (NATS); and
- Ministry of Defence.

16.2.6 Assessment of Potential Effects

16.2.6.1 Licensed Aerodromes

An RLoS assessment was carried out to determine the likelihood of the proposed turbines generating clutter. The results of this can be seen in **Table 16.5**.

Table 16.5 RLoS Assessment Results

Radar ID	Turbine Tip Height (m)	Turbine Base Height (m AOD)	Radar to Turbine (km)	LOS Visibility (m)	LOS Max Tip Height
GPA PSR	180	459	41.6	-100	280
GPA PSR	180	432	42.0	-137	317
GPA PSR	180	424	42.4	-179	359
GPA PSR	180	432	43.1	-114	294
Lowther Hill	180	358	15.2	180	0
Cumbernauld	180	459	68.9	-211	391

Glasgow Prestwick Airport

There is one PSR facility at GPA, located approximately 41.6 km (T1), 42.0 km (T3), 42.4 km (t4) and 43.1 km (T8) north-west of the Proposed Development. The Radar Assessment proves that none of the Proposed Development's turbines will be within RLoS of the PSR, therefore no effect will occur.

As a result, there will be no significant effects on GPA operations.

⁵⁰⁰ UK Airfields & Airports: Stonehill Farm [Online] Available at: Stonehill Farm - UK Airfield Guide (Accessed 17/02/2023)

Glasgow Airport

It is noted that Glasgow Airport was consulted and it was confirmed that the Proposed Development is outwith their consultation zone; therefore, RLoS assessments have not been conducted for Glasgow Airport.

As a result, there will be no significant effects on Glasgow Airport operations.

16.2.6.2 Instrument Flight Procedures

An IFP Assessment was carried out in line with the response received from GPA in **Table 16.4**. The site is in an area with a Sector Minimum Altitude (SMA) of 3900ft. The maximum tip elevation that can occur at the site is 650m (470+180). The SMA required for this obstacle height is 3200ft.

The site lies on the direct approach line to runway 30, close to the TRN hold at Lowest Altitude 6000ft. No procedures appear to vector arc over the site at less than 6000 ft. The worst-case tip elevation of the proposed development is 2132 ft.

There is therefore no risk of infringing the current ATCSMAC and it can be concluded that there will be no effect, and therefore no significant effect per the EIA Regulations.

16.2.6.3 National Air Traffic Services (EN Route) Ltd Facilities (NERL)

Lowther Hill PSR

The closest NERL facility to the Proposed Development is Lowther Hill PSR with the closest turbine located approximately 15.2 km to the east of the facility.

As seen in **Table 16.5**, the results of the RLoS assessment show that T9 of the Proposed Development will be within RLoS of the Lowther Hill PSR and will create an area of clutter on the radar displays at the unit.

It should be noted that the existing PSR at Lowther Hill is being replaced by NATS with a more advanced radar facility that has an in-built capability for mitigating the impact of wind turbines. As this new advanced radar facility will mitigate the impact from the Proposed Development, no bespoke mitigation is required and there will be no significant effects on the Lowther Hill PSR.

16.2.6.4 Ministry of Defence

The MOD response in **Table 16.3** refers to Military Low Flying and details how mitigation will likely be required due to the Proposed Development being within Tactical Training Area 20T where low flying military training can be carried out as low as 100 ft. Without mitigation, there would be a significant effect on Military Low Flying.

16.2.7 Mitigation

16.2.7.1 Lowther Hill PSR

Potential mitigation solutions for the Lowther Hill PSR are:

- Blanking and in-fill with the Cumbernauld radar;
- Blanking and in-fill with the Prestwick Airport Terma radar;
- Utilising the in-built mitigation in the new Indra radar installed at Lowther Hill.

16.2.7.2 Lighting for Military Low Flying

To mitigate any effects on military low flying, the MOD response states that “the MOD would request that the development be fitted with MOD accredited aviation safety lighting in accordance with the requirements of the Air Navigation Order 2016.”

This lighting will be fitted to the turbines, with the final lighting arrangement agreed with the MOD pre-construction.

16.2.7.3 *Residual Effects*

Following the implementation of mitigation measures for low flying aircraft, no effects will occur on aviation receptors. Therefore, there will be negligible (not significant) effects on aviation receptors as a result of the Proposed Development, which are not significant in line with the EIA regulations.

16.2.8 *Cumulative Effect Assessment*

No residual effects would occur as a result of the Proposed Development, therefore there is no prospective of cumulative effects occurring. There will be no significant cumulative effects on aviation receptors as a result of the Proposed Development.

16.2.9 *Visible Aviation Lighting Assessment*

As stated in **Section 16.2.7.2**, the turbines associated with the Proposed Development will be required to be installed with visible aviation lighting.

These lights would operate at 2000 cd when visibility from the proposed turbines is less than 5 km. If visibility of the proposed turbines is more than 5 km, the light intensity may be reduced to 10% of the 2,000 cd, which equates to 200 cd. This means that in moderate to excellent or 'clear' visibility the lights will operate at 200 cd and in moderate to poor visibility they will operate at 2,000 cd.

The lighting is omnidirectional however it will only emit light across a horizontal plain. This, in turn, reduces effects at ground level. In addition, physical light shields can be installed to deflect light from going beyond the horizontal plain e.g., further reduce effects of night-time lighting at ground level. The assessment of the visual effects of lighting considers the reduction in intensity owing to the horizontal direction of the lighting but not the use of physical light shields.

Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting includes a visual impact assessment of the effects of visible aviation lighting. The assessment is supported by a series of figures including:

- **Figure 6.14:** Baseline Light Pollution;
- **Figure 6.15:** ZTV of Turbine Hub Lighting; and
- **Figure 6.16:** Lighting Intensity.

Night-time photomontages have also been produced:

- **Figure 6.17g, h and i:** A76 Sanquhar Castle (night-time photomontage);
- **Figure 6.19g, h and i:** Kirkconnel (night-time photomontage); and
- **Figure 6.20h, i and j:** Euchar Water Minor Road (night-time photomontage).

Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting is based on the following parameters:

- All turbines would have red, medium intensity, steady red, visible lights mounted on the hub (105 m);
- 2,000 cd and 200 cd intensity lights have been assessed representing two differing worst-case situations. 2,000 cd represents the maximum intensity possible. 200 cd represents the maximum intensity that the 2,000 cd light would be operated at when visibility extending from the windfarm exceeds 5 km;

- Potential light intensity is assumed to accord with the International Civil Aviation Organisation (ICAO) minimum standard of 2,000 cd minimum intensity required over + 3° beam spread from the horizontal plane;
- All turbines would also have low-intensity lights (32 cd) to be provided on the turbine towers at an intermediate level of half the hub height (125 m);
- It is assumed that the visual effect of turbine lighting at night would result from visible lighting located on the hubs, and on the towers, of all turbines with the wind farm layout shown in **Figure 1.3: Site Layout**; and
- The steady red lighting fixed to the top of the hubs and to the turbine towers may appear to turn on and off with the blade movement. This would occur when the turbine blades pass between the lights and the observers.

Technical Appendix A6.3: Visual Assessment of Visible Aviation Lighting considers the visual effect of the turbine aviation lighting from three representative viewpoints (**Viewpoint 1: A76 Sanquhar Castle; Viewpoint 3: Kirkconnel; and Viewpoint 4: Euchan Water Minor Road**), all of which experience low to medium levels of lighting in the baseline. At night, the structures of the proposed turbines would not be visible during the hours of darkness. The aviation lighting on the hubs and towers would, however, be potentially visible and the assessment has considered if the effects of this lighting on visual receptors could potentially be significant.

The assessment found that while the aviation lighting would have an effect on visual receptors at each of the three viewpoints, that these effects would not be significant with the exception of the effect on **Viewpoint 4: Euchan Water Minor Road** under the scenario in which a lighting intensity of 2,000 cd is assessed. This significant effect would relate to the limited influence of baseline lighting in this less developed rural context, despite the limited intensity of the lights owing to the angle of the lights. There would not be a significant effect from this location in respect of the 200 cd intensity lighting assessed. The conclusions from the assessment of the other viewpoints relate to a combination of the limited number of hub lights visible, their relatively well contained extents and the baseline influence from lighting in the settled valley where the viewpoints are located. Although the aviation lighting would add to the effects of the baseline lighting experienced from these viewpoints and would extend the effects above the enclosing ridgeline of the valley, the effects would be not significant.

16.2.10 Summary of Effects

An assessment of potential impacts on aviation associated with the Proposed Development has been carried out, specifically investigating the potential effects on licenced aerodromes, National Air Traffic Services (NATS) and the MOD.

Following the installation of aviation lighting for low flying, no significant effects are anticipated as a result of the Proposed Development on aviation receptors.

16.2.11 Statement of Significance

An assessment has been made of the potential for significant effects of the Proposed Development on the aviation resource. Due to more advanced radar facilities being proposed by multiple bodies with the in-built capability for mitigating the impact of wind turbines, this assessment did not identify potential significant effects on any receptors during the construction, operation and decommissioning of the Proposed Development.

16.3 Telecommunications, Television Reception and Utilities

16.3.1 Introduction

Due to the size and nature of wind turbines, they have the potential to interfere with electromagnetic signals passing above ground during operation. Infrastructure affected can include telecommunication

links, microwave links and television reception. Aviation can also be affected by turbines and is addressed separately in **Section 16.3** of this Chapter.

In particular, the tower and rotating blades of wind turbines have the most potential for interference with electromagnetic signals. The degree and nature of the interference will depend on:

- The location of the wind turbines with respect to the receiver and the transmitter;
- Characteristics of the rotor blades (including size, shape and composition);
- Signal frequency;
- Screening obstacles between turbine and respective receivers and transmitters, including terrain; and
- The radio wave propagation in the local atmosphere.

In addition, other infrastructure such as buried utilities, existing and / or proposed, may be affected by the construction of the Proposed Development.

This Section of the EIA Report details the relevant guidance, consultation that has been undertaken with infrastructure operators, the existing baseline for these elements as relevant to the Proposed Development and an assessment of the likely effects as a result of the Proposed Development.

16.3.2 Legislation, Policy and Guidance

There are a number of documents which provide guidance on telecommunications considerations for onshore wind energy developments. The guidance considered in this assessment are:

- Ofcom (2009) Tall Structures and Their Impact on Broadcast and Other Wireless Service⁵⁰¹;
- The Scottish Government (2014) Onshore Wind Turbines⁵⁰²;
- Ofcom (2003) Guidelines for Improving Digital Television and Radio Reception⁵⁰³.

The potential effects as a result of the Proposed Development have been assessed with reference to the above documents.

16.3.3 Assessment Methodology and Significance Criteria

16.3.3.1 Scoping Responses and Consultation

Telecommunication operators were consulted in April 2022 within the Scoping Request and information was requested for any telecommunication links which may be affected due to the Proposed Development. Turbine co-ordinates and dimensions of the scoping layout were provided to consultees.

Ofcom monitors the fixed microwave links throughout the UK, whereas JRC manages the radio spectrum used by the UK Fuel and Power Industry. Atkins undertakes a similar role for the water industry. Arqiva operates the Freeview terrestrial transmission network including BBC and ITV.

Although no objections were received from consultees at Scoping, updated consultation was undertaken pre-submission in February 2023 to ensure that the updated site layout (as shown in **Figure 1.3**) did not interfere with original scoping responses. **Table 16.6** provides a summary of the consultation undertaken.

⁵⁰¹ Ofcom (2009) Tall Structures and their Impact on Broadcast and Other Wireless Services [Online] Available at: Microsoft Word - Guidance_FINAL_V3.doc (ofcom.org.uk) (Accessed: 09/02/2023)

⁵⁰² Scottish Government (2014) Onshore Wind Turbines [Online] Available at: <https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/> (Accessed 14/03/2022)

⁵⁰³ Ofcom (2023) Guidance for TV and Radio Broadcasters [Online] Available at: Guidance for TV and radio broadcasters - Ofcom (Accessed on 17/02/2023)

Table 16.6 Consultation Responses

Consultee	Type and Date	Summary of Response	Response to Consultee
British Telecommunications (BT)	Scoping Response, 21 st April 2022	The Proposed Development should not cause interference to BT's current and presently planned radio network.	N/A
	Pre-submission consultation, 14 th February 2023	Updated site layout, including turbine coordinates, was sent to BT. Confirmed no objections to the Proposed Development.	N/A
Joint Radio Company (JRC)	Scoping Response, 19 th April 2022	The Proposed Development was cleared with respect to radio link infrastructure operated by Scottish Power and Scotia Gas Networks. JRC does not foresee any potential problems based on known interference scenarios and the data you have provided.	N/A
	Pre-submission consultation, 14 th February 2023	Updated site layout, including turbine coordinates, was sent to BT. Confirmed no objections to the Development.	N/A
Ofcom	Scoping Response	Ofcom no longer respond to Scoping Requests and instead request that developers use their online search portal to identify potentially affected links.	N/A

16.3.3.2 Baseline Methodology

The search for existing telecommunication, television and microwave links was undertaken within an approximate 1 km radius of the Site boundary, which covers all turbine locations and beyond the boundary of the Proposed Development. This ensures all telecommunication and microwave links potentially affected are identified.

Sanquhar is the closest village to the Site at a distance of approximately 0.5 km to the North-East of the site boundary, along with several dwellings along Blackaddie Road. These areas have been considered in the search for telecommunication, television and microwave links.

16.3.3.3 Significance Criteria

Should the construction and operation of the Proposed Development materially affect the operation of telecommunication links, such as through degradation of signal quality to the extent that it warrants an objection from the link operator, this would be considered a significant effect. Mitigation is generally available either through rerouting of any affected links or upgrades to the transmitting and/or receiving apparatus.

16.3.3.4 Assessment Limitations

The assessment is based on desk-based research, assisted by an extensive consultation process. No limitations or data gaps have been identified.

16.3.4 Baseline and Assessment of Potential Effects

16.3.4.1 Telecommunications and Television

Consultation with the relevant organisations was initiated during the Scoping request to identify any potential microwave or telecommunication links that could be affected by the Development, and to identify these as constraints to design. BT and JRC identified no links associated with the Proposed Development and have raised no objections as detailed in **Table 16.6** above.

Consultees were contacted again in February 2023, following a change to the site layout (including turbine coordinates and number of turbines). Both BT and JRC confirmed there were no objections to the Proposed Development.

Digital television signals are rarely affected by the operation of wind turbines; however, in some cases interference can be caused by blocking or reflections. A minimum signal strength is required for digital television to operate effectively, if a property already receiving a weak digital signal experiences additional blocking or reflections from wind turbines, the signal level may drop, causing the television to pixelate or cut out intermittently. Reflections and blocking from other objects (such as trees) close to a receptor can cause similar effects. Simple measures to boost the signal through an improved receiver are usually sufficient to correct the issue.

The nearest property to the turbines is Glenmaddie, which is financially involved, and is located less 970 m from T11. The area surrounding the Proposed Development, which will include the nearest properties, receives television signals that were made exclusively digital after the digital switchover was completed, and hence no analogue TV signals are broadcast in the area. As a result, and considering the intervening distance between the nearest turbine and property, television reception received by the nearest properties to the Proposed Development will not be affected, and no effects will occur.

However, in the event that interference which is directly attributable to the Proposed Development is experienced, the Applicant will endeavour to implement a suitable mitigation solution. Examples of technical solutions include:

- Changing the receptor height;
- Re-orientating the receptor to receive signals from an alternative transmitter; and
- Upgrading the receptor system or installation of satellite television.

The requirement for a corrective action would be most appropriately identified after the onsite survey is complete, and the Proposed Development is operational.

Broadcast radio (FM, AM and DAB digital radio) are transmitted on lower frequencies than those used by analogue TV signals. Lower frequency signals tend to pass through obstructions more easily than the higher frequency TV signals, and diffraction effects also become more pronounced at lower frequencies. Both of these factors will tend to lessen the impact of wind turbines on radio reception. Should interference to radio signals be experienced as a result of the Proposed Development, the technical solutions described in the above paragraph are considered as suitable mitigation measures.

16.3.4.2 Utilities

Other below ground infrastructure, such as utilities, could be affected during construction; however, implementation of best practice would ensure that these are not adversely affected during construction or operation⁵⁰⁴.

Chapter 11 – Hydrology and Soils provides a full assessment of potential impacts on public and private hydrology related utilities.

A linesearch⁵⁰⁵ utility search was undertaken during the EIA process which identified no onsite cabling but that Scotia Gas Networks (SGN) may have utilities within 1 km of the Site that have the potential to be affected by the Proposed Development. It is likely that this utility may be servicing residential properties within the Site or those proximate to the Site boundary. SGN have been contacted for confirmation and a response is awaited at the time of writing. It should also be noted that the Proposed Development has been designed to avoid any disruptions to the existing cable that

⁵⁰⁴ BWEA, (1994) Best Practice Guidelines of Wind Energy Developments [Online] Available at: <https://www.thenbs.com/PublicationIndex/documents/details?Pub=BWEA&DocID=258180> (Accessed 19/04/2023).

⁵⁰⁵ Linesearch Online Tool [Online] Available at: <http://www.linesearchbeforeudig.co.uk/#> (Search undertaken 19/04/2023)

passes through the Site. This cable forms the grid connection between Twentysilling Hill Wind Farm and Glenglass substation. The Proposed Development has been designed to largely avoid the cable; the proposed access track crosses the cable, and appropriate construction measures, such as split ducting followed by concrete encasement with a reinforced concrete protection slab, will be implemented to ensure no impact to the cable.

Prior to construction, a more detailed line search for undergrounded utilities would occur and any services located. Adverse effects would be avoided through the implementation of safe systems of work, such as Health and Safety Executive (HSE) guidance on underground excavation⁵⁰⁶. During construction, there may be construction traffic passing beneath electricity lines along the transportation route. Similarly, it is known that construction traffic will travel over Scottish Water assets on Site. Although it is very unlikely that any damage to such infrastructure will occur, appropriate management measures will be put in place to ensure they are not affected by the Proposed Development, and that the Proposed Development is constructed in accordance with relevant health and safety legislation as appropriate. Pre-construction consultations with Scottish Water will be undertaken to ensure minimal impact on existing utilities during construction also. Following the implementation of such measures, if necessary, there will be no effect on utility infrastructure as a result of the Proposed Development, and it is not considered further.

16.3.5 Summary of Effects

The Ofcom search for fixed links confirmed there were no live fixed links operating across the proposed turbines. Consultation undertaken with the telecommunications consultees has confirmed there would be no adverse effects on operations within the surrounding area that would interfere with telecommunications and electromagnetic signals. Effects on television reception are unlikely, and technical solutions are readily available as suitable mitigation measures should adverse effects be present. Adverse effects on infrastructure such as utilities would be avoided through safe systems of work and best practice measures.

⁵⁰⁶ Health and Safety Executive (2014) Avoiding danger from underground services [online] Available at: <https://www.hse.gov.uk/pubns/priced/hsg47.pdf> (Accessed 19/04/2023)

17. SCHEDULE OF MITIGATION

This Chapter of the Environmental Impact Assessment Report (EIA Report) provides a summary of mitigation measures that have been proposed within the EIA Report to prevent, reduce or offset the effects associated with the Cloud Hill Wind Farm (the Proposed Development).

Embedded mitigation measures have been integral to the design evolution of the Proposed Development as outlined in **Chapter 4: Description of the Proposed Development**. The overall aim of the design strategy was to create a wind farm with a cohesive design that relates to the surrounding landscape whilst taking account of the environmental characteristics of the area in which the Proposed Development is located (the Site), for example, priority habitats, peat, and hydrological resources.

Table 17.1 presents a schedule of mitigation measures for the Proposed Development listed according to the relevant environmental topic, which would be applied during the construction and operation of the Proposed Development.

Table 17.1 Schedule of Mitigation

Environmental Subject Area	Mitigation Proposed for the Development	Timing
Chapter 3: Site Selection and Design	Mitigation by Design This EIA Report utilised the mitigation hierarchy, where the strategy of avoidance, reduction, and remediation was utilised. This approach seeks to first to avoid potential effects, then to reduce those which remain and lastly, where no other measures are possible, to propose mitigation measures. Embedded mitigation was used to minimise any predicted environmental effects. This was particularly relevant to the avoidance of direct effects (e.g. on known protected species). By employing an iterative design process, undertaken in conjunction with the EIA process, a number of potential effects were avoided completely. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable project. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' within the design of the scheme. These are detailed in relevant chapters within Volume 1: EIA Report Text, as well as in this Schedule of Mitigation.	Pre-submission
Chapter 4: Description of the Proposed Development Chapter 6: Landscape and Visual Impact Assessment (LVIA)	Micrositing A micrositing allowance of 50 metres (m) in all directions has been included for all proposed turbine infrastructure. Beyond this distance, approval from the Council would be needed. This is to allow for a degree of flexibility should unsuitable ground conditions be encountered or in the event of environmental constraints identified during pre-construction surveys, particularly as there are known previous mine workings in the area. Turbines would not be micro-sited into deeper peat or closer to watercourses and any changes will be subject to the approval of the Ecological Clerk of Works (ECoW) with other specialist environmental advice (e.g., geotechnical, hydrology, archaeology, etc.) as required.	Pre-construction and Construction
	Construction Method Statements (CMSs) All aspects of construction will be controlled via a series of detailed CMSs which will be prepared by an Infrastructure Contractor appointed by the Applicant, who will have an overall responsibility for environmental management on the construction site.	Pre-construction and Construction
	Construction Environmental Management Plan (CEMP) A Construction Environmental Management Plan (CEMP) will be the overarching document which combines the principles of all other management plans and environmental plans outlined within this EIA Report and would support the CMSs and Pollution Prevention Plan (PPP). The CEMP will typically be supported by the following documents, where required, which apply to the construction process: ▪ Site induction and training; ▪ Working hours; ▪ Enabling works; ▪ Surface water and drainage management; ▪ Waste management;	Pre-construction and Construction

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- Wastewater and water supply monitoring and control; - Oil and chemical delivery and storage; - Water quality monitoring; - Ecological protection measures; - Construction noise management; - Cultural heritage written scheme of investigation; - Handling of excavated materials; - Reinstatement and restoration; - Traffic management; - Environment incident response and reporting; and - Use and extent of borrow pits. Outline documents have provided for the Biodiversity Enhancement Management Plan (oBEMP, Appendix TA: 7.6) and Peat Management Plan (oPMP, Appendix TA: 10.2). Draft documents have been provided for the Water Construction Environmental Management Plan (WCEMP, Appendix TA: 11.2) and Access Management Plan (AMP, Appendix TA: 14.1). All documents have been included as part of this EIA Report and will be agreed and approved with the relevant bodies prior to construction.	
Chapter 6: Landscape and Visual Impact Assessment (LVIA)	Embedded Mitigation Measures to reduce effects upon the landscape resource and visual amenity were predominantly achieved through the design and site selection of the wind farm. The suitability of the site determined as: - The landscape had suitability for wind development, and derives its character from this. This has been realised through the location of the Sandy Knowe, Hare Hill (and Hare Hill Extension), Sanquhar, Whiteside Hill and Twentyshilling Wind Farms on these hills which establish wind farms as a baseline feature of the surrounding landscape; - The Proposed Development would not directly affect National Scenic Areas (NSAs), any mapped interest of Wild Land (WLA) and would not be located in a Regional Scenic Area (RSA) or Special Landscape Area (SLA); - The number of cumulative developments would prevent the Proposed Development from introducing wind farms developments into the landscape and help concentrate this type of development within one, upland area; - The Proposed Development may appear as an extension to Whiteside Hill Wind Farm, as the Site abuts the eastern edge of it; - The turbines would be located on the hills forming the southern valley side of the Nithsdale Valley to reduce potential impacts relating to noise and visual amenity; - The contained pattern of visibility which would be patchy to the west, east and south but more consistent to the north, largely due to the screening effect of surrounding uplands, which would notably reduce the extent of visibility across these parts of the Study Area; and - The general visibility of the site would be limited to localised areas and short sections of routes. A number of design principles have been considered in order to minimise landscape and visual impacts through alterations to layout, design and siting, management practices and mitigation. All design principles	Pre-submission

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	were based upon the characteristics of the existing landscape and visual baseline conditions and are detailed fully below: ▪ To create a visually legible design, insofar as was possible on a site, which is constrained by other environmental and technical issues, and create a simple, positive layout, viewed consistently from different positions; ▪ To ensure that the Proposed Development in views from the Nithsdale Valley appear as a relatively well-defined group in which the turbines relate well to the landform and each other; ▪ To use existing access tracks where possible and ensure that new access tracks are sympathetic to the natural landform, as far as possible; ▪ To locate borrow pits with consideration of topography, proximity to access tracks and orientation in respect of visibility, and to restore these areas through replacing topsoil and natural vegetation, albeit with rock faces exposed; ▪ To group turbines to create a balanced and coherent image from key viewpoints, avoiding where possible excessive 'stacking' or overlapping of turbine rotors in lines, favouring an irregular cluster, that reflects the nature of the undulating landscape; ▪ To site buildings and the BESS within low lying and less exposed areas; and ▪ To group the infrastructure in order to limit the number of areas affected. All mitigation for landscape and visual effects were embedded into the final design for the Proposed Development.	
	Aviation Lighting Per the ICAO (a UN body) Civil Aviation Authority (CAA) standards, all turbines in the Proposed Development will be fitted with visible lighting, as they are all in excess of 150m above ground level. The intensity of the visible lights will be dependent on the clarity of atmospheric visibility and the degree of negative/positive vertical angle of view from the light to the receptor. Per the ICAO standards, lights are required to be switched on 30 minutes after sunset, and 30 minutes before sunrise, removing the likelihood of visible lighting during twilight.	Operation
Chapter 7: Ecology	Biodiversity Enhancement Management Plan An outline BEMP (oBEMP, Appendix TA: 7.6) has been included as part of this EIA Report. Post consent, habitat management will be implemented in accordance with a detailed BEMP written and developed in full following consent and agreed with NatureScot and the Council at the pre-construction stage, where relevant. The implementation of the BEMP will be undertaken during construction, with ongoing monitoring undertaken post-construction as required by the BEMP. Monitoring, as outlined within the oBEMP, will comprise of 4 aims: ▪ Aim 1: Restoring and enhancing peatland habitats by recording changes to the structure and composition of the vegetation and species abundance, evenness and diversity. Recording of impacts from deer/livestock will also be included using the Herbivore Impact Assessment (HIA) in the NatureScot (formerly SNH) Guidance. The respective monitoring surveys will be carried out at the most appropriate times of year and repeat surveys will be carried out in the same month in each monitoring	Pre-construction, Construction and Operation

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	year (1, 2, 3, 5 10, 15) to gather comparable data. Peat dams or reprofiled hagsgs will be monitored to ensure works are successful over the first three years after works are completed; ▪ Aim 2: Enhancing habitats for Waders through Breeding Bird Surveys (BBS). These will be undertaken in years 1, 2, 3, 5, 10 and 15 to determine the distribution of territories for target wader species. Grassland habitat monitoring will be undertaken following the same approach as detailed in Aim 1; ▪ Aim 3: Enhancing the ecological and hydrological value of watercourses. Planted areas will be monitored for the first five years following planting to ensure successful establishment. Trees will be inspected by suitably experienced personnel and evidence of damage (e.g. browsing by deer) or disease will be recorded. Where necessary, failed trees should be replaced in the winter following the inspection (i.e. November to March). Presence of any invasive non-native species will also be a focus of the inspection, with any specimens recorded being removed in a timely and appropriate manner; and ▪ Aim 4: Increasing the level of broadleaved woodland and hedgerow, whilst enhancing the habitat for black grouse. Black grouse surveys will be undertaken in years 1, 2, 3, 5, 10 and 15 to monitor success of planting for black grouse. Black grouse surveys will be undertaken in years 1, 2, 3, 5, 10 and 15 to monitor success of planting for black grouse. Finally, habitat monitoring of planted areas will be carried out in line with the approach detailed in Aim 3. The above monitoring will also be noted in the detailed HMP post consent.	
	Environmental Clerk of Works A suitably qualified Ecological Clerk of Works (ECoW) will be appointed prior to the commencement of construction to advise the Applicant and the Principal Contractor on all ecological matters. The ECoW will be required to be present onsite during the construction phase and will carry out monitoring of works and briefings with regard to any ecological sensitivities on the Site to the relevant staff of the Principal Contractor and subcontractors. If it is not possible to determine the status of features during ECoW checks, further monitoring by use of camera traps may be required.	Pre-construction and Construction
	Species Protection Plan A Species Protection Plan (SPP) will be implemented within the Site during the construction and decommissioning phases of the development, although it can also be used for guidance should the need arise for maintenance during the operational period. The SPP will be a live document subject to review and updating and will assist staff in the protection of species during construction and decommissioning, under the guidance of the ECoW. The SPP identified the potential presence of European Protected Species (otters and bats) and Nationally Protected Species (badger, water vole and reptiles). The SPP details that if the status of the potential protected feature remains unoccupied, construction may occur in the area, but not damaging the potential feature under close supervision by the Eco; or, if the status of the feature changes to occupied, then the under-noted procedure for occupied sites will be followed. The ECoW will be responsible for this survey work as required. If an occupied feature exists within the Site or disturbance free zone, and infrastructure cannot be microsited away, a licence to disturb will be applied for to NatureScot; or a licence to damage or destroy will	Construction and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	be applied for to NatureScot if there are no reasonable alternatives for otters and bats. For vole burrows or badger setts, the Applicant will discuss any licensing requirements and appropriate mitigation with NatureScot. If reptiles are found during their hibernation period, the Applicant will discuss appropriate mitigation with NatureScot; however, reptiles are capable of actively avoiding disturbances during their active phase. In addition to the site-specific mitigation measures above, the following general mitigation is proposed to increase the protection levels on protected species and reduce general disturbance: ▪ Covering/securing all excavations and piping. If this is not possible then a means of escape must be provided for any animal that could fall in e.g., a ramp with a gradient of 45o or shallower; ▪ Any temporarily exposed open pipe system should be capped in such a way as to prevent mammals gaining access, as may happen when contractors are offsite. If such pipes are left for an extended time, periodic checks will be carried out to ensure that the pipe is inaccessible to animals; ▪ All excavations will be checked at the start of works and prior to the commencement of any works activities to ensure otters and badgers are not present or have become trapped overnight; ▪ Night-time working will be minimised to reduce disturbance to nocturnal and crepuscular fauna. Where this is not possible, security lighting used in the Site compound and those areas where lighting is absolutely necessary to ensure safe working conditions will be angled downwards to reduce light spillage into adjacent areas. Lighting outwith the Site compound will be switched off when no works are being undertaken. Other required lighting will be directed to where it is needed and away from features (including setts, treelines, watercourses/riparian habitats, mammal paths, etc.) to minimise light disturbance; ▪ Works in the vicinity of watercourses (within 50 m) which are frequently used by otter should commence one hour after sunrise and should cease no later than one hour before sunset; ▪ All works undertaken in proximity to watercourses will be undertaken in line with pollution prevention measures outlined in a detailed Construction Environment Management Plan (CEMP); ▪ An appropriate speed limit (of around 15 to 20 mph) for all vehicles on the Site, and vehicle movements will be kept to pre-determined routes wherever possible; ▪ Watercourse crossings will be designed to allow the passage of small mammals on the Site, where appropriate; ▪ Vegetation within 50 m of all watercourses should be left undisturbed except in areas of construction of watercourse crossings and access roads leading to crossings as well as construction associated activities (such as drainage and mitigation). ▪ Chemicals should not be stored within 100 m of a sett, holt or couch, or within 10 m of hibernacula, or other protected feature, or along mammal paths. All paints, chemicals and sealants used during the construction process will be removed from the working area at the end of each working day. Open tins or other containers will not be left at the works areas but will be stored in a suitable container at the site compound; and ▪ Any areas for location of wind turbines and infrastructure will be subject to inspection by an experienced ecologist prior to any works within these areas. The ECoW will monitor the Site so that in-	

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	situ materials associated with works will not incidentally create reptile refuges, e.g., piles of cut vegetation. Materials will be removed from Site if advised by the ECoW.	
Chapter 8: Ornithology	Embedded Mitigation Embedded mitigation has been considered at the early stages of the Proposed Development design process to minimise the risk of disturbance, displacement and collision. This has involved: ▪ Avoidance of the recorded peregrine falcon nesting locations by at least 500 m; ▪ Avoidance of the recorded barn owl roost/nest location by at least 500 m; and ▪ Avoidance of the black grouse lekking area by at least 500 m.	Pre-submission
	Bird Disruption Management Plan A Bird Disturbance Management Plan (BDMP) will be implemented during construction of the Development. The BDMP will detail measures to ensure legal compliance and safeguard breeding birds known to be in the area and will include species-specific guidance. The BDMP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction works. The Ecological Clerk of Works (ECoW) will oversee the implementation of the above measures.	Pre-construction and Operation
	Pre-Construction Surveys Specific, targeted pre-construction surveys for black grouse would be undertaken to identify up-to-date lekking areas within 750 m of construction activity immediately prior to construction commencing. This would be overseen by the assigned ECoW. The BDMP would be extended to include protection of lek sites and specific construction control measures to minimise lek disturbance for any leks within 750 m of the Development. Pre-construction checks would also be carried out for curlew and lapwing to identify if any of these breeding waders would be displaced by construction activities. They would also be included in the BDMP and managed through the presence of an ECoW.	Pre-construction
	Operational Maintenance To reduce any potential impacts on foraging curlews, efforts will be made to ensure that permanent lighting at the substation and BESS is minimised (e.g., use of reduced intensity lighting, lighting timers, focussed directional lighting to only light key areas, suitably opaque screening), whilst ensuring that these measures would not result in additional impacts (e.g., trees as screening could increase perceived predation threat and result in displacement). In order to minimise the disturbance effects to any breeding black grouse, operational maintenance would be scheduled outside the period within two hours of dawn during the core black grouse breeding months of (March to May). Black grouse will be included as a key species in the Biodiversity Enhancement Management Plan (BEMP). The detailed HMP would include confirmed Management Units and detailed Management Prescriptions, such as to increase breeding productivity of Black Grouse and Curlew.	Operation

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	Nesting or foraging waders may be displaced from foraging habitats which may impact on productivity, fitness and survival rates. Curlew will be included as a key species in the BEMP to provide habitat enhancement. The habitat improvements to Curlew through the BEMP will also ai to benefit Lapwings.	
	Operational Lighting Consultation between the Applicant and the relevant regulatory bodies would be undertaken on a reduced site-specific turbine lighting scheme. Lighting would also be considered for the substation. As discussed above, lighting at the substation and BESS will be minimised through the measures noted above, in Operational Maintenance.	Operation
	Protection of Nesting birds If any nests (or breeding territories of Schedule 1 species) are identified during pre-construction surveys, an exclusion zone around the nest/breeding territory will be established (with the distance appropriate to the species and agreed through consultation with NatureScot). No works will be permitted within the exclusion zone and no personnel or vehicles will be allowed to enter or pass through until the ECoW has confirmed that the breeding attempt has reached a natural conclusion. Where this is not feasible, NatureScot will be contacted and further mitigation measures agreed to ensure that nesting birds are not harmed and any breeding Schedule 1-listed species are not disturbed.	Pre-construction and Construction
	Monitoring Ornithological monitoring will take place every year during the first five years of operation and then in Year 10, and every five years for the remainder of the operational period. In addition to the above, monthly survey visits will take place from April to July to record the presence of breeding raptors and waders within Search Areas as outlined within the oBEMP of this EIA Report, and ultimately the detailed BEMP. Black grouse monitoring will also be undertaken in April and May across the Site, based on the method detailed in Gilbert et al. (1998). Monitoring of works and briefings with regards to any ornithological sensitivities on the Site will be undertaken during the decommissioning period to the relevant staff within the Principal Contractor and subcontractors.	Operational and Decommissioning
Chapter 9: Archaeology and Cultural Heritage	Embedded Mitigation A number of design principles have been considered in order to minimise setting impacts on cultural heritage assets. These are listed below: - Removal of three turbines positioned in proximity to heritage assets to the east and north of the Proposed Development; - Relocation of remaining turbines to reduce the extent of landscape and visual effects; - Relocation of turbines to increase the transitional distance between the upland and lowland zones, also increasing the distance between turbines and key infrastructure inclusive of substation and BESS and Deil's Dyke (MDG12838), a likely Late Prehistoric landscape feature demarcating the split between upland and lowland zones;	Pre-submission

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	On-site non-designated cultural heritage assets identified through consultation with DGC, walkover survey and production of DBA (Technical Appendices A9.1). Direct (physical) impacts to known heritage assets within the CSA avoided where possible through movement of turbines and associated infrastructure, within the confines of constraints identified by other disciplines and topography.	
	Pre-Construction Mitigation The following pre-construction surveys are recommended: - Photographic and earthwork survey of known archaeological remains along with a programme of archaeological work comprising a trenching evaluation is recommended for ground truthing purposes. This will also help to identify any heritage assets not previously identified; - A walkover of the final infrastructure layout is recommended to ensure preservation by record of any previously undiscovered archaeological assets. Should the survey identify such assets, consultation with the LPA should be undertaken to determine an appropriate and proportionate mitigation strategy; At the present time no works are envisaged to the existing access track where it crosses Deil's Dyke. However, as track widening works cannot be discounted at the time of writing there is a risk of a potential direct effect to Deil's Dyke. Where access works are required that could adversely affect the asset the Applicant shall prepare a Method Statement for agreement with the Council prior to commencement of works. The Method Statement shall detail the requirements for a floated track design over the asset in order to minimise ground disturbance, and the requirement for a watching brief throughout these works. - A trial trench evaluation of new access track around Ulzieside Farmstead is recommended in order to limit any potential effects on known Late Iron Age occupation area. any assets within micro-siting distance (50 m) should be properly recorded with further consultation with the Council should any assets be affected.	Pre-construction
	Construction Mitigation The following construction surveys are recommended - Where heritage assets are located during pre-construction surveys within 50m of the Proposed Development (and so within "micro siting" distance), assets will be demarcated to physically protect those assets in-situ. - A watching brief of any improvements to the existing trackway or new tracks between Ulzieside farmstead and Deil's Dyke Borrow Pit. This will require areas of ground disturbance to be monitored by an attending archaeologist, with an archaeological watching brief to be recommended to mitigate any damage assets. - A watching brief should also occur at turbine locations and hardstandings. In the event that track widening is required where it crosses Deil's Dyke a watching brief shall be undertaken in line with the Method Statement agreed with the Council.	Construction
Chapter 10: Geology and Soils	Embedded Mitigation A number of design principles have been considered in order to minimise setting impacts on geology and soils. These are listed below: The avoidance of deep peat (depths greater than 1.0 m) within the design;	Pre-submission

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- The limitation of excavation of deep peat (such as the use of floating access tracks) where deep peat cannot be avoided; - The protection of peat by reusing peat on Site; and Proposing floating access tracks to minimise the impacts on deep peat. Maintenance of existing drainage is critical to avoid compaction of soils, therefore, all existing drainage network channels would be maintained and, where necessary, channelled below the access track construction drainage ditches on the upslope of the track. Further mitigation details on hydrological assets, such as drainage, can be found in the mitigation measures listed below for Chapter 11: Hydrology and Soils.	
	Management of Peat The following best practice guidance below will be carried out to minimise the risk of damage to soil structure: - Reinstatement and restoration will be planned in advance as this generally saves effort at a later stage, ensures opportunities are not lost, and a more successful outcome is achieved. For example, temporary soil and peat storage locations will be identified as close as possible to their final area of reuse to avoid double handling; - No trafficking of vehicles/plant or materials storage will occur outside demarcated working areas; - No trafficking of vehicles/plant on reinstated soil (topsoil or subsoil); - Only direct movement of soil from donor to receptor areas (no triple handling and/or ad hoc storage); - Soil handling is to be determined based upon soil moisture content. Where practicable soil handling when soil moisture content is above the lower plastic limit (the moisture content at which soil begins to behave as a plastic material and the soil is deemed too wet to handle without causing damage to the soil structure), should be avoided; - Where soil are wet or damp, to minimise compaction, soils should be handled using excavators rather than dozers; - No mixing of topsoil with subsoil, or of soil with other materials; - Soil is only to be stored in designated soil storage areas; - All soil storage areas (stockpiles) must be planned appropriately and must have clear signage accordingly by the appropriate contractors to ensure no cross contamination occurs and ease of identification for reinstatement; - Topsoil stockpiles should not exceed 4 m in height and subsoil stockpiles should not exceed 5 m in height. However, if the soil to be stockpiled is dry, formation of higher stockpiles may be permissible, if required, as the soil is likely to remain dry in the core of the stockpile for the entire storage period. However, the appropriateness of higher stockpiles will need to be established on a location by location basis; - Loose peat that is not overly wet can be stored in stockpiles up to a maximum height of 2m, with turves used to cover them to minimise drying; - Loose peat that is very wet (i.e. catotelmic peat that has little or no structure) would be relocated directly to its final reuse location without any temporary storage where possible. Where it is not possible to immediately reuse very wet peat it would be stored in purpose-built, bunded locations no deeper than 1m. Any bunded storage area would need to be designed with a sedimentation/settling pond to de-	Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	water wet peat and aid sediment containment. Each settling pond must be designed with appropriate filtration treatment facilities prior to connection into the construction-phase surface water drainage; ▪ Upon the placement of soils into stockpiles has been completed, rainfall and soil moisture conditions are of lesser importance, providing they do not lead to erosion resulting in a loss of the soil resource and potentially a change in soil composition if fine material is lost leaving a greater proportion of stones. Stockpile erosion can also result in significant environmental impacts, such as discharges of sediment laden for pathways that could be susceptible to local receptors (roads, drainage systems and surrounding land); ▪ Temporary soil and peat stockpiles will avoid sensitive habitats, areas of existing peat erosion and locations with moderate or high risk of peat slide (see Fig 10.2.5 Temporary Peat Storage Areas in EIA Report Volume 3 Technical Appendix 10.2 Outline Peat Management Plan); ▪ Temporary soil and peat stockpiles will be located greater than 50m from watercourses. Measures to manage and treat run-off prior to getting into watercourses and minimise the potential for soil erosion during the works will also be set in place through a series of site specific drainage control measures as set out in Technical Appendix A11.2 Water Construction Environmental Management Plan. ▪ Peat turves will be transferred intact to their temporary storage location where they will be stored, with vegetation upright, in a single layer covering acrotelmic peat stockpiles to minimise the peat drying out. Where required geotextile material can be used to protect underlying vegetation. Peat turves may be stored in double layers (separated by geotextile) provided that such storage does not extend beyond two months; ▪ The number and locations of temporary peat storage areas will be chosen to minimise the distance that stripped and excavated peat will have to be transported; ▪ Peat and carbon rich soils will be excavated and reinstated as quickly as possible in a progressive manner to protect these resources as far as possible and therefore minimise the area required for temporary storage at any one time; ▪ At this stage, temporary storage sites have not been identified. The final locations and footprints of each stockpile will be determined by the Site Engineer and ECoW. Once confirmed, stockpile locations will be accurately recorded on a plan of appropriate scale by the Contractor(s). Marker posts will need to be provided in locations which have been surveyed and recorded (this should also occur if further soil surveys are required); ▪ Plant and machinery only work when ground or soil surface conditions enable their maximum operating efficiency (i.e. when machinery is not at risk of being bogged down or skidding causing compaction or smearing); ▪ All plant and machinery must always be maintained in good working condition to ensure that the soil is stripped correctly, for example to ensure that the depth of the strip can be accurately controlled, and to minimise the risk of contamination through spillages; ▪ The size of the earthmoving plant to be used should be tailored to the size of the area to be stripped and the space available within the working area. For example, the use of a long reach excavator will minimise the need for movement across the soil surface and/or the use of low ground pressure wide tracked vehicles, will further reduce soil compaction; and	

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	▪ If any soil or aggregate materials are imported as part of the construction, the materials should be subject to sampling and analysis to ensure it is suitable for its intended use from an environmental risk and waste management perspective. This process should be fully documented. ▪ The deeper areas of peat are generally located on flatter areas on hilltops, separated by valleys and rivers. No assessment has been done to determine whether these areas of peat are hydrologically connected, but the geomorphological map included in Figure 10.1.2 of Technical Appendix 10.1 Peat Slide Risk Assessment provides insights into the peat deposits, the watercourses on Site and other geomorphological information on Site. There are areas of Blanket Bog identified on the Site which do not currently have infrastructure located on these areas. The Site infrastructure has been designed in order to avoid these high-risk areas. ▪ The Site Construction Manager, with advice as necessary from the ECoW and/or Site Engineer, will determine whether special mitigation measures are required, such as orientation of the stockpile, levelling/ benching to level the surface, bunding to contain stored materials and/ or site-specific drainage to ensure that runoff waters are sufficiently controlled; ▪ Peat turves and stockpiles will be regularly managed and inspected throughout their lifetime to ensure maintenance of stockpile stability and integrity. Depending on the length of storage and weather conditions, regular watering may be required to protect the peat from drying out; ▪ Temporary drainage of peat stockpiles will be inspected regularly to ensure that it is fit for purpose, that runoff from stockpiles is being appropriately managed and mitigated and that it is not draining directly into any watercourse; and ▪ Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action which would be recorded and monitored for effectiveness. It will be necessary for the contractor to prescribe methods and timing involved in the excavation, handling and storage of peat for use in reinstatement. The contractor will be responsible for appointing a geotechnical engineer who will monitor any potential stability risks. Construction methods will be based on the following principles: ▪ The surface layer of peat (acrotelm) and vegetation will be stripped separately from the catotelmic peat. This will typically be an excavation depth of up to 0.5 m; ▪ Acrotelmic material will be stored separately from catotelmic material; ▪ Careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be re-used; ▪ Less humified catotelmic peat which maintains its structure upon excavation should be kept separate from any highly humified amorphous or wet catotelmic peat; ▪ Acrotelmic material will be replaced as intact as possible once construction progresses/as it is complete; ▪ To minimise handling and transportation of peat, acrotelmic and catotelmic will be replaced, as far as is reasonably practicable, in the locality from which it was removed. ▪ Acrotelmic material is to be placed on the surface of reinstatement areas; ▪ Temporary storage of peat will be minimised, with restoration occurring in parallel with other works;	

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- Suitable storage areas should be sited in locations with lower ecological value, low stability risk and at a suitable distance from water courses; - Peat should be stored in stockpiles no greater than 2 m in height; - Reinstatement will, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials; - Managing the construction work as much as possible to avoid periods when peat materials are likely to be wetter i.e. high rainfall events; - Temporary storage and replacement of any peat excavated from the borrow pit should occur adjacent to and within the source pit; and - Transport of peat on Site from excavation to temporary storage and restoration site should be minimised. The following site-specific measures are proposed: - Floating track will be used on the tracks between Turbines 3 and 4 to minimise the impacts on peat, as deep peat up to 5m has been identified. The proposed area of floating tracks can be seen in Figure 10.2.4 in Appendix A; and - Acrotelmic peat excavated from the Site during construction will be used to 'sensitively reprofile' the borrow pits to tie in with the surrounding landform as far as reasonably practicable, with turves reused to allow natural regeneration wherever possible. However, where insufficient turves are available, or there is a risk of erosion then reseedling with a suitable upland seed mix to match surrounding habitats will be undertaken.	
	Peat Stability The following measures will be undertaken to ensure the stability of peat: - Floating tracks in areas where deep peat is located in areas of proposed access tracks; - Slope stability monitoring will occur during the construction phase of work where necessary. Where possible micro-siting of turbines within micro-siting buffer to further reduce any risk of peat instability should be undertaken following detailed design; - Avoiding peat where feasible and managing areas of peaty soils.	Construction
	Loss and Compaction of Peat and Soils The following measures will be undertaken to ensure that the loss and compaction of peat and soils is reduced: - Avoiding construction on peat deposits; - Minimising the loading of soils; - Reuse of peat that is removed from in situ conditions to other areas within the Proposed Development, such as reprofiling borrow pits with acrotelmic peat.	Construction
	Site Investigations Intrusive site investigations will be undertaken prior to construction at turbine locations located within areas of peat to further delineate and characterise the peat to ensure that turbines are in the most appropriate locations and allow for accurate micro-siting where required.	Pre-construction

Environmental Subject Area	Mitigation Proposed for the Development	Timing
Chapter 11: Hydrology and Hydrogeology	Embedded Design The following mitigation measures relating to the hydrological environment are embedded into the design and construction of the Proposed Development: 50 m watercourse buffers for construction works with the exception of watercourse crossings; - Good practice methods and works for the protection of hydrological receptors as outlined in the cells below; and - The requirement for access tracks crossing watercourses will be minimised, where possible, during the design stage. - A detailed Construction Environmental Management Plan (CEMP) shall be prepared by the Applicants appointed Principal Contractor, which shall include mitigation outlined below. - A Pollution Prevention Plan (PPP) shall be prepared by the Applicants appointed Principal Contractor which details measures to prevent pollution of the water environment, and support the Applicants forthcoming application for a Construction Site License from SEPA.	Pre-submission, Pre-construction and Construction.
	Sustainable Drainage Systems (SuDs) SuDS is a method of controlling surface water run-off in a manner that replicates natural drainage patterns. SuDs are a legal requirement and as the Proposed Development is above the threshold criteria under the CAR Regulations General Binding Rules (GBR) and direct consultation with SEPA is required prior to the commencement of construction to obtain a construction licence. Upon obtaining a licence from SEPA, SuDs measures are to be employed in line with the following best practice guidance: - CIRIA C648 – Control of water pollution from linear construction projects; - CIRIA C352 – Control of water pollution from construction sites; - CIRIA SuDS Manual (C753); - CIRIA Guidance on the construction of SuDS (C768); and - SEPA WAT-RM-08 Regulatory Method: SuDS; - SEPA WAT-SG-75 Sector-specific Guidance – Construction Sites; and - Water Assessment and Drainage Guide (WADAG); - GPP5: Works and maintenance in or near water; and - GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer. The following SuDs measures are proposed for the Proposed Development: - Pre-earthworks drainage; - Earthworks drainage; - Management of drainage from surplus and loose materials; - Discharge of water; and - Provision for storm events.	Pre-construction, Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	Sediment Pollution Prevention Sediment pollution and release of excess sediments can result in detrimental effects to fish spawning habitats by covering the stream bed. Mitigation measures should minimise mobilisation and release of sediments to the water environment. Water polluted by sediments are not allowed to leave the Site untreated and the final discharge from the Site must have acceptable levels of sediment (in line with baseline levels). The appointed contractor will work under a wet weather working policy during construction. Works that could mobilise sediments and impact the water environment would be stopped during heavy precipitation events. Sediment pollution prevention is to be employed in line with the following best practice guidance: - SEPA WAT-SG-26 - Good Practice Guide – Sediment Management; - SEPA WAT-SG-78 - Sediment Management Authorisation; - CIRIA C648 – Control of water pollution from linear construction projects; - CIRIA C352 – Control of water pollution from construction sites; and - GPP5 - Works and maintenance in or near water. The following sediment pollution measures are proposed for the Proposed Development: - Silt traps and silt matting; - Silt fencing; - Check dams; and - Settlement lagoons.	Pre-construction, Construction, Operation and Decommissioning
	Chemical Pollution Prevention Pollution from fuels and other chemicals can cause a variety of detrimental effects to freshwater ecology and can lead to loss of aquatic flora and fauna. Cement pollution and concrete wash-out can lead to increases in alkalinity and raise the pH of watercourses, which can be toxic to aquatic flora and fauna. Chemical pollution prevention is to be employed on site in line with best practice guidance, including the following: - SEPA Groundwater Protection Policy for Scotland (Section F); - SEPA WAT-SG-31: Special Requirements for Civil Engineering Contracts for the Prevention of Pollution; - SEPA WAT-SG-32: SEPA Guidance on the Special Requirements for Civil Engineering Contracts; - CIRIA Control of Water Pollution from Construction Sites (C532); - GPP5: Works and maintenance in or near water; - GPP8: Safe storage and disposal of used oils; - GPP13: Vehicle washing and cleaning; - PPG18: Managing fire water and major spillages; - GPP21: Pollution incident response planning;	Pre-construction, Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- GPP22: Dealing with spills; and - GPP26: Safe storage – drums and intermediate bulk containers. The following mitigation measures are proposed for the Proposed Development; - Storage of chemicals and oils in storage tanks above or below ground; - In the event of chemical spillage the following steps would be recommended: - Areas where transfer and handling of chemicals is to occur should have an impermeable surface; - Drainage systems onsite should be designed to enable the containment of spillages and appropriate disposal and treatment; - Emergency procedures are implemented for a spillage incident and leak detection measures (if appropriate); - Regular maintenance and inspection of chemical storage facilities to be conducted (may be carried out by onsite ECoW); and - Provision and training in the use of spill kits. - The careful batching and transportation of concrete on site.	
	Activities in the Water Environment Temporary activities related to construction phase works within the water environment include construction of temporary and permanent watercourse crossings. The following mitigation measures are proposed for the Proposed Development: - Watercourse diversions in line with: - SEPA WAT-SG-29: Temporary Construction Methods; - Forest and Water Guidelines; - SEPA WAT-SG-25 River Crossing – Good Practice Guide; - SEPA WAT-PS-06-02: Culverting watercourses; and - CIRIA C689: Culvert design and operation guide. - Watercourse crossings, in line with: - Forest and Water Guidelines; - SEPA WAT-SG-25 River Crossing – Good Practice Guide; - SEPA WAT-PS-06-02: Culverting watercourses; and - CIRIA C689: Culvert design and operation guide. - Culverts; and - Dewatering, in line with: - SEPA WAT-SG-29: Temporary Construction Methods; - SEPA Good Practice Guide WAT-SG-28: Intakes and Outfalls; and - SEPA Regulatory Method WAT-RM-11: Licensing Groundwater Abstractions including Dewatering.	Construction
	Measures to Protect Groundwater Dependent Terrestrial Ecosystems (GWTDEs) Foundations and linear infrastructure such as roads, tracks and trenches can disrupt groundwater flow. If carried out in close proximity to GWDTE, construction activities can have adverse effects on these receptors.	Pre-construction, Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	While several NVC communities were noted during the NVC survey, most were considered to be ombrotrophic in nature, meaning that they are rain-fed as opposed to being supported by groundwater. This was due to them either being found above impermeable bedrock or in low-lying topography where surface water and near-surface water drain and pool. M23, M6 and M25 communities within 250 m of turbines and excavations, and 100 m of site infrastructure have the potential to be impacted. Good practice measures outlined below will aim to minimise disruption of groundwater interflow patterns from sections of the GWDTE upslope and downslope of the Proposed Development infrastructure. This includes tracks being spanned with plastic pipes or drainage matting to ensure hydraulic conductivity. Measures to protect GWDTE are based on mitigation and good practice, similar to those outlined already in this document, as well as avoidance of GWDTE habitats during design. The following guidance document(s) are used to inform protection of GWDTE habitats: - SEPA LUPS-GU-31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. The following measures will ensure that water quality and the flow supply of groundwater and near-surface water are maintained during the construction and operational phase of the Proposed Development. Key measures include: - Silt traps may be deployed to trap and filter sediment-laden run-off throughout the construction phase of the Proposed Development; - Settlement lagoons may be constructed and actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. The location and management of the settlement lagoons is essential and will not be sited within vulnerable wetland areas where they may cause drying out and direct loss of habitat; - Flush areas, depressions or zones which may concentrate water flow, will be identified in advance of construction and a suitable drainage design shall be developed to address each location, to ensure hydraulic connectivity; - Site drainage design will avoid any severance of saturated areas to ensure hydrological connectivity is maintained. Site drainage design will be produced in advance of construction; - The length of time excavations are kept open and the duration of any dewatering will be minimised; - All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and - Water from dewatering activities are generally treated by settlement lagoons and will be discharged onto vegetated surfaces, ensuring no net loss of water from the hydrological system. If ponding of water is observed during the discharge onto vegetated surfaces, additional measures may be employed. Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow. These sections will be spanned with plastic pipes or drainage matting to ensure	

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	hydraulic conductivity under the road, and reduce water flow over the road surface during heavy precipitation. Additionally, the following design measures will ensure that effects on wetland habitats are minimised where dewatering will take place: ▪ A PPP is implemented to ensure good practice working methods are followed throughout construction works. ▪ Turbine foundations are constructed in holes in the ground that will be de-watered, and hence water flow is typically into the foundation area. This will prevent concrete leaching into groundwater or surface water in the event of shutter collapse. ▪ All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system. ▪ If required turbine foundations may be dewatered, temporarily lowering water levels in the superficial deposits and near-surface groundwater. The dewatering process would involve the treatment of any extracted water to remove any sediment and redistributing the water onto a vegetated surface in proximity to the excavation, considering the location of GWDTEs within the wider area. This process would not involve any net loss of water from the hydrological system and would ensure that the water being treated is of the same (or similar) quality to what was extracted. Hence, there would not be an unacceptable effect on groundwater or near-surface water supplying GWDTEs. Any dewatering for the construction of turbine foundations is relatively localised and temporary in nature (during construction phase), with shallow groundwater levels anticipated to recover and flow to adjust around turbines on completion.	
	Measures for Onsite Borrow Pits and Excavations The presence of onsite borrow pits and excavations can result in a significant environmental impact to water environment receptors as a result of any dewatering required, exposed ground and sediment-laden run-off. Borrow pits and excavations onsite will be regularly visually inspected by the ECoW to observe if there is any sediment-laden run-off from these areas. There will also be a water quality monitoring programme, across the Site where any changes to water quality or quantity will be monitored during construction and for 3 months post-construction. A 250 m buffer from watercourses was requested by SEPA. This has not been possible, therefore, as per SEPA scoping guidance, inductive drainage / mitigation layouts are provided in EIA Report Volume 3 Technical Appendix 11.2 Section 3.7 of the Outline Water Environmental Management Plan for each borrow pit. These plans are intended to be indicative and may be altered in the detailed drainage design layout, to be produced at a later date prior to construction.	Pre-construction, Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	Measures to Protect Water Environment from Tree Felling and Removal Tree felling is not anticipated, however should tree felling become necessary to facilitate the Proposed Development, the following measures will be implemented during tree felling as part of the Proposed Development to ensure that harvesting methods are in accordance with good practice: - Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains; - Brash will not be stockpiled within 50 m of a watercourse; - Brash mats will be used for vehicle trafficking to protect bare soils; - Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20; - Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation; and - Silt matting if used to be checked on a daily basis and replaced as required.	Pre-construction, Construction, Operation and Decommissioning
	Water Quality Monitoring Programme A surface water monitoring programme will be established prior to the construction phase of the Proposed Development. An indicative monitoring programme is set out below. Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Proposed Development infrastructure and upstream of other non-natural influences, where possible. Regular (daily) visual inspections of surface watercourses are proposed throughout works, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated and remedial action taken to prevent further effects, if necessary. To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis. Details will be agreed with SEPA in advance of construction. The following sampling frequency is proposed in order to establish baseline hydro-chemical conditions of surface water constituents: - Once every month for twelve months prior to the construction phase. - The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions: - Once a month in-situ monitoring and sampling for the duration of the construction phase; and - Once a month in-situ monitoring and sampling for 3 months during the post construction phase. Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures.	Pre-construction, Construction, Operation and Decommissioning
Chapter 12: Noise	Construction Noise The good practice measures will be implemented to include: Operations shall be limited to times agreed with the Council;	Construction

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- Deliveries of turbine components, plant and materials by HGV to site shall only take place by designated routes and within times agreed with the Council; - The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as advocated in BS 5228-1:2009; - Where practicable, the work programme will be phased, to reduce the combined effects arising from several noisy operations; - Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens; - All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions; - Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g., abnormal load movement; and - Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g. generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, $L_{Aeq,night}$ shall not be exceeded at the nearest noise-sensitive receptors. In the event that stone is required to be extracted from borrow pits by blasting, the following process would be employed to ensure that the effects of blasting noise and vibration on nearby properties are adequately controlled: - Compliance with deemed planning permission conditions specifying limits to vibration resulting from blasting, restrictions on times of blasting, and a requirement for vibration monitoring; - Preparation of a Scheme of Blasting, which will be submitted to the Council for approval prior to the commencement of any blasting; - Any blasting on-site would only take place between the hours of 10:00 to 16:00 on Monday to Friday inclusive and 10:00 to 12:00 on Saturdays, with no blasting taking place on a Sunday unless otherwise approved in advance in writing by the Council; and - Provision of information on blasting to neighbouring residents.	
	Operational Noise The Proposed Development is able to operate in compliance with the requirements of ETSU-R-97 without additional mitigation. Residual effects are the same as the operational effects.	Operation
Chapter 13: Traffic and Transportation	Construction Traffic Management Plan A Traffic Management Plan which would be agreed in consultation with Transport Scotland and the Council, which will incorporate measures such as: - As far as reasonably possible, deliveries should be scheduled outside of school opening and closing times; - All contractors will be provided with an induction pack containing information on delivery routes and any restrictions on routes including the presence of schools and other amenities within the Study Area;	Construction

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- Drivers are to be reminded of the presence of 20mph temporary speed restrictions on the main roads outside of these schools and that strict adherence to these speed limits is expected of all wind farm personnel; - Communications with local communities should be undertaken for planned activities such as turbine deliveries and concrete delivery days; - Drivers of all delivery vehicles will be made aware of the approved route to the Site and any restrictions. Drivers of HGVs and other vehicles will be made aware that only the approved route is to be used and that access from non-approved routes is prohibited. - Prior to the commencement of construction, the Principal Contractor will install temporary construction phase signage on the approved route to the Site to warn people of construction activities and associated construction vehicles. Pedestrian and road user safety will be enhanced via the installation of signage and the maintenance of sight lines; - The Principal Contractor will develop a logistics plan highlighting the access point for the Proposed Development, loading bay, pedestrian / vehicular segregation, welfare, storage, security and material handling that would be enforced following the full Proposed Development Area establishment; - Consideration of how a banksman and/or controlled convoy system would be used to improve the safety and efficiency of transport once they leave the A76(T) and join the C128 Blackaddie Road and the C125N; - To ensure that deliveries do not arrive in a convoy, the construction material 'lay down' areas will allow for a staggered delivery schedule throughout the day, avoiding peak and unsociable hours (i.e. before 06:00 and after 22:00); - An integral part of the progress meetings held with all trade contractors is the delivery schedule pro-forma. All contractors will be required to give details of proposed timing of material deliveries to the Site. At this stage, they would be given a specific area for delivery; - Under no circumstances will HGVs be allowed to lay up on surrounding roads. All personnel in the team will be in contact with each other and with Site management, who in turn will have mobile and telephone contact with the subcontractors; and - Roads will be maintained in a clean and safe condition. A wheel washing facility would be installed on-site during construction to reduce mud and debris being deposited onto the local road network.	
Chapter 14: Socio-Economics, Recreation and Tourism	Embedded Mitigation Mitigation by design achieved through an iterative design process, mitigating the potential impacts on Southern Upland Way users.	Pre-submission
	Outline Access Management Plan (oAMP) An outline access Management Plan to be provided to safely manage access to the Southern Upland Way (SUW) which sits within the site boundary. A full AMP will be created in conjunction with the Council's Principal Contractor, Access Officer and Southern Upland Way Rangers to mitigate any impacts that users of the SUW within the Site may experience during the construction, operational and decommissioning phases of the Proposed Development. The oAMP contains the following mitigation measures:	Pre-construction, Construction, Operation and Decommissioning

Environmental Subject Area	Mitigation Proposed for the Development	Timing
	- Notification of the timings, nature and duration of construction works, as well as their impacts on the utilisation of the SUW at this time. This will be communicated in advance to community councils as well as through relevant platforms such as Scotways/Council/project website or by placing posters in public buildings like Sanquhar Library; - Communicating with residents, businesses and third-parties in close proximity to the SUW by letter advising of working hours and timetables; - Advance signage on public roads, the SUW and CDM locations to warn people of works that could interfere with their route/warn them of potential unexpected vehicle movements; - Erection of signage along the SUW during construction works which will include regular updates on the programme; - Installation of fencing or rope barriers to guide recreational users safely along the recognised route of the SUW rather than along the construction access track. This would also be managed by the on-Site contractors; and - Potential for areas of the SUW which fall within the Site in close proximity to construction traffic to have some localised, temporary delays for walkers (at maximum a matter of 15 minutes). This will be managed by on-Site contractors and would occur on the occasion that traffic loads are coming into, or leaving, the Site. - Specific training for service crews regarding the potential for ice throw; - Monitoring of ice risk conditions by Site maintenance personnel; and - Warning signage at access points to the Site to notify the public of the risk of ice fall from turbines. Warning signage will also be placed on/near turbine towers that pass the SUW and are theoretically within ice throw distance (Turbines 1, 3, 4, 7 and 8). This will advise members of the public to stand back from the turbines and to take care when nearby and in-line with turbine blades, under icy conditions.	
Chapter 15: Climate Change and Carbon Balance	Embedded Mitigation The design choices made as a consequence of the key constraints are considered to be mitigation which is 'embedded' in the design; the following are most relevant for the CCIA: - Proposed Development infrastructure built to withstand strong windspeeds and to harness energy; - Turbine spacing (3 x 5 rotor distance) sufficient to reduce turbulence effects on turbines downwind; - Turbines are located to maximise energy generation while minimising environmental impacts; - The Proposed Development design aims to minimise environmental impacts e.g., through use of existing track layout; - Turbines, and associated infrastructure, have not been sited in areas of deep peat to minimise peat disturbance; - Implementation of a final CEMP, PMP etc. (to be agreed with the LPA and selected consultees by condition prior to construction) during construction to minimise environmental impacts and peat disturbance; and 50m buffers from watercourses incorporated in layout design, protecting water quality and also protecting Proposed Development infrastructure from flooding.	Pre-submission

Environmental Subject Area	Mitigation Proposed for the Development	Timing
Chapter 16: Other Issues	Shadow Flicker Shadow flicker effects may require mitigation should complaints be received. Several forms of shadow flicker mitigation are available, including: - Control at Property: the provision of blinds, shutters, or curtains to affected properties. - Control on Pathway: for example, screening via planting close to an affected property; and - Control at Source: for example, shutdown of turbines at times when effects occur.	Operational
	Telecommunications, Television Receptors and Utilities Mitigation is generally available either through rerouting of any affected links or upgrades to the transmitting and / or receiving apparatus. Examples of technical solutions include: - Changing the receptor height; - Re-orientating the receptor to receive signals from an alternative transmitter; and - Upgrading the receptor system or installation of satellite television. Other below ground infrastructure, such as utilities, could be affected during construction; however, implementation of best practice would ensure that these are not adversely affected during construction or operation.	Pre-construction and Operation
	Aviation Potential mitigation solutions for the Lowther Hill PSR are: - Blanking and in-fill with the Cumbernauld radar; - Blanking and in-fill with the Prestwick Airport Terma radar; and - Utilising the in-built mitigation in the new Indra radar installed at Lowther Hill. To mitigate any effects on military low flying, the MOD response states that “the MOD would request that the development be fitted with MOD accredited aviation safety lighting in accordance with the requirements of the Air Navigation Order 2016.” This lighting will be fitted to the turbines, with the final lighting arrangement agreed with the MOD pre-construction.	Pre-construction and Operation

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