Artfield Forest Wind Farm

Environmental Impact Assessment Report

Volume 2: Main Report

March 2021

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Volume 2: Main Report – Glossary and Abbreviations

The tables below presents general terms that are used in the Environmental Impact Assessment Report.

Term (in alphabetical order)	Definition
Applicant	Artfield Forest Wind Farm Ltd (wholly owned by Statkraft UK Ltd)
Assessment	Process by which information about effects of a proposed plan, project or intervention is collected, assessed and used to inform decision making
Baseline conditions	Environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project
Brash	Cut off tree branches and tree tops
Construction phase	Period during which the building or assembling of a proposed development and its infrastructure is undertaken
Consultation bodies	Organisations that the competent authority is required to consult by virtue of the EIA Regulations
Consultation	Process by which those organisations or individuals with an interest in the area associated with the proposed scheme are identified and engaged as part of the EIA process
Coupe	An area of woodland that has been or is planned for felling
Cumulative impact	Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project. A cumulative impact may arise as the result of (a) the combined impact of a number of different environmental topic-specific impacts from a single environmental impact assessment project on a single receptor/ resource or (b) the combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/resource.
Decommissioning	Period during which a development and its associated infrastructure are removed from active operation
Developable Area	Areas on which the development of site infrastructure is proposed
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact with the importance (or sensitivity) of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.
EIA Regulations	The Electricity Works (Environmental Impact Assessment) (Scotland) regulations 2017 Collective term for the various statutory instruments through which the directives on environmental assessment have been implemented in the UK
Environmental Impact Assessment report	Otherwise known as an EIA report. Document produced in accordance with the EIA directive (as transposed into UK law by the EIA regulations) that reports the outcomes of the EIA process

Term (in alphabetical order)	Definition
European site	Sites that make up the European ecological network (also known as Natura 2000 sites). These include sites of community importance (scis), special protection areas (SPAs) and potential spas (pSPAs), special areas of conservation (SACs) and candidate or possible SACs (cSAC or pSAC), and Ramsar sites.
Forest residue	Non marketable woody matter, small tree tops, branches and tree stumps
Habitats regulations assessment	Assessment of the impacts of implementing a plan or policy on a European site, the purpose being to consider the impacts of a project against conservation objectives of the site and to ascertain whether it would adversely affect the integrity of the site
Habitats regulations	EC Council Directive 92/43/eec, known as the Habitats Directive, was translated into legal obligations in Scotland by the Conservation (natural habitats) Regulations 1994 (most recently amended in 2012). This legislation is more commonly known as the habitats regulations. The Habitats Regulations cover requirements for sites that are internationally important for threatened habitats and species (e.g, Natura sites), species that require strict protection (e.g., European protected species), and other aspects of the Habitats Directive.
Harvesting	Timber felling extraction and haulage
Impact	Change that is caused by an action; for example, land clearing (action) during construction that results in habitat loss (impact)
Mitigation	Measures intended to avoid, reduce and compensate adverse environmental effects
Monitoring	Continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Non-statutory consultee	Organisations and bodies that should be consulted on relevant planning applications
Nutrient enrichment (eutrophication)	Excess richness of nutrients in water or soils which results in adverse effects on the diversity of the biological system, the quality of the water, and the uses to which the water may be put.
Operation	Functioning of a development on completion of construction
Pollution	Any increase of matter or energy to a level that is harmful to living organisms of their environment (when it becomes a pollutant)
Proposed Development	Artfield Forest Wind Farm : The project that the applicant or promoter seeks to implement
Receptor	Defined individual environmental feature usually associated with population, fauna and flora with the potential to be affected by a project
Roosting site (bats)	Place where bats rest or sleep
Roosting site (birds)	Place where birds rest or sleep
Scoping	Process of identifying the issues to be addressed by the environmental impact assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered not significant.
Scoping opinion	Opinion provided by a competent authority that indicates the issues an environmental impact assessment of a proposed development should consider
SG	LDP2 'Wind Energy Development: Development Management Considerations' Supplementary Guidance (Feb 2020)

Term (in alphabetical order)	Definition
Shadow Flicker	A phenomenon caused by the moving shadow of the turbine rotor being cast over a narrow opening, such as a window or open door.
Significance	See 'significance of effect'
Significance of effect	Measure of the importance or gravity of the environmental effect, defined by either generic significance criteria or criteria specific to the environmental topic
Sites of special scientific interest	Main national conservation site protection measure in Britain designated under the wildlife and countryside act 1981
Special area for conservation	Sites designated under EU Directive (82/43/ECC) for the conservation of natural habitats and wild fauna and flora
Special protection area	Sites designated under EU Directive (79/409/EEC) for the conservation of wild birds
SPP	Scottish Planning Policy (2014) – Scottish Government policy on how nationally important land use planning matters should be addressed.
Study area	Spatial area within which environmental effects are assessed (i.e. Extending a distance from the project footprint in which significant environmental effects are anticipated to occur). This may vary between the topic areas.
The 2009 Act	The Climate Change (Scotland) Act 2009
The 2019 Act	The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
The Electricity Act	Electricity Act 1989
The Planning Act	Town and Country Planning Act (Scotland) 1997 as amended by The Planning etc. (Scotland) Act 2006 The provisions of the Planning (Scotland) Act 2019 are also starting to come into force.
Yield Class	An index of productivity of even aged stands of trees

Abbreviation (in alphabetical order)	Expanded Term
AA	Appropriate assessment
AIL	Abnormal Indivisible Load
AM	Amplitude Modulation
ASA	Archaeologically Sensitive Area
ATC	Automatic Traffic Counter
BAP	Biodiversity action plan
BCT	Bat Conservation Trust
BGS	British Geological Society
BoCC	Birds of Conservation Concern
BoP	Balance of Plant
BP	Borrow Pit
CAR	Controlled Activities Regulations
CBBPP	Construction Breeding Bird Protection Plan
CCP	The Scottish Government Climate Change Plan
CDEMP	Construction Demolition Environmental Management Plan

Abbreviation (in alphabetical order)	Expanded Term
CEMP	Construction (or Contract) Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CNAL	Construction Noise Assessment Location
CO_2	Carbon Dioxide
CTMP	Construction Traffic Management Plan
dB	Decibels
DECC	Department of Energy and Climate Change
DfT	Department for Transport
DGC	Dumfries and Galloway Council
DGRSG	Dumfries and Galloway Raptor Group
DGWLCS	Dumfries and Galloway Wind Farm Landscape Capacity Study
DoE	Department of the Environment
DTM	Digital Terrain Model
DUKES	Digest of United Kingdom Energy Statistics
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report or EIA report
ESRI	Environmental Systems Research Institute
EU	European Union
FEH	Flood Estimation Handbook
FL	Flight Level
FML	Fixed minimum level
GFT	Galloway Fisheries Trust
GHG	Greenhouse Gas
GPG	Good Practice Guide
GPS	Global Positioning System
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HER	Historic Environment Record
HES previously HS	Historic Environment Scotland
HGV	Heavy Goods Vehicle
HLA	Historic Land Use Assessment Data for Scotland
HMP	Habitat Management Plan
HRA	Habitats Regulations Assessment
Hz	Hertz
ICOMOS	International Council on Monuments and Sites
IEMA	Institute of Environmental Management and Assessment
IOA	Institute of Acoustics
JL	Japanese Larch

Abbreviation (in alphabetical order)	Expanded Term
km	Kilometre
LBAP	Local Biodiversity Action Plan
LDP	Local Development Plan
LFA	Low Flying Area
Lights	Light goods vehicles
m	Metre(s)
MAGIC	Multi-Agency Geographic Information for the Countryside
mAOD	Metres Above Ordnance Datum
MB	Mixed broadleaves
MBBS	Moorland Breeding Bird Survey
MIC	Maximum Instantaneous Charge
Mtoe	Million tonnes of oil equivalent
MW	Megawatt(s)
NAL	Noise Assessment Location
NC 500	North Coast 500
NCAP	National Collection of Aerial Photography
NCR	National Cycle Route
NERL	NATS En Route Prestwick Centre
NHZ	Natural Heritage Zone
NML	Noise Monitoring Location
NNR	National Nature Reserve
NPF3	National Planning Framework 3 (2014)
NPF3	National Policy Framework 3
NPF4	National Planning Policy Framework 4 – is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019.
NRHE	National Record for the Historic Environment
NRTF	National Road Traffic Forecast
NS	Norway spruce
NSA	National Scenic Areas
NSR	Noise Sensitive Receptor
NVC	National Vegetation Classification survey
OS	Ordnance Survey
PACR	Pre-Application Consultation Report
PAN	Planning Advice Note
PLHRA	Peat Landslide Hazard and Risk Assessment
PMP	Peat Management Plan
POI	Point of Interest
PWS	Private Water Supply
RD	Rotor Diameter(s)
RSA	Regional Scenic Area

Abbreviation (in alphabetical order)	Expanded Term
RSPB	Royal Society for the Protection of Birds
SAC	Special Protection Area
SBL	Scottish Biodiversity List
SEPA	Scottish Environmental Protection Agency
SG	LDP2 'Wind Energy Development: Development Management Considerations' Supplementary Guidance (Feb 2020)
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPAD	Scottish Palaeoecological Archive Database
SPP	Scottish Planning Policy
SS	Sitka spruce
SSP	Species Protection Plan
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SWSEIC	South West Scotland Environmental Information Centre
TMP	Traffic Management Plan
TRO	Traffic Regulation Order
TTA	Tactical Training Area
TTRO	Temporary Traffic Regulation Order
UNFCC	United Nations Framework Convention on Climate Change
UP	Un planted
VMS	Variable Message Signage
VP	Vantage Point
WCMS	Watercourse Method Statement
WLA	Wild Land Area
YC	Yield Class
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Introduction

1.1.1 This Environmental Impact Assessment Report (EIAR) has been prepared by Ramboll UK Limited (Ramboll) on behalf of Artfield Forest Wind Farm Ltd in support of an application for consent[1] to construct and operate a generating station incorporating wind turbine generators, energy storage and associated infrastructure with generation capacity of greater than 50 MW. The project is to be referred to as Artfield Forest Wind Farm ('the Proposed Development'). The Proposed Development will include up to 12 wind turbines on a site located approximately 8 km northwest of Kirkcowan and 15 km west of Newton Stewart, in Dumfries and Galloway, Scotland. The site location is shown in Figure 1.1.

1.1.2 The EIAR comprises five volumes:

- Volume 1: Non-Technical Summary (NTS);
- Volume 2: Main Report;
- Volume 3a: Figures;
- Volume 3b: Visualisations;
- Volume 4: Technical Appendices; and
- Volume 5: Confidential Information

1.2 Purpose and Scope of the EIAR

1.2.1 The EIAR has been prepared to accompany an application to Scottish Ministers under Section 36 of the Electricity Act 1989[2]. The EIAR has been prepared in accordance with The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (herein referred to as the 'EIA Regulations'). The EIAR has been prepared to meet the requirements of Schedule 4 of the EIA Regulations and the Institute of Environmental Management and Assessment (IEMA) Quality Mark Criteria.

1.2.2 The Proposed Development for which the applicant is seeking consent is as follows:

1.2.3 The erection and 30-year operation of a generating station comprising up to 12 wind turbine generators together with ancillary development including internal transformers and related switchgear at each turbine; associated turbine foundations and hardstanding areas; meteorological masts; access tracks with associated water crossings, passing place and turning heads; borrow pits; substation compound; energy storage; temporary site construction compounds; network of electrical cables; batching plant and associated ancillary works (as further described in EIAR Volume 2: Chapter 2: Development Description). The application for consent proposes a main access point into the wind farm directly from the public road west of Tarf Bridge.

[1] An application for consent for the proposed development will be made to the Scottish Ministers under section 36 of the Electricity Act 1989, along with a request for a direction that planning permission be deemed to be granted under section 57(2) of the Town and Country Planning (Scotland) Act 1997 as amended.

[2] Electricity generation projects below 50 MW are authorised under the Town and Country Planning (Scotland) Act, 1997. Those over 50 MW are authorised under Section 36 of the Electricity Act, 1989.

1.2.4 The Proposed Development has a secured distribution (33 kV) grid connection offer, connecting to Newton Stewart substation in 2024. Scottish Power Energy Networks will provide the grid connection, including gaining the necessary consents. The exact route of the connection and the technology solution have not yet been determined. As such, the grid connection is not included within the scope of this EIAR.

1.3 Other Planning Documents

1.3.1 The Application is accompanied by the following documents that do not form part of the EIAR:

- Planning Statement;
- Design and Access Statement; and
- Pre-Application Consultation Report.

1.4 Site History

1.4.1 The eastern section of the Site was previously the subject of a planning consent for Gass Wind Farm, a project developed by Willowind Energy Limited. The Gass Wind Farm project consisted of nine 126.5 m to tip wind turbines (Appendix A: Figure 1.4). The application (planning reference 14/P/1/0674) was approved by Dumfries and Galloway Council (DGC) on 26th August 2015. However, the planning permission for the Gass Wind Farm project lapsed in July 2019.

1.5 The Applicant

1.5.1 Artfield Forest Wind Farm Ltd (the Applicant), is wholly owned by Statkraft UK Ltd. For further information about Statkraft in the UK visit https://www.statkraft.co.uk/.

1.5.2 Statkraft is Europe's largest renewable energy generator and is committed to building out at least 600 megawatts (MW) of onshore wind development in Scotland over the next five years. In Scotland, Statkraft operates three onshore wind farms with a combined capacity of 155.5 MW and are currently constructing another two onshore wind farms. The Scotland team is based in Glasgow.

1.6 EIA Process

1.6.1 EIA is a process that identifies the potential environmental effects (both positive and negative) of a proposed development and proposes mitigation to avoid, reduce and offset any adverse environmental effects.

1.6.2 The Proposed Development is of a type listed in Schedule 2 of the EIA regulations (item (1) "a generating station"). On the basis that "*the development is likely to have significant effects on the environment by virtue of factors such as its nature, size or location*" an Environmental Impact Assessment (EIA) is required. In this case, the Applicant has volunteered to undertake an EIA rather than request a formal screening opinion.

1.6.3 The Applicant acknowledges the exceptional circumstances related to the Covid-19 pandemic. In this regard, some aspects of the scope of the EIA vary from normal practice in order to respond to constraints on normal working practices imposed as a result of the pandemic. All relevant assumptions made and limitations inherent to the EIA have been

recorded with a view to demonstrating that the resulting EIA Report provides a robust basis upon which the competent authorities can make a planning determination.

1.6.4 The key stages in the EIA process adopted for the proposed Artfield Forest Wind Farm are summarised below.

Scoping

1.6.5 The Applicant submitted a request for a Scoping Opinion to Scottish Ministers on 15th May 2020. This request was accompanied by a Scoping Report, prepared by the Applicant, which set out a summary of the proposals; identified the likely significant environmental effects, and summarised the proposed scope of the EIA.

1.6.6 A Scoping Opinion was received from ECU on 20th August 2020. The contents of this and other consultation responses received are summarised in Technical Appendix 1.1: Consultation Register, along with a list of all bodies consulted during the scoping exercise.

1.6.7 In addition to seeking a Scoping Opinion, the Applicant conducted a virtual public exhibition between 24th August 2020 and 18th September 2020, to seek the views of the local community. Live chat sessions were held, as follows:

- 3rd September 2020: between 11am-1pm;
- 3rd September 2020: between 5pm-7pm; and
- 18th September 2020: between 11am-1pm..

1.6.8 A summary of the representations received during the public exhibitions is provided in the Pre-Application Consultation Report (PACR) which accompanies the submission.

1.6.9 Further detail on the key issues identified through the scoping and consultation process are described in Chapter 3: Design Evolution and Alternatives.

1.6.10 Following scoping and baseline characterisation the EIAR provides an impact assessment chapter for each of the following disciplines/factors/issues:

- Landscape and Visual Impacts;
- Ecology;
- Ornithology;
- Hydrology, Hydrogeology and Geology;
- Cultural Heritage;
- Traffic, Transport and Access;
- Noise and Vibration;
- Aviation and Telecommunications;
- Socioeconomics;
- Forestry;
- Shadow Flicker; and
- Climate.

Non-significant Issues

1.6.11 During the scoping process several issues were identified as not being likely to cause significant effects on the environment as a result of the proposed development. These issues are described below.

Air Quality

1.6.12 The proposed development is not considered likely to give rise to significant effects on air quality. There is potential for it to give rise to some localised and temporary construction-related air quality effects associated with dust (foundation construction, passage of vehicles along access tracks) and construction plant and traffic exhaust emissions. However, the nature of the construction activities is that they will be relatively short term, intermittent and controllable through the application of good construction practice, and also at sufficient distance from sensitive receptors to be considered low/negligible impact.

1.6.13 The potential for nuisance effects on residential or recreational amenity will be limited and will be strictly controlled in accordance with a detailed Construction Environmental Management Plan (CEMP). An Outline CEMP is included in EIAR: Volume 4: Technical Appendix 2.1. On this basis, there is no potential for significant construction or operational air quality effect and no Air Quality assessment has been undertaken as part of the EIAR.

Ice Throw

1.6.14 The maximum potential distance of ice falling from turbines can be approximated using the formula 1.5 x (rotor diameter + hub height)[3]. For the proposed development, the maximum distance from a turbine where ice could be expected to fall is therefore approximately 382.5 m. Through site design, the risk to public safety is considered to be very low because the distance from the turbines to the nearest public road, residential property or core path is greater than 382.5 m. In line with current guidance[4], a permanent warning sign at the site's entrances is proposed to alert the public to the possibility of ice throw under certain weather conditions. Considering the above, no potential significant impacts as a result of Ice Throw from the proposed development are anticipated and no ice throw assessment is provided within this EIAR.

Land Use and Agriculture

1.6.15 On the basis that the land within the proposed development is predominantly used for plantation forestry, low intensity grazing and that only a small proportion of the area within the site (access tracks and tower bases) would be affected, the proposed development would not result in significant effects in terms of loss of the existing land. The construction work may result in some temporary loss of land or access restriction; however, it is considered that this can be adequately managed through agreements with the relevant parties. The permanent loss of land would be negligible, and it would remain possible for grazing and other rural/sporting land uses to continue around and within the site.

1.6.16 Overall, the proposed development would not materially affect choices regarding the type or intensity of other land operations, and, would not require any significant management changes. As such, no further assessment of land use or agriculture is included as part of the EIAR.

Major Accidents and Disasters

1.6.17 The EIA regulations require the consideration of the potential risks to human health, cultural heritage or the environment associated with the vulnerability of the proposed development to accidents and disasters. This requirement is interpreted as requiring the consideration of

[3] Seifert, H., Westerhellwg, A. and Kroning, J. (2003) Risk Analysis of Ice Throw from Wind Turbines. *Boreas,* 6.

[4] Scottish Renewables, Scottish Natural Heritage, SEPA and Forestry Commission Scotland (2015) Good Practice During Wind Farm Construction, Version 3, URL http://www.snh.gov.uk/docs/A1168678.pdf (Accessed 22/07/19).

high consequence events (even if of low likelihood) which would result in serious harm or damage to environmental receptors.

1.6.18 Given the nature of the proposed development, the potential for effects related to the vulnerability to accidents and disasters is likely to be limited to those effects associated with extreme weather, mechanical failure or structural damage. Relevant types of accident/ disaster, given the predominantly rural context of the proposed development, include:

- severe weather events, including high winds, high rainfall leading to flooding, or extreme cold leading to heavy snow and ice loading;
- fire;
- traffic related accidents; and
- mass movement associated with ground instability.

1.6.19 Severe weather resilience will be a core component of the wind farm design, and, includes consideration of flooding resilience and the ability to manage the site remotely in the event that it is inaccessible due to hazardous weather conditions. The wind farm design will include consideration of designing out health and safety risks associated with construction and operation (including accidents and disasters associated with fire and traffic movements) in accordance with the duties under The Construction (Design and Management) Regulations 2015.

1.6.20 Potential risks and hazard associated with mass movement (peat instability) have been assessed and presented as part of the EIAR in Volume 4: Technical Appendix 2.5: Peat Landslide Hazard and Risk Assessment.

1.6.21 No other potential significant effects on human health, cultural heritage or the environment associated with the vulnerability of the proposed development to accidents and disasters have been identified and therefore no specific Major Accidents and Disasters assessment has been included in the EIAR.

Baseline Characterisation

1.6.22 Baseline characterisation is the process by which the environmental conditions now and in the future assuming no development on the site are established. The process has included a combination of desk research, site survey and empirical study and projection.

1.6.23 The environmental baseline adopted for the purposes of the EIA is stated in each of the technical assessment chapters provided in the EIAR. The baseline is normally taken as the current character and condition of the site and surrounds, and the likely significant environmental effects of the development are then assessed in the context of the current conditions.

Mitigation by Design and Consideration of Alternatives

1.6.24 Following the baseline characterisation, the information collected on environmental constraints was used to inform the consideration of design alternatives. An iterative process was followed, whereby the Applicant considered a range of turbine layouts, tip heights, rotor sizes and access options. The aim of the design element of the EIA process was to develop an optimal solution which seeks to maximise potential renewable energy generation, within technical and environmental constraints. The main aim has been to avoid likely significant environmental effects through the design. Further details on the design process adopted in

the development of the proposed Artfield Forest Wind Farm are set out within Chapter 3: Design Evolution and Alternatives.

Impact Assessment

1.6.25 The next stage in the EIA process was to complete an impact assessment to address the likely significant effects remaining following the implementation of mitigation by design. An assessment chapter has been provided for each issue where it is considered that there are likely significant effects associated with the construction, operation, decommissioning or restoration phases of the proposed development. Each assessment chapter considers primary, secondary, direct, indirect and cumulative effects and defines the assessment methodology used and the criteria by which a significant effect is defined.

Additional Mitigation

1.6.26 The impact assessment is used to identify where additional mitigation is required to address likely significant effects, where it has not been possible to avoid the effect through design of the turbine or infrastructure layout. Mitigation has been considered following a hierarchy of first seeking to avoid effects, followed by seeking a reduction in effects to a level not considered significant, and finally where necessary and possible, offsetting or compensatory measures are considered.

Statement of Competence

1.6.27 In accordance with regulation 5(5) of the EIA Regulations, by appointing Ramboll UK Limited (Ramboll) the Applicant has ensured that the EIAR has been prepared by 'competent experts'. The EIAR has been compiled and approved by professional EIAR practitioners at Ramboll, holding relevant undergraduate and post-graduate degrees, membership of the Institute of Environmental Management and Assessment (IEMA) and Chartered Environmentalist status with the Society for the Environment. The EIAR meets the requirements of the IEMA EIA Quality Mark Scheme. This is a voluntary scheme operated by IEMA that allows organisations to make a commitment to excellence in EIA and to have this commitment independently reviewed on an annual basis.

1.6.28 The project team comprises the companies presented in Table 1.1 below. A compiled statement on the competence of the lead authors of the technical reports is included in Technical Appendix 1.2 (EIAR: Volume 4) and each of the impact assessment chapters provides details of the relevant professional memberships of the author, code or practice followed and assessment methodology used.

Table 1.1: Project Team

Team Member	Roles & Responsibility
Statkraft UK Ltd	Project Developer and owner of Artfield Forest Wind Farm Ltd
Ramboll UK Limited	EIA Project Management Landscape and Visual Impact Assessment Hydrology, Hydrogeology, Geology Peat Socioeconomics Shadow Flicker Climate
Avian Ecology	Ecology Ornithology

Table 1.1: Project Team	
Team Member	**Roles & Responsibility**
AOC Archaeology	Cultural Heritage & Archaeology
TNEI	Noise
Pell Frischmann	Traffic & Transport
Aviatica	Aviation and Telecommunications
McKay Forestry	Forestry

1.7 Copies of the EIAR

1.7.1 Paper copies of the EIAR and other documentation are normally made available to view at publicly accessible locations.

1.7.2 The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 were laid in Scottish Parliament on the 14th April 2020. These regulations make temporary modifications to the usual requirements placed on developer companies to make physically available application and EIA documentation for public inspection in named places within the locality of proposed developments, with respect to applications made under section 36 or section 37 of the Electricity Act 1989. The modifications require that companies making applications, or submitting further environmental information in connection with a live application, instead provide that all required documentation is available electronically for public inspection.

1.7.3 As such, the EIAR, including all figures, technical appendices and accompanying documents are available to view on the project website (www.artfield-forest.co.uk).

1.7.4 The application documents will be available via the Scottish Government energy consents portal (https://www.energyconsents.scot/Default.aspx).

1.7.5 For anyone who has difficulty accessing the documentation online, a CD or USB copy can be made available on request by calling 0800 772 0668.

1.8 Commenting on the Application

1.8.1 When the application for the proposed development is lodged with Scottish Government the applicant will advertise the application in accordance with legislation as follows:

- Edinburgh Gazette for one week;
- A national newspaper for one week;
- The Stranraer & Wigtownshire Free Press for two weeks;
- Dumfries & Galloway Standard for two weeks; and
- on the developers' application website at www.artfield-forest.co.uk.

1.8.2 The advertisement will provide details of the date by when representations should be made. The Scottish Government will invite formal representations on the proposed development, which will be taken into account before any decision is reached on the application.

1.8.3 Any representations in relation to the application should be made to the Energy Consents Unit mail box, at representations@gov.scot, via the Energy Consents website at www.energyconsents.scot or by post to The Scottish Government, Energy Consents Unit, 4th

Floor, 5 Atlantic Quay, 150 Broomielaw, Glasgow, G2 8LU, identifying the proposed development and specifying the grounds for representation. Written or emailed representations should be dated, clearly stating the name (in block capitals), full return email and postal address of those making representations.

2 Development Description

2.1 Introduction

2.1.1 This chapter provides a description of the Proposed Development for the purposes of identifying and assessing likely significant effects. Information is provided on:

- the location of the Proposed Development;
- the physical characteristics of the development, including, the land-use requirements during the construction and operational phases;
- the main characteristics of the construction and operational phase of the development having regard to the type and quantity of expected residues and emissions; and
- typical activities associated with the decommissioning of the Proposed Development.

2.1.2 This chapter is supported by the following technical appendices which are presented in Volume 4: Technical Appendices of the EIAR:

- Technical Appendix 2.1: Outline Construction Environmental Management Plan (OCEMP);
- Technical Appendix 2.2: Borrow Pit Assessment;
- Technical Appendix 2.3: Peat Survey Results;
- Technical Appendix 2.4: Peat Management Plan;
- Technical Appendix 2.5: Peat Landslide Hazard and Risk Assessment

2.1.3 Figures 2.1 to 2.10 are presented in Volume 3a: Figures of the EIAR and are referred to in the text as appropriate. The figures are as follows:

- Figure 2.1: Site Layout;
- Figure 2.2: Typical Wind Turbine Elevation;
- Figure 2.3: Typical Turbine Foundation and Crane Hardstanding Dimensions;
- Figure 2.4: Typical Access Track Detail;
- Figure 2.5a-c: Typical Watercourse Crossing Detail;
- Figure 2.6: Typical Substation and Control Building Layout;
- Figure 2.7: Typical Energy Storage Facility Layout;
- Figure 2.8: Typical Temporary Construction Compound Layout;
- Figure 2.9: Typical Anemometer Mast; and
- Figure 2.10: Typical Cable Trench Section

2.2 Site Location and Context

2.2.1 The Proposed Development Site ('the Site') covers an area of approximately 800 hectares (ha) and is located approximately 8 km northwest of Kirkcowan and 15 km west of Newton Stewart, Dumfries and Galloway, Scotland (approximate OS Grid Reference for Site centre: (NX 24367 66928 as illustrated in EIAR Volume 3a: Figure 1.1: Site Location).

2.2.2 Operational wind farms are an existing feature of the surrounding landscape. As illustrated on EIAR Volume 3a: Figure 1.2: Site Context, Kilgallioch wind farm is located to the north, Airies wind farm to the east, Glenchamber wind farm to the southwest and Artfield Fell and Balmurrie Fell wind farms are located directly west of the Site.

2.3 Description of Physical Characteristics

2.3.1 For the purposes of this EIAR, the Proposed Development would comprise up to 12 turbines of maximum tip height of 180 m[1] along with associated infrastructure, arranged as illustrated on Figure 2.1: Site Layout. The Proposed Development would include the following key components:

- Up to 12 three-bladed horizontal axis wind turbines with a maximum tip height of 180 m[1] (EIAR Volume 3a: Figures 2.1: Site Layout and 2.2: Typical Wind Turbine Elevation);
- Internal/ external transformers and related switchgear at each turbine;
- Permanent foundation and associated crane hardstanding at each turbine location (EIAR Volume 3a: Figure 2.3: Typical Turbine Foundation and Crane Hardstanding Dimensions);
- A network of on-site access tracks, with associated watercourse crossings, intervisible passing place and turning heads, connecting between turbines using both new and upgraded existing tracks (EIAR Volume 3a: Figure 2.1: Site Layout; Figure 2.4: Typical Access Track; and Figure 2.5: Typical Watercourse Crossing Detail);
- A control building and substation compound (selecting one of two options (EIAR Volume 3a: Figure 2.6: Typical Substation and Control Building Layout);
- An energy storage facility (selecting one of two options) (EIAR Volume 3a: Figure 2.7: Typical Energy Storage Facility Layout);
- Two temporary construction compounds and laydown area (including concrete batching plant) (EIAR Volume 3a: Figure 2.8: Typical Temporary Construction Compound Layout);
- Search areas of up to four borrow pits (EIAR Volume 3a: Figure 2.1: Site Layout);
- A permanent anemometer mast or LiDAR compound including associated foundations and hardstanding (EIAR Volume 3a: Figure 2.9: Typical Anemometer Mast);
- A main Site entrance on C3w (existing Gass Farm entrance), for use during construction and operation, designed to accommodate abnormal indivisible loads required for turbine component;
- A secondary Site access for use during construction only;
- A network of underground cable arrays within the Site connecting the turbines to the on-site substation (EIAR Volume 3a: Figure 2.10: Typical Cable Trench Section);
- Forestry felling and restocking and associated ancillary work; and
- Engineering operations which includes for example turbine foundations, access tracks, and peat excavation and restoration work.

2.3.2 The locations of the proposed turbines and other infrastructure would be constructed in the locations shown in Figure 2.1: Site Layout. However it would be permitted to adjust the location of the wind turbines, substation, control building, energy storage area, hardstanding areas, access tracks, temporary construction compound(s), borrow pit(s) or mast subject to restrictions set out in an appropriately worded planning condition. This process allows for minor changes in turbine or infrastructure locations to respond to possible variations in ground conditions across the Site, which would only be confirmed following detailed site investigation work carried out immediately prior to construction. This process also provides scope for further mitigation of localised potential environmental effects through avoidance of sensitive features. For the purposes of the EIA it is anticipated that no micrositing of more than 50 m from the position shown in Figure 2.1: Site Layout, except as permitted following written

[1] Maximum tip height of 180 m is being used in the EIAR for assessment purposes only.

approval of Dumfries and Galloway Council (DGC). Micrositing would be carried out under the supervision of an ecological clerk of works (ECoW) and an appropriately experienced and qualified engineer.

Wind Turbines and Turbine Layout

2.3.3 The turbine coordinates of the proposed turbines are set out in Table 2.1: Turbine Locations and Met Mast.

Table 2.1: Turbine Locations and Met Mast

Turbine Number	Easting	Northing
1	222922	569174
2	223529	569173
3	222907	568795
4	223539	568745
5	222556	568392
6	223260	568206
7	223700	568345
8	223753	567904
9	224092	567786
10	224553	567788
11	224381	567472
12	224800	567475
Met Mast	224592	567257

2.3.4 As described in paragraph 2.3.2, these locations would be subject to micrositing during the construction phase. The Construction Environmental Management Plan (CEMP) would include detailed guidance on the application of the proposed micrositing tolerance. An OCEMP is included in EIAR Volume 4: Technical Appendix 2.1: OCEMP.

2.3.5 The exact model of wind turbine to be installed at the Proposed Development would be selected through a competitive procurement process. An indicative turbine for the wind farm is shown on Figure 2.2 Typical Wind Turbine Elevations.

2.3.6 Wind turbines are available in a variety of colours, the most common being white, off-white or light grey. The finish is normally semi-matt. The colour of the turbines would be agreed in consultation with Dumfries and Galloway Council (DGC).

2.3.7 Based on current (2020) wind turbine generator technology the typical generation capacity for a turbine of the size and design proposed would be between 5 MW to 7 MW.

Permanent Land Take

2.3.8 The Site area is approximately 800 ha (EIAR Volume 3a: Figure 2.1: Site Layout). Within this area the permanent land take would be limited to the wind turbine hardstanding area, access tracks, permanent crane hardstandings, met mast hardstanding, substation and energy storage hardstandings which account collectively for about 1.38% of the total area within the Site.

2.3.9 The turbine foundation (EIAR Volume 3a: Figure 2.3: Typical Turbine Foundations and Crane Hardstanding Dimensions) is made up of a central excavation of approximately 22 m diameter

and an approximate depth of 3 m to 4 m subject to prevailing ground conditions. Sloping batters would increase the excavated area to approximately 32 m diameter at ground level.

2.3.10 Each turbine requires a crane hardstanding to facilitate construction and maintenance. At each turbine there would be an approximately 3,430 m² permanent hardstanding (EIAR Volume 3a: Figure 2.3: Typical Turbine Foundations and Crane Hardstanding Dimensions).

2.3.11 A 2 m wide maintenance hardstanding would be created around the base of each turbine. The foundation excavation would be backfilled and covered with soil; the foundations would be approximately 2.5 m to 1.5 m deep, leaving only the concrete plinth exposed at ground level to which the steel tower would be attached.

2.3.12 The Proposed Development would result in the construction of approximately 6.25 km of new track. The required running width of the track would be typically a minimum of 5 m on straight sections, with 0.5 m to 1 m wide shoulders on each side. Tracks would be wider on bends. The Proposed Development includes approximately 0.5 km of new track that would only be 4 m wide (including shoulders) for light vehicles. Typical access track details are presented on Figure 2.4: Typical Access Track Detail (EIAR Volume 3a). The total permanent land take area for the new tracks would be approximately 37,429 m², which includes the area for turning heads.

2.3.13 The Proposed Development also includes for the upgrade of 3.05 km of existing forestry track and the use of another 2.15 km of forestry tracks where upgrade is not required. The total permanent land take area for the upgraded tracks would be approximately 16,372 m².

2.3.14 The substation compound would have a footprint of approximately 5,000 m² (50 m x 100 m) (EIAR Volume 3a: Figure 2.6: Typical Substation and Control Building Layout). The substation building would require an approximate area of 300 m² (20 m x 15 m) within the substation compound.

2.3.15 The energy storage facility would take up an area of approximately 10,000 m² (100 m x 100 m) (EIAR Volume 3a: Figure 2.7: Typical Energy Storage Facility Layout).

2.3.16 One meteorological mast is proposed, with a hardstanding footprint of approximately 625 m² (25 m x 25 m) (EIAR Volume 3a: Figure 2.9: Typical Anemometer Mast).

Temporary Land Take

2.3.17 The excavation area around each turbine could be up to 800 m² and would be temporary. In addition to the permanent hardstanding, an additional 484 m² of temporary hardstanding for blade fingers and secondary crane pads during the construction phase would be required (EIAR Volume 3a: Figure 2.1: Site Layout).

2.3.18 The main construction compound, located at the Site entrance, would require a hardstanding area of approximately 5,000 m².

2.3.19 The temporary satellite construction compound (northern CC) would require a hardstanding area of approximately 2,500 m² (50 m x 50 m), which allows area for staff parking, welfare and plant and material storage. This area would be re-vegetated after construction is complete (EIAR Volume 3a: Figure 2.1 : Site Layout and Figure 2.8: Typical Temporary Construction Compound Layout).

2.3.20 The temporary concrete batching plant would locate either within the footprint of the temporary construction compound described above or within a borrow pit excavation area.

2.3.21 Most of the potential borrow pit excavation areas identified are irregular in shape with approximate parameters provided in Table 2.3 below. The total potential excavation area from all four borrow pits combined would be approximately 17,102 m².

2.3.22 Ancillary excavation works and material storage around other parts of the Proposed Development, such as those for cable trenching, would have a negligible impact on environmental receptors due to the very minor scale of the excavation or duration of the works and are not considered further in this EIAR.

2.3.23 The area of temporary and permanent land take associated with the Proposed Development is presented in Table 2.2: Summary of Temporary and Permanent Land Take.

Table 2.2: Summary of Temporary and Permanent Land Take

Energy Project Element	Temporary (m²)	Permanent (m²)
Turbines, Crane Pads and Laydown Areas	5,808 (12 x 484 m²) + 9,600 (12 x 800 m²) = 15,408	41,160 (12 x 3,430 m²)
Met Mast	0	625
On-site Access Tracks (New)	0	37,429
On-site Access Tracks (Existing upgrade)	0	16,372
Substations	0	5,000
Energy Storage Facility	0	10,000
Construction Compounds	7,500 (2,500 + 5,000)	0
Borrow pits potential excavation area	17,102	0
Total Land Take	40,010	110,586

Turbine Foundations and Hardstanding

2.3.24 Turbines are typically fixed to reinforced concrete foundations, approximately 22 m in diameter. The foundations would be formed in excavations approximately 3 m to 5 m deep, depending upon ground conditions (EIAR Volume 3a: Figure 2.3: Typical Turbine Foundations and Crane Hardstanding Dimensions).

2.3.25 Prior to excavation, topsoil and existing vegetation will be lifted and stored. After completion the foundation will be backfilled with suitable excavated or imported material and the original vegetation will be reinstated around the permanent hardstanding areas where possible.

2.3.26 Concrete for site construction, including turbine foundations, be batched on-site where possible.

2.3.27 The turbines would be erected using mobile cranes. These require areas of hardstand adjacent to the turbine locations, which can support the load of the cranes on their outriggers. The permanent hardstands, approximately 3,430 m², and approximately 484 m² of temporary hardstands at each turbine, are formed by excavating soft ground, and infilling with compacted stone (EIAR Volume 3a: Figure 2.3: Typical Turbine Foundations and Crane Hardstanding Dimensions). Temporary hardstand areas would be required for laydown of turbine components and for a support crane to assist the main erection crane.

Turbine Lighting

2.3.28 Article 222 of the Air Navigation Order (2016)[2] (ANO) requires that proposed 'en route obstacles' 150 m or higher above ground level are fitted with medium intensity steady red lights positioned as close as possible to the top of the obstacle and low intensity steady state lights at intermediate levels. The Proposed Development will be fitted with lighting to comply with the ANO and the relevant Civil Aviation Authority (CAA) policy statement[3]. Based on guidance at the time of writing, this will comprise a medium intensity light fitted to the nacelle and low intensity lights fitted at half the nacelle height, plus or minus 10 m to provide 360 degree visibility. In accordance with CAP764, all of the turbines would be lit with the exception of T3 and T9 , providing all 'perimeter' turbines with lighting.

Electrical Cabling

2.3.29 Electrical connections from the wind turbines to the on-site electrical substation and control building will be made via underground cables. All power and cabling on-site will be laid in trenches approximately 1.5 m wide and 1 m deep, located adjacent to the access tracks, in the verge or close to the track which will allow for easy access to lay the cable. Typical cable trench detail is illustrated in Figure 2.10: Typical Cable Trench (EIAR Volume 3a).

On-site Substation and Compound

2.3.30 The substation compound would measure approximately 50 m x 100 m and would include a control building.

2.3.31 The electrical cables would terminate at the substation and control building, which is likely to be approximately 300 m² in size. The substation and control building together would comprise switchgear, control equipment, basic welfare facilities including a toilet and parking area (EIAR Volume 3a: Figure 2.6: Typical Substation and Control Building Layout).

Energy Storage Facility

2.3.32 Located adjacent to the substation and control building would be an energy storage facility measuring approximately 100 m x 100 m containing battery containers, switchgear container, power conversion systems and security fencing (EIAR Volume 3a: Figure 2.7: Typical Energy Storage Facility Layout).

Temporary Construction Compounds

2.3.33 Two temporary construction compounds (CC) would be required to enable construction of the Proposed Development. The compounds would be located as shown on Figure 2.1: Site Layout (EIAR Volume 3a). Each compound area would include:

- access tracks and internal circulation routes for vehicles and pedestrians;
- lighting for security and safety during hours of darkness;
- surface water management measures;
- temporary office accommodation and welfare buildings (toilets, kitchen/ canteen, drying rooms);
- equipment storage;
- a receiving area for incoming vehicles;
- maintenance and refuelling facilities;

[2] URL: https://www.legislation.gov.uk/uksi/2016/765/article/222/made (accessed 03/11/2020)

[3] CAA Policy and Guidelines on Wind Turbines, CAP 764 (Draft June 2020)

- waste, recycling and materials management facilities;
- general laydown areas; and
- parking.

2.3.34 The temporary construction compounds' approximate areas would be as follows:

- Main CC: 5000 m²; and
- Northern CC: 2500 m².

2.3.35 The indicative layout of the temporary construction compounds are shown in EIAR Volume 3a: Figure 2.8: Typical Temporary Construction Compound Layout.

Permanent Meteorological Mast

2.3.36 It is proposed that there would be one meteorological mast on-site measuring up to hub height (EIAR Volume 3a: Figure 2.9: Typical Anemometer Mast). The meteorological mast would require a hardstanding area of approximately 625 m² (25 m x 25 m). The locations of the meteorological mast can be found on Figure 2.1: Site Layout (EIAR Volume 3a).

Access and Site Tracks

2.3.37 Access to Site would be taken from an existing entrance on C3w for use during construction and operation, designed to accommodate abnormal indivisible loads required for turbine component delivery. The Proposed Development also includes a secondary Site access for use during construction only, located southwest of Low Airies, through Meike Cairn. For more information on the delivery route to the Site see EIA Volume 2, Chapter 10: Traffic and Transport.

2.3.38 Approximately 6.25 km of new on-site access tracks; approximately 3.05 km of upgraded track and approximately 2.15 km of existing forestry track (where upgrade is not required) would be required to provide access to the wind turbines, substation compound, borrow pit search areas and construction compounds (Figure 2.1: Site Layout). Typical access track designs are shown in Figure 2.4: Typical Access Track Detail (EIAR Volume 3a). This figure shows the use of typical cut and fill access tracks.

2.3.39 The majority of tracks would have a 5 m running width with appropriate shoulders and widening on bends, at junctions and passing places. Tracks where it will only be accessed by light vehicles will be 4 m wide (including shoulders) (EIAR Volume 3a: Figure 2.1: Site Layout). The access track will be provided with intervisible passing places, where required.

2.3.40 In areas where the peat and topsoil are consistently less than 1 m deep, the vegetation and soil would typically be stripped to a suitable subsoil layer and the track (approximately 300 mm to 500 mm thick) would be constructed on the subsoil. The upper topsoil layer, together with turf, would be used in landscaping and revegetating the track shoulders and track side drainage, where possible.

2.3.41 Once the soil has been removed, as described above, to a suitable founding layer, the road and running surface would be constructed by laying a geotextile followed by tipping and compacting aggregate to the required depth. Cross-sections of a typical track build up following reinstatement are presented in Figure 2.4: Typical Access Track Detail (EIAR Volume 3a).

2.3.42 Where peat depths of 1 m or greater are identified and suitable engineering criteria are met, for example shallow topography (below 5%), the Proposed Development would use floating

road construction. It is anticipated that there would be a maximum of 1.55 km of floating track. The use of 'floating roads' in areas of deep peat eliminates the need for excavation.

2.3.43 The on-site track layout has been designed to minimise environmental disturbance and land take by wherever possible using existing tracks, avoiding areas of deeper peat and steep slopes in excess of 12 degrees as well as, wherever possible, avoiding or minimising areas of identified environmental constraints.

2.3.44 The track layout has been carefully designed to minimise the number of watercourse crossings where possible, which are discussed in the section below.

Borrow Pits

2.3.45 Borrow pit (BP) search areas have been identified covering a total of approximately 91,168 m² to supply material to construct the Proposed Development (coordinates provided in Table 2.3: Borrow Pit Search Areas). The use of all of these borrow pits would provide a greater volume of rock than would be needed for the construction of the Proposed Development but allows for the current uncertainty of the quality of the rock at these locations. It is likely that only some of the borrow pit search areas would be required. For the purposes of the assessment all four borrow pits will be assessed (EIAR Volume 4: Technical Appendix 2.2: Borrow Pit Assessment).

Table 2.3: Borrow Pit Search Areas

Borrow Pit Search Area No.	NGR Reference (Centre)		Search Area Approx. Dimensions (m)	Search Area (m²)	Potential Excavation Area Approx. Dimensions (m)	Potential Excavation Area (m²)
BP1	224817	566013	137 x 240	34,543	80 x 90	7,275
BP2	224637	566888	126 x 347	44,463	50 x 100	5,088
BP3	225918	567227	60 x 100	6,162	30 x 50	1,751
BP4	222961	568838	60 x 100	6,000	35 x 85	2,988

2.3.46 Stone would be required for various purposes, primarily track and hardstanding construction. If the stone on-site is found suitable then a proportion of this could be won from foundation excavation and the remainder will be sourced from on-site borrow pits or from off-site quarries.

Connection to Electricity Grid

2.3.47 The Proposed Development would connect to the Newton Stewart Substation to the east of the Site (NX 40032 64907), approximately 15 km from the on-site substation, via a distribution voltage connection. The grid connection would be the responsibility of the Distribution Network Operator (DNO) (Scottish Power Energy Networks) and would be subject to a separate consenting process. As such the details of the grid connection route are unknown at this stage.

2.4 Construction Activities

Construction Programme

2.4.1 The estimated construction period of the Proposed Development is approximately 18 months. This period is indicative only and may be subject to variation as a result of factors which include, but are not limited to, weather restrictions, ground conditions encountered through detailed investigation, turbine component and material delivery, timing of grid connection

works and public highway constraints. However, this is considered to represent a realistic case for the purposes of assessment.

2.4.2 Construction by the principal contractor will begin following agreement of the detailed design and approval of any pre-commencement conditions with the appropriate consenting authority. Key construction activities will involve:

- public road improvement and junction creation;
- construction of main Site access track;
- forestry felling activities and borrow pit excavation;
- construction of the temporary construction compounds and laydown areas;
- construction of all access tracks having established all required borrow pits;
- construction of temporary and permanent drainage measures;
- installation of concrete batching plant;
- construction of turbine foundations, crane hardstandings and laydown areas;
- excavation of cable trenches;
- laying of electricity and communications cables in trenches;
- construction of substation and control building;
- delivery, installation, testing and commissioning of wind turbines and permanent meteorological masts and ancillary equipment;
- installation of internal/ external turbine transformers and switchgear; and
- Site reinstatement and restoration in accordance with peat management plan.

2.4.3 The works are likely to follow the order as detailed above, however many activities will be undertaken concurrently to minimise the overall construction programme. Site restoration will be undertaken as soon as possible in affected areas to minimise disruption to land use.

2.4.4 Further ground investigation surveys will be undertaken prior to the main construction works beginning on-site to determine the specific quality of rock and the rock head depth underlying the locations for turbines and Site infrastructure.

2.4.5 The appointed contractor will develop the details of the Site design and construction methods in compliance with the Applicant's contract requirements and the EIAR.

2.4.6 The access tracks will be left in place following construction to provide permanent access for maintenance, repairs and eventual decommissioning of the Proposed Development. The construction works will be undertaken by a competent and experienced contractor in accordance with the project consent and any associated conditions and also in accordance with good industry practice. Prior to commencing construction, a more detailed construction and reinstatement programme will be submitted to the consenting authority.

2.4.7 Traffic movements associated with the construction of the Proposed Development including required Heavy Goods Vehicles (HGV) and heavy/ abnormal load movements are described in Chapter 10: Traffic and Transport.

2.4.8 An indicative construction programme is illustrated in Table 2.4: Indicative 18-Month Construction Programme below.

Table 2.4: Indicative 18-Month Construction Programme

	Month																	
Task*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	■	■	■	■	■	■	■	■										
2				■	■	■	■											
3							■	■	■	■								
4								■	■	■	■							
5								■	■	■	■							
6										■	■	■	■					
7											■	■	■	■	■	■		
8													■	■	■	■	■	■

*Task:

1. Site investigation/ forestry felling
2. Site establishment/ plant deliveries
3. Borrow pit working, access track construction and hardstanding areas
4 Foundations
5. Substation construction
6. Cabling
7. Erection of turbines
8. Site reinstatement and restoration

Hours of Work

2.4.9 The normal working hours will be as follows:

- Monday to Friday 0700 to 1900;
- Saturday 0700 to 1300; and
- no working on Sundays or public holidays without prior written approval from DGC.

2.4.10 No works, with the exception of turbine delivery, the completion of turbine erection or emergency work, will take place outside these hours, and any such out-of-hours works will be subject to prior agreement with DGC. The requirement for out-of-hours work could arise, for example, from delivery and unloading of abnormal loads or health and safety requirements, or to ensure optimal use is made of fair weather windows for the erection of turbine blades and the erection and dismantling of cranes.

Construction Traffic and Plant

2.4.11 Vehicle movements associated with construction works would include:

- Cars and minibuses for transporting construction personnel to the Site;
- Heavy goods vehicles (HGVs) for pre-construction delivery of site offices, construction equipment and materials;
- HGV abnormal load vehicles for delivery of the turbine components and base rings;
- Mobile road going cranes, used for the erection of the turbines; and
- Standard HGVs for transporting electric cable, steel reinforcement for foundations, construction plant fuel and other items and equipment.

2.4.12 A Traffic Management Plan would be agreed in consultation with DGC and Transport Scotland. This would address the scheduling, routing and overall management of abnormal loads movements along with the programming and management of all other HGV movements (EIAR Volume 4: Technical Appendix 10.2: Indicative Construction Traffic Management Plan).

Watercourse Crossing Schedule

2.4.13 As noted above, the number of watercourse crossings has been minimised through site design. Nevertheless, there is a requirement for nine crossings of watercourses as identified on 1:25k mapping. Out of the nine crossings, the likely crossing method for five of the crossings would be culverts, three would likely be upgrade of existing culverts and the final crossing on Tarf Water would likely be a single-span bridge.

Standard Mitigation and Working Methods during Construction

Construction Environmental Management Plan (CEMP)

2.4.14 The principal contractor would be responsible for implementing site-specific environmental management procedures included in a Construction Environmental Management Plan (CEMP). An outline CEMP is provided in Technical Appendix 2.1 (EIAR Volume 4). A detailed CEMP would be agreed with DGC and relevant statutory consultees prior to construction commencing.

Watercourse Crossings

2.4.15 Technical Appendix 9.2: Watercourse Crossing Assessment (EIAR Volume 4) contains details of the watercourse crossings required as part of the Proposed Development and the proposed crossing type together with the relevant requirements in relation to The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended.

2.4.16 Typical watercourse crossings are presented on Figure 2.5 (EIAR Volume 3a) and the final crossing type would be identified as part of the detailed design of the Proposed Development prior to construction and in line with current best practice guidance.

Private Water Supplies

2.4.17 A Private Water Supplies (PWS) abstraction is likely to be required both for the construction and operational phase of the wind farm. This may include either or both groundwater and surface water abstraction. Detailed feasibility studies will be carried our post-consent and the appropriate authorisations obtained from SEPA under CAR.

Peat Management

2.4.18 Technical Appendix 2.4: Draft Peat Management Plan (PMP) outlines the proposed working methods where the excavation of peat would be required and provides further details on potential volumes of peat excavated and the likely requirements for reinstatement. This provides details of the predicted volumes of peat that would be excavated for the Proposed Development, the characteristics of the peat that would be excavated, and how the excavated peat would be reused and managed within the Site. This document would be updated during the detailed design stage and agreed with SEPA prior to construction and would be included in the final version of the CEMP.

2.4.19 The detailed peat surveys across the Site have identified that approximately 50,000 m^3 of peat would be excavated as part of the construction activities associated with the Proposed Development. The Draft PMP (EIAR Volume 4: Technical Appendix 2.4) outlines how that peat would be recovered, managed and reused within the Site.

Peat Slide Risk

2.4.20 Technical Appendix 2.5: Peat Landslide Hazard and Risk Assessment (PLHRA) provides further technical information on the likely risk and hazards associated with peat instability, and the proposed standard mitigation and working methods that would be implemented during construction to seek to avoid adverse effects associated with peat instability.

2.5 Operational Characteristics

2.5.1 The EIA regulations (Schedule 4) require that EIAR provides "a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used".

2.5.2 The purpose and nature of the Proposed Development is that it would harness wind energy for the generation of electricity. The Proposed Development includes for a potential facility to store energy produced on-site. There would be no other production process associated with the Proposed Development. There would be no significant energy demand, use, material or natural resource used by the Proposed Development, with the exception of some very minor water and energy use in the control building and welfare facilities.

2.5.3 Wind turbines and wind energy projects are designed to operate largely unattended. Each turbine at the Proposed Development would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

2.6 Residues and Emissions During Construction and Operation

2.6.1 The EIA Regulations require that the EIAR provides an estimate, by type and quantity, of expected residues and emissions (such as water, air and soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced) resulting from the construction and operation of the Proposed Development.

2.6.2 Table 2.5: Residues and Emissions provides a summary of the anticipated residues and emissions.

Table 2.5: Residues and Emissions	
Topic	**Potential Residue/ Emission**
Water	Construction: Occasional and low quantity discharges could arise from pumping, or over-pumping in order to dewater foundation excavations. Pollution sources could arise as a result of soil erosion or from oil/ fuel or chemical storage and use. Full details of the assessment are present in Chapter 9: Hydrology, Hydrogeology and Geology. All discharges would be managed in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended by The Water Environment (Miscellaneous) (Scotland) Regulations 2017. The proposals for water the control and management of water quality and quantity from the Proposed Development are presented in Technical Appendix 2.1: OCEMP. Operation: Full details of the assessment are present in Chapter 9: Hydrology, Hydrogeology and Geology.
Air	Construction: The construction phase would require the transport of people and materials by road, with associated emissions to the atmosphere. There are no air quality management areas within the vicinity of the Proposed Development. Overall the quantity of air emissions is expected to be low relative to the general background air emissions from road traffic. No significant air emissions are anticipated. Operation: Due to the nature of the Proposed Development no significant point source or diffuse air emissions would be produced during its operation. The Proposed Development would contribute to providing renewable electricity, in turn displacing emissions associated with fossil fuel-based electricity generation elsewhere. The construction of the proposed infrastructure, and subsequent operation and decommissioning of the Proposed Development would include activities that either directly or indirectly result in CO_2 emissions. Technical Appendix 16.1: Carbon Balance Assessment calculates the greenhouse gas emissions and carbon payback times for wind farm developments in Scottish peatlands and concludes that the Proposed Development would 'pay back' the carbon emissions associated with its construction, operation and decommissioning in a 1.9-year period.
Soil and Subsoil	Construction: Soil and subsoil excavation, handling and storage would be required during construction. All soil and subsoil would be stored temporarily for use in reinstatement, such that there would be no residue (surplus) remaining following the construction work. Further details on peat management are provided in Technical Appendix 2.4: Draft Peat Management Plan. Operation: No requirement for soil or subsoil excavation or handling during the operation phase has been identified. No pollution sources have been identified for the operational phase.
Noise and Vibration	Construction: Noise sources during the construction phase would include increased traffic flows and noise from construction plant. Further details are provided in Chapter 11: Noise. Operation: The wind turbines would generate noise during operation, and the noise levels would vary according to the wind speed. The location of residential receptors in relation to the Proposed Development was a consideration in the design development process and the predicted noise levels are within acceptable limits. Full details of the noise impact assessment are present in Chapter 11: Noise.

Table 2.5: Residues and Emissions	
Topic	**Potential Residue/ Emission**
Light	Construction: Technical Appendix 2.1: OCEMP notes that temporary lighting would be required at the temporary construction compounds for security purposes and to ensure that a safe working environment is provided to construction staff. In addition, temporary lighting could be required to ensure safe working conditions at infrastructure locations during construction. All temporary lighting installations would be downward facing and all lights would be switched off during daylight hours and out with working hours. Operation: It is proposed to install visible lighting on the turbines in a pattern that would be acceptable to the Civil Aviation Authority for aviation visibility purposes. The Applicant proposes to seek opportunities to reduce or eliminate visible lighting through further consultation with relevant stakeholders. Further consideration to the impacts of lighting is reported in Chapter 5: Landscape and Visual Amenity The substation buildings are likely to be equipped with passive infra-red controlled security lighting. These would illuminate the substation compound area when activated. Any effect would be temporary and not expected to be significant during normal operation of the Proposed Development.
Heat and Radiation	No significant sources of heat and radiation have been identified during either the construction or operation phase of the Proposed Development.
Waste	Construction: Technical Appendix 2.1: OCEMP provides details on pollution prevention control and site waste management that would be implemented during construction. A Site Waste Management Plan would be designed to follow the principles of: Avoidance; Minimisation; Separable; Recyclable. Operation: The power generation aspect of the Proposed Development would not produce any waste emissions or pollutants. The general operation and maintenance of the Proposed Development has the potential to produce a small amount of waste. This is likely to be restricted to waste associated with the control building from employees and visiting contractors and the storage of oils and lubricants.

2.7 Decommissioning

2.7.1 At the end of the project's operational life (assumed to be 30 years), a decision will be made as to whether to refurbish, remove, or replace the turbines. If refurbishment or replacement were to be chosen, relevant consent applications will be made. If a decision were to be taken to decommission the Proposed Development, this will entail the removal of all the turbine components, transformers, the substation and associated buildings. Access tracks and underground cables will be left in place and foundations removed to a depth of 0.5 m below ground level to avoid environmental effects from removal. A Decommissioning Plan will set out environmental protection measures and restoration principles which will be implemented. This plan will be agreed with DGC.

2.7.2 An assessment of the decommissioning of the Proposed Development has not been undertaken as part of the EIA as: i) the future baseline conditions (environmental and other developments) cannot be predicted accurately at this stage, and ii) the proposals for refurbishment/ decommissioning are not known at this stage. However, an outline decommissioning strategy is included in the CEMP (EIAR Volume 4: Technical Appendix 2.1: OCEMP).

3 Design Evolution and Alternatives

3.1 Introduction

3.1.1 This chapter provides a description of the reasonable alternatives studied by the Applicant, which are relevant to the Proposed Development and its specific characteristics, in accordance with regulation 5(2)(d) and schedule 4 (paragraph 2) of the EIA regulations. The chapter provides a description of the main reasons for selecting the chosen option for the Proposed Development, taking into account the effects of the Proposed Development on the environment.

3.1.2 Chapter 4: Energy and Planning Policy of this EIA Report describes the legislative and policy background relevant to the Proposed Development. Where specific aspects of the legislative or policy context are relevant to the consideration of Site selection, alternatives and the main reasons for selecting the chosen option, they have been referenced in this chapter.

3.1.3 This chapter is structured to provide the following:

- A review of the Site selection considerations, including a review of the planning history of the Site, Site context, policy relevant to the Site selection and the Site feasibility assessment;
- An overview of the design objectives for this Site;
- A description of the reasonable alternatives studied (noting that this is limited to those which are considered relevant to the Proposed Development); and
- A description of the main reasons for selecting the final Proposed Development.

3.2 Site Selection Considerations

3.2.1 Statkraft UK has a publicly stated objective to deploy 600 MW of onshore wind and solar generation in the UK by 2025. As part of delivering on this objective, Statkraft are actively pursuing potential wind farm developments throughout Scotland. This section provides a description of the factors that led to the selection of the Site as a suitable location for wind farm development.

Planning History

3.2.2 The eastern section of the Site was previously the subject of a planning consent for Gass Wind Farm, a project developed by Willowind Energy Limited. The Gass Wind Farm project consisted of nine 126.5 m to tip wind turbines as illustrated in EIAR Volume 3a, Figure 3.1: Gass Wind Farm (Consented Layout). The application (planning reference 14/P/1/0674) was recommended for approval and subsequently approved by Dumfries and Galloway Council (DGC) on 26th August 2015 with planning permission issued in July 2016. However, the planning permission for the Gass Wind Farm project lapsed in July 2019. The previous consent granted for Gass Wind Farm was an important factor in the Site selection.

Current Land Use and Site Context

3.2.3 The Site is located in an area primarily consisting of coniferous commercial woodland plantation with areas of marshy grassland present on the eastern bank of Tarf Water. The southeastern area of the Site consists predominantly of several habitats including semi improved grassland, wet heath/acid grassland and two small pockets of sphagnum blanket bog.

3.2.4 The Site lies between the operational Artfield Fell and Balmurrie Fell Wind Farms to the west and the Airies Wind Farm to the east. Operational turbines of Kilgallioch Wind Farm lie to the northwest, and Glenchamber and Carscreugh Wind Farms are located to the southwest. In addition, there are current proposals in planning for an extension to Kilgallioch Wind Farm, which would bring turbines closer to the northern boundary of the Site, and a scoping stage development proposal for an extension to Airies Wind Farm, which would add turbines to the immediate east and north of the Site. As such, wind farms are a key characteristic of the existing landscape character.

3.2.5 Local supplementary guidance, the Dumfries and Galloway Wind Farm Landscape Capacity Study[1], identifies 'Plateau Moorland/Plateau Moorland with Forest' (landscape character type 17 or 17a, which the Site is located within) as presenting some opportunity for wind farm development, although it is noted that there would be high sensitivity to turbines greater than 150 m to tip. The abundance of existing operational wind farms also presents potential constraints to development based on the potential for cumulative effects to arise.

3.2.6 With the exception of the River Bladnoch Special Area of Conservation (SAC), the Site has no potential direct effects on geographic areas protected under national or international statutory designations for nature conservation including:

- Sites of Special Scientific Interest (SSSI);
- Special Protection Area (SPA);
- Special Area of Conservation (SAC);
- Ramsar sites;
- National Nature Reserve (NNR); and
- National Scenic Areas (NSA).

3.2.7 The Site is not within any formal landscape designations. The nearest regional designation is the Dumfries and Galloway Regional Scenic Area at 10 km. There are no other landscape designations within 10 km of the Site. The nearest cultural heritage asset of national importance is the Wood Cairn Scheduled Monument, at approximately 1 km northeast of the Site.

3.2.8 The nearest Wild Land Area (WLA) is 20 km north east of the Site, the Merrick WLA.

3.2.9 The Site is relatively distant from settlement and well-used roads, being approximately 5 km from the nearest settlement (New Luce) and more than 5 km away from the nearest A road (A75).

Relevant Planning Policy

3.2.10 As described in Chapter 4: Energy and Planning Policy, Scottish Planning Policy, 2014[2] (SPP) provides development planning guidance for onshore wind. It specifically includes reference to the need for planning authorities to set out in their development plans a Spatial Framework identifying those areas that are likely to be most appropriate for onshore wind farms. The Spatial Framework for Dumfries and Galloway is set out in Map 8 of the Local Development Plan (LDP) 2[3] and it shows that the Site is within an area defined as having potential for wind

[1] URL: https://www.dumgal.gov.uk/media/19742/LDP2-Draft-Supplementary-Guidance-Part-1-Wind-Energy-Development-Development-Management-Considerations/pdf/0892-16_Wind_Energy_Appendix_C_Landscape_Nov_2017.pdf?m=636491958681370000 (accessed 27.02.2020)

[2] The Scottish Government (2014) Scottish Planning Policy, The Scottish Government, Edinburgh, June 2014

[3] Dumfries and Galloway Council (2019) Local Development Plan 2, October 2019, URL: https://www.dumgal.gov.uk/media/21885/Adopted-Local-Development-Plan-2/pdf/Adopted_LDP2_OCTOBER_2019_web_version.pdf?m=637060550180970000 (accessed 23.10.2020)

farm development (where wind farms are likely to be acceptable subject to consideration of details) (Group 3). The only feature within the Site defined as an 'area of significant protection' is the Tarf Water (as part of the River Bladnoch SAC). On this basis, the selection of this Site can be considered to be consistent with the LDP2 spatial framework, subject to the detailed consideration against all relevant LDP2 plan policies.

3.2.11 This EIA Report does not make any judgements regarding the 'acceptability' of the Proposed Development, as defined in the LDP2. A separate Planning Statement is provided which presents an appraisal of the Proposed Development with reference to the energy and planning policy framework and other relevant material planning considerations.

Site Feasibility

3.2.12 A review of the consented Gass Wind Farm by the previous developer concluded that there would be no economically viable route to market for the Gass Wind Farm project. However an assessment by the Applicant identified the feasibility of developing an entirely new application for consent for a larger scheme across a wider landholding. While the principle of wind farm development in this location was accepted for the Gass Wind Farm, the acceptability of a larger wind farm would be subject to consideration on its own merits. By including an additional landownership within the Site boundary, the potential to accommodate up to 20 turbines was identified, with the majority of the potential development area located further north and west from the Gass Wind Farm consented layout. The larger Site was assessed (at the feasibility stage) as benefiting from suitable terrain, wind resource, accessibility and a secured a grid connection for 67.2 MW of capacity connecting at Newton Stewart in 2024. On the basis of the grid connection alone, the Site was identified as offering an opportunity to make a significant contribution to Statkraft's stated goal of deploying 600 MW of generation capacity by 2025. Furthermore, the deployment of 67.2 MW of generation here by 2024 would make a significant contribution to meeting national energy policy and climate emergency policy related goals of achieving net-zero emissions by 2045.

3.2.13 Following the completion of the Site feasibility study the Applicant has secured land agreements to develop the Site across a larger Site area.

3.3 Design Process

3.3.1 The Applicant appointed a team of specialist consultants to work alongside Statkraft UK in developing a wind farm proposal. Consistent with renewable energy policy (described in Chapter 4), the key overall objective is to maximise the energy generation potential of Site, whilst having regard to the protection of sensitive environmental receptors. A design process was agreed with the team that included the following parameters:

- Relevant design guidance will be derived from:
  - Good practice publications and industry standards (e.g. SNH (2017) Siting and Design of Wind Farms in the Landscape (Version 3a));
  - Planning policy documents (e.g. Dumfries and Galloway Local Development Plan 2: Supplementary Guidance); and
  - Consultation responses received through the pre-application consultation and EIA scoping.

3.3.2 A design brief was agreed with the Applicant to set out key parameters for the Proposed Development. The design brief subsequently set the scope for constraint mapping. The brief included:

- A Preliminary (pre-scoping) Turbine Layout provided by Statkraft UK (see EIAR Volume 3a, Figure 3.2i: Turbine Layout Evolution);
- Details of land available (illustrated by the application Site boundary); and
- Requirements for Site construction compounds, substation, laydown areas, access track geometry and crane hardstanding geometry.

3.3.3 The Applicant would be responsible for defining minimum acceptable turbine spacing and acceptable slope/gradient for tracks. Design guidance from the Applicant confirmed the following requirements for Site infrastructure:

- Road running width to be between 4.5 m and 7 m depending on gradient and bends;
- Road to have vertical grade no higher than 14%;
- The road has to be straight for 40 m before and after a bridge or culvert; and
- Turning are to be provided allowing loaded or unloaded blade transports (as required).

3.3.4 Following agreement of the design brief, the team was instructed to undertake all necessary desktop studies and field work to identify key environmental receptors and constraints (including cumulative constraints) of relevance to the design and assessment of the Proposed Development.

3.3.5 Further analysis was completed to categorise design constraints as either 'hard constraints' or 'soft constraints'. Hard constraints were defined as those features with formal protection as defined in legislation or adopted planning/industry guidance, where as soft constraints were characterised as having potential to constrain the development but, subject to careful design consideration and/or mitigation measures, the Proposed Development could be accommodated.

3.3.6 A summary of the constraints analysis is illustrated in a 'heat map' (see EIAR Volume 3a, Figure 3.3: Design Constraints Heat Map) that has the following typology:

- Red: Hard Constraints; and
- Amber: Soft Constraints.

3.4 Environmental Issues and Design Constraints

3.4.1 Following a baseline characterisation of the Site, the key environmental issues for consideration in the design process were identified. A summary of the key design considerations is provided in Table 3.1.

3.4.2 Issues were considered through design with the aim of 'designing out' significant effects. Where it is not possible to mitigate by design, the issues have been considered further as part of the EIA.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm

Topic	Analysis	Design Guidance
Landscape and Visual: LDP and Capacity Study	The Site is situated in Plateau Moorland with Forest Landscape (LCT17a) which is described in Appendix C of the Dumfries and Galloway Council LDP 2 – Supplementary Guidance[4] (hereafter referred to as the LCS) to have a High sensitivity to 'very large' typologies (i.e. >150 m to blade tip) and High-Medium sensitivity to 'large' typologies. Key issues/constraints according to LCS are: ▪ Potential for introduction of further variation in the type and size of turbines proposed within this and nearby landscape character types which would exacerbate the visual confusion and clutter already associated with the wind farms noted above. Repowering of wind farms (involving substantially larger turbines) and new much larger turbines, particularly in the northwestern part of this character type, would be likely to incur significant cumulative effects. ▪ Sequential visual impacts experienced when travelling on minor roads and footpaths, including the Southern Upland Way long distance footpath (SUW), where the incidence and extent of wind farm development could dominate views and overwhelm the viewer. ▪ Landscape and visual effects on small pockets of settled farmland and lochs if wind farms substantially extend on surrounding skylines or give a perception of encirclement. ▪ Visual interaction between smaller turbines which are more likely to be associated with pockets of settled farmland and large turbines within wind farms. ▪ Wider cumulative effects on the Merrick Wild Land Area (WLA) and Galloway Hills Regional Scenic Area (RSA) where	**Location and Cumulative Effects** The proposed development can be argued to represent 'infill' within the emergent pattern of development (subject to detailed layout design) and is unlikely to result in significant geographical expansion of cumulative effects. Whilst the consent of the previous Gass Wind Farm has limited weight in respect of the application for the Proposed Development, it is evidence that, even in the restrictive terms of the LCS, that the principle of wind farm development was accepted at the Site. **Turbine size** The design should consider cumulative effects with operational and consented wind farms particularly where turbine size, pattern and siting is noticeably different. While the LCS assesses the landscape to have High sensitivity to very large turbines, a detailed analysis suggests that there is potential to adopt a turbine size that is consistent with either Kilgallioch (146 m to tip) or the Kilgallioch extension (180 m to tip). The lack of consistency of potential candidate turbines for the Proposed Development with the neighbouring Artfield Fell, Balmurrie Fell in particular (and to a lesser extent with Glenchamber (126 m to tip) and Airies (137 m to tip) is noted; however, there is a prospect that Artfield Fell and Balmurrie Fell turbines will be removed or repowered in the medium-term[5]. There is an established pattern of reducing turbine sizes the nearer development is to the edge of the Plateau (i.e. from Kilgallioch, which holds the largest turbines, to Carscreugh wind

[4] Dumfries and Galloway Council (2020) Local Development Plan 2, Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' Dumfries & Galloway Wind Farm Landscape Capacity Study Supplementary Guidance February 2020, URL: 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 16.4.2020)

[5] Artfield Fell was commissioned c. 2007 and therefore it is anticipated that the operational life and planning permission would end in c. 2032 (assuming a 25 year permission), which would have eight years of overlap with the Proposed Development. Balmurrie Fell was commissioned five years later c. 2012, and therefore could have up to 13 years of overlap (source: URL: https://www.thewindpower.net/windfarm_en_16308_balmurrie-fell-(artfield-fell-ext).php (accessed 03/11/2020)

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm

Topic	Analysis	Design Guidance
	further development could consolidate and fill gaps creating a sense of near encirclement and domination. Much larger and closer turbines could significantly exacerbate cumulative effects. ▪ The outer fringes of this landscape character type, close to areas of settled farmland, where larger turbines could dominate small scale valleys including the notably diverse upper Cree valley (LCT 4). ▪ The rich archaeology found within areas of open moorland (addressed in Cultural Heritage design guidance). ▪ The Merrick WLA and RSA lying to the east of this character type where wind turbines could diminish the sense of naturalness and seclusion experienced and affect the setting of the western Galloway Hills. ▪ Recreational use of the eastern fringe of the LCT, with cycle/walking trails and promoted places of interest as part of the Galloway Forest Park and Dark Skies Park. ▪ Views from the Merrick WLA and other western Galloway Hills, from key viewpoints within Glen Trool such as the Bruce's Stone and from the SUW, A75 and A714. ▪ Cumulative effects with operational and consented wind farms particularly where turbine size, pattern and siting is noticeably different. ▪ Cumulative effects on the Merrick WLA and on the Galloway Hills RSA sited to the east of this landscape character type.	farm which has smaller machines). Further the emerging pattern and trend in the industry to provide a route to market and to maximise energy generation potential is towards turbines greater than 150 m to tip. To some extent, scale disparity between neighbouring wind farms is inevitable, although the ability to perceive the disparity will vary considerably depending on a range of factors. The key design guidance in relation to the Proposed Development is how the proposed development can adhere to the established pattern of typologies. In this case, a landscape preferred development area (see Figure 3.3) has been developed to reinforce the established pattern of development which identifies a preference for turbines in the northern and western extents of the Site. **Landscape character and designations** The Site is located within the interior of the Plateau Moorland landscape type (LCT17a) and minimises impacts on the outer fringes of this landscape which are close to areas of settled farmland, where larger turbines could dominate small scale valleys. As such this is not a significant driver for the design. The Site would consolidate the existing and emergent pattern of development in LCT17a and avoid significant effects on relatively distant designated areas including the Merrick WLA and Galloway Hills RSA. Turbines would not move closer to these designations. As such these designations are not a significant driver for the design. **Visual impacts** The landscape preferred development area (in Figure 3.3) has been developed to: ▪ Minimise sequential visual impacts experienced by creating greater separation from minor roads and footpaths. The Proposed Development is at sufficient distance from the SUW to not be considered to dominate views or overwhelm on this strategic trail and would avoid or minimise effects on the amenity of recreational receptors on the eastern fringe of this section of the LCT; ▪ Minimise impacts on settled farmland and lochs.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
		▪ Avoid interaction between smaller turbines which are more likely to be associated with pockets of settled farmland and large turbines within wind farms. ▪ Consolidate on the existing and emergent pattern of development in views from the Merrick WLA and other western Galloway Hills, from key viewpoints within Glen Trool from the SUW, A75 and A714. **Night time visual effects** The implication of exceeding 149.9 m to blade tip is that there will be a need for visible aviation lighting in accordance with Civil Aviation Authority requirements[6]. This could result in effects in respect of the character and amenity and purpose of promoted places as part of the Galloway Forest Park and Dark Skies Park (when visible). The use of a technical mitigation solution (e.g. transponder based radar activated lighting) would mean that the lighting would be very rarely used, and therefore overall unlikely to result in significant effects and is not a significant driver for the design.
Landscape and Visual: Landscape Fabric	The Site is bisected by the meandering course of the Tarf Water. The Site is part of an undulating plateau with elevations generally ranging between 110 m AOD and 165 m AOD, and but is punctuated by local high spots in the form of shallow fells including Mid Hill (144 m AOD) Black Hill (151 m AOD), Doon Hill (164 m AOD) and Horse Hill (181 m AOD). The form of the topography is not readily apparent however due to the extensive commercial forest cover present. In addition to the forest cover, there is an area, concentrated toward the southern extents of the Site, which comprises open moorland. Additionally, the Site contains a network of established forest tracks.	Key design guidance at the Site relating to minimising effects on landscape fabric includes: ▪ Using the simple landform, expansive scale and uniform land cover of coniferous forestry within the Site and more widely within the area to help accommodate larger typologies of turbines and, ancillary elements without significant effects on characteristic landforms and landcover at the Site. ▪ Preferential use of existing forest as a partial basis for Site infrastructure for the Proposed Development, thereby reducing the extent of disturbance and loss of characteristic topography and landcover at the Site. ▪ Use of a smaller number of larger turbines, in part, to reduce the footprint and land take of the Proposed Development whilst achieving the commercial and energy outputs anticipated/ required.

[6] Civil Aviation Authority (2020) Draft Policy and Guidelines on Wind Turbines, CAP 764, (Issued 7) Updated 2020 to include Policy Statement on the 'Lighting of Wind Turbine Generators above 150m in United Kingdom Territorial Waters' and adopting ICAO Annex 14.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
Landscape and Visual: Character and Designations	The Site lies within the Plateau Moorland with Forest Landscape (LCT17a), described in the LCS. This is LCT 174 Plateau Moorland with Forest in the SNH (NatureScot) landscape character assessment. The key Characteristics of this LCT state; "Wind farm development of forested or recently clear-felled areas northwestern, western and southwestern areas." "Large-scale wind farms are a key and defining characteristic in the west of the Plateau Moorland with Forest - Dumfries & Galloway with development forming an arc around the watersheds of the Water of Luce and Tarf Waters, surrounding the large area of open moorland between Eldrig and Craigmoddie Fells. Forestry has been restructured to accommodate turbines. The development has detracted from the qualities of wild character and remoteness in some to the west, but these qualities persist in the east and more expansive areas of open moorland." The Site is not subject to landscape designation, but there are a number of nationally and regionally important designations present within 45 km of the Site. All but one of these designations are located outwith 20 km of the Site and are therefore considered highly unlikely to experience significant effects. Mochrum Lochs RSA is situated approximately 10 km south of the Site and has variable potential visibility due to the extent of woodland cover.	The critical design issue in relation to landscape character will be its position within a landscape characterised by wind farm development, and the emergent pattern of development that provides opportunities for the development to be located as 'infill' development and to avoid the geographical expansion of effects associated with existing and consented developments. The potential for the proposed development to increase the level of cumulative effects on landscape character will be considered, focussed on the following character types: ▪ Drumlin Pasture in Moss; ▪ Moss and Forest Lowland and Moor Lowland; ▪ Upland Fringe; ▪ Peninsula; and ▪ Coastal Flats. Consideration will be given to the potential for cumulative effects on Merrick WLA in the design; however it is considered that significant effects at this summit are unlikely.
Landscape and Visual: Visual Amenity	Significant impacts to visual amenity are unlikely to occur beyond 20 km therefore receptors beyond this are not considered further from a design perspective. The following settlements with visibility within 20 km have been identified; Kirkcowan, Glenluce, New Luce, and Newton Stewart. Within 5 km of the Site are a number of scattered smaller settlements and farmsteads.	The key issues in respect of visual amenity will relate to: ▪ impacts on residential visual amenity of properties within 2 km of the proposed developments turbines; ▪ effects on the amenity and character of key routes such as the A75; and ▪ effects on the amenity of recreational routes, including the SUW and cycleways and core paths; as well as key summits used by hill walkers such as Merrick. The landscape preferred development area ensures sufficient separation distance from the closest properties of at least 1 km. Only three properties (all of which have financial interest in operational wind farms) are located within 2 km of the landscape preferred development area.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
Cultural Heritage and Archaeology: Non-designated heritage assets on Site	There are 15 known heritage assets within the Site as previously recorded by the National Record of the Historic Environment and/ or Dumfries and Galloway Historic Environment Record. These have the potential to be subject to direct physical impacts as a result of the Proposed Development. Impacts would relate to the removal (partial or whole) of these heritage assets through groundbreaking works and construction activities on Site.	Turbines and site infrastructure should be sited to avoid impacts upon known remains. Where infrastructure will be located in close proximity to known assets but will not directly impact upon it mitigation measures such as the fencing of assets to prevent inadvertent damage by plant movement during the construction phase may be required. Where assets cannot be avoided this is likely to require mitigation through preservation by record undertaken through archaeological watching brief or trial trench evaluation.
Cultural Heritage and Archaeology: Designated heritage assets and non-designated heritage assets of national importance beyond the Site boundary	The key consideration centres around impacts upon the setting of on Wood Cairn (SM 1953) located c. 706 m to the north of the Site boundary. HS (now HES) and D&G Council Archaeology Service deemed impacts upon the setting of this asset to be Moderate-Major to Major (and significant) for Gass Wind Farm (although HS did not object to the application for Gass Wind Farm). HES identify the important elements of the setting of Wood Cairn as being: ▪ Its position on the summit of Eldrig Fell giving it a prominent location above the upland plateau to the north (where Kilgallioch Extension is proposed) and above the lower lying ground of the Tarf Water valley to the south; this means that it is a prominent landmark in views from these directions and there are substantial views across the wider landscape from it; and ▪ Its relationship with broadly contemporary non-designated assets to the north on the upland plateau. HES objected to Kilgallioch Extension on the basis that the proposed turbines would disrupt the relationship between Wood Cairn and broadly contemporary and multi-period monuments on the upland plateau, making it difficult to understand and appreciate said relationships. HES further found that the turbines, rather than the cairn, would be the dominant feature in views from the area of settlement and that the turbines would be visible behind the cairn, and therefore detract from views of it, from lower lying ground toward the Tarf Water.	Where possible turbines should be sited to minimise impacts upon the setting of Wood Cairn, both creating separation through turbine siting for views from the Cairn itself, and in views to the Cairn from the lower lying ground of the Tarf Water valley to the south and the broadly contemporary non-designated assets to the north on the upland plateau. The design should aim to avoid turbines appearing behind Wood Cairn when viewed from the area of broadly contemporary assets located on the plateau to the north and also be mindful of HES's comment about the importance of the cairn as a dominant landscape feature in views from lower ground, including from the Tarf Water.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
	There are a significant number of other designated heritage within the 5 km and 10 km study areas which could also be subject to setting impacts, but likely to a lesser extent.	
Ecology	The Site is dominated by coniferous plantation and mixed plantation woodland, which is considered to be of negligible nature conservation value. Key considerations include: ▪ The River Bladnoch SAC (Tarf Water) and the fish within the river – afforded protection in legislation under Conservation (Natural Habitats, &c.) Regulations 1994 (as amended); ▪ Bats – A European protected species – afforded protection in legislation under Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Using the criteria set-out in Table 3a of NatureScot guidance (2019)[7], the project area is considered to most closely fit the description of a 'low/ moderate' site risk for bats; ▪ Localised areas of priority habitats present (specified in UK Biodiversity Action Plan, Annex I of the Habitats Directive, or the Scottish Biodiversity List, including Wet Heath M15; Wet Heath/Grassland M15/U4; Molinia Mire M15d; Rush Pasture M23; M23b(M6); M23b/M25a; Flush M25(M6); M25(U4); M25/M6; M25a; Fen (Valley Mire) M25a/M25b; Flush/Grassland Mosaic M25/M6(M23); Flush/Grassland Mosaic M25/M6(M23); Marshy Grassland MG9; Mire/ Grassland Mosaic U4/M25/M23(S4), broadleaved woodland. ▪ Other constraints from protected species including water voles, red squirrel, otter and badger (although badger are unlikely to be present).	The design should incorporate a 50 m buffer between infrastructure and SAC (including excavation areas, where possible). This buffer was agreed and approved by NatureScot through pre-application consultation. Crossings over SAC should be minimised or avoided where possible. A 50 m buffer from blade tip to woodland edge should be incorporated into the design to avoid impacts on bats – this equates to a 97 m buffer around each turbine (for 180 m tip) to woodland edge and an 80 m buffer from watercourses. Buffers on watercourses for bats and for pollution prevention (a minimum of 50 m) would avoid any significant effects for other protected species, including otter, water vole and fish.
Ornithology	Review of information from Gass Wind Farm confirmed that low numbers of pink-footed goose and lapwing flights were recorded. No other pertinent species were recorded and no collision risk was required. There was no evidence of scarce breeding raptors using the Site or immediate surrounds (i.e. within 2 km), no evidence of black grouse within the 1.5 km study area and other	No design interventions are required to address ornithology receptors or sensitivities.

[7] NatureScot (2019) Bats And Onshore Wind Turbines: Survey, Assessment And Mitigation, URL: https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation (accessed 27/3/2020)

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
	surveys identified a fairly typical assemblage of breeding woodland and farmland birds. Further detailed baseline surveys, including flight activity surveys, moorland breeding bird surveys, breeding raptor and owl searches, breeding black grouse survey and nightjar survey were undertaken in 2018 and 2019. Surveys are broadly consistent with the results from Gass Wind Farm.	
Hydrology and Hydrogeology	A desk-top review of key receptors and constraints was undertaken using opensource datasets as well as a review of previous studies including the Gass Wind Farm application. Mapping of all watercourses, a review of designated sites, private water supplies and potential for groundwater dependent habitats was undertaken. The Tarf Water flows east along the northern margin of the Site and then south through the Site. The north-western most boundary of the Site is formed by the Mulniegarroch Burn, a tributary to the Tarf water. The Site is drained by a network of small burns that flow to the Tarf Water, which in turn flows from the Site at its south east corner. The Site is likely to have connectivity with the River Bladnoch SAC (Tarf Water) afforded protection in legislation under Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). It is noted that the Site is dominated by coniferous plantation woodland, with extensive artificial drainage (visible in aerial photography of the Site). Artfield Wind Farm PWS is located just south of the proposed development boundary. A number of other PWSs are located within a 5 km radius of the Site. The ecology (NVC) survey data identifies potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) including wet heath (M15), Molinia Mire (M15d), Rush Pasture (M23/M23b/M25a), Flush (M25), Fen (M25a/M25b), Marshy Grassland (MG9) and other mosaics indicating some potential for groundwater dependency. Analysis of the mapping of these habitats identified that the majority of these areas are associated with evident surface water features e.g. they are located within a watercourse flood plain or ponding location (depressions/valley bottom) or	The design should avoid placing turbines, and crane hardstandings within 50 m of natural watercourses. The design should aim to minimise the number of direct interactions with the water environment by designing out watercourse crossings where possible and minimising interactions with the SAC in particular. It is noted that turbines located within 50 m of identified artificial drainage channels may require additional runoff mitigation and pollution control measures in recognition of the potential pathway-receptor connectivity. Detailed risk assessment would be required for any PWS abstractions identified within 250 m of the proposed infrastructure (as would be classified under SEPA LUPG31). SEPA guidance is that 250 m / 100 m buffers are needed to high and moderate GWDTE respectively. Potential high GWDTE should be considered, however as described in the analysis, where the habitats are clearly linked to either rain-fed systems or surface watercourses/features they should not be treated as a design constraint.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
	forest rides (and influenced by artificial drainage ditches). It is considered that areas of blanket bog in the south of the Site (associated with deeper peat) are likely to ombrogenous (rain-fed) systems. On this basis, areas of moderate or high GWDTE are considered to be limited in extent, with the majority of potential areas considered more likely to have low to moderate groundwater dependency.	
Peat	A review of the SNH Carbon Rich Soil and Deep Peat and Peatlands Habitat Map (2016) confirms that areas of peat and organic material are present across the Site. Most of the Site is Class 5, 'areas of peat soil but no peatland habitat recorded'. There is a small pocket of Class 1 ('nationally important carbon rich soils, deep peat and priority peatland habitat') and some areas of Class 2 (('nationally important carbon rich soils, deep peat and priority peatland habitat') located in the south of the Site (south of Mid Hill). The majority of the Site is covered with coniferous plantation woodland, some of which is over what would have been 'priority peatland habitat' prior to afforestation; however due to ploughing for forestry and extensive artificial drainage the peat present is likely to be highly modified.	No significant areas of priority peatland habitat have been identified (other than the areas close to the southern boundary). These areas should be avoided . The design should avoid siting turbines and infrastructure in areas of peat, particularly deep peat (>1 m depth); however it is noted that peat under forestry is likely to be highly modified – it is possible to see areas of poor forestry growth in the aerial photography which are likely to coincide with deeper peat. Highly modified peat is considered to be of lower ecological value in its present state (relative to unmodified peat forming habitat), but opportunities may exist to limit forest replanting on areas of deeper peat where there is the opportunity to seek to restore peat forming habitat.
Forestry	The overall area of woodland within the study area covers some 679 ha of plantation forest and associated open ground. The woodland area is comprised of three separately managed units Meikle Cairn Forest, Gass Forest and Artfield Forest. Meikle Cairn and Gass forests have entered the forest restructuring phase with felling and replanting taking place.	The design should seek to minimise woodland loss, ensure any "stand-off" distance is justified and minimised (e.g. for ecology (bat) mitigation). Compensatory planting will be required for permanent loss of all infrastructure including tracks (where not required as a forest road). Design should consider possible opportunity for "forest to bog restoration".
Traffic and Transport	The main transport impacts will be associated with the movement of general HGV traffic travelling to and from the Site during the construction phase of the development. Each turbine is likely to require between 11 and 13 abnormal loads to deliver the components to Site. The components will be delivered on extendable trailers which will then be retracted to the size of a standard HGV for the return journey.	In terms of Site design, it is proposed that access is taken from the unclassified public road to the south of the Site, west of Tarf Bridge.
Noise	The Site is located within a rural location where background noise levels are relatively low. The predominant noise sources in the area are wind induced noise (wind passing through vegetation	The key design criteria for the Site will be to ensure that the 'Total ETSU-R-97 Noise Limits' are not exceeded by the cumulative operation of all turbines in the area. To enable wind

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
	and around buildings), local watercourses, agricultural noise and birdsong. At some receptors the soundscape is affected by local road traffic noise. There are a number of scattered residential properties around the Site. ETSU-R-97[8] and the IOA GPG[9] make it clear that background noise levels should be established in the absence of noise from wind turbines. Due to the presence of a number of operational wind farms around the Proposed Development, noise monitoring undertaken to derive background noise levels could have been influenced by noise from existing operational turbines. In such circumstances the IOA GPG suggests a number of methods that can be used as an alternative; Section 5 of Technical Appendix 11.2 (EIAR Volume 4) specifies these options in further detail. On consideration of these options, and following a review of the existing data available and potential monitoring locations around the Proposed Development, it was proposed that the original background noise measurements, used to inform the other consented and operational schemes, are used to derive the Total ETSU-R-97 Noise Limits. This approach was set out in initial consultation undertaken with the Council (as detailed in Annex 3 of Technical Appendix 11.2 (EIAR Volume 4)).	farm noise for individual developments to be controlled 'Site Specific Noise Limits' must be set which take account of the proportion of the Total ETSU-R-97 Noise Limit which has been given to, or could realistically be used by other schemes. In order to meet the likely required noise limits at noise sensitive receptor locations, turbines would need to be limited to an area broadly consistent with the landscape preferred development area (see Figure 3.3).
Aviation	The Site is located in uncontrolled airspace from ground level to Flight Level 195 (approximately 19,500 feet above sea level). Above that level is the Class C controlled airspace of the Scottish Upper Airspace Control Area, within which air traffic services are provided by the NATS En Route (NERL) Prestwick Centre. Radars used to provide these services include those at Great Dun Fell and Lowther Hill. The Site will not be visible to Great Dun Fell or Lowther Hill radar. The Site is located within Low Flying Area (LFA) 16 and within the Borders Tactical Training Area, known as LFA20(T), where	There are no aviation constraints for the Site design related to radars or MoD low flying. Turbines > 149.9 m will require visible aviation lighting in accordance with Civil Aviation Authority requirements[10]. A technical mitigation solution (e.g. transponder based radar activated lighting) would mean that the lighting would be very rarely used.

[8] URL: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf (accessed 03/11/2020)

[9] URL: https://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf (accessed 03/11/2020)

[10] Civil Aviation Authority (2020) Draft Policy and Guidelines on Wind Turbines, CAP 764, (Issued 7) Updated 2020 to include Policy Statement on the 'Lighting of Wind Turbine Generators above 150m in United Kingdom Territorial Waters' and adopting ICAO Annex 14.

Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm		
Topic	**Analysis**	**Design Guidance**
	military aircraft are permitted to fly as low as 100 feet above ground level. However the Site is wholly located within a part of LFA20T which has been designated by the Ministry of Defence (MoD) as a "low priority military low flying area less likely to raise concerns". MoD have confirmed they have no concerns regarding the Site. Danger areas associated with the Luce Bay weapons and trials ranges are located 2 km west of the Site. Radar services to aircraft using those ranges are provided by a Watchman primary surveillance radar operated by QinetiQ, located at the former West Freugh airfield, 15 km south west of the Site. While there is some potential line of Site from West Freugh radar, MoD have confirmed they have no concerns regarding the Site. An unlicensed airfield with occasional light aircraft use is located at Castle Kennedy, 11 km south west of the Site. There are no air defence or meteorological radars within range and line of sight of turbines up to 200 m tip height on the Site. There are also no airfields, airstrips, gliding or other aviation sites within 10 km of the Site. The Site is also well beyond the 50 km restricted zone around the Eskdalemuir seismic array.	
Telecommunications	The Ofcom Spectrum Information Portal identifies one fixed telecommunications link within 3 km of the Site boundary. This is a Vodafone microwave link running from the Artfield Fell wind farm to the Cambret Hill radio mast, 28 km south east of the Site. It runs through the Site. Terrestrial television signals in the area surrounding the Site are broadcast from the Cambret Hill transmitter.	The Ofcom-recommended Bacon formula should be used to determine the minimum acceptable separation between the centre of the link path and any part of a wind turbine in the Proposed Development. The maximum size of buffer zone around the centre of the link would be 24.7 m. In addition an allowance of 50 m is made for inaccuracies in the stated grid references for each end of the link. The required separation between the link and any part of a turbine is therefore 74.7 m. In addition Bacon recommends that wind turbines are not placed any closer than 500 m from the transmitter at either end of the link.

3.5 Design Evolution and Alternative Layouts

3.5.1 Figure 3.2 summarises the wind farm design evolution from pre-scoping stage to the design freeze layout. The following paragraphs explain the changes made through the four key iterations.

Layout 1: Pre-Scoping Layout

3.5.2 The pre-scoping layout (Figure 3.2i) was developed by the Applicant based on desk based assessment only to provide a theoretical maximum generation capacity and as a starting point for the design process. The pre-scoping layout was developed based on the following parameters:

- The layout maintains a 750 m buffer from residential properties and was consistent with the Gass Wind Farm layout in terms of maintaining approximately 1 km separation from the public road to the south of the Site; and
- The layout was originally developed based on the identified 'preferred development area' set out in the Dumfries and Galloway Local Development Plan (2014) (noting that this has now been superseded by the adopted 2019 Local Development Plan 2).

Layout 2: Design Workshop 1 Layout

3.5.3 The first design iteration was made in preparation for the first design workshop which followed the collection of baseline data from onsite surveys and detailed desktop analysis. The Applicant prepared a 'wind yield optimised layout' which maximised separation distances, of the 12 turbines (as shown in Figure 3.2ii). This layout was developed by the Applicant based on a 'heat map' incorporating key constraints and maintaining a 750 m buffer from residential properties.

3.5.4 The heat map, as illustrated in Figure 3.3 and EIAR Volume 3a, Figure 3.4: Turbine Layout Evolution with Heat Map incorporates:

- a Site boundary 'blade oversail' buffer – to prevent turbines being positioned too close to the Site boundary, resulting in blades oversail outside of the Site boundary (in some wind directions);
- buffers on watercourses based on the requirements of NatureScot guidance[11] for the protection of bats (and in turn this also provides the buffers required to protect watercourses themselves);
- known cultural heritage assets within the Site; and
- sensitive habitats.

3.5.5 As a result of the constraints mapping, the number of turbines reduced from 20 to a total of 12.

3.5.6 The layout was used as the basis for further interrogation and discussion by the team of environmental specialists during design workshop 1

3.5.7 Energy yield modelling by the Applicant considered alternative candidate turbines, with a range of tip heights between 150 m and 180 m. The conclusions of the modelling were that a 180 m tip would provide a significant increase in energy yield. As such, based on the energy and planning policy set out in Chapter 4 (as further explained in the supporting Planning

[11] NatureScot (2019) Bats And Onshore Wind Turbines: Survey, Assessment And Mitigation, URL: https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation (accessed 27/3/2020)

Statement), the Applicant has selected the 180 m to tip turbine in order to deliver the greatest potential contribution to meeting the Scottish Government targets for renewable electricity generation and to assist the attainment of the legally binding net zero emission reduction targets.

Layout 3: Design Chill Layout

3.5.8 The second major design iteration (see Figure 3.1iii) was made following the first design workshop with a particular focus on landscape and visual noise and cultural heritage design drivers. .

3.5.9 Detailed landscape and visual analysis was undertaken, which confirmed a preferred development area for 180 m tip height turbines, which has the effect of restricting the turbine layout to a smaller area of the Site. The analysis confirmed that, subject to locating turbines within the preferred development area, 180 m tip height turbines could be accommodated within the Site and that this could be considered to be consistent with the emerging pattern of development (linking to Kilgallioch Extension wind farm to the north and Airies II to the east). As noted in Table 3.1, the preferred development area for both noise and landscape/ visual constraints is broadly consistent.

3.5.10 Layout 3 achieves the following in terms of 'mitigation by design':

- The turbine array consolidates the emergent pattern of development by locating turbines to the north and west within the Site, 'infilling' between Kilgallioch (and Kilgallioch Extension), Airies (and Airies II), increasing the separation from the edge of the upland plateau to the south, further from settled farmland, residential properties and transport corridors.
- The turbine array achieves separation of at least 1 km from residential properties (with only two properties within 2 km of the turbine array), therefore protecting residential amenity in terms of both visual amenity and noise amenity.
- The design ensures that the 'Total ETSU-R-97 Noise Limits' are not exceeded by the cumulative operation of all turbines in the area.
- The layout avoids, or where this is not possible, minimise impacts on all known cultural heritage assets within the Site, such that no significant effect are predicted.
- Through pre-application consultation with Historic Environment Scotland (HES), a series of viewpoints were agreed for the purpose of assessing likely significant effects on the setting of nationally important heritage assets around the Site. Following a review of the HES consultation responses to the Kilgallioch Extension Wind Farm application, and further communications with HES (including the provision of preliminary wireline visualisations), Layout 3 moves turbines to the west such that turbines would not appear in the backdrop of views to Wood Cairn (SM1953) when viewed from the broadly contemporary (non-designated) assets located to the north. Further, the layout was designed to avoid fundamentally altering the perceived 'dominance' of Wood Cairn over the surroundings (as referred to in HES consultation). Turbines would be clearly positioned on lower ground to the west and with visual separation.
- The Site layout incorporates suitable buffers to watercourses sufficient to protect the SAC and relevant protected species including bats, water vole and otter.
- The layout avoids all priority peatland habitats.
- Forestry "stand-off" was optimised based on NatureScot guidance for the protection of bats, noting that the stand-off buffers were agreed with NatureScot through pre-application consultation.

- The turbine array is located with sufficient separation from noise sensitive receptors to allow the noise emissions from the Proposed Development to be more than 10 dB below the Total Noise Limits (under ETSU-R-97), allowing a conclusion that the Proposed Development will not result in significant effects on residential amenity as a result of noise, either on its own or cumulatively.
- The turbine array avoids placing any turbines within the 74.7 m Vodafone microwave link protection zone and avoids placing turbines closer than 500 m to the transmitter at either end of the link.

Layout 4: Design Freeze Layout (October 2020)

3.5.11 The fourth and final major design iteration (see Figure 3.1iv) was produced following receipt of a scoping opinion in August 2020 from Scottish Ministers, post-scoping consultation, public exhibition held in September 2020, further 'stage 2' peat probing surveys and following the design workshop 2 in August 2020. The design workshop provided the forum for examining changes that were proposed through the consultation process and through further review of environmental constraints.

3.5.12 An access track layout was included in the design at this stage. The access track layout was refined through a number of iterations to achieve the following mitigation by design:

- The access tracks follow existing Site access track routes as far as possible, reducing the 'new' infrastructure footprint as far as possible, whilst incorporating a track geometry required to allow turbine blades and other components to be delivered.
- By following existing tracks as far as possible, the areas of woodland removal have been optimised.
- The proposed access track route deviates from the existing track network to reach Turbine 11, thus avoiding the need to traverse through an area of sensitive 'wet woodland' habitat identified in pre-application consultation by Scottish Forestry.
- The number of watercourse crossings has been optimised as far as possible, with the number of crossings of the Tarf Water limited to one. Consideration was given to avoiding crossing the Tarf Water altogether, however within the limitation of the current land option agreements between the Applicant and local landowners, it would not be possible to access the site the east of the Tarf Water during construction (for turbine component deliveries) or operation (for operational maintenance) without a crossing of the Tarf Water. An initial design looked at an access strategy with tracks following the previously consented Gass Wind Farm track layout to get to Doon Hill but this was disregarded as it would have either involved two crossings of the Tarf Water or significantly more track construction and would have missed the opportunity to make best use of existing tracks. Even with an alternative access (involving additional third party land agreements) there would still be a need to run electricity cables back from the turbines to the proposed substation, which would involve either a cable bridge or crossing under the Tarf Water). As such it is not possible to fully avoid a crossing of the Tarf Water.
- The location of the Tarf Water crossing was selected following the consideration of a number of options. The selected location allows for an acceptable vertical grade on Doon Hill and takes account of the bank conditions on either side of the river.
- The proposed crossing would be of a single span structure type (subject to detailed design), which means that there would be no 'in-channel' work required and therefore no direct impact on the SAC.

- The access tracks avoid areas of deeper peat where possible (and avoid all priority peatland habitat), with adjustments made to the tracks (and turbine positions) to avoid deep peat on the east side of Doon Hill.

3.5.13 Turbine positions and their associated crane hardstanding areas were subject to further micrositing in Layout 4 as follows:

- Turbine T10 was moved to the south west to allow the track and crane hardstanding to avoid the area of deep peat on the east side of Doon Hill (see EIAR Volume 3a, Figure 3.5: Layout 4 (Design Freeze) with Peat Depth) and to reduce the cut and fill required to develop a track over the top of the hill;
- Turbine T7 was moved to the west out of an area of deeper peat (thus also achieving a reduction in track length);
- Turbine T5 was moved to the south west into an area with no peat. Although the track would need to cross an area of deeper peat to reach this area, the track could be floated, and as such the move would avoid the need for excavation of peat;
- Turbine T6, T8 and T11 arrangements were optimised and microsited with respect to watercourse buffers and peat as far as possible; and
- By moving turbine T10 and T7 to the west, this further reinforces the design rationale from a cultural heritage perspective (by creating greater separation between the Proposed Development and Wood Cairn). While turbine T5 moves closer to Cairn na Gath (SM1922), this was reviewed using wireline visualisations to consider potential setting effects and it was concluded that the difference between layout 3 and 4 was negligible.

3.5.14 A number of borrow pit search areas were also defined at this stage. These search areas were considered in relation to the environmental constraints information, particularly, ecological habitat, hydrology and landscape and visual amenity constraints. It is proposed that up to four borrow pits (within the four search areas) will be located on the Site.

3.5.15 The proposed met mast was added at this stage in an area of no identified environmental constraints (aside from forestry), to meet parameters that would allow the mast to be used for power performance testing.

3.6 Summary of Preferred Option

3.6.1 The preferred option taken forward for assessment is the Layout 4: Design Freeze Layout as presented in EIAR Report: Volume 2: Chapter 2: Development Description and shown in Figure 2.1: Site Layout.

3.6.2 By following the design guidance described in Table 3.1, the number of turbines was reduced from 20 to 12, infrastructure footprint has been optimised to minimise overall track length and the number of watercourse crossings. Likely significant effects have been avoided or minimised as far as reasonably practicable through the design process.

4 Energy and Planning Legislation and Policy

4.1 Introduction

4.1.1 This chapter of the EIA Report describes the legislative and policy background relevant to the Proposed Development. It refers to national energy and planning policy at a national and local level. This chapter does not include an assessment of the accordance of the Proposed Development with reference to planning policy: a separate Planning Statement has been prepared to support the application and should be referred to for a detailed planning policy appraisal.

4.1.2 This chapter has been written by David Bell BSc (Hons) DipUD MCIHT MRTPI a Chartered Town Planner and Director of David Bell Planning Ltd. Mr Bell has 30 years' experience of planning and development matters and is a specialist in renewables and onshore wind planning.

4.2 The Legislative Framework

The Electricity Act 1989

4.2.1 The Proposed Development will have an overall installed capacity over 50 Megawatts (MW). In Scotland, onshore renewable energy developments that have capacity to generate over 50 MW require consent from the Scottish Ministers under the Electricity Act 1989 (the Electricity Act). In such cases the Planning Authority is a statutory consultee in the development management process and procedures.

4.2.2 In the case of an application under Section 36 of the Electricity Act 1989 (the Electricity Act) the Development Plan does not have primacy in the decision making process. Furthermore, the provisions of Schedule 9 of the Electricity Act are relevant to the assessment of the Proposed Development.

4.2.3 Schedule 9 sub-paragraph 3(1) of the Electricity Act advises that a license holder (or person authorised by exemption):

"(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."

4.2.4 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."

4.2.5 At sub-paragraph 3(3), it 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*."

4.2.6 The provisions of Schedule 9 of the Electricity Act set out a number of features to which regard must be had and such features have been addressed in the EIA process.

The Town and Country Planning (Scotland) Act 1997

4.2.7 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. The provisions of the Planning (Scotland) Act 2019 are also starting to come into force.

4.2.8 Section 57(2) of the Planning Act 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*".

4.2.9 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*".

4.2.10 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).

4.2.11 The Scottish Ministers will determine the application having regard to the statutory duties in Schedules 8 and 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 Development Plan.

4.3 Renewable Energy Policy: Summary

4.3.1 In recent years, European, United Kingdom (UK) and Scottish Government policies have focussed increasingly on concerns about climate change. Each tier of Government has developed targets, policies and actions to achieve targets to deal with the climate crisis and generate more renewable energy and electricity.

4.3.2 The Renewable Energy Directive 2009/28/EC on the promotion of the use of energy from renewable sources established an overall policy for the production and promotion of energy from renewable sources in the European Union (EU). It requires the EU to fulfil at least 20% of its total energy needs with renewables by 2020 – to be achieved through the attainment of individual national targets. All EU countries must also ensure that at least 10% of their transport fuels come from renewable sources by 2020.

4.3.3 In December 2018, the revised Renewables Energy Directive (2018/2001) entered into force – establishing a new binding renewable energy target for the EU for 2030 of at least 32%, including a clause for a possible upwards revision by 2023.

4.3.4 On 29 March 2017, the UK formally notified of its intention to leave the EU under Article 50 of the Treaty of the EU. The European Union (Withdrawal Agreement) Act 2020 received Royal Assent on 23 January 2020 and converts all EU laws, rules and targets into domestic UK governance. The existing EU renewable energy targets for the UK, such as the requirements of the Renewable Energy Directive, remain applicable.

4.3.5 The UK Government retains responsibility for the overall direction of energy policy, although some elements are devolved to the Scottish Government. The UK Government has published a series of policy documents setting out how targets can be achieved. Onshore wind generation, located in Scotland, is identified as an important component to achieve these various goals.

4.3.6 The Scottish Government has published a number of policy documents and its own targets. The most relevant policy, legislative documents and more recent statements published by the Scottish Government include:

- The Letter from Chief Planner to all Heads of Planning in relation to energy targets and SPP (November 2015);
- Scottish Energy Strategy (December 2017);
- Onshore Wind Policy Statement (December 2017);
- The Scottish Government's declaration of a Climate Emergency (April 2019);
- The Scottish Government's 'Programme for Government' (September 2020);
- The Scottish Climate Change Plan Update (2020); and
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 and the legally binding net zero target for 2045 and interim targets for 2030 and 2040.

4.3.7 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*. "

4.3.8 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.

4.3.9 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.

4.3.10 The Proposed Development would make a contribution to the attainment of emissions reduction, renewable energy and electricity targets at both the Scottish and UK levels. Detailed reference to the renewable energy policy context is provided in the Planning Statement.

4.4 National Planning Policy

The National Planning Framework

4.4.1 National Planning Framework 3[1] (2014) (NPF3) is a long-term strategy for Scotland. It is the spatial expression of the Scottish Government's Economic Strategy, and of plans for development and investment in infrastructure.

4.4.2 Part of the vision is of Scotland as a low carbon place, where the opportunities arising from the ambition to be a world leader in low carbon energy generation have been seized. NPF3 is informed by, and aims to help achieve, the Scottish Government's climate change and renewable energy targets.

4.4.3 NPF3 acknowledges that the energy sector accounts for a significant share of the country's greenhouse gas emissions, and that addressing this requires capitalising on Scotland's outstanding natural advantages, including its significant wind resource. NPF3 makes it clear that onshore wind will continue to play a significant role in de-carbonising the energy sector and diversifying energy supply.

4.4.4 National Planning Policy Framework 4 (NPF4) is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019. The NPF4 'Position Statement' was published for consultation on the 26 November 2020 and a consultation draft NPF4 will be issued in September 2021. The Position Statement anticipates that NPF4 will include a focus on providing a plan for achieving net-zero emissions. The Scottish Government expects that NPF4 will state that the Global Climate Emergency should be a material consideration in considering applications for appropriately located renewable energy developments. The Position Statement does not represent new policy at this time but represents a 'direction of travel'. Priority policy changes under consideration include strengthening support for re-powering and expanding existing wind farms and updating the current spatial framework for onshore wind to continue to protect National Parks and National Scenic Areas, whilst allowing development outwith these areas where they are demonstrated to be acceptable on the basis of site specific assessments. Overall the Position Statement indicates that existing strong policy support for onshore wind farm development is likely to grow even stronger in response to the declared Climate Emergency and the drive to attain net zero emissions.

Scottish Planning Policy

4.4.5 Scottish Planning Policy[2] (2014) (SPP) is Scottish Government policy on how nationally important land use planning matters should be addressed.

4.4.6 SPP contains a number of principal policies, one of which expresses "a presumption in favour of sustainable development". Paragraph 28 states that:

"the planning system should support economically, environmentally and socially sustainable places by enabling development that balances the costs and benefits of a proposal over the longer term. The aim is to achieve the right development in the right place; it is not to allow development at any cost".

[1] Scottish Government, National Planning Framework 3 (2014) Available at: https://www.gov.scot/publications/national-planning-framework-3/ [Last accessed: 14/11/20]

[2] Scottish Government, Scottish Planning Policy (2014) Available at: https://www.gov.scot/publications/scottish-planning-policy/ [Last accessed: 14/11/20]

4.4.7 Paragraph 29 highlights a series of criteria which should guide decision-making in this regard and the following provisions are considered relevant to the Proposed Development:

- Net economic benefit;
- Economic issues, challenges and opportunities;
- Good design and qualities of successful places;
- Delivery of infrastructure;
- Climate change mitigation and adaptation;
- Principles of sustainable land use as set out in the land use strategy;
- Protecting, enhancing and promoting cultural heritage;
- Protecting, enhancing and promoting natural heritage and landscape;
- Reducing waste; and
- Over-development, amenity and effects on water, soil and air.

4.4.8 To support in achieving the outcome of making Scotland a low carbon place, the planning system should support the change to a low carbon economy, including deriving the equivalent of 100% of electricity demand from renewable sources by 2020. It should support the development of electricity generation from a diverse range of renewable sources. It should guide development to appropriate locations and advise on the issues that should be taken into account when specific proposals are being assessed.

4.4.9 Onshore wind is referred to specifically in paragraphs 161 to 166 (development planning considerations) and paragraphs 169 to 174 (development management considerations) of SPP within the 'Low Carbon Place' outcome. Development planning guidance for onshore wind includes reference to the need for planning authorities to set out in their development plans a Spatial Framework identifying those areas that are likely to be most appropriate for onshore wind farms. Table 1 in SPP provides guidance on how spatial frameworks should be set out. They should identify three types of areas including:

- Group 1: Areas where wind farms will not be acceptable (National Parks and National Scenic Areas);
- Group 2: Areas of significant protection (i.e. national and international designations, nationally important environmental interests, community separation for considering visual impact); and
- Group 3: Areas with potential for wind farm development (where wind farms are likely to be acceptable subject to consideration of details).

4.4.10 Chapter 3: Design Evolution and Alternatives provides further description of how the Site is consistent with the Dumfries and Galloway Council spatial framework for onshore wind farms (as set out in the adopted Local Development Plan).

4.4.11 More generally, SPP advises that the siting and design of development should take account of local landscape character. Decisions should take account of potential effects on landscapes and the natural and water environment, including cumulative effects. Applicants should seek to minimise adverse impacts through careful planning and design. Planning permission should be refused where the nature or scale of a development would have an unacceptable impact on the natural environment.

4.4.12 Beyond the Spatial Framework for wind farms the following considerations, outlined in paragraph 169, should be taken into account (where applicable) when determining development proposals:

- Net economic impact;
- Scale of contribution to renewable energy generation targets;
- Effect on greenhouse gas emissions;
- Cumulative impacts;
- Impact on communities and dwellings (including visual impact, residential amenity, noise and shadow flicker);
- Landscape and visual impacts (including wild land);
- Effect on natural heritage (including birds);
- Impacts on carbon rich soils (using carbon calculator);
- Impact on public access (including long distance walking and cycling routes and scenic routes);
- Impacts on the historic environment (including scheduled monuments, listed buildings and their setting);
- Impacts on tourism and recreation;
- Impacts on aviation and defence interests and seismological recording;
- Impacts on telecommunications and broadcasting installations;
- Impacts on transportation (road traffic and adjacent trunk roads);
- Effects on hydrology (water environment and flood risk);
- Opportunities for energy storage; and
- Conditions relating to decommissioning of development, including ancillary infrastructure and site restoration.

4.4.13 SPP is under review and a draft new NPF4 is expected to be published in September 2021. NPF4 will become the single national planning policy document, replacing both NPF3 and SPP and it is intended to have Development Plan status.

4.5 National Planning Advice

4.5.1 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 4.1 below.

Table 4.1: Relevant PANs and Specific Advice Notes

Title	Summary of Document
PAN 1/2013 Environmental Impact Assessment	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	Advises developers on the importance of discussing their proposals with the planning authority and Scottish Natural Heritage (SNH) 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.
PAN 61 (2001) Sustainable Urban Drainage Systems	Good practice drainage guidance.

Table 4.1: Relevant PANs and Specific Advice Notes	
Title	**Summary of Document**
PAN 68 (2003) Design Statements	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	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	This document provides advice on how to engage with local communities through the planning process.
PAN 1/2011 Planning and Noise	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	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 - OnShore Wind Turbines (updated 2014)	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 SPP, so the 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)	Details the role of the planning system in relation to the environmental protection regimes.
Online Planning Advice on Flood Risk (2015)	Provides advice on the role of the planning system and the assessment and management of flood risk.
Online Planning Guidance, COVID 19 Emergency and Pre-Application Consultation and Requirements for a Public Event (April 2020)	Provides guidance on the effect of the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 which makes temporary suspension of public meetings/ events and on alternative online consultation and expected practice.

4.6 The Development Plan & Relevant Policies

The Development Plan

4.6.1 The Development Plan for the Dumfries and Galloway Council (DGC) area is as follows:

- the Dumfries and Galloway Local Development Plan 2[3] (the LDP) (adopted October 2019); and
- LDP2 'Wind Energy Development: Development Management Considerations' Supplementary Guidance[4] (February 2020) (the SG).

4.6.2 The SG contains at Appendix C, the 'Dumfries and Galloway Wind Farm Landscape Capacity Study' (the DGWLCS).

[3] Dumfries & Galloway Council, LDP2 (2019) Available at: https://www.dumgal.gov.uk/ldp2 [Last accessed: 14/11/20]

4 Dumfries & Galloway Council, LDP2 Supplementary Guidance (2020) Available at: https://www.dumgal.gov.uk/ldp2 [Last accessed: 14/11/20]

Relevant Policies

4.6.3 **Policy IN1 'Renewable Energy'** relates to renewable energy proposals in general and is as follows:

"*The Council will support development proposals for all renewable energy generation and/ or storage which are located, sited and designed appropriately. The acceptability* of any proposed development will be assessed against the following considerations:*

- landscape and visual impact;
- cumulative impact;
- impact on local communities and individual dwellings, including visual
- impact, residential amenity, noise and shadow flicker;
- the impact on natural and historic environment (including cultural heritage and biodiversity);
- the impact on forestry and woodlands;
- the impact on tourism, recreational interests and public access.

To enable this assessment sufficient detail should be submitted, to include the following as relevant to the scale and nature of the proposal:

- any associated infrastructure requirements including road and grid;
- connections (where subject to planning consent);
- environmental and other impacts associated with the construction and operational phases of the development including details of any visual impact, noise and odour issues;
- relevant provisions for the restoration of the site;
- the scale of contribution to renewable energy generation targets;
- effect on greenhouse gas emissions; and
- net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.

Acceptability will be determined through an assessment of the details of the proposal including its benefits and the extent to which its environmental and cumulative impacts can be satisfactorily addressed. "

4.6.4 **Policy IN2 'Wind Energy'** is specific to wind energy developments and is as follows:

"*Assessment of all wind farm proposals:*

The Council will support wind energy proposals that are located, sited and designed appropriately. The acceptability of any 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 arising from 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 other 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.

**Acceptability will be determined through an assessment of the details of the proposal including its benefits and the extent to which environmental and cumulative impacts can be addressed satisfactorily*. "

Other LDP Policies

4.6.5 **Policy OP1** 'Development Considerations' is an overarching policy that sets out general development considerations. It highlights that development will be assessed against various considerations depending on the scale, nature and location of the proposal including general amenity; historic landscape; landscape; biodiversity and geodiversity; transport and travel; sustainability; and the water environment.

4.6.6 **Policy OP2** 'Design Quality and Placemaking' is an overarching policy that sets out general considerations in relation to design quality of new development. It highlights that

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.

4.6.7 **Policy ED11** 'Dark Skies' relates to the Council's support for the Galloway Forest Dark Sky Park. The Council will assess proposals for development on their merit where they do not adversely affect the objectives of the Dark Sky Park designation.

4.6.8 **Policy HE1** 'Listed Buildings' sets out certain considerations that apply to development proposals that impact on the character or appearance of a listed building or its setting.

4.6.9 **Policy HE2** 'Conservation Areas' sets out that the Council will support development within or adjacent to a Conservation Area that preserves or enhances the character and appearance of the area.

4.6.10 **Policy HE3** 'Archaeology' sets out that the Council will support development and protects significant archaeological and historic assets and protect the wider historic environment from adverse effects.

4.6.11 **Policy HE4** 'Archaeologically Sensitive Areas' sets out that the Council will support development that safeguards the character, archaeological interest and setting of Archaeologically Sensitive Areas as designated by the Council.

4.6.12 **Policy HE6** 'Gardens and Designed Landscapes' sets out that the Council will support development that protects or enhances the significant elements, specific qualities, character, integrity and setting, including key views to and from, gardens and designed landscapes included in the Inventory of Gardens and Designed Landscapes or the Non-Inventory List. Proposals that would have a detrimental effect on the specific quality, character or integrity of a garden or designed landscape will not be approved unless it is demonstrated that the proposal has benefits of overriding public interest.

4.6.13 **Policy NE2** 'Regional Scenic Areas' sets out that development within, or which affects Regional Scenic Areas, may be supported where the Council is satisfied that the landscape character and scenic interest for which the area has been designated would not be significantly adversely affected.

4.6.14 **Policy NE4** 'Sites of international importance for biodiversity' sets out that development proposals likely to have a significant effect on an existing or potential Special Protection Area, existing or candidate Special Area of Conservation or Ramsar site, including developments outwith a site, will require an appropriate assessment and will only be permitted where *inter alia* the development does not adversely affect the integrity of the site.

4.6.15 **Policy NE5** 'Species of international importance' sets out that 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 *inter alia* that the development would not be detrimental to the maintenance of the population of the species at a favourable conservation status in its natural range, and that there is no satisfactory alternative and the development is required for preserving public health or safety or for other areas of overriding public interest.

4.6.16 **Policy NE6** 'Sites of national importance for biodiversity and geodiversity' sets out that development affecting Sites of Special Scientific Interest and other national nature conservations will only be permitted where *inter alia* it will not adversely affect the integrity of the area or the qualities for which it has been designated or that any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

4.6.17 **Policy NE7** 'Forestry and Woodland' sets out that proposals should seek to ensure that ancient and semi-natural woodlands and other woodlands with high nature conservation value are protected and enhanced.

4.6.18 **Policy NE8** 'Trees and Development' sets out that where it is not possible to retain woodland then appropriate replacement planting will be required. Any such replacement planting scheme would be located where possible within the region and follow guidance contained within the Forestry and Woodland Strategy.

4.6.19 **Policy NE11** relates to the water environment. It sets out that the Council will not permit development which would result in deterioration in the status of a waterbody or which would likely impede the improvements in waterbody status as set out in the Solway Tweed River Basin Management Plan, unless there are exceptional justifying circumstances. The policy further sets out that culverting of waterbodies should only be carried out where acceptable mitigation measures would be put in place to protect habitats, passage of fauna, and river form and flow.

4.6.20 **Policy NE12** 'Supporting the Water Environment' relates to protection of water margins. It sets out that where new development is proposed adjacent to or in the vicinity of waterbodies, the water margins will be protected unless there are compelling reasons to justify why this should not be done.

4.6.21 **Policy NE15** 'Protection and Restoration of Peat Deposits as Carbon Sinks' relates to the protection and restoration of Peat Deposits as Carbon Sinks. It sets out that the Council will safeguard and protect peat deposits. Where renewable energy generating development is proposed the balance of advantage in terms of climate change mitigation must be with the proposed development.

4.6.22 **Policy T1** 'Transport Infrastructure' sets out that development proposals will be appraised to determine their effects on the performance of the strategic and regional highway network.

4.7 Supplementary Guidance

4.7.1 The LDP2 'Wind Energy Development: Development Management Considerations' Supplementary Guidance (February 2020) (the "SG") provides further detail in support of the development management considerations in Policy IN2 'Wind Energy'. It sets out a statement on the main factors that are to be taken into account in reaching planning decisions and details the criteria contained in the policy.

4.7.2 As noted, the SG contains at Appendix C, the 'Dumfries and Galloway Wind Farm Landscape Capacity Study[5]' (the DGWLCS).

4.8 Summary

4.8.1 This chapter has set out the legislative background, a summary of the renewable energy policy framework, and the national and local planning policies and guidance relevant to the consideration of the Proposed Development. It provides an objective summary of the energy and planning policy considerations that have been taken into account in the preparation of

[5] Dumfries and Galloway Council, Dumfries and Galloway Wind Farm Landscape Capacity Study (2020) Available at: https://www.dumgal.gov.uk/article/17034/LDP2-Supplementary-Guidance [Last accessed: 14/11/20]

the EIA Report in order to ensure that it provides the appropriate information for the consideration of the planning application.

4.8.2 As noted, the policy appraisal for the Proposed Development is contained in a separate Planning Statement.

5 Seascape, Landscape and Visual Amenity

Executive Summary

The following chapter identifies the significant construction and operational effects on the seascape, landscape and visual resource of a study area arising from the Proposed Development. Seascape and landscape assessment addresses the effects of the change and development on seascape and landscape as a resource, whilst the visual assessment considers the effects of change and development on the views available to people and their visual amenity

The Seascape, Landscape and Visual Impact Assessment (SLVIA), is accompanied by a number of specialist assessment including:

- A Wild Land Impact Assessment for the Merrick Wild Land Area (NatureScot WLA01);
- A Night-time Lighting Assessment; and
- A Residential Visual Amenity Assessment.

All assessments are undertaken in accordance with current best practice and the *Guidelines for Landscape and Visual Impact Assessment*, (third edition, Landscape Institute and Institute of Environmental Management and Assessment, 2013). The Wild Land Impact Assessment follows the *Assessing the Impacts on Wild Land Areas – Technical Guidance* (NatureScot, 2020), and the Residential Visual Amenity Assessment complies with the *Residential Visual Amenity Assessment (RVAA) – Technical Guidance Note* 2/19 (Landscape Institute, 2019). The Night-time Lighting Assessment is illustrated by visualisations which are selected and prepared in accordance with the *Visual Representation of Wind Farms Guidance – Version 2.2* (NatureScot, 2017).

The Proposed Development comprises a twelve-turbine wind farm with turbines with a maximum tip height of 180 m above ground level and associated infrastructure. The Proposed Development is sited on a moorland plateau landscape which is characterised by extensive commercial forestry and a large cluster of existing wind developments, including:

- Kilgallioch;
- Airies;
- Stranoch (consented and potentially replaced by Stranoch 2 which is in-planning);
- Artfield Fell;
- Balmurrie Fell; and
- Glenchamber.

The Proposed Development Site would be surrounded by existing wind farms, namely Kilgallioch Wind Farm (to the north); Artfield Fell (to the south west), and Airies Wind Farm (to the east). The proposed Kilgallioch Extension and Airies II would extend the existing Kilgallioch and Airies schemes. This grouping of wind development on the moorland plateau includes Balmurrie Fell located immediately west of Artfield Fell Wind Farm, and Glenchamber Wind Farm which lies south of Artfield Fell. The Proposed Development would effectively represent 'in-fill' development within this cluster of developments and would not result in an increased lateral spread of development. This offers benefits in respect of the avoidance of a more dispersed pattern of development that would inevitably cause the spreading of cumulative effects.

The Proposed Development has been sited and designed to minimise seascape, landscape and visual effects taking account of good practice provided in *Siting and Design of Wind Farms in the Landscape, Version 3a* (NatureScot, 2017) and the Proposed Development is within the Dumfries and Galloway Council's *Areas with potential for wind farm development* (Spatial Framework Map 8, Dumfries and Galloway Council Local Development Plan 2, October 2019). Mitigation considerations have resulted in adopting the following key measures:

- The Proposed Development is sited away from:
  - Settlement and individual dwellings;
  - Distinctive landscape features, the scale and form of which could be compromised;
  - Is set back from the prominent upland fringe; and
  - Away from the A75 corridor.
- Consider the overall relationship of the Proposed Development to the emerging cumulative pattern of development with larger turbine types on the plateau moorland and smaller turbines on transitioning slopes of the upland fringe landform;
- Consider the localised 'fit' of the larger proposed turbines with neighbouring smaller turbines ensuring that these are not 'overshadowed' and the overall vertical extent of wind turbines is even thus reducing potential 'visual complexity';
- Ensure the spread of wind development remains within the overall footprint of the existing wind developments so that the twelve proposed turbines would effectively read as an extension of Kilgallioch (existing), Kilgallioch Extension (in-planning), Airies (existing) and Airies II (in-planning) wind developments; and
- Consider the local topography to minimise views, e.g. the conical landform of Artfield Fell would screen most of the hubs from receptors to the west.

The ZTV for the Proposed Development illustrates the efficacy of this approach as the viewshed is relatively constrained and limited for a wind development scheme of this size and type.

Significant effects arising as a result of the Proposed Development are predicted on the following receptors:

LANDSCAPE RECEPTORS

- Localised areas of LCT174: Plateau Moorland with Forest – Dumfries and Galloway.

VISUAL RECEPTORS

- Localised parts of the Southern Upland Way within approximately 6 km of the proposed turbines (there would be no significant effects on the remainder of the SUW within the study area); and
- Localised parts of the Moors of Wigtownshire Walk Core Path within the Tarf Bridge section of the path (no significant effects are predicted on the western sections of this footpath), and the Three Lochs Kirkcowan Core Path.

CUMULATIVE – IN-ADDITION EFFECTS

- Recreational Routes including: The Moors of Wigtownshire Walk (locally around Tarf Bridge), Three Lochs Kirkcowan, and Glenkitten Fell.

CUMULATIVE – IN-COMBINATION EFFECTS

- Galloway Hills RSA, Mochrum Lochs RSA, and South Ayrshire Scenic Area;

- Landscape character areas: LCT72; LCT73; LCT78; LCT83; LCT159; LCT167; LCT168; LCT172; LCT173; LCT174; LCT175; LCT179 and LCT181;
- Recreational Routes including: SUW, Mull of Galloway Trail, New Luce to Kilhern – Circular Walk, The Moors of Wigtownshire Walk, Three Lochs Kirkcowan, Glenkitten Fell, Stranoch to Beneraird, and NCR 73;
- Transport routes including sections of: A75, A7814, A747, and B7005; and
- Settlements including: Glenluce, Newton Stewart, Stranraer, Wigtown and Creetown.

By way of conclusion, it is noted that all wind energy developments coming forward at this time are larger than existing onshore wind farms, and it is generally accepted that such developments will result in significant effects. Within this context, the significant effects predicted to arise from the Proposed Development are relatively few. Significant landscape and visual effects are limited to receptors within approximately 6 km of the proposed turbines, and significant in-addition cumulative effects are also constrained to within approximately 6 km of the Proposed Development. Cumulative in-combination effects are relatively wide-spread, however, this reflects on the context of existing wind development which is a key characteristic of the moorland plateau landscape.

Given that current best practice suggests that clustering wind developments is preferable to spreading potential impacts over wider parts of the landscape, and since there are very few significant effects predicted (other than the cumulative in-combination effects) it is considered that overall, the Proposed Development is suitable in terms of landscape and visual matters.

5.1 Introduction

5.1.1 This chapter considers the likely significant effects on the seascape, landscape and visual resource associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the existing seascape, landscape and visual baseline context and cumulative context;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

5.1.2 The assessment has been carried out by Sitara Keppie CMLI, with technical review by Robert Bainsfair CMLI of Ramboll UK Limited. Both are Chartered Landscape Architects with over 20 years' of experience working across a wide range of sectors including renewable energy and have extensive experience of managing and undertaking seascape, landscape and visual impact assessments (SLVIA), cumulative assessments (CSLVIA), and providing expert witness evidence for wind farm developments throughout Scotland (further detail on professional competency is provided in Volume 4: Technical Appendix 1.2).

5.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures:
  - Figure 5.1: Topography;
  - Figure 5.2: Land Use;
  - Figure 5.3a-b: Landscape Character Type Compared to Local Council;
  - Figure 5.4a: Landscape Designations;
  - Figure 5.4b: Landscape Designations with Blade Tip ZTV;
  - Figure 5.5a: Transportation Routes, Recreation Routes and Summits;
  - Figure 5.5b: Route Analysis;
  - Figure 5.6a: ZTV;
  - Figure 5.6b: Blade Tip v Hub Height ZTV;
  - Figure 5.7: Cumulative Context;
  - Figure 5.7a: Cumulative ZTV: Proposed Development, Hadyard Hill and Dersalloch;
  - Figure 5.7b: Cumulative ZTV: Proposed Development, Glenchamber and Carscreugh;
  - Figure 5.7c: Cumulative ZTV: Proposed Development, Artfield Fell and Balmurrie Fell;
  - Figure 5.7d: Cumulative ZTV: Proposed Development, Wether Hill and Blackcraig Hill;
  - Figure 5.7e: Cumulative ZTV: Proposed Development, North Rhins and Knocknain Farm;
  - Figure 5.7f: Cumulative ZTV: Proposed Development, Windy Standard and Windy Standard II;
  - Figure 5.7g: Cumulative ZTV: Proposed Development, Hare Hill and Hare Hill Extension;
  - Figure 5.7h: Cumulative ZTV: Proposed Development, Afton and Sanquhar;

- Figure 5.7i: Cumulative ZTV: Proposed Development, Barlockhart and Barlockhart Moor Extension;
- Figure 5.7j: Cumulative ZTV: Proposed Development, Assel Valley and Tralorg;
- Figure 5.7k: Cumulative ZTV: Proposed Development, Mark Hill and Chirmorrie;
- Figure 5.7l: Cumulative ZTV: Proposed Development and Airies;
- Figure 5.7m: Cumulative ZTV: Proposed Development, Kilgallioch and Kilgallioch Extension;
- Figure 5.7n: Cumulative ZTV: Proposed Development, Arecleoch and Arecleoch Extension;
- Figure 5.7o: Cumulative ZTV: Proposed Development, Knockman Hill and Mochrum Fell;
- Figure 5.7p: Cumulative ZTV: Proposed Development, South Kyle and Benbrack;
- Figure 5.7q: Cumulative ZTV: Proposed Development, Torrs Hill and Lorg;
- Figure 5.7r: Cumulative ZTV: Proposed Development, Over Hill and Knockshinnoch;
- Figure 5.7s: Cumulative ZTV: Proposed Development, Windy Standard III and Windy Rig;
- Figure 5.7t: Cumulative ZTV: Proposed Development, Enoch Hill and Pencloe Consented Wind Farm;
- Figure 5.7u: Cumulative ZTV: Proposed Development, Glenshimmeroch and Margree;
- Figure 5.7v: Cumulative ZTV: Proposed Development, Troston Loch Wind Farm and Cornharrow;
- Figure 5.7w: Cumulative ZTV: Proposed Development, Meikle Float Farm and Larbrax;
- Figure 5.7x: Cumulative ZTV: Proposed Development, Stranoch 2 and Glen App;
- Figure 5.7y: Cumulative ZTV: Proposed Development, Airies II and Kilgallioch Extension;
- Figure 5.7z: Cumulative ZTV: Proposed Development, Down Hill Farm and North Threave;
- Figure 5.7za: Cumulative ZTV: Proposed Development, Trostie and High Barcaple;
- Figure 5.7zb: Cumulative ZTV: Proposed Development, North Kyle and High Park;
- Figure 5.7zc: Cumulative ZTV: Proposed Development, Sanquhar Six and Sanquhar II;
- Figure 5.7zd: Cumulative ZTV: Proposed Development and Kirk Hill Wind Farm;
- Figure 5.7ze: Cumulative ZTV: Proposed Development and Whiteside Hill;
- Figure 5.7zf: Cumulative ZTV: Proposed Development and Clauchrie Wind Farm;
- Figure 5.7zg: Cumulative ZTV: Proposed Development and Greenburn Wind Park;
- Figure 5.7zh: Cumulative ZTV: Proposed Development and Shepherds Rig;
- Figure 5.7zi: Cumulative ZTV: Proposed Development and Pencloe Wind Farm;
- Figure 5.8: Lighting Intensity – Cardinal Lights ;

- Volume 3b – Visualisations:

  - Figures 5.9a to 5.9f: Visualisations: Viewpoint 1: A714 West of Glentrool;
  - Figures 5.10a to 5.10j: Visualisations: Viewpoint 2: Merrick;
  - Figures 5.11a to 5.11h: Visualisations: Viewpoint 3: Glenvernock Fell;
  - Figures 5.12a to 5.12h: Visualisations: Viewpoint 4: Bruce's Stone, Merrick Car Park;
  - Figures 5.13a to 5.13j: Visualisations: Viewpoint 5: Cairnsmore of Fleet;
  - Figures 5.14a to 5.14l: Visualisations: Viewpoint 6: Fell End;

- Figures 5.15a to 5.15f: Visualisations: Viewpoint 7: A75, Creetown;
- Figures 5.16a to 5.16f: Visualisations: Viewpoint 8: Fell Loch;
- Figures 5.17a to 5.17h: Visualisations: Viewpoint 9: Minor Road, South of Mochrum Loch;
- Figures 5.18a to 5.18j: Visualisations: Viewpoint 10: Knoch Fell;
- Figures 5.19a to 5.19f: Visualisations: Viewpoint 11: Mull of Galloway;
- Figures 5.20a to 5.20h: Visualisations: Viewpoint 12: A75, Glenluce;
- Figures 5.21a to 5.21f: Visualisations: Viewpoint 13: Whitecairn Caravan Site;
- Figures 5.22a to 5.22f: Visualisations: Viewpoint 14: Sandhead;
- Figures 5.23a to 5.23h: Visualisations: Viewpoint 15: Mains of Larg, New Luce;
- Figures 5.24a to 5.24h: Visualisations: Viewpoint 16: Minor Road, Balmurrie Fell;
- Figures 5.25a to 5.25j: Visualisations: Viewpoint 17: Beneraird;
- Figures 5.26a to 5.26h: Visualisations: Viewpoint 18: SUW North of Balmurrie Fell;
- Figures 5.27a to 5.27h: Visualisations: Viewpoint 19: Tarf Bridge;
- Figures 5.28a to 5.28h: Visualisations: Viewpoint 20: North from Loch Ronald, and
- Figures 5.29a to 5.29h: Visualisations: Viewpoint 21: Eldrig Fell.

- Volume 4: Technical Appendices

  - Technical Appendix 5.1: Designated and Classified Land;
  - Technical Appendix 5.2: Seascape and Landscape Character Type Descriptions;
  - Technical Appendix 5.3: Viewpoint Assessment;
  - Technical Appendix 5.4: Residential Visual Amenity Assessment;
    Figure 5.4.1: Residential Visual Amenity Assessment Property Locations;
  - Technical Appendix 5.5: Wild Land Impact Assessment;
  - Technical Appendix 5.6: Route Visibility Analysis, and
  - Technical Appendix 5.7: Night-time Lighting Assessment.

5.1.4 Figures and technical appendices are referenced in the text where relevant.

5.2 Assessment Methodology and Significance Criteria

Scope of Assessment

5.2.1 The study area of the Seascape, Landscape and Visual Impact Assessment (SLVIA) comprises a 45 km radius extending from the outermost turbines of the Proposed Development. This is presented on Figures 5.1 to 5.7zi.

5.2.2 This chapter considers effects on:

- landscape fabric, caused by changes to the physical form of the landscape and its elements;
- seascape and landscape character, designations and classifications, caused by changes in the key characteristics and qualities of the landscape as a result of the Proposed Development; and
- visual amenity, caused by changes in the composition and scenic qualities of views on visual amenity as a result of the Proposed Development.

5.2.3 The chapter assesses both in-addition and in-combination effects arising from two different scenarios:

- the Proposed Development in conjunction with the baseline context of operational and consented developments; and

- the Proposed Development in conjunction with the cumulative baseline and Proposed Developments subject to a valid planning application[1].

5.2.4 This chapter assesses the seascape, landscape and visual effects of the Proposed Development as described in Chapter 2 (EIAR Volume 2). This chapter considers the effects on:

- Landscape fabric;
- Seascape and Landscape character;
- Designated Landscape and Classified landscapes; and
- Visual amenity.

5.2.5 Effects on landscape fabric occur when there is physical change to components of the landscape such as the landform, land use or land cover. Effects on seascape and landscape character arise when there is change to their key characteristics and associated distinct and recognisable pattern of elements. Visual effects are a subset of landscape effects and comprise changes in views and scenic quality.

5.2.6 Seascape, landscape and visual effects may also have implications for cultural heritage assets, specifically on the setting of Gardens and Designed Landscapes (GDLs) and on listed buildings and scheduled ancient monuments. However, such matters are addressed in EIAR Chapter 6: Archaeology and Cultural Heritage, whilst the SLVIA addresses matters pertaining to potential effects on the character and amenity of GDLs.

5.2.7 Seascape, landscape and visual considerations have influenced the design of the Proposed Development. The design analysis and guidance referenced during the design of the Proposed Development is described in EIAR Volume 2: Chapter 3: Design Evolution and Alternatives.

5.2.8 The scope of the assessment has been informed by consultation responses summarised in Table 5.1 and the following published guidance:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA)[2];
- Landscape Character Assessment[3];
- Techniques for Judging Capacity and Sensitivity[4];
- Siting and Designing Wind Farms in the Landscape[5];
- Assessing Effects on Wild Land[6]; and
- Guidance: Cumulative Effects of Wind Farms[7].

[1] NB an exception is made in the case of the proposed Airies II Wind Farm development, which is at the scoping stage; however given its proximity to the Proposed Development, it has been included within this cumulative future baseline scenario.
[2] "Guidelines for Landscape and Visual Impact Assessment", third edition, Landscape Institute and Institute of Environmental Management and Assessment (2013)
[3] "Landscape Character Assessment" The Countryside Commission and Scottish Natural Heritage (2002)
[4] "Topic Paper 6: Techniques and Criteria for Landscape and Visual Impact Assessment – Third Edition" Scottish Natural Heritage and the Countryside Agency (2002)
[5] "Siting and Designing Wind Farms in the Landscape, Guidance, Version 3a" Scottish Natural Heritage (August 2017)
[6] "Assessing impacts on Wild Land Areas – technical guidance" Nature Scot (September 2020)
[7] "Assessing the Cumulative Impact of Onshore Wind Energy Developments" Scottish Natural Heritage (2012)

Consultation

5.2.9 Table 5.1 summarises the consultation responses received regarding the scope and approach adopted in the SLVIA and provides information as to how and where within the chapter the consultees comments have been addressed.

5.2.10 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 5.1: Consultation Responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
Dumfries and Galloway Council	Scoping Response	Refer to Landscape Architects comments. Particular attention is drawn to: • Viewpoints; and • Aviation lighting.	See responses below in the rows discussing Viewpoints and Aviation lighting.
		Requested Capacity Study Landscape Character Types (LCT) to be used instead of Nature Scot LCTs.	The SLVIA take cognisance of the recommendation of the DGWLCS as set out in Paragraphs 5.2.25 and 5.2.30 of this SLVIA.
		Provided advice on the turbine typology and sensitivities of the host LCT.	The advice is noted and effects on LCTs are assessed in Assessment Table in the Technical Appendix 5.2 of the SLIVA.
		Request for cumulative assessment to fully address existing, consented, in-planning and where absolutely necessary, scoping schemes.	The SLVIA addresses existing, consented, in-planning and the in-scoping Airies II development since it neighbours the Proposed Development.
		Mitigation of effects should focus on optimising the design of the wind farm. This must be tested through the LVIA process.	The design methodology is set out in Chapter 3: Design Evolution and Alternatives of the EIAR. Mitigation is set out in Section 5.6 of the SLVIA.
	Scoping Response – DGC Landscape Architect	<u>Viewpoints (VPs):</u> Viewpoints at distances of greater than 20 km from the Proposed Development should be represented by a wireline and baseline photograph.	Following receipt of the scoping opinion, further consultation on viewpoints for the LVIA was carried out. This response is presented further down in this table and superseded any response to the scoping request.
		Requested additional VPs:	
		• Three Lochs Caravan Park	Not included – there are 3 viewpoints provided from near to the Proposed Development (VP18 to VP20) which inform the likely impacts on the areas close to the site and which provide worst case visibility of the Proposed Development.
		• Core Path 432 near Fell of Loch Ronald	Included as VP20.
		• Eldrig Fell	Included as VP21.
		• Tarf Bridge	Included as VP19.
		• A75, Barlae	Not included – the ZTV indicates that there is fragmented theoretical visibility on the landform of Barlae. VP6 from Fell End is closer to the Proposed Development from a similar direction.
		• Southern Upland Way (SUW) at Craig	Not included – the summit of the Fell has constrained and restricted

Table 5.1: Consultation Responses			
Consultee	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
		Airie Fell	theoretical visibility (as per ZTV). VP18 is from SUW as it passes within approx. 1 km of the Proposed Development.
		• SUW Caves of Kilhern	Not included – VP15 is from a approx. 3 km west of here and VP16 is at about 2 km uphill.
		• Torwood House and Bungalow	Not included – ZTV indicates theoretical visibility of 3 to 6 turbines around the access road and grounds, and north of the properties there is mature woodland which would screen/ substantially limit views of the turbines. VP19 from Tarf Bridge is from about 1 km northeast of here.
		• Minor road NE of Drumphail access	Not included – VP13 is just over 2 km southwest of here.
		• SUW, Nith, Rhins Peninsula	Not included – VP11 and VP14 are from the Rhins Peninsula. Given the distance and theoretical visibility it is considered that these two VPs allow for a comprehensive assessment.
		• DGC Border, B7023 at Loch Maberry	Not included VP3 is approx. 4 km southeast and is located outwith forestry areas for a clearer view.
		<u>Residential Viewpoints:</u> Further work is required to look at the local area in detail.	A Residential Visual Amenity Assessment (RVAA) has been prepared for Artfield Forest Wind Farm. Refer to Technical Appendix 5.4.
		<u>Aviation Lighting:</u> Referred to DGC Supplementary Guidance on Dark Sky Friendly Lighting.	The turbines with nacelle and mid-level lighting are indicated in the wirelines for each of the assessment viewpoints (refer to the 53.5 degree wireline for each viewpoint – the turbines labelled in blue would be lit and red label indicates the two unlit turbines). Aviation lighting ZTV is provided in Figure 5.8: Lighting Intensity – Cardinal Lights (Volume 3a: Figures).
		Requested Aviation lighting on hubs/ nacelle and towers are shown on all wirelines.	
		Requested aviation lighting ZTVs are provided at an early opportunity.	
		Full aviation visualisations to be presented for the following:	Night-time visualisations have been prepared in accordance with NatureScot visualisation guidance[8] which recommends that only viewpoints that are regularly visited at night or from where there is a particular sensitivity to light be illustrated. For this reason, three of the six viewpoints are provided.
		• Merrick – Wild and Area WLA/ Dark Sky Park;	• Included to illustrate view from Dark Sky Park (Figure 5.10h);
		• Bruce's Stone – Dark Sky Park;	• Not included since the viewpoint not regularly visited at night, nor is there a particular sensitivity to light;
		• Glenvernoch Fell;	• Included from location where the

[8] "Visual Representation of Wind Farms - Guidance", NatureScot (2017)

Table 5.1: Consultation Responses			
Consultee	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
			minor road intersects the SUW (Figure 5.11f);
		• Three Lochs Caravan Park;	• Not included since the caravan park is next to mature forest which would limit views;
		• Tarf Bridge; and	• Not included as this location is neither regularly visited at night nor is it sensitive to light, and
		• Fell End minor road.	• Included as the viewpoint is from a minor road en-route to several properties (Figure 5.14h).
		<u>Other comments</u>	
		• Requested inclusion of Merrick WLA due to implications of aviation lighting.	• A Wild Land Impact Assessment has been prepared for the Merrick Wild land Area– see Technical Appendix 5.5.
		• Minor roads and tracks added to recreational receptors.	• Core Paths within 10 km of the Site are included in the SLVIA – many follow minor roads and tracks.
		• Galloway Dark Skies Park included as a sensitive receptor.	• This relates to the conservation and legibility of dark skies within the Dark Skies Park.
		• Different turbine heights tested as part of design mitigation.	• See Chapter 3: Design Evolution and Alternatives.
		• Referred to guidance in the DGC LDP 2, Wind Energy Supplementary Guidance.	• Policy informing the design is set out in Chapter 3: Design Evolution and Alternatives. All guidance used in the SLVIA is set out in Section 5.2. This includes the DGC LDP 2 and all appropriate supplementary guidance.
	Further Viewpoint Comments – DGC Landscape Architect[9]	• The inclusion of three additional representative viewpoints for Tarf Bridge, Loch Ronald and Eldrig Fell is welcomed. • With respect to the representative viewpoint near Loch Ronald please use the core path 432, near the Fell of Loch Ranald (property) access point.	• These viewpoints have been included as requested. • The requested position was adopted for the purpose of the assessment.
		• A75 Barlae – agree full visualisation not required but please include a wireline to demonstrate that visibility has been addressed in the design of the scheme as stated.	• This requested viewpoint was not included. The ZTV indicates that there is fragmented theoretical visibility on the landform of Barlae. VP6 from Fell End is closer to the Proposed Development from a similar direction. Please also note that these comments from the Council were received on 20/11/20 whilst the LVIA was being finalised, and could not be included at this late stage.
		• Minor road near Garvilland. DGC disagree that this is similar to VP15 Mains of Larg. Please substitute this for	• VP13 Whitecairn Caravan Park has been used as a worst-case scenario for this location – see Figures 5.21a to

[9] Consultation comments received on 20 November 2020, in response to further information provided by Ramboll UK Limited on 4 September 2020. Given the timing of the response it was not possible to fully address all comments.

Table 5.1: Consultation Responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
		VP13 Whitecairn Caravan park as a worst-case scenario.	5.21d. (NB these comments were received on 20/11/20 when the SLVIA was in the process of being finalised, therefore too late to include).
		• DGC disagreed with omitting a VP from Craig Airie Fell. Requested inclusion as the outlook south is more open, and provides consistency with representation of other schemes.	• VP3 from Glenvernock Fell is close to this and from an open area with clear views. (NB these comments were received on 20/11/20 when the SLVIA was in the process of being finalised, therefore too late to include).
		• Torwood House Hotel and Bungalow may be covered as a residential viewpoint. Please provide a wireline.	• Torwood House is located outwith the 2 km Residential Visual Amenity Study Area. However, a wireline has been provided appended to the RVAA (Technical Appendix 5.4).
		• DGC was agreed that viewpoints at Caves of Kilhern and the A75 at Barlae were not required. A wireline from A75 at Barlae was requested.	• Noted. A wireline from Barlae is not included as the ZTV indicates that there is fragmented theoretical visibility on the landform of Barlae. VP6 from Fell End is closer to the Proposed Development from a similar direction.
		<u>Night-time visualisations and assessment:</u>	A Night-time Lighting Assessment is included in Technical Appendix 5.7
		• The inclusion of four representative night-time viewpoints for Merrick, Glenvernock Fell, Fell End, and Whitecairn Caravan Park is welcomed.	• As noted in the Aviation Lighting section above, six viewpoints were requested and three are included in accordance with the NatureScot visualisation guidance (see earlier response above).
		• DGC recommended that these be confirmed as practicable and a worst-case scenario is ensured. We have been advised by other consultants that night-time visualisations should be reachable by road for H&S reasons. • Requested inclusion of VP 4 Bruce's Stone car park.	• The project team considered it practicable in terms of H&S for these photographs to be taken. Ramboll's photography team are experienced in night-time photography and follow suitable H&S protocols when out on site. • There is no view to the Proposed Development from the car park at Bruce's Stone. The viewpoint taken is from south of the Stone itself and is not representative of this area.
		• Referred to previous comments to include Viewpoints 19 (Tarf Bridge) and 20 (Loch Ronald) for night-time visualisation.	• As previously noted, these two viewpoints are not at locations from which the Proposed Development would regularly be viewed at night-time, nor are these locations sensitive to light (as per NatureScot guidance referenced in row above).
		• As per SNH scoping advice, DGC request that wirelines from all the representative viewpoints indicate lighting at hub heights.	• See above comment – the EIAR confirms that lighting would be provided on all turbines except T3 and T9 unless otherwise agreed, in accordance with the proposed condition set out in Chapter 12: Aviation and Telecommunications.

Table 5.1: Consultation Responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
			(Turbine lighting is indicated on wirelines: refer to the 53.5 degree wireline for each viewpoint – the turbines labelled in blue would be lit and red label indicates the two unlit turbines).
		• Request that the cumulative assessment focussed on the schemes with which the cumulative interactions are likely to be greatest in terms of in-combination effects, appreciating a wider pattern of schemes will also be represented. Key schemes are: ○ Operational: Kilgallioch, Artfield and Balmurrie Fells, Airies, Glenchamber, Carscreugh, Barlockart Moor. ○ In-planning: Kilgallioch Extension. ○ Scoping/ in-planning: Airies II, Wood of Dervaird (for information).	• Noted and the cumulative assessment includes the Airies II in-scoping scheme as it would be directly adjacent the Proposed Development. Wood of Dervaird is not included.
NatureScot	Scoping Response	• NatureScot advise that turbine lighting could result in adverse impacts on the wild land qualities of the Merrick WLA, as well as adverse impacts on views from and within the core area of the Galloway Forest Dark Sky Park.	• A WLA is presented in Technical Appendix 5.5. which addresses the potential impacts on Wild Land.
		• NatureScot requested an assessment of the impact of the development proposal on the WLA, which should be informed by an assessment of the effects of its turbine lighting.	• A WLA is presented in Technical Appendix 5.5 and the Night-time Lighting Assessment is provided in Technical Appendix 5.7.
		NatureScot provided more detailed advice in Annex 1:	An assessment of the effect of proposed aviation lighting on turbines Lighting is provided in TA 5.7 and the lighting strategy is set out in Chapter 12: Aviation and Telecommunications which notes that the Proposed Development is surrounded on three sides by other existing operational wind farm developments with different lighting configurations. Further, the Proposed Development is located in close proximity to two other proposed wind farm developments with potentially different (again) lighting configurations (Kilgallioch Extension (in-planning) and Airies II (scoping)). To comply with Article 222 of the Air Navigation Order (2016), the lighting design, as specified in Chapter 2: Development Description, will have all turbines except Turbines 3 and 9 lit at medium intensity (2000 cd) at the nacelle height and low intensity (32 cd) half way between the ground and the nacelle. The lights will be capable of being dimmed to 10% of their peak intensity when a sensor at the wind farm detects that the visibility exceeds
		• An assessment of the impact of the development proposal on the WLA and the Dark Skies Park should be provided, informed by an assessment of the effects of its turbine lighting.	
		• The effects of lighting from the lower-lying interior of the WLA may also be intensified by channelled views down the unlit Glen Trool. The proposal could introduce eye-catching and prominent lights into an area important for its dark skies.	
		• A lighting assessment should include a night-time visualisation from the Merrick summit. We also recommend that the assessment includes a new additional viewpoint located at an appropriately selected location within the lower-lying part of the WLA further to the south (e.g. on one of the rugged hills close to Loch Enoch).	
		• The turbine lighting assessment should consider the cumulative effects of	

Table 5.1: Consultation Responses			
Consultee	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
		lights from other consented or application stage schemes.	5 km. The status and specification of lighting on existing operational developments (e.g. Artfield Fell, Balmurrie Fell, Airies, Glenchamber and Kilgallioch) and Proposed Development (e.g. Kilgallioch Extension and Airies II) may alter the ability of the lighting scheme on the Proposed Development to define the perimeter of the cumulative area of wind turbines, thus undermining the purpose of the lighting. As such, it is proposed to draft a lighting condition that allows for re-design of the lighting scheme, prior to construction, which may take into account the lighting status of adjacent developments and continue to provide warning to airspace users of the perimeter of the cumulative area of wind turbines. It is also anticipated that a technical mitigation solution, for example, in the form of transponder or radar activate lighting might become available during the application process or the lifetime of a consent. This would mean that lighting would be rarely required given the level of aviation activity in the area. This point too can be addressed in a planning condition. Turbine lighting would be provided on all turbines except turbines 3 and 9.
		• If directional lighting is to be employed as a form of mitigation, then it would also be useful to include a lighting intensity ZTV within the assessment.	
		• We welcome that the applicant is considering mitigation for lighting at this stage. We recognise that a range of mitigation options may be available and would encourage the applicant to explore these prior to application.	

Legislation and Policy Context

5.2.11 The scope and approach adopted in the SLVIA also reflects a number of relevant national and regional planning policies, as follows.

National Legislation and Policy

5.2.12 A desk study of the relevant national, regional and local planning guidance and landscape planning policy context was carried out and the findings summarised below. Broader policy deliberations are covered in the accompanying Planning Statement.

5.2.13 The Scottish Government's Planning Guidance on renewable developments is set out in the National Planning Framework (NPF3) and in the Scottish Planning Policy (SPP) published in 2014.

5.2.14 Table 1 of the SPP sets out the spatial framework to which onshore wind development should comply. The categories proposed for use in spatial frameworks comprise the following:

- Group 1 Areas: Where wind farms will not be acceptable such as in National Parks (NPs) or National Scenic Areas (NSAs).
- Group 2: Areas of significant protection which acknowledges areas designated/ classified for their international or national heritage value, outwith National Parks and National Scenic Areas including:
  - National and international designations including (principally those relating to cultural heritage and/ or ecological value);
  - Sites included in the inventory of Gardens and Designed Landscapes (GDLs);
  - Other nationally important classified landscapes such as Wild Land Areas (WLAs); and
  - Community separation for consideration of visual impact (i.e. an area not exceeding 2 km around cities, towns and villages identified on the local plan.
- Group 3 Areas: Areas with potential for wind farm development, subject to detailed consideration against policy criteria.

The Proposed Development Site is located within Group 3.

Local Policy

5.2.15 The Proposed Development would be located within the Dumfries and Galloway Council (DGC) administrative area, and the study area would extend northwards into the administrative areas of South Ayrshire Council, and East Ayrshire Council. The relevant planning context for the Proposed Development is contained within the:

- Dumfries and Galloway Council Local Development Plan 2 (DGCLDP2), October 2019;
- Dumfries and Galloway Council, Local Development Plan 2, Wind Energy Development: Development Management Considerations, Supplementary Guidance, February 2020; and
- Dumfries and Galloway Council, Local Development Plan 2, Landscape Capacity Study (DGWLCS)[10].

5.2.16 Policy IN1 of the DGCLDP2 states that:

"Acceptability will be determined through an assessment of the details of the proposal including its benefits and the extent to which its environmental and cumulative impacts can be satisfactorily addressed" (page 67)

5.2.17 Policy IN2 sets out the main considerations in respect of landscape and visual matters noting the following:

"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 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

[10] Dumfries and Galloway Council, Local Development Plan 2, Part 1 Wind Energy Development: Development Management Considerations Appendix 'C' Dumfries and Galloway Wind Farm Landscape Capacity Study, Supplementary Guidance, 2020.

The extent of any cumulative detrimental landscape or visual 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." (page 69)

5.2.18 The DGCLDP2 also set out the Spatial Framework as illustrated in Map 8. This and areas:

- areas where wind farms will not be acceptable;
- areas of significant protection; and
- areas with potential for wind farm development.

5.2.19 The Proposed Development is located within an area with potential for wind farm development which is consistent with SPP Group 3.

5.2.20 The DGWLCS comprises a strategic level relative sensitivity study for the distinct landscape character types (LCTs) that comprise the Dumfries and Galloway Region and comments to the relative sensitivities, in landscape and visual terms, of different typologies of wind farm development in each LCT.

5.2.21 The following SLVIA, whilst taking cognoscence of the findings presented in the DGWLCS contains an independent assessment of landscape sensitivity to the type of development proposed both within the host LCT in which the Proposed Development is located, as well as those neighbouring LCTs. The SLVIA is utilises the LCTs published in NatureScot's 2019 Landscape Character database and online character assessment, since this is the more up to date of the two character assessments, but makes reference to DGWLCS baseline material. It is noted that there are few differences in LCTs identified (as illustrated on Figure 5.3a which shows both NatureScot and the DGWLCS LCTs overlaid).

5.2.22 The DGWLCS comprises sensitivity of the landscape type, the Proposed Development would be located within LCT17a: Plateau Moorland with Forest, and the neighbouring landscape character type would be LCT17b: Plateau Moorland. The sensitivities to wind development allocated to these LCTs are addressed within the SLVIA and noted as follows:

LCT17a: Plateau Moorland with Forest:

- The Proposed Development would be located wholly within this LCT;
- A High sensitivity is noted for 'very large' typologies (turbines over 150 m) due to:
- "cumulative effects that would be likely to occur with some operational wind farms which comprise substantially smaller turbines and,
- on the Galloway Hills, Merrick WLA and smaller, diverse landscape features" (page 220, DGWLCS).

LCT17: Plateau Moorland:

- The Proposed Development would neighbour this LCT.
- A High sensitivity is allocated to 'very large' typologies (turbines over 150 m) due to "cumulative effects that would be likely to occur with operational and consented wind farms and potential effects on the setting of archaeological features". (page 221, DGWLCS).

5.2.23 The Proposed Development would be over 20 km from the Merrick WLA, and unlikely to be impacted significantly, however, a Wild land Impact Assessment has been undertaken as requested by NatureScot and Dumfries and Galloway Council. This is contained in Volume 4, Technical Appendix 5.5.

5.2.24 The potential for cumulative effects is also assessed within the SLVIA and the technical appendices that accompany it.

5.2.25 The sensitivities of all the LCTs are considered using criteria set out in the GLVIA and this is further explained in paragraphs 5.3.14 to 5.3.16 below.

Potential Effects Scoped Out

5.2.26 The Zone of Theoretical Visibility has been used to scope-out potential landscape and visual receptors within the 45 km radius study area that would experience no visibility of the Proposed Development.

5.2.27 To comply with Article 222 of the Air Navigation Order (2016), the lighting design, as specified in Chapter 2: Development Description, will have all turbines except Turbines 3 and 9 fitted with medium intensity (2000 Candela (cd) at the nacelle height and low intensity (32 cd) half way between the ground and the nacelle. The lights will be capable of being dimmed to 10% of their peak intensity when a sensor at the wind farm detects that the visibility exceeds 5 km.

5.2.28 Effects relating to the decommissioning of the Proposed Development are not assessed as such effects are anticipated to be equivalent or less than those expected to occur during its construction.

Method of Baseline Characterisation

Extent of The Study Area

5.2.29 The study area for the SLVIA comprises 45 km radius area extending from the outermost of the Proposed Development turbines. This accords with NatureScot's guidance[11] and has been agreed with the Energy Consents Unit (ECU), Dumfries and Galloway Council (DGC) and NatureScot (NS) during consultations.

Desk Study

5.2.30 Initially, a desk study was undertaken to establish the baseline context of the Proposed Development, including physical components of the landscape (i.e. landscape fabric) as well as the distinctive recognisable patterns of elements that form the landscape character of the area and of designated and classified landscapes. Visual elements and receptors/ receptor locations were also identified including settlements, transportation corridors and recreational trails and summits (i.e. walkers/ cyclists/ tourists/ general road users), as well as specific landscape character types and designated areas.

5.2.31 Landscape character types (LCTs) considered in the baseline and subsequent assessment were derived from the following:

- Scottish Landscape and Character Types Map and Descriptions, NatureScot, digital mapping published 2019[12]; and

[11] Scottish Natural Heritage Visual Representation of Wind Farms Guidance, Version 2.2, February 2017
[12] URL: https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

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

5.2.32 Descriptions of landscape designations and classifications contained in the SLVIA are derived from the following publications:

- 01 Merrick Wild Land Area, NatureScot Description of Wild Land Area, 2017;
- "An assessment of the sensitivity and capacity of the Scottish seascape in relation to windfarms" Scottish Natural Heritage Commissioned Report No.103 (NatureScot, 2005); and
- "Regional Scenic Areas Technical Paper" Dumfries and Galloway, Local Development Plan 2, January 2018.

5.2.33 Other datasets used in the preparation of this SLVIA included:

- Ordnance Survey 1:50,000 and 1:250,000 mapping;
- Ordnance Survey 50 - 5 m Digital Terrain Model;
- Scottish Landscape Character Assessment data - NatureScot data sets;
- Gardens and Designed Landscapes - Historic Environment Scotland datasets;
- National Scenic Areas - Scottish Government data sets;
- Sensitive Landscape Areas – East Ayrshire Council data sets;
- Wild Land Areas - NatureScot data sets; and
- Road network - Ordnance Survey Meridian 2 data sets.

Field Survey

5.2.34 Desktop findings were verified and augmented by targeted field reconnaissance during which all key sensitive receptor locations including the selected viewpoints were visited. During the field reconnaissance draft wireline images, mapping, GIS/ GPS data collection systems and augmented reality tools such as Ventus AR were utilised to verify theoretical visibility (including cumulative visibility).

Illustrative Materials

5.2.35 The SLVIA is illustrated by a range of tools including Zone of Theoretical Visibility (ZTV) plans, photographs, wirelines, and photomontages. All outputs have been prepared in accordance with current best practice comprising:

- Visual Representation of Wind Farms Guidance, version 2.2, NatureScot 2017[13]; and
- Landscape Institute (2019) Technical Guidance Note – 06/19 Visual Representation of Development Proposals[14].

5.2.36 ZTVs have been prepared to assist in the identification of areas from where there is potential visibility of the Proposed Development, illustrated in EIAR Volume 3a: Figures 5.6a and 5.6b, and Figures 5.7a to 5.7zi. ZTVs are based on Ordnance Survey (OS) digital terrain data supplied as a mixture of gridded height data at 5 m and 50 m interval

[13] URL: https://www.nature.scot/visual-representation-wind-farms-guidance (accessed 15/12/2020)
[14] URL: https://www.landscapeinstitute.org/visualisation/ (accessed 15/12/2020)

resolution. This data does not reflect the screening effect of vegetation or built structures and so the visibility shown on the ZTVs is more extensive than would be experienced in reality. Where the ZTV shows no visibility, it is predicted that no turbines would be seen.

5.2.37 The blade tip ZTV (Figure 5.6a) illustrates the extent of the Proposed Development viewshed based on the visibility of turbines from base to maximum blade tip, whilst the blade tip/ hub height comparison drawing in Figure 5.6b contains comparison of blade tip visibility and hub height visibility. This makes it possible to identify locations from where the Proposed Development would be seen as blade tips only and would therefore be less prominent.

5.2.38 In order to establish the cumulative theoretical visibility, ZTVs were prepared for all operational, under construction, consented and in-planning wind farm projects within 45 km of the Proposed Development (EIAR Volume 3a: Figure 5.7). The cumulative ZTVs are included in EIAR Volume 3a: Figures 5.7a to 5.7zi.

5.2.39 Wireline visualisations (EIAR Volume 3b Figures 5.9a to 5.29h) illustrate both the baseline wind farms (i.e. existing and consented) from each viewpoint, and the cumulative wind farms, which includes In-planning schemes and the In-scoping wind farm (Airies II) that would immediately neighbour the Proposed Development.

Assessment of Effects

5.2.40 The aim of the SLVIA is to identify, predict and evaluate potential significant effects arising from the Proposed Development. Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, landscape sensitivity to change, the prediction of magnitude of impact and assessment of significance of the residual effects has been based on pre-defined criteria, the level of effects being determined by a comparison of the sensitivity of receptors and the magnitude of impact arising from the Proposed Development.

5.2.41 The SLVIA considers the seascape, landscape and visual effects on designated landscapes in the study area, including National Scenic Areas (NSAs) and local designations such as: Regional Scenic Areas (RSAs); Scenic Areas (SAs) and Sensitive Landscape Areas (SLAs). Landscape classifications such as Wild Land Areas (WLAs) and inventory listed Gardens and Designed Landscapes (GDLs) have also been assessed. Where the ZTV demonstrates that there would be no possible views of the Proposed Development, designated landscapes are omitted from the SLVIA.

5.2.42 Representative viewpoints were chosen in consultation with DGC, NatureScot, and non-statutory consultees in respect of this application. These viewpoints are considered to be representative of the main sensitive receptors in the study area. The viewpoints have also been checked against the cumulative ZTVs for existing/ consented and proposed wind farms within the study area in order to ensure that they provide representative coverage of potential cumulative visibility and related effects. Viewpoint locations are detailed in EIAR Volume 4: Technical Appendix 5.3 and are included in EIAR Volume 3b: Figures 5.9a to 5.29h.

5.2.43 Analysis of the potential effects on seascape, landscape and visual amenity arising from the Proposed Development at each of these viewpoints has been carried out. This analysis has involved the production of computer-generated wirelines and/ or photomontages to predict the operational views of the Proposed Development from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints have been analysed to

identify the magnitude of impact and the residual effects on landscape character and visual amenity at each viewpoint location.

Criteria for Assessing The Sensitivity Of Receptors

5.2.44 The sensitivity of the seascape and landscape to change is defined as high, medium or low based on professional interpretation of a combination of its susceptibility to change associated with the type of development proposed, and the value attributed to the seascape or landscape. In respect of susceptibility to change, paragraph 5.40 of the GLVIA notes that:

5.2.45 "This means the ability of the landscape receptor (whether it be the overall character or quality/ condition of a particular character type or area, or an individual element and/ or feature, or a particular aesthetic and perceptual aspect) to accommodate the Proposed Development without undue consequences for the maintenance of the baseline situation and/ or the achievement of landscape planning policies and strategies."

5.2.46 The following aspects inform the susceptibility of the landscape to wind energy development:

- Landscape scale and landcover;
- Existing land-use;
- The pattern and complexity/ simplicity of the landscape;
- Visual enclosure/ openness of views and distribution of visual receptors;
- The scope for mitigation, which would be in character with the existing landscape; and
- The degree to which the particular element or characteristic contribution to the landscape character and can be replaced or substituted.

5.2.47 The value of the landscape receptor is not simply dependant on a formal designation, but rather, is predicated on a number of other related factors, such as:

- Landscape quality and condition - the more intact the intrinsic characteristics of the landscape the higher the value;
- Scenic quality – the degree to which the landscape appeals to the senses (primarily but not exclusively visually);
- Rarity – this may be the presence of a rare feature or quality, and/ or the extent to which the character of the landscape is uncommon;
- Representativeness – the extent to which the landscape contains elements that are referred to as exemplary or considered important;
- Conservation interest – including the presence of valued wildlife, earth science, archaeological, historical or cultural aspects;
- Recreation value – where the landscape is evidently valued for recreational activity for which the experience of the landscape is important;
- Perceptual aspects – in particular the sense of wildness and/ or tranquillity present within the landscape; and
- Associations with historic people or events.

5.2.48 In determining value, the SLVIA uses, as its primary indicator, formal landscape designations. Where non-designated landscapes are considered to have a high value this is stated, and a justification given based on the criteria noted above (based on the GLVIA guidance, Box 5.1, page 84).

5.2.49 Visual receptor sensitivity is also defined as high, medium or low based on an interpretation of a combination of parameters, and also relates to the susceptibility and value ascribed to visual receptors, vantage points (such as formalised viewpoints) or receptor locations. The criteria utilised in determining the susceptibility of visual receptors are in accordance with GLVIA which notes that susceptibility of visual receptors to change depend on:

- "The occupation or activity of people experiencing the view at particular locations; and
- The extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations." (paragraph 6.32, page 113)

5.2.50 The value of the visual receptors has been determined by taking account of the following:

- Recognition of value as in a landscape designation or cultural heritage asset, and as noted in popular tourist guidebooks and references (e.g. the 'Queen's View');
- The land use or main activity at the viewpoint/ receptor location and receptor expectations;
- The frequency and duration of use of receptor location[15]; and
- The landscape character and quality of the intervening landscape.

5.2.51 In relation to land use at the viewpoint, visual sensitivity is defined in Table 5.2, below.

Table 5.2: Sensitivity in Relation to Receptor Type and Activity

Sensitivity	Receptor Type and Activity
High	• Tourists and those engaged in outdoor recreational activities for which the landscape and views form a key part of their experience, including hill walkers and visitors to formal vantage points; • Passengers and Tourists travelling on key routes; • Passengers on trains and ferries where visual amenity and scenic qualities form an integral part of receptors experience and expectations; • Walkers on strategic recreational footpaths or on hills, cycle routes or rights of way; • Visitors to landscapes/ sites that have a strong physical, cultural or historic connection with the landscape or a particular view; and • Residential receptors at individual dwellings and within settlements.
Medium	Local road users/ commuters who are generally travelling alone and/ or are focused on the road rather than the adjoining landscape.
Low	• People engaged in outdoor sports or recreation (other than appreciation of the landscape); and • Receptors located in commercial and retail buildings, industrial complexes, and other locations where people's attention may be focused on their work or activity.

Criteria For Assessing The Magnitude of Impact

5.2.52 The magnitude of impact arising from the Proposed Development may be described as substantial, moderate, slight, negligible or none based on the interpretation of a combination of largely quantifiable parameters, as follows:

15 With cognisance of the high value ascribed to receptor locations within WLAs despite relatively low frequencies of use.

- The distance of receptors from the Proposed Development;
- The duration of the predicted change and whether it is reversible;
- The size and scale of the change anticipated;
- The geographical extent of the study area, landscape character unit, designation or route that would be affected;
- The angle of view in relation to main receptor activity;
- The degree of contrast;
- The background context to the Proposed Development; and
- The extent and nature of other built development visible, including vertical elements.

5.2.53 Table 5.3 provides a brief definition for different magnitudes of impact.

Table 5.3: Magnitude of Impact

Magnitude	Definition
Substantial	Total loss or considerable alteration/ interruption of key elements, features or characteristics of the landscape character and/ or composition of views resulting in a substantial change to baseline conditions.
Moderate	Notable partial loss or alteration to one or more key features or characteristics of the baseline, resulting in a prominent, but localised change within a broader unaltered context.
Slight	Discernible loss or alteration to one or more key elements, features or characteristics of the baseline conditions. Change arising from the loss/ alteration would be discernible but underlying landscape character or view composition would be broadly consistent with baseline.
Negligible	Very limited or imperceptible loss or alteration to one or more key elements/ characteristics of the baseline. Change may be barely discernible.
None	No aspect of the Proposed Development would be discernible. The Proposed Development would result in no appreciable change to the landscape resource or view.

Criteria for Assessing Cumulative Effects

5.2.54 Table 5.4 provides a brief definition for different magnitudes of cumulative impact.

Table 5.4: Magnitude of Cumulative Impact

Magnitude	Definition
Substantial	The Proposed Development would represent a considerable or possibly fundamental increase in the influence of wind energy development on the character of the landscape and/ or the composition of views.
Moderate	The Proposed Development would represent a notable and possibly considerable increase in the influence of wind energy development on the character of the landscape and/ or the composition of views. Moderate cumulative impacts may, however, equate to a localised change within an otherwise unaltered context.
Slight	The Proposed Development would represent a minor addition to the influence of wind energy development on the character of the landscape and/ or the composition of views. The change would be discernible, but the original baseline conditions would be largely unaltered.
Negligible	The Proposed Development would represent a barely discernible addition to influence of wind energy development on the character of the landscape and/ or the composition of views. The baseline condition of the landscape or view would, for all intents and purposes, be unaffected.
None	No other cumulative development would be apparent.

5.2.55 In assessing potential cumulative seascape, landscape and visual effects, consideration has been given to cumulative effects arising from combined, concurrent and and/ or consecutive (concurrent) visibility (where the observer is able to see two or more developments from one viewpoint location), and sequential effects (where a number of similar developments would be visible individually or simultaneously over a sequence of connected viewpoints, such as would be found along a road or footpath). This is in accordance with current NatureScot guidance.

5.2.56 A distinction is made, in the assessment, between in-combination effects (i.e. the effect arising from the Proposed Development and all other wind farm development taken together) and in-addition effects (i.e. the effect attributable specifically to the Proposed Development as a result of its addition to the cumulative wind farm context). This is considered particularly appropriate in respect of this Proposed Development due to the extensive developed context and the Proposed Development's relationship to an established pattern of development.

5.2.57 With the exception of the proposed Airies II scheme, no other developments that are at scoping stage have been included in the detailed assessment as they may undergo substantial change before a formal planning application is submitted and may not progress to an application at all. This according accordance with current NatureScot projects which Airies II was included due to its proximity and inevitable importance. The final list of cumulative developments for consideration has been agreed with DGC, and is summarised in Table 5.6, below (paragraph 5.4.34). No consideration has been given to turbines less than 50 m to maximum blade tip height above ground level.

Criteria for Assessing Significance

5.2.58 Table 5.5 illustrates how residual effects are determined by combination of the sensitivity of receptors with the magnitude of impact. For the purposes of this assessment significant landscape or visual effects are generally **major** or **major/ moderate.** However, occasionally moderate effects may be significant. Where this is considered to be the case it is stated along with a reasoned justification.

Table 5.5: Residual Effects

	Magnitude of Change				
Landscape and Visual Sensitivity	Substantial	Moderate	Slight	Negligible	None
High	Major	Major/ moderate	Moderate	Moderate/ minor	None
Medium	Major/ moderate	Moderate	Moderate/ minor	Minor	None
Low	Moderate	Moderate/ minor	Minor	Minor/none	None

5.2.59 In line with the recommendations in the GLVIA this matrix is not used as a prescriptive tool or arithmetically, and the methodology and analysis of potential effects at any particular location must allow for the exercise of professional judgement. Descriptions of residual effects, especially those considered significant, are described in narrative text.

5.2.60 Landscape and visual effects can be adverse (i.e. having a detrimental effect on the physical elements, character and visual amenity of the area) or beneficial (i.e. having a positive effect on the landscape and visual amenity of the area through strengthening or augmentation of baseline conditions and/ or improvement of the existing landscape or

views). For the purposes of this assessment residual effects are assumed to be adverse, unless stated otherwise.

Limitations and Assumptions

5.2.61 With the exception of the Residential Visual Amenity Assessment in TA5.4, the SLVIA focuses on receptors in publicly accessible locations.

5.2.62 The data utilised in completion of the SLVIA has a number of inherent limitations related to data tolerances and levels of accuracy. However, these have been taken into account in the assessment.

5.2.63 There are several factors which overstate the impacts as illustrated in the visualisations. These are:

- The night-time visualisations have been included for Viewpoint 2 from Merrick (Figures 5.10a to 5.10j); Viewpoint 3 from Glencernock Fell (Figures 5.11a to 5.11h), and Viewpoint 6 from Fell End (Figures 5.14a to 5.14l). These illustrate the type of lighting proposed, potential impacts of which are explained in the Lighting Assessment in TA5.7. However, technical mitigation solutions are being considered by the Applicant in order to avoid the necessity for regular visible lighting. Such technologies include the use of transponder or radar activated lighting systems that would result in the turbines being lit infrequently and for a short duration only. However, in the absence of certainty over such mitigation, the SLVIA addresses potential effects of the lit turbines, as a worst case.
- Viewpoint 4: Bruce's Stone, Merrick Car Park (Figures 5.12a to 5.12h) – This location was requested by DGC, but the car park itself has no view towards the Proposed Development, therefore the view is from south of Bruce's Stone, overlooking Glen Trool. The location of the viewpoint is relatively precarious, off the path and on the higher reaches of the gorge slope and consequently, visited infrequently.
- The atmospheric conditions captured in the baseline photographs for Viewpoint 4, 9 and 10 (Figures 5.12a to 5.12h; Figures 5.17a to 5.17h, and Figures 5.18a to 5.18j, respectively) are such that the baseline wind developments are not clearly discernible. In order to provide a clear image of the cumulative context and how the Proposed Development relates to, additional visualisations were prepared for these viewpoints with existing turbines photomontaged into the image.
- In Viewpoint 5 from Cairnsmore of Fleet (Figures 5.13a to 5.13j) and Viewpoint 6 from Fell End (Figures 5.14a to 5.14l), the angle of the rotor of existing wind turbines are oblique to the viewpoint, with the consequence that the existing turbines have a lessened prominence in the view. In contrast, and in accordance with NatureScot visualisation guidance, the Proposed Development is shown in the visualisations with its rotors facing the viewpoint with a consequent increase in the Proposed Development perceived prominence. The consequence of this differing orientation of existing and proposed turbines serves to exaggerate the potential impact of the Proposed Development within the cumulative context. Therefore, to aid understanding of the potential impact, a further photomontage has been prepared to with the rotors of existing turbines re-imaged to face towards the viewpoint, so as to represent a worst case and to provide a consistent appearance when viewed in conjunction with the Proposed Development.

- In Viewpoint 17: Beneraird (Figures 5.25a to 5.25j) both atmospheric conditions and angle of in the rotors of existing turbines result in a photomontage that when undertaken according in accordance with NatureScot guidelines results in an overstatement of impact of the Proposed Development. As in the photomontages for Viewpoints 4, 5, 9 and 10, an additional photomontage has been produced for this location that orientates existing and proposed turbines towards the viewer.

5.3 Baseline Conditions

Current Baseline

Landform and Hydrological Landscape Features

5.3.1 Figure 5.1 illustrates the topography within the study area. The Proposed Development site is situated on an undulating plateau between the Galloway Hills to the east and northeast, and the smaller Southern Upland hills near Glen App to the west. A notable feature within the plateau are small hills or fells which form focal points in the landscape.

5.3.2 The Proposed Development Site is located at elevations between 145 m above ordnance datum (AOD) to 165 mAOD, and is located between Artfield Fell and Green Top rising to 244 mAOD to the west, and Eldrig Fell which peaks at 227 m, to the east. A little further southeast, Fell End Culvennan Fell reaches 213 mAOD, and to southwest Larig Fell and Bught Fell extend to 205 mAOD.

5.3.3 To the south, the plateau gives way to an upland fringe landscape several kilometres to the southwest of the Proposed Development site and which is characterised by exposed slopes and ridgelines that are prominent in views from the A75 corridor and adjoining coastline.

5.3.4 Several kilometres southeast of the Proposed Development a series of drumlin landscapes are evident, the rounded deposition forms a notable characteristic alongside the A75.

5.3.5 The Galloway Hills occupy almost the entire eastern portion of the study area. These uplands contain the highest hill in the southwest of Scotland, the Merrick, and the Galloway Ring of Fire comprising 30 peaks within the hill range, many of which are Corbetts (mountains reaching over 760 m) or Grahams (separate mountains which extend to over 609 m).

5.3.6 The coastal landscape of the southern boundary of Dumfries and Galloway has a distinctive character dominated by mud flats around Wigtown Bay and raised beaches and rocky shoreline around the much of the Machars headland and the Rhins Peninsula.

5.3.7 There are several lochs, including Loch Ryan which is a sea loch, and numerous streams and burns which feed into the three notable water courses within the study area:

- The Water of Luce and its two tributaries, Cross Water of Luce and Main Water of Luce in the western portion of the study area, flow within shallow, flat-bottomed valleys.
- Cree River in the eastern part of the Site flows within a narrow wooded valley, the main tributaries of which include:
  - The Water of Trool which takes water from Loch Trool through Glen Trool to join Cree River;
  - Penkiln Burn which flows into Cree River just north of Newton Stewart; and
  - Palnure Burn which conducts water from Clatteringshaws Loch to feed River Cree close to the estuary.

- In the northern half of the study area, the River Stinchar and its tributary Duisk River, flow through steep-sided and flat-bottomed valleys. The River Stinchar flows from the hills to the east of Carrick Forest to the sea at Ballantrae, and River Duisk starts its journey from just south of Barr to join the River Stinchar at Pinwherry.

Other Landscape Features

5.3.8 Wind farms form a feature of the landscape within the study area. There are two main clusters of existing wind farm development within the study area: a large cluster on the main body of the plateau which stretches through the northern half of Dumfries and Galloway into Ayrshire, and the smaller cluster along the spine of the Ayrshire Foothills from east of Girvan to Delamford Hill. The larger grouping centres on the existing Kilgallioch and Arecleoch wind farms, with the consented Chirmorie development between these two wind farms, and Airies Wind Farm to the southwest of Kilgallioch. Artfield Fell and Balmurrie Fell sit on the south western edge of this group of developments. The smaller cluster in the north of the study area comprises the existing Assel Valley and Hadyard Hill developments along with Tralorg which is under construction at the time of writing this SLVIA.

5.3.9 Some of the small hills on the Dumfries and Galloway plateau have associated small-scale wind developments located on them, including Artfield Fell and Balmurrie Fell (on Artfield Fell and Balmurrie Fell respectively), and Carscreugh which is located along the elongated ridge of Carscreugh Fell located south of the Proposed Development Site where the plateau transitions to the Machars Headland .

Landcover and Land-Use

5.3.10 The land cover over much of the Ayrshire and Dumfries and Galloway plateau is peatlands, bog, moors and heathland. There are also large areas of coniferous woodland and areas of natural grasslands and pasture land. The uplands of the Galloway Hills are dominated by moors and heathland and there are large areas of coniferous forestry usually associated with lower slopes. On the lower altitudes around the coastal fringe, Rhins Peninsula, Machars headland there are large areas of agricultural land, and much of the lowlands in Ayrshire are dominated by pasture and agricultural fields.

Seascape and Landscape Character Types

5.3.11 There are 36 LCTs within the study area, of which 24 would be subject to some theoretical visibility of the Proposed Development. The Proposed Development, itself, is located in the Plateau Moorland with Forest – Dumfries and Galloway LCT174. There are also six seascape character types (SCTs) within the study area, and three of these would be subject to potential visibility of the Proposed Development.

5.3.12 The location and extent of LCTs and SCTs is illustrated in Figure 5.3a. This shows LCT areas as identified by NatureScot, and also illustrates how the DGWLCS LCTs key into these. The areas are largely the same, the main difference being that the DGWLCS LCTs identifies various sub-categories.

5.3.13 The full descriptions of LCTs and SCTs are provided in Technical Appendix 5.2 which also identifies LCTs and SCTs to be assessed and those which are not included due to lack of, or virtual lack of, potential visibility.

5.3.14 A sensitivity rating is allocated to each LCT and SCT in accordance with the GLVIA guidance, as noted in Technical Appendix 5.2. In addition, the sensitivities applied by the DGWLCS to

the Plateau Moorland with Forest – Dumfries and Galloway LCT[16], within which the Proposed Development is located, and the neighbouring Plateau Moorland – Dumfries and Galloway LCT[17] are considered in this SLVIA. It must be noted that these sensitivities differ from those assessed in accordance with GLVIA guidance due to the remit of the DGWLCS study. This is addressed in paragraphs 5.2.27 to 5.2.29 above.

5.3.15 The DGWLCS allocates a High sensitivity to both the Plateau Moorland with Forest – Dumfries and Galloway (host LCT), and the neighbouring Plateau Moorland – Dumfries and Galloway LCT. This is primarily due to the potential for cumulative impacts that may arise given the smaller turbines of Artfield Fell and Balmurrie Fell. If due care were not given to design of the layout of proposed schemes, the results may be cumulative discord and dissonance which would downgrade the landscape quality. The need for careful design and consideration of the cumulative composition of wind development within these LCTs is noted and has been undertaken by careful design (as set out in section 5.5 of this chapter and in Chapter 3: Design Evolution and Alternatives).

5.3.16 Potential impacts on the Merrick WLA was also cited as a reason for the High sensitivity allocated to the host LCT, and this is fully addressed in Technical Appendix 5.5. In respect of the neighbouring LCT (Plateau Moorland – Dumfries and Galloway), archaeological artefacts and sites were noted as the other consideration which contribute to a High sensitivity. This consideration is fully addressed in Chapter 6: Archaeology and Cultural Heritage.

Designations

5.3.17 The location and geographical extent of landscape designations and classifications within the study area are shown on Figure 5.4a. The Designated and Classified landscapes within the study area are described in Technical Appendix 5.1 which also notes which landscapes are included in the SLVIA due to potential visibility. Those landscapes that have no theoretical visibility of the Proposed Development, or those from which there is highly constrained theoretical visibility that would be screened by mature (non-productive) woodland or built structures, are excluded from this SLVIA since they are unlikely to be impacts at all or significantly affected.

5.3.18 The Proposed Development Site is not subject to a landscape designation.

5.3.19 Designated landscapes with theoretical visibility of the proposed include:

- The Galloway Hills RSA which is 12.2 km east northeast of the Proposed Development;
- Machars Coast RSA, lies 26.1 km south southeast of the Proposed Development;
- Mochrum Lochs RSA is located 12.8 km south southeast of the Proposed Development;
- Rhins Coast RSA is 16 km west southwest of the Proposed Development; and
- South Ayrshire Scenic Area which lies 7.8 km north of the Proposed Development.

5.3.20 There are fourteen inventory listed Gardens and Designed Landscapes (GDLs) within the study area. Most of these have no potential visibility of the Proposed Development. The four GDLs that would have potential views and are therefore included in this SLVIA are:

- Ardwell House which is 24 km south southwest;
- Logan Botanic Gardens, located 28.7 km south southwest;

[16] NH reference LCT174/DGWLCS reference 17a.
[17] NH reference LCT173/DGWLCS reference LCT17.

- Logan House (Balzieland) which is 26.75 km south southwest; and
- Monreith, situated 26.2 km south east.

5.3.21 There is also one Wild Land Area within the study area, namely Merrick WLA which lies 21.6 km northeast of the Proposed Development.

Transportation Network

5.3.22 The study area is bisected by various regionally important as well as minor local roads, most of which follow the valleys or lower elevations, and follow the coastline along the east coast of the Rhins Peninsula and along much of the headland around Luce Bay and Wigtown Bay. Figure 5.5a shows the roads within the study area.

5.3.23 The key roads from which there would be potential for views of the Proposed Development include:

- A75: this is the primary trunk road which links the A74(M) to Stranraer, providing the main access route to Stranraer and the ferry port. It is identified as being a trunk road within the Strategic Transport Network in the DGCLDP2. It is the only trunk road within the study area that would have any theoretical views of the Proposed Development.
- A714: from Newton Stewart to Girvan, this A class road is identified as a regional road within the Strategic Transport Network (DGCLDP2). It is mainly routed along valleys and traverses the plateau moorland around the Glentrool area.
- A747: this is a regional road, as classified in the Strategic Transport Network. Two sections of this road: from Newton Stewart to Wigtown, and from Glenluce to the B7005 form part of cycle route 73. These two sections are also within 20 km of the Proposed Development and the ZTV illustrates that theoretically, there may be visibility.
- B7005: This B class road connects Wigtown to the A747 on the western coast of the Machars headland at a distance of 18 km to 21 km south of the Proposed Development site. It forms part of cycle route 73.

5.3.24 In accordance with Table 5.2, the sensitivity of receptors on key transportation routes varies from medium in respect of general commuters who may be travelling alone and concentrating on the road rather than the adjoining landscape, and high in respect of tourists who are more likely to carry passengers, and who are likely to focus on the landscape.

Rail

5.3.25 The west coast line from Ayr to Stranraer is within the study area. However, the ZTV in Figure 5.5 shows that the vast majority of the line would have no views of the Proposed Development. Consequently, the railway has been scoped-out of the SLVIA.

Recreational Routes and Summits

5.3.26 There are a number of long-distance routes, cycleways and core paths within the 45 km study area. These are illustrated on Figure 4.5a: Transportation Routes, Recreation Routes and Summits.

5.3.27 There are three long distance routes that are recognised by NatureScot as 'Great Trails'[18] within the study area. The Ayrshire Coastal Path is scoped-out of this SLVIA since it would have no theoretical views of the Proposed Development. The long distance footpaths that are considered in this SLVIA are:

- The Southern Upland Way (SUW): The SUW traverses east-west across the study area and passes just north of the Proposed Development Site coming to within approximately 1.3 km of the turbine 1 and turbine 5 (at which point the trail is within the Kilgallioch Wind Farm), and
- The Mull of Galloway Trail: this Great Trail is some 17 km southwest of the Proposed Development (from nearest turbine to nearest part of the trail). At its southern-most point, the footpath starts at Mull of Galloway and travels up the east coast of Rhins Peninsula to Stranraer, and then northwards to Glenapp Church where it terminates.

5.3.28 There are numerous core paths listed within the 45 km study area and noted on the DGC website[19]. The most relevant to this SLVIA are those within approximately 10 km of the Proposed Development from which there is the greatest potential for significant effects to occur. The SUW is included as a core path in the DGCLDP2; however, it is addressed in its own right as one of Scotland's Great Trails so is not included as a core path. The five core paths that have potential for significant effects on visual amenity are:

- The New Luce to Kilhern walk, which comes to within approximately 6 km west of the Proposed Development. This is a circular walk from New Luce, taking in the Caves of Kilhern and the Loups of Barnshangan waterfall.
- The Moors of Wigtownshire walk which starts at Glenluce and continues through the Water of Luce valley taking in the cultural heritage sites such as Glenluce Abbey, remains of iron age forts and deserted villages. The walk climbs out of the valley along the minor road which follows the Cross Water of Luce and then crosses over moorland to return back to Glenluce. The walk comes to within approximately 1 km south of the nearest proposed turbine.
- Three Lochs Kirkcowan; this route is recommended for walking, cycling or horse-riding on The Three Lochs estate and boasts facilities at the Balminnoch caravan site. This is a circular route starting at the caravan park and following tracks between Loch Ronald and Loch Heron, over the shoulder of Fell Hill, and returning on the track between Loch Heron and Black Loch. Much of the route is through forestry. At its closest point, the route comes to within approximately 1.2 km southeast of the nearest proposed turbine.
- Glenkitten Fell; this walk is from the SUW where it crosses Purgatory Burn and strikes northwards to Glenkitten Fell and down to the Cross Water of Luce. Most of the walk is through the existing Kilgallioch Wind Farm turbines before reaching Glenkitten Fell. The walk is approximately 1 km northwest from the nearest proposed turbine.
- Stranoch to Beneraird and Shennas; this is a long distance walk over rough ground which connects core paths within South Ayrshire Council area. At its starting point near Dirniemow Bridge the walk is just over 6 km northwest of the nearest proposed turbine.

[18] URL: https://www.nature.scot/enjoying-outdoors/routes-explore/scotlands-great-trails (accessed 15/12/2020)
[19] Core paths: walking and cycling in Dumfries and Galloway: https://info.dumgal.gov.uk/mapviewers/pathsmap.aspx

5.3.29 Within the study area there are two Corbetts, of which one, Merrick (843 m), would have potential views of the Proposed Development. Of the five Grahams within the study area, four would have potential views to the Proposed Development, namely, Mullwharchar (692 m), Craignaw (645 m), Millfore (657 m), and Cairnsmore of Fleet (711 m). For the purposes of this SLVIA two summit views are included which would be representative of the nature of likely effects. These are from Merrick in the northwestern part of the study area, and from Cairnsmore of Fleet in the southeastern portion of the study area, at distances of 25.2 km and 25.3 km respectively from the Proposed Development.

5.3.30 The sensitivity allocated to walkers on recreational routes and summits is considered to be High as noted in Table 5.2: Sensitivity in Relation to Receptor Type and Activity.

Settlement

5.3.31 The study area is relatively well settled with towns and villages adjoining roads, many of which follow the line of valleys and are scattered along the coastline. Smaller groups of dwellings, farmhouses and individual dwellings are scattered across the agricultural lowland, and the uplands and moorland are less settled. The ZTV has been utilised to identify settlements which would have theoretical views of the Proposed Development. These include:

- Glenluce is a small village on the route of the A75 trunk road in the west of Dumfries and Galloway. It is located 10.6 km south southwest of the Proposed Development Site.
- Newton Stewart is a town situated on the River Cree at a distance of 15.5 km east southeast of the Proposed Development Site.
- Stranraer is located on the southern bank of the Ryan Loch which is a sea loch. It lies 18.8 km west southwest of the Proposed Development Site.
- Wigtown is situated south of Newton Stewart on the northern bank of River Bladnoch. It lies 21.7 km southeast of the Proposed Development Site.
- Creetown is a small settlement on the east of the River Cree estuary. It is located 24 km southeast of the Proposed Development Site.
- Whithorn is a small town on the Machars headland south of Wigtown. It lies 33.7 km south southeast of the Proposed Development Site.

5.3.32 There are three individual properties within a 3 km radius of the Proposed Development. These are addressed in the RVAA, Technical Appendix 5.4.

5.3.33 In accordance with the criteria in Table 5.2, residential receptors (including scattered dwellings as well as larger settlements) are generally assumed to have a high sensitivity to the type of development proposed.

Cumulative Context

5.3.34 Table 5.6 summarises the cumulative context at the time of the SLVIA. The location of these developments is indicated in Figure 5.7.

Table 5.6: Cumulative Wind Farms

Status	Wind Farm	No of Turbines	Max Height of Turbines to Blade Tip (m)	Direction from the Proposed Develop-ment	Approx. Distance from the Proposed Development	Landscape Character Type
Operational	Airies	14	137	E	1.5 km	Plateau Moorland with Forest – Dumfries and Galloway
	Arecleoch	60	135	NW	8.7 km	Southern Uplands with Forest (25 turbines); Plateau Moorland - Ayrshire (35 turbines)
	Artfield Fell	15	74	SSW	0.6 km	Plateau Moorland – Dumfries and Galloway
	Assel Valley	10	110	N	25.4 km	Foothills - Ayrshire
	Balmurrie Fell	7	80	SW	1.1 km	Plateau Moorland – Dumfries and Galloway (7 turbines)
	Barlockhart Moor	4	115	S	10.5 km	Drumlin Pasture in Moss and Moor Lowland (2 turbines); Peninsula (2 turbines)
	Blackcraig Hill	23	110	ENE	46.5 km	Foothills with Forest – Dumfries and Galloway
	Carscreugh	18	70	S	6.1 km	Upland Fringe – Dumfries and Galloway
	Dersalloch	23	125	NNE	38.2 km	Foothills – Ayrshire
	Downhill Farm	1	77	N	33.6 km	Low Hills – Ayrshire
	Glen App	11	126	W	13.9 km	Plateau Moorland – Ayrshire (10 turbines); Plateau Moorland – Dumfries and Galloway (1 turbine)
	Glenchamber	11	126	SSW	2.7 km	Plateau Moorland – Dumfries and Galloway
	Hadyard Hill	52	110	N	25.2 km	Foothills - Ayrshire
	Kilgallioch	96	146	WNW	0.5 km	Plateau Moorland – Dumfries and Galloway (22 turbines); Plateau Moorland – Ayrshire (11 turbines); Plateau Moorland with Forest – Dumfries and Galloway (63 turbines)
	Knocknain Farm	1	54	WSW	25.8 km	Peninsula
	Mark Hill	28	110	N	15 km	Plateau Moorland - Ayrshire
	Meikle Float Farm	1	54	SW	26 km	Peninsula
	North Rhins	11	100	WSW	22.5 km	Peninsula
	North	1	53.7	N	34.7 km	Low Hills - Ayrshire

Table 5.6: Cumulative Wind Farms

Status	Wind Farm	No of Turbines	Max Height of Turbines to Blade Tip (m)	Direction from the Proposed Develop-ment	Approx. Distance from the Proposed Development	Landscape Character Type
	Threave					
Consented	Barlockhart Moor Extension	4	115	S	10.3 km	Peninsula
	Benbrack	18	149.9	NE	43.2 km	Southern Uplands with Forest – Dumfries and Galloway
	Chirmorie	21	146	NNW	7.3 km	Plateau Moorland – Ayrshire
	Glenshimmeroch	10	150	ENE	45.6 km	Foothills with Forest – Dumfries and Galloway
	High Barcaple	1	62	E	43 km	Drumlin Pastures
	Knockman Hill	5	81	ENE	45 km	Foothills with Forest (Dumfries and Galloway)
	Larbrax	8	100	WSW	26 km	Peninsula
	Mochrum Fell	8	126	E	47 km	Foothills with Forest – Dumfries and Galloway
	South Kyle	50	150	NE	45 km	Southern Uplands with Forest – Dumfries and Galloway (20 turbines); Southern Uplands with Forest – Ayrshire (30 turbines)
	Torrs Hill	2	100	NE	35 km	Foothills with Forest – Dumfries and Galloway
	Tralorg	8	100	N	27.6 km	Foothills – Ayrshire
	Trostie	1	53.7	E	41.3 km	Foothills with Forest – Dumfries and Galloway
	Windy Standard III	20	178	NE	45.3 km	Southern Uplands with Forest – Dumfries and Galloway
In-Planning	Arecleoch Extension	13	200	NNW	10.2 km	Plateau Moorland – Ayrshire
	Clauchrie Windfarm	18	200	NNE	18.7 km	Plateau Moorland – Ayrshire (16 turbines); Southern Uplands – Ayrshire (2 turbines)
	Kilgallioch Extension	11	180	N	0.6 km	Plateau Moorland with Forest – Dumfries and Galloway
	Kirk Hill Wind Farm	8	115.5	N	35.3 km	Low Hills – Ayrshire
	Shepherds Rig	19	149.9	NE	44.6 km	Southern Uplands with Forest – Dumfries and Galloway (18 turbines); Narrow Wooded River Valley – Dumfries and

Table 5.6: Cumulative Wind Farms

Status	Wind Farm	No of Turbines	Max Height of Turbines to Blade Tip (m)	Direction from the Proposed Develop-ment	Approx. Distance from the Proposed Development	Landscape Character Type
						Galloway (1 turbines)
	Stranoch 2*	20	175	W	6.8 km	Plateau Moorland – Dumfries and Galloway
Scoping	Airies II	9	200	NNE	0.5 km	Plateau Moorland with Forest – Dumfries and Galloway

* NB: Stranoch 2 replaces the consented Stranoch wind development and has been used to illustrate the worst case cumulative situation since larger turbines are now proposed.

5.3.35 It is important to consider the operational life (and potential overlap within operational life) of the Proposed Development with Artfield Fell Wind Farm and Balmurrie Fell Wind Farm[20]. The Proposed Development (assumed to be operational in 2024 and for approximately 30 years) would potentially coexist with Artfield Fell (in its current form) for around a quarter of the proposed operational life, assuming that Artfield Fell would be either repowered or decommissioned around 2032. The Proposed Development would potentially coexist with Balmurrie Fell for less than half of the operational life of the Proposed Development. This would alter the cumulative situation.

5.3.36 In general terms, the emergent pattern of development is one based on clusters of turbines on the central part of the Dumfries and Galloway and Ayrshire plateau moorland with larger typologies being located on the interior of the moorland plateau and within forested part of the plateau, and smaller turbines at the southern extent of the plateau. Several developments are grouped together closely so as to appear as one large development. Arecleoch, its Extension and the consented Chirmorie Wind Farm would group closely together to form concentration of large scale wind turbines within the northern extent of the plateau landform within which they are located.

5.3.37 Similarly, Kilgallioch, Kilgallioch Extension and Airies wind developments would appear as one larger development further south on the plateau landform.

5.3.38 The pattern of development moving southwards off the plateau onto the transitional slopes is one of turbine size decreasing with proximity to the coast. Thus, Airies turbines step down in size from Kilgallioch Extension, and Glenchamber turbines are smaller again, but larger than the Carscreuch development which is positioned on a ridge north of the A75. This emergent pattern responds to the altitude and land form changes from larger wind farms on the simpler, flatter upland plateau to smaller developments on the slopes of the upland fringe topography.

5.3.39 Exceptions to this pattern occur at Artfield Fell and Balmurrie Fell developments which are situated on smaller scale distinctive conical fell landforms.

[20] Artfield Fell was commissioned c. 2007 and therefore it is anticipated that the operational life and planning permission would end in c. 2032 (assuming a 25 year permission), which would have eight years of overlap with the Proposed Development. Balmurrie Fell was commissioned five years later c. 2012, and therefore could have up to 13 years of overlap (source: URL: https://www.thewindpower.net/windfarm_en_16308_balmurrie-fell-(artfield-fell-ext).php (accessed 03/11/2020).

Future Baseline

5.3.40 In the event that the Proposed Development does not go ahead, the future baseline is likely to continue to be subject to pressure for wind energy developments, many of which are likely to be of the type of larger typologies that are already a feature of new applications and proposals for repowering of extant sites in Scotland.

5.3.41 In the event that Kilgallioch extension and Airies II developments are consented, there would be larger turbines introduced into the part of the study area adjoining the Site, and given their size, under the current aviation regulations the Kilgallioch Extension and Airies II turbines would introduce a requirement for aviation turbine lighting in whichever form that is proposed. It is noted that the objective of the emerging guidance from the Civil Aviation Authority on lighting of potential aviation obstructions is to provide lighting to mark the perimeter of en-route obstructions. Chapter 12: Aviation and Telecommunications includes mitigation in the form of a condition that would allow the lighting design to be revisited to consider the cumulative development as a whole, potentially allowing for a coordinated approach to providing a lighting strategy for the Kilgallioch, Airies, Artfield group.

5.3.42 Artfield Fell wind farm was commissioned in 2007, therefore proposals for decommissioning or repowering would be required to be brought forward within the next few years. Since the Artfield Fell turbines are so small, it seems unlikely that repowering would be proposed without upgrading the turbines to larger capacity machines. However, the location of this development, elevated as it is on top of Artfield Fell, could make it more difficult to integrate larger turbines in this location. The same is true for Balmurrie Fell wind farm.

5.3.43 Whether the in-planning Kilgallioch Extension and/ or the Airies II development which is at scoping stage go ahead or not, current and emerging policy (e.g. NPF4 and declaration of a Global Climate Emergency) and energy market drivers are pushing turbines heights upwards and the plateau landscape within Dumfries and Galloway has the combination of characteristics including large scale with simple land cover which would suit larger scale wind developments.

Summary of Sensitive Receptors

Scoped-Out Receptors

5.3.44 Designations scoped-out of this SLVIA due to lack of or very limited/ distant theoretical visibility as detailed in TA5.1 are:

- Fleet Valley NSA;
- Solway Coast RSA;
- East Ayrshire SLA;
- Barganny GDL;
- Blairquhan GDL;
- Cally GDL;
- Castle Kennedy GDL;
- Craigengillan GDL;
- Culzean Castle GDL;
- Galloway House GDL;

- Glenapp GDL;
- Kilkerran GDL; and
- Lochnaw Castle GDL.

5.3.45 Landscape and Seascape Character Types scoped out of this SLVIA are detailed in TA5.2 and summarised as follows:

- LCT59 Raised Beach Coast and Cliffs;
- LCT62 Coastal Headlands;
- LCT63 Coastal Valley with Policies;
- LCT69 Upland River Valleys – Ayrshire;
- LCT70 Lower Dale – Ayrshire;
- LCT71 Middle Dale – Ayrshire;
- LCT77 Low Hills – Ayrshire;
- LCT160 Narrow Wooded River Valley – Dumfries and Galloway;
- LCT164 Flooded Valley;
- LCT165 Upper Dale – Dumfries and Galloway
- LCT178 Southern Upland with Forest – Dumfries and Galloway;
- SCT6 Narrow Coastal Shelf;
- SCT9 Sounds, Narrows and Islands; and
- SCT10 Outer Firth with Islands.

5.3.46 The visual receptors scoped out of the SLVIA are:

- Railway line from Ayr to Stranraer has very little potential for views of the Proposed Development;
- Roads:
  - A751 (connecting the A77 to the A75 east of Stranraer) and the A712 (from Newton Stewart to New Galloway) would have no theoretical views of the Proposed Development;
  - A77 from Ayr to Stranraer would have no potential views of the Proposed Development and a small section of this road connecting Stranraer to Portpatrick would experience fragmented theoretical visibility for several kilometres. Overall the A77 would not be significantly impacted by the Proposed Development.
- Core Paths outwith 10 km from the Proposed Development as these would not be significantly impacted; and
- Summits have been scoped-out since the Viewpoint Assessment demonstrates that the visual effect from the summits of Merrick and Cairnsmore of Fleet would not be significant, therefore it is highly unlikely that climbers of the other summits in the Galloway Hills would be subject to significant visual effects.

Scoped-In Receptors

5.3.47 Table 5.7 provides a summary of the sensitive receptors scoped-in to the detailed assessment.

Table 5.7: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
Designations and Classified Landscapes		
Galloway Hills RSA	High	Scenic quality and designation status
Machars Coast RSA	High	Scenic quality and designation status
Mochrum Lochs RSA	High	Scenic quality and designation status
Rhins Coast RSA	High to Medium	Scenic quality and designation status
South Ayrshire Scenic Area	High within Valleys and Rugged Uplands Medium within Plateau Moorland and Ayrshire Foothills	Whilst a local designation it has no citation setting out special qualities and covers a very large area, and the SAC LDP refers to the LCTs for sensitivities.
Arwell House GDL	High	Nationally important resource
Logan Botanic Gardens GDL	High	Nationally important resource
Logan House (Balzieland) GDL	High	Nationally important resource
Monrieth GDL	High	Nationally important resource
Seascape and Landscape Character Types		
LCT72 Pastoral Valleys – Ayrshire	High	Small scale landscape with high scenic quality
LCT73 Upland Glens	High	Small scale landscape with high scenic quality
LCT76 Foothills – Ayrshire	Medium	Medium to large scale landscape largely characterised by wind farms and coniferous plantations.
LCT78 Plateau Moorland – Ayrshire	Medium to Low	Large scale landscape with simple landcover characterised by wind farms.
LCT81 Southern Uplands – Ayrshire	High to Medium	Large scale landscape with complex, dramatic landform.
LCT82 Southern Uplands with Forestry – Ayrshire	Medium	Simple landform and land cover with unremarkable scenic quality.
LCT83 Rugged Upland – Ayrshire	High	Large scale, dramatic landscape with wildness characteristics.
LCT156 Peninsula	High	Complex landscape pattern of largely high scenic value and numerous antiquities of cultural interest.
LCT157 Peninsula with Gorsey Knolls	High	Landscape with complex landforms and small-scale elements of high scenic value.
LCT158 Coastal Flats – Dumfries and Galloway	Medium to High	Simple topography and landcover with numerous antiquities and cultural heritage interest.
LCT159 Shallow Flat Bottomed Valley	High	Small, intimate scale landscape with sites of historical and cultural interest.
LCT167 Moss and Forest Lowland	High to Medium	Medium scale landscape with complex pattern of undulations and lochs.
LCT168 Drumlin Pasture in Moor Lowland	High to Medium	Complex landform with strongly coherent landscape character.
LCT169 Drumlin Pastures	High to Medium	Complex topography with strongly coherent landscape character.
LCT172 Upland Fringe – Dumfries and Galloway	High	Prominent landscape with sites of historical interest .

Table 5.7: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
LCT173 Plateau Moorland – Dumfries and Galloway	Medium	Large scale landscape with simple land cover used for recreation (core paths and SUV routed through).
LCT174 Plateau Moorland with Forest – Dumfries and Galloway	Medium to Low	Large scale landscape with simple land cover and characterised by wind farms. Also used for recreation (core paths and SUV routed through).
LCT175 Foothills – Dumfries and Galloway	High	Exposed and prominent landscape parts of which are designated RSA.
LCT176 Foothills with Forest – Dumfries and Galloway	Medium	Simple landcover and medium scale landscape.
LCT177 Southern Uplands – Dumfries and Galloway	High to Medium	Large scale landscape with dramatic landforms creating distinctive landmarks.
LCT179 Coastal Uplands	High to Medium	Large scale landscape with complex pattern of landscape features and high scenic value.
LCT180 Rugged Uplands – Dumfries and Galloway	High	Large scale, dramatic landscape with wildness characteristics and high scenic value.
LCT181 Rugged Granite Uplands with Forest – Dumfries and Galloway	High	Large scale, dramatic landscape with wildness characteristics and high scenic value.
SCT1 Remote High Cliffs	Medium to High	Large scale landscape with strong vertical emphasis and high scenic quality.
SCT3 Deposition Coastline, Open Views	Medium to High	Complex pattern of landscape features and land uses with long range views.
SCT4 Outer Firth	High to Medium	Intricate pattern of landscape features with high scenic quality recognised in part by Fleet Valley NSA designation.
Transport and Recreational Routes		
A75	Medium	Local road users/.commuters generally travelling alone and/.or focused on road rather than adjoining landscape.
A714	Medium	Local road users/.commuters generally travelling alone and/.or focused on road rather than adjoining landscape.
A747	Medium	Local road users/.commuters generally travelling alone and/.or focused on road rather than adjoining landscape.
B7005	Medium	Local road users/.commuters generally travelling alone and/.or focused on road rather than adjoining landscape.
Great Trail – Southern Upland Way	High	Strategic recreational long distance footpath
Great Trail – Mull of Galloway	High	Strategic recreational long distance footpath
Core Path – New Luce to Kilhern walk	High	Recreational footpath
Core Path – Moors of Wigtownshire walk	High	Recreational footpath
Core Path – Three Lochs Kirkcowan	High	Recreational footpath
Core Path – Glenkitten Fell	High	Recreational footpath
Core Path – Stranoch to Beneraird & Shennas	High	Recreational footpath
Settlements		

Table 5.7: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
Glenluce	High	Residential receptors
Newton Stewart	High	Residential receptors
Stranraer	High	Residential receptors
Wigtown	High	Residential receptors
Creetown	High	Residential receptors
Whithorn	High	Residential receptors

5.4 Assessment of Likely Effects

Potential Construction Effects

5.4.1 The construction phase would be approximately 18 months in duration. The methods that would be utilised during the construction stage are described in Chapter 2: Proposed Development.

5.4.2 The following elements and activities associated with the construction phase of the Proposed Development have the potential to result in effects on the landscape and visual amenity of the study area:

- Construction of an upgraded site entrance and access tracks from the existing Gass Farm entrance west of Tarf Bridge;
- Construction of temporary site construction compounds incorporating site offices;
- Woodland removal within productive plantation forest, including permanent felling around turbines and infrastructure;
- Construction of site infrastructure, including a mixture of upgraded existing tracks and new tracks between turbine locations;
- Construction of laydown areas and crane pads;
- Construction of substation and compound, incorporating control room;
- Construction of energy storage facility;
- Excavation and construction of turbine foundations;
- Erection of turbines;
- Excavations of trenches for underground cables;
- Excavation of temporary mineral extraction areas (borrow pits);
- Creation of a temporary concrete batching plant;
- HGV and abnormal load deliveries to site and movement of vehicles on-site; and
- Reinstatement work, including restoration of borrow pits and removal of temporary accommodation works.

5.4.3 The majority of effects occurring during this phase would concern disturbance of existing landcover at the Site and potential for long term change or loss of characteristic vegetation with consequent effects on the character and amenity of the Site and the adjoining area. It is noted that the current land use (and this landscape fabric) is dominated by productive

plantation forest, which would be subject to ongoing restructuring over the lifetime of the Proposed Development and is therefore of low sensitivity. The Site includes three privately owned productive conifer forests. Artfield Forest, Gass Forest and Meikle Cairn Forest. The majority of felling proposed is within the Artfield Forest unit, which was planted in 1982 and 1983 and is now reaching maturity. There is no approved forest plan in place, but it is noted that felling/ restructuring of the woodland would likely take place in the absence of the Proposed Development within the next five years. Within the Site, Gass Forest has completed all the felling of first rotation. Meikle Cairn has been undergoing restructuring since 2014, with a contract end date for the current forest plan of 2024. Further information is provided in Chapter 14: Forestry; however for the purposes of this chapter, it is notable that the current land use creates a dynamic and constantly changing landscape fabric. A large proportion of the construction effects would be managed through adoption of good practice and careful construction management and monitoring regimes (such as those presented in outline Construction and Environmental Management Plan (CEMP) EIAR Volume 2: Technical Appendix 2.1). Given the relatively localised, short duration and partially reversible nature of such effects, and the low sensitivity of the productive forest they are considered unlikely to result in significant effects on landscape fabric.

Potential Operational Effects

5.4.4 The operational life of the Proposed Development would be 30 years, although for the purposes of this assessment the operational life (in years) is arbitrary and effects are considered to be long term but ultimately reversible. The operational elements with the potential to affect the landscape and visual amenity of the study area are:

- Wind turbine generators and external transformers;
- En-route lighting on turbine towers/ nacelles;
- On-site access tracks and hardstanding areas;
- Restored temporary mineral extraction areas (borrow pits);
- Any retained off-site highway improvements and any new roads for HGV deliveries established during the construction phase of the Proposed Development;
- Sub-station/ Site control building; and
- Potential energy storage facility.

5.4.5 The fabric of the landscape would be impacted by the foundations, tracks and hardstanding that would be retained during operational phase of the Proposed Development. The borrow pits would also affect the fabric of the landscape.

5.4.6 The wider character of the landscape, seascape, designated and classified landscapes have potential to be impacted by views to the Proposed Development turbines and how they might appear in relationship with existing and consented wind developments.

Potential Decommissioning Effects

5.4.7 Decommissioning of the Proposed Development could have effects similar to that of the construction period with temporary disturbance of landscape fabric and effects on landscape character and visual amenity, both within the Site and in the wider study area. Detailed decommissioning proposals would be devised in conjunction with DGC, NS and other statutory consultees prior to the commencement of this phase, the emphasis being upon minimising landscape and visual effects.

Potential Cumulative Construction Effects

5.4.8 Potential cumulative effects would arise as a result of the Proposed Development in-addition and in-combination with the existing, consented and in-planning wind developments within the study area.

Potential Cumulative Operational Effects

5.4.9 Potential cumulative effects would arise as a result of the Proposed Development in-addition and in-combination with the existing, consented and in-planning wind developments within the study area. Two scenarios are used to assess cumulative effects: in-addition cumulative effects and in-combination cumulative effects.

5.4.10 In-addition effects would result from the addition of the Proposed Development turbines into the cumulative wind developments. In other words, how much additional influence of wind development would be perceived on landscape receptors, and how would the visual amenity of visual receptors change as a result of the Proposed Development turbines being added into the cumulative situation.

5.4.11 In-combination effects consider how the wider array of existing, consented and in-planning schemes along with the Proposed Development are likely to affect the landscape and visual receptors taken together.

5.5 Mitigation

5.5.1 The siting and design of the Proposed Development has been influenced by a number of national and regional sources of guidance, including:

- NatureScot's current guidance on the siting and design of wind farms[21];
- Scottish Planning Policy; and
- DGC's 2020 adopted Wind Energy Development Supplementary Guidance (SG)[22].

NatureScot Guidance

5.5.2 Paragraph 1.15 of the NatureScot guidance states that "wind farms should be sited and designed so that adverse effects on landscape and visual amenity are minimised and so that landscapes which are highly valued are given due protection."

5.5.3 Paragraph 2.16 states that "turbine size is also a key issue in upland landscapes, where they are viewed against, or from, landscapes of a more intricate scale and pattern; or where it is otherwise difficult to discern the landscape scale and distance. By illustrating the scale of an upland landscape, wind turbines may seem to conflict with the expansive nature of these areas."

5.5.4 Paragraph 2.20 goes on to propose that "ancillary elements for a wind farm development should be designed so they relate to the key characteristics of a landscape. It is important that these elements do not confuse the simplicity of the wind farm design, or act as a scale indicator for the turbines themselves. Undergrounding power lines within the wind farm, using transformers contained within tower bases (where possible), and careful siting of substations, transmission lines, access tracks, control buildings and anemometer masts will

[21] "Siting and Design of Wind Farms in the Landscape, Version 3a" SNH (2017)
[22] Dumfries and Galloway Council, Local Development Plan 2, Wind Energy Development: Development Management Considerations, Supplementary Guidance, February 2020

all help to achieve a coherent wind farm design. Simplicity of appearance and use of local, high quality materials will further enhance this."

5.5.5 Paragraph 2.25 addresses the layout of turbines and suggests that "turbines can be arranged in many different layouts. The layout should relate to the specific characteristics of the landscape - this means that the most suitable layout for every development will be different."

5.5.6 Paragraph 3.24 goes on to state that "it is generally preferable for wind turbines to be grouped on the most level part of a site, so the development appears more cohesive, rather than as a poorly related group of turbines."

5.5.7 The guidance identifies skylines to be of critical importance and posits that the design should avoid detracting from, or overwhelming the character of distinctive skylines, as well as avoiding variable heights or overlapping turbines.

5.5.8 The guidance also discusses the relationship between wind farms. A key factor determining the cumulative impact of wind farms is the distinct identity of each development. This relates to their degree of separation and similarity of design between wind farms. This applies whether they are part of a single development, a wind farm extension, or a separate wind farm in a wider group. A wind farm, if located close to another of similar design, may appear as an extension. However, if it appears at least slightly separate and of different design, it may conflict with the other development.

DGC Guidance

5.5.9 The key considerations pertaining to design of wind farms are presented in section C4 of the SG which refers to the NatureScot's Siting and Designing Wind Farms guidance, and highlights that visual impacts "*can be minimised by use of appropriate:*

- Siting of wind farm, set back of turbines in relation to sensitive receptors locations (dwellings, settlements, main roads, etc.) and to landform;
- Siting to avoid prominent landforms (e.g. valley slopes, ridges, landmark hills) and their setting;
- Size, design and number of turbines;
- Positioning of turbines in relation to sensitive receptors (e.g. nearby dwellings);
- Positioning of turbines in relation to other turbines; and
- Siting and design of ancillary buildings, power lines, access tracks etc."

5.5.10 In respect of mitigation and cumulative impact section D8 notes that "the concept of 'patterns' in development are an accepted part of spatial planning (e.g. settlements, industrial estates and transport hubs). Developments that are concentrated in appropriate locations with similarities in layout, design and materials can create clusters with unified appearance which appear to 'fit' within the landscape. Conversely, developments that are dissimilar and/ or spill over into different landscape character areas are unlikely to achieve a landscape fit. The boundaries of settlements, etc. are defined and enforced to ensure that development clusters do not coalesce or lead to 'urban sprawl'". This would allude to a key priority being to check the geographical spread of wind development into set areas which are influenced by wind development.

Siting and Design Priorities

5.5.11 The design of any onshore wind farm is a matter of balance between commercial, technical and environmental constraints and opportunities. EIAR Chapter 3: Design Evolution and Alternatives provides a summary of the key design drivers and decisions made during the course of the design of the Proposed Development.

5.5.12 It is clear from the description of the design process that landscape and visual considerations, such as the existing landscape and visual baseline context as well as the published guidance and recommendations made by NatureScot and DGC (as summarised above) were key to the design development. In landscape and visual terms, the siting and design priorities applied included:

- Location of the Proposed Development within the 'areas with potential for wind farm development' as illustrated in the Spatial Framework Map 8;
- Location of the Proposed Development is set back from settlement and individual dwellings;
- Location of the Proposed Development away from distinctive landscape features the scale and form of which could be compromised;
- Positioning of turbines on lower elevations of the plateau to create an even composition;
- Positioning within the existing cluster of wind developments so that it appears as an extension of the existing Kilgallioch wind development and Kilgallioch Extension and is 'land-locked' by Artfield Fell Wind Farm to the west and south, and Airies turbines to the east;
- Positioning of the turbines to ensure that the spread of wind development does not extend beyond the existing overall footprint of wind developments (the Proposed Development would be located in between existing Kilgallioch Wind Farm, Kilgallioch Extension, existing Airies turbines and the in-scoping Airies II development, with Artfield Fell turbines to the south;
- Minimise the extent to which the Proposed Development would be seen without the context of the Kilgallioch and Airies wind farms (and their extensions in the event that they are consented);
- The overall fit of the Proposed Development is consistent with the emerging cumulative pattern of development with larger turbines on the plateau and smaller turbines on the transitioning slopes of the upland fringe landform;
- The careful consideration of topography ensures that the maximum blade tip elevation of the Proposed Developments turbines would be level or lower than with the small wind developments of Artfield Fell and Balmurrie Fell. This relationship is evidenced in the Visualisations (Figures 5.10a to 5.29h). Whilst the Proposed Development would be similar in scale and spacing to Kilgallioch Wind Farm and its Extension, the vertical extent of the Proposed Development would not overshadow the smaller Artfield Fell and Balmurrie Fell turbines; and
- Minimise the amount of site infrastructure and ancillary elements required, and carefully position these to take full advantage of the local topography undulations in order to screen such elements from receptors outwith the Proposed Development Site.

The effectiveness of this approach is well demonstrated by the existing Glenchamber Wind Farm, and illustrated in Viewpoint 15 from Mains of Larg, New Luce (Figures 5.23a to 5.23h). The Proposed Development would sit behind the smaller turbines with bases and lower parts of towers concealed by landform, and not break the skyline.

5.5.13 By taking this overall approach the Proposed Development has been designed to minimise visual complexity that may occur when wind farms of varying sizes are situated within close proximity to one another.

5.5.14 The design layout takes into account the smaller turbines of Artfield Fell and Balmurrie Fell wind farms. Notably, the height difference has been accommodated by ensuring the proposed turbines of the Proposed Development are on lower ground and relate to the existing Kilgallioch wind farm and the in-planning Kilgallioch Extension. This relationship is evidenced in the Visualisations (Figures 5.10a to 5.29h) which illustrate that the apparent vertical extent of the blade tip of proposed turbines is viewed at a similar height to the blade tips of the smaller Artfield Fell and Balmurrie Fell turbines.

5.5.15 It is important to note that the proposed turbines have been located as far north as possible within the Site area in order to:

- relate more closely to the operational Kilgallioch development;
- fit with the in-planning Kilgallioch Extension, and
- to fit within the existing pattern of larger scale development sited more centrally within the plateau with the smaller developments leading onto the edges of the plateau and neighbouring landscape character types.

This approach also ensures the proposed turbines are further from the settlements in the southern part of the study area.

5.5.16 Turbine type, relative size and geometry of turbines was also considered during the design of the Proposed Development. Whilst it is desirable to match the specification of the turbine type and geometry for new development with that of existing established developments immediately adjacent, this is problematic in a position, such as that of the Site and adjoining plateau, where there is already a diverse mix of turbine typologies. It is noted that generation scale (as opposed to domestic scale) turbine manufacturers are in the process of discontinuing turbines smaller than 149 m to tip. It is also the case that disparity in typologies is a feature of differing landscape contexts (i.e. Fell landforms as opposed to open flat plateau) and differing ages of development (Artfield Fell wind farm is almost at the end of its consent having been consented in 2004 and commissioned in 2007). In landscape terms differences in turbine type and geometry are often cited as exacerbating residual landscape and visual effects. However, the subject is more nuanced and complex than this and depends, upon a range of circumstances, including:

- the relative rotor size of turbines (as this is often the main element that is visible and intervisible between schemes);
- the proximity, relative visibility and prominence of neighbouring wind farms, larger turbines may be less obviously different when seen more distantly and less prominently (as in views from the south west in which smaller turbines are seen in the foreground and the Proposed Development set behind creating an illusion of similar size, for example from minor road by Whitecairn Caravan Site, Viewpoint 13, Figure 5.21f);

- the degree to which contrasting schemes overlap and whether larger turbines are seen behind or in front of adjacent developments. Seen at distance and substantially overlapped by smaller turbines the contrast between existing and proposed turbines can be lessened. Conversely, when seen in front of small turbines, larger models do not distort the perspective of receptors, as in the case in views from locations to the east of the Proposed Development, including the view from Glenvernock Fell (Viewpoint 3, Figure 5.11a to 5.11h);
- Whilst rotor size differences can result in variations in rotor speed between neighbouring schemes, this can also be the case in respect of different models of turbines with the same geometry. It is also the case that some differences in rotor speed occur within individual wind farms as a result of differing wind conditions associated with topography, elevation and land cover.

5.5.17 The efficacy of the siting and design measures is evidenced by the relatively constrained viewshed indicated in the ZTV in EIAR Volume 3a: Figure 5.6a. Matters pertaining to the design and appearance of the Proposed Development, including matters pertaining to appreciable turbine size differences, are discussed in relation specific viewpoint locations in EIAR Volume 4: Technical Appendix 5.3: Viewpoint Assessment.

Substation and Energy Storage Facility

5.5.18 The control building and substation, along with potential associated energy storage facility, would be located within the undulating elevated large-scale forested landscape within the Site and away from the SUW which runs north of the Proposed Development Site. The buildings and housings would be positioned in the lee of The Torr, a local high point within the plateau, in order to provide some scope for screening this aspect of the Proposed Development from external receptor locations during construction.

Mitigation during Construction

General Construction Mitigation Measures

5.5.19 The location and management of construction elements has been carefully considered to minimise environmental effects including potential landscape and visual effects during the construction stage. Additionally, the following general precautionary measures would be adopted in order to minimise landscape and visual effects:

- All working areas would be restricted as far as practicable to the specified areas and demarcated to prevent incursion of site plant into non-construction locations;
- Material storage/ temporary stockpiles would be retained for the shortest duration practicable and would be sited to avoid visual intrusion to neighbouring receptor locations, with particular regard to avoidance the northern part of the Proposed Development Site near the SUW; and
- Peat materials would be placed directly wherever practicable to avoid double handling, reduce vehicle movements, and to reduce potential drying and oxidisation of the peat. Where this is not possible the peat shall be stored in accordance with the EIAR Volume 4: Technical Appendix 2.4: Peat Management Plan (PMP).

Temporary Construction Compound and Lay-Down Areas

- Temporary site compounds and temporary mineral extraction areas would be reinstated prior to the commencement of the operational phase of the Site to avoid the

necessity of retaining restoration materials on-site over the operational period and to avoid sustained effects on landscape fabric character and visual amenity;

- The surface of lay-down areas would be reinstated to replicate the appearance of adjoining moor and heathland; and
- Excavations for turbines foundations, laydown areas and underground cables, would be reinstated prior to commencement of the operational phase of the Proposed Development and all track sides would be reinstated with translocated turves to ensure they would blend in with the adjoining (undisturbed) ground in the Site.

5.5.20 Two temporary construction compounds are proposed: one close to the main Site entrance near Tarf Bridge the other between turbines 4 and 7. The use of two temporary compounds is intended to limit the necessary overall size of the compound and reduce the length and frequency of on-site vehicle movements.

5.5.21 Temporary compounds would be returned to a condition consistent with that of the adjoining moor and heathland during final construction works at the Site.

Mitigation during Operation

5.5.22 Mitigation measures relating to the operational phase of the Proposed Development have been incorporated into the design of the scheme, as described above.

Mitigation during Decommissioning

5.5.23 The decommissioning phase of the Proposed Development would be of a shorter duration relative to that of the construction phase, with the removal of all above ground structures and reinstatement of disturbed ground. It is anticipated that the turbine foundations would be removed to a depth of 0.5 m and all other below ground structures would be left in place to avoid further disturbance. There would therefore be a temporary impact from the activities on site to remove structures, but this would be of relatively short duration. Accordingly, the decommissioning phase is considered to be likely to have a minimal effect on the landscape and visual amenity of the locality. Mitigation measures associated with decommissioning would be agreed during the preparation of the final decommissioning plan, that would require approval of statutory consultees and ECU.

5.6 Assessment of Residual Effects

Construction Effects

Landscape Fabric

5.6.1 Chapter 2: Development Description details the land take associated with the construction of the Proposed Development. This indicates that the Proposed Development would cause temporary disturbance of, or change to around 4 hectares (ha) of the Site. Permanent land take would be approximately 11 ha associated with turbine bases, crane pads, met mast, the substation, control room and compound, the potential energy storage facility, and site access tracks.

5.6.2 The key change to the fabric of the landscape within the Site would relate to some minor localised changes to Site topography and changes to characteristic land cover. This is considered to represent a non-significant effect, and one which would be largely reversible upon decommissioning of the Proposed Development.

Residual Effects on Seascape and Landscape Character Types During Construction

5.6.3 The effect of construction operations at the development Site would be localised to construction locations and would be of relatively short duration and much of the disturbance associated with construction would be ameliorated or removed during subsequent reinstatement activities. Consequently, they are not considered to represent significant residual effects on landscape character either within or in the adjacent landscape.

Residual Effects on Landscape Designations During Construction

5.6.4 As with predicted effects on landscape character types, effects on designated landscapes within the study area are also not anticipated to be significant. The Proposed Development would occur outwith designated areas and would therefore have no direct effect on designated landscapes. Whilst indirect effects are likely, primarily as a result of the operation of cranes and erection of turbines, such effects would be localised and would be of a short duration. Consequently, such effects are not considered to represent significant residual effects on adjacent designated landscapes.

Residual Effects on Visual Amenity During Construction

5.6.5 Construction operations at the Site would be confined to locations within the Site that are screened from the majority of external receptor locations, including settlements, transportation routes and the majority of recreational routes, the exception to this being the operation of site cranes and erection of turbines. However, even these aspects of the construction operations would be of relatively short duration. In this context, residual construction effects on visual amenity are considered unlikely to be significant

Operational Effects

Seascape and Landscape Character Types

5.6.6 Twenty-four LCTs and three SCTs have been assessed as part of this SLVIA. These are listed and described in Technical Appendix 5.2, and where there is variance in the character or the level of effects from the Proposed Development in different units of the LCT this is identified.

5.6.7 Based on the assessment undertaken significant residual effects were found to be restricted to the local landscape character of host LCT, 174: Plateau Moorland with Forest – Dumfries and Galloway. No significant effects were predicted on the other LCTs or SCTs within the study area.

5.6.8 The findings of this assessment are largely due to the landscape fit of the Proposed Development within the existing baseline of wind development, the magnitude of impact of which is limited as follows:

- To the west and northwest the small fells, namely Artfield Fell, Balmurrie Fell, Green Top, Quarter Fell and Big Craigenlee largely screen the Proposed Development. The Proposed Development is situated at elevations over 100 m lower than these landforms and would be seen behind the intervening Artfield Fell and Balmurrie Fell turbines;
- To the north are the existing, extensive turbines of Kilgallioch Wind Farm as well as several fells including Ha' Hill, Craigmoddie Fell, Craig Airie Fell, White Fell, Far Cairn and Benbrake Hill which limit visibility (as borne out in the ZTV) and ensure that the Proposed Development turbines would appear to be indistinguishable from Kilgallioch in views from locations to the north;

- Eastwards there are further elevated fell landforms (Eldrig Fell and Urrall Fell) and extensive forestry plantations, which combine to effectively screen the Proposed Development from the lower land and valleys to the east; and
- Visibility southeastwards is interrupted by Fell End, Barskeoch Fell, Culvennan Fell and Barfad Fell, and southwestwards by Carscreugh Fell and Bught Fell. The Proposed Development would also be seen behind Carscreugh Wind Farm and Airies turbines in views from the southwest and southeast, respectively.

5.6.9 Significant effects within LCT174 are largely concentrated within the lower-lying areas surrounding the Proposed Development and at the elevated Fells noted above. Beyond this the influence of the Proposed Development lessens due to the combination of intervening topography, forestry and the influence of existing wind turbines.

5.6.10 The established pattern of wind energy developments that enclose the Proposed Development Site and form a key constituent of the landscape and views. The existing Airies and Kilgallioch turbines are large scale – 130 m to 146.5 m to tip, respectively. Moreover, current proposals for extensions to these schemes include turbines of 180 m in the case of Kilgallioch Extension, and 200 m in the case of Airies II. In this context, the scale of the Proposed Development is consistent with the scale of these turbines.

5.6.11 The larger Kilgallioch and Airies schemes avoid the hills and fells whilst the existing Artfield Fell and Balmurrie Fell turbines are arrayed on the tops of such hills. Both the hill top locations and the small size of turbines (just under 80 m to blade tip) result in these wind farms being incongruous with the emerging cumulative pattern of development.

5.6.12 The addition of the Proposed Development, between the Kilgallioch and Airies wind farms and backdropped by Artfield Fell and Balmurrie Fell turbines atop the small hills, would not significantly alter the baseline characteristics of the LCTs within the study area, except locally within a few kilometres of the Proposed Development Site. Localised significant effects are predicted for the landscape immediately surrounding the Proposed Development and to the south and southeast of the Proposed Development, around the Ronald Loch area.

5.6.13 The assessment on cumulative impacts on the LCTs and SCTs concludes that;

- There would be no significant *in-addition* cumulative on the LCTs;
- All but seven of the twenty-four LCTs would have significant *in-combination* cumulative effects (but with negligible contribution from the Proposed Development); and
- There would be no significant in-addition or in-combination cumulative effect on the SCTs.

Landscape Designations

5.6.14 A detailed assessment has been made of the potential effects of the Proposed Development on five local designations, four GDLs and one Wild Land Area.

5.6.15 There would be no significant effect on any of the designated and classified landscapes as detailed in Technical Appendix 5.1 (RSAs, SA, and GDLs) and Technical Appendix 5.5, which sets out the detailed Wild Land Impact Assessment, also noted no significant effects. The findings of the detailed assessments are summarised below.

LOCAL DESIGNATIONS

5.6.16 The RSAs in Dumfries and Galloway and Scenic Areas in South Ayrshire, lack citations detailing the special qualities for which they are designated. DGC has provided a post-

designation technical paper[23] which notes the key characteristics of each designated landscape, however, the paper actually draws on the LCTs and notes key points in relation to the RSA. This information is fairly general and does not draw out or fully address the setting of, or special qualities of the designation, nor does it note vantage points from where these key characteristics of the RSA would be best experienced. Therefore the assessment of potential effects on the RSAs is relatively general and relates to the key characteristics of LCTs as noted in the DGC technical paper. Equally the paper did not inform the making of the designation. South Ayrshire Council has designated much of its administrative area as Scenic Areas (SA). These also lack citations and there is no information about specific special qualities. The South Ayrshire Council Local Development Plan notes that the SA designation is based on Scottish Natural Heritage LCTs[24]. A largely general assessment has been made for both RSAs and SAs.

5.6.17 The assessment of landscape designations is detailed in Technical Appendix 5.1, and the occurrence of significant effects summarised below:

- Galloway Hills RSA
  - There are no residual effects predicted to result from the Proposed Development on this RSA since it is a distance of over 12 km west and it would be situated within an existing group of wind turbines. Whilst slightly larger than the existing turbines, the Proposed Development would not alter the underlying character of the landscape as experienced from the RSA;
  - The *in-addition* cumulative effects of the Proposed Development are predicted to be minor/ none and not significant: whilst the proposed turbines would add to the influence of wind energy development, the addition of twelve turbines into the existing cumulative pattern of developments would not alter the baseline condition of the landscape or the views to it; and
  - A **significant in-combination cumulative effect** is predicted on the RSA. This is largely related to the wide-spread and complex pattern of existing, consented and in-planning development. The Proposed Development would be noticeable from elevated parts of the RSA and would add a degree of complexity to the scale of the vertical elements in the landscape but the change as a result of the Proposed Development would be limited to an area already influenced by wind development, so the effect on the RSA would remain largely unchanged.
- Machars Coast RSA
  - Given the highly constrained theoretical visibility of the Proposed Development from this RSA, and since it would be in the opposite direction to the important views from the RSA, there would be no significant effects arising;
  - There would be no in-addition cumulative effects as the key element of the RSA is the coastal strip and views outwards towards the sea. There are no potential views of the Proposed Development from the coastline and it would be on the opposite side of the RSA so would not affect any views from the few elevated locations from which the Proposed Development would be theoretically visible; and
  - No in-combination cumulative effects are identified.
- Mochrum Lochs RSA

[23] Regional Scenic Areas Technical Paper, Dumfries and Galloway Council Local Plan 2 (January 2018).

[24] LDP Policy: Protecting the Landscape, page 41, South Ayrshire Local Development Plan 2014.

- The Proposed Development would not result in significant effects on this RSA since views towards the RSA are from relatively elevated locations and would not detract from the key elements which include the interplay between the lochs and low hills within the RSA and the panoramic views towards the coast and sea beyond which is in the opposite direction to the Proposed Development;
- The in-addition cumulative effect of the Proposed Development would not be significant. It would not extend the influence of wind development into parts of the view from the RSA that are currently turbine-free, nor would it be in the direction of important views from the RSA which are towards the coast; and
- **In-combination cumulative effects are predicted to be significant**. This is largely related to the wide-spread and complex pattern of existing, consented and in-planning developments. The Proposed Development would form a minor addition to the overall influence of wind farms being situated in the same field of view as existing wind farms, in between the operational Glenchamber turbines (to the west) and Airies wind farm (to the east), and in front of the operational Kilgallioch wind farm.

- Rhins Coast RSA

  - The Proposed Development would be a small, barely discernible element within the collection of existing baseline wind developments visible on the horizon in southeastern parts of the RSA, therefore there would be no significant effects;
  - The in-addition cumulative effects would not be significant as the Proposed Development would result in no discernible change to the emerging pattern of wind developments; and
  - In-combination cumulative effects would not be significant since the emerging cumulative pattern of development are distant and affect one part of the views inland and away from the cliffs and coastal edge which are important elements of this RSA.

- Scenic Area (South Ayrshire)

  - The Proposed Development would be barely discernible within potential views from this SA given the extent of intervening existing wind developments, therefore it would not have a significant effect on the SA;
  - The Proposed Development would represent a barely discernible addition to the existing, consented and in planning wind energy developments within and in close proximity to the SA; and
  - The **in-combination effect of the Proposed Development would be significant** given the extent, complexity and diversity of wind energy development emerging within and close to this SA.

- Gardens and Designed Landscapes – four GDLs have been assessed, namely Ardwell House GDL; Logan Botanic Gardens GDL; Logan House (Balzieland) GDL; and Monreith GDL. There would be virtually no views towards the Proposed Development from these GDLs because views are screened by policy planting and/ or agricultural field boundaries and shelterbelts. Any restricted views would not affect the key components for which the GDLs are listed. Therefore there are no effects arising, significant or otherwise.

- Wild Land – this is fully assessed in Technical Appendix 5.5 and summarised as follows:

- The Wild Land Impact Assessment has been undertaken in accordance with NatureScot's Wild Land Assessment Guidance[25];
- There are no significant effects predicted: the effect of the Proposed Development on the baseline 'wildness' aspects of the WLA are predicted to be:
  i. Minor on the perception of naturalness;
  ii. Minor on the contrast of the WLA in relation to the adjacent forest park;
  iii. Minor on the visibility of human elements; and
  iv. None on the rugged landscape/ physical challenge presented by the WLA.
- The overall conclusion of the WLIA is that since there are no views of the Proposed Development from the interior of the WLA, the 'strong sense of naturalness would not be impacted'.

Visual Amenity

TRANSPORTATION ROUTES

5.6.18 The transportation routes assessed are mapped on Figure 5.5a, and Technical Appendix 5.6: Route Visibility Analysis contains a statistical analysis of visibility of the Proposed Development as well as other wind farm developments in the study area from key transportation and recreational routes. The analysis also provides details of the relative distance and direction of visible wind farms to allow for comparison and determination of potential cumulative effects, including sequential effects.

A75 BETWEEN CROCKETFORD AND STRANRAER

5.6.19 The A75 traverses the study area in a general east-west orientation between Crocketford and Stranraer. The ZTV indicates that the Proposed Development would come into view approximately 4 km east of Carluith at which point the Proposed Development would be 29.1 km to the east. There would be intermittent theoretical views to the Proposed Development for approximately 5 km after which theoretical visibility would be relatively sustained along a 15 km length stretch to east of Newton Stewart. However, it is likely that the Proposed Development would be indiscernible for much of this length as illustrated at Viewpoint 7: Creetown (Figure 5.15a to 5.15f).

5.6.20 From Newton Stewart to approximately 5 km east of Glenluce the ZTV indicates intermittent theoretical views. Areas of roadside woodland planting and embankments, as well as tree cover around dwellings and farms would further restrict the glimpses and potential views from this stretch of road. Any views of the Proposed Development would be of short duration of up to 1.9 km. Beyond Glenluce the remainder to the A75 to Stranraer would have no views of the Proposed Development.

5.6.21 Where there are views of the Proposed Development from the A75, these are likely to be:

- long distant views of tips which barely show over woodland/ structures on the horizon (e.g. around Creetown);
- glimpsed and short-duration views between Newton Stewart and Glenluce; and
- around Glenluce there would be potential for a short stretch of clear, unbroken views from the A75 as it passes over an embankment elevated above Glenluce. Viewpoint 12: Glenluce, illustrates this view which shows up to six tips peaking over the horizon behind the existing Carscreugh and Glenchamber.

[25] NatureScot (2020) Assessing the Impacts on Wild Land Areas – Technical Guidance

5.6.22 Less than half of the route of the A75 through the study area would have potential views of the Proposed Development. There would be limited alteration to views from the A75 and the Proposed Development may be discernible in places, but views would be of short duration. The underlying character of views would be broadly consistent with the baseline. Consequently, the magnitude of impact would be slight and the residual effect on the amenity of the route would be Moderate/ Minor and not significant.

5.6.23 Cumulative Effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a minor addition to the influence of wind farm development along this route. The magnitude of impact is considered to be Slight and the cumulative effect would be Moderate/ Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible in the same views as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Clauchrie (in-planning); Glenchamber (existing); Kilgallioch (existing); Kilgallioch Extension which is in-planning; and Stranoch 2 (which is also in-planning and which would replace the consented Stranoch I scheme. Stranoch II has been included in the SLVIA to ensure worst case impacts are addressed. The Proposed Development would always be seen within the context of some or all of the above noted developments, and most often in combination with Airies (existing) and Airies II (in-planning – scoping) of which it would appear to be a part of. The magnitude of impact is considered to be Substantial and the in-combination cumulative effect would be **Major/ Moderate and significant.** This is largely a result of the existing diversity and complexity of wind developments visible from the Newton Stewart to Glenluce section of the route, with the Proposed Development being a minor addition.
- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. Therefore the magnitude of impact is ascribed as Negligible since the Proposed Development would represent a barely discernible addition to the influence of wind energy developments within sequential views from this route.

A714 BETWEEN GIRVAN AND THE A746

5.6.24 This is the regional road connecting Wigtown and Newton Stewart to Girvan in South Ayrshire. The route analysis demonstrates that less than half of the road through would have views of the Proposed Development. Most theoretical views would be glimpses over the short lengths of road from which the Proposed Development would be potentially visible. The 10 km section between Feoch Bridge (east of Barrhill) and Glengruboch Hill would have the most sustained views. However, the large expanses of mature forestry on either side of the A714 from Bargennan to Barrhill would restrict views. Where visible, the Proposed Development would be seen in context of the operational Arecleoch, Kilgallioch and Airies turbines.

5.6.25 The visual amenity of the A714 would be largely unaffected. There would be a slight change to views from the northern section between Barrhill and Bargennan where the Proposed Development is visible. Views would be short lived being screened by forestry for much of

the time. The magnitude of impact would be Negligible since the Proposed Development would represent a very limited alteration to the existing baseline of the existing turbine cluster already visible from this section of road. The visual effect is considered to be Minor.

5.6.26 Cumulative Effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a minor addition to the influence of wind energy development along this route which, in addition to the existing wind farms noted above, would be primarily visible in context of: Chirmorie (consented), Airies II (scoping), Kilgallioch (in-planning) and Stranoch 2 (in-planning). The magnitude of impact is considered to be Slight and the cumulative effect would be Moderate/ Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible from the same length of the route as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Clauchrie (in-planning); Glenchamber (existing); Kilgallioch (existing); Kilgallioch Extension (in-planning); Stranoch 2 (in-planning); Mark Hill (existing); and Tralorg (consented). The Proposed Development would always be seen within the context of some or all of the above noted developments, and most often in combination with Kilgallioch (existing) and Kilgallioch Extension (in-planning) of which it would appear to be a part of. The magnitude of impact is considered to be Substantial and the in-combination cumulative effect would be **Major/ Moderate and significant.** As described this is largely as a result of the existing diversity and complexity of wind development visible from some of this route, with the Proposed Development a minor addition.
- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. The twelve proposed turbines would appear to be part of the extensive Kilgallioch wind farm as the Proposed Development would be seen to the south of it. Therefore the magnitude of impact is ascribed as Negligible since the Proposed Development would represent a barely discernible addition to the influence of wind energy developments within sequential views from this route.

A747 BETWEEN GLASSERTON AND GLENLUCE

5.6.27 The route analysis (Technical Appendix 5.6) shows that along the length of the A747 around the Machars headland from Glasserton to Glenluce, there are five areas of potential visibility. There is the possibility of two glimpsed views of the proposed turbines from near Monreith at distances of 29 km or more. Given the frequent groups of trees associated with the agriculture and properties in that area it is likely that the potential views would be screened or heavily filtered so that the Proposed Development would be not be discernible at these locations.

5.6.28 Figure 5.5b demonstrates that there would be an area of sustained theoretical visibility during the stretch of the A747 shared with National Cycle Route 73 (NCR73). This would commence from near Auchenmalg to Milton Burn. The road climbs steeply from approximately 25 mAOD at Auchenmalg to some 50 mAOD at the brow of the hill at which point the tips of the proposed turbines would come into view. Near to Challochum, the road is bounded by a gorse hedge on the east which would filter views of the turbines, and a

copse of trees and mature trees associated with the scattered farms would further filter views towards the Proposed Development.

5.6.29 Approximately 3 km south of Glenluce the proposed turbines become potentially visible for two short stretches in the vicinity of Blackhart Moor operational wind farm and the consented Blackhart Moor Extension. Any possible views of the proposed turbines would be of tips set behind the intervening operational Carscreugh and Glenchamber schemes, with Blackhart Moor turbines in the foreground.

5.6.30 Given the minimal views of the Proposed Development from this road, the magnitude of impact is considered to be Negligible as the Proposed Development would barely alter the baseline views from this route. The effect on the visual amenity of the A747 is predicted to be Minor/ None.

5.6.31 Cumulative Effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a barely discernible addition to the influence of wind along this route given the constrained potential views. The magnitude of impact is considered to be Negligible and the cumulative effect would be Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible in the same views as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Clauchrie (in-planning); Glen App (existing); Glenchamber (existing); Kilgallioch (existing); Kilgallioch Extension (in-planning); and Stranoch 2 (in-planning). The Proposed Development would always be seen within the context of some or all of the above noted developments, and most often in combination with Carscreugh (existing) and Glenchamber (existing). The magnitude of impact is considered to be Substantial and the in-combination cumulative effect would be **Major/ Moderate and significant.** This is largely a result of the existing diversity and complexity of wind development visible from the small sections of this route.
- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. Therefore, the magnitude of impact is ascribed as Negligible since the Proposed Development would represent a barely discernible addition to the influence of wind energy developments within sequential views from this route.

RECREATIONAL ROUTES

B7005 AND NATIONAL CYCLE ROUTE 73 – WIGTOWN TO ALTICRY

5.6.32 The B class road is the route of NCR73 from Wigtown to Alticry where the B class road joins the A747 and the cycle route continues along the A class road.

5.6.33 There are stretches of sustained theoretical visibility from around Hillhead to Culshabbin. However, the route passes through mature coniferous plantations in this area which would largely screen views. Any possible views of the Proposed Development would be perpendicular to the direction of travel so difficult to appreciate whilst engaged in cycling or driving.

5.6.34 The visual amenity of this route is considered to be slightly impacted by the Proposed Development and the effect on visual amenity is assessed to be Minor and not significant.

5.6.35 Cumulative Effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a minor addition to the influence of wind farms along this route. The magnitude of impact is considered to be Slight and the cumulative effect would be Moderate/ Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible in the same views as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Clauchrie (in-planning); Cornharrow (in-planning); Glenchamber (existing); Glen App (existing); Kilgallioch (existing); Kilgallioch Extension (in-planning); North Rhins (existing); and Stranoch 2 (in-planning). The Proposed Development would always be seen within the context of some or all of the above noted developments, and most often in-combination with Airies (existing) and Airies II (in-planning – scoping) of which it would appear to be a part of. The magnitude of impact is considered to be Substantial and the in-combination cumulative effect would be **Major/ Moderate and significant.** As described this is largely as a result of the existing diversity and complexity of wind development visible from this route.
- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. Therefore the magnitude of impact is ascribed as Negligible since the Proposed Development would represent a barely discernible addition to the influence of wind energy developments within sequential views from this route.

SOUTHERN UPLAND WAY

5.6.36 The long distance footpath which is listed as one of Scotland's Great Trails, the Southern Upland Way crosses the study area from northeast to southwest, and passing within 1.3 km of the Proposed Development.

5.6.37 The Visual Analysis of the route shows that theoretically, the Proposed Development would come into view around at 19.6 km. These views would be from elevated slopes of Glen Trool. Any views that are not screened by the large areas of coniferous forestry within the Glen would be panoramic and the Proposed Development would be visible within the context of the existing Kilgallioch and Airies schemes. Other wind developments, including Artfield Fell and Arecleoch are likely to be visible within the same direction of view from elevated vantage points.

5.6.38 On the lower slopes of the Glen, and crossing onto the plateau, the SUW would lose sight of the Proposed Development until the route comes to within approximately 11 km of it. At approximately 6 km north the SUW enters the operation Kilgallioch wind farm, and the route continues through the turbines for some 3 km when it exits Kilgallioch at 1.3 km northwest of the Proposed Development which is the closest the route would come to the proposed wind farm and from which Viewpoint 18 (Figures 5.26a to 5.26h) illustrates the view.

5.6.39 Travelling southwestwards, the route begins the descent down to New Luce and the river valley, passing the operational Artfield and Balmurrie wind farms to the southeast. There would be no views to the Proposed Development from the Water of Luce valley, and restricted views are likely as the footpath skirts the coniferous plantation on Craig Fell, beyond which there would be no theoretical views until the footpath nears Stranraer, where it crosses the Mull of Galloway Trail. In this area there are large areas of tree planting which would limit views towards the Proposed Development. Passing to the south of Stranraer, there would be clear, long distance views to the Proposed Development from Dunbae Hill. The Proposed Development would be on the horizon within a grouping of existing wind development including Glenchamber, Carscreugh, Artfield Fell, Balmurrie with the Airies and Kilgallioch behind these schemes. The Proposed Development would be set behind Artfield Fell and Balmurrie Fell. The proposed turbines are unlikely to be clearly discernible and read as part of the larger, rather complex group of turbines.

5.6.40 The visual effect on the SUW is considered to be Moderate for most of the route and **Major** (significant) within 6 km the since the Proposed Development would add large scale wind turbines in close proximity to the route which would add to the existing complexity of wind development and interrupt views eastwards towards the Galloway Hills.

5.6.41 Cumulative Effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a minor addition to the influence of wind energy developments along this route. The magnitude of impact is considered to be Slight and the cumulative effect would be Moderate/ Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible in the same views as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Assel Valley (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Clauchrie (in-planning); Glenchamber (existing); Glen App (existing); Hadyard Hill (existing); Kilgallioch (existing); Kilgallioch Extension (in-planning); Stranoch 2 (in-planning); and Tralorg (consented). The Proposed Development would always be seen within the context of some or all of the above noted developments, and most often in combination with Airies (existing) and Airies II (in-planning – scoping) of which it would appear to be a part of. The magnitude of impact is considered to be Substantial and the in-combination cumulative effect would be **Major/ Moderate and significant.** As described this is largely as a result of the existing diversity and complexity of wind development visible since the Proposed Development would add to the existing diversity and complexity of wind development visible from the Newton Stewart to Glenluce section of the route.
- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. Within the study area the SUW route would pass through the large grouping of cumulative wind farms noted above, and on the Rhins Peninsula walkers would experience a loose grouping of the existing North Rhins and Knocknain Farm schemes and the consented Larbrax wind farm. The addition of the Proposed Development into sequential views would result in a slight magnitude of impact since the Proposed Development would not largely alter the cumulative

sequential baseline. The Sequential effect is considered to be Moderate and not significant.

MULL OF GALLOWAY TRAIL

5.6.42 The Mull of Galloway Trail is routed from the southern tip of the Mull of Galloway, along the east coast to of the Rhin Peninsula to just north of Sandhead where the route moves northwards to Stranraer. From the coastline at Stranraer the footpath turns eastwards to move along the coast northwards to the Water of App where it turns inland to terminate at Glenapp Church.

5.6.43 There are intermittent theoretical views of the Proposed Development from the Mull of Galloway to Stranraer, and no potential visibility from Stranraer to Glenapp Church. The distance from the footpath to the nearest proposed turbine would range from 34.9 km at the southern-most point of the Mull of Galloway the footpath to 16.9 km at Stranraer. Intervening vegetation and structures would reduce potential views from Sandhead Bay to Stranraer.

5.6.44 The type of views from this footpath are illustrated in Viewpoint 11 from the Mull of Galloway and Viewpoint 14 from Sandhead (Figures 5.22a to 5.22f). Viewpoint 11 (Figures 5.19a to 5.19f) is from a distance of 37.96 km and the Proposed Development is barely discernible within the view. It may be visible on a clear day when it would form part of a large grouping of wind development. Viewpoint 14 illustrates the potential views of the 11 tips and one hub of the Proposed Development theoretically visible at 22.39 km distance. These would not be readily discernible as intervening woodland would screen some of the blades which would sit behind Artfield Fell and Balmurrie Fell turbines. The Proposed Development would be in the same field of view as the Kilgallioch, Artfield Fell, Balmurrie Fell, and Glenchamber developments, and the existing Carscreugh scheme would be visible as a separate development to the south.

5.6.45 The Proposed Development would be distant in most views from the Mull of Galloway Trail, and where visible along the eastern coast of the peninsula, it would not be clearly discernible. The Proposed Development would barely alter the visual amenity of the footpath. Therefore the visual effect on the Mull of Galloway Trail is predicted to be Moderate/ Minor and not significant.

5.6.46 Cumulative effects are as follows:

- In-addition cumulative effects – the Proposed Development would result in a barely perceptible addition to the influence of wind energy developments along this route. The magnitude of impact is considered to be Negligible and the cumulative effect would be Moderate/ Minor to Minor and not significant.
- In-combination cumulative effects – the following schemes would be potentially visible in the same views as the Proposed Development (from the same locations as noted above): Airies existing; Airies II (scoping); Arecleoch existing; Arecleoch Extension (in-planning); Artfield Fell (existing); Assel Valley (existing); Balmurrie Fell (existing); Blackhartmoor (existing); Blackhartmoor Extension (consented); Carscreugh (existing); Chirmorie (consented); Glenchamber (existing); Glen App (existing); Kilgallioch (existing); Kilgallioch Extension (in-planning); and Stranoch 2 (in-planning). The Proposed Development would always be seen within the context of some or all of the above noted developments. Other wind farms theoretically visible from this route include: North Rhins (existing), Knocknain Farm (existing), and Larbrax (consented).

The magnitude of impact is considered to be Substantial and the in-combination cumulative effect is predicted to be **Major/ Moderate and significant.** As described this is largely as a result of the existing diversity and complexity of wind development visible from this route.

- Sequential – the Route Visibility Analysis shows that the Proposed Development would not add further visibility of wind development into sections of route that do not presently have views of wind farms. Within the study area this Great Trail has views of the grouping of cumulative wind farms noted above, and towards Stranraer, there would be views westwards to the North Rhins (existing), Larbrax (consented) and Knocknain Farm (existing) developments on the Rhins Peninsula. The addition of the Proposed Development into sequential views would result in a negligible magnitude of impact since the Proposed Development would barely alter the cumulative sequential baseline. The Sequential effect is considered to be Moderate/ Minor and not significant.

CORE PATHS

5.6.47 There are five core paths within approximately 10 km of the Proposed Development that are considered in this SLVIA as it is unlikely that there would be significant effects on core paths beyond this distance.

NEW LUCE TO KILHERN – CIRCULAR WALK

5.6.48 This circular walk starts in New Luce and follows the Southern Upland Way uphill across moorland and taking a left turn to the Caves of Kilhern and the archaeological remains of a communal burial ground. The route continues past these sites of interest to meet the minor road which can be followed downhill back to New Luce.

5.6.49 The ZTV illustrates that views towards the Proposed Development would be intermittent with turbine tips rising above the horizon into view behind the operational Artfield Fell and Balmurrie Fell turbines, and then dipping out of view again at distances of 5 km to 8 km. Shortly after turning left towards the Caves of Kilhern, the blades and possibly the hub-tops of the Proposed Development would be visible. At this location the path is orientated northwest cutting across the slope whilst views to the proposed turbines would be at right angles to the point of focus, uphill. Turning left to join the minor road back to New Luce the Proposed Development would come into and dip out of view once more, set behind the operational Artfield Fell and Balmurrie Fell developments.

5.6.50 Viewpoint 15 from New Luce (Figures 5.23a to 5.23h), and Viewpoint 16 from the minor road by Balmurrie Fell (Figures 5.24a to 5.24h) illustrate the likely views of the Proposed Development. Whilst the Proposed Development would be clearly visible within sections of this core path, it would not alter the components of the view being set behind, and within the same field of view as the existing turbines of Artfield Fell and Balmurrie Fell. The influence of wind development would be marginally increased. Therefore the effect on the visual amenity of this core path is predicted to be Moderate and not significant.

5.6.51 Cumulative magnitude of change is considered to be Slight for in-addition cumulative effects, resulting in a Moderate and not significant effect.

5.6.52 In-combination magnitude of change is assessed to be Moderate since the range of existing wind developments is of diverse typologies and relatively complex. This would result in **Major/ Moderate and significant** in-combination cumulative effect.

5.6.53 Sequential magnitude of change is Slight as the Proposed Development would represent a minor addition to the existing cumulative wind farm baseline as visible from this circular walk. The sequential effect would be Moderate and not significant.

THE MOORS OF WIGTOWNSHIRE WALK

5.6.54 This relatively long circular path starts in Glenluce and heads to New Luce along the river valley. The route then follows the minor road uphill passing Balmurrie Fell and Artfield Fell to Tarf Bridge where a sharp right turn takes the path onto the minor road back to Glenluce. The ZTV for much of the length of this path there would be no views of the Proposed Development (around Glenluce and within the Water of Luce valley). The views on the minor road to Balmurrie Fell would slightly affect the visual amenity of walkers by adding turbines tips in behind the Artfield Fell and Balmurrie Fell turbines. There would be a greater magnitude of impact on the visual amenity of walkers around the Tarf Bridge area as Proposed Development would add large scale turbines into the views, adding an additional layer of complexity into the existing wind development baseline. Shortly after leaving Tarf Bridge to return to Glenluce, the Proposed Development would once more recede behind the landform of smaller hills and undulations constraining the views to up to six turbines for much of the walk that has potential views.

5.6.55 Viewpoint 16 from Balmurrie Fell (Figures 5.24a to 5.24h) illustrates the worst-case views from the New Luce to Tarf Bridge leg of the route, and Viewpoint 13 (Figures 5.21a to 5.21f) demonstrates the constrained views of the Proposed Development likely form much of the Tarf Bridge to Glenluce part of the path. The visual amenity of walkers along the Water of Luce valley section would be unaffected. Around Tarf Bridge however, the Proposed Development would introduce large scale wind turbines into views from paths which would notably alter the views. Therefore the visual effect on this core path ranges from Moderate for most of the route, and **Major** (significant) within the Tarf Bridge locality.

5.6.56 Cumulative magnitude of change is considered to be Slight for in-addition cumulative effects for most of the Core Path, and a Moderate impact on walkers within the area around Tarf Bridge. The resulting in-addition cumulative effect would be Moderate and not significant effect for most of the path and a localised **Major/ Moderate and significant** effect around Tarf Bridge.

5.6.57 In-combination magnitude of change is assessed to be Moderate since the range of existing wind developments is of diverse typologies and relatively complex. This would result in **Major/ Moderate and significant** in-combination cumulative effect.

5.6.58 Sequential magnitude of change is Slight as the Proposed Development would represent a minor addition to the existing cumulative wind farm baseline as visible from this circular walk. The sequential effect would be Moderate and not significant.

THREE LOCHS KIRKCOWAN

5.6.59 This path centres on the experience of the three lochs: Loch Ronald, Loch Heron and Black Loch within the Three Lochs Estate. The circular walk starts at the Balminnoch caravan park from where views of the Proposed Development would be constrained (as illustrated on the ZTV). As the route passes between Loch Heron and Loch Ronald, the Proposed Development would come into view and Viewpoint 20 from Loch Ronald illustrates this. The path then turns left where it begins the ascent to Fell Hill. This part of the route is through mature forestry so views would be screened/ heavily filtered.

5.6.60 The Proposed Development would introduce large scale wind turbines into the views from this path which would be altered substantially. The visual effect on this core path is predicted to be **Major** and significant**.**

5.6.61 Cumulative magnitude of change is considered to be Substantial for in-addition cumulative effects for most of the Core Path, due to the size of the proposed turbines combined with proximity to the path. The cumulative effect would be **Major** and significant.

5.6.62 In-combination magnitude of change is assessed to be Substantial since the range of existing wind developments is of diverse typologies and relatively complex and clearly visible from this path. This would result in **Major** and significant in-combination cumulative effect.

5.6.63 This is a relatively short circular route for which sequential effects would not be measurable (given the short length and local area of influence of the core path).

GLENKITTEN FELL

5.6.64 This is short spur off the Southern Upland Way from the southern edge of Kilgallioch Wind Farm to Glenkitten Fell approximately 6 km northwest. Most of the path is through the existing large scale Kilgallioch wind turbines from which the path emerges from wind farm and enters coniferous forestry.

5.6.65 The Proposed Development would add further turbines into the local area, however, since the core path is within the Kilgallioch turbines, this would not substantially alter the view. The proposed turbines would be a notable addition into the views and as such the effect on the visual amenity is predicted to be Moderate.

5.6.66 Cumulative magnitude of change is considered to be Moderate for in-addition cumulative effects as most of the core path is within Kilgallioch wind farm and the Proposed Development would result in an addition to wind turbines at the start of the walk (by the SUW). Given the size of the proposed turbines combined with proximity to the path the cumulative effect would be **Major/ Moderate** and significant.

5.6.67 In-combination magnitude of change is assessed to be Substantial since the range of existing wind developments is of diverse typologies and relatively complex and clearly visible from this path. This would result in **Major/ Moderate** and significant in-combination cumulative effect.

5.6.68 This is a relatively short circular route for which sequential effects would not be measurable (given the short length and local area of influence of the core path).

STRANOCH TO BENERAIRD & SHENNAS

5.6.69 This long distance path starts at the Water of Luce just north of New Luce at approximately 6 km northwest of the Proposed Development. The ZTV shows the wind turbines would come into visibility as the path climbs the slopes of the Stranoch and Stab Hill. Where there are views of the Proposed Development these would be in context of, and behind the Kilgallioch turbines. The magnitude of impact is considered to be slight given that there would be a discernible alteration to the view, but the composition would remain consistent with the baseline. The effect on the visual amenity of this core path would be Moderate and not significant.

5.6.70 Cumulative magnitude of change is considered to be Slight for in-addition cumulative effects since there would be constrained theoretical views of the Proposed Development from much

of the route, and sections where there would be no views possible. The cumulative in-addition effect would be Moderate and not significant.

5.6.71 In-combination magnitude of change is assessed to be Moderate since the existing wind developments visible from this path would be of varying typologies and the wind developments would form a complex feature in the views from the path. This would result in **Major/ Moderate and significant** in-combination cumulative effect.

5.6.72 In respect of sequential effects, users of this core path would rarely not have views to wind farm development as the path passes through the two groups of Stranoch 2 (in-planning) turbines and has views of Kilgallioch (existing and in-planning extension), Airies (existing) and Airies II (scoping), Artfield Fell and Balmurrie Fell turbines at the southeastern end and Arecleoch (existing and in-planning extension) at the northwestern extent. The magnitude of impact of the Proposed Development on sequential views would be slight as it would represent a minor addition of further influence of turbines into the sequential views. The effect would be Moderate and not significant.

SETTLEMENTS

GLENLUCE

5.6.73 Glenluce is a small village in the southwest of Dumfries and Galloway and 10.6 km south southwest of the Proposed Development. It is situated to the north of the A75 which is elevated above the village. The village is linear in form, following a tributary of the Water of Luce. As such most of the settlement is lower lying than the surrounding landscape.

5.6.74 Most of the settlement would have no views of the Proposed Development as illustrated in the ZTV, although there is potential for constrained views from the eastern part of the settlement. There is also potential for views on the approach to the village. Viewpoint 12 (Figures 5.20a to 5.20h) from Glenluce is taken from the A75. This viewpoint illustrates the low-lying nature of the village and demonstrates the negligible magnitude of impact. The overall effect on the visual amenity of the village is assessed to be Minor and not significant.

5.6.75 In respect of cumulative assessment, the cumulative ZTVs demonstrate that there are theoretical views of the existing Carscreugh, Glenchamber and Barlockhart Moor wind farm developments from parts of the village. However, actual views are limited as verified during the site reconnaissance. The potential views of the Proposed Development are limited to the eastern edge of the settlement. Actual views are likely to be further restricted by local topography combined with intervening structures and vegetation around the village.

5.6.76 Cumulative magnitude of change is considered to be negligible for in-addition cumulative effects since any views there may be are likely to be of the tips of the proposed turbines. The cumulative effect would be Moderate/Minor and not significant.

5.6.77 In-combination magnitude of change is assessed to be moderate given the potential for views of the existing Glenchamber, Carscreugh and Glenchamber wind farms. The in-combination cumulative effect is predicted to be **Major/ Moderate** and significant.

NEWTON STEWART

5.6.78 The town of Newton Stewart straddles the River Cree and is situated 15.5 km east of the Propose Development. The nucleated form of the town is low-lying around the river and the western edge is more elevated. The ZTV illustrates that the majority of the town would have no views of the Proposed Development, and any theoretical visibility is limited to the

western edges of the town. The areas of theoretical visibility encompass the woodland blocks around the Hill of Old Hall, and Blairmont Park which is woodland covered small hill.

5.6.79 It is anticipated that views would be limited by the localised landforms and tree cover along the western side of the town. Therefore, the magnitude of impact on the settlement is considered to be negligible and the effect on visual amenity would be Minor, and not significant.

5.6.80 When considering the cumulative effects, the cumulative ZTVs demonstrate that there are theoretical views of the existing Carscreugh and Glenchamber, Kilgallioch (existing and in-planning extension), Airies (existing), Airies II (scoping) wind farm would be potentially visible in combination with the Proposed Development from potential vantage points. It is considered highly likely that much of the theoretical visibility would be screened/ heavily filtered by the numerous trees and woods in the western edge of the settlement.

5.6.81 Cumulative magnitude of change is considered to be negligible for in-addition cumulative effects since any views there may be are likely to be screened. The cumulative effect would be Moderate/ Minor and not significant.

5.6.82 In-combination magnitude of change is assessed to be moderate given the potential for views of the existing Airies, Aires II, Kilgallioch, Kilgallioch Extension, Carscreugh and Glenchamber wind farms. The in-combination cumulative effect is predicted to be **Major/ Moderate** and significant.

STRANRAER

5.6.83 This town is situated on the southern banks of the sea inlet of Ryan Loch at 18.8 km distance west southwest of the Proposed Development. Potential views of the Proposed Development would be restricted to the upper east-facing slopes of Stranraer. Whilst the Proposed Development would be clearly visible on the horizon, at over 18 km distance, it would be seen in the context of the Carscreugh (existing), Glenchamber (existing), Artfield Fell (existing), Balmurrie Fell (existing), Airies (existing), Airies II (scoping), Kilgallioch (existing), Kilgallioch (in-planning), Stranoch 2 (in-planning), Chirmorie (consented), Arecleoch (existing) and Arecleoch Extension (in-planning). Given its partially restricted visibility, distant position relative to this settlement, and substantially developed context the magnitude of impact would be slight, and the effect on visual amenity the settlement would be Moderate and not significant.

5.6.84 Cumulative magnitude of change is considered to be negligible for in-addition cumulative effects since any views the Proposed Development would be barely discernible within the context of the various cumulative wind developments. The cumulative effect would be Moderate/ Minor and not significant.

5.6.85 In-combination magnitude of change is assessed to be moderate given widespread context of wind development on the horizon. The in-combination cumulative effect is predicted to be **Major/ Moderate** and significant.

WIGTOWN

5.6.86 This small village lies to the south of Newton Stewart on the northern bank of River Bladnoch, at 21.7 km southeast of the Proposed Development. The ZTV indicates that there would be potential views of the Proposed Development from the northeastern edge of the settlement. The distance combined with the filtering effect of the many local mature trees would result in a negligible magnitude of impact. The effect on the visual amenity of the settlement would therefore be Moderate/ Minor and not significant.

5.6.87 To the north east of the settlement there is potential for filtered views of the following wind farms: Airies (existing), Airies (scoping), Kilgallioch (existing), Kilgallioch (in-planning), Carscreugh (existing), Artfield Fell (existing) and Balmurrie Fell (existing). Within the context of this group of wind developments the Proposed Development would represent a minor addition to the influence of wind energy developments. Therefore the in-addition cumulative effect is predicted to be Moderate and not significant.

5.6.88 The in-combination cumulative effect, as informed by the various developments noted above, is likely to represent a moderate magnitude of impact. This is due to the concentration of cumulative wind farms which are widespread and represent a degree of complexity where visible across the northeastern horizon from the northern edge of the settlement. The in-combination effect is predicted to be **Major/ Moderate** and significant.

CREETOWN

5.6.89 This small settlement is situated to the east of the River Cree estuary at 24 km southeast of the Proposed Development. The settlement is orientated so that many of the properties would face the direction of the Proposed Development which would be discernible within a larger group of existing wind turbines. The magnitude of impact is predicted to be slight. The effect on the visual amenity of the settlement would be Moderate and not significant.

5.6.90 Viewpoint 7, Figures 5.15a to 5.15f, illustrate the visibility of the Proposed Development in context of the cumulative baseline developments. This shows that the in-addition magnitude of impact of the Proposed Development would be slight as the Proposed Development would be discernible but the baseline conditions would remain largely unaltered. The in-addition cumulative effect would be Moderate and not significant.

5.6.91 The in-combination magnitude of change on the residents of Creetown would be moderate since the ZTV illustrates that there is potentially widespread visibility of the Proposed Development from the settlement. Whilst this would be filtered by intervening structures and mature vegetation within the streets of the settlement, any views there are would be of a large cluster of wind development on the horizon. The in-combination effect would be **Moderate/ Major** and significant.

WHITHORN

5.6.92 This small town lies 33.7 km south southeast of the Proposed Development on the Machars headland. The ZTV demonstrates that a small number of dwellings in the southern part of the settlement would have potential views of the Proposed Development. Given the distance, the magnitude of impact would be slight and the effect on the visual amenity of the settlement would be Moderate and not significant.

5.6.93 There is potential to have constrained views to the following wind farms: Airies (existing), Airies II (scoping), Kilgallioch (existing), Kilgallioch Extension (in-planning), Artfield Fell (existing); Balmurrie Fell (existing) and Carsceugh (existing). The magnitude of change in respect of in-addition cumulative effects is considered to be Negligible since the Proposed Development is likely to represent an indiscernible level of change at a distance of over 30 km. This would result in a Moderate/ Minor and not significant in-addition cumulative effect.

5.6.94 The in-combination cumulative effect is likely to be Moderate and not significant since the magnitude of change would be slight due to the distance and restricted theoretical views.

Individual Properties – Residential Visual Amenity

5.6.95 Individual properties are not generally included in the SLVIA because the planning system does not provide any specific protection to private views and the general outlook from individual properties. However, an RVAA was prepared which considers the potential impacts on individual properties that may be close enough to the proposed turbines to be subjected to potentially *"overbearing effects"* (as defined through the appeal process to date). The RVAA (Technical Appendix 5.4) noted three properties within 2 km of the Proposed Development and concludes that there would not be overbearing effects on the visual amenity from these dwellings.

Viewpoint Assessment

5.6.96 Twenty-one viewpoints have been selected to verify the effect of the Proposed Development from representative viewpoints within the study area. The Viewpoint Assessment, Technical Appendix 5.3 assesses the viewpoints in respect of their baseline context and residual effects arising from the operational phase of the Proposed Development. The Viewpoint Assessment is accompanied by a series of visualisations in Figures 5.9a to 5.29h.

5.6.97 The Viewpoint Assessment noted significant residual effects on the landscape character and visual receptors at Viewpoints 18, 19, 20 and 21. All four viewpoints are within 6 km of the Proposed Development Site.

5.6.98 Significant in-combination effects have been noted for most of the receptors from the viewpoints. This is a direct result of the extensive and complex cumulative baseline in this part of Dumfries and Galloway.

Assessment of Aviation Lighting Impacts

5.6.99 Currently, all but two of the Proposed Development turbines are expected to be fitted with steady red 2,000 candela aviation obstruction lights on their nacelles and intermediate low intensity lights of 32 candela on turbine columns. It is noted that the lights would be capable of being dimmed to 10% of the maximum intensity during periods of meteorological visibility that exceed 5 km.

5.6.100 Additionally, it is noted that the Applicant is currently seeking a technical mitigation solution, such as transponder or radar activated lighting. Should this be agreed with the Civil Aviation Authority and formally adopted for the scheme the incidence of the lighting being activated is expected to be infrequent and of short duration. The Applicant is also pursuing to draft a planning condition that allows for flexibility to include re-design of the lighting scheme, prior to construction, which may take into account the lighting status of adjacent developments and continue to provide warning to airspace users of the perimeter of the wider cumulative area of wind turbines. These measures taken together would ensure that no significant operational effects on the landscape and visual resource would arise as a result of aviation lighting.

5.6.101 Notwithstanding the specification and design of the lighting system, an assessment of potential lighting impacts has been undertaken, based on the current lit scheme, and its findings presented in Technical Appendix 5.7. The assessment concludes that there would be no significant effects arising as a result of lighting on landscapes that are sensitive to light (Wild Land, Dark Skies Park and remote mountains).

5.6.102 In terms of visual amenity, significant effects would be confined mainly to road users in vehicles on the minor road along the southern boundary of the Proposed Development site

and for night-time walkers along discrete sections of the of the SUW mainly within the Kilgallioch Wind Farm part of the route.

Residual Cumulative Operational Effects

Emergent Pattern of Cumulative Development

5.6.103 The Cumulative Context plan, Figure 5.7, illustrates the wind developments within the study area and just beyond it. It differentiates the operational schemes from consented and those in planning. Also shown is the proposed extension to Airies – Airies II – which is at scoping stage since this development would be an immediate neighbour to the Proposed Development. Other scoping sites are shown for a fuller context.

5.6.104 Examination of the Cumulative Context plan reveals that operational developments essentially form three clusters: two large and one smaller one. One large cluster of developments is situated to the northeast of the study area (including Windy Standard I, II and III, and Benbrack, South Kyle, Enoch Hill, Afton and Windy Rig), and a smaller cluster of wind development (including Hadyard Hill, Assel Valley and Tralorg) is located within the northern part of the study area in South Ayrshire. The third large grouping of wind developments relates to the plateau landform (LCT 173: Plateau Moorland and LCT174: Plateau Moorland with Forest) both within the Dumfries and Galloway Council and South Ayrshire Council areas.

5.6.105 This emerging cluster of development extends southwards from the operational Arecleoch scheme which is immediately next to the consented Chirmorie Wind Farm. The operational Kilgallioch scheme and Airies Wind Farm continue the pattern of large-scale wind turbines southwards over the plateau interior.

5.6.106 As the plateau begins to transition to the slopes of the upland fringe (LCT172) the height of turbines also decreases as exemplified by the Glenchamber development. The Carscreugh Wind Farm has smaller again turbines as it sits on the edge of the upland fringe.

5.6.107 The smaller Artfield Fell and Balmurrie Fell wind farms also form part of this cluster of wind development, but they do not conform to the large-scale-turbines-that are characteristic of the-wider plateau. Instead these developments comprise small turbines on small distinctive conical fells within the plateau. Nonetheless, the vertical extent of these smaller turbines on top of hills reach similar heights as the taller existing turbines and those of the Proposed Development.

5.6.108 The in-planning Stranoch 2, Arecleoch Extension and Kilgallioch Extension emerging pattern of development follow the trend towards larger turbines on the core of the plateau, as does the Airies II development which is in scoping.

5.6.109 The Proposed Development would also conform to this emerging pattern, consolidating the existing Kilgallioch and Airies wind developments, being located between these two existing schemes.

5.6.110 In general, this approach would result in the Proposed Development rarely being visible in isolation, and as it is designed to sit between (and behind) the Kilgallioch, Airies and Artfield Fell developments. It would appear behind existing turbines in views from the north, east, west and southwest. Should Kilgallioch Extension and/ or Airies II be consented, the Proposed Development would also be situated behind larger development in views from the east and northeast. The Proposed Development would represent 'in-filling' and consolidation

of the existing and consented pattern of development and takes cognoscence of currently undetermined proposals.

5.6.111 The efficacy of the location and design of the Proposed Development is evidenced by the limited number of significant landscape or visual effects that are reported in Table 5.8: Summary of Potential Significant Effects of the Proposed Development, below.

5.7 Summary

5.7.1 Table 5.8 provides a summary of the likely significant effects identified for landscape and visual receptors.

Table 5.8: Summary of Potential Significant Effects of the Proposed Development

Potential Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Construction			
No significant effects identified for landscape fabric	None required	N/A	Not significant
Localised temporary effects (not significant) on Seascape and Landscape Character Types	None required	N/A	Not significant
Localised temporary effects (not significant) on Landscape Designations	None required	N/A	Not significant
Localised temporary effects (not significant) on Visual Amenity	None required	N/A	Not significant
Operation			
Effects on DGC Regional Scenic Areas – ranging from Moderate to None and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Effects on South Ayrshire Scenic Area – Minor and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Effects on Gardens and Designed Landscapes (GDL) – None	None required	N/A	Not significant
Effects on Merrick WLA – Minor to None and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Effects on local landscape character – LCT174: Plateau Moorland with Forest – Dumfries and Galloway – Major/ Moderate to Moderate/ Minor Landscape Effect on (localised significant effect on part of the host) LCT	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant** (localised)
Effects on all other LCTs and SCTs – ranging from moderate to none and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Effects on transport routes (including national cycle routes): ranging from Moderate/ Minor to	Mitigation inherent in the design.	N/A	Not significant

Table 5.8: Summary of Potential Significant Effects of the Proposed Development			
Potential Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
none and not significant (Visual Effects)	No further mitigation proposed.		
Southern Upland Way – Moderate generally (not significant) to Major (significant) within approx. 6 km of the route from the nearest turbine of the Proposed Development – Visual Effects	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant** (localised)
The Moors of Wigtownshire Walk – Major (significant) visual effect locally within the Tarf Bridge section Moderate (not significant) for remainder of route	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant** (localised)
Three Lochs Kirkcowan – Major (significant) Visual Effects	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**
All other recreational routes: ranging Moderate/ Minor to none and not significant Visual Effects	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Effects on settlements: ranging from Moderate to None and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Cumulative Operation			
In-addition cumulative effects on all RSA and South Ayrshire Scenic Area – ranging from Moderate/ Minor to None and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-combination cumulative effects on Galloway Hills and Mochrum Lochs RSA and South Ayrshire Scenic Area – ranging from Major to Major/ Moderate and significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**
In-combination cumulative effects on Machars Coast (none) and Rhins Coast (moderate) RSA– not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-addition and In-combination cumulative effects on GDL – none	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
Merrick WLA – In-addition cumulative effects (none)	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-addition cumulative effects on landscape character – ranging from Moderate/ Minor to None and not significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant

Table 5.8: Summary of Potential Significant Effects of the Proposed Development			
Potential Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
In-combination cumulative effects on landscape character – ranging from Major to Major/ Moderate (significant) for LCT72; LCT73; LCT78; LCT83; LCT159; LCT167; LCT168; LCT172; LCT173; LCT174; LCT175; LCT179 and LCT181.	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**
In-combination cumulative effects on landscape character (all other LCT and SCT) – Moderate (not significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-addition cumulative effects on transport routes (A75, A7814, A747, B7005 and NCR 73) – Moderate/ Minor to Minor (not significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-combination cumulative effects on transport routes (A75, A7814, A747, B7005 and NCR 73) – Major/ Moderate (significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**
In-addition cumulative effects on recreational routes (SUW, Mull of Galloway Trail, New Luce to Kilhern – Circular Walk; Stranoch to Beneraird), Moderate to Moderate/ Minor (not significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-addition cumulative effects on recreational routes, The Moors of Wigtownshire Walk (Moderate/ Major – locally around Tarf Bridge); Three Lochs Kirkcowan – (Major); Glenkitten Fell (Major/ Moderate) – Significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant** (localised)
In-combination cumulative effects on recreational routes - SUW, Mull of Galloway Trail, New Luce to Kilhern – Circular Walk, The Moors of Wigtownshire Walk, Three Lochs Kirkcowan, Glenkitten Fell; Stranoch to Beneraird (Major to Major/ Moderate) Significant	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**
In-addition cumulative effects on settlements (all) – ranging Moderate to Moderate/ Minor (not significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
In-combination cumulative effects on settlements – Glenluce, Newton Stewart, Stranraer, Wigtown and Creetown (Major/ Moderate (significant) (Whithorn is Moderate and not significant)	Mitigation inherent in the design. No further mitigation proposed.	N/A	**Significant**

6 Archaeology and Cultural Heritage

6.1 Introduction

6.1.1 This chapter considers the likely significant effects on archaeology and cultural heritage associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the historic environment baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, setting and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

6.1.2 The assessment has been carried out by Mark Littlewood and Victoria Oleksy of AOC Archaeology Group. Mark Littlewood is a Project Officer and an Associate of the Chartered Institute for Archaeologists. He has over 20 years' of experience in commercial archaeology. Victoria Oleksy is an Assistant Director and Consultancy Sector Head with over 15 years' of experience working on cultural heritage assessments. Victoria specialises in EIAs, Archaeological Impact Assessment, Conservation Management Plans and has appeared as an expert witness for planning appeals and called-in planning applications. Further details on the professional competency of the authors is provided in Volume 4: Technical Appendix 1.2.

6.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 6.1: The Site and heritage assets;
  - Figure 6.2: Heritage assets within 1 km of the Site;
  - Figure 6.3: Heritage assets within 10 km of the Site;
  - Figure 6.4a: Designated assets, ASA and the blade tip ZTV;
  - Figure 6.4b: Designated assets, ASA and the hub height ZTV;
  - Figure 6.5a: Designated assets, northern East Rhins and the blade tip ZTV;
  - Figure 6.5b: Designated assets, northern East Rhins and the hub height ZTV;
  - Figure 6.6a: Designated assets, southern East Rhins and the blade tip ZTV;
  - Figure 6.6b: Designated assets, southern East Rhins and the hub height ZTV;
  - Figure 6.7a: Designated assets, Knock Fell and the blade tip ZTV;
  - Figure 6.7b: Designated assets, Knock Fell and the hub height ZTV;
  - Figure 6.8: Cumulative windfarms and the Study Area;
  - Figure 6.9: CH Viewpoint 1: Laggangarn, standing stones (Site 221, SM90199 and HES Property in Care);
  - Figure 6.10: CH Viewpoint 2: Bennan of Garvilland fort (Site 225, SM1955);
  - Figure 6.11: CH Viewpoint 3: Wood Cairn, Eldrig Fell (Site 242, SM1953);
  - Figure 6.12: CH Viewpoint 3b: Wood Cairn, Eldrig Fell (Site 242, SM1953);
  - Figure 6.13: CH Viewpoint 3c: Wood Cairn, Eldrig Fell (Site 242, SM1953);
  - Figure 6.14: CH Viewpoint 4: High Eldrig Cairn (Site 328, HER No. MDG2179);
  - Figure 6.15: CH Viewpoint 5: Scheduled Monument Cairn na Gath, long cairn, Balmurrie Fell (Site 226, SM1922);

- Figure 6.16: CH Viewpoint 6: Scheduled Monument Wells of the Rees, wells 550 m NNE of Kilgallioch (Site 222, SM2002);
- Figure 6.17: CH Viewpoint 7: Scheduled Monument Caves of Kilhern (Site 229, SM1928);
- Figure 6.18: CH Viewpoint 8: Dirvannie Township (Site 276, HER No. MDG13123);
- Figure 6.19: Cultural Heritage Viewpoint Locations;
- Figure 6.20: Extract from a map by Blaeu, 1654;
- Figure 6.22: Extract from a map by Roy, 1752-55;
- Figure 6.21: Extract from a map by Ainslie, 1782;
- Figure 6.23: Extract from Ordnance Survey map, 1848-50; and
- Figure 6.24: Extract from Ordnance Survey map, 1896.

- Volume 4: Technical Appendices
  - Technical Appendix 6.1: Settings Assessment;
  - Technical Appendix 6.2: Plates; and
  - Technical Appendix 6.3: Site Gazetteer.

6.1.4 Figures and technical appendices are referenced in the text where relevant.

6.2 Assessment Methodology and Significance Criteria

Scope of Assessment

6.2.1 The archaeology and cultural heritage assessment considers the potential both for direct effects on archaeology and heritage assets within the Site resulting from the construction of the Proposed Development, and for effects upon the settings of key heritage assets within the wider landscape. The assessment also identified measures that should be taken to mitigate any predicted significant adverse effects.

6.2.2 This chapter considers effects on:

- Nationally designated heritage assets;
- Non-designated Assets deemed to be of National Significance by the Dumfries and Galloway Archaeology Service;
- Non-designated heritage assets; and
- Hitherto unrecorded heritage assets that may survive within the Site.

6.2.3 The chapter assesses cumulative effects as arising from the addition of the Proposed Development to other cumulative developments, which are the subject of a valid planning application or those which are at the pre-application stage but where they may be particularly relevant to assessing cumulative effects[1]. It is noted that the proposed Airies II Wind Farm will be considered in the cumulative assessment despite it being at a pre-application stage. This is because of its close proximity to both the Proposed Development and the heritage assets under consideration. Given these factors it is considered that the proposed Airies II Wind Farm has the potential to have a bearing on the assessment of likely significant effects. Operational, under construction and consented developments are considered as part of the baseline. Developments close to the end of their operational life will be included as part of the baseline to present 'worst case scenario'.

[1] SNH (2012). Guidance - Assessing the cumulative impact of onshore wind energy developments. Available at: https://www.nature.scot/guidance-assessing-cumulative-impact-onshore-wind-energy-developments.

6.2.4 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2).

6.2.5 The scope of the assessment has been informed by consultation responses summarised in Table 6.1 and the following legislation, polices and guidelines/ guidance:

- Ancient Monuments and Archaeological Areas Act (1979)[2];
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997)[3];
- Town and Country Planning (General Development Procedure) (Scotland) Order (1992)[4];
- Historic Environment Policy for Scotland (HEPS)[5];
- Scottish Planning Policy (SPP)[6];
- Planning Advice Note 2/2011 (PAN 2)[7];
- Local Development Plan 2 (Dumfries & Galloway Council 2019)[8];
- Environmental Impact Assessment Handbook v5, Historic Environmental Scotland (HES) and Scottish Natural Heritage (SNH)[9]; and
- Managing Change in the Historic Environment: Setting[10].

Consultation

6.2.6 Table 6.1 summarises the consultation responses received regarding Archaeology and Cultural Heritage and provides information on where and/or how they have been addressed in this assessment.

6.2.7 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 6.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised
Historic Environment Scotland 18 May 2020	Pre-Application Consultation prior to Scoping	HES consider that the following designated assets may be subject to adverse impacts to their setting from the Proposed Development: • Wood Cairn, cairn, Eldrig Fell (SM1953; Site

[2] UK Government (1979). The Ancient Monuments and Archaeological Areas Act 1979. Available at: http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf.

[3] UK Government (1997). Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Available at: https://www.legislation.gov.uk/ukpga/1997/9/pdfs/ukpga_19970009_en.pdf.

[4] UK Government (1992). Town and Country Planning, Scotland

[5] Historic Environment Scotland (2019a). Historic Environment Policy for Scotland. Available at: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/.

[6] Scottish Government (2020). Scottish Planning Policy. Available at: Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy.

[7] Scottish Government (2011). PAN2/2011 Planning and Archaeology. Available at: http://www.scotland.gov.uk/Resource/Doc/355385/0120020.pdf.

[8] Dumfries and Galloway (2019). Local Development Plan 2

[9] Historic Environment Scotland (2018). Environmental Impact Assessment Handbook. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=6ed33b65-9df1-4a2f-acbb-a8e800a592c0.

[10] Historic Environment Scotland (2016). Managing Change in the Historic Environment: Setting. Available at: https://www.historicenvironment.scot/media/2359/setting-2.pdf.

Table 6.1: Consultation Responses		
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**
		242); • Cairn na Gath, long cairn, Balmurrie Fell (SM1922; Site 226); • Laggangarn, standing stones (SM90199; Property in Care; Site 221); and • Wells of Rees, wells 500 m NNE of Kilgallioch (SM2002; Site 222). HES welcome intention to include photomontages taken from Wood Cairn (Site 242) and from the north of Wood Cairn with the cairn in the foreground. They also recommend a visualisation from Wood Cairn looking towards Cairn na Gath (Site 226) should be considered. HES recommend that particular attention is given to the assessment of cumulative impacts upon the setting of Wood Cairn (Site 242). With regard to Cairn na Gath (Site 226) HES request that assessment is supported by wireframes and photomontages. Assessment should include consideration of the potential for the Proposed Development to impact upon the relationship between Cairn na Gath (Site 226) and Wood Cairn (Site 242) and consideration should be given to cumulative impacts. With regard to Laggangarn, standing stones (Site 221), HES request that the assessment is supported by wireframes and photomontages and that consideration be given to cumulative impacts. With regard to Wells of Rees (Site 222) HES request that the assessment is supported by wireframes and that cumulative impacts are considered. HES recommend further consultation with them during the design process and request sight of visualisations in advance of any EIA Report and planning application.
Historic Environment Scotland 02 June 2020	Scoping Response	HES's Scoping Response reiterated the points made in their pre-application advice of the 18th May and further noted that would be happy to provide advice on the proposed EIA methodology prior to an application being made.
Historic Environment Scotland 25 September 2020	Direct Consultation	HES were consulted on visualisation required on the 25 August 2020 and replied to this consultation request on 25 September 2020. HES indicated that they were content with the visualisation proposals for Wood Cairn (Site 242), Laggangarn, standing stone (Site 221), Bennan of Garvilland, for (Site 225), Wells of Rees (Site 222) and Caves of Kilhern, chambered Cairn (Site 229). HES noted the that a wireline was proposed for Cairn na Gath (Site 226) and recommended that photomontage also be produced. HES requested further information with regard to constraints which had informed the design chill layout.
Historic Environment Scotland 5 November 2020	Direct Consultation	HES were consulted on the proposed EIA methodology on 16 October 2020 and responded to the consultation request on 5 November 2020. HES indicated that they were largely content that the methodology proposed for the project was appropriate. They suggested some minor alterations to the wording of the magnitude of impact table (Table 6.4) which have been incorporated.

Table 6.1: Consultation Responses		
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**
Dumfries and Galloway Archaeology Service	Scoping Report	Dumfries and Galloway Council Archaeology Service provided a Scoping Response on 30 July 2020. The response agreed with the 10 km Study Area and agreed that no significant heritage assets beyond 10 km need be assessed. The Archaeology Service indicated that that it was appropriate that detailed assessment should focus on heritage assets of high sensitivity, but suggested that 'regionally significant assets' of regional significance should be assessed to 5 km where these included burial cairns, hill forts, settlements and commemorative monuments. It was also requested that Non-Inventory Designed Landscapes be considered. In particular it was note that detailed assessment must be included for: • Designated monuments within a 10 km boundary; at Wood Cairn (HS ref SM1953), Bennan of Garvilland fort (SM1955), Caves of Kilhern (SM1928), Cairn na Gath (SM1922), Laggangarn standing stones (SM90199), Wells of the Rees (SM2002); • Non-designated assets at Dirvannie (MDG13123), Monandie (MDG2177), High Eldrig (MDG2180), Craigmoddie (MDG2317), Dirvachlie (MDG14483), High Eldrig cairn (MDG2179), White Cairn (MDG2165); • Promoted Sites at Linn's Grave (MDG2327); • East Rhins Archaeological Sensitive Area; and the Non-Inventory Designed Landscape at Torwood (MDG21005). The Archaeology Service requested that visualisations be agreed with them in due course and that visualisations would be required from Wood Cairn (Site 242); Dirvannie (Site 276); High Eldrig Cairn (Site 328); Caves of Kilhern (Site 229); Laggangarn, standing stone (Site 221) and Bennan of Garvilland fort (Site 225). The Archaeology Service requested that a walkover survey be undertaken along with a review of Scottish Government remote sensing data and that these be used to inform the assessment.

Method of Baseline Characterisation

Extent of the Study Area

6.2.8 The aim of this assessment is to identify the archaeological and cultural heritage significance of the Site and to identify the likely significant direct and setting effects which may result as a consequence of the Proposed Development. Four study areas were identified for this assessment:

- A core study area (the Site) which includes all land within the Site which is subject to assessment for potential direct effects. This study area was subject to identification of known heritage assets, map regression, review of aerial photographs, review of Scottish remote sensing data and walkover survey which were used to identify cultural heritage assets which may be directly affected by the Proposed Development;
- A 1 km study area (the 1 km Study Area) for the identification of all known heritage assets and known previous archaeological interventions in order to help predict whether

any similar hitherto unknown archaeological remains are likely to survive within the Site and thus be impacted by the Proposed Development;

- A 5 km study area (the 5 km Study Area) for the assessment of potential effects on setting of all designated heritage assets including Scheduled Monuments; all Listed Buildings; Inventoried Gardens and Designed Landscapes; Inventoried Battlefields and Conservation Areas and non-designated nationally important assets as identified by Dumfries and Galloway HER. This study area is covered by the Zone of Theoretical Visibility (ZTV); and
- A 10 km study area (the 10 km Study Area) for the assessment of potential effects on setting of nationally important designated heritage assets including Scheduled Monuments; Category A Listed Buildings; Inventoried Gardens and Designed Landscapes and Inventoried Battlefields. The 10 km Study Area also identifies Dumfries and Galloway HER assets that are not statutorily designated but which are defined as being of 'national significance' by the Archaeology Service.

Desk Study

6.2.9 A detailed desk-based assessment was carried out, drawing on existing databases, archive records, historical maps and historical and modern aerial photography and was used to identify sites and areas that have archaeological and historic environment potential. The following sources were consulted:

- Historic Environment Scotland Spatial Data: for up-to-date data on the locations and extents of Scheduled Monuments, Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes and Inventory Historic Battlefields;
- National Record for the Historic Environment (NRHE) as held by HES: for records of non-designated heritage assets and records of previous archaeological investigations;
- National Collection of Aerial Photography (NCAP) as held by HES: for historical vertical aerial photographs of the Site;
- Dumfries and Galloway Historic Environment Record (HER): for a digital database extract in GIS for all assets within the Site, all assets deemed to be that are not statutorily designated but which are defined as being of Regional Significance by the Archaeology Service within 5 km of the Site boundary and all assets deemed to be that are not statutorily designated but which are defined as being of National Significance by the Archaeology Service within 10 km of the Site boundary;
- Relevant bibliographic references to provide background and historic information;
- Map Library of the National Library of Scotland: for Ordnance Survey maps and other historical map resources;
- Historic Land-Use Assessment Data for Scotland (HLAMap): for information on the historic land use character of the Site and the surrounding area;
- Scottish Palaeoecological Archive Database (SPAD) (Coles et al. 1998[11]): for information on sites with palaeoenvironmental and palaeoecological potential; and
- Scottish Government, Scottish Remote Sensing Portal: for any LiDAR data covering the Site.

6.2.10 Each heritage asset referred to in the text is listed in the Gazetteer in Technical Appendix 6.3 (EIAR Volume 4). Assets have been assigned a 'Site No.' unique to this assessment,

[11] Coles, G.M., Gittings, B.M., Milburn, P. and Newton, A.J. (1998) 'Scottish Palaeoecological Archive Database', http://www.geo.ed.ac.uk/spad/

and the Gazetteer includes information regarding the type, period, grid reference, HER number, protective designation, and other descriptive information, as derived from the consulted sources. Multiple records can be associated with one asset, for example, several areas may be associated with one Scheduled Monument. A full list of assets with coordinates is available in the Gazetteer.

Field Survey

6.2.11 An archaeological walkover survey of the Site was undertaken with the aim of identifying any previously unknown archaeological features. Wherever possible, all known and accessible heritage features were assessed in the field to establish their survival, extent, significance and relationship to other sites. Weather and any other conditions affecting the visibility during the survey were also recorded. All heritage features encountered were recorded and photographed. The location of features noted in the field was recorded on an US GPS Navstar enabled iPad using Environmental Systems Research Institute (ESRI)'s ArcGIS Collector software. All features were recorded directly through ArcGIS Collector in full British National Grid coordinates.

Criteria for the Assessment of Effects

6.2.12 The following guidance was adhered to when undertaking the assessment:

- Chartered Institute for Archaeologists (CIfA) Code of Conduct[12];
- CIfA Standard and guidance for commissioning work or providing advice on archaeology and the historic environment[13];
- CIfA standard and guidance for historic environment desk-based assessment[14]
- Historic Environment Scotland Managing Change in the Historic Environment: Setting[15]; and
- HES and SNH's Environmental Impact Assessment Handbook[16].

Scope and Methodology

6.2.13 The assessment distinguishes between the term 'impact' and 'effect'. An impact is defined as a physical change to a heritage asset or its setting, whereas an effect refers to the outcome for the heritage asset(s) as a result of this impact. The first stage of the assessment involves establishing the importance of the heritage asset and assessing the sensitivity of the asset to change (impact). Using the proposed design for the Proposed Development, an assessment of the impact magnitude is made and a judgement regarding the level and significance of effect is arrived at.

[12] Chartered Institute for Archaeologists (2019). Code of Conduct. Published December 2014. Revised October 2019

[13] Chartered Institute for Archaeologists (2020). Standard and guidance for commission work or providing consultancy advice on archaeology and the historic environment. Published December 2014. Updated October 2020

[14] Chartered Institute for Archaeologists (2020). Standard and guidance for historic environment desk-based assessment. Published December 2013. Updated October 2020

[15] Historic Environment Scotland (2016). Managing Change in the Historic Environment: Setting. Available at: https://www.historicenvironment.scot/media/2359/setting-2.pdf.

[16] Historic Environment Scotland (2018). Environmental Impact Assessment Handbook. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=6ed33b65-9df1-4a2f-acbb-a8e800a592c0.

Criteria for Assessing Sensitivity of Heritage Assets

6.2.14 The definition of cultural significance is readily accepted by heritage professionals both in the UK and internationally and was first fully outlined in the Burra Charter, which states in article one that 'cultural significance' or 'cultural heritage value' means aesthetic, historic, scientific, social or spiritual value for past, present or future generations[17]. This definition has since been adopted by heritage organisations around the world, including HES. HEPS[18] notes that to have cultural significance an asset must have a particular "aesthetic, historic, scientific or social value for past, present and future generations". Heritage assets also have value in the sense that they "...create a sense of place, identity and physical and social wellbeing, and benefits the economy, civic participation, tourism and lifelong learning" (Scottish Government 2014[19]).

6.2.15 The rating of sensitivity of heritage assets is first and foremost made in reference to their designation. For non-designated assets sensitivity will be assigned based on professional judgement and guided by the criteria presented in Table 6.2; which itself relates to the criteria for designations as set out in Designation Policy and Selection Guidance[20] and Scotland's Listed Buildings Guidance[21].

Table 6.2: Criteria for establishing sensitivity of heritage assets

Sensitivity	Receptors
Very High	World Heritage Sites; Other designated or non-designated assets with demonstrable Outstanding Universal Value.
High	Scheduled Monuments (as protected by the Ancient Monuments and Archaeological Areas Act 1979[22] (the "1979 Act"); Category A Listed Buildings (as protected by the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997[23]) (the "1997 Act"); Inventory Gardens and Designed Landscapes (as protected by the 1979 Act[24], as amended by the Historic Environment (Amendment) (Scotland) Act 2011[25])(the "2011 Act"); Inventory Battlefields (as protected by the 1979 Act, as amended by the "2011 Act"); Outstanding examples of some period, style or type; Non-Designated assets considered to meet the criteria for the designations as set out above (as protected by SPP, 2014[26]).

[17] ICOMOS (2013). Burra Charter. Available at: https://australia.icomos.org/publications/charters/.

[18] Historic Environment Scotland (2019). Historic Environment Policy for Scotland. Available at: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/.

[19] Scottish Government (2020). Scottish Planning Policy. Available at: Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy.

[20] Historic Environment Scotland (2019). Designation Policy and Selection Guidance. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b.

[21] Historic Environment Scotland (2019). Scotland's Listed Buildings. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=34c90cb9-5ff3-45c3-8bc3-a58400fcbc44.

[22] UK Government (1979). The Ancient Monuments and Archaeological Areas Act 1979. Available at: http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf.

[23] UK Government (1997). Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Available at: https://www.legislation.gov.uk/ukpga/1997/9/pdfs/ukpga_19970009_en.pdf.

[24] UK Government (1979). The Ancient Monuments and Archaeological Areas Act 1979. Available at: http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf.

[25] UK Government (2011). Historic Environment (Amendment) (Scotland) Act 2011. Available at: http://www.legislation.gov.uk/asp/2011/3/pdfs/asp_20110003_en.pdf.

Table 6.2: Criteria for establishing sensitivity of heritage assets	
Sensitivity	**Receptors**
Medium	Category B and C Listed Buildings (as protected by the 1997 Act[27])(the "1997 Act"); Conservation Areas (as protected by the "1997 Act"); Major or representative examples of some period, style or type; or Non-designated assets considered to meet the criteria for the designations as set out above (as protected by SPP, 2014[28])("SPP, 2014").
Low	Locally Listed assets; Examples of any period, style or type which contribute to our understanding of the historic environment at the local level.
Negligible	Relatively numerous types of features; Findspots of artefacts that have no definite archaeological remains known in their context; The above non-designated features are protected by Paragraph 137 of SPP[29].

6.2.16 Determining cultural heritage significance can be made with reference to the intrinsic, contextual and associative characteristics of an asset as set out in HEPS[30] and its accompanying Designation Policy and Selection Guidance[31]. HEPS Designation Policy and Selection Guidance indicates that the relationship of an asset to its setting or the landscape makes up part of its contextual characteristics. The Xi'an Declaration (ICOMOS 2005[32]) set out the first internationally accepted definition of setting with regard to heritage assets, indicating that setting is important where it forms part of or contributes to the significance of a heritage asset. While SPP does not differentiate between the importance of the asset itself and the importance of the asset's setting, HES's Managing Change Guidance[33], in defining what factors need to be considered in assessing the impact of a change on the setting of a historic asset or place states that the magnitude of the proposed change should be considered "relative to the sensitivity of the setting of an asset" (HES 2020, 11[34]); thereby making clear that assets vary in their sensitivity to changes in setting and thus have a relative sensitivity. The EIA Handbook[35] suggests that cultural significance aligns with sensitivity but also states that "the relationship between value and sensitivity should be

[26] Scottish Government (2020). Scottish Planning Policy. Available at: Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy.

[27] UK Government (1997). Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. Available at: https://www.legislation.gov.uk/ukpga/1997/9/pdfs/ukpga_19970009_en.pdf.

[28] Scottish Government (2020). Scottish Planning Policy. Available at: Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy.

[29] ibid

[30] Historic Environment Scotland (2019). Historic Environment Policy for Scotland. Available at: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/.

[31] Historic Environment Scotland (2019b). Designation Policy and Selection Guidance. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b.

[32] ICOMOS (2005). Xi'an Declaration on The Conservation Of The Setting of Heritage Structures, Sites And Areas. Adopted in Xi'an, China, by the 15th General Assembly of ICOMOS on 21 October 2005

[33] Historic Environment Scotland (2016). Managing Change in the Historic Environment: Setting. Available at: https://www.historicenvironment.scot/media/2359/setting-2.pdf.

[34] Historic Environment Scotland (2020). Managing Change in the Historic Environment: Setting

[35] Historic Environment Scotland (2018). Environmental Impact Assessment Handbook. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=6ed33b65-9df1-4a2f-acbb-a8e800a592c0.

clearly articulated in the assessment"[36]. It is therefore recognised[37] (ibid) that the importance of an asset is not the same as its sensitivity to changes to its setting. Elements of setting may make a positive, neutral or negative contribution to the significance of an asset. Thus, in determining the nature and level of effects upon assets and their settings by the development, the contribution that setting makes to an asset's significance and thus its sensitivity to changes to setting need to be considered.

6.2.17 This approach recognises the importance of preserving the integrity of the setting of an asset in the context of the contribution that setting makes to the experience, understanding and appreciation of a given asset. It recognises that setting is a key characteristic in understanding and appreciating of some, but by no means all, assets. Indeed, assets of High or Very High sensitivity to direct impacts do not necessarily have high sensitivity to changes to their settings (e.g. do not necessarily have a high relative sensitivity). An asset's relative sensitivity to alterations to its setting refers to its capacity to retain its ability to contribute to our understanding and appreciation of the past in the face of changes to its setting. The ability of an asset's setting to contribute to an understanding, appreciation and experience of it and its significance also has a bearing on the sensitivity of that asset to changes to its setting. Heritage assets of High or Very High sensitivity to direct impacts will not necessarily have a similar sensitivity to effects on their setting; this would be true where setting does not appreciably contribute to their significance. HES's guidance on setting makes clear that the level of effect may relate to "the ability of the setting [of an asset] to absorb new development without eroding its key characteristics"[38]. Assets with Very High or High relative sensitivity to settings effects may be vulnerable to any changes that affect their settings, and even slight changes may erode their key characteristics or the ability of their settings to contribute to the understanding, appreciation and experience of them. Assets whose relative sensitivity to changes to their setting is lower may able to accommodate greater changes to their settings without having key characteristics eroded.

6.2.18 The criteria used for establishing an asset's relative sensitivity to changes to its setting is detailed in Table 6.3. This table has been developed based on AOC's professional judgement and experience in assessing setting effects. It has been developed with reference to the policy and guidance noted above including SPP [39], HEPS[40] and its Designation Policy and Selection Guidance[41], the Xi'an Declaration [42], the EIA Handbook[43] and HES's guidance on the setting of heritage assets[44].

[36] Scottish Natural Heritage & Historic Environment Scotland (2018). Environmental Impact Assessment Handbook v5, 184. Available at: https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf.

[37] ibid

[38] HES (2020). P.11.

[39] Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy/.

[40] Historic Environment Scotland (2019). Historic Environment Policy for Scotland. Available at: https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/historic-environment-policy-for-scotland-heps/.

[41] Historic Environment Scotland (2019). Designation Policy and Selection Guidance. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b.

[42] ICOMOS (2005). Xi'an Declaration on The Conservation Of The Setting of Heritage Structures, Sites And Areas. Adopted in Xi'an, China, by the 15th General Assembly of ICOMOS on 21 October 2005

[43] Scottish Natural Heritage & Historic Environment Scotland (2018). Environmental Impact Assessment Handbook v5. Available at: https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf.

[44] Historic Environment Scotland (2020). Managing Change in the Historic Environment: Setting

Table 6.3: Criteria for Establishing Relative Sensitivity of a Heritage Asset to Changes to its Setting	
Relative Sensitivity	**Criteria**
Very High	An asset, the setting of which, is critical to an understanding, appreciation and experience of it should be thought of as having Very High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, make an essential direct contribution to their cultural significance (e.g. form part of their Contextual Characteristics (HES, 2019[45], Annex 1)).
High	An asset, the setting, of which, makes a major contribution to an understanding, appreciation and experience of it should be thought of as having High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, contribute directly to their cultural significance (e.g. form part of their Contextual Characteristics (HES, 2019, Annex 1)).
Medium	An asset, the setting of which, makes a moderate contribution to an understanding, appreciation and experience of it should be thought of as having Medium Sensitivity to changes to its setting. This could be an asset for which setting makes a contribution to significance but whereby its value is derived mainly from its other characteristics (HES 2019).
Low	An asset, the setting of which, makes some contribution to an understanding, appreciation and experience of it should generally be thought of as having Low Sensitivity to changes to its setting. This may be an asset whose value is predominantly derived from its other characteristics.
Marginal	An asset whose setting makes minimal contribution to an understanding, appreciation and experience of it should generally be thought of as having Marginal Sensitivity to changes to its setting.

Criteria for Assessing Magnitude of Impact

6.2.19 Potential impacts, that is the physical change to known heritage assets, and unknown buried archaeological remains, or changes to their settings, in the case of the Proposed Development relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during the construction phase or the placement of new features within their setting during the operational phase.

6.2.20 The magnitude of the impacts upon heritage assets caused by the Proposed Development is rated using the classifications and criteria outlined in Table 6.4.

Table 6.4: Criteria for classifying magnitude of change	
Magnitude of change	**Criteria**
High	Substantial loss of information content resulting from total or large-scale removal of deposits from an asset; Major alteration of an asset's baseline setting, which materially compromises the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset and erodes the key characteristics[46] of the setting.
Medium	Loss of information content resulting from material alteration of the baseline conditions by removal of part of an asset; Alteration of an asset's baseline setting that effects the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset to a degree but whereby the cultural significance of the monument in its current setting remains legible. The key characteristics of the setting are not eroded.

[45] Historic Environment Scotland (2019). Designation Policy and Selection Guidance. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b.

[46] Historic Environment Scotland (2020). Managing Change in the Historic Environment: Setting

Table 6.4: Criteria for classifying magnitude of change	
Magnitude of change	**Criteria**
Low	Detectable impacts leading to minor loss of information content; Alterations to the asset's baseline setting which, although visible, would not affect the ability to understand, appreciate and experience the contribution that setting makes to the asset's overall significance.
Negligible	Loss of a small percentage of the area of an asset's peripheral deposits; A reversible alteration to the fabric of the asset; A marginal alteration to the asset's baseline setting.
None	No effect predicted.

Criteria for assessing significance

6.2.21 The predicted level of effect on each heritage asset is then determined by considering the asset's sensitivity in conjunction with the predicted magnitude of the impact. The method of deriving the level of effect is provided in Table 6.5.

Table 6.5: Level of effects based on inter-relationship between the sensitivity of the heritage asset and/ or its setting and the magnitude of impact

Magnitude of Impact	Sensitivity				
	Negligible	**Low**	**Medium**	**High**	**Very High**
High	Minor	Moderate	Moderate	Major	Major
Medium	Negligible/Neutral	Minor	Moderate	Moderate	Major
Low	Negligible/Neutral	Negligible/Neutral	Minor	Minor	Moderate

6.2.22 The level of effect is judged to be the interaction of the asset's sensitivity (Tables 6.2 and/ or 6.3) and the magnitude of the impact (Table 6.4). In order to provide a level of consistency, the assessment of sensitivity, the prediction of magnitude of impact and the assessment of level of effect is guided by pre-defined criteria. However, a qualitative descriptive narrative is also provided for each asset to summarise and explain each of the professional value judgements that have been made in establishing sensitivity and magnitude of impact for each individual asset.

6.2.23 Using professional judgment and with reference to the Guidelines for Environmental Impact Assessment (as updated) (IEMA 2017[47]), and the EIA Handbook (2018[48]) the assessment considers moderate and greater effects to be significant (shaded grey in Table 6.5, above), while minor and lesser effects are considered not significant.

Integrity of setting

6.2.24 SPP[49] notes that where there is potential for a proposed development to have an adverse effect on a Scheduled Monument or on the integrity of its setting, permission should only be granted where there are 'exceptional circumstances'. Adverse effects on integrity of setting are judged here to relate to whether a change would seriously adversely affect the asset's

[47] IEMA, (2016). Guidelines for Environmental Impact Assessment. Available at: https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf

[48] Historic Environment Scotland (2018). Environmental Impact Assessment Handbook. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationid=6ed33b65-9df1-4a2f-acbb-a8e800a592c0.

[49] Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy/.

key attributes or elements of setting which contribute to an asset's significance to the extent that that the setting of the asset can no longer be understood or appreciated.

6.2.25 In terms of effects upon the setting of heritage assets, it is considered that only those effects identified as 'significant' in the assessment will have the potential to adversely affect integrity of setting. Where no significant effect is found it is considered that the integrity of an asset's setting will remain intact. This is because for many assets, setting may make a limited contribution to their significance and as such changes would not affect integrity of their settings. Additionally, as set out in Table 6.4, lower ratings of magnitude of change relate to changes that would not obscure or erode key characteristics of setting.

6.2.26 Where significant effects are found, a detailed assessment of adverse effects upon integrity of setting is made. Whilst non-significant effects are unlikely to affect integrity of setting, the reverse is not always true. That is, the assessment of an effect as being 'significant' does not necessarily mean that the adverse effect to the asset's setting will harm its integrity. The assessment of an adverse effect upon the integrity of an asset's setting, where required, will be a qualitative one, and will largely depend upon whether the effect predicted would result in a major impediment to the ability to understand or appreciate the heritage asset and therefore reduce its cultural significance.

Criteria for Assessing Cumulative Effects

6.2.27 In terms of cultural heritage, it is necessary to consider whether the effects of the Proposed Development in conjunction with other schemes would result in an additional cumulative change upon the settings of heritage assets, beyond the levels predicted for the Proposed Development alone. The in combination effect also needs to be considered. However, only those assets which are judged to have the potential to be subject to significant cumulative effects will be included in the detailed cumulative assessment provided. The cumulative assessment will have regard to the guidance on cumulative effects upon heritage assets as set out in Environmental Impact Assessment Handbook V5 (SNH & HES 2018[50]) and will utilise the criteria used in determining effects resulting from the Proposed Development alone as outlined in Tables 6.2-6.5. The assessment of cumulative effects will consider whether there would be an increased impact, either additive or synergistic, upon the setting of heritage assets as a result of adding the Proposed Development to a baseline, which may include operational, under construction, consented or proposed developments as agreed with DGC. In determining the degree to which a cumulative effect may occur as a result of the addition of the Proposed Development into the cumulative baseline a number of factors are taken into consideration including:

- the distance between wind farms;
- the interrelationship between their Zones of Theoretical Visibility (ZTV);
- the overall character of the asset and its sensitivity to wind farms;
- the siting, scale and design of the wind farms themselves;
- the way in which the asset is experienced;
- the placing of the cumulative wind farm(s) in relation to both the individual proposal being assessed and the heritage asset under consideration; and

[50] Scottish Natural Heritage & Historic Environment Scotland (2018). Environmental Impact Assessment Handbook v5. Available at: https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf.

- the contribution of the cumulative baseline schemes to the significance of the effect, excluding the individual proposal being assessed, upon the setting of the heritage asset under consideration.

6.2.28 This assessment is based upon a list of operational or consented developments along with developments where permission has been applied for. All cumulative developments within 45 km of the Site are listed in EIAR Chapter 5: Landscape and Visual Amenity. While all have been considered, only those which contribute to, or have the possibility to contribute to, cumulative effects on specific heritage assets are discussed in detail in the text. Additionally, given the emphasis SNH place on significant effects, cumulative effects are only discussed for those assets where this has been requested by the consultees or where professional judgement indicates the potential for a significant cumulative effects.

Criteria for assessing residual effects

6.2.29 The residual effect is what remains following the application of mitigation and management measures, and construction has been completed and is thus the final level of effect associated with the Proposed Development. The level of residual effect is defined using criteria outlined in Table 6.2 to Table 6.5. No direct mitigation is possible for setting effects (beyond embedded mitigation by design) and therefore residual effects on the setting of heritage assets would be the same as predicted for the operational phase. The predicted level of effect on each heritage asset is then determined by considering the asset's sensitivity in conjunction with the predicted magnitude of the impact.

Limitations and Assumptions

6.2.30 This assessment is based upon data obtained from publicly accessible archives as described in the Data Sources in Section 6.2.9 as well as a walkover survey and site visits to assets subject to setting assessment. NRHE data was acquired in February 2020 as was Dumfries and Galloway HER data and data is current to this date. Historic Environment Scotland Designation data was downloaded from the HES portal in February 2020 and is current to this date. The scope of the baseline data gathering, including study areas and sources was agreed with consultees via the Scoping process and the assessment adheres to relevant policy and guidance for undertaken assessment of archaeological and cultural effects. The identification of the historic environment baseline provide an appropriate level of interrogation of known heritage assets and allows for a robust assessment of potential impacts.

6.2.31 Given the largely forested nature of the Site, visibility during the walkover survey was limited and further hitherto unknown buried archaeological remains may survive on the Site. This limitation has been taken account of and, in response, mitigation measures, post-consent, have been included to ensure that any such remains which are identified are either avoided or minimised, or where this is not possible recorded. This will ensure that any hitherto unknown significant effects are minimised or avoided as appropriate and in line with planning policy and guidance.

6.3 Baseline Conditions

Current Baseline

Proposed Development Site

6.3.1 Desk-based assessment has identified 15 cultural heritage assets that lie within the Site (Figure 6.1). Fourteen of these assets comprise farmsteads and field systems, one asset is

an incised cross slab forming a door lintel within Low Eldrig farmhouse. These assets are of probable post-medieval date.

Wider Landscape

6.3.2 The assessment has identified 93 Scheduled Monuments that are within 5 km of the Site (Figure 6.3). A further 157 Scheduled Monuments are situated between 5 km and 10 km of the Site. Those that are closest to the Site include:

- The Scheduled Laggangarn Standing Stones (Site 221, List No. SM90199), situated 2.4 km to the north of the Site boundary (Appendix 6.2: Plates 1 and 2);
- The Scheduled Bennan of Garvilland hillfort (Site 225, List No. SM1955), situated 2.5 km to the southwest of the Site boundary (Appendix 6.2: Plate 3);
- The Scheduled Wood Cairn (Site 242, List No. SM1953), situated 670 m to the east of the Site boundary (Appendix 6.3: Plates 4 and 5);
- The Scheduled Cairn na Gath (Site 226, List No. SM1922), situated 1.3 km to the southwest of the Site boundary (Appendix 6.2: Plate 6); and
- The Scheduled Wells of the Rees (Site 222, List No. SM2002), situated 2.9 km to the north of the Site boundary(Appendix 6.2: Plate 7).

6.3.3 The majority of the Scheduled Monuments within 10 km of the Site relate to remains of hut circles, burnt mounds, cairns, clearance cairns and field systems dating from the prehistoric to the post-medieval periods. These scheduled assets are also predominantly situated to the west of the Site and within the Archaeologically Sensitive Area of East Rhins. Dumfries and Galloway Council Local Development Plan Policy HE4[51] requires that the Council Archaeologist is consulted on all proposals falling within this area which would cause ground disturbance or have a visual impact. The Scheduled Monument of Knock Fell hillfort (Site 228, List No. SM1988), is contained within the Archaeologically Sensitive Area of Knock Fell, situated 7.9 km to the south of the Site.

6.3.4 The Dumfries and Galloway HER records further non-designated assets which it assesses as being of National Importance to the north and east of the Site, and these consist of further remains of hut circles, burnt mounds, cairns, clearance cairns and field systems dating from the prehistoric to the post-medieval periods.

6.3.5 There are two Listed Buildings within 1 km of the Site boundary:

- The 19th century Artfield Farmhouse, a Category C Listed Building (Site 251, List No. LB19372), situated 320 m to the west of the Site boundary; and
- The 19th century Gass Farm, a Category C Listed Building (Site 252, List No. LB19375), 740 m to the south of the Site boundary.

6.3.6 Three Category B Listed Buildings and three Category C Listed Buildings are situated within 5 km of the Site boundary. These include the 19th century Category B Listed Building of Lucewater House (Site 253, List No. LB19377), situated 4.7 km to the west of the Site boundary and the Category B Listed Buildings of the Parish Church and the War Memorial (Sites 254 and 255, List No. LB19380) within the Conservation Area of New Luce 4.9 km to the west of the Site boundary; the two structures are designated together under the same Listed Building Number. A further four Category A Listed Buildings are located between 5 km and 10 km of the Site boundary. These Category A Listed Buildings are:

[51] Dumfries and Galloway (2019). Local Development Plan 2

- Kirkcowan Parish Church (Site 258, List No. LB10066), situated 8.3 km to the southeast of the Site boundary;
- The 16th century tower house at Craichlaw House (Site 259, List No. LB10076), 6.3 km to the southeast of the Site boundary;
- Shennanton House country house (Site 260, List No. LB13106) , dated to 1908, situated 8.3 km to the east of the Site boundary; and
- Castle of Park country house (Site 261, List No. LB16761), dated to 1590, situated 8.9 km to the southwest of the Site boundary.

6.3.7 The eastern boundary of New Luce Conservation Area (Site 262) is within 5 km of the Site, approximately 4.9 km to the west of the Site boundary within the north to south aligned river valley of the Water of Luce.

6.3.8 There are no Inventory Gardens and Designed Landscapes and no Historic Battlefields within 10 km of the Site boundary. The Dumfries and Galloway HER lists the Torwood House Policies 19th century Landscape Park, 960 m to the south of the Site as being of Regional Importance.

6.3.9 A further 84 sites within 10 km of the Site boundary are non-statutory heritage assets which the Dumfries and Galloway Archaeology Service consider to be of National Importance.

Archaeological and Historical Background

PREHISTORIC AND ROMAN (8000 BC- AD 410)

6.3.10 There are no recorded assets within the Site dating to the prehistoric or Roman periods.

6.3.11 Thirty three assets that potentially date to the prehistoric and Roman periods are located within the 1 km Study Area. The closest, known asset to the Site is a burnt mound at High Eldrig at Site 357. This asset is situated 45 m to the east of the Site and is considered by Dumfries and Galloway Archaeology Service to be of National Importance. Further cairns and burnt mounds are located in the High Eldrig area at Sites 351, 355 and 356. Although these assets may date from the prehistoric to the 19th century their location close to the Site's eastern boundary does suggest the possibility for prehistoric activity within the Site.

6.3.12 The lack of similar assets dating to the prehistoric or Roman period within the Site could be attributed to the lack of detailed archaeological survey within the Site before the Site was forested. The Dumfries and Galloway HER records that most of the earthworks identified as potential prehistoric assets were visited by the Royal Commission on the Ancient and Historical Monuments of Scotland in 1989. The closest of these assets to the Site is the site of a prehistoric hut circle at Site 320, 690 m to the east of the Site. The Archaeology Service have assessed this asset as being of National Significance.

6.3.13 No assets that can be definitely dated to the Roman period are recorded within the 1 km Study Area. However, the Dumfries and Galloway HER considers that some assets dating to the prehistoric period may have continued in use through the Roman period. These include hut circles potentially dating from the Early Bronze Age to the Roman period such as Site 320 and Site 337 and cairns and cairnfield sites at Sites 342 and 351 to 354. However, the cairns at Sites 342 and 351 to 354 could date from the Early Bronze Age all the way through to the 19th century and could be clearance cairns used when opening up areas of land for agricultural purposes. Due to the purpose behind their creation, clearance cairns are difficult to date; they tend to be simple mounds of stones created when the land is cleared. Without intrusive investigations they are not distinctive enough to identify and such features tend not to have artefactual evidence contained within them; this would limit any techniques

for dating to environmental sampling. It should also be noted that environmental sampling may not recover sufficient material from these types of assets to date them.

6.3.14 Based on the above, the potential for archaeological remains of prehistoric or Roman date to be encountered within the Site cannot be discounted; however, on the basis of the current evidence, there is considered to be a medium potential for prehistoric and a low potential for Roman remains to survive on the Site.

EARLY HISTORIC AND MEDIEVAL (AD 410-1600)

6.3.15 There are no known assets dating to the early historic and medieval period within the Site. Within the 1 km Study Area there are 11 assets that may originate from the medieval period; the deserted township of High Airies at Site 321, 540 m to the east of the Site may date from medieval period to the 19th century.

6.3.16 The lack of early historic and medieval assets within the Site could be due to a lack of archaeological investigation within the Site. It is possible that the post-medieval farmsteads situated within the Site had their antecedents in the medieval period. The farmsteads and field systems that have been assessed as dating from the post-medieval period to the 18th century or from the post-medieval period to the modern period are situated within the lower lying ground within the Site; the majority of the field systems that have been dated from the post-medieval period onwards are located relative to these farmsteads. Assets from these later periods such the buildings at Site 295 and 296, the post-medieval farmsteads and field systems of Tarf Water at Site 300 and Site 299 on the west and east banks of the Tarf Water respectively, the farmstead at Site 306 and at Low Eldrig farmstead at Site 298 are situated in the south, middle and east of the Site. Relatively few farmstead and field systems are in the north of the Site although there is the isolated field system and farmstead at Horse Hill (Site 279) in the far north of the Site.

6.3.17 Based on the above, the potential for archaeological remains of early historic and medieval date to be encountered within the Site cannot be discounted; on the basis of the current evidence, there is considered to be a low potential for early historic remains to survive on the Site and a medium potential for medieval remains to survive on the Site.

POST-MEDIEVAL (AD 1600-1900)

6.3.18 A number of assets within the Site and the 1 km Study Area date to the post-medieval period; almost all of these relate to farming and consists of shielings, sheepfolds, field systems and farmsteads and other farm structures. These include a number of assets that may have their origins in the medieval period.

6.3.19 Early pre-Ordnance Survey maps of the Site such as Bleau's map of 1654[52] (Figure 6.20) tend to be schematic and lack detail. Artfield, labelled '*Artfell*' is depicted along with a south to north aligned river which probably equates to the Tarf Water.

6.3.20 Roy's map of 1752-55[53] (Figure 6.21) is the first map to show settlements that surround the Site in any detail. Artfield (labelled '*Hartfield*') and Balmurrie Fell (labelled '*Balmuryhill*') are depicted along with the unlabelled Tarf Water to the east of these geographic features. Buildings are depicted at High Eldrig (labelled '*High Eldrick*') and other farmsteads are depicted to the east of the Site. To the north, structures are located at the site of the

[52] Blaeu, J., 1646, Galaxiid pars occidentalior, in qua vicecomitatvs Victoniensis cum regalitate Glenlucensi

[53] Roy, W., 1747-55, Military Survey of Scotland

Scheduled Monument of Laggangarn Standing Stones (Site 221. List No. SM90199). These structures are probably earlier buildings associated with the farmstead of Kilgallioch which are situated roughly 500 m to the northeast of Site 221. New Luce is depicted on Roy's map to the west of the Site, although Roy's map does not depict any road infrastructure near the Site.

6.3.21 Ainslie's map of 1782[54] (Figure 6.22) depicts Artfield and an unlabelled road aligned southwest to northeast; this is the precursor to the modern, undesignated road that bounds the Site to the south.

6.3.22 The First Edition Ordnance Survey map surveyed from 1846 to 1847 and published in 1848 to 1850[55] (Figure 6.23) shows the farmsteads and agricultural features that occupied the Site. The Site west of the Tarf Water is depicted with few structures present; there are a few hay rees and land divisions. However, the relative paucity of land divisions indicates that the Site was not intensively farmed. As the topography within this portion of the Site consists of steep hills interspersed with slightly lower lying areas it is likely that the west portion of the Site was used for rough pasture. Low Eldrig Farmstead (Site 298) is clearly depicted as the extant remains of farmstead in the northeast corner of the Site.

6.3.23 The Ordnance Survey map that was revised in 1893 and published in 1896[56] (Figure 6.23) shows relatively few changes from the First Edition Ordnance Survey Map (Figure 6.22); Low Eldrig Farmstead (Site 298) is still depicted as an extant farmstead in the northeast corner of the Site.

MODERN (AD POST 1900)

6.3.24 There are no known assets dating to the modern period within either the Site or within the 1 km Study Area.

Aerial photography

6.3.25 Online vertical and oblique aerial photographs held by NCAP were analysed as part of this assessment. The photographs in the online collection that include vertical and oblique views of the Site did not provide any information that is additional to information provided in the other data sources listed in Section 6.2.9. Historic vertical and oblique aerial photograph held by NCAP that are not available online were not accessible due to the Covid-19 pandemic. Aerial photographs are primarily examined to allow for identification of cropmark site, historic land use and areas of disturbance. Cropmarks are often only visible in areas of arable cultivation. As historic mapping indicates that the Site has been forested for several decades and that prior to this it was unimproved the potential for identifying cropmarks is low. Historic mapping has been used identify historic land uses and features. As such the

[54] Ainslie, J., 1782, Scotland

[55] Ordnance Survey, 1848, Wigtownshire, Sheet 7 (includes: Kirkcowan; Penninghame), Surveyed: 1846, Published: 1848

Ordnance Survey, 1848, Wigtownshire, Sheet 11 (includes: Inch; New Luce), Surveyed: 1846-7, Published: 1848

Ordnance Survey, 1849, Wigtownshire, Sheet 6 (includes: New Luce), Surveyed: 1846-7, Published: 1849

Ordnance Survey, 1850, Wigtownshire, Sheet 12 (includes: Kirkcowan; New Luce; Old Luce), Surveyed: 1846-7, Published: 1850

[56] Ordnance Survey, 1896, Wigtownshire, Sheet VII.SE (includes: Kirkcowan), Revised: 1893, Published: 1896

Ordnance Survey, 1896, Wigtownshire, Sheet VII.SW (includes: Kirkcowan; New Luce), Revised: 1893, Published: 1896

Ordnance Survey, 1896, Wigtownshire, Sheet XIII.NE (includes: Kirkcowan; New Luce), Revised: 1893, Published: 1896

Ordnance Survey, 1896, Wigtownshire, Sheet XIII.NW (includes: New Luce), Revised: 1893, Published: 1896

inability to examine the full complement of NCAP photography for the Site is not consider a significant limitation.

LiDAR survey

6.3.26 The Scottish Government's, Scottish Remote Sensing Portal was accessed to ascertain the nature of any publicly accessible LiDAR data that may cover the Site Currently there is partial coverage of the Site available as part of the Phase III data set. The area of coverage lies largely outwith the Proposed Development footprint, with the exception of the area in the vicinity of Borrow Pit 3 in the east of the Site and the south of the Site where the temporary construction compound is proposed and where the existing forestry track will be upgraded. Examination of the LiDAR data indicated no previously unrecorded areas of interest. The area in which Borrow Pit 3 is proposed shows the existing access track (which does not require upgrading) and furrows and drainage, associated with the forestry works. No previously unrecorded features were identified via LiDAR review in the southern extent of the Site where the construction compound is proposed.

Walkover survey

6.3.27 The current land-use character of the Site is forestry with various phases of planting and growth; hard compacted gravel roads afford access throughout the Site. There are also relict areas of medieval and post medieval agriculture and dry stone wall field boundaries within the Site. The portion of the Site west of the Tarf Water is covered by mature forest land with good, gravel roadways and grassed firebreaks. Bordering the undesignated road that the forms the southern boundary to the Site there is an area of rough pastureland that is bound to the east by the Tarf Water. East of the Tarf Water the eastern portion of the Site consists of managed forestry. Areas of this managed forest had been subject to felling with other land portions that have subsequently been replanted; these trees were observed to be in an immature state.

6.3.28 The Site was visited on the 28 and 29 of July 2020 in clear weather with good visibility. The survey confirmed that all proposed turbine locations are within forested areas. Their location deep within forested areas rendered the identification of heritage assets within the vicinity of the proposed turbine locations difficult and it is probable that any assets within forested areas have been significantly degraded by the ploughing for and the planting of trees.

6.3.29 Site visits to key heritage assets in the wider study area were undertaken from the 27 July to the 5 August 2020 to assess, with the aid of wireline visualisations, the predicted impact of the Proposed Development on their settings. These site visits included any assets specifically identified by consultees as requiring assessment and those identified through analysis of the blade tip height ZTV that lie within the Study Areas where it is considered, on the basis of professional judgement, that the impact on their settings could be significant.

6.3.30 Given the large number of Scheduled Monuments to the west of the Site and non-designated assets deemed to be of National Importance by Dumfries and Galloway Council Archaeology Service within 10 km of the Site the setting assessment has grouped these assets within areas which required visits; these areas were determined by Zones of Theoretical Visibility, historic and modern map analysis and identification of related groups of assets during the desk based assessment. These groupings were further refined during the walkover assessment and setting assessment surveys conducted by AOC Archaeology within the 10 km Study Area between the 27 July and the 5 August 2020.

Future Baseline

6.3.31 Future baselines (without the Proposed Development) would largely be expected to mirror the current baseline. Any alteration to the baseline condition of the heritage assets within the Site would likely relate to continued use of the Site for forestry operations. This could result in further degradation or loss of known or hitherto unrecorded assets within the Site. The current baseline is taken as the basis for the construction effects assessment presented here.

6.3.32 The setting of the Site and assets within the wider study area will be altered in the future through the construction of consented turbines and other developments (See Figure 6.8). The effects of consented and proposed turbines on the setting of heritage assets is discussed under cumulative effects.

Summary of Sensitive Receptors

Scoped Out Receptors

6.3.33 Designated heritage assets which were found to lie outwith the ZTV have been scoped out of this assessment. Consideration has been given to the potential for proposed turbines to be visible in key views of heritage assets, even where turbines would not be visible from assets themselves and where appropriate such assets have been included. Assets identified in the Gazetteer (Technical Appendix 6.3) but not noted below in Section 6.4 or in Technical Appendix 6.1 would have no impact upon their setting.

6.3.34 Linn's Tomb (Site 409, Dumfries and Galloway HER Asset of National Significance HER No. MDG2327) was noted by the Dumfries and Galloway Archaeology Service as requiring assessment. As it was particularly identified it is noted here. The asset lies outwith the ZTV, being located as it is on the northeast slopes of Craigmoddie Fell which rises to the south-southeast between the asset and the Proposed Development. No views of the Proposed Development would be available from the asset. Areas to the north and northeast where views of the asset are possible, and from which the asset is appreciable, are also outwith the ZTV and as such further consideration of impacts upon its setting have been scoped out.

Scoped In Receptors

RECEPTORS BROUGHT FORWARDS FOR ASSESSMENT OF DIRECT EFFECTS

6.3.35 A total of 15 heritage assets have been identified within the Site. Their sensitivity has been classified according to the method shown in Table 6.2 and is summarised below in Table 6.6.

Table 6.6: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
279 - Horse Hill: Field System and Farmstead	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
291 - Drumdown: Structure, Field System, Farmstead	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
292 - Drumdown: Structure	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
293 - The Torr: Field	Negligible	Incomplete example (impacted by previous forestry works) of a feature type that is numerous throughout Dumfries and Galloway and Scotland.

Table 6.6: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
294 - The Torr: Structure (Hay Ree)	Negligible	Hay Rees are numerous across Dumfries and Galloway. This example represent an incomplete version likely damage by forestry operations.
295 - Black Hill: Field, Building	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
296 - Black Hill: Field, Building	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
298 - Low Eldrig: Field System, Farmstead	Medium	Asset of a relatively common type in Dumfries and Galloway and Scotland but more extensive and more well preserved than other nearby examples making it a representative example of its type.
299 - Tarf Water/ Inshanks: Field System, Farmstead	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
300 - Tarf Water/ Black Loop: Field, Farmstead	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
301 - Meikle Cairn: Field	Negligible	Incomplete example (impacted by previous forestry works) of a feature type that is numerous throughout Dumfries and Galloway and Scotland.
302 - Barnighlea: Field System, Structure	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
304 - Mid Hill: Field System	Negligible	Feature of a type that is numerous in Dumfries and Galloway and Scotland.
306 - Tarf Water/ Gasshead: Farmstead	Low	Common type of asset in Dumfries and Galloway and Scotland with potential to contribute to our understanding of the historic environment at a local level.
324 - Low Eldrig: Cross Slab (possible)	Low/Medium	A representative example of reuse of a possible cross-slab that may have belonged to an earlier building on the Site.

RECEPTORS BROUGHT FORWARDS FOR ASSESSMENT OF SETTINGS EFFECTS

6.3.36 As a result of consultation with HES and the Dumfries and Galloway Archaeology Service, the following receptors listed below have been brought forward for detailed assessment and have been subject to site visits. Further details are provided in the Gazetteer in Technical Appendix 6.3. Assets which lie outwith the ZTV and where no significant views of them would include turbines have not been brought forward for assessment.

6.3.37 Visualisations have been provided to inform the assessment. The assessment of the potential impacts upon the setting of these assets is dealt with in this chapter. Several other assets which lie within the ZTV have been subject to assessment via site visits (sometimes in groups). Given the number of assets and in order to provide a proportionate assessment the potential for impacts upon their setting is presented in Technical Appendix 6.1.

6.3.38 Given the preliminary findings outlined above and in consultation with HES and Dumfries and Galloway Archaeology Service the following assets have been carried forward for detailed assessment:

- Scheduled Monument Wood Cairn (Site 242, List No. SM1953);
- Scheduled Monument Laggangarn Standing Stones (Site 221, List No. SM90199);

- Scheduled Monument Wells of the Rees, wells 500m NNE of Kilgallioch, (Site 222, List No: SM2002);
- Dirvannie Township (Site 276, Dumfries and Galloway HER Asset of National Significance HER No. MDG13123);
- High Eldrig Farmstead (Site 329, Dumfries and Galloway HER Asset of National Significance HER No. MDG2180);
- High Eldrig Farmstead (Site 329, Dumfries and Galloway HER Asset of National Significance HER No. MDG2180);
- Scheduled Monument Caves of Kilhern Chambered Cairn (Site 229, List No. SM1928);
- Scheduled Monument Bennan of Garvilland fort (Site 225, List No. SM1955;
- Scheduled Monument Cairn na Gath (Site 226, List No. SM1928);
- Monandie Farmstead (Site 326, Dumfries and Galloway HER Asset of National Significance HER No. MDG2177);
- Craigmoddie Farmstead (Site 407, Dumfries and Galloway HER Asset of National Significance HER No. MDG2317);
- Dirvachlie Farmstead (Site 427, Dumfries and Galloway HER Asset of Regional Significance HER No. MDG14483;
- High Eldrig Cairn (Site 328, Dumfries and Galloway HER Asset of National Significance HER No. MDG2179);
- White Cairn, High Airies (Site 322, Dumfries and Galloway HER Asset of National Significance HER No. MDG2165);
- Linn's Tomb (Site 409, Dumfries and Galloway HER Asset of National Significance HER No. MDG2327); and
- East Rhins Archaeologically Sensitive Area.

6.4 Assessment of Likely Effects

Potential Construction Effects

6.4.1 During construction, direct physical impacts are likely to occur from tree clearance, earthmoving operations, creation of the substation, road construction, excavation of borrow pits and construction of all associated infrastructure (turbine bases, compounds, drainage etc.). Setting effects are likely to occur due to the introduction of construction machinery on Site, additional construction traffic and construction of compounds. Settings effects relating to construction would be short term, temporary effects and would not exceed the operational effects upon setting and so are not discussed further here.

6.4.2 The Proposed Development has been designed to avoid direct impacts on known heritage assets where possible. Table 6.7 below provides a list of assets which may be subject to direct effects and summarises the expected magnitude of impact and level of effect.

Table 6.7: Summary of Direct Effects

Receptor	Sensitivity	Magnitude of Impact	Level of Effect
Site 279 - Horse Hill: Field System and Farmstead	Low	Low	Negligible
Site 293 - The Torr: Fields	Negligible	Negligible	Negligible
Site 294 - The Torr: Structure	Negligible	Negligible	Negligible

Table 6.7: Summary of Direct Effects			
Receptor	**Sensitivity**	**Magnitude of Impact**	**Level of Effect**
Site 295 - Black Hill: Field, Building	Low	Negligible	Negligible
Site 296 - Black Hill: Field, Building	Low	Negligible	Negligible
Site 298 - Low Eldrig: Field System, Farmstead	Medium	Low	Minor

6.4.3 Existing forestry tracks (Technical Appendix 6.2: Plate 8) pass through the field systems associated with Black Hill (Site 296) and The Torr (Site 293). These tracks would require to be upgraded as part of the Proposed Development. As the tracks are already in existence upgrading would result in the loss of a small percentage of the asset's deposits, in an area which has already been disturbed. On this basis the magnitude of impact is judged to Negligible and given the asset's Low and Negligible sensitivity respectively, the level of effect is judged to be **Negligible** and not significant.

6.4.4 A new section of access track would pass to the east of the field and building at Black Hill (Site 295). The track would be located within c. 7 m of the site of the building and would pass immediately adjacent to the eastern side of the field as shown on historic Ordnance Survey mapping. This could result in the loss of a small percentage of the asset's peripheral deposits, noting that the site of the asset has also been previously disturbed by forestry operations. On this basis the magnitude of impact is judged to be Negligible. Given the asset's Low sensitivity, the level of effect would be **Negligible** and not significant.

6.4.5 The structure at The Torr (Site 294) is annotated as a 'Hay Ree' on historical Ordnance Survey mapping. It is located within the Borrow Pit Search Area but outwith the currently proposed Borrow Pit Excavation Area, lying c. 9 m to the north of the northern boundary of the excavation area. On this basis there is potential for the Proposed Development to result in the loss of a small percentage of the asset's peripheral deposits, noting that the asset has previously been disturbed by forestry operations. On the basis the magnitude of impact is judged to be Negligible. The level of effect would be **Negligible** and not significant.

6.4.6 The field system and farmstead at Horse Hill (Site 279) would be impacted upon by the construction of a new access track associated with Turbine 1. The site of the farmstead building is located c. 62 m to the west of the access track and would not be impacted upon, however the access track would pass through the eastern portion of the northern fields associated with the farmstead. This could result in minor loss of information content, noting that the asset has already been disturbed by forestry operations. Given the asset's Low sensitivity this would result in **Negligible** level effects which are not significant.

6.4.7 The field system and farmstead at Low Eldrig (Site 298) (Technical Appendix 6.2: Plate 9) would be crossed by a new section of access track at the southern extent of its field system. This would comprise the creation of c. 50 m length of 4 m wide access track which would join Turbine 12 to an existing forestry track, also located within the field system. The existing forestry track would not require any upgrades. The farmstead buildings at Low Eldrig are located c. 325 m to the north and would not be impacted upon. The impacts, as described above would be limited to the southernmost field associated with the asset and it is noted that this area has already been subject to forestry operations and construction of an access track through it. At most the Proposed Development would result minor loss of information content. Given the asset's Medium sensitivity this would result in a **Minor** level of effect which is not significant.

Potential Operational Effects

6.4.8 Direct effects upon known and any previously unknown archaeological remains which may be present on the Site would cease with the completion of the groundworks stage of construction and consequently no direct effects are predicted during the operational phase of the development.

6.4.9 Operational phase effects include impacts upon the settings of assets such as World Heritage Sites, Listed Buildings, Scheduled Monuments, Conservation Areas, Inventory Battlefields and Inventory Gardens and Designed Landscapes. While there are no designated heritage assets within the Site, this assessment has identified 250 Scheduled Monuments, 12 Listed Buildings and one Conservation Area within 10 km of the Site. Within 10 km of the Site the Dumfries and Galloway HER lists 84 non-designated assets of National Significance. Consideration has been given to the potential for impacts upon the setting of all of these assets. In line with Section 6.3.38, assets which were identified by consultees as requiring assessment and those assets where a significant effect is predicted are assessed below. Consideration of impacts upon the setting of all other designated and Nationally Significant assets are presented in Technical Appendix 6.1.

Wood Cairn (Site 242)

6.4.10 The Scheduled Monument of Wood Cairn (Site 242, List No. SM1953) is situated 1.1 km to the northeast of Turbine 10. A Zone of Theoretical Visibility indicates that 11 to 12 turbines would be visible from the western half of this asset with 7 to 8 turbines visible from the eastern half.

6.4.11 Wood Cairn (Site 242) comprises the remains of a prehistoric burial cairn that dates from the Neolithic to the Early Bronze Age period (c. 4000-1500 BC), which is situated on the summit of the hill of Eldrig Fell. The monument is roughly circular in shape, measuring approximately 18 m in diameter and 2 m high, it has extensive views over the surrounding landscape in all directions. Marker cairns, probably for survey purposes have been constructed on its surface; at the time of the site visit undertaken by AOC Archaeology on the 4 February 2020, two prominent marker cairns with a smaller marker cairn were observed. However, with the exception of the addition of the marker cairns Wood Cairn is assessed as an undisturbed cairn.

6.4.12 Wood Cairn (Site 242) has a relationship with the settled prehistoric landscapes surrounding the summit of Eldrig Fell, which lie predominantly to the northwest. Existing wind farms were observed to the north and west (Kilgallioch Wind Farm, southwest (Artfield Fell and Balmurrie Fell Wind Farms) and the southeast (Airies Wind Farm) and are relatively prominent in the views from the cairn. Views to the northwest also have turbines present in long reaching views, with the operational turbines at Kilgallioch visible in the foreground. Despite the presence of turbines in the landscape already, these do not obscure the relationships with Wood Cairn and the prehistoric settlement remains to the northwest (though turbines are a distracting feature in this view) and they do not obscure the topographical relationship of Wood Cairn to the Tarf Water valley to the south, over which it has extensive views. Wood Cairn is judged to have High relative sensitivity to changes to its setting as setting makes a direct contribution to its significance.

6.4.13 The Proposed Development would result in turbines being set closer to Wood Cairn than the operational turbines at Artfield Fell wind farm to the west. Figures 6.11 to 6.13 illustrate the views from Wood Cairn towards the Proposed Development and indicate that turbines would be prominent in views southwest, though the topographical position above Tarf Water could

still be appreciated. Figure 6.11 indicates the view in the direction of Cairn na Gath (Site 226), as requested by HES. Turbines in this location are set further from Wood Cairn, at distances of between c. 1.7 km and 2.7 km. While still prominent in views the spacing of the turbines is such that distinct topographical feature of Artfield Fell is still appreciable as is the prominent and visible location of Wood Cairn itself. Wood Cairn has no intervisibility with the Scheduled Cairn na Gath (Site 226, List No. SM1922), the hills of Artfield Fell and Balmurrie Fell block any intervisibility with this asset, which is situated below the western facing slop of Balmurrie Fell.

6.4.14 Figure 6.14 has been taken from High Eldrig Cairn (Site 328) and has been orientated to show the relationship between High Eldrig Cairn and Wood Cairn and how the turbines would feature in such views. High Eldrig Cairn is located amongst a group of prehistoric remains situated on the upland plateau to the northwest of the Wood Cairn. The relationship between these assets and Wood Cairn forms a key characteristic of the setting of the cairn. The assets are broadly contemporary and the placement of Wood Cairn on the summit of Eldrig Fell overlooking these assets was likely a key factor in its siting and the current views between them allows for an understanding and appreciation of how the assets would have related to one another in the past. All of the Proposed Development turbines would be seen to the right (west) of Wood Cairn when it is viewed from the prehistoric remains at the upland plateau. This has been a deliberate design intention (see Chapter 3: Design Evolution and Alternatives), to ensure that the turbines are not seen in the backdrop of the cairn in this view and to provide as much offset between the cairn and turbines as possible, thus maintaining a largely undistracted visual link between the prehistoric remains on the upland plateau and the cairn.

6.4.15 The Proposed Development turbines would be a notable addition to views west and southwest from Wood Cairn. However the location of the proposed turbines in the valley at a distance of 1.1 km to the southwest for the nearest turbine would still allow for an understanding of the topographical position of the asset above the Tarf Water to the south and overlooking Artfield Fell to southwest. The relationship between the prehistoric remains on the upland plateau at High Eldrig and Wood Cairn would not be severed and the Proposed Development turbines have been placed so as to offset in these views, meaning that the cairn's position of prominence above the settlement remains and can still be readily appreciated. On this basis it is judged that the alteration to the asset's current setting would impact the ability to understand the contribution that setting makes to significance to a degree; however overall it is judged that the key characteristics of setting would not be eroded and that cultural significance of the asset in its setting would remain legible. As such the Proposed Development would result in a **Medium** magnitude of impact, the resulting effect would be **Moderate** and significant. As the changes would not materially erode key characteristics and the relationship of Wood Cairn to its setting would remain legible, the contribution that setting makes to the cultural significance of the asset still being readily understood, it is judged that the integrity of the setting of the asset would remain intact.

Laggangarn Standing Stones (Site 221)

6.4.16 The Scheduled Monument Laggangarn Standing Stones (Site 221) is comprised of two standing stones of prehistoric date; although it is believed that there would originally have been more stones; and local tradition records at least 14 standing stones were upstanding at some point. The surviving two standing stones have incised crosses on them; the larger crosses probably date from the 7th to the 9th centuries AD. The two stones stand on a prominent mound; the land rising slightly as one approaches the stones from the southwest.

A bend in the Tarf Water surrounds the asset to the northeast and southeast. The mound on which the stones are situated and the lower ground immediately surrounding it are currently enclosed within mature, managed forestry. If the trees were removed, Laggangarn Standing Stones would have reasonably uninterrupted views to the southwest, away from, the Proposed Development. Though it is noted that any commercial forestry cropped would likely be replanted and as such any visibility may be temporary. On the basis of the current setting within forestry, which limits the ability to understand and appreciate the relationship of the asset to its surroundings, the stones are judged to have a Medium relative sensitivity to changes to their setting.

6.4.17 The nearest Proposed Development turbine would be located 2.56 km to the south. Figure 6.9 provides a wireline visualisation illustrating the views to the Proposed Development in the event of tree felling. All 12 of the Proposed Development turbines would be visible if the forestry were to be cropped. While they would be visible the turbines would not change the relationship between the stones and the Tarf Water and they would only feature very peripherally in presumed important views to and from the southwest. On this basis the Proposed Development would result in alterations to the asset's baseline setting but these alterations would not affect the ability to understand, appreciate or experience the contribution that setting makes to the asset's overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting effect would be **Minor** and not significant.

Wells of the Rees, wells 500 m NNE of Kilgallioch, (Site 222)

6.4.18 The Scheduled Monument of the Wells of the Rees, wells 500 m NNE of Kilgallioch, (Site 222) is situated 3.08 km from the nearest Proposed Development turbine. The wells are said to have been built from the fabric of the nearby church of Kilgallioch by penitents for religious purposes. They are recorded as having domed, un-mortared structures built above the well openings. At the time of the site visit the asset was heavily overgrown with ferns making the extent of the built remains difficult to appreciate. The asset is set on relatively high ground on a south facing slope which looks across the upland plateau and to the fells at Artfield and Balmurrie. The setting of the asset insofar as it contributes to its significance largely relates to its immediate surrounding and the association with the former church (though little is known about this) and its location on routeway marked by Laggangarn which lies to the southwest. The setting of the asset makes a moderate contribution to an understanding, appreciation and experience of it and the relative sensitivity of the asset to changes in its setting is judged to be Medium.

6.4.19 Figure 6.16 provides a visualisation to demonstrate the visibility of the Proposed Development from Wells of the Rees. As with Laggangarn, all 12 turbines would be visible in views south from the Wells of Rees. They would appear to the left (east) of the operational Kilgallioch Wind Farm which is located in close proximity to the asset to the north, west and southwest (Figure 6.16a to 6.16e). The Proposed Development turbines would be located at distance of 3.08 km and the turbines would be seen beyond the immediate expanse of upland plateau visible to the south which would provide a good degree of topographical separation. The turbines further would not interfere with views to the southwest towards Laggangarn. On this basis it is predicted that the Proposed Development would form an alteration to the asset's baseline setting but that it would not affect the ability to understand, appreciate and experience the contribution that setting makes to the overall cultural significance of the asset. On this basis the magnitude of impact is judged to be **Low**, the resulting effect would be **Minor** and not significant.

Dirvannie Township (Site 276)

6.4.20 Dirvannie Township (Site 276) is situated 0.98 km from the nearest Proposed Development turbine. Nine unroofed buildings, one partially roofed building, one roofed building, two unroofed structures, two enclosures and a field system are recorded at Site 276 on the Ordnance Survey First Edition map of 1849. These assets are situated in the low lying valley to the north of the Proposed Development. The setting of this township insofar as it contributes to an understanding and appreciation of the asset, is related to the immediately surrounding agricultural landscape, which it would have been sited to exploit, and the burn of Ha' Hill Strand to the south. The wider landscape does not contribute materially to its significance and on balance it is judged to have Medium relative sensitivity to changes to its setting.

6.4.21 Figure 6.18 shows that all 12 of the Proposed Development turbines would be visible to the south-southeast of the township. The majority of turbines would be on land further south, and would be partially shielded by the higher portions of land in the north of the Site, though all would be visible to hub height. Views west and north of Dirvannie already include prominent views of the operational Kilgallioch Wind Farm. The Proposed Development would not affect the relationship between Dirvannie and its surrounding agricultural land, the adjacent watercourse or indeed other farmsteads on the upland plateau. On this basis it is predicted that the Proposed Development would form an alteration to the asset's baseline setting but that it would not affect the ability to understand or appreciate the contribution that setting makes to the overall significance of the asset. The setting of this township is within the agricultural landscape in which it is situated and is not directly associated with landscapes towards the south within the boundary of the Site. Therefore, the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

High Eldrig Farmstead (Site 329)

6.4.22 High Eldrig Farmstead (Site 329) is situated 1.3 km from the nearest Proposed Development turbine, though the field systems extend to within 1.1 km of the nearest Proposed Development turbine. The setting of this medieval to 19th century farmstead with its cultivation terraces is within the agricultural landscape, the field system, in which it is situated, including land on the western slopes of Eldrig Fell and likely Eldrig Loch to the east. The wider landscape does not contribute materially to its significance and on balance it is judged to have Medium relative sensitivity to changes to its setting.

6.4.23 The ZTV (Figures 6.4 and 6.5) indicates that between 11 to 12 turbines would be visible farmstead and field system though this would reduce to 9 to 10 turbines at the western extent of the field system. While located in relatively close proximity, the Proposed Development turbines would not impinge upon the relationship between the farmstead buildings and their associated field systems. They would be seen beyond immediate topographical features associated with the farmstead such as Eldrig Fell and Loch. They would not obscure any relationship with other farmsteads in the immediate area which are largely located to the northwest, along the upland plateau, and to the south and southeast and to the north and east of the Tarf Water. As such the Proposed Development would alter the asset's baseline setting but would not affect any of the key characteristics of its setting such that the contribution that setting makes to the asset's overall significance can no longer be understood. On this basis the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

Caves of Kilhern Chambered Cairn (Site 229)

6.4.24 The Scheduled Monument of the Caves of Kilhern Chambered Cairn (Site 229) is situated 4.6 km from the nearest Proposed Development turbine. The asset comprises the remains of a long cairn that has been heavily disturbed. The cairn is orientated east-northeast to west-southwest; although the locations of specific entrances to this cairn have not been ascertained by previous archaeological investigations. It is situated on a northwest facing slope on the south side of the valley of Cross Water of Luce and is within and close to the eastern boundary of the East Rhins Archaeologically Sensitive Area. The key characteristics of its setting relate to its relationship with the valley of the Cross Water of Luce and the inhabited prehistoric landscape within this valley. It was clearly placed to be prominent within this valley and to be visible from and have views over broadly contemporary assets within the valley. Its setting makes a major contribution to an understanding, appreciation and experience of it and such it is judged to be of High relative sensitivity to changes to its setting.

6.4.25 The ZTV (Figure 6.6) indicates that 11 to 12 turbines would be visible from the cairn and Figure 6.17 indicates that largely only the tips of the 12 Proposed Development turbines would be visible in views to the northeast. The very tops of hubs of four turbines would be visible though little to none of the towers would be seen. The Proposed Development turbines would be located beyond the landforms of Balmurrie and Artfield Fells and the operational wind farms which are located on these hills. The Proposed Development would be located outwith the valley system to which the cairn relates and it would not intervene between the cairn and any of the broadly contemporary monuments within the valley, though it is noted that turbines may be visible beyond the cairn when viewed from other assets which lie to its west. Given the distance to the Proposed Development and its location well outwith the valley of the Cross Water of Luce, it would represent an alteration to the baseline setting of the asset but one which would not erode key characteristics and would not affect the ability to understand, appreciate and experience the contribution that setting makes to significance. As such the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

Bennan of Garvilland fort (Site 225)

6.4.26 The Scheduled Ancient Monument of the Bennan of Garvilland fort (Site 225) is situated 5.5 km from the nearest Proposed Development turbine. This Iron Age hillfort sits on the summit of the Bennan of Garvilland Hill; this hill is a prominent feature to the southwest of the Site. The Bennan of Garvilland Hill is one of a cluster of hills to the southwest of the Site; these hills decrease towards the Site as the local topography settles into a more level plateau. Visually the hillfort can be best appreciated from the south as the prominence of the hill and its steep topography is more discernible when viewed from the south. The hillfort has clear views to the northeast along the Drumpail Burn, to the west to the Main Water of Luce and to the northwest to the Cross Water of Luce. Key sightlines are across lower lying ground to the northeast and across the lower lying areas in the south of the Site away from the Proposed Development and to the southeast to ridges further south where the Scheduled Carscreugh Croft cairn (Site 240) and the Ballach A-Heathry Early Bronze Age to Late Bronze Age cairn (Site 402), deemed by Dumfries and Galloway Archaeology Service to be of National Significance, are situated. Further key sightlines to the northwest and west are slightly more constrained by hills immediately in the vicinity of Site 224 in these directions. However, it is probable that Bennan of Garvilland fort has a key relationship to the prehistoric landscape and assets to the northwest and west. Therefore, although

sightlines to the northeast and southeast may add to and understanding of the fort's defensive position it is probable that Bennan of Garvilland has a defensive and societal relationship to the assets in its immediate vicinity and to the prehistoric landscape to the northwest and west. This provides the hillfort with a commanding defensive position and its current setting allows for an understanding of this and its placement in a strategic location which would allow for surveillance over the landscape in most directions. The setting of the hillfort makes a major contribution to the ability to understand the asset and contributes directly to its cultural significance. On this basis the hillfort is judged to be of High relative sensitivity to changes to its setting.

6.4.27 Eleven to 12 of the Proposed Development turbines would be visible at a distance of over 5 km. Figure 6.10 indicates that seven of these would be visible to hub height with the remaining five visible as tips. The Proposed Development turbines would be located beyond the operational Glenchamber and Artfield Forest turbines and clearly behind the distinctive landform of Artfield Fell. The Proposed Development would not erode the key sightlines from the hillfort, as defined above. Key sightlines northeast would only feature peripheral views of the Proposed Development turbines, in views which, as noted above, already contain turbines. Furthermore, it is likely that the fort has key relationships to the prehistoric landscapes to the northwest and west, views that would not be impacted upon by the Proposed Development. The Proposed Development would not intrude upon its relationship with the adjacent watercourses. The Proposed Development would be visible in the distance to the northeast when approaching the hillfort from the south but the degree of separation would be such that the turbines would not detract from the prominence of the fort over the elements of landscape with which it is associated. As such it is considered that the turbines would represent an alteration to the baseline setting of the asset and, although turbines would be visible, they would not affect the ability to understand, appreciate or experience the contribution that setting makes to the asset's overall significance. Therefore, the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

Cairn na Gath (Site 226)

6.4.28 The Scheduled Monument Cairn na Gath (Site 226) is situated 1.6 km from the nearest Proposed Development turbine. This prehistoric long cairn is situated on a small hillock below Balmurrie Fell. Balmurrie Fell features steeper slopes and includes the Balmurrie windfarm which are seen behind the cairn in views from the west and looking to the east. The cairn itself lies along a roughly north to south alignment with hills around Kilmacfadzean rising to the west beyond which the land slopes away to the southwest and the valley of the Cross Water of Luce. Principal views are largely to the north and southwest where topography is lower and views east and northeast are limited by the rising land of Balmurrie and Artfield Fells. Potentially contemporary non-designated assets are located to the north of the cairn and include hut circles (Site 337) and cairnfields (Site 325 and 343). Further hut circles (Site 396) and burnt mounts (Site 398) are located to the east and south. The location of the cairn on a small hillock affords it good views over the broad valley system between Balmurrie Fell and minor hills to the west and over the valley of the Cross Water of Luce to the southwest. It is prominent within its localised setting. Its setting makes a direct contribution to its significance.

6.4.29 The ZTV (Figure 6.6) indicates that between four and six of the Proposed Development turbines would be visible from Cairn na Gath (Site 226, List No. SM1928). The wireline presented in Figure 6.15 indicates that only three of these turbines would be visible to hub

height with the lower portions of their towers being obscured by the Balmurrie and Artfield Fell landforms. The wireline indicates that another three tips would be visible to the right (south) of the hubs and would be largely obscured by Balmurrie and Artfield Fells and would appear behind the existing Balmurrie and Artfield Fell turbines. The turbines would not appear along the main axis of the cairn and would be located to the rear when looking south-westwards to the Cross Water of Luce. Further the turbines would not impinge upon the relationship between the cairn and any of the nearby broadly contemporary assets. The turbines would be visible but clearly located beyond the landscape, bound to the east by Balmurrie and Artfield Fells, to which the cairn relates. As such the turbines would form an alteration to the assets setting but not one which would diminish the ability to understand and appreciate the contribution that the setting makes to the significance of the asset. On this basis the magnitude of impact is judged to be Low and the resulting effect would be **Minor** and not significant.

Monandie Farmstead (Site 326)

6.4.30 The Monandie Farmstead (Site 326) is situated 1.02 km to the northeast of the nearest Proposed Development turbines. This medieval to 19th century farmstead consists of two buildings at the core of a small field system with a kiln situated roughly 30 m away to the east-southeast. The setting of this post-medieval farmstead, insofar as it contributes to the significance of the asset, primarily relates to its associated agricultural landscape, which includes its cultivation terraces and its proximity to agricultural resources which likely determined the siting of this asset in the landscape. Its relationship to other farmsteads on the upland plateau also contributes to an understanding of this area's use in the post-medieval period with a greater focus on small scale agricultural settlements. The wider landscape setting does not contribute materially to an understanding and appreciation of the asset. On the basis of the above and on balance, it is judged to be of Medium relative sensitivity to changes to its setting.

6.4.31 The ZTV (Figure 6.4) indicates that 11 to 12 of the Proposed Development turbines would be visible from the asset (Site 326). While located in relatively close proximity, the Proposed Development turbines would not impinge upon the relationship between the farmstead buildings and their associated field system. They further would not obscure any relationship with other farmsteads in the immediate area which are largely located to the northwest and southeast, along the upland plateau and to the north and east of the Tarf Water. As such the Proposed Development would alter the asset's baseline setting; however, while the Proposed Development turbines would be visible they would not affect any of the key characteristics of its setting such that the contribution that setting makes to the asset's overall significance could no longer be understood, appreciated or experienced. On this basis the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

Craigmoddie Farmstead (Site 407)

6.4.32 The Craigmoddie Farmstead (Site 407) is situated 2.9 km to the north of the nearest Proposed Development turbine. The asset comprises a medieval to 19th century farmstead consisting of three unroofed buildings, two roofed buildings, two enclosures and a field system with two attached, unroofed structures. It sits on the lower southern and southeastern slopes of Craigmoddie Fell with tributaries of the Lodens Burn located within the eastern field system and to the south of the western field system. Like the other post-medieval farmsteads discussed above, the setting of this post-medieval farmstead insofar as it contributes to the significance of the asset primarily relates to its associated agricultural

landscape, which includes its field system and the topographical features with which it is directly associated. It is its proximity to agricultural resources which likely determined the siting of this asset in the landscape. The wider landscape setting does not contribute materially to an understanding and appreciation of the asset. On the basis of the above and on balance, it is judged to be of Medium relative sensitivity to changes to its setting.

6.4.33 The ZTV (Figures 6.4a and 6.4b) indicates that 11 to 12 turbines tips would be visible from the farmstead (Site 407). Towards the north of the asset all turbines would be visible to hub height but towards the south where Craigmoddie Fell slopes away this visibility would decrease such that at the southern extent of the asset only one to three hubs would be visible, with only blades visible for the rest of the turbines. However, the Proposed Development turbines would not impinge upon the relationship between the farmstead buildings and its associated field system nor would they impact upon the relationship between the asset and Craigmoddie Fell or Lodens Burn. Given the distance of separation between the assets and the turbines, it is judged that the Proposed Development would alter the asset's baseline setting; however, while the Proposed Turbines would be visible they would not affect any of the key characteristics of its setting such that the contribution that setting makes to the asset's overall significance could no longer be understood, appreciated or experienced. On this basis the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

Dirvachlie Farmstead (Site 427)

6.4.34 The Dirvachlie Farmstead (Site 427) is situated 1.7 km from the nearest Proposed Development turbine. It is a post-medieval to 18th century farmstead of comprised of three unroofed buildings, a kiln, fields and two unroofed structures along with additional elements. It sits on lower lying land to the east of Monandie Rig, north of Tocher Knowes and south of Drumley. It is located on east facing slope with land dropping away to the northeast. Like the aforementioned post-medieval farmsteads, the setting of this post-medieval farmstead insofar as it contributes to the significance of the asset primarily relates to its associated agricultural landscape, which includes its field system and the topographical features with which it is directly associated. It is its proximity to agricultural resources which likely determined the siting of this asset in the landscape. Its relationship to other farmsteads on the upland plateau also contributes to an understanding of this area's use in the post-medieval period with a greater focus on small scale agricultural settlements. The wider landscape setting does not contribute materially to an understanding and appreciation of the asset. On the basis of the above and on balance, it is judged to be of Medium relative sensitivity to changes to its setting.

6.4.35 The ZTV indicates that 11 to 12 turbines tips would be visible from the farmstead. However, the Proposed Development turbines would not impinge upon the relationship between the farmstead buildings and its associated field system nor would they impact upon the relationship between the asset and the immediately surrounding topographical features. Given the distance of separation between the assets and the turbines, it is considered that the Proposed Development would alter the asset's baseline setting; however, while the Proposed Turbines would be visible they would not affect any of the key characteristics of its setting such that the contribution that setting makes to the asset's overall significance could no longer be understood, appreciated or experienced. On this basis the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

High Eldrig Cairn (Site 328)

6.4.36 The High Eldrig Cairn (Site 328) is situated 0.93 km north of the nearest Proposed Development turbine. Assessed as a probable burial cairn dating from the Early Bronze Age to the Late Bronze Age, High Eldrig Cairn is set within the lower lying landscape to the north of the summit of Eldrig Fell and the Proposed Development along with a number of other prehistoric assets in this area including further cairns and cairnfields and burnt mounds in its immediate vicinity and extending to the northwest and southeast along the upland plateau. Site 268 to the southeast may comprise the remains of a hut circle. Wood Cairn (Site 242) sits above these assets on the summit of Eldrig Fell. High Eldrig Cairn sits on a locally prominent shoulder of land forming the southernmost extent of Monandie Rig. It lies between Monandie Burn and Loch Strand watercourses which lie to its west and east respectively. Land slopes away to the south and towards the Tarf Water. The site of the cairn was likely chosen to allow for views from it and views of it from the surrounding associated landscape. In addition to its topographical setting, key characteristics include intervisibility with Wood Carin to the southeast and with other prehistoric assets located in close proximity and along the upland plateau. The asset is considered to have High relative sensitivity to changes to its setting.

6.4.37 The ZTV (Figures 6.4a and 6.4b) indicates that 11 to 12 turbines would be visible to hub height and Figure 6.14 indicates that turbines would form prominent features in views south along the valley of the Tarf Water. Two of these turbines are visible in Figure 6.14 which has been orientated to demonstrate the visual relationship of the assets on the upland plateau with Wood Cairn (Site 242) and how the Proposed Development turbines would be seen in these views. The turbines have been purposefully located so that they do not appear directly juxtaposed with Wood Cairn when viewed from this location but are rather offset to the right (south and west) (See Chapter 3 Design Evolution and Alternatives). As Figure 6.14b demonstrates, this ensures that the cairns are not dominated in these views by the Proposed Development turbines and that their intervisibility and the ability to appreciate their prominent locations is maintained. Furthermore, the turbines would not diminish the ability to understand the relationship between the High Eldrig cairn and other elements of the prehistoric landscape on the upland plateau. The Proposed Development turbines, although located in relatively close proximity to High Eldrig cairn, would be set outwith the area of prehistoric occupation. It is considered that the Proposed Development, as a result of its height and proximity would alter the baseline setting of the asset in a way that would impact the ability to understand and appreciate the contribution that setting makes to the overall significance of the asset to a degree; this by virtue of the fact that they could be distracting features in the vicinity. However, overall it is considered that the cultural significance of the assets in its current setting would remain legible. Therefore, the magnitude of impact would be **Medium**, the resulting effect would be **Moderate** and significant. As the changes would not materially erode key characteristics of setting, as defined above, and the relationship of High Eldrig Cairn to its setting would remain legible, the contribution that setting makes to the significance of the asset still being readily understood, it is judged that the integrity of the setting of the asset would remain intact.

White Cairn, High Airies (Site 322)

6.4.38 The White Cairn, High Airies (Site 322) is situated 1.6 km from the nearest Proposed Development turbine. An intact burial cairn dating from the Early Bronze Age to the Late Bronze Age, White Cairn is set amid lower lying land to the southeast of the summit of the hill of Eldrig Fell. It sits on a slight swelling on the lower, eastern side of a northern spur of

Meikle Cairn and overlooks land which slopes down to the east towards the Black Burn. Key views would have been over lower lying land to the east. A hut circle (Site 320) is located to the southeast. The existing wind turbines of Airies Wind Farm are located to the east, north and south of the cairn, with the closest wind turbine at a distance of 162 m. The cairn was clearly set in a location to provide views over and to be seen from land to the east, however the Airies turbines have compromised the ability of the cairn's setting to contribute to an understanding, appreciation and experience of it. This is because of their very close location to the cairn and their immediate presence in views east. On this basis the cairn is considered to have Medium relative sensitivity to its setting.

6.4.39 The ZTV (Figures 6.4a and 6.4b) indicates that 11 to 12 turbines would be visible to hub height from the cairn (Site 322) itself. When viewed from the east and southeast (and from within about 1 km) visibility of Proposed Development turbines behind the cairn would be variable as the turbines of the Proposed Development would be partially screened by the slopes near Elridg Fell within the Site. Visibility from the east would range from no visibility in areas to the northeast of High Aries Farmstead (Site 321) to full visibility in the areas directly east of the cairn at a distance of about 200 m, however Airies turbines would be located in the immediate vicinity of any observer in this view. At this point the Proposed Development turbines would be visible at a distance of 1.8 km. While turbines would be visible in views of the cairn from the east, the intervening distance from these locations would mean that the prominence of the cairn over the land sloping down to the east would remain appreciable, insofar as this is still appreciable in the context of the Airies turbines. The Proposed Development would not impinge upon views to the east from the cairn which has already been compromised by the Airies turbines. On this basis it is not considered that the Proposed Development would form an impact such that there would be an affect upon an ability to understand, appreciate and experience the contribution that setting makes to the overall significance of the asset. Therefore, the magnitude of impact would be **Low**, the resulting effect would be **Minor** and not significant.

East Rhins Archaeologically Sensitive Area

6.4.40 The East Rhins Archaeologically Sensitive Area has been divided into specific geographic areas as part of this assessment to focus and simplify discuss. These areas and the assets within them have been subjected to detailed assessment within Technical Appendix 6.1 where overall a **Minor** level effect, which is not significant is predicted.

Potential Decommissioning Effects

6.4.41 In the event of decommissioning, or replacement of turbines, it is anticipated that the levels of direct effect would be similar but of a lesser level than those predicted during construction. This is on the assumption that works would take place within the construction footprint, would require less ground breaking and any archaeology within the construction footprint would have been recorded and removed previously. Decommissioning would be undertaken in line with best practice processes and methods at that time and would be managed through an agreed Decommissioning Environmental Management Plan.

6.4.42 In the event of decommissioning, all operational effects upon the settings of heritage assets would be reversed with the removal of the turbines, leading to a neutral effect.

Potential Cumulative Construction Effects

6.4.43 Archaeological remains are by their very nature an irreplaceable resource and are subject to threats both within and outwith the planning system. The range of non-development

threats is broad and includes deterioration of upstanding structural remains through natural weathering and erosion. In terms of the Site, loss resulting from ongoing forestry operations is also possible. Any archaeological remains which may be present on the Site need to be understood within this context of gradual loss which occurs on an local, regional and national scale. Archaeological investigations allow any loss to be controlled through programmes of recording, sampling and analysis. The consequence of this is that where direct impacts occur through either development or academic research, then our understanding of these assets is enhanced, and the results of these investigations inform our knowledge of the past. Indeed, our understanding of archaeological heritage in Dumfries and Galloway and Scotland on the whole is itself the cumulative product of the results of numerous investigations undertaken over many generations. Any direct impacts which may result from the Proposed Development would be addressed through the detailed programme of mitigation that is set out below in Section 6.5. Proposed mitigation includes comprehensive investigations should this be required, the results of which would contribute to our overall understanding of Dumfries and Galloway's past and therefore create a beneficial cumulative legacy. The significance of the cumulative effect on archaeology during construction, combined with other developments or causes of loss would thus be **Negligible** and not significant. As such this assessment will focus on the likely significant cumulative effects upon the setting of heritage assets which have the potential to occur during the operational phase.

Potential Cumulative Operational Effects

Wood Cairn (Site 242)

6.4.44 The current cumulative baseline includes the operational wind farms at Airies to the southeast, Balmurrie Fell, Artfield Fell and Glenchamber to the southwest and Kilgallioch to the northwest (Figure 6.8). As such turbines are already found in the setting of Wood Cairn and encircle it albeit with gaps to the south and northeast. In considering the cumulative effect of adding the Proposed Development to operational wind farms it is noted that the Proposed Development would bring further encirclement and result in turbines being located in closer proximity to the cairn, 1.1 km at the closest. However, as per the discussion of the impacts upon Wood Cairn, resulting from the Proposed Development itself, set out above in Paragraphs 6.4.10 to 6.4.15, the Proposed Development has been carefully designed to be set off to the west of Wood Cairn, ensuring that the turbines would not be seen directly behind it when viewed from the prehistoric assets on the upland plateau and ensuring that the cairn's elevated position above the Tarf Water valley is still appreciable (see Figure 6.12 and 6.13). On this basis the cumulative effects of adding the Proposed Development to the operational turbines is judged not to exceed the effects of the Proposed Development on its own. They are judged to be **Moderate** and significant.

6.4.45 Consideration must also be given to the effects of adding the Proposed Development to the future cumulative baseline which would also include the In Planning Kilgallioch Extension and the In Scoping Airies II. While there is less certainty about Airies II it has been included for the reasons given Paragraph 6.2.3. In this scenario further turbines, of the In Planning Kilgallioch Extension would be located to the northwest of Wood Cairn and would be set amongst the non-designated prehistoric assets on the upland plateau. The Kilgallioch Extension turbines would be seen in views from Wood Cairn towards these broadly contemporary assets and at least one turbine, lying within 0.92 km, would be located directly southeast of the non-designated assets on the upland plateau and would intervene in views between Wood Cairn and these assets, affecting a key characteristic of setting. The

addition of the In Scoping Airies II turbines would see further encirclement of the asset with views to the south including turbines and would leave only views to the northeast without. The Airies turbines, which are currently pre-application and therefore could be subject to change, would also be located in very close proximity to Wood Cairn with the nearest turbine being located 310 m to the southwest and further turbines being located at 520 m and 552 m to the northwest and southeast respectively. These turbines would be located between the cairn and the upland plateau and would be located on High Eldrig hill itself, supplanting the cairn as the dominant man-made feature in this topographical location. In this instance it is possible that integrity of setting would be adversely affected as the turbines would affect the ability to understand the prominent siting of the cairn overlooking the upland plateau to the northwest and the lower lying land of the Tarf Valley to the west and southwest. The proposed turbines of Kilgallioch Extension and Airies II would sever the relationship between Wood Cairn and the prehistoric assets on the upland plateau. As such the key characteristics of the asset's setting would be eroded and integrity of its setting adversely affected. The addition of the Proposed Development to the operational, In Planning and In Scoping turbines would see further turbines fill in the gaps between the operational turbines and Kilgallioch Extension and Airies II. However, they would be seen behind the Airies II turbines and would be unlikely to further elevate the impact that Airies II would be having on its own. On this basis and in this scenario, the magnitude of impact of adding the Proposed Development turbines to a theoretical baseline, which includes the operational turbines, Kilgallioch Extension and Airies II, would be **Low** and the level of cumulative effect would be **Minor** and not significant.

6.4.46 While the above is likely in a scenario that includes both Kilgallioch Extension and Airies II or indeed Airies on its own, it is noted that if the Proposed Development were to be added to Kilgallioch Extension on its own, the effect of adding the Proposed Development would be greater. This is because it would be the Proposed Development causing further encirclement of the cairn. This encirclement could affect the ability to understand the prominent siting of the cairn overlooking the upland plateau to the northwest and the lower lying land of the Tarf Valley to west and southwest. On this basis and considering a scenario where Proposed Development would be added to Kilgallioch Extension the impact has the potential to be **Medium**, this would result in a **Moderate** cumulative effect which is significant.

6.4.47 The in combination effect of all the operational and proposed wind farms discussed above has the potential to result in **High** magnitude impacts and **Major** and significant cumulative effects. However, it is noted that the key characteristics of the setting of Wood Cairn would mainly be affected by Kilgallioch Extension and Airies II which would adversely impact upon the key characteristics of the cairn's setting. The integrity of the asset's setting has the potential to be adversely affected for the reasons set out above, as such in this scenario regard may require to be had to paragraph 145 of SPP.

Laggangarn Standing Stones (Site 221)

6.4.48 The current cumulative baseline includes the operational Kilgallioch Wind Farm which surrounds the asset to its north, west and south. The closest operational turbine is located 639 m to the west. The operational turbines at Balmurrie Fell, Artfield Fell and Airies do not currently contribute to impacts upon the standing stones as they are not visible beyond the forestry which surrounds the asset. Given the asset's current setting it is not judged that the addition of the Proposed Development to the operational turbines would result in any

greater impact than has been predicted for the Proposed Development on its own and **Minor** level cumulative effect is predicted.

6.4.49 Consideration must also be given to a theoretical and future cumulative baseline scenario which includes not only the operational turbines but also the In Planning Kilgallioch Extension and the In Scoping Airies II. In this scenario, the Proposed Development turbines would be seen to the south of the proposed Kilgallioch Extension. Introducing additional turbines behind Kilgallioch Extension would not materially increase the impact being caused by Kilgallioch Extension on its own. Adding the Proposed Development in this view would not further affect the ability to understand and appreciate the contribution that setting makes to the asset's overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting cumulative effect would be **Minor** and not significant.

Wells of the Rees, wells 500 m NNE of Kilgallioch, (Site 222)

6.4.1 The current cumulative baseline includes the operational Kilgallioch Wind Farm which surrounds the asset to its north and west. The closest operational turbine is located 489 m to the north. The operational turbines at Balmurrie Fell, Artfield Fell and Airies do not currently contribute to impacts upon the asset as they are not visible beyond the forestry which surrounds the asset. Given the asset's current setting it is not judged that the addition of the Proposed Development to the operational turbines would result in any greater impact than has been predicted for the Proposed Development on its own and **Minor** level cumulative effect is predicted.

6.4.2 Consideration must also be given to a theoretical and future cumulative baseline scenario which includes not only the operational turbines but also the In Planning Kilgallioch Extension and the In Scoping Airies II. The additional Proposed Development turbines would be seen to the south of the proposed Kilgallioch Extension. Introducing additional turbines behind Kilgallioch Windfarm extension would not materially increase the impact being caused by Kilgallioch Extension on its own. Adding the Proposed Development in this view would not further affect the ability to understand, appreciate and experience the contribution that setting makes to the asset's overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting cumulative effect would be **Minor** and not significant.

Caves of Kilhern Chambered Cairn (Site 229)

6.4.3 The current cumulative baseline includes the operational wind farms at Glenchamber, Artfield Fell, Balmurrie Fell and Kilgallioch as well as the operational turbines at Carscreugh. These wind farms effectively run in a north to south alignment between the asset and the Proposed Development. The Proposed Development would largely be seen behind the operational Balmurrie and Artfield turbines when viewed from the Caves of Kilhern Chambered Cairn (Site 229) as indicated in Figure 6.17a. The Proposed Development turbines would largely be screened by the landforms of Balmurrie and Artfield Fell and they would not materially increase the horizontal spread of turbines beyond Balmurrie. Introducing additional turbines behind the operational Balmurrie Fell and Artfield Fell windfarms would not affect the ability to understand the contribution that setting makes to the asset's overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting cumulative effect would be **Minor** and not significant. The impact of adding the Proposed Development would not be further increased if in In planning and In Scoping schemes are also taken into consideration as part of the theoretical future baseline.

Bennan of Garvilland fort (Site 225)

The current cumulative baseline includes the operational wind farm at Glenchamber which is located within 1.04 km to the north. Beyond this the Artfield Fell turbines are visible and those of Balmurrie Fell and Kilgallioch are visible to the north (see Figure 6.10). The Proposed Development would be visible beyond the Glenchamber and Artfield Fell turbines and would not materially increase the horizontal spread of turbines present in this view. Introducing further turbines beyond the operational Glenchamber and Artfield Fell turbines would not affect the ability to understand, appreciate and experience the contribution that setting makes to the asset's overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting cumulative effect would be **Minor** and not significant. The impact of adding the Proposed Development would not be further increased if In Planning and In Scoping schemes are also taken into consideration as part of the theoretical future baseline.

Cairn na Gath burial cairn (Site 226, List No. SM1928).

6.4.4 The current cumulative baseline includes the operational wind farms at Balmurrie Fell and Artfield Fell. The nearest Balmurrie Fell turbines is located 565 m to the west of the cairn. The Kilgallioch turbines are visible at greater distance, 1.37 km, to the north. The Proposed Development would increase the number turbines that are seen to the east of the Scheduled Monument of the Cairn na Gath burial cairn (Site 226, List No. SM1928), though these would not be located in any key views as outlined in Paragraph 6.4.28 above. The introduction of the Proposed Development turbines in the northwest of the Site would add more turbines to the views northeast from the asset beyond the ridgelines of Balmurrie Fell and Balmurrie Fell windfarm, extending the horizontal spread of turbines in views from the asset to the east and northeast. In a scenario which also includes the In Planning Kilgallioch Extension and In Scoping Airies II, Airies II will not be visible and therefore not add to the cumulative effects. Kilgallioch Extension would increase the horizontal spread of the turbines south of the Kilgallioch turbines. Together the Proposed Development turbines and those of Kilgallioch Extension would add turbines in views to the northeast, between operational turbines, in an area which is currently without turbines. While there would be an increase in the horizontal spread of turbines in views to the east and northeast these turbines would not impact key views to the north, south and southwest. As such it is not considered that the additive or in combination effects of adding the Proposed Development to the cumulative baseline would increase the impact beyond that predicted for the Proposed Development itself. A **Minor** level cumulative effect is predicted.

High Eldrig Cairn (Site 328)

The current cumulative baseline includes the operational wind farms at Airies to the southeast, Balmurrie Fell, Artfield Fell and Glenchamber to the southwest and Kilgallioch to the northwest (Figure 6.8). As such turbines are already found in the setting of High Eldrig cairn and encircle it albeit with gaps to the south and northeast. In considering the cumulative effect of adding the Proposed Development to operational wind farms it is noted that the Proposed Development would bring further encirclement and result in turbines being located in closer proximity to the cairn, 0.93 km at the closest. However, as per the discussion of the impacts upon High Eldrig cairn, resulting from the Proposed Development itself, set out above in Paragraphs 6.4.36 to 6.4.37, the Proposed Development would not be seen behind Wood Cairn in views from High Eldrig and would not intervene between High Eldrig cairn other broadly contemporary monuments on the plateau. On this basis the

cumulative effects of adding the Proposed Development to the operational turbines is judged not to exceed the effects of the Proposed Development on its own. They are judged to be **Moderate** and significant.

6.4.5 Consideration must also be given to the effects of adding the Proposed Development to the future cumulative baseline which would also include the In Planning Kilgallioch Extension and the In Scoping Airies II. In this scenario turbines of the In Planning Kilgallioch Extension would be located around High Eldrig cairn and within 181 m of it and would intervene between the asset and the other prehistoric remains on the upland plateau. The Airies II turbines would be located within 670 m and would be intervene in views of Wood Cairn from High Eldrig cairn. Kilgallioch Extension and Airies II, on their own or in combination, would have significant effects upon High Eldrig cairn and as they have the potential to affect key characteristics of the asset's setting could have an adverse effect on integrity of setting. In this scenario, the Proposed Development would be seen in the context of, and in most cases beyond, the much closer Kilgallioch Extension and Airies II turbines. Introducing additional turbines in this scenario would not materially increase the impact upon the setting of this asset. The impacts in a cumulative scenario would primarily be derived from impacts from Kilgallioch Extension and the proposed Airies II. On this basis adding the Proposed Development to the theoretical cumulative baseline would result in a **Low** magnitude cumulative impact resulting in **Minor** level of cumulative effect which is not significant.

6.4.6 The above is likely in a scenario that includes both Kilgallioch Extension and Airies II, and indeed likely to be the case for Airies II on its own given the proposed location of turbines in relation to the High Eldrig and Wood Cairn. However, it is noted that if the Proposed Development were to be added to Kilgallioch Extension on its own, the effect of adding the Proposed Development would be greater. This is because it would be the Proposed Development causing further encirclement of the cairnin combination with Kilgallioch Extension.

6.4.7 The in combination effect of all the operational and proposed wind farms discussed above has the potential to result in **High** magnitude impacts and **Major** and significant cumulative effects. However, it is noted that the key characteristics of the setting of High Eldrig cairn would mainly be affected by Kilgallioch Extension and Airies II which adversely impact upon the key characteristics of the cairn's setting. The integrity of the asset's setting has the potential to be adversely affected for the reasons set out above in 6.4.52.[57].

White Cairn, High Airies (Site 322)

6.4.8 The current cumulative baseline includes Airies wind farm which surrounds the cairn and turbines are located within 162 m. These Airies turbines are located in key views to the east of the monument and seen in views of the cairn from the east. The Proposed Development would be seen beyond the Airies turbines. If the cumulative scenario also includes the In Scoping Airies II these turbines would also be located between the cairn and the Proposed Development. Introducing additional turbines behind Airies wind farm and proposed Airies II turbines would not materially increase the impact upon the setting of this asset. The impacts in a cumulative scenario would primarily be derived from the impacts of the proposed Airies II which would, together with the operational Airies turbines, surround the cairn. On this basis adding the Proposed Development to the theoretical cumulative

[57] Scottish Government (2020). Scottish Planning Policy. Available at: https://www.gov.scot/publications/scottish-planning-policy

baseline, which includes Airies and Airies II would result in a **Low** magnitude cumulative impact resulting in **Minor** level of cumulative effect which is not significant.

Post-medieval assets to the north of the Proposed Development

6.4.9 The Dirvannie Township (Site 276), High Eldrig Farmstead (Site 329), the Monandie Farmstead (Site 326) , the Craigmoddie Farmstead (Site 407) and the Dirvachlie Farmstead (Site 427) are considered as a group for cumulative effects as their setting primarily relates to the agricultural landscape to the north of the Proposed Development. The current cumulative baseline for these assets includes the operational Kilgallioch wind farm to the west, as well as the operational wind farms of Artfield Fell and Balmurrie Fell to the southwest and Airies to the southeast. In planning Kilgallioch Extension and Airies II turbines would be located on the High Eldrig hill and on the upland plateau that forms the setting of these assets. Adding the Proposed Development turbines to the current operational turbines would not increase the level of effect beyond that predicted for the Proposed Development itself. Further introducing the Proposed Development turbines behind the proposed Kilgallioch Extension and the proposed Airies II windfarm would not affect the ability to understand and appreciate the agricultural setting of these farmsteads and the contribution that it makes to the assets' overall significance. It is considered that there would be a **Low** magnitude of impact, the resulting cumulative effect would be **Minor** and not significant.

East Rhins ASA

6.4.10 The theoretical cumulative baseline includes the operational Arecleough, Kilgallioch, Balmurrie Fell, Artfield Fell, Carscreugh and Glenchamber as well as the consented Chirmorie. The East Rhins ASA is located to west of the Proposed Development and the operational wind farms of Kilgallioch, Balmurrie Fell, Artfield Fell and Glenchamber largely already intervene between the ASA and the assets therein and the Proposed Development. This is also true for the In Planning Kilgallioch Extension and Airies II which would be seen behind Kilgallioch, Balmurrie Fell and Artfield Fell. As such the Proposed Development turbines will be seen in views which already contain turbines. They will be seen behind these turbines and as such they will not materially alter the current setting of the ASA or assets therein. On this basis the impact of adding the Proposed Development turbines to the cumulative baseline is considered to result in a **Low** magnitude impact and a **Minor** cumulative effect which would not be significant.

6.5 Mitigation

6.5.1 National and local planning policies and planning guidance require a mitigation response that is designed to take cognisance of the possible impacts upon heritage assets by a proposed development and avoid, minimise or offset any such impacts as appropriate. The planning guidance expresses a general presumption in favour of preserving heritage remains in situ. Their 'preservation by record' (i.e. through excavation and recording, followed by analysis and publication, by qualified archaeologists) is a less desirable alternative.

6.5.2 It is acknowledged that despite the walkover survey undertaken to inform this assessment, there may be further previously unrecorded subtle archaeological features within the Site or hitherto unknown buried remains. Given the presence of known assets and the potential for presently unknown archaeological remains, in particular of post-medieval date, to survive within the Site, a programme of archaeological works would be undertaken prior to the commencement of construction and during the construction of the Proposed Development.

Mitigation during Construction

Protection of Archaeological Sites

6.5.3 Following tree felling but prior to the commencement of construction further walkover survey would be undertaken in the areas of previously recorded remains which would be impacted by the Proposed Development as outlined in Table 6.7. The aim of these further surveys would be to establish the extent of survival of the assets in question. The results should be reported on in a Walkover Survey report and would be used to inform the Written Scheme of Investigation for the Archaeological Watching Brief (see below).

6.5.4 Elements of these assets which would not be directly impacted upon would be demarcated prior to construction commencing so that inadvertent damage by plant movement is avoided. The Hay Ree at The Torr (Site 294) would also be demarcated where it is found to survive to ensure that the Borrow Pit Extraction Area does not encroach upon its remains.

Archaeological Watching Brief

6.5.5 An Archaeological Watching Brief would be maintained on ground breaking works which are predicted to cross or be located immediately adjacent to archaeological remains as outlined in Table 6.7. A Watching Brief would also be maintained on a proportion of all other ground breaking works to assess the potential for hitherto unrecorded buried archaeological remains to survive on the Site. The aim of the Watching Brief would be to identify any archaeological remains threatened by the Proposed Development, to assess their significance and to mitigate any impact upon them either through avoidance or, if preservation in situ is not warranted, through preservation by record. If significant archaeological remains are identified during the Watching Brief there is the potential that further works, such as excavation and post-excavation analyses, could be required. Details of mitigation would be agreed with DGC in consultation with the Dumfries and Galloway Archaeology Service through a Written Scheme of Investigation (WSI).

Mitigation during Operation

6.5.6 The Landscape and Visual Assessment (Chapter 5) discusses the measures taken to reduce the appearance or visual presence of the turbines within the wider landscape. The Proposed Development has been designed to present a clearly structured, balanced arrangement which responds positively to key landscape features and local topography. In particular and as set out in Chapter 3, the design has considered the presence and setting of the Scheduled Wood Cairn (Site 242) and sought to reduce impacts upon the setting of it, particularly by placing turbines to avoid them being seen directly behind the cairn in views from the broadly contemporary monuments at High Eldrig, which forms a key characteristic of its setting.

Mitigation during Decommissioning

6.5.7 Where decommissioning activities will take place fully within the construction footprint it is anticipated that assets which required demarcating during construction would require this again. The aim would be to avoid inadvertent damage by plant movement. No Watching Brief would be required on ground breaking works within the construction footprint during decommissioning. If ground breaking works were required outwith the construction footprint these maybe subject to further monitoring via a Watching Brief in line with Paragraph 6.5.5 above.

6.5.8 Decommissioning would be undertaken in line with an agreed Decommissioning Environmental Management Plan which would adhere to best practice at the time of decommissioning.

6.6 Assessment of Residual Effects

Residual Construction Effects

6.6.1 The Proposed Development has been designed, where possible, to avoid direct impacts on known heritage assets. The implementation of the above outlined mitigation measures would prevent inadvertent damage to known heritage assets; allow for recording of peripheral deposits associated with known remains and investigate the potential for previously unknown assets. Following the completion of construction no further groundworks would be undertaken. Mitigation would allow for the detailed recording of any remains encountered during the construction phase and the results would therefore enhance our understanding of the areas archaeological heritage. The only direct effects on known heritage assets would be on non-designated assets with a negligible to medium sensitivity and the magnitude of impact would not exceed Low in each case. On the basis that mitigation measures would be employed and would allow for recording of elements of assets which would be removed there would be minimal loss of information content and the effects would be **Negligible** and not significant. Potential effects on unknown and previously unrecorded buried remains cannot be predicted at this stage, although any such impact are also addressed by the proposed mitigation measures.

Residual Operational Effects

6.6.2 The predicted residual effects on the settings of designated heritage assets would be the same as assessed for the operational and cumulative effects. This assessment has found the potential for significant residual effects upon the setting of two heritage assets: the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig Cairn (Site 328).

6.6.3 No other significant residual operational effects are anticipated.

Residual Decommissioning Effects

6.6.4 No direct effects are anticipated to arise from decommissioning provided works are contained within the construction footprint. Demarcation of archaeological assets in close proximity to working areas would ensure that accidental damage resulting from plant movement is avoided.

6.6.5 All operational effects upon the settings of designated assets would be reversed with the removal of the turbines following decommissioning, leading to a neutral residual effect.

Residual Cumulative Construction Effects

6.6.6 Cumulative effects relating to cultural heritage are for the most part limited to effects upon the settings of heritage assets. While there can, in some rare cases, be cumulative direct effects, none are anticipated to result from the construction, operation or decommissioning of the Proposed Development. As such this assessment will consider the potential for cumulative effects upon the setting of heritage assets which have the potential to occur during the operational phase.

Residual Cumulative Operational Effects

6.6.7 The predicted residual cumulative effects on the settings of designated heritage assets would be the same as assessed for the operational and cumulative effects. This assessment has found the potential for significant residual effects upon the setting of two heritage assets: the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig cairn (Site 328).

6.6.8 No other significant residual operational effects are anticipated.

6.7 Monitoring

6.7.1 No monitoring is required outwith the measures noted above under Section 6.5 which are to be undertaking during the construction phase.

6.8 Summary

6.8.1 This chapter identifies the archaeological and cultural heritage value of the Site and assesses the potential both for direct and setting effects on heritage assets resulting from the construction, operation and decommissioning of the Proposed Development. This chapter also identifies measures that should be taken to mitigate predicted adverse effects.

6.8.2 Fifteen known heritage assets are within the Site. No significant impacts are expected upon these as the iterative design process has largely allowed for mitigation through avoidance. One **Minor** effect on Site 298 and five **Negligible effects** upon Sites 279, 293, 294, 295 and 296 are expected. The potential for hitherto unknown archaeological remains to survive on Site has been considered and mitigation measures have been suggested to ensure identification, assessment and recording of any such assets as required.

6.8.3 Operational effects include impacts upon the settings of designated assets such as World Heritage Sites, Listed Buildings, Scheduled Monuments, Conservation Areas, Inventoried Battlefields and Inventoried Gardens and Designed Landscapes. Impacts upon setting are a material consideration in the planning process. There are no designated heritage assets within the Site. There are 93 Scheduled Monuments that are within 5 km of the Site. A further 157 Scheduled Monuments are situated between 5 km and 10 km of the Site. There are two Listed Buildings within 1 km of the Site boundary, three Category B Listed Buildings and three Category C Listed Buildings within 5 km of the Site boundary and a further four Category A Listed Buildings are located between 5 km and 10 km of the Site boundary. The eastern boundary of New Luce Conservation Area (Site 262) is within 5 km of the Site boundary. There are no Inventory Gardens and Designed Landscapes and no Historic Battlefields within 10 km of the Site boundary. The Dumfries and Galloway HER lists the Torwood House Policies 19th century Landscape Park, 960 m to the south of the Site boundary as being of Regional Importance. A further 84 sites within 10 km of the Site boundary are non-statutory heritage assets which the Dumfries and Galloway Archaeology Service consider to be of National Importance.

This assessment has identified two Moderate and significant effects upon heritage assets resulting from the Operational Phase of the Proposed Development. These would result from impacts upon the settings of the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig Cairn (Site 328). Significant cumulative effects are also expected upon Wood Cairn (Site 242) and High Eldrig cairn (Site 328). In a currently theoretical situation where the cumulative scenario includes the Proposed Development along with the

proposed Kilgallioch Extension and proposed Airies II, the cumulative impact may affect the integrity of the setting of Wood Cairn and High Eldrig cairn, though it is noted that the most harmful effects would result from Kilgallioch Extension and Airies II.

Table 6.8: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Construction			
Non-significant effects upon known heritage assets. (Sites 279, 293, 294, 295, 296 and 298)	Walkover survey following felling but prior to commencement of construction to identify the extent of survival of known remains and demarcating of remains if required. Watching brief on ground breaking works which will cross or be located in the vicinity of these assets.	Planning Condition with scope agreed by Written Scheme of Investigation	Ensure avoidance of inadvertent damage to heritage assets and recording of remains where assets are to be removed will ensure preservation by record leading to minimal loss of information content and **Negligible** effects.
Possible significant effects upon hitherto unknown archaeological remains.	Walkover survey following felling but prior to commencement of construction to identify the extent of survival of known remains and demarcating of remains if required. Watching brief on ground breaking works which will cross or be located in the vicinity of these assets.	Planning Condition with scope agreed by Written Scheme of Investigation	Ensure avoidance of inadvertent damage to heritage assets and recording of remains where assets are to be removed will ensure preservation by record leading to minimal loss of information content and **Negligible** effects.
Operation			
Significant effects upon the settings of the Scheduled Wood Cairn (Site 242) and non-designated High Eldrig Cairn (Site 328).	N/A	N/A	Significant effects upon the settings of the Scheduled Wood Cairn (Site 242) and non-designated High Eldrig Cairn (Site 328).
Cumulative Operation			
Significant effects upon the settings of the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig cairn (Site 328).	N/A	N/A	Significant effects upon the settings of the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig Cairn (Site 328).

7 Ecology

7.1 Introduction

7.1.1 This chapter considers the likely significant effects on important ecological receptors associated with the construction, operation and decommissioning of the Proposed Development.

7.1.2 The assessment is based upon comprehensive baseline data, comprising specifically targeted ecological field surveys of important and legally protected ecological receptors identified during desk study and consultation feedback. It draws on pre-existing information, where appropriate, from other studies, survey data sources and is based on the Guidelines for Ecological Impact Assessment (EcIA) in the United Kingdom (CIEEM, 2018[1]) and NatureScot's[2] Environmental Impact Assessment Handbook[3].

7.1.3 The specific objectives of the chapter are to:

- describe the ecological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

7.1.4 The assessment has been carried out by Avian Ecology Ltd. Lead authors: Mr Howard Fearn MSc MCIEEM, Director and Ms Stacey Whiteley BSc (Hons) MCIEEM, Senior Ecologist. Mr Fearn and Ms Whiteley have over 15 and 10 years' experience respectively as professional ecologists, specialising in renewable energy developments. Both Mr Fearn and Ms Whiteley have contributed to, and led on, many large scale renewable energy projects in Scotland, including numerous wind energy projects (refer to Volume 4: Technical Appendix 1.2)

7.1.5 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 7.1: Ecological Statutory Designated Sites for Nature Conservation;
  - Figure 7.2: Phase 1 Habitat Plan;
  - Figure 7.3: National Vegetation Classification Plan;
  - Figure 7.4: Protected and Notable Flora Records;
  - Figure 7.5: Existing Terrestrial Mammal Records;
  - Figure 7.6: Terrestrial Mammal Survey Results;
  - Figure 7.7: Bat Activity Survey Plan;
  - Figure 7.8: Bat Activity Survey Results;
  - Figure 7.9: Electrofishing Records; and
  - Figure 7.10: Fish Habitat Survey Sample Points and Results.
- Volume 4: Technical Appendices

[1] CIEEM (2018, updated 2019) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester

[2] NatureScot is the operating name of Scottish Natural Heritage (SNH)

[3] Scottish Natural Heritage (2014, updated 2018) Environmental Impact Assessment Handbook. V5.

- Technical Appendix 7.1: Habitats and Vegetation;
- Technical Appendix 7.2: Protected Species;
- Technical Appendix 7.3: Outline Habitat Management Plan (HMP); and
- Technical Appendix 7.4: Information to Inform a Habitats Regulations Appraisal (HRA).

7.1.6 Figures and technical appendices are referenced in the text where relevant.

7.1.7 The Site is defined by the red line site boundary shown on Figure 7.1: Ecological Statutory Designated Sites in Volume 3a of the EIA Report.

7.2 Assessment Methodology and Significance Criteria

Scope of Assessment

7.2.1 The assessment presented within this Chapter has been undertaken in accordance with CIEEM guidelines (CIEEM, 2018[1]) and considers the following main potential impacts upon ecological receptors associated with construction, operation and decommissioning of the Proposed Development:

- Habitat Loss/ Deterioration - direct and indirect loss and deterioration of habitats;
- Mortality/ loss of life - incidental loss of life or injury through construction activities to species; and
- Disturbance/ Displacement of Species - disturbance and displacement of faunal species; loss, damage or disturbance to their breeding and/ or resting places.

7.2.2 The potential effects are considered as a result of the Proposed Development alone and cumulatively, in-combination with other wind turbine developments.

7.2.3 CIEEM guidelines (2018[1]) stipulate that it is not necessary to carry out a detailed assessment of impacts upon ecological receptors that are sufficiently widespread, unthreatened and resilient to impacts of the Proposed Development. As such, the assessment considers effects upon designated sites and ecological receptors which are considered important on the basis of relevant guidance and professional judgement.

7.2.4 Where ecological receptors are not considered so important as to warrant a detailed assessment, or where they would not be significantly affected on the basis of baseline information, these are 'scoped out' of the assessment. Mitigation measures for such receptors may however, still be outlined as appropriate to reduce and/ or avoid any potentially adverse effects or to ensure legislative compliance.

7.2.5 The assessment has been undertaken in recognition of design evolution and embedded mitigation measures, as detailed in full within Chapter 2: Development Description and Chapter 3: Design Evolution and Alternatives (EIA Report Volume 2) and standard practices and construction environmental management included within the outline Construction Environmental Management Plan (CEMP) (EIA Report Volume 4: Technical Appendix 2.1: CEMP).

7.2.6 The scope of the assessment has been informed by consultation responses summarised in Table 7.1 and the following key legislation, planning policy and guidance:

European

- Environmental Impact Assessment (EIA) Directive (85/337/EEC) (as amended)[4]; and,
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive')[5].

National

- Article 17 Habitats Directive Report 2019: Species Conservation Status Assessment: 2019 (JNCC, 2019[6]);
- Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012[7]);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition (Collins, 2016[8]);
- Bat surveys: Good Practice Guidance 2nd edition (Hundt, 2012[9]);
- Bats and onshore wind turbines: survey, assessment and mitigation (SNH, 2019a[10]);
- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended for Scotland) (the 'Habitat Regulations')[11];
- Good Practice During Wind Farm Construction (SNH, 2019[12]);
- Guidance on Assessing the Impacts of Groundwater Abstractions and Groundwater Dependant Terrestrial Ecosystems (GWDTEs) (Scottish Environmental Protection Agency (SEPA) 2017[13]);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018[1]);
- General pre-application and scoping advice for onshore wind farms (NatureScot, 2020[14]);
- NatureScot Carbon and Peatland map (2016[15]);
- Scottish Biodiversity List (SBL) (Scottish Government, 2020[16]);

[4] Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, and subsequently amended

5 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

[6] JNCC (2019) The UK Approach to assessing Conservation Status for the 2019

Article 17 reporting under the EU Habitats Directive. Joint Nature Conservation Committee,

Peterborough. Available to download from https://jncc.gov.uk/article17 [accessed May 2020].

7 SNH (2012) Assessing the cumulative impact of onshore wind energy developments. SNH, Inverness.

8 Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition. Bat Conservation Trust, London.

9 Hundt (2012) Bat Surveys: Good Practice Guidelines 2nd edition. Bat Conservation Trust, London.

10 SNH (2019) Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation. Joint Publication with SNH, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust (BCT)

11 The Conservation (Natural Habitats, &c.) Regulations 1994.

12 SNH (2019) Good Practice During Wind Farm Construction. SNH, Inverness.

13 SEPA (2017) Guidance on Assessing the Impacts of Groundwater Abstractions and Groundwater Dependant Terrestrial Ecosystems. SEPA.

14 NatureScot (2020). SNH General Pre-application and/ Scoping Advice to Developers for Onshore Wind Farms. SNH, Inverness.

[15]https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map

16 Scottish Biodiversity List (2020). Published by the Scottish Government at https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list .

- Standing Advice for Planning Consultations – Protected Species: Badger (NatureScot, 2020a[17]);
- Standing Advice for Planning Consultations – Protected Species: Bats (NatureScot, 2020b[18]);
- Standing Advice for Planning Consultations – Protected Species: Freshwater Pearl Mussel (NatureScot, 2020c[19]);
- Standing Advice for Planning Consultations – Protected Species: Great Crested Newt (NatureScot, 2020d[20]);
- Standing Advice for Planning Consultations - Protected Species: Otter (NatureScot, 2020e[21]);
- Standing Advice for Planning Consultations - Protected Species: Pine Marten (NatureScot, 2020f[22]);
- Standing Advice for Planning Consultations - Protected Species: Red Squirrel (NatureScot, 2020g[23]);
- Standing Advice for Planning Consultations - Protected Species: Water Vole (NatureScot, 2020h[24]);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[25];
- The Nature Conservation (Scotland) Act 2004[26];
- The Wildlife and Countryside Act 1981 (as amended in Scotland under the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2011)[27]; and
- The Wildlife and Natural Environment (Scotland) Act 2011[28].

Local

- Dumfries and Galloway Local Biodiversity Action Plan priority species list[29].

Consultation

7.2.7 Table 7.1 summarises the consultation responses received regarding ecology issues, and provides information on where and/ or how they have been addressed in this assessment.

7.2.8 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

17 NatureScot (2020a) Standing Advice for Planning Consultations – Protected Species: Badger. SNH, Inverness.

18 NatureScot (2020b) Standing Advice for Planning Consultations – Protected Species: Bats. SNH, Inverness.

19 NatureScot (2020c) Standing Advice for Planning Consultations – Protected Species: Freshwater Pearl Mussel. SNH, Inverness.

20 NatureScot (2020d) Standing Advice for Planning Consultations – Protected Species: Great Crested Newt. SNH, Inverness.

21 NatureScot (2020e) Standing Advice for Planning Consultations – Protected Species: Otter. SNH, Inverness.

22 NatureScot (2020f) Standing Advice for Planning Consultations – Protected Species: Pine Marten. SNH, Inverness.

23 NatureScot (2020g) Standing Advice for Planning Consultations – Protected Species: Red Squirrel. SNH, Inverness.

24 NatureScot (2020h) Standing Advice for Planning Consultations – Protected Species: Water Vole. SNH, Inverness.

25 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.

26 Nature Conservation (Scotland) Act 2004.

27 The Wildlife and Countryside Act 1981 (as amended in Scotland under the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2011.

28 The Wildlife and Natural Environment (Scotland) Act 2011.

29 https://swseic.org.uk/resources/.

Table 7.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
Dumfries and Galloway Council (DGC)	No response received through Scoping		
Fisheries Management Scotland (FMS)	No response received through Scoping		
Galloway Fisheries Trust (GFT) – 7 June 2020	Scoping Response	GFT requested updated fish habitat and electrofishing surveys on watercourses subject to impact within the Site.	An updated Fish Habitat survey was undertaken in September 2020 by GFT (Technical Appendix 7.2: Protected Species). Survey methodology was agreed with GFT. Electrofishing surveys have not been undertaken to inform the baseline, as agreed with NatureScot (below).
Marine Scotland Science (MSS) – 3 June 2020	Scoping Response	Recommended contacting GFT and Bladnoch District Fisheries Board (BDFB) for information on local fish populations. Recommended fish population surveys in watercourses potentially impacted by the development. Recommended that the assessment includes: • Potential effects on the River Bladnoch SAC and qualifying interest species Atlantic salmon *Salmo salar*; • Acidification through clear-felling on water environments; • Cumulative impacts on water quality and fish populations.	Requests were sent to GFT and BDFB for any records they held. GFT confirmed they held electrofishing survey results for a nearby section of the Tarf Water but have not provided the records following two requests. Fish habitat surveys were undertaken in September 2020, as detailed within Technical Appendix 7.2: Protected Species. Fish population surveys have not been undertaken to inform the assessment as embedded mitigation is considered to be adequate to avoid potentially significant effects, as agreed with NatureScot (below). Baseline is further informed by desk study information from recently completed surveys for the Kilgallioch Extension Wind Farm[35]. See also GFT response, above. Water quality monitoring is proposed within the CEMP (EIA Report Volume 4, Technical Appendix 2.1: CEMP). Chapter 9: Hydrology, Hydrogeology and Geology considers likely significant effects associated with potential exacerbation of the existing high degree of acidification in the Tarf Water.
NatureScot – 25 June 2019	Other - Survey Scoping	NatureScot was approached to discuss the approach to Ecological and Ornithological survey effort in August 2019 (see also Chapter 8: Ornithology).	Surveys were undertaken in accordance with the advice provided (see Technical Appendix 7.1: Habitats and Vegetation and Technical Appendix 7.2: Protected Species).

Table 7.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
NatureScot – 18 June 2020	Scoping Response	With the exception of fisheries and terrestrial mammals, NatureScot agreed with the scope of proposed ecological assessments and surveys. NatureScot agree that the calculation project size and habitat risk is correct and in accordance with their guidance in relation to bats (SNH, 2019)[10]. Further walkover survey for protected mammal species was requested. In relation to the River Bladnoch Special Area of Conservation (SAC), NatureScot confirmed that an HRA, including Appropriate Assessment (AA) is required. The AA should be informed by an updated Fish Habitat Survey and existing baseline information from the Gass Wind Farm[34] electrofishing surveys. NatureScot are in agreement that likely effects could be addressed by the submission of an adequate CEMP/ Pollution Prevention Plan (PPP) and through the appropriate design of any watercourse crossings. The CEMP/ PPP should be in accordance with SEPA guidance[30].	In accordance with NatureScot advice, updated Fish Habitat and Terrestrial Mammal surveys were undertaken in September 2020 (Technical Appendix 7.2: Protected Species). Information to inform a HRA is presented in Technical Appendix 7.4: HRA and includes data from updated 2020 fish habitat surveys and existing desk study information, in accordance with the advice (Technical Appendix 7.2: Protected Species). An outline CEMP is provided in EIA Report Volume 4, Technical Appendix 2.1: CEMP.
Scottish Environmental Protection Agency (SEPA) – 4 June 2020	Scoping Response	Stated key ecological issues that would need to be addressed as: • Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems (GWDTE) and buffers; • Peat depth survey and table detailing re-use proposals; • Map and table detailing forest removal; • Map and Site layout of borrow pits; • Schedule of mitigation including pollution prevention measures; and • Borrow Pit Site Management Plan of pollution prevention measures. SEPA confirmed that habitat	GWDTEs assessed during National Vegetation classification (NVC) survey, as detailed in Technical Appendix 7.1: Habitats and Vegetation. An assessment of potential groundwater dependency is provided in Chapter 9: Hydrology, Hydrogeology and Geology. Peat information (on depth and re-use) is provided in Technical Appendix 2.3 and 2.4. Information regarding forestry removal is provided in Chapter 14: Forestry. Details of pollution prevention measures, Site management plans and associated mitigation is presented in Technical Appendix 2.1: CEMP.

[30] https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

Table 7.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
		survey information is not required for areas which are heavily forested or recently felled.	
Scottish Wildlife Trust	No response was received through Scoping		
South West Scotland Environmental Information Centre (SWSEIC)	Data Request	Ecological records provided.	Included in Technical Appendix 7.1: Habitats and Vegetation and Technical Appendix 7.2: Protected Species.

Potential Effects Scoped-Out

7.2.9 Ecological receptors have been scoped-out of further assessment where there is no potential for significant effects upon the ecological receptor, or where the ecological receptor is not considered important at a local (or below) level, is not a GWDTE or subject to legal protection.

7.2.10 Coniferous plantation woodland has been scoped-out of detailed assessment. This habitat is considered to be of low ecological value, of less than local value and not a potential GWDTE.

7.2.11 On consideration of the desk study and of the extent and nature of the Proposed Development, the following species or species-groups are scoped-out of detailed assessment:

- Invertebrates, amphibians and reptiles – NatureScot (2020[14]) guidance states that there are some species which, with standard mitigation, are unlikely to experience a significant environmental effect during construction/ operations of onshore wind farms (e.g. invertebrates, amphibians, reptiles etc.) and therefore are scoped-out of detailed assessment.
- Roosting Bats – no potential maternity and/ or hibernation/ swarming sites have been identified within at least 200 m plus blade tip of the proposed turbine locations. Therefore, in accordance with NatureScot (SNH, 2019[12]) guidance, effects can be scoped-out.

7.2.12 As per NatureScot (SNH, 2020[12]) guidance, there are some species that with standard mitigation measures, are unlikely to experience significant effects as a result of the Proposed Development (e.g. invertebrates, reptiles and amphibians) and as such, do not require surveys to inform an EIA.

7.2.13 On this basis, baseline surveys for invertebrates, reptiles and amphibians have not been undertaken to inform the design and assessment of the Proposed Development. Mitigation measures to avoid or where otherwise reduce adverse effects and ensure legislative compliance (where applicable) have however, been outlined.

7.2.14 Targeted surveys for red squirrel have not been undertaken as presence has been previously established locally through desk study. With measures to avoid disturbance to red squirrels and/ or damage to dreys during construction works requiring woodland clearance outlined herein, targeted surveys are not required as per NatureScot guidance (2020g[23]).

Method of Baseline Characterisation

Extent of the Study Area

7.2.15 The main Study Area within which baseline information in relation to ecological receptors has been obtained has comprised the Site, extended to 5 km for proximity to designated sites with ecological interest (further extended to 10 km for sites with bats as qualifying interests).

7.2.16 Full details of Study Areas adopted for desk study and field surveys are provided in Volume 4, Technical Appendices 7.1 to 7.4 and illustrated on Volume 3a, Figures 7.1 to 7.10.

Desk Study

7.2.17 A desk study review of existing ecological information was undertaken to:

- Identify the location of designated sites for nature conservation within and within close proximity to the Site;
- identify existing records of protected and/ or notable species and habitats within and within close proximity to the Site;
- identify any factor or receptors that may influence the potential for impacts to ecological receptors as a result of the Proposed Development;
- inform the requirement for further detailed survey; and
- provide context for assessment.

7.2.18 The following key sources were consulted:

- SNH Sitelink[31];
- Scotland's Environment Map[32];
- South West Scotland Environmental Information Centre (SWSEIC);
- Saving Scotland's Red Squirrels[33];
- Galloway Fisheries Trust (GFT);
- NatureScot Carbon and Peatland Map (2016[15]); and
- EIA documentation for the consented (now lapsed) Gass Wind Farm (2014[34]) and Kilgallioch Extension Wind Farm (2019[35]) developments.

7.2.19 EIA documentation for the operational Kilgallioch Wind Farm[36] has also been reviewed with respect to fisheries as the project is located upstream of the Site in the Tarf Water catchment.

7.2.20 Additional peer-reviewed literature and industry guidance is referred to where relevant.

7.2.21 Records of protected and notable species within 5 km of a central grid reference of the Site boundary, and extended to 10 km for bats, were obtained from SWSEIC. For other data sources the search area varied in accordance with the availability and extent of data. Full details and results of the desk study undertaken are provided in Technical Appendices 7.1: Habitats and Vegetation and Technical Appendix 7.2: Protected Species.

[31] https://sitelink.nature.scot/home

[32] https://www.environment.gov.scot/maps/scotlands-environment-map/

[33] https://scottishsquirrels.org.uk/squirrel-sightings/

[34] Sgurr Energy (2014) Gass Wind Farm. ES Chapter 7 Ecology

[35] Scottish Power Renewables (2019) Kilgallioch Extension Wind Farm EIA Report. – Chapter 8 Ecology and Biodiversity

[36] Scottish Power Renewables (2011) Kilgallioch Wind Farm EIA Report: Chapter 9A: Ecology.

Field Survey

7.2.22 Detailed knowledge of habitats and species and the presence or likely presence of protected and notable species has been derived from field surveys.

7.2.23 The following field surveys have been completed:

- Phase 1 Habitat Survey;
- National Vegetation Classification (NVC) survey;
- Terrestrial mammal surveys;
- Bat activity surveys; and
- Fish and freshwater pearl mussel habitat survey.

7.2.24 Table 7.2 provides a summary of field survey methodologies. Full details are presented in Technical Appendix 7.1: Habitats and Vegetation and Technical Appendix 7.2: Protected Species.

7.2.25 All field surveys have been undertaken within the most recently available 18-month survey window prior to submission, as per NatureScot (SNH, 2020[14]) guidance.

Table 7.2: Field Survey Methodologies

Ecological Receptor	Methodology
Habitats and Vegetation	The Study Area comprised all habitats within the Site. A Phase 1 Habitat survey was undertaken on 1 and 2 June 2019, followed up with an additional visit on 2 September 2020. The survey was undertaken in accordance the UK industry standard Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Methodology (JNCC, 2010[37]), extended to include the additional recording of specific receptors indicating the presence, or likely presence, of protected or notable species. A National Vegetation Classification (NVC) survey was subsequently undertaken between 15 and 17 September 2019 following the guiding principles detailed in the NVC: Users' handbook (Rodwell, 2006[38]). Full details are provided in Technical Appendix 7.1: Habitats and Vegetation and presented on Figure 7.2: Phase 1 Habitat Plan and Figure 7.3: NVC Plan. Protected and notable flora records are presented on Figure 7.4: Protected and Notable Flora Records.
Terrestrial Mammals (exc. Bats)	The Study Area comprised all areas of suitable habitat for target species within the Site and out to at least 200 m for otter and water vole, 250 m for pine marten and 100 m for badger. Study Areas are presented on Figure 7.6: Protected Terrestrial Mammal Results. Targeted surveys for terrestrial mammals were undertaken between 12 September and 4 November 2019, followed up with an additional visit on 2 September 2020. Survey effort comprised walkover and camera trap surveys. Target species for survey included otter *Lutra lutra*, water vole *Arvicola amphibius*, pine marten *Martes martes* and badger *Meles meles*. Surveys have been undertaken in accordance with SNH guidance (2020a-i[17],[18],[19],[20],[21],[22],[23],[24]). Full details are provided in Technical Appendix 7.2: Protected Species.
Bats	Study Areas are presented on Figure 7.7: Bat Activity Survey Plan. The Study Area for the ground-level transects comprised the Site and the Study Area for the preliminary roost assessment comprised a 200 m plus blade tip buffer of the proposed turbines. Bat activity surveys were undertaken in 2019 in accordance with NatureScot (SNH,

[37] JNCC (2010). Handbook for Phase 1 Habitat Survey - a technique for environmental audit. Revised Reprint 2010. JNCC, Peterborough

[38] Rodwell, J. S. (2006). National Vegetation Community Users' Handbook. JNCC, Peterborough

Table 7.2: Field Survey Methodologies	
Ecological Receptor	**Methodology**
	2019[10]) guidance. Surveys consisted of ground level activity surveys; 12 static bat detectors were used to sample the spring, summer and autumn periods. A preliminary roost assessment to identify maternity and/ or hibernation/ swarming sites was also completed. Full details are provided in Technical Appendix 7.2: Protected Species.
Fish and freshwater pearl mussel	Study Areas are presented on Figure 7.10: Fish Habitat Survey Sample Points and Results. The Study Area comprised targeted sections of watercourses within and intersecting the Site. A fish habitat survey to identify any areas of critical fish habitats (i.e. spawning, nursery areas, juvenile and adult holding areas) potentially impacted by the Proposed Development was completed in September 2020 following the Scottish Fisheries Co-ordination Centre methodology[39] and with reference to additional species-specific guidance (e.g. in the context of Hendry and Cragg-Hine)[40]. The survey included gradient analysis, habitat mapping and classification and searches for evidence of fish species. Full details are provided in Technical Appendix 7.2: Protected Species.

Criteria for the Assessment of Effects

7.2.26 The assessment has been undertaken in accordance with CIEEM guidelines (2018[1]) and includes the following stages:

- determination and evaluation of important ecological receptors;
- identification and characterisation of impacts;
- outline of mitigating measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures; and
- identification of appropriate compensation measures to offset significant residual effects.

Criteria for Assessing the Sensitivity of Receptors

7.2.27 Relevant European, national and local guidance from governments and specialist organisations has been referred to in order to determine the sensitivity (or importance) of ecological receptors. Reference has also been made to NatureScot's guidance on key ecological receptors when considering the development of onshore wind farms in Scotland (SNH, 2020[41]).

7.2.28 In addition, importance has also been determined using professional judgement and taking account of the results of baseline field and desk study findings and the functional role of receptors within the context of the geographical area.

7.2.29 It should be noted that importance does not necessarily relate to the level of legal protection that a feature receives, and ecological receptors may be important for a variety of reasons, such as their connectivity to a designated site, rarity or the geographical location of species relative to their known range.

7.2.30 For the purposes of this assessment the sensitivity or importance of an ecological feature is considered in the context of a defined geographical area, ranging from International to Local, as detailed in Table 7.3.

[39] https://www.sfcc.co.uk/resources/habitat-surveying.html

40 Hendry, Dr K., Cragg-Hine., Dr D (2003) Restoration of Riverine Salmon Habitats. A Guidance Manual. Environment Agency.

41 SNH (2020) General pre-application and scoping advice for onshore wind farms.

Table 7.3: Sensitivity/ Geographic Scale of Ecological Receptor Importance	
Sensitivity/ Importance	**Definition**
Very High – International	An internationally designated site i.e. Special Area of Conservation (SAC) and/ or Ramsar site or candidate site (cSAC). Large areas of priority habitat listed under Annex I of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource. A regularly occurring, nationally significant population of any internationally important species, listed under Annex II or Annex IV of the Habitats Directive.
High – National	A nationally designated site e.g. Site of Special Scientific Interest (SSSI), or area meeting criteria for national level designations. Significant extents of a priority habitat identified in the Scottish Biodiversity List (SBL), or smaller areas which are essential to maintain the viability of that ecological resource. A regularly occurring, regionally significant population of any nationally important species listed as a SBL priority species and species listed under Schedule 1 or Schedule 5 of the Wildlife and Countryside Actor Annex II or Annex IV of the Habitats Directive.
Medium – Regional	Viable areas of key semi-natural habitat identified in the UKBAP. A regularly occurring, locally significant population of any nationally important species listed on the SBL and species listed under Schedule 5 of the Wildlife and Countryside Act or Annex II or Annex IV of the Habitats Directive. Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including extensive areas of semi-natural woodland.
Low – Local	Other species of local conservation, specifically those listed by the Dumfries and Galloway Local Biodiversity Action Plan (LBAP). Areas of habitat or species considered to appreciably enrich the ecological resource within the local context e.g. species-rich flushes or hedgerows. All other species and habitats that are widespread and common and which are not present in locally, regionally or nationally important numbers or habitats which are considered to be of poor ecological value.

Criteria for Assessing the Magnitude of Change

7.2.31 Once identified, potential effects are described making reference to the following characteristics as appropriate:

- adverse or beneficial;
- extent, magnitude;
- duration;
- timing;
- frequency; and
- reversibility.

7.2.32 The assessment only makes reference to those characteristics relevant to understanding the nature of an effect and determining its significance. For the purposes of this assessment the temporal nature of potential effects are described as follows:

- Negligible: of inconsequential duration;
- Short-term: for 1-5 years;
- Medium-term: for 5-10 years;
- Long-term: >10-30 years; and
- Permanent: >30 years.

7.2.33 The criteria used to determine the magnitude of impacts are set out in Table 7.4.

Table 7.4: Impact Magnitude

Magnitude	Definition
Very High	The effect (either on its own or in-combination with other proposals) may result in the permanent total or almost complete loss of a site and/ or species status or productivity.
High	The effect (either on its own or in-combination with other proposals) may adversely affect the conservation status of a site and/ or species population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/ or the population levels of species of interest.
Medium	The effect (either on its own or in-combination with other proposals) would not adversely affect the conservation status of a site and/ or species, but some element of the functioning might be affected and impacts could potentially affect its ability to sustain some part of itself in the long term.
Low	Neither the above or below applies, but some observable adverse effect is evident on a temporary basis or affects extent of habitat/ species abundance in the local area.
Negligible	A very slight (indiscernible) reduction in a site and/ or species status or productivity and/ or no observable effect.
Beneficial	The effects are considered to be beneficial to a species or sites nature conservation status.

Criteria for Assessing Cumulative Effects

7.2.34 Potentially significant cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location.

7.2.35 For aquatic receptors, potential cumulative effects are likely to be significant only for other developments located relatively close (i.e. within 2 km) and within the same hydrological sub-catchments.

7.2.36 For (non-avian) species potentially significant cumulative effects are only likely where other developments are located within the regular range of more mobile species, e.g. bats. Cumulative impacts have therefore been assessed with reference to NatureScot guidance (SNH, 2019[12]) for bats only.

7.2.37 The cumulative assessment includes consideration of:

- Existing wind farm developments, either operational or under construction;
- Consented wind farm developments, awaiting implementation; and
- Wind farm applications awaiting determination within the planning process with design information in the public domain.

7.2.38 The adjacent Airies II Wind Farm (at Scoping stage) is also included within the cumulative assessment.

7.2.39 Those developments which have been withdrawn and/ or refused are not considered, unless an appeal is currently in progress and information is available.

7.2.40 Whilst single or small scale wind turbine developments may contribute to cumulative effects, these have been scoped-out of assessment as applications for such developments do not generally consider the potential for impacts upon ecological receptors in sufficient detail so as to enable meaningful assessment.

Criteria for Assessing Significance

7.2.41 CIEEM guidelines (2018[1]) note that "A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects have been lawfully permitted following EIA procedures."

7.2.42 For the purposes of this assessment significant effects are therefore identified as those which encompass 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).

7.2.43 Such effects are identified by considering the importance of a feature, the magnitude of the effect and applying professional judgement based on best available evidence, to identify whether the integrity of a feature would be affected.

7.2.44 The term 'integrity' is used here to refer to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

7.2.45 For the purposes of this assessment, significant effects are primarily expressed with reference to an appropriate geographical scale.

7.2.46 In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.

7.2.47 Where the assessment proposes measures to mitigate adverse effects on ecological receptors, a further assessment of residual effects, taking into account such measures, has been undertaken.

7.2.48 CIEEM guidelines (2018[1]) do not recommend the sole use of a matrix table as commonly set out in EIA Report Chapters to determine 'significant' and 'non-significant' effects. For the purposes of this assessment presented herein, Table 7.5 sets out adapted CIEEM terminology and equivalent in the context of the EIA Regulations.

7.2.49 Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 7.5: Effect (EIA Significance)

Significant	Major Adverse/ Beneficial	A medium or high, medium or long-term adverse or beneficial effect upon the integrity of an ecological feature at a National (Scottish) or International level.
	Moderate Adverse/ Beneficial	A high or very high, long-term or permanent adverse or beneficial effect upon the integrity of an ecological feature at a Regional level or above.
Non-significant	Minor Adverse/ Beneficial	A low or medium, short-term or long-term adverse or beneficial effect upon the integrity of an ecological feature at a Regional level or below.
	Negligible/ Beneficial	A negligible or low adverse or beneficial effect upon the integrity of an ecological feature, typically at a site level or below.

Limitations and Assumptions

7.2.50 No limitations to baseline information gathering and subsequent assessment presented herein have been identified.

7.3 Baseline Conditions

Current Baseline

7.3.1 This section provides a summary of baseline ecological conditions in relation to:

- Designated sites for nature conservation;
- Habitats and vegetation;
- Terrestrial mammals;
- Bats;
- Fisheries; and
- Additional species.

7.3.2 Detailed information regarding desk study records and field survey results are presented in Technical Appendix 7.1: Habitats and Vegetation and Technical Appendix 7.2: Protected Species, where relevant.

Designated Sites for Nature Conservation

7.3.3 This section should be read with reference to Figure 7.1: Ecological Statutory Designated Sites for Nature Conservation.

7.3.4 Table 7.6 provides a summary of statutory designated sites with cited ecological interests located within 5 km of the Site, extended to 10 km for sites with bats as a qualifying interest feature. Distances specific within Table 7.6 are measured from the Proposed Development to the designated boundary at its nearest point.

7.3.5 There are no non-statutory designated sites located within 2 km of the Proposed Development.

7.3.6 Sites designated for ornithological interests only are considered separately in Chapter 8: Ornithology.

Table 7.6: Statutory Designated Sites for Nature Conservation

Site Name	Approximate Distance to Proposed Development	Qualifying Interests
River Bladnoch SAC	Within the Site	Atlantic salmon
Kirkcowan Flow SSSI, SAC	1.2 km E	Blanket bog Depressions on peat substrates
Kilhern Moss SSSI, SAC	4.2 km SW	Blanket bog Depressions on peat substrates
Blood Moss SSSI	4.7 km NE	Blanket bog

7.3.7 Hydro-ecological designated areas include internationally, nationally and locally designated ecological areas where hydrology or hydrogeology is a key factor in their designation. Further information is presented in Chapter 9: Hydrology, Hydrogeology and Geology. The Site is not located within a statutory hydro-ecologically designated area; although hydrologically the Site drains into the Tarf Water and the River Bladnoch SAC.

Habitats and Vegetation

7.3.8 The habitats baseline has been established with reference to data presented in the Gass Wind Farm ES[34], as updated and extended by 2019 surveys.

7.3.9 Detailed survey results are provided in Volume 4: Technical Appendix 7.1: Habitats and Vegetation, and illustrated on Volume 3a Figure 7.2: Phase 1 Habitats Plan and Figure 7.3: NVC Plan.

7.3.10 The Site is predominately comprised of productive coniferous plantation forestry with a complex mosaic of grassland, wet heath and blanket bog habitats within open areas and along the Tarf Water riparian corridor.

7.3.11 Forestry comprises Sitka spruce *Picea sitchensis* plantation woodland (A1.2.2), of varying maturity and height (between 5 m and 20 m), with areas of clear-fell (A4.2) and recent replanting. Forest rides generally consist of narrow, linear tracts of marshy grassland (B5) or wet heath vegetation (D2).

7.3.12 Open areas within the Site along the Tarf Water riparian corridor and grazed fields of Gass Farm support a complex mosaic of marshy grassland, wet heath and blanket bog communities. Wet heath and bog habitats are fragmented within the Site and degraded by anthropogenic factors including afforestation and drainage.

7.3.13 Notwithstanding the high degree of modification, peat-forming species such as *Sphagnum* moss and cotton grass *Eriophorum angustifolium* were recorded throughout blanket bog habitats, indicating that the bog was active.

7.3.14 The extent of habitats within the Site which fall under the description of Active Priority Blanket Bog (Maddock, 2011[42]) include M17, M19 and M15 which all lie on peat of depths greater than 1 m, totalling 5.88 ha and 0.74% of the Site, as shown on Figure 7.3: National Vegetation Classification Plan in Volume 3a and Figure 2.3.1 of Technical Appendix 2.3: Peat Depth Survey Results in Volume 4 of the EIA Report.

7.3.15 A summary of habitat types and communities, along with approximate areas is provided in Table 7.7. Forest rides are not included within the areas and percentages in Table 7.7, they total 33.06 ha.

7.3.16 Priority habitats identified through NVC survey present on-site are summarised in Table 7.8.

Table 7.7: Summary of Baseline Habitats and Vegetation Communities, Including Approximate Area and Relative Percentage Coverage within the Site

Phase 1 Habitat Type	Corresponding NVC Community	Extent (ha)	Relative (%) Coverage
Broadleaved semi-natural woodland (A1.1.1)	N/A	1.61	0.20
Broadleaved plantation woodland (A1.1.2)	N/A	4.11	0.52
Coniferous plantation (A1.2.2)	N/A	626.5	78.62
Recently felled coniferous woodland (A4.2)	N/A	17.88	2.24
Sphagnum bog: blanket bog (E1.6.1)	M17b M17	3.96 0.39	0.50 0.05
Fen: valley mire (E3.1)	M25a/M23b M19a	3.08 1.08	0.39 0.14
Marshy grassland (B5)	M23a/M25/U4/M6/S4 MG9	4.84 1.24	0.61 0.16

[42] Maddock (2011) UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG.

Table 7.7: Summary of Baseline Habitats and Vegetation Communities, Including Approximate Area and Relative Percentage Coverage within the Site

Phase 1 Habitat Type	Corresponding NVC Community	Extent (ha)	Relative (%) Coverage
	M25/M6	3.45	0.43
	MG10/M25a	4	0.50
	M23b	17.97	2.25
	M4	0.18	0.02
Semi-improved neutral grassland (B2.2)	MG6a	40.08	5.03
Wet dwarf shrub heath (D2)	M25a	3.6	0.45
Wet heath/ acid grassland mosaic (D6)	M15/U4/M23b/M17	24	3.01
	M15/U4	0.45	0.06
	U4	1.21	0.15

Table 7.8: Summary of Vegetation Communities

NVC Community	Corresponding Habitats Directive Annex 1[5]	SBL Priority Habitat[16]	LBAP[29]
M15 Trichophorum cespitosum – Erica tetralix wet heath	Northern Atlantic wet heaths with *Erica tetralix*	Blanket mire	Purple moor grass pastures
U4 Festuca ovina – Agrostis capillaris - Galium saxatile grassland	N/A	N/A	Acid grassland
MG9 Holcus lanatus – Deschampsia cespitosa grassland	N/A	N/A	Acid grassland
MG10 Holcus lanatus – Juncus effusus rush pasture	N/A	N/A	Acid grassland
M4 Carex rostrata - Sphagnum fallax mire	Transition mires and quaking bogs	Upland flushes, fens and swamps	Upland springs and flushes
M6 Carex echinata – Sphagnum fallax/ denticulatum mire	N/A	Upland flushes, fens and swamps	Upland springs and flushes
M17 Trichophorum cespitosum – Eriophorum vaginatum blanket mire	Active raised bog and blanket bog.	Blanket mire	Blanket bog
M19 Calluna vulgaris-Eriophorum vaginatum blanket mire	Active raised bog and blanket bog.	Blanket mire	Blanket bog
M23 Juncus effusus/ acutiflorus – Galium palustre rush pasture	N/A	Upland flushes, fens and swamps	Upland springs and flushes
M25 Molinia caerulea – Potentilla erecta mire	N/A	Blanket mire	Purple moor grass pastures
S4 *Phragmites australis* swamp and reed beds	N/A	Upland flushes, fens and swamps	Upland springs and flushes

PEATLAND

7.3.17 The Carbon and Peatland Map 2016[43] was consulted to determine likely peatland habitat classes present in the Site. 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". It identifies potential areas of "nationally important

[43] https://soils.environment.gov.scot/maps/thematic-maps/carbon-and-peatland-2016-map/

carbon-rich soils, deep peat and priority peatland habitat". Class 1 peatlands are "likely to be of high conservation value" and Class 2 "of potentially high conservation value and restoration potential". Class 1 and Class 2 peatlands are considered to be nationally important under Scottish Planning Policy[44]. It is recognised that this definition is not purely for nature conservation and so not directly applicable to evaluating purely the Nature Conservation Value of a peatland.

7.3.18 Priority peatland habitats are defined by NatureScot as "land covered by peat-forming vegetation or vegetation associated with peat formation" which is considered to be comparable to the definition of Annex 1[5] 'active' bog habitats.

7.3.19 The Carbon and Peatland Map (2016) identifies that the majority of the site (and most of the infrastructure areas) are not located within areas of Class 1 or Class 2 priority peatland; comprising of a mixture of Class 5 and Class 0 (Mineral soils) peatland. Small areas of Class 1 are present on the northern boundary and southern boundary within the open fields of Gass Farm including one small area of Class 2. The Proposed Development largely avoids peat depth >0.5 m and Class 1 and 2 soils but small areas of access track include areas likely to be considered Class 1 Peatland, as presented on Figure 2.3.3 of Technical Appendix 2.3.

7.3.20 As the Carbon and Peatland Map is a high-level tool, peat depth surveys (as detailed in Volume 4: Technical Appendix 2.3) and detailed phase 1 habitat and NVC surveys have also been carried out to inform the detailed site assessment on peatland. Information derived from site-specific surveys is considered to be the most accurate and is subsequently the most appropriate data set for use in the assessment.

7.3.21 Much of the priority peatland overlaps with areas of blanket bog mapped during the habitat surveys. Potential Class 1 priority peatland is located on the northern boundary of the Site and within the open mosaic habitats of Gass Farm in the south.

7.3.22 The peat survey identified that the majority of the developable area was located on no peat, or very shallow peat (<0.5 m in depth) as presented on Figure 2.3.1. Pockets of deeper peat were identified within the north western and north eastern sections of the Site and in the south within Gass Farm.

7.3.23 Peat surveys identified that the peatland soils are degraded, largely dry and in an advanced state of decomposition, consistent with afforestation and artificial drainage measures undertaken across the Site, and therefore not considered to align with the requirements of national importance. Class 1 soils within the Site are therefore considered to be of regional value.

7.3.24 This Chapter includes an assessment of priority habitats. For clarity, for the purposes of impact assessment, priority habitats have been defined with reference to Annex I of the Habitats Directive and SBL priority habitats; however these are broadly the same as those classified as priority peatland habitats defined in the Carbon and Peatland Map[32].

Terrestrial Mammals - Excluding Bats

7.3.25 Baseline terrestrial mammal conditions are summarised in Table 7.9.

7.3.26 Full details are provided in Technical Appendix 7.2: Protected Species and results from 2019 and 2020 surveys are presented in Volume 3a – Figure 7.6: Terrestrial Mammal Results.

[44] https://www.gov.scot/publications/scottish-planning-policy/

Table 7.9: Summary of Baseline Terrestrial Mammal Conditions	
Ecological Receptor	**Summary**
Badger	No records of badger were received through desk study from SWSEIC or Gass Wind Farm ES[34]. No evidence of badgers was identified within the Site and the forested nature of the Site is considered to offer low foraging and sett building opportunities for badger. An incidental sighting of badger prints was identified 1.1 km east of the Proposed Development in the Kilgallioch Extension Wind Farm EIA Report[35] and which suggests the presence of the species within the wider surrounding area.
Otter	No existing records of otter were received from SWSEIC. No holts or potential resting places were identified during 2019 or 2020 field surveys however, a single otter scat was found at a small footbridge in the north of the Site in September 2020. Field surveys undertaken to inform the Gass Wind Farm ES[34] also identified a single spraint along Tarf Water and Kilgallioch Extension Wind Farm EIA Report[35] identified a potential hover (resting place) on Tarf Water. As such the species presence locally is established. Watercourses within the Site are suitable for commuting and foraging otter and tributaries offer suitable vegetation structure to support resting otter; however the dense coniferous plantation and wetland habitats limit holt creation opportunities.
Pine Marten	A single record of pine marten was returned from SWSEIC during the desk study, near to Muirglass, 1.5 km north of the Site. No evidence of pine marten was identified by Kilgallioch Extension EIA Report[35] or Gass Wind Farm ES[34] baseline studies. Five potential pine marten scats were identified within the Site during 2019 and 2020 walkover surveys. A possible pine marten form (resting site) was also found at the base of a stone wall near to a scat. Dense coniferous plantation within the Site provides extensive suitable habitat for pine marten. The suitability of the Site for pine marten is further enhanced due to its connectivity to a large conifer resource in the wider area.
Red Squirrel	A review of records of red squirrel from Saving Scotland's Red Squirrels website and records received from SWSEIC, found the closest record, approximately 10 m south of the Site. Potential foraging evidence was also recorded during baseline surveys for Gass Wind Farm ES[34]. No incidental evidence of presence was established during 2019 or 2020 walkovers. Conifer plantations in the northern and central sections of the Site provide extensive suitable habitat for red squirrel. The suitability of the Site for red squirrel is further enhanced due to its connectivity to a large conifer resource in the wider area.
Water Vole	No records were received of water vole from SWSEIC. No evidence of presence was identified during Gass Wind Farm ES[34] baseline studies but suitable habitat was identified. Kilgallioch Extension Wind Farm EIA Report[35] identified a moderate water vole population north of the Site on Tarf Water and tributaries within the River Bladnoch catchment. Burrows and feeding remains were identified at two locations during 2020 walkover surveys within the Site.

Terrestrial Mammals - Bats

7.3.27 The habitats within the Site comprise large areas of low value habitat in large commercial forestry areas, intersected by sheltered forest rides supporting wet heath and blanket bog

habitats, which offer moderate foraging opportunities for bats. The Tarf Water is likely to provide a foraging and commuting resource for bats, by offering slow flowing water in the main, by bordering semi-improved and marshy grassland and commercial plantation forestry.

7.3.28 Upper reaches of burns and watercourses within the Site offer lower value foraging and commuting opportunities as they are, in the main, over shadowed by forestry with limited aquatic vegetation and ultimately reduced invertebrate resource.

7.3.29 There are no features within the Site with potential to support significant hibernation or maternity roosts within the Site, which is likely to be primarily used for foraging of a small number of bats, with commuting principally focused towards the Tarf Water.

DESK STUDY

7.3.30 The UK Habitats Directive Article 17 Report (2019[6]) identifies that the Site is located within the known species distribution range for Daubentons *M. daubentonii* natterers *M. nattereri,* Whiskered *M. mystinacinus,* Liesler's *Nyctalus leisleri* common pipistrelle *Pipistrellus* and soprano pipistrelle *P.pygmaeus*, noctule *N.noctula.*

7.3.31 SWSEIC provided records for six species of bat, although no confirmed roost records were returned. Records are shown in Volume 3a of the EIA Report Figure 7.5: Existing Terrestrial Mammal Records and in summary comprised: *Myotis spp*, Daubentons natterers*,* Liesler's common pipistrelle and soprano pipistrelle.

7.3.32 The Gass Wind Farm ES[34] reported common pipistrelle, soprano pipistrelle, *Myotis spp.,* and Leisler's bat during walked transect and automated activity surveys in 2012 and 2013. No roosts were identified.

7.3.33 Surveys undertaken to inform the adjacent Kilgallioch Extension Wind Farm[35] identified six species of bat in 2019; common pipistrelle, soprano pipistrelle, noctule, Leisler's, *Myotis spp*, and brown long-eared bat. A potential roost location was identified at High Eldrig, located approximately 1.4 km north east from the nearest Proposed Development turbine.

FIELD SURVEYS

PRELIMINARY ROOST ASSESSMENT OF STRUCTURES AND TREES

7.3.34 The Site is dominated by coniferous plantation woodland which offers negligible bat roost opportunities and no structures were identified within the study area with the potential to support maternity or significant hibernation roosts.

7.3.35 The only buildings within the Site are those at Low Eldrig. Low Eldrig consists of two stone buildings located at NX251679. During survey, each building was in a poor condition, with no roof, no windows and had not been in use for some time. Potential opportunities for roosting bats were considered to be negligible. The location is shown on Figure 7.7: Bat Activity Survey Plan.

7.3.36 Ten mature ash *Fraxinus excelsior* trees were located within 10 m of the buildings and which were also considered to provide low bat roost potential.

7.3.37 Overall the Site is considered to be of low/ negligible bat roosting potential in accordance with BCT guidance (Collins, 2016[8]).

AUTOMATED DETECTOR SURVEYS

7.3.38 Bat activity surveys were undertaken between May and October 2019 in accordance with NatureScot guidance (SNH, 2019). Twelve ground-level automated monitoring stations

(MS1 to MS12, Figure 7.7: Bat Activity Survey Plan) were deployed in May, June, July, August and October 2019.

7.3.39 Monitoring locations were chosen as to provide a representative sample of habitats within the Site, both within forestry rides, and more open locations such as grazed pasture and clear-fell.

7.3.40 Bat activity surveys recorded activity characteristic of the following species: brown long-eared bat, common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and *Myotis spp.*

7.3.41 Table 7.10 summarises the results of automated detector surveys, with full details provided in Technical Appendix 7.2: Protected Species. Results are also presented in Volume 3a – Figure 7.8: Bat Activity Survey Results.

7.3.42 All sonogram data was uploaded to Ecobat in order to quantify bat activity in accordance with NatureScot (SNH, 2019[12]) guidance, with full results presented in Technical Appendix 7.2: Protected Species.

7.3.43 Overall 22,675 bat passes were recorded, over 12 monitoring stations. Bats were detected on 98 nights between 22.05.2019 and 31.10.2019, out of a possible 103 recording dates and a collective 895 nights from 12 static bat detectors.

Table 7.10: Total No. Bat Passes, Maximum Passes per Night and Mean Passes per Night (Whole Site)

Species	No. Bat Passes	Percentage of Total (%)	Max Passes per Night	Mean Passes per Night[45]
Brown long-eared	29	0.1	2	0.03
Common pipistrelle	3,132	13.8	210	3.50
Leisler's	308	1.4	28	0.34
Myotis	507	2.2	26	0.57
Noctule	1,105	4.9	40	1.23
Soprano pipistrelle	17,594	77.6	749	19.66
Total	22,675	100.0	749	25.34

7.3.44 The activity of four of these species (common pipistrelle, soprano pipistrelle, noctule and Leisler's bat) was considered to be of a sufficient level so as to warrant assessment. Based on the updated bats and wind farms guidance (SNH, 2019[12]) for Stage 1 (potential risk of a site based on habitats and development-related receptors) the Proposed Development is assessed as being of 'Medium Site Risk'.

7.3.45 Stage 2 of the SNH (2019[12]) guidance requires an overall risk assessment, based on activity levels of high collision risk bat species. The risk assessment for common pipistrelle, Leisler's bat and noctule is concluded to be "Low/ Medium Site Risk" and as "Medium Site Risk" for soprano pipistrelle.

Fisheries

7.3.46 The Site falls under the River Bladnoch catchment in the Solway Tweed River Basin District. The Site also forms part of the Tarf Water and Tarf Water to Water of Malzie, to Drumpail and Tidal Weir nested catchments. Full details are provided in Chapter 9: Hydrology, Hydrogeology and Geology.

[45] Total passes recorded / total nights included

7.3.47 The European Water Framework Directive (WFD) requires that surface waterbodies in member states are classified according to ecological status. The Scotland's Environment website[32] confirms the status of the following watercourses within the Site:

- Tarf Water: Poor status.

7.3.48 The remainder of the watercourses within the Site are not classified. Further details are provided in Chapter 9: Hydrology, Hydrogeology and Geology.

7.3.49 A review of UK Habitats Directive Article 17 Report (2019[6]) identified that the Site is located outside the known species distribution range for freshwater pearl mussel. No records of this species were received from SWSEIC and no evidence of presence was recorded during Gass Wind Farm ES[34] and Kilgallioch Wind Farm EIA Report[35] baseline surveys.

7.3.50 However, freshwater pearl mussel are thought to be present in the River Bladnoch catchment, and recent unrelated electrofishing surveys by GFT in 2019 confirmed glochidia (mollusc larva) presence on trout parr at an undisclosed location (GFT, 2019)[46], which indicates pearl mussel presence locally.

7.3.51 Trout *Salmo trutta*, eel *Anguilla Anguilla* and salmon were recorded along the Tarf Water and its tributaries as part of Gass Wind Farm[34] and Kilgallioch Extension Wind Farm[35] baseline studies.

7.3.52 All records are presented on Figure 7.9: Electrofishing Records in Volume 3a.

7.3.53 A summary of habitat suitability for fish is presented in Technical Appendix 7.2: Protected Species.

7.3.54 A total of 10 watercourses within the Site were subject to walkover habitat surveys in September 2020. Surveyed watercourses and results are presented on Figure 7.10: Fish Habitat Sample Points and Results in Volume 3a. In summary, six watercourses provided suitable habitat for salmonides and eels. Two more provided suitable habitat for trout only, and two did not contain any suitable habitats for fish species. Four of them were considered to offer suitable habitats for freshwater pearl mussel.

7.3.55 In summary, the Tarf Water and on-Site tributaries offer varied habitat suitability for Atlantic salmon, trout, eel, lamprey and freshwater pearl mussel. It is therefore reasonable to conclude that these species are potentially present within suitable watercourses within the Site as their presence has previously and recently been established within the upper and lower reaches of the River Bladnoch north and south of the Site.

Additional Species

7.3.56 No other species are considered as having significant potential effects as a result of the Proposed Development

Future Baseline

7.3.57 In the absence of the Proposed Development, assuming a "do-nothing" scenario or gap between baseline surveys and the commencement of construction of the Proposed Development, changes in baseline ecology conditions (i.e. distributions and populations) are

[46] https://gallowayfisheriestrust.org/news.php?nID=282?nID=282#:~:text=Last%20week%20GFT%20were%20out,Bladnoch%20surveying%20four%20different%20sites.&text=Freshwater%20pearl%20mussels%20can%20live,of%20the%20longest%2Dlived%20invertebrates

most likely to result from habitat modifications within or surrounding the Site due to land management practices (principally forestry works).

7.3.58 In the absence of the Proposed Development, the habitats within the Site are considered likely to remain under the existing management regime, comprising principally commercial forestry workings. These operations may alter the distribution of faunal species recorded during baseline surveys; however, it is highly unlikely this would be in such a way as to substantially alter the baseline reported here.

7.3.59 The Site is not subject to any other development pressures or management which would affect the habitats or species in such a way that the present baseline conditions presented here would become substantively different.

7.3.60 Whilst short-term and small-scale variability in populations and distributions may occur, and revisions to conservation statuses and designations are possible, such changes would be unlikely to qualitatively alter the conclusion of the assessment presented within and have been accounted for through application of a precautionary approach and appropriate mitigation.

Summary of Sensitive Receptors

7.3.61 A summary of identified sensitive/ important ecological receptors is provided within Table 7.11.

Table 7.11: Summary of Identified Sensitive/ Important Ecological Receptors

Sensitivity	Receptor		
Very High/ International	River Bladnoch SAC		
High/ National	N/A		
Medium/ Regional	Wet heath/ acid grassland mosaic Blanket bog Fish and freshwater pearl mussel	Common pipistrelle Soprano pipistrelle Nyctalus species	
Low/ Local	All other habitats and vegetation Pine marten Red squirrel	Otter Water vole Myotis species	Brown long-eared bat Badger

Scoped-Out Receptors

7.3.62 The Site is not located within the same sub-catchments as Kirkcowan Flow SAC (as discussed further within Chapter 9: Hydrology, Hydrogeology and Geology), and the potential for hydrological connectivity between the Site is discounted and therefore scoped-out.

7.3.63 The habitats present within the Site are presented on Figure 7.2: Phase 1 Habitat Plan and Figure 7.3: NVC Plan, presented in Volume 3a. There are small stands of broadleaved woodland, broadleaved plantation woodland and stand-alone trees within the Site. These features are of local importance but are scoped-out as they are distanced enough from Proposed Development infrastructure to avoid potential effects.

7.3.64 Habitats within the Site which are considered to be of local value, or are not subject to direct or indirect of the Proposed Development by virtue of distance from the Proposed Development, are scoped-out. M19a blanket mire habitat is scoped-out as it is only present

within the Site in an isolated forest ride, of local value and not considered to be representative of an Annex 1 Habitat[5] and is not located on priority peatland habitat.

7.3.65 Ecological features assigned 'Low' importance have been scoped-out of detailed assessment on the basis of their absence or presence in numbers of very low importance, low levels of activity recorded during baseline surveys (Volume 4: Technical Appendix 7.1 and 7.2) and/ or as they are not considered a priority for assessment in accordance with guidance (NatureScot, 2020[41]), given their generally accepted low sensitivity to wind farm developments.

7.3.66 *Myotis* species and brown long-eared bat are scoped-out of detailed assessment as they are considered to be of low population level vulnerability to wind farms in accordance with NatureScot guidance (SNH, 2019[12]) and therefore of low sensitivity.

7.3.67 Construction would mainly take place during daylight hours during the season when bats are active (April to October, inclusive), therefore any disturbance for foraging and commuting bats is highly unlikely to occur and is therefore scoped-out.

7.3.68 Precautionary mitigation measures are outlined to ensure legislative compliance during the construction and decommissioning phases for protected and notable species.

Scoped-In Receptors

7.3.69 A summary of scoped-in for detailed assessment if provided in Table 7.12.

Table 7.12: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
River Bladnoch SAC	High/ International	Provided protection under the Habitats Regulations[5]. The SAC intersects the Site and a new crossing of the Tarf Water is proposed which has the potential to result in direct and indirect impacts to the SAC. The Tarf Water supports Atlantic salmon, the qualifying interest feature of the River Bladnoch SAC.
Wet Heath and Blanket Bog	Medium/ Regional	The Carbon and Peatland Map 2016 (Figure 2.3.3 of Technical Appendix 2.3: Peat Survey Results) indicates that the majority of the Site comprises Class 5 peatland habitats. The Proposed Development largely avoids peat depth >0.5 m and Class 1 and 2 soils but small areas of access track include areas likely to be considered Class 1 Peatland, as presented on Figure 2.3.3 of Technical Appendix 2.3. Peat was found to be largely dry and in an advanced state of decomposition, consistent with afforestation and artificial drainage measures undertaken and therefore identified Class 1 soils are considered to be of regional value. The wet heath and blanket bog habitats within the Site supported *Sphagnum* moss indicating that the habitats were 'peat forming' and active; however wet heath and blanket bog habitats are heavily modified through anthropogenic activities (commercial forestry and drainage) and they are small and isolated in extent. Despite their heavily modified state, the presence of indicator species, and being located on deep peat (>1 m) warrant the habitat type to be considered of medium sensitivity. Habitat loss as a result of the Proposed Development has been minimised through a sensitive and iterative design

Table 7.12: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
		process. Direct land-take resulting in the loss of some Annex 1[5]/ SBL[16] habitat types will however be unavoidable. Such habitats are fragmented within the Site but are widespread locally. Additionally, temporary habitat losses are also anticipated to occur during the construction and decommissioning phases of the Proposed Development. The potential for indirect effects on adjoining/ nearby habitats for example through local changes to hydrology is also considered within the assessment.
Bats: Namely common pipistrelle, soprano pipistrelle and Nyctalus species	Medium/ Regional	All bat species are protected under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended)[5], the Wildlife and Countryside Act 1981 (as amended)[27] and the Nature Conservation (Scotland) Act 2004[26] (as amended). They are also SBL[16] and Dumfries and Galloway LBAP[29] priority species. Activity recorded during 2019 baseline surveys was dominated by soprano pipistrelle, representing moderate activity. Activity of all other species was low to moderate, in accordance with NatureScot (SNH, 2019[10]) guidance (see Technical Appendix 7.2: Protected Species).
Fish	Medium/ Regional	The Proposed Development has the potential to result in indirect effects on the River Bladnoch SAC due to the construction of a new water crossing over the Tarf Water, extensive forestry removal and ultimately therefore, local fish populations.
Freshwater Pearl Mussel	Medium/ Regional	No records were received, although freshwater pearl mussel are thought to be present in the River Bladnoch catchment. Recent surveys have confirmed glochidia presence on trout parr during electrofishing surveys at an undisclosed location (GFT, 2019[47]).

7.4 Assessment of Likely Effects

7.4.1 This section presents an assessment of effects upon statutory designated sites and important ecological receptors (Table 7.12), both as a result of the Proposed Development alone, and cumulatively in-combination with other wind farm developments in the absence of additional mitigation.

7.4.2 The Proposed Development has been assessed for an operational life of 30 years.

Potential Construction Effects

Statutory Designated Sites for Nature Conservation – The River Bladnoch SAC

7.4.3 There are two potential pathways for significant effects on the River Bladnoch SAC:

- Indirect: potential changes in hydrology due to run-off, erosion and sedimentation, along with pollution which may result in the event of contaminant spillage or through the extensive removal of forestry;

[47] https://gallowayfisheriestrust.org/news.php?nID=282?nID=282#:~:text=Last%20week%20GFT%20were%20out,Bladnoch%20surveying%20four%20different%20sites.&text=Freshwater%20pearl%20mussels%20can%20live,of%20the%20longest%2Dlived%20invertebrates.

- Disturbance to qualifying interest feature Atlantic salmon: discussed separately under Fisheries.

7.4.4 The number of watercourse crossings required to facilitate access to the Proposed Development have been minimised through sensitive scheme design. A 50 m buffer has been applied around all watercourses and waterbodies within the Site, and no turbines are located within these buffers. However, where proposed access tracks are required to cross a watercourse, there is a requirement for infrastructure to be included within the 50 m buffer, although this is only applicable in a limited number of locations. This has been considered within a Watercourse Crossing Assessment (Technical Appendix 9.2).

7.4.5 Where feasible within micrositing allowances, the narrowest locations would be selected, informed by the stability of channel banks.

7.4.6 Other than the single crossing of the Tarf Water, no other infrastructure will be microsited to where it falls within 50 m of the River Bladnoch SAC.

7.4.7 Crossings comprise five small burns (with maximum width of 0.5 m) and a single crossing of the Tarf Water. A further three existing crossings would require upgrading/ improvement works to facilitate development.

7.4.8 The new crossings would likely comprise either an open bottom or a full culvert in accordance with SEPA guidance[48], with the exception of the Tarf Water crossing which would consist of a single span structure (bridge). This would maintain hydraulic connectivity and passage for fish and additional wildlife.

7.4.9 The proposed water crossings would also be of sufficient size so as not to restrict or concentrate flows downstream and to convey flows during periods of heavy rainfall (e.g. 1 in 200-year event plus climate change allowance).

7.4.10 The main new crossing required over the Tarf Water, would comprise a single-span bridge crossing which would maintain the bankside structure and vegetation and bed of the watercourse. Direct loss or damage to the watercourse is therefore considered to be highly unlikely. In stream supports are not required.

7.4.11 The design of other watercourse crossings (which feed into the Tarf Water), through the use of culverts, would also minimise direct damage and maintain flow and passage of mammals and aquatic fauna.

7.4.12 Overall potential effects upon the aquatic environment are considered to be highly localised and mitigated through sensitive Proposed Development design.

7.4.13 As discussed in Chapter 9: Hydrology, Hydrogeology and Geology, there is the potential for impact on surface water through the release of contaminated water, stored chemicals or nutrient enrichment through forest felling during the construction phase.

7.4.14 Construction effects would therefore be of **Medium** magnitude effect on a very highly sensitive receptor, of **Major Adverse** significance, which is **Significant** in the context of the EIA Regulations.

7.4.15 The removal of forestry and potential acidification is considered further in Chapter 9: Hydrology, Hydrogeology and Geology, and in Chapter 14: Forestry.

[48] SEPA Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2001: WAT-PS-06-02: Culverting of Watercourses – Position Statement and Supporting Guidance. June 2015. Version 2.0. https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf .

7.4.16 Information to Inform a Habitats Regulations Appraisal is provided in Technical Appendix 7.4 Volume 4.

7.4.17 In summary, Likely Significant Effects have been identified on the River Bladnoch SAC, a European site and information to inform an Appropriate Assessment has been provided, including mitigation measures that will form a committed part of the Proposed Development.

7.4.18 The mitigation measures as described will ensure direct or indirect effects on the favourable conservation status of qualifying species (Atlantic salmon) and hence no effects on the integrity of the River Bladnoch SAC alone or in combination with other projects or plans. Similarly there will be no appreciable effects on functionally linked habitat likely to affect the integrity of the SAC.

7.4.19 The mitigation measures proposed are well established and in line with guidance and regulation and hence can be considered to be achievable and effective in preventing identified potential adverse effects. The mitigation will be secured by planning condition within the planning consent as part of the final CEMP.

Habitats

7.4.20 Proposed turbine locations, proposed access tracks and infrastructure have been designed to minimise the requirement for land-take, impacts on those most ecological sensitive habitats and the number of water crossings, reducing the loss of the most ecologically sensitive habitats and potentially sensitive habitats.

7.4.21 All Proposed Development turbines have been located within commercial forestry habitats, avoiding the direct and indirect loss or damage to habitats of moderate or high value or GWDTE habitats.

7.4.22 There are three main ways by which habitats may be affected during the construction phase of the Proposed Development:

- Direct loss: to accommodate the Proposed Development infrastructure. These losses are considered permanent in the context of this assessment;
- Disturbance: the effects of disturbance are variable in their extent, depending on the nature of the disturbance and sensitivity of the habitat feature. Some disturbance types (for example, creation of temporary hard standing areas at the contractor's compound) may result in medium- to long-term disturbance which require extended recovery periods. In other cases (for example, installation of cables at the sides of access tracks, traversing of machinery) disturbance is short-term, and certain habitat types are able to recover quickly; and
- Indirect effects: these primarily relate to changes in hydrology of wetlands in the context of a wind farm development, the potential for run-off, erosion and sedimentation, along with pollution which may result in the event of contaminant spillage or through the extensive removal of forestry.

7.4.23 The potential for effects upon the hydrological supporting conditions of bog, water quality, soils and peat as a result of surface and groundwater flows, sediment and contaminant discharges, soil loss, erosion and compaction are detailed within Chapter 9: Hydrology, Hydrogeology and Geology, and Chapter 14: Forestry.

7.4.24 The Proposed Development has been designed to avoid priority habitats[5,16] so far as possible by the use of existing tracks and placement of turbines within commercial forestry habitats. The use of cross drains under new tracks, installed at regular intervals would maintain

hydrological flow across surrounding habitats. Silt traps would also be included, subject to pre-construction site investigations.

7.4.25 The Proposed Development has been designed to avoid deep peat (>1 m), with the exception of peat underlying forestry plantation, which is considered to be highly modified and of low ecological value. Where tracks are required on peat >1 m depth, floating tracks would be used to maintain hydrology, therefore it is unlikely that the groundwater would be disrupted and lead to drainage of priority habitats/ Peatland habitats (floating roads do not disrupt the catotelm peat layer). Drainage impacts would be restricted to a few metres, either side of the track, if any.

7.4.26 It is considered unlikely that indirect drainage impacts would have such an impact on priority habitats/ Peatland habitats as to result in any more than Temporary (Stewart & Lance, 1991[49]) and localised effects at a sub-community scale.

7.4.27 Overall potential effects upon the aquatic environment are considered to be highly localised and mitigated through sensitive Proposed Development design, standard best practice construction methods and pollution prevention controls in accordance with current guidance (as detailed within Technical Appendix 2.1: CEMP). The final CEMP would be agreed through consultation with NatureScot so as to avoid impacts on aquatic environments and the integrity of the River Bladnoch SAC designation.

CONSTRUCTION EFFECTS – DIRECT HABITAT LOSS

7.4.28 The dominant habitat which would be lost through construction of the Proposed Development is commercial plantation woodland, which is considered to be of negligible nature conservation value.

7.4.29 The total land-take of the Proposed Development, i.e. the area to be permanently lost under the surface footprint of the proposed turbine hard standings, access track and associated infrastructure is approximately 11.06 ha.

7.4.30 The majority of permanent habitat loss relates to coniferous plantation forestry (for details, please see Chapter 14: Forestry) and semi-improved grassland (MG6a: 1.5 ha).

7.4.31 Permanent habitat loss would also include 0.05 ha of M19, 0.1 ha of M17 and 0.4 ha of M15 (M15/U4/M23b/M17 mosaic) priority/ peatland habitats. This represents 0.42% of the extent of this habitat type within the Site.

7.4.32 Habitat losses represent a very small loss in the total area of these remaining habitats within the Site. Permanent direct loss effects of habitats of medium sensitivity would therefore be of no more than **Low magnitude** effect, of **Minor Adverse** significance, which is **Non-Significant** in the context of the EIA Regulations.

CONSTRUCTION EFFECTS – DISTURBANCE

7.4.33 Creation of borrow pits, turning heads and construction compounds would require temporary habitat disturbance of the area approximately 4 ha, i.e. the footprint of the temporary infrastructure. Further details are provided in Chapter 2: Development Description.

7.4.34 Temporary habitat loss solely relates to semi-improved grassland (excluding commercial plantation forestry) of local value, up to 3.13 ha and avoiding the most ecological sensitive and notable habitats (particularly Annex 1[5]).

[49] 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*

7.4.35 Disturbance effects on habitats of medium sensitivity would therefore be no more than **Negligible to Low Magnitude** on this local value receptor of **Negligible Adverse** significance, which is **Non-Significant** in the context of the EIA Regulations.

CONSTRUCTION EFFECTS – INDIRECT

7.4.36 As discussed in Chapter 9: Hydrology, Hydrogeology and Geology, there is the potential for impact on surface water through the release of contaminated water, stored chemicals or nutrient enrichment through forest felling during the construction phase.

7.4.37 Construction effects would therefore be of **Low/Medium** magnitude effect on a receptor of medium sensitivity, of **Minor Adverse** significance, which is **Non-Significant** in the context of the EIA Regulations.

7.4.38 The removal of forestry and potential acidification is considered further in Chapter 9: Hydrology, Hydrogeology and Geology, and in Chapter 14: Forestry.

Bats

7.4.39 The construction of the Proposed Development would result in the permanent and temporary loss of habitats, which are of low/ moderate foraging and commuting value to bats. Baseline surveys have also demonstrated overall moderate use of the Site by bats, with the majority of the bat activity relating to soprano pipistrelle.

7.4.40 The closed canopy coniferous plantation woodland which dominates the Site is appraised as having low value for bats, although woodland edge and woodland rides offer moderate foraging potential. The Tarf Water, which intersects the Site, offers commuting opportunities to the surrounding landscape.

7.4.41 The baseline surveys revealed activity of common pipistrelle, soprano pipistrelle *Myotis* species, noctule, Leisler's and brown long-eared bat on-Site within the established emergence time for these species (as defined in Technical Appendix 7.2: Protected Species). Therefore it is likely there are roosts for these species in the local area. No maternity or hibernation/ swarming sites were identified within at least 200 m plus rotor radius of the Proposed Development turbines. Impacts of bat displacement/ disturbance during construction are considered to be of no more than **Short-term**, **Low magnitude** effect on a receptor of **medium sensitivity** and be of **Minor adverse** significance and **Non-Significant** in the context of the EIA Regulations.

Fish and Freshwater Pearl Mussel

7.4.42 The River Bladnoch SAC is designated for supporting Atlantic salmon and all watercourses within the Site drain into the Tarf Water, a component of the River Bladnoch SAC.

7.4.43 Freshwater pearl mussel are also known to be present within the River Bladnoch catchment, but are not a qualifying species of the River Bladnoch SAC.

7.4.44 The River Bladnoch SAC is a receptor of very high/ international sensitivity; however, potential effects upon the aquatic environment are considered to be largely avoided through sensitive bridge crossing design and the 50 m buffer included within layout design, as discussed above and within Chapter 9: Hydrology, Hydrogeology and Geology.

7.4.45 The potential for impact on surface water could result in the pollution, increased sedimentation and nutrient enrichment of watercourse within the Site and downstream.

7.4.46 Effects on Atlantic salmon, a receptor of very high sensitivity in the absence of mitigation would be of **Moderate** magnitude, of **Major** significance and **Significant** in the context of the EIA Regulations.

7.4.47 Effects on freshwater pearl mussel, a receptor of medium sensitivity, in the absence of mitigation would be of **Moderate** magnitude, of **Moderate** significance and **Significant** in the context of the EIA Regulations.

7.4.48 Summary of Likely Construction Effects

7.4.49 Table 7.13 provides a summary of the likely construction effects on the identified receptors, in the absence of mitigation.

Table 7.13: Potential Construction Effects

Receptor/ Sensitivity	Summary of Assessment	Magnitude of Impact Prior to Mitigation	Effect
Statutory Designated Sites for Nature Conservation – River Bladnoch SAC	There is potential to impact on surface water due to run-off, erosion and sedimentation, along with pollution which may result in the event of contaminant spillage or through the extensive removal of forestry.	Medium	Significant
Annex 1 and Priority Peatland habitats	Direct habitat loss under the footprint of the Proposed Development.	Low	Not Significant
	Temporary disturbance to habitats during the construction phase.	Negligible/ Low	Not Significant
	Indirect pollution through surface water run-off, sedimentation etc.	Low/ Medium	Not Significant
Bats	Potential for disturbance and displacement of bat populations.	Low	Not Significant
Atlantic Salmon	There is potential for increased surface water drainage resulting in increased sedimentation, pollution and nutrient enrichment through construction and extensive removal of forestry.	Medium	Significant
Freshwater Pearl Mussel	There is potential for increased surface water drainage resulting in increased sedimentation, pollution and nutrient enrichment through construction and extensive removal of forestry.	Medium	Significant

Potential Operational Effects

7.4.50 Potential operational effects are restricted to bats only.

7.4.51 Direct effects for other sensitive ecological receptors (such as habitat loss and disturbance) are not anticipated to occur during the operational period.

7.4.52 Potential for impacts on surface water, groundwater, peat and GWDTEs are discussed separately in Chapter 9: Hydrology, Hydrogeology and Geology.

Bats

7.4.53 NatureScot (SNH, 2019[12]) states that operational wind farms can affect bats in three ways:

- Death or physical injury caused by interaction with operational wind turbines (e.g. collision or barotrauma);
- Loss of, or damage to, commuting and foraging habitat; and,

- Displacement of individuals or populations from the area.

7.4.54 The assessment of operational effects is restricted to noctule, Leisler's, common and soprano pipistrelle species only, as they are categorised as of high risk of collision from wind turbine developments (SNH, 2019[12]).

7.4.55 Operational impacts on bats are difficult to characterise due to the limited evidence base; bat mortality in the UK is poorly understood and this prohibits mortality risks to be accurately quantified and predicted. Assessments are therefore undertaken based on current guidance (SNH, 2019[12]).

7.4.56 NatureScot guidance (SNH, 2019[12]) requires a two-stage site assessment approach, as follows:

- Stage 1 - gives an indication of the potential risk level of a site, based on consideration of habitat and development-related features; and
- Stage 2 - uses the output of Stage 1 (i.e. the potential risk level of a site) to provide an overall risk assessment based on the activity level of high collision risk species.

7.4.57 Following the Site Risk Level matrix presented in Table 3a of the SNH 2019[12] guidance for Stage 1, the Proposed Development is assessed as being of Moderate Site Risk (Moderate Habitat Risk and Medium Project Size).

7.4.58 Stage 2 of the assessment process has been informed by the output from Ecobat which provides a numerical comparative interpretation of bat activity at development sites (Lintott *et al.,* 2018[50]).

7.4.59 The evaluation of bat activity for Stage 2 is presented within Technical Appendix 7.2: Protected Species.

7.4.60 In summary, the Proposed Development is categorised as being of Medium site risk (Medium Habitat Risk and Medium Project Size). Furthermore, for the overall risk assessment, the Proposed Development is a maximum of Medium risk for common and soprano pipistrelle, noctule, and is of Low risk to Leisler's bat, following the criteria set out in NatureScot (SNH, 2019[12]) guidance.

7.4.61 The risk of operational mortality to bats is generally acknowledged to be lowest at locations with low bat activity. Additionally, the availability of woodland foraging habitats within 1.5 km of proposed turbine locations, is suggested to have a protective effect upon pipistrelle species, with bats more likely to use these high value foraging habitats (and other suitable linear features) than be attracted to the wind turbines (Mathews *et al*., 2016[51]).

7.4.62 Activity of common pipistrelle was consistently low to moderate across all monitoring stations, with the highest activity recorded at MS12 (Figure 7.8 in Volume 3a of the EIA Report), located on the woodland edge of the Site on the south western boundary. Noctule activity was also largely consistent across all monitoring stations at a moderate level.

7.4.63 Leisler's activity was also highest at MS7 (although mean bat passes per night was higher at MS1) and activity was generally low overall.

50 Lintott, P.R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F., 2018. Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. Ecology and evolution, 8(2), pp.935-941

51 Mathews, F., Richardson S., Lintott, P. & Hosken, D. (2016) Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. Final report. University of Exeter.

7.4.64 Soprano pipistrelle activity was largely low to moderate across all monitoring stations, with highest activity recorded at MS6, MS10 and MS12, representing high activity.

7.4.65 The NatureScot bats and wind farm guidance (SNH, 2019[12]) advises that to reduce potential impacts upon bats, resulting from operational wind turbine development, a 50 m 'stand-off' distance should be maintained around bat habitat features, into which no part of the turbine intrudes. The guidance provides a formula for calculating this 'stand-off' distance.

7.4.66 The layout of the Proposed Development would require the felling of plantation woodland habitat around all 12 turbines. Re-planting would be undertaken within the felled area, but a buffer of 97 m would be maintained between the turbine and the re-planted plantation woodland (and existing woodland to be retained), creating a 'keyhole' design. This is based on the calculation provided in the bats and wind farm guidance (SNH, 2019[12]) and tree height reaching a maximum of 25 m during the lifespan of the Proposed Development. As such the Proposed Development provides a 50 m buffer for all turbine locations.

7.4.67 Based on activity levels recorded and subsequent analysis as outlined, death or injury levels are considered likely to be low. The Proposed Development is not considered to represent a site of concern to bat collision risk following the approach set out in bats and wind farm guidance (SNH, 2019[12]). It is acknowledged that low risk sites can still result in bat casualties, and therefore embedded mitigation (i.e. the turbines are located away from those habitat features most used by bats) would reduce the level of risk for all turbines.

7.4.68 A 50 m buffer between the blade tip and woodland edge has been a key component of Project Design. With this buffer, impacts of bat collision risk mortality are subsequently considered to be of no more than **Long-term**, **Low magnitude** on this receptor of medium sensitivity and be a **Minor adverse** significance and **Non-significant** in the context of the EIA Regulations.

7.4.69 Loss and damage to bat foraging or commuting habitat is considered to be inconsequential and are subsequently an impact of **Negligible magnitude** and **Negligible effect** significance. As such the effects would be **Non-Significant** in the context of the EIA Regulations.

7.4.70 Based on activity levels recorded and subsequent analysis as outlined, displacement levels are likely to be low and are subsequently considered to represent no more than a **Low/ medium magnitude** impact, of **Minor Adverse** effect significance. As such the effects would be **Non-Significant** in the context of the EIA Regulations.

7.4.71 Summary of Likely Operational Effects

7.4.72 Table 7.14 provides a summary of the likely construction effects on the identified receptors, in the absence of mitigation.

Table 7.14: Potential Operational Effects

Receptor/ Sensitivity	Summary of Assessment	Magnitude of Impact Prior to Mitigation	Effect
Bats	Collision risk/ mortality	Low	Not Significant
	Loss or damage to commuting or foraging habitat.	Negligible	Not Significant
	Displacement of foraging and commuting bats.	Low	Not Significant

Potential Decommissioning Effects

7.4.73 Potential decommissioning effects are considered to be similar to those identified for the construction phase (but limited to disturbance). Decommissioning effects are therefore not considered separately for each ecological receptor.

7.4.74 In the absence of mitigation, decommissioning effects may result in the disturbance of protected and notable species, and indirect habitat disturbance.

7.4.75 The removal of infrastructure and potential pollution or acidification is considered further in Chapter 9: Hydrology, Hydrogeology and Geology, and in Chapter 14: Forestry.

Potential Cumulative Construction Effects

7.4.76 Cumulative effects for construction are considered in relation to aquatic receptors only.

7.4.77 Potential for construction cumulative effects on bats are considered highly unlikely to occur in recognition of the implementation of the 50 m buffer between blade tip and woodland edge, which is a key component in the design of both the Proposed Development and Kilgallioch Extension.

7.4.78 The only potential for significant cumulative effects on aquatic receptors would be through the pollution of watercourses, which drain into the River Bladnoch SAC.

7.4.79 A recent application for Scoping has been submitted to DGC for Airies II Wind Farm (20/1062/SCO), which is located immediately adjacent to the northern and eastern boundary of the Site. As this project is at Scoping stage, there is currently insufficient information available in the public domain to undertake a detailed cumulative assessment. In the event an application were to be submitted, there is potential that these two developments could be constructed at the same time, and being both located within the Tarf Water catchments, could result in cumulative effects on the River Bladnoch SAC. As no detailed information is currently available on assessment of effects, a detailed cumulative assessment on ecological receptors cannot be undertaken.

7.4.80 Notwithstanding, a high level assessment can be undertaken on the assumption that for any development to proceed it will be required to comply with legislation and planning policy, and a full assessment of effects and subsequent mitigation or compensation will be required, as necessary. In the NatureScot scoping response for Airies II, it is recommended that the development will need to include sufficient mitigation measures to ensure no adverse effects on the integrity of the River Bladnoch SAC and this could be achieved through an appropriate CEMP/ PPP and through the sensitive design of the development. The potential for cumulative effects to occur is therefore considered to be negligible.

7.4.81 The Gass Wind Farm[34] consent has now lapsed and the project would therefore not be built. This project is therefore excluded from potential cumulative effects.

7.4.82 Kilgallioch Extension Wind Farm concluded no significant effects on watercourses in the Tarf Water Catchment and therefore increased potential for effects if the two sites were to be constructed simultaneously is considered to be highly unlikely.

7.4.83 The potential for cumulative pollution or acidification is considered further in Chapter 9: Hydrology, Hydrogeology and Geology, and in Chapter 14: Forestry.

Potential Cumulative Operational Effects

7.4.84 Cumulative operational effects are considered in relation to bats only.

7.4.85 Bat collision impacts have been minimised through the sensitive and considered design of the Proposed Development and by implementation of standard good practice measures regarding buffer distances of turbines from woodland edges, commuting corridors and other bat features in order to minimise the potential for impacts on commuting and foraging bats and therefore the likelihood of cumulative construction impacts.

7.4.86 The implementation at other wind farm sites of standard good practice measures regarding buffer distances of turbines from forestry edges to minimise impacts on commuting and foraging bats, further minimises the likelihood of cumulative impacts.

7.4.87 Cumulative impacts on bats are considered to be no more than **long term**, **medium adverse** and **Non-Significant** in the context of the EIA Regulations.

7.5 Mitigation

Mitigation during Construction

7.5.1 The mitigation schedule set out below identifies measures that shall be implemented through the CEMP.

Construction Environmental Management Plan (CEMP)

7.5.2 An outline CEMP is provided in EIA Report Volume 4: Technical Appendix 2.1: Construction Environmental Management Plan.

7.5.3 A CEMP would be in place during the construction phase of the Proposed Development. The CEMP would include all good practice construction measures, pollution prevention controls and monitoring to be implemented over the course of the Proposed Development in line with current industry and mandatory statutory guidance and as detailed within Chapter 2: Development Description.

7.5.4 Good practice with respect to peatland environments would be implemented. Further details on peat and water management during construction are provided in Chapter 9: Hydrology, Hydrogeology and Geology and Technical Appendix 2.1: Outline CEMP.

7.5.5 Good practice techniques for vegetation and habitat reinstatement would be adopted and implemented on areas subject to disturbance during construction as soon as is practicable.

7.5.6 The CEMP would also include Habitat Specific Protection Plans (HSPPs) detailing good practice measures for construction works within North Atlantic wet heath and blanket bog habitats. HSPPs would detail measures required to manage construction works within these sensitive habitats and include habitat restoration measures.

7.5.7 The CEMP would be submitted to NatureScot for approval prior to the commencement of construction works, in consultation with DGC and the SEPA.

7.5.8 The inclusion of measures within a CEMP is an accepted approach at nearby wind farms, i.e. Kilgallioch Wind Farm[36] (operational) and Kilgallioch Extension Wind Farm[35].

Ecological Clerk of Works

7.5.9 A suitably qualified and experienced Ecological Clerk of Works (ECoW) would be appointed prior to the commencement of construction and decommissioning activities and through whom appropriate ecological advice would be provided throughout.

7.5.10 The ECoW would be responsible for undertaking and/ or co-ordinating checks for protected species before construction and decommissioning activities commence. The ECoW (or

appointed 'clerks' on behalf of the ECoW) would also maintain a watching brief as necessary throughout the construction and decommissioning phase to ensure compliance with relevant legislation and advise on any working restrictions.

7.5.11 The ECoW will be responsible for overseeing watercourse crossing installations and upgrading works, implementing the Watercourse Crossing Method Statement (WCMS) and monitor the recommended mitigation measures to ensure they are appropriate and functioning correctly to protect watercourses and fish populations in the vicinity and downstream.

7.5.12 The detailed scope of the role and responsibilities of the ECoW would be agreed in consultation with NatureScot.

Watercourse Crossings

7.5.13 Construction shall be carried out in accordance with best SEPA practice[52] and SEPA Guidance for Pollution Prevention[53], with full details of proposed mitigation measures at watercourse crossings provided in Chapter 9: Hydrology, Hydrogeology and Geology.

7.5.14 Measures include:

- Implementation of at least a 50 m buffer from all watercourses within the Site, with the exception of six unavoidable new watercourse crossings;
- A WCMS will be included within the final approved CEMP that will include detailed prescriptions for the construction of watercourse crossings;
- New crossings would comprise a mixture of natural channels and artificial drains. Further details are provided in Technical Appendix 9.2: Watercourse Crossing Assessment in Volume 4 of the EIA Report. The crossings will allow the free passage of mammals and aquatic ecology;
- Splash boards and run-off diversion measures, including silt fencing adjacent and parallel to watercourses beneath bridges and at culvert crossings, will be used at all crossings during construction to prevent direct siltation of watercourses;

7.5.15 In addition, as detailed above, the WCMS would include all good practice construction measures and pollution prevention controls, to negate potentially significant effects upon the aquatic environment over the construction phase and operational lifetime of the Proposed Development.

7.5.16 The WCMS would include measures so as to ensure all works are completed in accordance with relevant legislative requirements.

7.5.17 The requirement for monitoring of water quality within watercourses downstream of the Proposed Development would be agreed with SEPA and Marine Scotland. Procedures for this would be detailed in the CEMP and the WCMS. Prior to works, baseline water quality monitoring shall be carried out (both upstream and downstream) and repeated during the construction works at agreed intervals.

Tree Felling

7.5.18 Detailed description of measures that shall be implemented to mitigate potential negative impacts due to the release of diffuse pollution due to forestry operations are discussed in Chapter 14: Forestry.

52 SEPA, 2010. Engineering in the Water Environment: Good Practice Guide, River Crossings

53 SEPA 2018. Works and Maintenance in or Near water: GPP5

GWDTE

7.5.19 Requirement for mitigation in relation for GWDTE habitats is discussed in Chapter 9: Hydrology, Hydrogeology and Geology.

River Bladnoch SAC

7.5.20 As discussed above under Watercourse Crossings, the potential for impacts on the River Bladnoch SAC shall be managed through the implementation of the WCMS included within the CEMP (as detailed within Technical Appendix 2.1: Draft Construction Environmental Management Plan).

7.5.21 With the exception of the Tarf Water crossing, no infrastructure shall be microsited, nor associated construction activity take place, within 50 m of the River Bladnoch SAC boundary without prior approval of the DGC in consultation with NatureScot.

7.5.22 Further details of mitigation measures are provided in Chapter 9: Hydrology, Hydrogeology and Geology.

Sensitive Habitats

7.5.23 Mitigation to minimise potential adverse effects related to surface water and groundwater discharge are discussed in Chapter 9: Hydrology, Hydrogeology and Geology. Measures include the implementation of a Pollution Prevention Plan (PPP) that would be complied by the contractor in accordance with SEPA guidance[54] to ensure that the release of sediments or pollutants or disruption to hydrology to the surrounding environment is avoided.

7.5.24 Temporary habitat losses would be reinstated to pre-construction conditions following completion of construction works in accordance with the measures outlined within the CEMP, as such, losses would be short-term and reversible.

7.5.25 Additional mitigation for habitat losses is not required; however the CEMP will include measures to ensure protection of sensitive habitats; blanket bog and wet heath from indirect and disturbance effects (as discussed in Technical Appendix 2.1: Construction Environmental Management Plan) and would also include the protection of other lower value habitats (local value: e.g. marshy grassland).

7.5.26 To ensure that all drainage measures employed during the construction phase of the Proposed Development are maintained appropriately and remain effective, the performance of the drainage measures will be monitored. The drainage management works will, therefore, be supervised by the ECoW and shall be in accordance with the CEMP.

7.5.27 The storage of potentially contaminative materials (oils, cements/ grouts) shall be carried out at least 50 m from watercourses. Fuels, oils or chemicals stored onsite shall be sited over an impervious base and according with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

7.5.28 The requirement for monitoring of water quality within watercourses downstream of the Proposed Development would be agreed with SEPA and Marine Scotland. Procedures for this would be detailed in the CEMP. Prior to works, baseline water quality monitoring shall be carried out (both upstream and downstream) and repeated during the construction works at agreed intervals.

[54] Supporting Guidance (WAT-SG-75), Sector Specific Guidance: Construction Sites February 2018, URL: https://www.sepa.org.uk/media/340359/wat-sg-75.pdf (accessed 19 November 2020)

Protected Mammals

7.5.29 Pre-construction and pre-decommissioning surveys for protected mammal species (including bats, water vole, otter, badger, pine marten and red squirrel) would be undertaken no more than six months before the commencement of construction or tree felling activities as part of the CEMP. Surveys would be undertaken in accordance with current survey guidance and would aim to identify the presence or likely presence of protected mammals within working areas and appropriate buffers. Surveys would include all parts of the Site where effects could potentially occur.

7.5.30 Updated ecological information obtained from the pre-construction protected species' surveys would be used to inform and guide the implementation of Species Protection Plans (SPPs) or species-specific mitigation plans, identification of any licencing requirements and appropriate mitigation (including micrositing) if required.

7.5.31 SPPs would be designed to provide the contractor and ECoW with approved methodologies and mitigation measures for carrying out certain activities and would be agreed in consultation with NatureScot and DGC.

7.5.32 Although the trees within the Site are considered of low value for roosting bats, given the protection afforded to individual bats and their roosts, where the felling or lopping of any mature tree is proposed (in any works associated with the Proposed Development) mitigation to ensure legislative compliance would be implemented.

Fisheries and Freshwater Pearl Mussel

7.5.33 Prior to construction commencing or associated tree felling, a fish monitoring plan including surveys pre-construction, during construction and post construction would be agreed with NatureScot, SEPA and GFT. This would likely include electrofishing surveys to establish and monitor fish population sizes and demography.

7.5.34 Measures outlined in the CEMP and within Chapter 9: Hydrology, Hydrogeology and Geology would ensure water quality is maintained during construction. No further mitigation is required.

7.5.35 Mitigation measures would be adapted as necessary on review of the fish monitoring plan to ensure the avoidance of degradation of water quality and/ or impacts on fish and fresh water pearl mussel populations.

Reptiles

7.5.36 A SPP would be prepared for reptiles prior to the commencement of construction activities. The SPP would detail measures to be implemented during construction activities to protect reptiles (and amphibians encountered) from harm during the construction and decommissioning phases.

7.5.37 The SPP would be agreed in consultation with NatureScot and detail emergency procedures to be implemented by site workers in the event reptiles are encountered during works.

Mitigation during Operation

7.5.38 No specific mitigation measures are required during the operational phase; however, enhancement measures provided at part of the HMP (Technical Appendix 7.3: Outline Habitat Management Plan) would remain in place during the operational phase.

7.5.39 A 97 m diameter initial keyhole for woodland clearance during construction has been adopted around each proposed turbine location in accordance with bats and wind farm

guidance (SNH, 2019[12]) and agreed with NatureScot through survey scoping (Table 7.1): 50 m stand-off buffer between turbine blade tip and woodland edge. Further details are provided in Chapter 2: Development Description. This buffer would be maintained free of trees with compensatory planting provided elsewhere within the Site and surrounding area (see Chapter 14: Forestry).

Mitigation through Decommissioning

7.5.40 Decommissioning phase effects are considered to result in no greater scope and magnitude of effects upon ecological features than would occur during the construction phase, albeit occurring over a shorter timescale.

7.5.41 At the point of decommissioning, a Decommissioning Environmental Management Plan (DEMP) will be developed through consultation with DGC, NatureScot and GFT.

7.5.42 Further details are provided in Chapter 9: Hydrology, Hydrogeology and Geology.

Habitat Management Plan

7.5.43 An Outline HMP is provided in Technical Appendix 7.3: Outline Habitat Management Plan. The HMP commits to the increase the diversity of heath and peatland habitats to provide biodiversity enhancement within the Site, particularly focussed on clear-fell areas where no replanting is proposed.

7.5.44 These measures and any subsequent management requirements would be delivered in agreement with NatureScot, DGC and GFT.

7.6 Assessment of Residual Effects

7.6.1 No significant adverse residual effects upon ecological features would occur as a result of the construction, operation or decommissioning of the Proposed Development.

Monitoring

7.6.2 Monitoring would be undertaken during construction in accordance with the CEMP (Technical Appendix 2.1: CEMP) in relation to hydrology, detailed further within Chapter 9: Hydrology, Hydrogeology and Geology. Monitoring of the aquatic environment would ensure the provisions of the CEMP are appropriate.

7.6.3 A monitoring plan would also be established and incorporated into the CEMP in consultation and agreement with SEPA and GFT. The aim of the monitoring plan would be to review and where necessary, update baseline conditions prior to construction works commencing and to continue throughout the construction and operational phase to confirm that the mitigation measures with respect to fish populations, water quality, sedimentation and maintenance of potential fish passages are performing.

7.6.4 The monitoring plan would also include details of response and remediation measures in the event mitigation measures are found not to be performing.

7.7 Summary

7.7.1 A summary of significant ecological effects is provided in Table 7.15 below.

Table 7.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Construction			
Medium (significant) indirect effects on the River Bladnoch SAC through changes in hydrology.	With the exception of the Tarf Water crossing, no infrastructure shall be microsited, nor associated construction activity take place, within 50 m of the River Bladnoch SAC boundary without prior approval of the DGC in consultation with NatureScot; Best practice environmental management during construction and in particular watercourse crossing construction would be implemented through the proposed CEMP. Monitoring of works by the ECoW, inspection of watercourses during the construction phase. Baseline and subsequent water quality monitoring.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not Significant
Low (non-significant) direct loss of habitats Annex 1 and Priority Peatland Habitats to accommodate the Proposed Development.	Not required. The CEMP would also include Habitat Specific Protection Plans (HSPPs) detailing good practice measures for construction works within North Atlantic wet heath and blanket bog habitats. HSPPs would detail measures required to manage construction works within these sensitive habitats and include habitat restoration measures Enhancement provided through HMP.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not Significant
Negligible to low (non-significant) temporary short term disturbance of habitats.	Not required. Re-instatement of habitats post construction.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not Significant
Low to medium (non-significant) indirect changes in hydrology of wetlands through pollution, sedimentation or erosion.	Not required. Drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not Significant
Low (non-significant) displacement/ disturbance of foraging and commuting bats (common	Not required. Enhancement provided through HMP.	Planning Condition requiring HMP to be agreed as per Technical	Not Significant

Table 7.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
pipistrelle, soprano pipistrelle, *Nyctalus spp*).		Appendix 7.3: HMP.	
Potential (non-significant) for direct killing/ injuring, disturbance and/ or displacement of other protected mammals.	Not required. To ensure legislative compliance pre-construction surveys for protected mammals will be undertaken to identify the presence or likely presence of species within working areas to inform SPPs.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not Significant
Medium (significant) impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on fish populations.	With the exception of the proposed watercourse crossings, no infrastructure shall be microsited, nor associated construction activity take place, within 50 m of watercourses without prior approval of the ECoW. Implementation of best practice with regards to construction methods in close proximity to watercourses. To include diversion ditches around excavation works. Baseline and subsequent water quality and fish population monitoring.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not Significant
Medium (significant) impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on Fresh water pearl mussel populations.	With the exception of the proposed watercourse crossings, no infrastructure shall be microsited, nor associated construction activity take place, within 50 m of watercourses without prior approval of the ECoW. Implementation of best practice with regards to construction methods in close proximity to watercourses. To include diversion ditches around excavation works. Baseline and subsequent water quality monitoring.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not Significant
Potential (non-significant) for direct killing/ injuring, disturbance and/ or displacement of reptile species.	Not required. To ensure legislative compliance an SPP will be prepared and adopted for the construction phase, including precautionary avoidance measures.	Detailed through the CEMP and associated SPPs. Monitoring of works by the ECoW.	Not Significant
Operation			
Negligible to low (non-significant) direct collision/mortality, loss or damage of habitats or disturbance/ displacement of commuting and/ or foraging habitats for bats	Not required. Appropriate buffer included (>50 m) in the design of the Proposed Development between turbines and woodland edge habitats.	A 97 m buffer to be maintained tree-free during operation of the Proposed Development (see Technical Appendix 7.3: HMP).	Not Significant

Table 7.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Decommissioning			
Indirect effects on the River Bladnoch SAC through changes in hydrology.	Implementation of best practice with regards to decommissioning methods in close proximity to watercourses. To include diversion ditches around excavation works.	DEMP and PPP agreed through consultation with DGC, NatureScot and GFT. Monitoring of works by the ECoW.	Not Significant
Temporary short term disturbance of habitats.	Re-instatement of habitats post decommissioning.	DEMP and PPP. Monitoring of works by the ECoW.	Not Significant
Indirect changes in hydrology of wetlands through pollution, sedimentation or erosion.	Drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	DEMP and PPP. Monitoring of works by the ECoW.	Not Significant
Displacement/ disturbance of foraging and commuting bats (common pipistrelle, soprano pipistrelle, *Nyctalus spp*).	Not required.	Not required.	Not Significant
Potential for direct killing/ injuring, disturbance and/ or displacement of other protected mammals.	To ensure legislative compliance pre-construction surveys for protected mammals will be undertaken to identify the presence or likely presence of species within working areas to inform SPPs.	CEMP and associated SPPs. Monitoring of works by the ECoW.	Not Significant
Impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on fish populations.	A 50 m buffer to watercourses. Implementation of best practice with regards to decommissioning methods in close proximity to watercourses. To include diversion ditches around excavation works. Baseline and subsequent water quality and fish population monitoring.	DEMP and PPP agreed through consultation with DGC, NatureScot and GFT.	Not Significant
Impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on Fresh water pearl mussel populations.	Not required.	DEMP and PPP agreed through consultation with DGC, NatureScot and GFT.	Not Significant
Potential for direct killing/ injuring, disturbance and/ or displacement of reptile species.	Not required. To ensure legislative compliance an SPP will be prepared and adopted for the construction phase, including precautionary avoidance measures.	CEMP and associated SPPs. Monitoring of works by the ECoW.	Not Significant
Cumulative Construction			
Indirect effects on the River Bladnoch SAC through changes in hydrology.	Not required.	N/A	Not Significant
Direct loss of habitats	Not required.	N/A	Not Significant

Table 7.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Annex 1 and Priority Habitats to accommodate the Proposed Development.			
Temporary short term disturbance of habitats.	Not required.	N/A	Not Significant
Indirect changes in hydrology of wetlands through pollution, sedimentation or erosion.	Not required.	N/A	Not Significant
Displacement/ disturbance of foraging and commuting bats (common pipistrelle, soprano pipistrelle, *Nyctalus spp*).	Not required.	N/A	Not Significant
Potential for direct killing/ injuring, disturbance and/ or displacement of other protected mammals.	Not required.	N/A	Not Significant
Impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on fish populations.	Not required.	N/A	Not Significant
Impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on Fresh water pearl mussel populations.	Not required.	N/A	Not Significant
Potential for direct killing/ injuring, disturbance and/ or displacement of reptile species.	Not required.	N/A	Not Significant
Cumulative Operation			
Direct collision/ mortality, loss or damage of habitats or disturbance/ displacement of commuting and/ or foraging habitats for bats.	Not required. Appropriate buffer included (>50 m) in the design of the Proposed Development between turbines and woodland edge habitats.	A 97 m buffer to be maintained tree-free during operation of the Proposed Development (see Technical Appendix 7.3: HMP).	Not Significant

8 Ornithology

8.1 Introduction

8.1.1 This chapter considers the likely significant effects on important ornithological receptors associated with the construction, operation and decommissioning of the Proposed Development.

8.1.2 The assessment is based upon comprehensive baseline data, comprising specifically targeted ornithological field surveys of important and legally protected ornithological receptors identified during desk study and consultation feedback. It draws on pre-existing information, where appropriate, from other studies, survey data sources and is based on the 'Guidelines for Ecological Impact Assessment (EcIA) in the United Kingdom' (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018)[1] and NatureScot's 'Environmental Impact Assessment Handbook' (formerly Scottish Natural Heritage (SNH), 2014)[2].

8.1.3 The specific objectives of the chapter are to:

- describe the ornithological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

8.1.4 The assessment has been carried out by Avian Ecology Ltd. Lead authors: Mr Howard Fearn MSc MCIEEM, Director and Ms Stacey Whiteley BSc (Hons) MCIEEM, Senior Ecologist. Mr Fearn and Ms Whiteley have over 15 and 10 years' experience respectively as professional ecologists, specialising in renewable energy developments. Both Mr Fearn and Ms Whiteley have contributed to, and led on, many large scale renewable energy projects in Scotland, including numerous wind energy projects (further details of the competency of authors is provided in Volume 4: Technical Appendix 1.2).

8.1.5 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 8.1: Ornithological Statutory Designated Sites;
  - Figure 8.2: Desk Study Records;
  - Figure 8.3: Vantage Point Flight Activity Survey Plan;
  - Figure 8.4: Breeding Bird Study Area;
  - Figure 8.5a: VP Flight Activity Survey Target Species Results (Raptors);
  - Figure 8.5b: VP Flight Activity Survey Target Species Results (non-Raptors);
  - Figure 8.6: VP Flight Activity Survey Target Species Results (Inside Collision Risk Height); and
  - Figure 8.7: MBBS Results
- Volume 5: Confidential Information

[1] CIEEM (2018, updated 2019) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester

[2] Scottish Natural Heritage (2014, updated 2018) Environmental Impact Assessment Handbook. V5.

- Figure 8.A: Confidential Annex 1 / Schedule 1 Breeding Raptor and Owl Results
- Volume 4: Technical Appendices
  - Technical Appendix 8.1: Ornithology; and
  - Technical Appendix 8.2: Collision Risk Analysis.

8.1.6 Figures and technical appendices are referenced in the text where relevant.

8.2 Assessment Methodology and Significance Criteria

Scope of Assessment

8.2.1 The assessment presented within this Chapter has been undertaken in accordance with CIEEM guidelines (CIEEM, 2018[1]) and considers the following main potential impacts upon ornithological receptors associated with construction, operation and decommissioning of the Proposed Development:

- Collision Mortality – the risk of mortality resulting from collision or interaction with the turbines and/or other wind farm infrastructure; and,
- Disturbance/Displacement of Species - disturbance and displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the construction and operation of the Proposed Development.

8.2.2 The potential effects are considered as a result of the Proposed Development alone and cumulatively, in-combination with other wind farm developments.

8.2.3 CIEEM guidelines (2018)[1] stipulate that it is not necessary to carry out a detailed assessment of impacts upon ornithological receptors that are sufficiently widespread, unthreatened and resilient to impacts of the Proposed Development.

8.2.4 As such, the assessment considers effects upon designated sites and ornithological receptors which are considered important on the basis of baseline information, relevant guidance, literature, professional judgement of the authors and opinions of statutory advisory bodies provided through consultations in relation to the Proposed Development and, where relevant, other wind farm developments.

8.2.5 Where ornithological receptors are not considered so important as to warrant a detailed assessment, or where they will not be significantly affected on the basis of baseline information (e.g. passerine species), these are 'scoped out' of the assessment. Mitigation measures for such receptors may however, still be outlined as appropriate to reduce and/or avoid any potentially adverse effects or to ensure legislative compliance for breeding and roosting birds.

Legislation, Policy and Guidance

8.2.6 In preparation of this Chapter, reference has been made to the following key pieces of legislation, planning policy and guidance:

European

- Environmental Impact Assessment (EIA) Directive (85/337/EEC) (as amended)[3];
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive)[4]; and,

[3] Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, and subsequently amended

- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (the Birds Directive)[5].

National

- Assessing Connectivity with Special Protection Areas (SNH, 2016a[6]);
- Assessing the cumulative impacts of onshore wind farms on birds (SNH, 2018a[7]);
- Assessing the significance of impacts from onshore wind farms out with designated areas' (SNH, 2018b[8]);
- Birds of Conservation Concern 4 (BoCC) (Eaton *et al*., 2015[9]);
- Environmental Statements and Annexes of Environmentally Sensitive Bird Information: Guidance for Developers, Consultants and Consultees (SNH, 2016c[10]);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine' (CIEEM, 2018[11]);
- Implications of Additional Protection for Hen Harrier, Red Kite and Golden Eagle Under Schedules A1 & 1A of the Wildlife and Countryside Act (1981) (SNH, 2014[12]);
- Natural Heritage Zone Bird Population Estimates (Wilson *et al*., 2015[13]);
- Pre-application/scoping advice to developers of onshore wind farms (NatureScot, 2020[14]);
- Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2017[15]);
- Scottish Biodiversity List (SBL) 2013[16];
- The Conservation of Habitats and Species Regulations 2010, as amended in Scotland (the Habitats Regulations[17]);

[4] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

[5] Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (the Birds Directive).

[6] SNH (2016a). Assessing Connectivity with Special Protection Areas. SNH, Inverness.

[7] SNH (2018a). Assessing the cumulative impacts of onshore wind farms on birds. SNH, Inverness.

[8] SNH (2018b). Assessing the significance of impacts from onshore wind farms outwith designated areas. SNH, Inverness;

[9] Eaton, M.A, Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds, 108, pp. 708–746.

[10] SNH (2016c). Environmental Statements and Annexes of Environmentally Sensitive Bird Information. SNH, Inverness.

11 CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine Version 1.1 (Updated September 2019). Chartered Institute for Ecology and Environmental Management, Winchester.

[12] SNH (2014). Implications of Additional Protection for Hen Harrier, Red Kite and Golden Eagle under Schedules A1 & 1A of the Wildlife and Countryside Act (1981). SNH, Inverness.

[13] Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned Report Number 1504.

[14] NatureScot (2020). SNH General Pre-application/Scoping Advice to Developers of Onshore Wind Farms. NatureScot, Inverness.

[15] SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage, Inverness.

16 Scottish Biodiversity List (2013). Available at: https://www.webarchive.org.uk/wayback/archive/20160402063428/http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [accessed October 2020].

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017[18];
- The Nature Conservation (Scotland) Act 2004[19];
- The Wildlife and Countryside Act 1981 (as amended)[20]; and
- The Wildlife and Natural Environment (Scotland) Act 2011[21].

Local

- Dumfries and Galloway Biodiversity Action Plan[22].

Consultation

8.2.7 Table 8.1 summarises the consultation responses received regarding Ornithology and provides information on where and/or how they have been addressed within this assessment.

8.2.8 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIA Report Volume 4).

Table 8.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
NatureScot – 25 June 2019	Other – Survey Scoping	NatureScot was consulted to provide advice on the proposed approach to baseline Ecological and Ornithological information in August 2019 (See also Chapter 7: Ecology).	Surveys were undertaken in accordance with advice provided (See Technical Appendix 8.1: Ornithology).
NatureScot – 18 June 2020	Scoping Response	NatureScot accepted approach to baseline data gathering and assessment. Recommended consultation with the RSPB and Dumfries and Galloway Raptor Group (DGRSG) to obtain any appropriate records.	In accordance with NatureScot advice, existing ornithological records were requested and obtained from the RSPB and the DGRSG.
Royal Society for the Protection of Birds (RSPB) – 19 December 2018	Data request	Information request for existing ornithological records within approximately 2 km of the Site. Records were received in 2018.	Information provided used to inform the requirement and approach to baseline ornithological surveys, notably in relation to breeding raptors. Record details considered sensitive are restricted to Confidential Figure 8.A.
RSPB – 5 June 2020	Scoping Response	Agreement of survey methodologies undertaken and identification of target species.	Survey methodology and impact assessment follows process agreed. Potential connectivity to

17 Accessed via https://www.legislation.gov.uk/uksi/2010/490/contents/made [October 2020]
18 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
19 The Nature Conservation (Scotland) Act 2004.
20 Wildlife and Countryside Act 1981 (as amended).
21 The Wildlife and Natural Environment (Scotland) Act 2011.
22 https://swseic.org.uk/resources/ [accessed October 2020]

Table 8.1: Consultation Responses			
Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
		RSPB requested that connectivity to the Glen App and Galloway Moors Species Protection Area (SPA) is considered within the assessment.	the Glen App and Galloway Moor SPA is considered under paragraph 8.2.11 – 8.2.16 and scoped-out.
DGRSG - 4 March 2020	Data Request	Information request for existing ornithological records. Email correspondence from DGRSG in 2020 confirmed no records held.	Such records are included within the desk study section of Technical Appendix 8.1: Ornithology. Records have been used to inform and review the requirement for baseline ornithology surveys and have been considered as part of this assessment.
South West Scotland Environmental Information Centre (SWSEIC)	Data Request	Ornithological records provided.	Included in Technical Appendix 8.1: Ornithology
Dumfries and Galloway Council (DGC)	No response received through Scoping		
Scottish Wildlife Trust	No response received through Scoping		

Potential Effects Scoped Out

Habitat Loss

8.2.9 The Proposed Development will result in the direct and permanent loss of commercial forestry plantation and negligible areas of wet heath and blanket bog habitats, as detailed within Chapter 7: Ecology. Habitat losses have the potential to result in the loss or otherwise lower the quality of nesting and foraging opportunities for ornithological receptors which are known to use or inhabit the Site. Overall direct and permanent habitat losses on the basis of the nature and scale of the Proposed Development are considered to be small, resulting in an adverse impact upon ornithological receptors at no more than Site level only. Suitable habitats and therefore nesting and foraging opportunities will remain abundant within the Site, the immediate and wider surrounding area. Habitat losses for ornithological receptors are therefore not considered within the detailed assessment as losses would not be significant for any species.

8.2.10 The potential for indirect habitat loss to ornithological receptors as a result of disturbance and displacement is however, assessed for both the construction and operational phase of the proposed development.

Statutory Designated Sites for Nature Conservation: Glen App and Galloway Moors Special Protection Area

8.2.11 Glen App and Galloway Moors Special Protection Area (SPA) is located c 6.2 km west of the Site and is designated by virtue of its importance for breeding hen harrier.

8.2.12 NatureScot guidance (SNH, 2016[6]) provides information on dispersal and foraging distances for a key bird species in order to identify the potential for 'connectivity' between development proposals and SPAs. Table 1 of the guidance presents typical foraging

distances for these species, which for hen harrier is stated to be "*core range of 3 km, and maximum range of 10 km during the breeding season*". Subsequently the Proposed Development lies outside the core range; however, within the identified 10 km maximum range.

8.2.13 NatureScot's (2016[6]) guidance clearly states that the core range should be used when determining whether there is connectivity between projects and qualifying interests. The maximum range may be useful on occasion, such as when there is a lack of closer foraging sites between the proposal and the SPA.

8.2.14 In this case, the Site comprises commercial plantation forestry, of poor foraging value for hen harrier, and extensive foraging habitat is available to the south and west of the Site, between the Site and the Glen App and Galloway Moors SPA. Furthermore, Artfield Fell and Balmurrie Fell Wind Farm are located in open moorland to the west of the Site. No evidence of breeding hen harriers was found during two breeding seasons of survey (in 2018 and 2019) of the Site and surrounding area, nor were breeding birds found during surveys for the former Gass Wind Farm (in 2012 and 2013) or the Kilgallioch Extension Wind Farm (also 2018). Full details are presented in Technical Appendix 8.1: Ornithology. Subsequently the Site and adjoining land are not considered to regularly support breeding hen harriers.

8.2.15 It is therefore concluded that the NatureScot defined core range is the most appropriate value to consider, and that there is subsequently no pathway for Likely Significant Effect (LSE) on the qualifying interests of the Glen App and Galloway Moors SPA, either alone, or in combination with other developments.

8.2.16 Potential connectivity between the Site and the SPA is therefore scoped-out.

Method of Baseline Characterisation

Extent of the Study Area

8.2.17 Study Areas, within which baseline information in relation to ornithological receptors has been obtained has comprised the Site (Figure 8.1) and areas out to at least 500 m, extended up to 6 km for specific species. Field surveys as per current NatureScot guidance (SNH, 2017[15]) and detailed in Technical Appendix 8.1: Ornithology.

8.2.18 The locations of statutory designated sites for nature conservation with ornithological qualifying interests have also been identified within 10 km of the Site, extended to 20 km for internationally designated sites with migratory goose interests (Figure 8.1).

8.2.19 Full details of Study Areas adopted for desk study and field surveys are provided in Technical Appendix 8.1: Ornithology and illustrated on Figures 8.1 to 8.4.

8.2.20 Species specific Study Areas included the Site, extended to:

- Moorland Breeding Birds Survey (MBBS) Study Area – 500 m, as shown on Figure 8.4;
- Woodland Grouse Study Area – 1.5 km, as shown on Figure 8.4;
- Nightjar *Caprimulgius europaeus* Study Area – 500 m, as shown on Figure 8.4; and,
- Schedule 1[20] and Annex 1[5] listed raptors and owls Study Area – 2 km, as shown on Figure 8.4, extended to 6 km for eagle species.

8.2.21 The Vantage Point (VP) Flight Activity Study Area, within which flight activity of target species has been recorded, included the Proposed Development turbine locations and areas out to 500 m, as shown on Figure 8.3.

Desk Study

8.2.22 In accordance with NatureScot guidance (SNH, 2017[15]), a desk study has been undertaken to establish an overview of known and likely bird populations and designated sites in proximity to the Proposed Development, in order to identify known or likely target species and for which further survey may be required.

8.2.23 The desk study also included a review of designated sites within proximity to the Proposed Development and consultation with specialist recording groups for existing ornithological records comprising; the RSPB, DGRSG and the South West Scotland Environmental Information Centre (SWSEIC).

8.2.24 The desk study has also comprised a review of the NatureScot Sitelink website[23] to identify the proximity of the Site to statutory designated sites.

8.2.25 EIA documentation for the consented (now lapsed) Gass Wind Farm (2014[24]) and adjacent Kilgallioch Extension Wind Farm (2019[25]) has also been reviewed, together with additional peer reviewed literature and industry guidance referred to, where appropriate.

8.2.26 Full details of the desk study undertaken are provided within Technical Appendix 8.1: Ornithology.

Field Survey

8.2.27 The following field surveys were carried out between April 2018 and August 2019:

- Vantage Point (VP) flight activity surveys (April 2018 – August 2019);
- Moorland breeding bird survey (MBBS) (2018 and 2019);
- Breeding Annex 1[5] and Schedule 1[20] raptor and owl searches (2018 and 2019);
- Breeding woodland grouse searches (2018); and,
- Breeding Nightjar survey (2018).

8.2.28 Surveys have been undertaken in accordance with current NatureScot (SNH, 2017[15]) guidance with full details presented in Technical Appendix 8.1: Ornithology.

TARGET SPECIES

8.2.29 Target species for survey and reporting consist of Annex 1[5] and Schedule 1[20] listed species and red-listed species on BoCC[9], adopting a precautionary approach and with reference to NatureScot (SNH, 2017[15] & 2018[2]) guidance which details priority species for assessment at onshore wind farms.

8.2.30 Target species also included those species listed as qualifying interest species for identified designated sites for nature conservation (Table 8.5) and for which core foraging ranges in accordance with current NatureScot (SNH, 2016[6]) guidance, overlap with the Site.

8.2.31 Passerine species were not identified as target species for survey and recording and are not considered sensitive to wind farm developments (SNH, 2017[15]; 2018[8]). Observations of notable species e.g. those listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) during MBBS were however recorded.

[23] SNH, Sitelink website. Available at: https://sitelink.nature.scot/home

[24] Sgurr Energy (2014) Gass Wind Farm. ES Chapter 8 Ornithology

[25] Scottish Power Renewables (2019) Kilgallioch Extension Wind Farm EIA Report. – Chapter 8 Ecology and Biodiversity

8.2.32 Gulls and commoner species including buzzard *Buteo*, kestrel *Falco tinnunculus* and sparrowhawk *Accipiter nisus*, mallard *Anas platyrhynchos* and raven *Corvus corax*, were also not identified as target species given their general widespread number and abundance, but were recorded as secondary species during VP flight activity surveys.

FIELD SURVEY PERSONNEL

8.2.33 All field surveys were completed by experienced, reputable and professional ornithologists, fully conversant in established bird survey methodologies for proposed wind turbine developments.

8.2.34 Details of field surveyors are provided in Technical Appendix 8.1: Ornithology.

Criteria for the Assessment of Effects

8.2.35 The assessment has been undertaken in accordance with CIEEM guidelines (2018)[1] and includes the following stages:

- determination and evaluation of important ornithological receptors;
- identification and characterisation of impacts;
- outline of mitigating measures to avoid and reduce significant impacts;
- assessment of the significance of any residual effects after such measures; and,
- identification of appropriate compensation measures to offset significant residual effects.

Criteria for Assessing the Sensitivity of Receptors

8.2.36 Relevant European, national and local guidance from governments and specialist organisations has been referred to in order to determine the sensitivity (or importance) of ornithological receptors. Reference has also been made to Annex 1 of NatureScot guidance (SNH, 2017[15]) on key ornithological receptors when considering the development of onshore wind farms in Scotland and species with 'restricted ranges' potentially at risk of impacts from wind farms.

8.2.37 In addition, sensitivity has also been determined using professional judgement and taking account of the results of baseline field and desk study findings and the functional role of receptors within the context of the geographical area.

8.2.38 It should be noted that sensitivity, or importance does not necessarily relate to the level of legal protection that a receptor receives, and receptors may be important for a variety of reasons, such as their connectivity to a designated site, rarity or the geographical location of species relative to their known range.

8.2.39 For the purposes of this assessment the sensitivity or importance of an ornithological receptor is considered in the context of a defined geographical area, ranging from International to Local, as detailed in Table 8.2.

Table 8.2: Sensitivity / Geographic Scale of Ornithological Feature Importance	
Sensitivity / Geographical Scale of Importance	Definition
Very High - International	An internationally designated site i.e. Special Protection Area (SPA) and/or Ramsar site or candidate site (pSPA). A regularly occurring species present in internationally important numbers (>1% of its biogeographic population) listed under Annex I of the Birds Directive[5], or regularly occurring migratory species listed under Annex II of the Birds Directive[5] connected to an internationally designated site for this species.
High – National	A nationally designated site e.g. Site of Special Scientific Interest (SSSI), or area meeting criteria for national level designations. A regularly occurring species present in nationally important numbers (>1% of its Scottish population) and listed as a UK BAP[22], SBL priority species[16] Red-listed bird of Conservation Concern (Eaton *et al*., 2015)[9] and listed under Schedule 1 of the Wildlife & Countryside Act[20] or Annex 1 of the Birds Directive[5].
Medium - Regional	A regularly occurring species present in regionally important numbers i.e. >1% of its relevant Natural Heritage Zone (NHZ) population (Wilson *et al*., 2015[13]) or appropriate alternative and listed as a UK BAP[22], SBL priority species[16], Red-listed birds of Conservation Concern (Eaton *et al*., 2015)[9] or listed on Schedule 1 of the Wildlife & Countryside Act[20] or Annex 1 of the Birds Directive[5].
Low – Local	All other species that are widespread and common and which are not present in regionally or nationally important numbers, but which do contribute to the local breeding/wintering bird assemblage.

Criteria for Assessing the Magnitude of Change

8.2.40 Once identified, potential effects are described making reference to the following characteristics as appropriate:

- adverse or beneficial;
- extent;
- magnitude;
- duration;
- timing;
- frequency; and
- reversibility.

8.2.41 The assessment only makes reference to those characteristics relevant to understanding the nature of an effect and determining its significance. For the purposes of this assessment the temporal nature of potential effects are described as follows:

- Negligible: of inconsequential duration;
- Short-term: for 1-5 years;
- Medium-term: for 5-10 years;
- Long-term: >10-30 years; and
- Permanent: >30 years.

8.2.42 The criteria used to determine the magnitude of impacts are set out in Table 8.3.

8.2.43 It is important to note that, where reference is made to population level effects to assess magnitude (e.g. at the Regional NHZ population level), the most recently published population estimates used are considered to be guides.

8.2.44 In addition, it will often be impossible to equate an impact to an actual population loss. For example, where birds may be displaced from a wind farm site as a result of construction or operational activities, such a loss may be temporary or may reasonably result in the relocation of birds to suitable habitats elsewhere within the Site, immediate or wider area. Where uncertainty arises a precautionary approach has been adopted.

8.2.45 As such, professional judgement, on the basis of best available evidence, has been used to inform the assessment of impacts presented within.

Table 8.3: Impact Magnitude

Magnitude	Definition
Very High	The effect (either on its own or in-combination with other proposals) may result in the permanent total or almost complete loss of a designated site and/or species status or productivity. E.g. Affecting >80% of the relevant Regional NHZ population.
High	The effect (either on its own or in-combination with other proposals) may adversely affect the conservation status of a designated site and/or species population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest. E.g. Affecting 30%-80% of the relevant Regional NHZ population.
Medium	The effect (either on its own or in-combination with other proposals) would not adversely affect the conservation status of a designated site and/or species, but some element of the functioning might be affected and impacts could potentially affect its ability to sustain some part of itself in the long term. E.g. Affecting >10%-30% of the relevant Regional NHZ population.
Low	Neither the above or below applies, but some observable adverse effect is evident on a temporary basis or affects the extent of a species abundance in the local area. E.g. Affecting 1%-10% of the relevant Regional NHZ population.
Negligible	A very slight (indiscernible) reduction in a species status or productivity and/or no observable effect. e.g. Affecting <1% of the relevant Regional NHZ population.
Beneficial	The effects are considered to be beneficial to a species or designated sites nature conservation status.

Criteria for Assessing Cumulative Effects

8.2.46 Potentially significant cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location.

8.2.47 Cumulative impacts have therefore been assessed with reference to NatureScot (SNH, 2018[7]) guidance for important ornithological receptors subject to a detailed assessment.

8.2.48 The cumulative assessment includes consideration of:

- Existing wind farm developments, either operational or under construction;
- Consented wind farm developments, awaiting implementation; and
- Wind farm applications awaiting determination within the planning process with design information in the public domain.

8.2.49 Those developments which have been withdrawn and/or refused are not considered, unless an appeal is currently in progress and information is available.

8.2.50 Small wind farm developments, including those with three turbines or less, have also been scoped out as applications for such developments do not generally consider the potential for impacts upon ornithological receptors in sufficient detail.

8.2.51 With regard to the spatial extent of the cumulative assessment, NatureScot (SNH, 2018[7]) guidance recommends that cumulative effects should typically be assessed at the relevant Regional NHZ population level. All developments within NHZ 19 (Western Southern Uplands & Inner Solway), which have been considered for the purposes of an assessment of cumulative effects are included within Technical Appendix 8.1: Ornithology.

Criteria for Assessing Significance

8.2.52 CIEEM guidelines (2018[1]) note that "A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects have been lawfully permitted following EIA procedures."

8.2.53 For the purposes of assessment significant effects are identified as those which encompass 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).

8.2.54 Such effects are identified by considering the importance of a receptor, the magnitude of the effect and applying professional judgement based on best available evidence, to identify whether the integrity of a receptor will be affected.

8.2.55 The term integrity is used here to refer to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

8.2.56 For the purposes of this assessment, significant effects are primarily expressed with reference to the most recently published Regional NHZ population level[13] (or suitable alternative), in line with NatureScot's interests of a species status at wider spatial levels[6]. The significance of effects at other geographical scales is also expressed where appropriate on a precautionary basis and where sufficient information allows a meaningful assessment.

8.2.57 In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.

8.2.58 Where the assessment proposes measures to mitigate adverse effects on ornithological receptors, a further assessment of residual effects, taking into account such measures, has been undertaken.

8.2.59 CIEEM guidelines (2018[1]) do not recommend the sole use of a matrix table as commonly set out in EIA Report Chapters to determine 'significant' and 'non-significant' effects. For the purposes of this assessment presented herein, Table 8.4 sets out adapted CIEEM terminology and equivalent in the context of the EIA Regulations.

8.2.60 Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 8.4: Effect (EIA Significance)

Significant	Major Adverse/ Beneficial	A medium or high, medium or long-term adverse or beneficial effect upon the integrity of an ornithological receptor at a National (Scottish) or International level.
	Moderate Adverse/ Beneficial	A high or very high, long-term or permanent adverse or beneficial effect upon the integrity of an ornithological receptor at a Regional (NHZ) level (or suitable alternative) or above.

Table 8.4: Effect (EIA Significance)		
Non-significant	Minor Adverse/Beneficial	A low or medium, short-term or long-term adverse or beneficial effect upon the integrity of an ornithological receptor at a Regional (NHZ) level (or suitable alternative) or below.
	Negligible/Beneficial	A negligible or low adverse or beneficial effect upon the integrity of an ornithological receptor, typically at a Site level or below.

Limitations and Assumptions

8.2.61 Limitations are discussed in full within Technical Appendix 8.1: Ornithology. In summary no limitations to baseline information gathering and subsequent assessment herein presented have been identified.

8.2.62 The Proposed Development layout was extended north in 2019 after one year of VP Flight Activity and breeding bird surveys and therefore Study Areas were accordingly increased to cover this area. This is not considered a limitation as the majority of the Site was covered by the surveys in two years.

8.2.63 An additional VP was also added in April 2019 (VP4) so as to provide coverage of the increased study area. NatureScot agreed with the baseline proposals in their Scoping Response on 18 June 2020, as detailed within Table 8.1. A total of 36 hours were undertaken at VP4 from early May to August 2019. Only two flights of target species (one hen harrier and one goshawk) were recorded during the entire 36 hour survey period at VP4. Given the low activity of target species from VP4 during the breeding season, and the low number of target species flights during the non-breeding season at VPs 1-3, the lack of data for VP4 during the non-breeding season is not considered a limitation.

8.2.64 Overall no limitations to the survey data in establishing an accurate reflection of the levels of target species activity within adopted Study Areas, and particularly the Site, are identified.

8.3 Baseline Conditions

Current Baseline

8.3.1 This section provides a summary of baseline ornithological conditions.

8.3.2 It provides an overview of the Proposed Developments proximity to designated sites for nature conservation with ornithological interests, together with the known distribution and flight activity of target species.

8.3.3 Full details are provided within Technical Appendix 8.1: Ornithology, with information that is considered sensitive presented in Volume 5, Figure 8.A: Confidential Ornithology.

Designated Sites for Nature Conservation

8.3.4 This section should be read with reference to Figure 8.1.

8.3.5 Table 8.5 provides a summary of statutory designated sites for nature conservation with cited ornithological interests, located within 10 km of the Site, extended to 20 km for internationally designated sites with migratory goose interests[26].

8.3.6 Sites designated for ecological receptors are addressed separately in Chapter 7: Ecology.

[26] No additional sites were identified within 10-20km with migratory goose interests.

8.3.7 The distances specified within Table 8.5 are from the Site boundary to the designated boundary at its nearest point.

Table 8.5: Designated Sites for Nature Conservation

Designated Site	Distance / Orientation	Ornithological Qualifying Interests
Derskelpin Moss SSSI	5.6 km, south east	▪ Dunlin *Calidris alpina* (breeding); ▪ Breeding bird assemblage, incl. teal *Anas crecca*, tufted duck *Aythya fulgula*, common sandpiper *Actitis hypoleucos*, redshank *Tringa totanus*, oystercatcher *Haematopus ostralegus*, golden plover *Pluvalis apricaria* and black grouse *Tetrao tetrix*; and, ▪ Foraging hen harrier *Circus cyaneus*, merlin *Falco columbaris* and short-eared owl *Asio flammeus*.
Glen App and Galloway Moors SPA	6.2 km, west	▪ Hen harrier (breeding).
Glen App and Galloway Moors SSSI	6.2 km, west	▪ Hen harrier (breeding).
Loch of Inch and Torrs Warren SPA	10 km, south west	▪ Greenland white-fronted goose *Anser albifrons* (non-breeding); and ▪ Hen harrier (non-breeding).
Loch of Inch and Torrs Warren Ramsar Site	10 km, south west	▪ Greenland white-fronted goose (non-breeding).

VP Flight Activity Surveys

8.3.8 VP flight activity surveys were undertaken between April 2018 and August 2019 adopting four VP locations (Figure 8.3) to provide coverage of the VP Study Area required in accordance with NatureScot (2017[15]) guidance, comprising the Proposed Development turbine locations out to 500 m.

8.3.9 Survey effort and viewshed visibility coverage of the Site is detailed within Technical Appendix 8.1: Ornithology.

8.3.10 Target species flight activity "at collision risk" recorded during the VP survey effort (April 2018 – August 2019) is summarised in Table 8.6. The total number of flights, total number of birds and the total spent at collision risk is presented.

8.3.11 Flights at collision risk are considered to be any flight >20 m above ground level.

8.3.12 In addition to the species listed in Table 8.6, flight activity of merlin was recorded but all flights were below collision risk height and therefore not considered 'at collision risk' as a result of the Proposed Development.

8.3.13 Detailed flight records for all species are presented in Technical Appendix 8.1: Ornithology and illustrated on Figure 8.5a and 8.5b. Flight records for species 'at collision risk' are illustrated on Figure 8.6.

Table 8.6: Target Species Flight Activity Summary ('at risk' flights)

Species	Total No. Flights	Total No. Birds	Total Time Spent "At Collision Risk" (s)
Greylag goose *Anser anser*	1	1	70
Goosander *Mergus merganser*	1	4	116
Grey heron *Ardea cinerea*	3	3	169

Table 8.6: Target Species Flight Activity Summary ('at risk' flights)			
Species	Total No. Flights	Total No. Birds	Total Time Spent "At Collision Risk" (s)
Hen harrier	4	4	250
Goshawk *Accipiter gentilis*	7	7	485
Golden plover	1	1	35
Peregrine falcon *Falco peregrinus*	1	1	126

8.3.14 VP flight activity surveys undertaken for Gass Wind Farm[24] recorded only six flights of pink-footed goose and three lapwing *Vanellus vanellus*.

8.3.15 A single pink-footed goose flight was recorded during baseline surveys for Kilgallioch Extension Wind Farm[25], along with greylag goose (two flights), hen harrier (16 flights), goshawk (one flight), red kite (two flights), merlin (one flight), peregrine falcon (two flights) and short-eared owl (two flights).

Collision Mortality Risk

8.3.16 Calculations of collision mortality risk have been undertaken for hen harrier. No other target species recorded during VP flight activity surveys between April 2018 and August 2019 had three or more 'at risk' flights, with resulting collision risks reasonably concluded as being very low.

8.3.17 Predicted collision mortality is summarised in Table 8.7 and full details are presented in Technical Appendix 8.2: Collision Mortality.

Table 78.7: Predicted collision mortality of hen harrier		
Season	Annual Seasonal Mortality	30 Year Seasonal Mortality
Year 1 Breeding Season (2018)	0.000	0.000
Year 1 Non-breeding Season (2018-19)	0.002	0.075
Year 2 Breeding Season (2019)	0.005	0.139

Moorland Breeding Bird Surveys

8.3.18 The Study Area comprised the Site plus a 500 m buffer.

8.3.19 In 2018 and 2019, the MBBS Study Area was found to support a maximum of two pairs of snipe *Gallinago gallinago* and a single mallard pair. Territories were located in open habitat on the periphery of Site and presented on Figure 8.7.

8.3.20 No breeding wader territories were recorded within the Site.

8.3.21 A small number of common crossbill *Loxia curvirostra* breeding territories were also recorded in suitable woodland habitat within the Study Area in 2018 and 2019. The species is likely to breed widely within suitable habitats of the Site.

8.3.22 Gass Wind Farm EIA documentation[24] identified one lapwing and snipe territory within open pasture in the south of the Site in the Gass Farm landholding in 2012 and 2013. Kilgallioch Extension Wind Farm[25] identified a further two snipe territories on open moorland to the north of the Site in 2018.

Annex 1 / Schedule 1 Breeding Raptor and Owl Searches

8.3.23 The Study Area comprised the Site plus a 2 km buffer.

8.3.24 A single goshawk display flight was recorded in May 2018 with a potential territory identified within the Site (as shown on Figure 8.7). No further observations of this species were made during searches and no nest sites were identified within the Site; however flight activity of goshawk recorded during VP surveys suggested the Site may form part of a territory.

8.3.25 A barn owl nest site was also identified outside the Site to the north in 2018, with the locations presented in Confidential Figure 8.A. This nest site was also noted in the Kilgallioch Extension Wind Farm EIA Report[25].

8.3.26 No breeding territories of any additional Schedule 1[20] or Annex 1[5] species were recorded.

8.3.27 Baseline surveys to inform Gass Wind Farm in 2013 did not identify any breeding raptors.

Breeding Woodland Grouse

8.3.28 The Study Area comprised the Site plus a 1.5 km buffer.

8.3.29 No black grouse were recorded within the Study Area in 2018.

8.3.30 The habitats within the Site are considered sub-optimal for lekking birds, due to the predominance of closed canopy plantation woodland.

8.3.31 No black grouse leks were identified during baseline surveys for Gass Wind Farm[24] (in 2013) or Kilgallioch Extension Wind Farm[25] (2018).

Nightjar

8.3.32 The Study Area comprised all suitable habitat (clear fell and regenerating plantation) within the Site.

8.3.33 No nightjars were recorded within the Study Area in 2018.

8.3.34 The habitats within the Site are considered sub-optimal for nightjar, due to the predominance of closed canopy plantation woodland.

8.3.35 No nightjar surveys were undertaken during baseline surveys for Gass Wind Farm[24] or Kilgallioch Extension Wind Farm[25], but records were received from SWSEIC within 2 km of the Site.

Additional Results from Desk Study

8.3.36 Full desk study results are presented in Technical Appendix 8.1: Ornithology and results are included on Figure 8.2.

8.3.37 In addition to those results discussed above, Kilgallioch Extension Wind Farm[25] recorded three hen harrier winter roosts within open moorland to the north of the Site comprising 2-4 birds. In 2007 two winter roosts were recorded and four were observed in 2018, all within 1km of the Site. The majority of associated flights were within close proximity to the roost locations and within open moorland. Two flights headed south over forestry within the northern extents of the Site. Full details are provided on Confidential Figure Annex Figure 2 of the Kilgallioch Extension Wind Farm[25].

Future Baseline

8.3.38 In the absence of the Proposed Development, assuming a “do-nothing” scenario or gap between baseline surveys and the commencement of construction of the Proposed

Development, changes in the baseline ornithology conditions (i.e. distributions and populations) are most likely to result from habitat modifications within or surrounding the Site due to local land management practices, principally, forestry works.

8.3.39 Breeding bird densities would therefore reasonably be expected to remain at comparable levels with those recorded during field surveys and identified through desk study i.e. at relatively low levels, albeit central territory locations may shift.

8.3.40 The establishment of additional breeding raptor territories within the Site is considered unlikely, given the general absence of suitable nesting habitat features for other raptor species (such as deep heather swards and crags).

Summary of Sensitive Receptors

8.3.41 A summary of identified sensitive/important ornithological receptors is provided within Table 8.8.

Table 8.8: Summary of Identified Sensitive/Important Ornithological Receptors

Sensitivity	Feature		
Very High / International	n/a		
High / National	n/a		
Medium / Regional	Hen harrier (non-breeding) Goshawk (breeding)		
Low / Local	Greylag goose All other wildfowl All ducks	Merlin Nightjar All other commoner raptors All owls	Raven Black grouse All waders (including snipe) All gulls All passerines

Scoped Out Receptors

STATUTORY DESIGNATED SITES FOR NATURE CONSERVATION

8.3.42 No statutory designated sites for nature conservation with qualifying ornithological interests are located within or immediately adjacent to the Site, the closest being the Derskelpin Moss SSSI, 5.6 km south east.

8.3.43 Given the considerable spatial segregation between the Site and designated sites no direct impacts will occur. Furthermore, with the implementation of standard pollution prevention and run-off control measures that are a standard accompaniment to construction works, the impacts of the Proposed Development on any statutory designated site which support ornithological interests are considered to be negligible and not considered further within the assessment.

8.3.44 The potential for connectivity with the Glen App and Galloway Moors SPA has been scoped-out (see Section 8.2) and the SPA is therefore not considered further.

HEN HARRIER (BREEDING)

8.3.45 Breeding hen harrier are scoped-out. Surveys did not identify breeding activity within the Site or Study Areas and the majority of VP flight activity represented non-breeding birds.

8.3.46 Only two flights of this species were recorded during the breeding season; one in April 2018, and second in 2019. The flight in 2019 was of a ring-tail bird in late August (a juvenile bird)

which was not holding a territory. No evidence of breeding was observed during surveys and lack of activity over the course of the breeding seasons suggests that the Site does not support a breeding hen harrier territory.

8.3.47 Furthermore, no evidence of breeding was identified during baseline surveys for the Proposed Development or through desk study review of Gass Wind Farm ES[24]. Baseline surveys undertaken for Kilgallioch Extension Wind Farm[25] identified three winter roost locations within open moorland to the north of the Proposed Development (within 2 km of the Site), which would explain the flights during the non-breeding season within the VP flight activity Study Area. No evidence of breeding was found during the Kilgallioch surveys.

LOW SENSITIVITY / LOCAL IMPORTANCE

8.3.48 Ornithological receptors assigned local importance / low sensitivity have been scoped-out of detailed assessment on the basis of their established presence in numbers of very low importance, low levels of activity recorded during baseline surveys (Technical Appendix 8.1: Ornithology) and/or as they are not considered a priority for assessment in accordance with NatureScot (SNH, 2018[8]) guidance, given their generally accepted low sensitivity to wind farm developments.

8.3.49 As all wild birds and their nests are protected under the provisions of the Wildlife and Countryside Act 1981 (as amended[20]) mitigation measures are however, outlined to ensure legislative compliance and protection for the in-use nests, eggs and dependent young of all wild birds.

Scoped In Receptors

8.3.50 A summary of ornithological receptors scoped into detailed assessment is provided in Table 8.9.

Table 8.9: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Hen harrier (non-breeding)	Medium / Regional	Hen harrier is listed on Schedule 1[20] and Annex 1[5] and is a red-listed BoCC[9], an SBL[16] species and listed in Annex 1 of NatureScot (SNH, 2017)[15] guidance. No nest sites or breeding activity of hen harrier has been identified and the Site does not fall within a core foraging range for this species. The Site does however fall within a an extended non-breeding foraging range, with small numbers of hen harriers known to roost in open moorland within 2 km to the north of the Site, as identified within the Kilgallioch Extension Wind Farm EIA Report[25]
Goshawk	Medium / Regional	Goshawk is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)[20] and listed in Annex 1 of NatureScot guidance (SNH, 2017)[15]. The most recently published NHZ 19 'Western Southern Uplands and Inner Solway' population for goshawk is estimated to be 31 pairs (62 breeding birds), based on 2013 data submitted to the SRMS[27]. Goshawk flight activity recorded during baseline VP Flight Activity Surveys between April 2018 and August 2019 comprised a total of eight flights. No confirmed nest sites of goshawk were recorded within the Study Area during baseline Annex 1/Schedule 1 Breeding Raptor and Owl searches in 2018 and 2019 however, observations suggested that the Study Area is located within

[27] http://raptormonitoring.org/wp-content/uploads/2020/08/Goshawk_2018.pdf [accessed October 2020]

Table 8.9: Summary of Receptor Sensitivity		
Receptor	Sensitivity	Justification
		part of at least a single goshawk pair nesting range. This single breeding territory represents 3.2% of the most recently published regional NHZ population estimate.

8.4 Assessment of Likely Effects

8.4.1 This section presents an assessment of effects upon important ornithological receptors (Table 8.9) both as a result of the Proposed Development alone, and cumulatively in-combination with other wind farm developments in the absence of additional mitigation.

8.4.2 The Proposed Development has been assessed for an operational life of 30 years.

8.4.3 The following potential effects have been assessed:

- Inadvertent destruction of in-use nests during construction;
- Disturbance to birds during construction due to vehicular traffic, operating plant and the presence of construction workers;
- Disturbance to birds during the operation of the turbines, vehicular traffic and the presence of people during operations; and
- Collision mortality of birds with turbine blades and other infrastructure.

Cumulative Effects

8.4.4 Cumulative displacement and collision effects during the construction and operation phase of the Proposed Development are considered for hen harrier and goshawk only.

8.4.5 The assessment has been undertaken at the NHZ 19 'Western Southern Uplands and Inner Solway' geographical scale. A list of wind farms included in the cumulative assessment is presented in Annex 5 of Technical Appendix 8.1: Ornithology.

8.4.6 The assessment considers mitigation measures proposed for other projects listed in Annex 5, Technical Appendix 8.1: Ornithology when determining overall significance of cumulative effect.

Potential Construction Effects

8.4.7 Potential construction phase ornithological effects associated with the Proposed Development are considered to relate to disturbance / displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the construction of the Proposed Development.

8.4.8 Potential effects are assessed on the assumption that embedded mitigation measures, as detailed in Section 8.2 and within Chapter 2: Development Description are implemented.

8.4.9 During construction of the Proposed Development, noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. The magnitude of effect would be dependent on the timing, the extent of displacement, species affected and availability of alternative suitable habitats within the Site's locality.

Hen Harrier

8.4.10 Kilgallioch Extension Wind Farm[25] identified three winter roosts within 2 km of the Proposed Development used by four individuals during the 2018/2019 non-breeding season, which are on open moorland within 2 km of the Site.

8.4.11 Low levels of hen harrier flight activity were observed during baseline VP Flight Activity Surveys between April 2018 and August 2019, with a total of five flights recorded, all of single birds. Four of the flights were recorded outside the breeding season (April to August inclusive), with a single flight recorded during the early 2018 breeding season and a single flight of a ringtail bird (a juvenile) recorded during the late 2019 breeding season.

8.4.12 There is limited information available on the disturbance of non-breeding roosts at wind farms, although there is evidence regarding breeding birds with nests recorded within 110 m of construction activity at Paul's Hill II Wind Farm in Moray[28]. It is therefore reasonable to assume that non-breeding birds are also tolerant to construction activities.

8.4.13 The habitats within the Site predominantly comprise closed canopy commercial forestry and provide relatively poor foraging and roosting opportunities for hen harrier. Open moorland to the north and south east provides improved roosting opportunities when compared to the Site and the occasional presence of individual transient or roosting birds is not precluded. Some level of disturbance to foraging and roosting birds in proximity to construction works may therefore potentially occur.

8.4.14 Such displacement effects would however, be temporary and would not result in the lowering of the perceived quality of any known wintering hen harrier range, likely to cause reduced breeding success or impair survival, to the extent of the abandonment of the Study Area by the species.

8.4.15 This is on account of extensive and preferable open moorland habitats for foraging and roosting available within the wider area and which will not be affected by the Proposed Development.

8.4.16 In the absence of mitigation, construction works are considered to result in no more than a Short-term Negligible Adverse effect at the Regional NHZ population level, of Negligible Adverse significance which is Non-Significant in the context of the EIA Regulations.

Goshawk

8.4.17 In a review of disturbance and safe working distances to active goshawk nests, most studies recommend a distance of 400 m; with expert opinion suggesting a 300 m-500 m protective buffer, with individual birds often more tolerant up to closer range (Ruddock and Whitfield, 2007[29]).

8.4.18 The choice of nest sites by goshawks within their nesting range can be variable between years. Depending on the location of future nest sites within proximity to construction working areas, some Negligible level of disturbance may be caused to breeding birds and foraging birds and which may result in lowered productivity in the Short-term. It is

[28] Haworth, P. & Fielding, A. (2012). A review of the impacts of terrestrial wind farms on breeding and wintering hen harriers. Haworth Conservation.

29 Ruddock, M. and Whitfield, D.P (2007) A review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Limited to Scottish Natural Heritage

considered unlikely that this territory would be lost, but rather the pair would relocate into other areas of available forestry away from disturbing activities.

8.4.19 Overall, construction phase disturbance to goshawks is considered to represent no more than an effect of Minor Adverse significance, which is Non-Significant in the context of the EIA Regulations.

Potential Operational Effects

8.4.20 Potential operational ornithological effects associated with the Proposed Development are considered to relate to collision mortality and disturbance / displacement of birds from the area occupied by the Proposed Development and surrounding areas as a result of the operation of the Proposed Development.

8.4.21 Collision risk analysis has been undertaken for hen harrier only, on the basis of the low incidence of "at collision risk" flight activity recorded for all other target species.

8.4.22 Full details are provided in Technical Appendix 8.2: Collision Risk Modelling.

Displacement

HEN HARRIER

8.4.23 Displacement studies have concluded that hen harriers have a low sensitivity to disturbance at operational wind farms and that birds will nest within 200 m to 300 m of operational turbines[30]. Post-construction monitoring at the operational Berry Burn Wind Farm reports nesting within 250 m of operational wind turbines and within 200 m of access tracks[31] and nesting has been recorded within 200 m of operational wind turbines at the Pauls Hill II Wind Farm[29].

8.4.24 Whitfield and Madders (2005[30]) concluded from a review of previous studies that if displacement of foraging hen harriers occurs, then it will likely be limited to within 100 m of wind turbines, if it occurs at all, with Haworth and Fielding (2012[28]) also finding no clear evidence of hen harrier foraging displacement at distances beyond 100 m[29].

8.4.25 Indirect losses of potential foraging habitat are therefore not likely to affect the perceived quality of the potential foraging range for transient non-breeding individual birds, to a level likely to cause reduced survival or subsequent abandonment of the Study Area. This is on account of the very small levels of potential operational displacement ascertained from species studies[30].

8.4.26 Operation of the Proposed Development has the potential to displace small numbers of hen harrier near the two northernmost turbines, from within open moorland to the north; however, any displacement is not considered to result in abandonment by roosting birds in recognition of the abundance of suitable habitats elsewhere within the local vicinity of the Site.

8.4.27 Operational disturbance is therefore considered to represent no more than a Long-Term Negligible Adverse effect at the Regional NHZ population level, of Negligible Significance which is Non-Significant in the context of the EIA Regulations.

30 Whitfield, D.P and Madders, M. (2006). A review of the impacts of wind farms on hen harriers Circus cyaneus and an estimation of collision avoidance rates. A report prepared by Natural Research Ltd

31 Statkraft UK Ltd (2020) Berry Burn Extension Wind Farm EIA Report. Chapter 9.

GOSHAWK

8.4.28 There is limited evidence for displacement effects upon goshawk as a result of operational wind farms.

8.4.29 No flights were recorded within 200 m of the Proposed Development turbines.

8.4.30 Losses of potential foraging habitat would not be considered to affect the perceived quality of the potential foraging range of any breeding pair of goshawk, or result in reduced breeding success of subsequent abandonment.

8.4.31 Operational displacement effects, whilst long-term, would similarly be considered to be of no more than a Low Magnitude effect at the Regional NHZ population levels, which is of Minor Adverse significance and Non-Significant in the context of the EIA Regulations.

Collision Mortality

HEN HARRIER

8.4.32 Annual hen harrier collision mortality has been assessed on the basis of 'at collision risk' flight activity recorded during baseline VP Flight Activity Surveys between April 2018 and August 2019.

8.4.33 A Collision Risk Model (CRM) has been completed using a total of three flights which entered the collision risk zone in that time. An avoidance rate of 99% was used, in accordance with NatureScot (SNH, 2018[32]) guidance.

8.4.34 The CRM predicts a non-breeding season mortality of 0.002 per annum, equal to one bird every 500 non-breeding seasons.

8.4.35 The predicted mortality rate of 0.002 represents 0.005% of the most recently published Regional NHZ population (18 pairs; assumed 36 breeding adult birds).

8.4.36 Overall collision mortality risks to hen harrier are considered to result in no more than a Long-term Negligible Adverse effect at the Regional NHZ population level, of Negligible Adverse Significance which is Non-Significant in the context of the EIA Regulations.

GOSHAWK

8.4.37 Eight goshawk flights were recorded during VP flight activity surveys between April 2018 and August 2019, with six of these occurring outside the collision risk zone. Given the very low level of "at collision risk" flight activity (two flights only), CRMs for the species have not been completed due to the inconsequential levels of collision mortality risk for the species that would reasonably be predicted.

8.4.38 Overall collision mortality risks to goshawk are considered to be of no more than a Long-term Negligible Adverse effect at the Regional NHZ population level, of Negligible Adverse significance which is Non-Significant in the context of the EIA Regulations.

Potential Decommissioning Effects

8.4.39 Potential decommissioning effects are assumed to be similar to those identified for the construction phase (i.e. disturbance / displacement). Decommissioning effects are therefore not considered separately for each species.

[32] SNH (2018). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (v2 September 2018). SNH, Inverness.

8.4.40 The future of the bird community at the time of decommissioning (30 years) is unknown and cannot be reasonably assumed with any certainty.

8.4.41 In the absence of mitigation, decommissioning effects may result in the destruction of nest sites and disturbance and displacement of medium sensitivity species such as goshawk and hen harrier.

8.4.42 Providing the implementation of good practice measures such as those included in the outline Construction Environmental Management Plan (CEMP) (EIA Report Volume 4: Technical Appendix 2.1), be included, it is unlikely that significant effects upon important ornithological features would occur.

Potential Cumulative Construction Effects

8.4.43 Construction activities at nearby projects could result in cumulative disturbance and displacement effects when within close proximity to the Site and undertaken at the same time.

8.4.44 The potential for cumulative effects to occur is only considered in relation to Kilgallioch Extension Wind Farm[25] and the proposed Airies II Wind Farm (20/1062/SCO) which is at Scoping stage. All other projects within at least 5 km are operational and therefore will not contribute to cumulative effects.

8.4.45 Direct habitat loss impacts for all target species is considered to be Negligible for Kilgallioch Extension Wind Farm[25], in the context of remaining suitable habitats for such species within the wind farm site and immediate surrounding area. As such, a detailed cumulative assessment of potential impacts at the Regional NHZ population scale is not considered necessary.

8.4.46 Construction impacts of the Kilgallioch Extension Wind Farm[25] were deemed to be short-term, negligible adverse and Non-Significant. Their cumulative assessment also concluded a highly unlikelihood of cumulative construction effects.

8.4.47 It is considered unlikely that construction disturbance effects of the Proposed Development could increase to any more than short-term, minor adverse and Non-Significant, should the two developments be constructed simultaneously, in recognition of the lack of breeding activity of target species within both the Proposed Development and the Kilgallioch Extension Wind Farm[25].

8.4.48 A recent application for Scoping has been submitted to DGC for Airies II Wind Farm (20/1062/SCO), which is located immediately adjacent to the northern and eastern boundary of the Site. As this project is at Scoping stage, there is currently insufficient information available in the public domain to undertake a detailed cumulative assessment. In the event an application were to be submitted, there is potential that these two developments could be constructed at the same time, and therefore result in cumulative construction effects.

8.4.49 Notwithstanding, a high level assessment can be undertaken on the assumption that for any development to proceed it will be required to comply with legislation and planning policy and a full assessment of effects and subsequent mitigation or compensation will be required, as necessary. In NatureScot's scoping response for Airies II, it is recommended that the mitigation included within the Scoping Report (Section 8.4.12) is adopted but also extended to include all breeding birds and not just Schedule 1 / Annex 1 raptors and owls that are referenced. The potential for cumulative effects to occur is therefore considered to be negligible.

8.4.50 Gass Wind Farm[24] consent has now lapsed and the project will therefore not be built and is also excluded from potential cumulative effects.

8.4.51 The cumulative effects of the Proposed Development in-combination with other projects within the NHZ 19 region are predicted to be Negligible Adverse and Non-Significant in the context of the EIA Regulations.

Potential Cumulative Operational Effects

8.4.52 Predicted effects of the Proposed Development for target species of medium sensitivity identified as potentially subject to significant effects, were identified to be Negligible for both hen harrier and goshawk.

8.4.53 Predicted collision mortality estimates and disturbance / displacement effects for both species are considered to be inconsequential at any population level and therefore there is no potential for significant cumulative effects over the lifetime of the Proposed Development.

8.4.54 It is considered highly unlikely that cumulative impacts would lead to any effect greater than Long-term, Negligible Adverse, and therefore Non-Significant in the context of the EIA Regulations.

8.5 Mitigation

Mitigation During Construction

8.5.1 The mitigation schedule set out below identified measures that shall be implemented through the CEMP.

8.5.2 No significant effects on identified important ornithological resources are predicted to occur as a result of the Proposed Development.

8.5.3 Mitigation is however proposed to reduce and where possible avoid potentially adverse effects to breeding birds within the Site over the course of construction works and the operational period of the Proposed Development, and in relation to the potential for offences to occur under the provisions of the Wildlife and Countryside Act 1981 (as amended)[20].

Construction Environmental Management Plan (CEMP)

8.5.4 An outline CEMP is provided in EIA Report Volume 4: Technical Appendix 2.1.

8.5.5 All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) ii, which makes it an offence to intentionally or recklessly kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs. In addition, all wild birds listed on Schedule 1 of the Act[20] receive additional legal protection which makes it an offence to intentionally or recklessly disturb these species while building a nest, or are using or near a nest containing eggs or young; or to disturb their dependent young.

8.5.6 Prior to the commencement of construction activities a Construction Breeding Bird Protection Plan (CBBPP) will be prepared and submitted for agreement in consultation with DGC and NatureScot which will form part of the CEMP. A proposed Outline CEMP is provided in Technical Appendix 2.1.

8.5.7 The CBBPP will be informed by a pre-commencement breeding bird survey to establish the status and distribution of Schedule 1 breeding birds within the Site and within 500 m of

disturbing activities. This will be done in the first available breeding season following receipt of consent and will be updated should construction activities not commence within three years of the survey date, and, in the absence of any existing sufficiently adequate information for the Site.

8.5.8 The CBBPP will detail the following measures and any additional measures required on account of findings from the pre-commencement breeding bird survey, to ensure the protection of breeding birds over the course of construction works during the breeding season, updated to reflect best available species guidance applicable at the time.

SITE CLEARANCE ACTIVITIES

8.5.9 Habitat clearance activities, where these coincide with the breeding bird season (1 March to 31 August, inclusive) will be subject to a pre-clearance survey by a competent ornithologist to identify any active wild bird nests. Should any active nests be found, works will only proceed under the advice of the appointed ornithologist and following a disturbance risk assessment. This will include all works within the Site (i.e. both the Site and along the Site access route).

8.5.10 Work exclusion buffers around identified nest sites would be implemented where necessary in accordance with best available species guidance applicable at the time and/or as agreed in consultation with NatureScot.

8.5.11 Additional mitigation measures with respect to limiting increased suitability of key hole areas for foraging hen harrier are not required. The Site is located outside of the core foraging range of any known hen harrier nest site.

SCHEDULE 1 RAPTORS

8.5.12 To avoid potential disturbance to breeding Schedule 1 listed[21] raptors, all areas within 500 m of construction activities within the Site will be surveyed in advance of works being commenced during the core breeding season (1 March to 31 August, inclusive), to identify any nesting locations for such species.

8.5.13 Where necessary, work exclusion buffers around identified nest sites will be established where necessary in accordance with best available species guidance applicable at the time and/or as agreed in consultation with NatureScot. No works will be permitted within the implemented exclusion buffer.

8.5.14 Whilst not a legislative requirement, the CEMP will include measures to safeguard roosting hen harriers during the non-breeding season, if present. Prior to commencement of works, a suitably experienced ornithologist will undertake checks for roosting harriers in suitable areas of habitat up to 600 m from active construction areas. In the event that roosting hen harriers, works will only proceed under the advice of the appointed ornithologist and following a disturbance risk assessment.

Mitigation during Operation

8.5.15 Prior to the commissioning of the Proposed Development, an Operational Breeding Bird Protection Plan (OBBPP), detailing measures to ensure the protection of breeding birds during any operational maintenance activities required during the breeding season, will be prepared on the basis of best available species guidance applicable at the time and will be submitted for agreement in consultation with DGC and NatureScot.

8.5.16 Measures to ensure legislative compliance and reduce the potential for disturbance to breeding birds will however be implemented during the construction phase of the Proposed Development through the CEMP (EIA Report Volume 4: Technical Appendix 2.1).

8.6 Assessment of Residual Effects

8.6.1 No significant residual effects on hen harrier, goshawk or any other sensitive ornithological receptor are predicted during the construction, operation or decommissioning phases of the Proposed Development, either alone, or in-combination with other wind turbine developments.

8.6.2 No additional mitigation is required.

8.7 Monitoring

8.7.1 No operational phase monitoring is required or proposed.

8.8 Summary

8.8.1 A summary of potential effects is provided in Table 8.10.

Table 8. 10: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Negligible (non-significant) effect on hen harrier (non-breeding) through Displacement / Disturbance	Not required. Precautionary checks for winter roosts and the implementation of protection zones around any identified roost locations.	Through a CEMP, agreed post consent and prior to construction commencing.	Not significant
Minor (non-significant) effect on goshawk through Displacement / Disturbance	Not required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Through a CEMP and CBBPP, agreed post consent and prior to construction commencing.	Not significant
Operation			
Negligible (non-significant) effect on hen harrier through Collision Mortality	Not required.	n/a	Not significant
Negligible (non-significant) effect on hen harrier through Displacement	Not required.	n/a	Not significant
Minor (non significant) effect on goshawk from displacement	Not required.	n/a	Not significant
Negligible (non-significant) effect on goshawk through Collision Mortality	Not required.	n/a	Not significant

Table 8. 10: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Decommissioning			
Hen Harrier – Displacement/ Disturbance	Not required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Through a CEMP and CBBPP, agreed post consent and prior to construction commencing.	Not significant
Goshawk – Displacement/ Disturbance	Not required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Through a CEMP and CBBPP, agreed post consent and prior to construction commencing.	Not significant
Cumulative Construction			
Hen Harrier – Displacement/ Disturbance	Not required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Through a CEMP and CBBPP, agreed post consent and prior to construction commencing.	Not significant
Goshawk – Displacement/ Disturbance	Not required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Through a CEMP and CBBPP, agreed post consent and prior to construction commencing.	Not significant
Cumulative Operation			
Hen Harrier – Collision Mortality	Not required.	n/a	Not significant
Hen Harrier – Displacement	Not required.	n/a	Not significant
Goshawk – Displacement	Not required.	n/a	Not significant
Goshawk – Collision Mortality	Not required.	n/a	Not significant

9 Hydrology, Hydrogeology and Geology

9.1 Introduction

9.1.1 This chapter considers the likely significant effects on Hydrology, Hydrogeology and Geology associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the hydrology, hydrogeology and geology baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

9.1.2 The assessment has been carried out by Briony McIntosh of Ramboll UK Limited (Ramboll). Briony has four years' hydrological consultancy experience. This chapter has been reviewed by Christopher Day, a hydrologist with over ten years' experience of specialist hydrology, hydrogeology and geology EIA and is a member of CIWEM (refer to Volume 4: Technical Appendix 1.2 for further details of professional competency).

9.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 9.1: Surface Water Features;
  - Figure 9.2: Bedrock Geology;
  - Figure 9.3: Superficial Geology;
  - Figure 9.4: Private Water Supplies;
  - Figure 9.5: Soils Map of Scotland;
  - Figure 9.6: GWTDE NVC Classification; and
  - Figure 9.7: Peat Depths.
- Volume 4: Technical Appendices
  - Technical Appendix 9.1: Groundwater Dependent Terrestrial Ecosystems (GWDTE) Assessment; and
  - Technical Appendix 9.2: Watercourse Crossing Assessment.

9.1.4 Figures and technical appendices are referenced in the text where relevant. Reference is made to Technical Appendix 2.3: Peat Survey Results, Technical Appendix 2.4: Peat Management Plan and Technical Appendix 2.5: Peat Landslide Hazard Risk Assessment to support the assessment of impacts on the peat resource.

9.2 Assessment Methodology and Significance Criteria

Scope of Assessment

9.2.1 This chapter considers the likely significant effects on the water environment, taking account of the hydrological, hydrogeological and geological characteristics of the Site.

9.2.2 This chapter considers effects on:

- Water quality (including both surface water and groundwater bodies) and assessment of the impacts from pollution;

- Flood risk, and the potential for direct and indirect impacts of the Proposed Development on flood risk;
- Water resources, impacts on flow regimes and the geomorphological characteristic of watercourses as a result of proposed watercourse crossings;
- Any alterations to regimes of water supplying Private Water Supplies in the locale of the Proposed Development or within potential hydrological connection to the Site;
- The potential for effects on carbon rich soil and deep peat; and
- The potential for the Proposed Development to impact hydrology or hydrogeology with secondary effects on GWDTEs.

9.2.3 This chapter considers the potential for changes to the hydrological and hydrogeological regimes to impact upon GWDTE. The chapter also considers the potential to impact on carbon rich soil and deep peat, but we note that the ecology or biodiversity effects (e.g. on priority peatland habitats) are captured in Chapter 7: Ecology, while climate change related effects associated with impacts on carbon rich soil and deep peat are considered in further detail in Chapter 16: Climate.

9.2.4 The chapter assesses cumulative effects as arising from the addition of the Proposed Development to other cumulative developments, which are the subject of a valid planning application or are otherwise likely to become planning applications (in this case the assessment includes the Airies II (scoping stage) Wind Farm due to the proximity to the Proposed Development and the potential for in-combination effects within the same river catchment). Operational, under construction and consented developments are considered as part of the baseline. Developments close to the end of their operational life will be included as part of the baseline to present 'worst case scenario'.

9.2.5 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2) and takes in to account the Draft Construction Environmental Management Plan (CEMP) (Volume 4: Technical Appendix 2.1).

9.2.6 The scope of the assessment has been informed by consultation responses summarised in Table 9.1 and the following guidelines/ policies:

National Legislation and Policy

- Water Environment and Water Services (Scotland) Act 2003;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR);
- The Water Environment (Miscellaneous) (Scotland) Regulations 2017;
- Flood Risk Management (Scotland) Act 2009;
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017;
- The Public and Private Water Supplies (Miscellaneous Amendments) (Scotland) Regulations 2015;
- The Public Water Supplies (Scotland) Regulations 2014 (as amended 2017); and
- The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013.

Guidance and Advice

- Pollution Prevention Guidelines (PPG) 1: Understanding your environmental responsibilities - good environmental practices (July 2013);

- Guidance for Pollution Prevention Guidelines (GPP) 2: Above ground oil storage tanks (January 2018);
- GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (November 2017);
- GPP 5: Works and maintenance in or near water (January 2017);
- PPG 6: Working at construction and demolition sites (2012);
- GPP 13 Vehicle washing and cleaning (April 2017);
- GPP 21: Pollution incident response planning (July 2017);
- PPG 22: Incident response - dealing with spills (October 2018);
- Planning Advice Note (PAN) 79: Water and Drainage (September 2006);
- LUPS-GU4: Planning guidance on on-shore windfarm developments (2017);
- LUPS-DP-GU2a: Development Plan Guidance on Flood Risk (2018);
- LUPS-GU19: Planning advice on wastewater drainage (2011);
- LUPS-GU31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3 (September 2017);
- WAT-SG-25: Good Practice Guide - River Crossings (November 2010) ;
- WAT-SG-26: Good Practice Guide - Sediment Management (September 2010);
- WAT-SG-29: Good Practice Guide - Temporary Construction Methods (March 2009);
- WAT-SG-75: Sector Specific Guidance: Construction Sites;
- WAT-PS-06-02: Culverting of Watercourses (June 2015);
- SEPA (2015), CAR - A Practical Guide, Version 8.4 (October 2019);
- Scottish Renewables, Scottish Natural Heritage (SNH), SEPA, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW (2019), Good Practice During Wind Farm Construction (4th Edition); and
- Scottish Government (2012) River Crossings and Migratory Fish.

Consultation

9.2.7 Table 9.1 summarises the consultation responses received regarding hydrology and hydrogeology and provides information on where and/ or how they have been addressed in this assessment.

9.2.8 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 9.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
NatureScot 18 June 2020	Scoping	The Tarf Water, which intersects the proposed development Site, is part of the River Bladnoch Special Area of Conservation (SAC). There is potential for construction or other activities to release silt or other pollutants into the SAC and this could damage the qualifying feature (Atlantic salmon). The potential requirement for the construction of new crossings over the	This chapter includes the preparation of a CEMP and PPP as a committed mitigation measure (outline provided as Technical Appendix 2.1 of this EIA report). This chapter includes the implementation of a water quality monitoring programme to during construction phase as a committed

Table 9.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
		Tarf Water could result in direct and indirect effects on the SAC. We agree it is likely that effects could be addressed by the submission of an adequate CEMP/ Pollution Prevention Plan (PPP) and through the appropriate design of any watercourse crossings. The CEMP/ PPP should be in accordance with SEPA guidance and include Site-specific measures to avoid the risk of impacts on the species for which the Site is designated. These measures should ensure there is minimal direct disturbance of the qualifying feature, and protect against adverse indirect impacts on important ecological requirements such as on water quality, water flow and/ or river channel substrate.	mitigation measure.
Galloway Fisheries Trust 7 June 2020	Scoping	The development area all drains into the Tarf Water, which is designated as part of the River Bladnoch Special Area of Conservation (SAC) (designated for Atlantic salmon). Watercourse crossing designs will be important to ensure there are no fish impacts. It is important to know, through updated fish surveys, what fish species are present at each location to ensure suitable designs are used.	This chapter includes the implementation of a water quality monitoring programme during construction phase as a committed mitigation measure. Potential indirect/ secondary effects on fish associated with impacts on water quality are addressed in Chapter 7: Ecology.
Galloway Fisheries Trust 7 June 2020	Scoping	It is important to recognise that large scale felling of conifers, which is required for this development, often causes water quality and fisheries impacts especially where planting has occurred on peat. This will need to be considered fully in the EIA and a robust water quality monitoring programme put into place.	The scale of felling in relation to the catchment size is addressed in Chapter 14: Forestry. Potential for nutrient enrichment and/ or acidification is addressed in this chapter.
Galloway Fisheries Trust 7 June 2020	Scoping	It is essential that a detailed accurate map of peat depths is part of the EIA for the whole Site, including within the forestry plantation areas.	Figure 9.7: Peat Depths (EIA Volume 3a: Figures) is provided to provide a characterisation of peat depth across the Site. Further detail on peat management and potential instability risk is provided in Technical Appendix 2.2 and 2.3.
Marine Scotland 3 June 2020	Scoping	The following should be considered in the EIA: • The River Bladnoch is an SAC; • Acidification is a known problem in the area; • The potential impact of felling on water quality and fish populations; and • The potential cumulative impact on the water quality and fish populations as a result of the present development and other developments which have	This chapter includes the implementation of a water quality monitoring programme during construction phase as a committed mitigation measure. The scale of felling in relation to the catchment size is addressed in Chapter 14: Forestry. Potential for nutrient enrichment and/ or acidification is addressed in this chapter. Potential indirect/ secondary effects on fish associated with impacts on water quality are addressed in

Table 9.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
		hydrological connectivity with Artfield Forest wind farm.	Chapter 7: Ecology.
SEPA 4 June 2020	Scoping	The EIA must include a map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications.	All proposed infrastructure superimposed over watercourse mapping and a 50 m surface water feature buffer is provided in Figure 9.1. Technical Appendix 9.2: Watercourse Crossing Assessment provides outline details of typical watercourse crossing design. The Applicant confirms that the detailed design of watercourse crossings will include a consideration of flood conveyance to accommodate a 1 in 200, 0.5% AEP plus climate change design standard. The relevant permissions under CAR will be made for all relevant watercourse crossings at the pre-construction (post-consent) phase.
SEPA 4 June 2020	Scoping	The EIA must include Map and assessment of impacts upon Groundwater Dependent Terrestrial Ecosystems and buffers.	Provided in Technical Appendix 9.3.
SEPA 4 June 2020	Scoping	The EIA must include peat depth survey, detailed map of peat depths, and table detailing re-use proposals.	Provided in TA 2.3 (Peat Survey Results) and TA 2.4 (Peat Management Plan).
SEPA 4 June 2020	Scoping	The EIA must include schedule of mitigation including pollution prevention measures.	Mitigation measures are provided in Section 9.4 and summarised in Section 9.8 of this chapter, with potential residual impacts identified.
SEPA 4 June 2020	Scoping	The EIA must include borrow Pit Site Management Plan of pollution prevention measures.	Mitigation measures are provided in Section 9.4 and summarised in Section 9.8 of this chapter, with potential residual impacts identified. A Borrow pit assessment is provided in TA 2.2.
SEPA 4 June 2020	Scoping	The EIA must include map of proposed waste water drainage layout (if applicable) and map of proposed surface water drainage layout.	Given the nature and location of the Proposed Development, operational waste water would be limited to that arising from the occasional use of Site welfare facilities and would be likely to be managed through the use of a septic tank, on-site filtration and discharge to ground. The Applicant would anticipate providing a detailed design and appropriate drawings in support of a future application, where further detail would be provided to satisfy CAR post-consent. Indicative details for surface water drainage are provided as part of the development description in Chapter 2.
SEPA 4 June 2020	Scoping	The EIA must include map of proposed water abstractions including details of the proposed operating regime.	Given the nature and location of the Proposed Development it is envisaged that there will be a potential need for temporary private

Table 9.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
			water supply during construction for Site welfare and concrete batching. A low volume permanent private water supply is likely to be required for the operational Site welfare facilities. Potential locations for Site welfare during construction and operation are provided as part of the development description in Chapter 2. At this stage it is not known whether the water supply would be a surface or groundwater abstraction, or the volume of abstraction required. Further details on the precise location and type of supply would be determined following consent and would be subject to further ground investigation and feasibility analysis. Further consideration to the requirements under the CAR would be made post-consent.
SEPA 4 June 2020	Scoping	We expect the application to be supported by a comprehensive peat survey and Site-specific Peat Management Plan. It will be necessary to undertake a comprehensive peat survey and develop a Site-specific Peat Management Plan.	Provided in TA 2.3 (Peat Survey Results) and TA 2.4 (Peat Management Plan).
SEPA 4 June 2020	Scoping	Authorisation is required under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) to carry out engineering works in or in the vicinity of inland surface waters.	Appropriate CAR licenses would be applied for, in consultation with SEPA, by the appointed contractor.
SEPA 4 June 2020	Scoping	Management of surplus peat or soils may require an exemption under The Waste Management Licensing (Scotland) Regulations 2011. Proposed crushing or screening will require a permit under The Pollution Prevention and Control (Scotland) Regulations 2012.	Provided in TA 2.2 (Borrow Pit Assessment) and TA 2.4 (Peat Management Plan).
SEPA 4 June 2020	Scoping	A Controlled Activities Regulations (CAR) Construction Site Licence will be required for management of surface water runoff from a construction site, including access tracks.	Appropriate CAR licenses would be applied for, in consultation with SEPA, by the appointed contractor. It is likely that the appointed principal contractor will assume the role as "Responsible Person" for the purposes of the Construction Site Licence.
Energy Consents Unit (ECU) August 2020	Scoping	Scottish Ministers request that the Company investigates the presence of any private water supplies which may be impacted by the development. The EIA report should include details of any supplies identified by this investigation, and if any supplies are identified, the Company should provide an assessment of the potential impacts, risks, and any	One PWS (Artfield Fell Wind Farm) is located within 250 m of the Site (Figure 9.4) but more than 250 m from proposed infrastructure and excavations and no infrastructure is proposed in the vicinity of the upstream watercourse source. Therefore, there will be no requirement for a separate detailed

Table 9.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
		mitigation which would be provided.	risk assessment for PWS abstractions (in line with SEPA LUPS guidance 4 and 31).
ECU August 2020	Scoping	Scottish Ministers consider that where there is a demonstrable requirement for peat landslide hazard and risk assessment (PLHRA), the assessment should be undertaken as part of the EIA process to provide Ministers with a clear understanding of whether the risks are acceptable and capable of being controlled by mitigation measures. The PLHRA: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition) should be followed in the preparation of the EIA report, which should contain such an assessment and details of mitigation measures.	A Peat Landslide Hazard Risk Assessment is provided as TA 2.5.
Dumfries and Galloway Council – Flood Risk Team 14 June 2020	Scoping	The area proposed for development intersects sections of the Medium Likelihood (0.5% Annual Exceedance Probability) Fluvial floodplain. Developer needs to manage surface runoff from the Site during and after construction. Runoff should mimic that of existing conditions and not be increased. Developer should consider the rate of runoff into the watercourses which are located within the Site. Any significant increase may increase the flood risk downstream. Developer is advised to have measures in place regarding future maintenance of drains and culverts.	All Site infrastructure to be located outwith areas of potential flood risk. Watercourse crossing design shall be to the 1 in 200 (0.5%) AEP design standard, and flow calculation shall be carried out by the contractor in detailed design. The implementation of SuDS measures and drainage best practice measures shall ensure runoff rates do not exceed current rates. Technical Appendix 7.3: Outline Habitat Management Plan, identifies the potential to restore some areas which are currently cultivated for forestry to support peatland habitats. In doing so, artificial drainage would be blocked, enhancing the flood storage potential of the Site across an area over an area of up to 30 ha.
Dumfries and Galloway Council – Flood Risk Team 14 June 2020	Scoping	The Applicant is required to ensure that the development does not have an adverse effect on any private water supplies, or the quality of water provided there from. The Developer shall compile a list of all private water supplies in the vicinity of the development and quantify any risk of the Proposed Development having an adverse effect on those private water supplies. Where an adverse effect is identified the Developer shall propose a programme of works to mitigate against the effects of the development regarding those supplies.	One PWS (Artfield Wind Farm) is located within 250 m of the Site (Figure 9.4) but more than 250 m from proposed infrastructure. No excavation or infrastructure is proposed in the vicinity of the upstream watercourse source. Therefore, there will be no requirement for a separate detailed risk assessment for PWS abstractions (in line with SEPA LUPS guidance 4 and 31).

Potential Effects Scoped-Out

9.2.9 SEPA and Dumfries and Galloway Council note the development intersects sections of the Medium Likelihood (0.5% Annual Exceedance Probability) fluvial floodplain. The Proposed Development infrastructure (with the exception of sections of access track leading to

watercourse crossings) has been located outwith the 50 m watercourse buffer and is not located within the flood extent indicated for the Tarf Water[1] and has therefore further detailed assessment of potential vulnerability to flood risk has been scoped-out of this assessment.

9.2.10 Detailed assessment of potential flow rates at proposed watercourse crossing locations would be carried out by a contractor at the detailed design stage such that all of the watercourse crossings identified for the Proposed Development would be designed in compliance with requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended. The design of watercourse crossings would also take account of the future 'with climate change' baseline, and to avoid altering the flow regime would be sized for a 1:200 year plus climate change flood event. Detailed flow rate calculations shall not be carried out within the EIA assessment.

9.2.11 One PWS (Artfield Wind Farm) is located within 250 m of the Site (Figure 9.4) but more than 250 m from proposed infrastructure and excavations and no infrastructure is proposed in the vicinity of the upstream watercourse source. Therefore, there will be no requirement for a separate detailed risk assessment for PWS abstractions (in line with SEPA LUPS guidance 4 and 31[2]).

Method of Baseline Characterisation

Extent of the Study Area

9.2.12 The study area covers the Site as detailed in Chapter 2: Development Description (EIAR Volume 2) and watercourses with downstream connectivity with the Site (as well as their relevant 50 m buffer zones).

Desk Study

9.2.13 The methodology for baseline characterisation is set out as follows:

- describe surface water hydrology, including watercourses, springs and ponds;
- identify existing catchment pressures;
- identify private drinking water abstractions and public water supplies within the study area;
- identify any flood risks;
- describe the hydromorphological conditions of watercourses;
- collect soil, geological and hydrogeological information; and
- confirm surface water catchment areas and watersheds.

9.2.14 Published information consulted to determine the baseline condition include:

- Ordnance Survey 1:25,000 and 1:50,000 mapping;
- 5 m Digital Terrain Model (DTM) data;
- Aerial and LiDAR imagery (ESRI world imagery);
- British Geological Survey (BGS) Geology of Britain Viewer (1:50,000) for superficial and bedrock;
- BGS Hydrogeological and Groundwater Vulnerability Maps of Scotland (1:625,000);

[1] SEPA Flood Maps. http://map.sepa.org.uk/floodmap/map.htm [Accessed 10 October 2020]

[2] LUPS-GU31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3 (September 2017); GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (November 2017)

- National Soils Map for Scotland (National Soils Inventory for Scotland (NSIS1));
- SEPA Flood Risk Management Maps (updated 23 April 2018) web mapping;
- SEPA Water Classification Hub;
- Drinking Water Quality Regulator for Scotland (DWQR) Private Water Supply Map; and
- Drinking Water Protected Areas - Surface, Scottish Government.

Field Survey

9.2.15 A Site walkover was conducted by Ramboll on the 9, 10 and 11 September 2020. Conditions on the date of the survey were clear and dry and the Site visit was preceded by a period of dry weather. The purpose of the Site walkover was to (i) assess the general hydrological condition of the Site, (ii) characterise watercourses at the Site such that proposed watercourse crossing points may be assessed, and (iii) assess hydrological conditions at potential GWDTE sites. The survey consisted of visual inspection and geolocated surveying of watercourses across the Site.

Criteria for the Assessment of Effects

Criteria for Assessing the Sensitivity of Receptors

9.2.16 Effects on water resources are described as beneficial, neutral or adverse and are considered with reference to the value or sensitivity of the receptor, as described in Table 9.2.

Table 9.2: Sensitivity of Environmental Resource

Sensitivity of Receptor	Definition	Typical Criteria
High	International or national level importance. Receptor with a high quality and rarity, regional or national scale and limited potential for substitution/ replacement.	• High likelihood of fluvial/ tidal flooding in the sub catchment - defined as 1:10 probability in a year. • EC Designated Salmonid/ Cyprinid fishery. • Surface water Water Framework Directive (WFD) class 'High'. • Scottish Government Drinking Water Protected Areas. • Aquifer providing regionally important resource such as abstraction for public water supply, abstraction for PWS. • Supporting a site protected under EC or UK habitat legislation/ species protected by EC legislation. • Protected Bathing Water Area. • Active floodplain. • Highly GWDTE. • Presence of carbon rich soils and deep peat with high conservation value.
Medium	Regional, county and district level importance. Receptor with a medium quality and rarity, regional scale and limited potential for substitution/ replacement.	• Medium likelihood of fluvial/ tidal flooding in the sub-catchment - defined as a 1:200 probability in a year. • Surface water WFD class 'Good' or 'Moderate'. • Aquifer providing water for agricultural or industrial use. • Local or regional ecological status / locally important fishery. • Contains some flood alleviation features. • Presence of carbon rich soil and deep peat, of potentially high conservation value and restoration potential. • Moderately GWDTE.
Low	Local importance. Receptor is on-site or on a	• Surface water WFD class 'Poor'. • Unproductive strata/ no abstractions for water supply.

Table 9.2: Sensitivity of Environmental Resource		
Sensitivity of Receptor	**Definition**	**Typical Criteria**
	neighbouring site with a low quality and rarity, local scale. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character.	• Sporadic fish present. • No flood alleviation features. • Sewer. • Absence of carbon rich soil/ deep peat or severely degraded peat (e.g. overplanted with forestry and artificially drained). • Potential GWDTE confirmed to be of low sensitivity to change due to heavily modified underlying groundwater bodies.

Criteria for Assessing the Magnitude of Change

9.2.17 The size or magnitude of each impact is determined as a predicted deviation from the baseline conditions during construction, operation and decommissioning, as described in Table 9.3.

Table 9.3: Magnitude of Impact in a Receptor	
Magnitude of Impact	**Criteria**
High	Large alteration/ change in the quality or quantity of and/ or to the physical or biological characteristics of environmental resource.
Medium	Medium alteration/ change in the quality or quantity of and/ or to the physical or biological characteristics of environmental resource.
Low	Small alteration/ change in the quality or quantity of and/ or to the physical or biological characteristics of environmental resource.
Negligible	No alteration/ change detectable in the quality or quantity of and/ or to the physical or biological characteristics of environmental resource.

Criteria for Assessing Cumulative Effects

9.2.18 Potential cumulative environmental impacts to water resources have been assessed where concurrent proposed wind farm sites or construction activity may be in hydrological connection with the Proposed Development, or water resource receptors.

9.2.19 Where potential cumulative impacts are identified, the same criteria as used for assessment of the Proposed Development shall be employed.

Criteria for Assessing Significance

9.2.20 Table 9.4 illustrates how residual effects are determined by comparison of the sensitivity of receptors with the magnitude of predicted change. For the purposes of this assessment significant effects are major or major/ moderate.

Table 9.4: Residual Effects					
	Magnitude of Change				
Sensitivity	**High**	**Medium**	**Low**	**Negligible**	**None**
High	Major	Major/ moderate	Moderate	Moderate/ minor	None
Medium	Major/ moderate	Moderate	Moderate/ minor	Minor	None
Low	Moderate	Moderate/ minor	Minor	Minor/ none	None

Limitations and Assumptions

9.2.21 This assessment refers to, and uses publicly available data sources and Site-specific survey to the Proposed Development which is considered robust and sufficient to enable this assessment to be complied.

9.3 Baseline Conditions

Current Baseline

Surface Hydrology

9.3.1 The topography of the Site is such that the Proposed Development is entirely within the catchment of the Tarf Water. The Tarf Water is included as part of the River Bladnoch Special Area of Conservation (SAC) which is designated under the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) due to the presence of Atlantic salmon *Salmo salar*.

9.3.2 The Tarf Water flows in an easterly direction along the northern margin of the Site and then in a southerly direction, initially at the north east boundary of the Site and then southwards through the Site.

9.3.3 A small area in the west of the Site (on which no Site infrastructure is proposed), drains initially to the Drumpail Burn, which crosses the westernmost margin of the Site flowing from the Site in a south westerly direction before eventually discharging to the Tarf Water, approximately 1.5 km downstream of the southern boundary of the Site.

9.3.4 The Purgatory Burn (which forms the north west boundary of the Site), discharges to the Tarf adjacent to the north boundary of the Site. As the Tarf Water flows around the northern margin of the Site, and southwards through the Site, a number of small, unnamed burns and drains discharge surface waters to the Tarf Water from the Site area.

9.3.5 Surface water features are shown in Figure 9.1.

9.3.6 SEPA catchment mapping shows that the catchment area from the source to the confluence with the Drumpail Burn (1.5 km downstream) is approximately 42.71 km², while the entire River Bladnoch catchment is 289.10 km².

9.3.7 A hydrology survey was conducted in September 2020. The River Tarf was viewed both along the northern margin of the Site and towards the centre of the Site. Within the Site, the Tarf Water is generally between 6 m and 8 m wide, with a peat, gravel or cobble substrate. The banks are generally well vegetated and between 1 m and 2 m high. Smaller surveyed watercourses ran in narrow, straight channels with a variety of bed substrates but usually peat or cobble. A full assessment of watercourses to be crossed is presented in Technical Appendix 9.2. No springs or wells were identified during the Site survey.

9.3.8 Numerous artificial drains are present across the Site associated with the productive conifer plantation areas and the rough grazing areas near the Site entrance. Drainage of the Site for forestry operations has been carried out with the aim of reducing the water table to promote tree growth. The establishment of drainage on the Site for commercial forestry is such that surface water drainage patterns, and levels of near-surface groundwater, are likely to be significantly impacted from a natural or near natural state. It is anticipated that the presence of an artificial drainage network at the Site would be expected to lead to reduced water storage in the upper layers of peat soils (where present) and an increase in

runoff rates, when compared to the natural, or near-natural state of the Site prior to development for forestry.

Water Quality

9.3.9 The Tarf Water has been classified under SEPA's River Basin Management Plans (RBMP)[3] as having 'Poor' overall condition and 'Pass' overall chemistry in 2018. It is noted that the SEPA previously classified the Tarf Water has having 'Moderate' overall condition in 2011, identifying a number of pressures including the impacts of acidification/ pH as a result of forestry operations and acid rain, morphological alternations from forestry and diffuse source pollution.

9.3.10 The condition of the SAC was last assessed in 2011 as 'unfavourable recovering' with agricultural operations, forestry operations and water quality cited as negative pressures[4]. The Tarf Water (upstream of the Drumpail Burn) is classified by SEPA/ Forest Research (2018[5] data) as 'failing' in relation to acidification, while the catchment downstream of the Drumpail Burn is 'at risk'. Water quality sampling results collected as part of the Gass Wind Farm EIA (2014) noted that the levels of electrical conductivity, pH and dissolved oxygen in the watercourses were consistent with nutrient poor (oligotrophic) conditions. The results identified a pH ranging from 5.26 to 6.01, which is likely to be influenced by the conifer plantations and peat present within the catchment.

9.3.11 The Drumpail Burn has been classified under the RBMP[3] as being in 'Poor' overall condition in 2018. Overall chemical quality of the Drumpail Burn was not assessed in 2018.

9.3.12 Other watercourses within the Site are not classified within the RBMP.

Geology

9.3.13 A review of online British Geological Survey (BGS)[6] mapping indicted that the majority of the Site is underlain by Wacke of the Portpatrick Formation and Glenwhargen Formation. A fault is present within the northernmost area of the Site and the underlying geology is Wacke of the Kirkcolm Formation (see Figure 9.2).

9.3.14 The superficial geology of the Site predominantly comprises peat with deposits in the south east of the Site comprising Till (Diamicton) (see Figure 9.3). 1:50,000 BGS mapping[7] shows that superficial deposits in close proximity to the Tarf comprise alluvial deposits. Some areas are mapped as having no superficial deposits present which could imply that rockhead is relatively shallow in these areas.

9.3.15 There are no designated geological sites within the Site boundary.

Groundwater Bodies

9.3.16 The Site is underlain by the Galloway groundwater body (ID 150694 under SEPA's RBMP's) which is approximately 2108 km² in area[3]. The groundwater body is designated as being in

[3] SEPA River Basin Management Plan Water Environment Hub https://www.sepa.org.uk/data-visualisation/water-classification-hub/ [Accessed 30 October 2020]

[4] URL: https://sitelink.nature.scot/site/8355#overview (accessed 19 November 2020)

[5] URL: https://www.forestresearch.gov.uk/tools-and-resources/catchments-vulnerable-acidification/ (accessed 19 November 2020)

[6] British Geological Survey. Geology of Britain Viewer. http://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.86032856.1169274852.1604068096-1921194967.1578408888 [Accessed 30 October 2020].

[7] BGS Onshore Geo Index. Available online: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.141365041.262654197.1602670475-360476160.1575038393 [last accessed November 2020]

'Good' overall condition including being of 'Good' water quality, with a target to keep this status in the forthcoming years.

9.3.17 According to the BGS Hydrogeological and Groundwater Vulnerability Maps of Scotland (1:625,000), the underlying geology is recognised as a Low productivity aquifer. Such aquifers are characterised as having limited groundwater potential, with small amounts of groundwater limited to near surface weathered zones and secondary fractures (e.g. rare springs). Low productivity aquifers do not widely contain groundwater in exploitable quantities; however, some bedrock formations can locally yield water supplies in sufficient quantities for private/ domestic use. The overlying superficial deposits are considered to be generally of low permeability; however, groundwater may be present in sand and gravel lenses, hence locally important aquifers or perched groundwater bodies may be present, although are unlikely to be continuous over a wide area. No springs or wells were identified within the Site.

Flood Risk

9.3.1 A review of the Scottish Environment Protection Agency (SEPA) online Flood Mapping (2014)[8] indicates areas of the Site are at high and medium flood risk from the Tarf Water. The extent of flooding appears confined to the immediate floodplain of the watercourse and represents a very small area of the overall Site. No infrastructure, apart from track crossings, would be located within these flood risk areas, therefore detailed assessment of fluvial or tidal flood risk is not considered necessary within the EIA assessment. Where watercourse crossings are required, the appointed contractor shall provide flow calculations and detailed design to demonstrate that crossings are suitable to accommodate a 1 in 200 (0.5%) annual probability flood.

Soil and Peat

9.3.2 According to the National Soils Map of Scotland[9], approximately 70% of the total Site area is classified as Class 5 soils, comprising peat soil with no peatland vegetation (see Figure 9.5). These areas are predominantly in use for productive conifer plantation forestry, with some areas recently clear-felled or replanted as part of the forest restructuring process (further detail is provided in Chapter 14: Forestry). A central area of the Site, running from north to south, is classified as Class 0 mineral soils with no peatland vegetation. Limited areas of the Site, in close connection to the Tarf Water form Class 3 predominantly peaty soil with some peat, characterised by peatland vegetation with some heath. A limited area in the south of the Site is classified as being of Class 1 priority peatland habitat characterised by peatland vegetation. Further detailed assessment of the distribution of peatland habitats within the Site based on Site specific habitat mapping is provided in Chapter 7: Ecology, which confirms the limited extents of peatland habitats within the Site.

PEAT GEOMORPHOLOGY

9.3.3 Digital aerial photography and Digital Terrain Model (DTM) LIDAR data was used to interpret and map geomorphological features within the developable areas of the Site. This interpretation and the resulting geomorphological map, as shown in Figure 2.5.4 (EIAR Volume 4), were subsequently verified during Site walkover and survey undertaken by an experienced peatland geomorphologist and hydrologist in September in 2020.

[8] SEPA Flood Maps http://map.sepa.org.uk/floodmap/map.htm [Accessed 27 March 2020]

[9] National Soil Map of Scotland, Carbon and Peatland 2016 Map. Available online: https://map.environment.gov.scot/Soil_maps/?layer=1# [last accessed October 2020]

9.3.4 The geomorphological features recorded are shown on Figure 2.5.4 (EIAR Volume 4). The presence, characteristics and distribution of peatland geomorphological features have been defined to understand the hydrological function of the peatland, with particular reference to the balance of erosion and peat accumulation (or condition), and the sensitivity of peatland to potential land-use changes.

9.3.5 As noted above, the Site has historically been intensively managed with significant areas of commercial forestry plantation and felling, with artificial drainage measures used. In some areas diffuse natural drainage systems were also noted. Within the commercial plantation and forestry areas it was noted that the acrotelmic peat was highly modified as a result of planting and felling activities. No evidence of peat erosion or instability were generally noted.

9.3.6 No significant evidence of instability features were identified, with very few haggs, groughs, and other features noted. No pipes were observed (e.g. through collapsed pipe ceilings or underground water flow). No major instability features, evidence of incipient instability or past landslides were noted.

Peat Depth and Character

9.3.7 Two peat depth probing surveys were undertaken at the Site, with a combined total of 1,708 peat probes taken. This comprised 338 peat depth probes during the Phase 1 survey, as part of a low resolution survey across the developable area of the Site, and a further 1,370 probes during Phase 2 survey based on a more mature development layout. An additional 517 peat probes taken as part of the previous Gass Wind Farm application were also used. The combined peat depth dataset was 2,225 probes. The results of the surveys were used to inform the design layout of the Proposed Development.

9.3.8 Most of the developable area of the Site (areas on which the development of Site infrastructure is proposed) has either no peat present or has a shallow depth of peaty soil present (~60% <0.5 m in depth). The areas of shallow peat (<0.5 m) can be considered as organo-mineral soils. These are further summarised as follows:

- 449 no. samples (20.0 %) located on land with no peat/ absent;
- 886 no. samples (40.0 %) located on land with less than or equal to 50 cm depth of peat or organo-mineral soil;
- 260 no. samples (12.0 %) fell on land with between 51 cm and 100 cm depth of peat; and
- 630 no. samples (28 %) located on land with more than 100 cm depth of peat.

9.3.9 The maximum depth of peat recorded at the Site was 6.4 m, located in the south western part of the Site during the peat survey for the Gass Wind Farm. The maximum depth of peat recorded during the Phase 1 peat probe survey was 5.5 m, located to the north western part of the Site. The maximum depth of peat recorded during the Phase 2 peat probe survey was 5.7 m, located east of Turbine 10. The mean peat depth recorded was 0.87 m.

9.3.10 The peat depth data was interpolated in GIS using an inverse distance weighting approach, the results of which are shown on Figure 9.7 (EIAR Volume 3a).

9.3.11 Overall, the peats sampled across the developable area of the Site were relatively shallow, particularly in the southern and central parts of the Site. Deep areas of peat (defined here as >1 m in depth) were noted, particularly in the north western, north eastern and south western areas of the Site. The peat was found to be generally dry and in a state of

advanced decomposition. This is likely to be as a result of the presence of coniferous plantation and extensive artificial drainage across the Site, which has resulted in modification to the integrity and composition of the peat and carbon rich soils.

9.3.12 Further details of the peatland condition and findings from the peat surveys are included in the Peat Depth Survey Report and Peat Landslide Hazard and Risk Assessment (EIAR Volume 4: Technical Appendix 2.3 and 2.5).

9.3.13 The Kirkcowan Flow SAC and Site of Special Scientific Interest (SSSI) is located approximately 1.4 km north of the Site. This area is designated for containing Blanket bog and depressions on peat substrates. Connectivity between the Proposed Development and this designated site is considered unlikely on the basis of distance and lack of hydrological connectivity and as such no further assessment is provided.

Groundwater Dependent Terrestrial Ecosystems

9.3.14 According to ecological surveying carried out at the Site by Avian Ecology and reported in Chapter 7 (Ecology), potentially groundwater dependent vegetation communities are recorded predominantly in topographic depressions, areas of poorly draining ground and ground which is closely associated with a surface water feature e.g. the Tarf Water. Detailed description of GWDTE areas is provided in Chapter 7 (Ecology) and TA 9.1 (Groundwater Dependent Terrestrial Ecosystem Assessment). Figure 9.6: GWDTE shows the location of the potential groundwater dependent vegetation.

9.3.15 The Site is underlain by a low productivity aquifer and areas identified as potentially groundwater dependent, through classification of NVC vegetation communities, are assessed in TA 9.1 to be predominantly reliant on surface water supplies. At three locations hydrological assessment is suggestive of the predominant significance of surface water contribution to the maintenance of vegetation communities (based on the accumulation of surface water due to depressions in local topography and the presence of upslope sources of surface runoff), however, the potential for a degree of groundwater contribution is not ruled out. As the likelihood of groundwater dependency across the Site is assessed to be Low, all potential GWDTE areas identified through NVC surveying are assessed to be of Low Sensitivity with regards to the disruption of groundwater supplies.

Future Baseline

9.3.16 There is potential for climate change to impact on future baseline conditions. Climate change studies predict a decrease in summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. This suggests that there may be greater pressures on PWS's in summer months in the future. However, summer storms are predicted to be of greater intensity. Therefore, peak fluvial flows associated with extreme storm events may also increase in volume and velocity. These climate change factors have been taken into account when considering the potential for likely significant effects.

Summary of Sensitive Receptors

9.3.17 Table 9.5 provides a summary of the baseline receptor sensitivity..

Table 9.5: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Surface water	High	The River Tarf is designated as part of the River Bladnoch SAC. The primary reason for the designation of the Bladnoch River as an

Table 9.5: Summary of Receptor Sensitivity		
Receptor	**Sensitivity**	**Justification**
		SAC is the presence of a high-quality salmon population (Atlantic Salmon, *Salmo salar*), which supports a spring run of salmon. The Tarf water is designated as being in 'Poor' overall condition by SEPA in the RBMP. Surface waters at the Site are shown to drain to the Tarf and therefore, there is potential for alteration of water quality in tributaries of the Tarf to impact the SAC site.
Groundwater	Low	The Site is underlain by impermeable bedrock of the Portpatrick Formation and Glenwhargen Formation which are assessed to form a Low productivity aquifer by the BGS. Superficial geology of peat and till (diamicton) are assessed to be of limited productivity while alluvium in close connection to the Tarf may be of higher productivity.
Carbon rich soil and deep peat	Low to High	Peat soils on the Site are shown to comprise predominantly Class 5 peat soils (peat soil with no peatland vegetation). The peat and peat soils present were found to be generally dry and in a state of advanced decomposition (see Technical Appendix 2.3). This is likely to be as a result of the presence of coniferous plantation and extensive artificial drainage across the Site, which has resulted in modification to the integrity and composition of the peat and carbon rich soils. The modification and drying of the peat resource on the Site and is likely to mean that the soils are a carbon source more than a carbon sink (although this is likely to be offset by the tree based carbon storage where peat is <0.5 m deep). Where the Site is dominated by commercial forestry, peat soils are considered to be of low sensitivity with respect to alterations to the hydrological regime as the hydrological regime is heavily modified in its current baseline state. There is the potential for changes to water table or soil loss through excavation or erosion to lead to a reduction in carbon sequestration at the Site, however areas of high sensitivity peatland habitat at the Site are extremely limited in extent due to the high degree of modification imposed by forestry land management. Conversely, there is the potential to boost carbon sequestration and storage by restoring areas of degraded heath or bog, potentially raising the water table in targeted areas and providing enhanced flood storage. Where carbon rich soil and deep peat with high conservation value are present on the Site they are considered to be of high sensitivity.
Groundwater Dependent Terrestrial Ecosystems	Medium	Assessment (TA 9.1) shows that vegetation communities identified as potentially groundwater dependent through NVC surveying, which could be affected by the Proposed Development, are unlikely to be fed by the groundwater aquifer. As such the sensitivity of such areas is primarily to alterations in surface water and near surface water flows.

9.4 Assessment of Likely Effects

9.4.1 The following section provides the assessment of likely effects in the absence of mitigation, as summarised in Tables 9.6 and 9.7.

Potential Construction Impacts

Chemical Pollution

9.4.2 There is the potential for the accidental release of stored fuels, oils and materials (e.g. cement and grout) used on-site during construction works to negatively impact surface waters on the Site and downstream from the Site, and the underlying groundwater.

Potential effects include degradation of water quality and indirect effects on aquatic habitats and species.

9.4.3 Two borrow pit locations are proposed across the study area. Such locations may represent areas where the unsaturated zone of the bedrock would be exposed and therefore of a relatively higher vulnerability with regard to groundwater contamination. These areas are located outwith the 50 m buffer of watercourses within the Site.

9.4.4 Were such a release to occur, there is the potential for a negative impact to surface water resources and to shallow groundwater (if present) in near-surface peat and superficial deposits, with a subsequent impact on biodiversity. Potential effects include degradation of water quality, direct effects on aquatic ecology and indirect effects on the ecology of downstream receptors.

Sedimentation and Increased Erosion Rates

9.4.5 There is the potential for the discharge of increased sediment loads due to construction activity and erosion, to negatively impact on aquatic ecology or fluvial morphology of receptors downstream from the Proposed Development. There is also potential for surface water runoff with relatively high sediment loads to be discharged over or into soil, which may in turn impact on local infiltration capacity. Increased sediment loads may be the result of excavation and surface disturbance, excavation and dewatering of foundation excavations or the mobilisation of stockpiled material.

9.4.6 When designing the Site layout, a 50 m buffer has been applied around all watercourses and waterbodies across the Site, and no turbines are located within these buffers. However, where proposed access tracks are required to cross a watercourse, there is a requirement for infrastructure to be included within the 50 m buffer, although this is only applicable in a limited number of locations. This has been considered within a Watercourse Crossing Assessment (Technical Appendix 9.2). As such, the Site design has sought to reduce the potential for the release of sediments to the water environment and it would be anticipated that sediment in distributed overland flows would be entrained in areas of vegetation or smaller surface water channels. However, there remains the potential that sediment mobilised via surface water runoff could reach surface water receptors via overland flow or flow through the extensive network of artificial drains present in the forestry areas.

9.4.7 There is the potential for hardstanding and compacted surfaces to increase rates of surface runoff on the area of the Proposed Development and for infrastructure to create preferential drainage pathways. Increases in surface runoff may in turn lead to higher risks of erosion and sedimentation and also have the potential to increase flood risk downstream.

Alteration to Water Table and Carbon Sequestration

9.4.8 The peat soils present and likely to be impacted by the Proposed Development were found to be generally dry and in a state of advanced decomposition (see Technical Appendix 2.3). This is likely to be as a result of the presence of coniferous plantation and extensive artificial drainage across the Site, which has resulted in modification to the integrity and composition of the peat. Where the Site is dominated by commercial forestry, peat soils are considered to be of low sensitivity with respect to alterations to the hydrological regime as the hydrological regime is heavily modified in its current baseline state. The impact on these areas is considered to be of negligible to low magnitude and not significant on the basis that water tables will not be altered. No turbines are proposed for the isolated/ localised pockets of deep peat within the Site where water table is higher and vegetation layer intact (and

therefore have high conservation value). There may be potential for some effects associated with infrastructure in these areas, e.g. where proposed new tracks transit across deeper, wetter peat. The effects would be very small in areal extent and would be minimised through the use of floating road construction (as described in Chapter 2: Development Description), and sub-track drainage to maintain hydrological connectivity. Taking this embedded mitigation into account, along with the very limited extent of impacts, the magnitude of impact on high value peat within the Site is considered to be negligible, resulting in a minor effect (not significant).

9.4.9 Available evidence indicates that following afforestation of peat soils, there is a loss of peat carbon and a gain in tree carbon[10]. This is consistent with the situation at the Site, which noted dry peat and significant decomposition, indicative of oxidation and a loss of carbon that would not have been the case without forest ploughing, drainage and overplanting. As such it is considered that an indirect effect on loss of carbon storage through peat disturbance by the Proposed Development is unlikely.

Alteration to Surface Water Flows and Runoff

9.4.10 The construction of access tracks could lead to the restriction of surface water flows and near-surface flows downslope across the Site. This leads to the potential for a reduction in the water supply to down slope mire habitats and the risk of peat soils becoming dry or eventually desiccated due to a lowering of the water table and alterations to the drainage pattern.

9.4.11 There is the potential for the Proposed Development to increase rates of runoff, leading to a temporary increase in flood risk and indirect effects on aquatic ecology, fluvial morphology downstream of the Site. Areas of potentially reduced permeability include proposed hardstanding areas, tracks and areas of compacted hardcore.

Impacts due to Tree Felling and Forestry Operations

9.4.12 There is the potential, due to the felling and clearing of areas of forestry for diffuse pollution to affect surface waters. During the construction phase of the Proposed Development potential impacts are primarily nutrient input (phosphorus) to surface waters due to the disturbance of soils and the input of suspended solids due to soil disturbance associated with clear felling.

Impact on GWDTE

9.4.13 An assessment of potential effects to GWDTE areas is provided in Technical Appendix 9.1. There is the potential for alteration in the quality or quantity of groundwater supplies to areas identified as potentially groundwater dependent to lead to drying out or an alteration in water chemistry, and therefore the composition of vegetation communities.

Watercourse Crossings

9.4.14 During the construction of watercourse crossings there is potential for activities to negatively impact both water quality and the natural morphology. SEPA's good practice guide (Engineering in the water environment: River crossings (Natural Scotland and SEPA, 2010[11])) identifies that where proper care is not taken during the construction phase

[10] Douglas Campbell, Peter Robson Roxane Andersen, Russell Anderson, Steve Chapman, Neil Cowie, Ruth Gregg, Renée Hermans, Richard Payne, Mike Perks, Vicky West (2019) Peatlands and Forestry, IUCN UK Peatland Programme's Commission of Inquiry on Peatlands.

[11] URL: https://www.sepa.org.uk/media/151036/wat-sg-25.pdf (accessed 19 November 2020)

disturbance of river bed and banks can lead to the direct loss of aquatic flora and fauna, and the release of fine sediments and other pollutants that may lead to the smothering of plants and animals or the habitats they depend on.

9.4.15 Crossings (and culverts) will be designed to ensure protection of the existing channel and substrate, allow free passage of fish and include provision of suitable ledges or mammal crossings to ensure free passage to otters during periods of high water flow.

9.4.16 An assessment of the proposed locations of watercourse crossings, and the likely licensing requirements for crossings are set out in Technical Appendix 9.2.

Summary of Likely Construction Effects

9.4.17 Table 9.6 provides a summary of the likely construction effects on the identified sensitive receptors, in the absence of mitigation.

Table 9.6: Potential Construction Effects

Receptor/ Sensitivity	Summary of Assessment	Magnitude of Impact Prior to Mitigation	Effect
Surface water/ High	• There is the potential to impact on surface water quality through the release of contaminated water, stored chemicals or nutrient enrichment through forest felling on-site during construction works. • Forest felling may exacerbate existing issues relating to acidification within the Tarf Water (River Bladnoch SAC) catchment. • There is the potential to impact on flow rate/ volume resulting in impacts on aquatic ecology or fluvial morphology during construction.	High	Significant
Groundwater	• There is the potential for the release of deleterious materials (such as oils and fuels) to lead to a reduction in groundwater quality. • The installation of turbine foundations, the sourcing of construction materials from borrow pits and the presence of tracks and cable trenches could lead to alteration in groundwater flows. • Dewatering and temporary abstraction operations could lead to localised lowering in groundwater levels.	Low	Not Significant
Peat/ Low to High	• The erosion potential of any peat disturbed may be increased as a consequence of the high degree of modification and localised drying of the peat as a result of forest over-planting. However the peat present is predominantly of low sensitivity. Disturbance is unlikely to result in release of stored carbon as the peat is already dry and in a state of advanced decomposition. • The locations of proposed turbines and infrastructure have been selected such that the majority of any areas of deep peat (greater than 0.5 m in depth[12]) are avoided. All turbines are located in areas avoiding peat deeper than 1 m. • Short sections of track will be required across areas of deep peat, but would be floated (approx. 0.8 km), meaning that impacts on the carbon storage potential of the peat is not significantly impacted. • According to the Peat Landslide Hazard Risk Assessment (TA 2.5) most of the Site is considered to be of 'low' or 'very	Low - None	Not Significant

[12] As defined by NatureScot, URL: https://www.nature.scot/sites/default/files/2018-05/Carbon%20and%20Peatland%20map%20consultation%20analysis%20report.pdf (accessed 15/03/21)

Table 9.6: Potential Construction Effects			
Receptor/ Sensitivity	**Summary of Assessment**	**Magnitude of Impact Prior to Mitigation**	**Effect**
	low' likelihood of a peat landslide. Areas of Moderate likelihood are not located within areas associated with Proposed Development infrastructure. Potential for up to 30 ha of peatland habitat restoration (with some priority peatland habitat) is proposed within the Site.		
GWDTE/ Medium	• There is potential to alter and disrupt local groundwater flow during construction, in particular through temporary excavations for tracks and foundation works. • Potential effects include temporary direct effects of local dewatering and alterations to downstream flow regimes and indirect effects on habitats/ ecosystems dependent on groundwater. • The baseline analysis confirms that the potential GWDTE are likely to be of low-moderate groundwater dependency and are mostly associated with flow accumulation in local depressions or influences by natural or artificial surface water features.	Low	Not Significant

Potential Operational Effects

9.4.18 The potential risk of the release of pollutants or sediment from the activities relating to the operational phase of the Proposed Development is substantially lower than during construction because of the decreased levels of ground disturbance. Additionally, the operation or refuelling of plant machinery shall not take place on the Proposed Development area during the operational phase.

9.4.19 There is the potential for hardstanding surfaces and compacted tracks and infrastructure to lead to increased rates of surface runoff, in turn leading to the potential for increased risk of surface erosion and downstream flood risk; however as described in Chapter 2: Development Description, the Proposed Development will incorporate a drainage design using Sustainable Drainage Systems (SuDS) principles in accordance with The SuDS Manual (C753) 2015[13].

9.4.20 There is the potential for infrastructure installed at the Site to present a barrier to near surface flows across the Site during the operational phase. Were cross drainage measures not appropriately installed, there is the potential for tracks to impede the movement of surface waters across blanket bog leading to the drying out or desiccation of areas dependent on water supply or retention.

9.4.21 Table 9.7 summarises the likely operational effects.

Table 9.7: Potential Operational Effects			
Receptor/ Sensitivity	**Summary of Assessment**	**Magnitude of Impact Prior to Mitigation**	**Effect**
Surface water/ High	• There is limited potential to impact on surface water quality during operation as there would be no source for release of contaminated water or chemicals. • The Proposed Development would be designed in accordance with SuDS principles and therefore would not	Low/ None	Not Significant

[13] URL: https://www.susdrain.org/resources/SuDS_Manual.html (accessed 19 November 2020)

Table 9.7: Potential Operational Effects			
Receptor/ Sensitivity	**Summary of Assessment**	**Magnitude of Impact Prior to Mitigation**	**Effect**
	impact on flow rate/ volume.		
Groundwater	• The Site is underlain by impermeable bedrock of the Portpatrick Formation and Glenwhargen Formation which are assessed to form a Low productivity aquifer by the BGS. Superficial geology of peat and till (diamicton) are assessed to be of limited productivity while alluvium in close connection to the Tarf may be of higher productivity in localised areas.	Low	Not Significant
Peat/ Low to High	• There are not anticipated to be any adverse effects on soils and peat further to those identified during the construction phase. • Potential for up to 30 ha of beneficial peatland habitat restoration is proposed within the Site. This would require potential interventions through the operational phase to deliver potential beneficial effects. Further detail is provided in Technical Appendix 7.3: Outline Habitat Management Plan.	Low	Not Significant
GWDTE/ Medium	• The baseline analysis confirms that the potential GWDTE are likely to be of low-moderate groundwater dependency and are mostly associated with flow accumulation in local depressions or influences by natural or artificial surface water features. There are not anticipated to be any additional adverse effects on GWDTE further to those identified during the construction phase. • The proposed infrastructure is unlikely to create a barrier to groundwater flow or result in dewatering of any sensitive habitats.	None	Not Significant

Potential Decommissioning Effects

9.4.22 While the risks to water resources are similar to those identified during the construction phase, decommissioning shall additionally require the breaking up and removal of concrete structures and reinforcement (e.g. turbine bases, transformers substations or buildings); the excavation and removal of crushed rock, geotextile or geogrid reinforcement materials; lifting and removal of cables and the dismantling and laying down of turbine components prior to removal from the Site.

9.4.23 During the decommissioning phase there is the potential for construction activity to impair the condition of hydrological and hydrogeological resources on and downstream of the Site. SNH commissioned report (Welstead *et al*, 2013) identifies that potential risks to ground and surface water environment may include the potential for:

- Bank instability and increased erosion leading to effects on the quality of aquatic habitats and ecology;
- Establishing rapid drainage paths leading to the potential for increased pollution extent;
- The drainage of water dependent habitats;
- Sedimentation and pollution from suspended materials leading to effects on fisheries and protected habitats/ species;
- Spills of fuels and oils from vehicles, turbine gearboxes and transformers leading to effects on fisheries and protected habitats/ species; and
- Soil compaction leading to increased runoff and erosion potential leading to effects on fisheries and protected habitats/ species.

Cumulative Effects

9.4.24 Cumulative developments assessed below are those within 2 km of the Proposed Development, and sites outwith a 2 km buffer in potential upstream or downstream hydrological connection to the Site. Operational sites are considered highly unlikely to impact surface waters in connection to the Site. While identified below, operational sites are not assessed further with regards to potential cumulative effects. Table 9.8 shows developments considered in cumulative assessment.

Table 9.8: Developments Considered in Cumulative Assessment

Windfarm Name	Status	Rationale for assessment
Airies II	In-scoping	Site in hydrological connection to Tarf Water adjacent to the Proposed Development
Kilgallioch Extension	In-Planning	Outwith 2 km buffer. In hydrological connection to tributaries of the Tarf Water, discharging to the Tarf upstream of, and adjacent to, the Proposed Development.
Artfield Fell	Operational	Operational - no further assessment
Balmurrie Fell	Operational	Operational - no further assessment
Kilgallioch	Operational	Operational - no further assessment
Glenchamber	Operational	Operational - no further assessment

9.4.25 There are two sites at which development is proposed, and at which there is the potential for cumulative hydrological effects during the construction phase: Airies II and the Kilgallioch Extension.

Potential Cumulative Construction Effects

9.4.26 The construction of proposed Airies II or Kilgallioch Extension wind farm sites at the same time as the Proposed Development could lead to the cumulative denudation of water quality in the River Tarf, in line with the potential construction effects identified above. Given the proximity of the proposed Airies II Wind Farm, there is some potential that cumulative impacts could occur to surface drainage flows. However, taking in to account the heavily modified drainage patterns of both the proposed Artfield and Airies wind farms, this is considered highly unlikely.

Potential Cumulative Operational Effects

9.4.27 Were accidental spills or leaks of potentially polluting substances (for example fuels or oils) to occur on separate sites at the same time there is the potential cumulative impacts could occur to surface waters. It should be noted that no bulk storage of such materials would be anticipated, and that such incidents would be limited to accidental release from service vehicles or equipment, or the failure wind turbine gear boxes due to poor maintenance.

9.4.28 Were measures designed to prevent increased runoff rates on wind farm sites poorly maintained or damaged, there is the potential for altered drainage patterns to lead to increased runoff rates, which could lead to erosion of soils and increased downstream flood risk.

9.5 Mitigation

Mitigation during Construction

9.5.1 The mitigation schedule set out below identifies measures that shall be implemented through the CEMP and detailed assessment of further measures that shall be implemented at hydrologically sensitive locations.

Chemical Pollution

9.5.2 The potential for impacts on the water environment through the release of pollutants or sediments during the construction phase shall be managed through the implementation of a CEMP (as detailed in Technical Appendix 2.1: Draft Construction Environmental Management Plan). The CEMP shall incorporate measures to ensure that the release of sediments or pollutants to the surrounding environment is avoided.

9.5.3 The storage of potentially contaminative materials (oils, cements/ grouts) shall be carried out at least 50 m from watercourses. Fuels, oils or chemicals stored on-site shall be sited over an impervious base and according with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended).

Sedimentation and Erosion

9.5.4 The CEMP would include measures to minimise potential adverse effects related to surface water and groundwater discharge, including impacts associated with dewatering which may arise from the excavation of borrow pits and turbine foundations. Therefore, the contractor shall be required to meet regulatory requirements and implement best practice measures as set out in SEPA planning guidance.

9.5.5 It is anticipated that the Proposed Development would be subject to a construction site licence (under the CAR regulations).

9.5.6 Where required, interceptor ditches shall divert waters to locations downstream of proposed excavation or soil disturbance works associated with the installation of turbine foundations, the development of construction compounds and batching plants, groundworks during the installation of the substation and the excavation of borrow pits. These would be specified in a Pollution Prevention Plan (PPP) that would be compiled by the contractor in accordance with SEPA guidance[14].

9.5.7 Sediment capture methods to be implemented at the Site would be detailed in the Drainage Impact Assessment and the CEMP. Such measures shall ensure that sediment laden runoff shall be directed to settlement ponds suitable for the containment of volumes of water and sediment as appropriate to the area of disturbed or excavated ground (taking in to account the potential for rainfall events). Water discharged from settlement ponds shall be directed to vegetated areas and measures such as silt fences shall ensure sediment loads are fully entrained.

9.5.8 A detailed Borrow Pit Assessment would be prepared prior to commencement including details of the proposed drainage layout at each location and details of methods by which stockpiled materials would be separated from surface runoff as far as practicably possible.

[14] Supporting Guidance (WAT-SG-75), Sector Specific Guidance: Construction Sites February 2018, URL: https://www.sepa.org.uk/media/340359/wat-sg-75.pdf (accessed 19 November 2020)

9.5.9 Where drains are installed, either temporarily during the construction phase or in association with the installation of Site infrastructure, check dams would be installed at suitable intervals (as defined by the gradient of the drain) to reduce flow velocity and allow the settlement of sediment loads prior to discharge to watercourses. These would be detailed in the PPP.

Alteration to Surface Water Flows and Runoff

9.5.10 Details of construction phase SuDS would be included in the PPP and the final CEMP, as required, to provide a surface water management and treatment train that would mitigate potential adverse impacts on the hydrology of the Site and surrounding areas during the construction phase of the Proposed Development. Measures would ensure that pre-development runoff rates are maintained and that rates of runoff to watercourses are not increased. A full SuDS solution would be developed prior to construction. Construction Site plans and proposed drainage measures shall form a PPP that would be compiled by the contractor.

9.5.11 At the limited number of locations where a track is required to cross a watercourse, or where other infrastructure is necessary within 50 m of a surface watercourse, either as described in this Chapter or as identified by the Ecological Clerk of Works (ECoW), the installation of SuDS measures shall be supervised by the ECoW during the construction phase of works. The requirement for monitoring of water quality within watercourses downstream of the Proposed Development would be agreed with SEPA and Marine Scotland. Procedures for this would be detailed in the CEMP. Prior to works, baseline water quality monitoring shall be carried out (both upstream and downstream) and repeated during the construction works at agreed intervals.

9.5.12 Any requirement for surface water or groundwater abstraction will be completed in accordance with the CAR.

Impacts due to Tree Felling and Forestry Operations

9.5.13 Detailed description of measures that shall be implemented to mitigate potential negative impacts due to the release of diffuse pollution due to forestry operations are discussed in Chapter 14: Forestry. Keyhole felling of areas around proposed turbine locations and Site infrastructure shall be carried out, it is proposed within the Outline Habitat Management Plan (HMP) (see Technical Appendix 7.3) that restoration of habitats shall be carried out around proposed turbine locations, with benefits for the underlying peat and carbon storage. Restoration of these areas shall include measures such as drain/ grip blocking to maintain a suitable water table level for the restoration of blanket-bog habitats. Commercial forestry operations shall continue across further areas included within the Site boundary. Good practice measures shall be implemented by the contractor responsible for felling operations in line with applicable General Binding Rules[15] and forestry industry good practice measures to protect the water environment[16].

GWDTE

9.5.14 As the potential GWDTE areas assessed are not considered likely to be groundwater dependent, specific mitigation with respect to groundwater supplies are not considered to be applicable.

[15] SEARS: Natural Scotland, undated. Reducing the Risk of water Pollution, Diffuse Pollution General Binding Rules (DP GBRs): Forestry. Available online: https://www.sepa.org.uk/media/59566/dp_gbr_forestry.pdf [Last accessed, October 2020]

[16] Forestry Research, 2019. Practice Guide: Managing Forest Operations to Protect the Water Environment.

9.5.15 It is considered that the maintenance of quality and quantity in surface water distribution across habitats identified as potentially groundwater dependent will be important, as these areas are assessed to be predominantly supported by surface water supply. Suitable drainage and surface water measures would be used to maintain hydrological connectivity in peatland and wetland habitats and prevent deleterious impacts on surface water distribution, which would be addressed in a CEMP for the Site to be developed by the contractor.

Watercourse Crossings

9.5.16 Construction shall be carried out in accordance with best SEPA practice[17] and SEPA Guidance for Pollution Prevention[18]. Splash boards and runoff diversion measures, including silt fencing adjacent and parallel to watercourses beneath bridges and at culvert crossings, will be used at all crossings during construction to prevent direct siltation of watercourses.

9.5.17 To ensure that all drainage measures employed during the construction phase of the Proposed Development are maintained appropriately and remain effective, the performance of the drainage measures will be monitored. The drainage management works will, therefore, be supervised by the Environmental Clerk of Works (ECoW) and shall be in accordance with the CEMP.

9.5.18 The detailed design of each watercourse crossing would seek to ensure hydraulic conveyance is maintained to prevent any restriction of flows, as well as allowing the free passage of mammals and aquatic ecology. Therefore, it is proposed that each watercourse crossing would have sufficient capacity to pass the climate change-adjusted 1:200-year flood including an allowance for partial blockage.

Mitigation during Operation

9.5.19 A Site maintenance programme with regard to Site plant and infrastructure would be implemented by the successful contractor.

9.5.20 A maintenance schedule would be developed for all SuDS and drainage assets installed at construction stage to ensure that the function and benefit provided by the asset remains for the lifetime of the Proposed Development.

Mitigation during Decommissioning

9.5.21 With regards to the control of sediments and potential pollutants, the mitigation employed during the decommissioning phase would be expected to be similar to that used during the construction phase.

9.5.22 At the point of full or partial decommissioning of the Proposed Development, the CEMP developed during the construction phase shall provide guidance for the management of risk to the water environment. The CEMP would be reviewed (along with any changes in legislation, climate, designations, habitats or water use) and used to plan decommissioning activity.

9.5.23 The potential for some infrastructure to remain in situ should be assessed, taking into account the potential disturbance to the surrounding area and the potential impacts were the backfill of excavations required (e.g. chemical effects of off-site material or the

[17] SEPA, 2010. Engineering in the Water Environment: Good Practice Guide, River Crossings.

[18] SEPA 2018. Works and Maintenance in or Near water: GPP5

reconfiguration of established drainage pathways). Where infrastructure is retained it would be shown that to do so represents the best practicable environmental option.

9.5.24 Decommissioning shall be planned such that:

- Disturbance to undeveloped areas is minimised;
- Works are carried out from existing infrastructure and developed areas (e.g. working on existing pads, working back to access point);
- Where material is excavated it should be used as backfill where appropriate or removed from Site for re-use or recycling. Where areas are backfilled the creation of preferential drainage pathways should be avoided (e.g. through the use of clay bunds);
- The CEMP shall provide guidance with regards to the potential mobilisation of sediments and the attenuation of sediment rich waters;
- The CEMP shall provide guidance for the handling of potentially contaminative materials such as fuels and oils;
- In situ soils should be retained; and
- If a site is being repowered materials should be retained and re-used on-site as far as practicable.

9.6 Assessment of Residual Effects

Residual Construction Effects

9.6.1 Pollution prevention measures specified within the Draft CEMP (Technical Appendix 2.1) would ensure compliance with SEPA's GPPs and PPGs. Measures such as the use of spill kits, placement of impermeable geotextile membranes and the suitable storage, maintenance and handling of equipment and materials would effectively limit the release of contaminants to the environment and the associated potential significant effects. Through the implementation of mitigation, the effects on surface waters or groundwater have the potential to be of a negligible/ none magnitude on receptors of high sensitivity, and are therefore **not significant**.

9.6.2 Provided mitigation measures and best practice methods are adhered to during the construction phase (as described in Technical Appendix 2.1: Draft CEMP), and specific guidance related to watercourse crossings referenced in Technical Appendix 8.2 are adhered to, residual adverse effects associated with sedimentation and erosion on controlled waters would be **not significant**.

9.6.3 Such measures are considered to provide suitable mitigation such that the potential impacts of chemical pollution, sedimentation and surface runoff and alterations to surface water features shall be **not significant.**

9.6.4 It is noted that there is the potential for beneficial effect on peat carbon sequestration at the Site where a proportion of the permanently felled areas around the turbines and Site infrastructure are restored to functional peatland habitat with peat-forming vegetation. The scale and extent of these beneficial effects would be modest and relatively uncertain. The latest evidence[19] suggests that peat carbon storage versus tree carbon storage varies with the peat depth in the context of the wider peatland resource in the surrounding area.

[19] Douglas Campbell, Peter Robson Roxane Andersen, Russell Anderson, Steve Chapman, Neil Cowie, Ruth Gregg, Renée Hermans, Richard Payne, Mike Perks, Vicky West (2019) Peatlands and Forestry, IUCN UK Peatland Programme's Commission of Inquiry on Peatlands.

Where the peat depth is >0.5 m, the evidence indicates that there would be long term benefit for carbon storage from restoring active peat forming habitat. Given the scope, extent and scale of the proposed restoration set out in Technical Appendix 7.3: Outline Habitat Management Plan the change is considered **not significant** in the context of the EIA regulations, however the benefit would more than offset any localised (non-significant) adverse effect on carbon rich soil and deep peat within the Site.

Residual Operational Effects

9.6.5 Following appropriate design and construction and provided suitable maintenance schedules are developed and are adhered to, residual adverse effects on surface waters or groundwater receptors, and on water resources during the operational phase would be **not significant**.

Residual Decommissioning Effects

9.6.6 Provided that the CEMP is reviewed (along with any changes in legislation, climate, designations, habitats or water use) and used to plan decommissioning activity, and that the mitigation measures and best practice methods are adhered to during the decommissioning phase, residual adverse effects on surface waters or groundwater receptors, and on water resources would be **not significant**.

Residual Cumulative Construction Effects

9.6.7 It is reasonable to assume that any cumulative development within catchments in potential hydrological connection to the Proposed Development would incorporate good practice drainage management measures into their respective designs, including temporary construction stage and permanent SuDS to manage the rate, quantity and quality of surface water runoff to a level where effects on the water environment would be negligible. It is considered that the addition of proposed Artfield Wind Farm (with negligible effects) would not give rise to significant cumulative effects when considered in-combination with those developments.

9.6.8 The Kilgallioch Extension is located to the north of the Site and an area of the Site drains to the south and Tarf Water via the Ha Hill Strand, the Monandie Burn, Loch Strand and several further smaller tributaries. EIA assessment carried out for the Kilgallioch Extension outlined best practice and mitigation measures to be implemented at the Site and concludes that no significant potential effects on hydrological, geological and hydrogeological receptors are predicted as a result of the development of Kilgallioch Extension. Provided that measures put in place at the Kilgallioch Extension are suitably implemented, it is therefore anticipated that potential cumulative construction effects would be **not significant**.

9.6.9 The Airies II is currently at the scoping stage of planning submission. It is anticipated that were construction of the proposed Airies Wind Farm to take place, measures similar to those proposed on the proposed Artfield Wind Farm would be implemented, such that potential cumulative construction effects would be **not significant**.

Residual Cumulative Operational Effects

9.6.10 As the potential for the Proposed Development to impact hydrological and hydrogeological receptors during the operational phase is predicted to be negligible, and it is anticipated that based on the implementation of good drainage practice and infrastructure design as required by SEPA, the potential for cumulative effects are negligible and **not significant.**

9.7 Monitoring

Construction Phase Monitoring

9.7.1 Taking the sensitivity of the Tarf Water and designation as a Special Area of Conservation (SAC, 'River Bladnoch') into account, a water quality monitoring programme should be carried out. A programme of water quality monitoring would be implemented prior to the initiation of construction activity such that a baseline of water quality may be established, and regular monitoring should be carried out during the construction phase. Water quality monitoring shall be supervised by the ECoW and the location and frequency of water quality monitoring shall be agreed with SEPA.

Operational Phase Monitoring

9.7.2 Taking in to account the minimal potential for impacts to the water environment during the operational phase, no ongoing monitoring is considered necessary.

Decommissioning Phase Monitoring

9.7.3 The potential impacts during the decommissioning phase are considered to be similar to those arising in the construction phase and therefore it is anticipated that a programme of water quality monitoring would be agreed with the relevant stakeholders prior to the initiation of decommissioning work.

9.8 Summary

9.8.1 Table 9.9 provides a summary of the likely significant effects considered, proposed mitigation commitments and the residual effects.

Table 9.9 Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Construction			
Major (significant) potential impact on surface waters (including the River Bladnoch SAC) on the Site and downstream from the Site, due to release of chemical pollutants.	Storage, containment and operational best practice shall be implemented. Suitable emergency spill or leak response kits and procedures shall be in place.	Detailed through the CEMP and associated Pollution Prevention Plan. Detailed specification shall be submitted to SEPA with regards to the application for a Construction Site License by the contractor.	Not Significant
Major (significant) potential impact on surface waters on the Site and downstream from the Site, due to effects on water quality due to increased sediment loads.	Implementation of 50 m buffers to watercourses. Implementation of best practice with regards to construction methods in close proximity to watercourses. To include diversion ditches around excavation works. Implementation of best practice with regards to construction of watercourse crossings. Baseline and subsequent water quality monitoring.	Detailed through the CEMP and associated Pollution Prevention Plan. Monitoring of works by the ECoW, inspection of watercourses during the construction phase.	Not Significant
Major (significant) potential impact on surface waters on the Site and downstream	Drainage management proposals to ensure pre-construction rates/ volumes of	Detailed drainage calculations to be submitted by the	Not Significant

Table 9.9 Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
from the Site, due to hardstanding and compacted surfaces leading to increased rates of surface runoff on the area of the Proposed Development and for infrastructure to create preferential drainage pathways.	runoff maintained. The drainage management works would be supervised by the ECoW.	contractor to quantify potential increases in surface runoff and define operational parameters for SuDS measures.	
Major (significant) potential impact on surface waters on the Site and downstream from the Site, due to restriction of surface water flows and near-surface flows downslope across the Site. This leads to the potential for a reduction in the water supply to downslope mire habitats.	Track design in accordance to best practice measures for the construction of tracks on peat. Maintenance of 'clean' water flows around construction locations. Suitable distribution of surface waters from SuDS measures.	Detailed design of tracks and infrastructure. Detailed through the CEMP.	Not Significant
Major (significant) potential impact on surface waters on the Site and downstream from the Site, due to the felling and clearing of areas of forestry for diffuse pollution to affect surface waters.	Best practice measures shall be implemented by the contractor responsible for felling operations in line with applicable General Binding Rules and Forestry Commission best practice measures to protect the water environment.	Carried out in line with regulatory requirements as set out for forestry operations.	Not Significant
Minor (non-significant) effects on groundwater, associated with chemical pollution, alteration of sub-surface flows and lowering groundwater table.	None required. Good practice drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP to be agreed.	Not Significant
Moderate/ minor (non-significant) effects on GWDTE	None required. Good practice drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP to be agreed.	Not Significant
Moderate/ minor to none (non-significant) effects of peat resource	A detailed Peat Management Plan (PMP) will be developed in accordance with the Stage 1 PMP presented in Technical Appendix 2.4 of this EIA Report. Recommended good practice measures set out in Technical Appendix 2.5: Peat Landslide Hazard Risk Assessment (PLHRA) will be implemented.	Planning Condition requiring scope of CEMP, incorporating PMP and good practice measures from PLHRA to be agreed.	Not significant
Operation			
None – Minor (non-significant) effects associated with alterations to runoff volumes and rates and fluvial morphology through the alteration of drainage patterns.	None required. Ongoing maintenance for all proposed drainage measures on the Site, particularly including water crossings and sustainable drainage features designed to manage water quality and	Relevant legislation and good practice measures for Site operation to be followed.	Not significant

Table 9.9 Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Groundwater recharge through impermeable surfaces. Sediment related pollution and chemical contamination of surface or groundwater.	runoff rate. Maintenance schedule for Site operation to follow good practice for managing hazardous chemicals.		
Potential indirect Minor (non-significant) effects on carbon rich soils and deep peat through alteration of drainage pathways. Potential beneficial (non-significant) effect on carbon rich soil and deep peat through enhancement.	None required. Beneficial effects realised through the HMP.	Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
No impact (non-significant) for GWDTE during operation further to those identified for the construction phase.	None required.	N/A	Not significant
Decommissioning			
Impacts due to construction activity (as assessed above).	Mitigation to be implemented as specified in the CEMP, and adapted if baseline conditions are found to have changed.	Decommissioning measures to be approved with SEPA through CAR licensing.	Not Significant
Disturbance of established habitats or drainage pathways.	Minimisation of construction footprint during decommissioning. Excavated material re-used where possible, and potential for material to remain in situ where applicable assessed.	Decommissioning measures to be approved with SEPA through CAR licensing.	Not Significant
Cumulative Construction			
Potential (non-significant) cumulative impacts to water quality of the River Tarf.	None required. In addition to measures set out above, the implementation of a water quality monitoring programme is proposed as a good practice measure. Water quality monitoring shall be supervised by the ECoW and the location and frequency of water quality monitoring shall be agreed with SEPA.	Planning Condition requiring scope of CEMP, associated Water Quality Monitoring Programme and appointment of ECoW to be agreed.	Not significant
Cumulative Operation			
No additional cumulative effects over and above those detailed above..	None required.	N/A	Not significant
No additional cumulative effects over and above those detailed above.	None required.	N/A	Not significant

10 Traffic, Transport and Access

10.1 Introduction

10.1.1 This chapter considers the likely significant effects on traffic, transport and access associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the existing access network and transport baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

10.1.2 The assessment has been carried out by Gordon Buchan BEng (Hons), MSc, CMILT, MCIHT, of Pell Frischmann Consultants Limited (see EIAR Volume 4: Technical Appendix 1.2). He has undertaken numerous impact assessments for wind farm developments across the UK and Ireland and has presented at several public inquires as an expert witness.

10.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 10.1: Road Study Area;
  - Figure 10.2: Abnormal Indivisible Load Route.
- Volume 4: Technical Appendices
  - Technical Appendix 10.1: Transport Assessment.

10.1.4 Figures and technical appendices are referenced in the text where relevant.

10.2 Assessment Methodology and Significance Criteria

Scope of Assessment

10.2.1 The scope of the assessment has been informed by consultation responses summarised in Table 10.1 and the following guidelines/policies:

- Institute of Environmental Assessment, Guidelines for the Environmental Assessment of Road Traffic (1993);
- Institution of Environmental Management and Assessment (IEMA) 'Guidelines for Environmental Impact Assessment' (2005);
- Table 2.2 of Volume 11, Section 2, Part 5 of the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2008; and
- Transport Scotland, Transport Assessment Guidance (2012).

10.2.2 A high-level overview of the effects of the traffic movements has been considered in accordance with Institute of Environmental Assessment (now Institute of Environmental Management and Assessment (IEMA)) Guidelines for the Environmental Assessment of Road Traffic. The document is referred to as the IEMA Guidelines in this chapter.

10.2.3 The methodology adopted in this assessment involved the following key stages:

- Determine the baseline for traffic and transport;

- Review Proposed Development for potential significant impacts;
- Evaluate significance of effects on receptors;
- Identify mitigation; and
- Assess residual effects.

10.2.4 This chapter considers effects on the following:

- The existing baseline transport conditions of the study area surrounding the site;
- The likely infrastructure requirements necessary to enable the Proposed Development;
- The likely effects and changes associated with the imposition of construction traffic on the local road network;
- The measures that would be required to mitigate against any potential significant effects of the temporary construction traffic;
- The likely traffic conditions during the operational phase of the Proposed Development; and
- The likely traffic conditions during the decommissioning phase of the Proposed Development.

10.2.5 A review of surrounding wind farm developments has been undertaken. Whilst Gass Wind Farm had planning consent, the consent has now expired. The application for the Proposed Development will replace it and as such there is no need to consider the Gass Wind Farm project further.

10.2.6 There are no further wind farm applications that would be accessed from either the C22w or C3w that have planning permission. One other wind farm application has consent, namely Barlockhart Extension, however this is located to the south of the site and accessed from the A75. Given the likely number of traffic movements generated by the Proposed Development and its location, there is unlikely to be any significant levels of traffic generated on the A75 that should be considered in the Proposed Development application.

10.2.7 Other wind farm developments in the area such as Airies II Wind Farm (currently at scoping stage) are proposed, along with potential electrical distribution transmission improvements but none are consented at the time of writing. As such, these cannot be considered as committed schemes and cannot be included in the development assessment as they may be refused or may not progress beyond scoping.

10.2.8 Other nearby developments such as Stranoch 2, Kilgallioch Extension and Chirmorie are all being accessed using different access routes and as such their respective construction traffic will have no effect on the study area for the Proposed Development.

10.2.9 Should other developments located close to the Proposed Development be consented, any crossover of traffic with the Proposed Development flows would be addressed via a traffic management plan. The inclusion of further traffic flows in the base line (i.e. including non-consented traffic) will dilute the potential impact that the Artfield Wind farm proposals will have. As such, the approach taken is considered to be an overly robust assessment.

10.2.10 No other significant planning applications have been consented and as such, there are no committed development flows to be included in the assessment. The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2).

Consultation

10.2.11 Table 10.1 summarises the consultation responses received regarding transport and access matters and provides information on where and/or how they have been addressed in this assessment. The following organisations made comment on transport matters:

- Dumfries & Galloway Council (DGC) Transport Department (as local roads agency); and
- Transport Scotland (as trunk roads agency).

10.2.12 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 10.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
Transport Scotland (1 June 2020)	Scoping	IEMA assessment proposals are acceptable.	Noted.
		Use of historic data is acceptable.	Noted.
		An Abnormal Indivisible Load (AIL) Assessment should be prepared.	An AIL assessment is appended to Technical Appendix 10.1, Transport Assessment (EIAR Volume 4).
Dumfries & Galloway Council Transport Team (8 July 2020)	Scoping	Transport Scotland should be consulted.	Transport Scotland was consulted and their comments are noted.
		The C22w and C3w (part) are identified as consultation routes as part of the Council's agreed forestry access routes. The U89w and U80w are not part of this agreement.	Noted.
		Collaborative access work improvements with other wind farm developer should be sought.	Noted.
		A detailed AIL route survey should be prepared and include swept path assessments and mitigation details.	An AIL assessment is appended to Technical Appendix 10.1, Transport Assessment (EIAR Volume 4). This outlines the proposed mitigation works.
		A Construction Traffic Management Plan (CTMP) will be required with details of the proposed movements.	The Transport Assessment (EIAR Volume 4: Technical Appendix 10.1) sets out a month by month traffic profile. The TA and this chapter outline further TMP measures that can be secured and delivered by a CTMP to be enabled via a planning condition.
		Co-ordination phasing of traffic may be required.	Agreed. The mitigation includes co-ordination with the South of Scotland Timber Officer and other stakeholders.

Table 10.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
		A Wear and Tear agreement will be required and repairs must be at the developer's expense.	Noted. A Wear and Tear agreement is noted in the mitigation section.
		A review of structures will be required and upgrades may be required.	Noted. The AIL assessment (appended to Technical Appendix 10.1, Transport Assessment (EIAR Volume 4)) contains a weight review for the proposed access routes.
		A worst case scenario of 100% of aggregate imported to the site should be undertaken.	This is an overly robust assumption as the nearby forestry road network has been constructed using stone won within the boundary of the Site. As multiple borrow pits are to be provided to supply the Site and the quality of material has been historically tested, it is not considered reasonable to assume 100% of material will be imported, when the actual import will be circa 10% (to allow access to the proposed borrow pits). To provide a compromise assessment that is robust, the Transport Assessment has assumed that 60% of all track and hardstand materials is imported to the site from the nearby quarry at Glenluce.
		The grid connection will result in possible traffic impacts on the study area.	The grid connection works form part of a separate planning application and would be addressed at that stage with either a full Transport Assessment or a CTMP. As this is to be delivered by a separate application we unable to provide any further details.

Potential Effects Scoped Out

10.2.13 The traffic effects during the operational phase of the Proposed Development are likely to be insignificant as expected traffic flows would be less than two vehicle movements per week, far below the recognised thresholds for triggering a formal transport assessment. As such, the effects during the operational phase are scoped out of the assessment.

10.2.14 The traffic effects during the decommissioning phase can only be fully assessed closer to that period, 30 years on from the completion of the site. As elements of the Proposed Development are likely to remain in situ (such as cable trenches, access tracks, etc), the traffic flows associated with the decommissioning works would be lower than those associated with the construction phase. The construction phase therefore represents a worst case assessment and as such, no further assessment of the decommissioning phase has been considered at this point in time and has been scoped out of the assessment.

Method of Baseline Characterisation

Extent of the Study Area

10.2.15 The study area includes both trunk roads and local roads that are likely to experience increased traffic flows resulting from the Proposed Development. The geographic scope was determined through a review of Ordnance Survey (OS) plans and an assessment of the potential origin locations of construction staff and supply locations for construction materials. Figure 10.1 illustrates the study area used in the assessment.

10.2.16 The Proposed Development would take access directly from an upgraded access junction located to the west of Tarf Bridge.

10.2.17 The access junction would be designed to accommodate all predicted loads and traffic for both the construction and operational phases of the Proposed Development.

10.2.18 A secondary access would be taken from an existing forestry access junction and would be used to allow access to one borrow pit (BP3 as shown on Figure 2.1: Site Layout (EIAR Volume 3a) on the east of the site. No material exports between this borrow pit and the main site access junction are proposed as internal links will be established across the site.

10.2.19 Access for construction materials would be predominantly from the south from the A75 and using the C22w and C3w roads. Both of these form part of the approved timber routes in Dumfries & Galloway.

10.2.20 Abnormal loads associated with the wind turbines have two access options to reach the Site entrance. Both share a common access from King George V Docks in Glasgow to the A75 via the M8, M74, M6 (to allow a U turn at either junction 44 or 42) and then westbound on the A75.

10.2.21 Option 1 for AIL loads is via the C22w and C3w. Option 2 would be via Carscreugh Wind Farm and the C3w. The final choice on access route will be agreed with DGC post consent and secured by planning condition.

10.2.22 The study area for the assessments has therefore been assumed to be:

- The A75 in the vicinity of Glenluce and Kirkcowan;
- The C22w between the A75 and its junction with the C3w; and
- The C3w between its junction with the C22w and Glenluce.

10.2.23 The study area is illustrated in Figure 10.1 (EIAR Volume 3a).

10.2.24 The study area includes the principal routes from the areas of material supply (quarries, readymix sources, etc), the site access junction, the trunk road network and the construction materials and abnormal load delivery routes. It is also of sufficient size to include the main areas of workforce accommodation during the construction period.

Desk Study

10.2.25 The desk study included reviews and identification of the following:

- Relevant transport planning policy;
- Accident data;
- Sensitive locations;
- Any other traffic sensitive receptors in the area (core paths, routes, communities, etc.);
- OS plans;
- Potential origin locations of construction staff and supply locations for construction materials to inform extent of local area roads network to be included in the assessment; and
- Constraints to the movement of AIL through a Route Survey including swept path assessments.

Field Survey

10.2.26 Field surveys were also undertaken and comprised the following:

- Site visit in spring 2020; and
- Review of constraints associated with the abnormal load access options.

Criteria for the Assessment of Effects

Criteria for Assessing the Sensitivity of Receptors

10.2.1 The IEMA 'Guidelines for Environmental Impact Assessment' (2005) notes that the separate 'Guidelines for the Environmental Assessment of Road Traffic' (1993) document should be used to characterise the environmental traffic and transport effects (off-site effects) and the assessment of significance of major new developments. The guidelines intend to complement professional judgement and the experience of trained assessors.

10.2.2 In terms of traffic and transport impacts, the receptors are the users of the roads within the study area and the locations through which those roads pass.

10.2.3 The IEMA Guidelines includes guidance on how the sensitivity of receptors should be assessed. Using that as a base, professional judgement was used to develop a classification of sensitivity for users based on the characteristics of roads and locations. This is summarised in Table 10.2.

Table 10.2: Classification Receptor Sensitivity

Receptor	Sensitivity			
	High	**Medium**	**Low**	**Negligible**
Users of Roads	Where the road is a minor rural road, not constructed to accommodate frequent use by HGVs. Includes roads with traffic control signals, waiting and loading restrictions, traffic calming measures.	Where the road is a local A or B class road, capable of regular use by HGV traffic. Includes roads where there is some traffic calming or traffic management measures.	Where the road is Trunk or A-class, constructed to accommodate significant HGV composition. Includes roads with little or no traffic calming or traffic management measures.	Where roads have no adjacent settlements. Includes new strategic trunk roads that would be little affected by additional traffic and suitable for Abnormal Loads and new strategic trunk road junctions capable of accommodating Abnormal Loads.

Table 10.2: Classification Receptor Sensitivity				
Receptor	**Sensitivity**			
	High	**Medium**	**Low**	**Negligible**
Users / Residents of Locations	Where a location is a large rural settlement containing a high number of community or public facilities and services.	Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.	Where a location is a small rural settlement, few community or public facilities or services.	Where a location includes individual dwellings or scattered settlements with no facilities.

10.2.4 Where a road passes through a location, users are considered subject to the highest level of sensitivity defined by either the road or location characteristics.

Criteria for Assessing the Magnitude of Change

10.2.5 The following rules, also taken from the IEMA Guidelines are used to determine which links within the study area should be considered for detailed assessment:

- Rule 1 – include highway 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 are predicted to increase by 10% or more.

10.2.6 The IEMA Guidelines identify the key impacts that are most important when assessing the magnitude of traffic impacts from an individual development. The impacts and levels of magnitude are discussed below:

- Severance – the IEMA Guidelines states that, "severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery." Further, "Changes in traffic of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' [or minor, moderate and major] changes in severance respectively". However, the Guidelines acknowledge that "the measurement and prediction of severance is extremely difficult";
- Driver delay – the IEMA Guidelines note that these delays are only likely to be "significant [or major] when the traffic on the network surrounding the development is already at, or close to, the capacity of the system";
- Pedestrian delay – the delay to pedestrians, as with driver delay, is likely only to be major when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross the road and would be considered major;
- Pedestrian amenity – the IEMA Guidelines suggests that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled. It is therefore considered that a change in the traffic flow of -50% or +100% would produce a major change in pedestrian amenity;
- Fear – there are no commonly agreed thresholds for estimating levels of fear and intimidation, from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow, changes in traffic flow of 30%, 60% and 90% are regarded as producing minor, moderate and major changes respectively; and

- Accidents and safety – professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

10.2.7 While not specifically identified, as more vulnerable road users, cyclists are considered in similar terms to pedestrians.

Criteria for Assessing Cumulative Effects

10.2.8 No cumulative assessment has been undertaken in transport terms as previously indicated.

Criteria for Assessing Significance

10.2.9 To determine the overall significance of effects, the results from the receptor sensitivity and magnitude of change assessments are correlated and classified using a scale set out in Table 2.4 of Volume 11, Section 2, Part 5 of the DMRB and summarised in Table 10.3.

Table 10.3: Significance of Effects

	Magnitude of Impacts			
Receptor Sensitivity	**Major**	**Moderate**	**Minor**	**Negligible**
High	Large	Large/Moderate	Moderate/Slight	Slight
Medium	Large/Moderate	Moderate	Slight	Slight/Neutral
Low	Moderate/Slight	Slight	Slight	Slight/Neutral
Negligible	Slight	Slight	Slight/Neutral	Neutral

10.2.10 In terms of the EIA Regulations, effects would be considered significant where they are assessed to be large or moderate. Where an effect could be one of Large/Moderate or Moderate/Slight, professional judgement would be used to determine which option should be applicable.

Limitations and Assumptions

10.2.11 The assessment is based upon average traffic flows in one month periods. During the month, activities at the site may fluctuate between one day and another and it is not possible to fully develop a day by day traffic flow estimate as no BoP contractor has been appointed and external factors can impact upon activities on a day by day basis (weather conditions, availability of materials, time of year, etc).

10.3 Baseline Conditions

Current Baseline

10.3.1 Due to the impact of COVID 19 travel restrictions, it has not been possible to collect 2020 traffic survey data for use in the assessment. Historic data from 2019 was used from the UK Government Department for Transport (DfT) traffic flow database as agreed with Transport Scotland (DGC did not comment on this assumption).

10.3.2 Two A75 count sites were used, both being located on either side of Kirkcown. Traffic data for the C22w and C3w was obtained from the Gass Wind Farm Transport Assessment. The Gass Wind Farm application covered the area that the Proposed Development application covers and the public data was publicly available.

10.3.3 The C22w and C3w traffic counts were taken from the 2013 Transport Assessment report and factored to a common baseline year of 2019 in common with the DfT traffic flows.

10.3.4 The use of the Gass Wind Farm Transport Assessment traffic flows does have a limitation due to the age of the traffic flows. The nature of both roads would suggest that traffic flows are unlikely to have changed markedly and if these flows under report the current traffic levels, this will result in a more robust review of traffic impact on either road.

10.3.5 The traffic counters allowed the traffic flows to be split into vehicle classes. The data was summarised into Cars/LGV (Car and Light Goods Vehicles) and HGVs (all goods vehicles >3.5 tonnes gross maximum weight). Table 10.4 summarises the 24 hour average weekday traffic data collected at the survey sites.

Table 10.4: Existing Traffic Conditions (Weekday Average Two Way Flows)

Survey Location	Cars & Lights	HGV	Total
A75 East of Kirkcowan	3804	594	4398
A75 West of Kirkcowan	3470	645	4115
C22w	122	7	129
C23w	75	1	76

10.3.6 Road traffic accident data for the 5 year period commencing 1 January 2015 through to the 31 December 2019 was obtained from the online resource crashmap.co.uk which uses data collected by the police about road traffic crashes occurring on British roads where someone is injured.

10.3.7 The statistics are categorised into three categories, namely "Slight" for damage only incidents, "Serious" for injury accidents and "Fatal" for accidents that result in a death.

10.3.8 A summary analysis of the incidents indicates that:

- 16 accidents were recorded within the study area roads within the five year period;
- Of those 16 accidents, 12 were classed as "Slight", three as "Serious" and one as "Fatal". The "Fatal" accident involved a motorcyclist in collision with a car;
- All accidents occurred on the A75 between Glenluce and Shennanton. No accidents were recorded on the C22w or C3w in the last year period;
- All accidents involved a car. HGVs were only involved in four "Slight" accidents;
- All three "Serious" accidents involved motorcyclists as a casualty. One "Slight" accident was recorded with a child casualty; and
- No accidents involved a cyclist as a casualty or pedal cycle as a vehicle in collision. One "Serious" and one "Slight" accident involved a young driver.

10.3.9 No accidents occurred within 700 m of the A75 / C22w junction. The analysis indicates that the vast majority of recorded accidents are categorised as being "Slight".

10.3.10 The only Core Paths recorded by DGC are the Three Lochs route that circles Loch Heron at Balminnoch and Glen Wood in Glenluce, that joins the Main Street with the Primary School. Neither Core Path cross the public road and appear to be primarily leisure walks according to information on the DGC's Core path plan.

10.3.11 The Sustrans National Cycle Route (NCR) has been consulted and indicates that none of the roads in the study area form part of the NCR or advisory link to it. There are no recommended cycle routes detailed in DGC Go Smart website or online maps.

Future Baseline

10.3.12 Construction of the project is due to commence during 2023 if consent is granted. To assess the likely effects during the construction phase, base year traffic flows were determined by applying a National Road Traffic Forecast (NRTF) low growth factor to the surveyed and obtained traffic flows.

10.3.13 The NRTF low growth factor for 2019 to 2023 is 1.027. This factor was applied to the 2019 survey data to estimate the 2023 Base traffic flows shown in Table 10.5.

Table 10.5: Future Traffic Conditions (Weekday Average Two Way Flows)

Survey Location	Cars & Lights	HGV	Total
A75 East of Kirkcowan	3907	610	4517
A75 West of Kirkcowan	3564	662	4226
C22w	125	8	133
C23w	77	1	78

10.3.14 If the Proposed Development did not proceed, traffic growth would occur and the links within the study network would experience increased traffic flows resulting from other development pressures, tourism traffic and population flows.

Summary of Sensitive Receptors

Scoped In Receptors

Table 10.6: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
A75 Users	Low	A class road with frequent, high levels of HGV use.
C22w Users	High	Minor rural road with infrequent HGV use.
C3w Users	High	Minor rural road with infrequent HGV use.
Residents along the C22w	Negligible	Individual or scattered dwellings with no community facilities.
Residents along the C3w	Negligible	Individual or scattered dwellings with no community facilities.
Residents at the Three Lochs Holiday Park	Low	Akin to a small rural settlement but with few local services.

10.4 Assessment of Likely Effects

10.4.1 The assessment is based upon the construction effects that may occur within the study area. In order to assess the effects, it is necessary to determine the likely traffic generation associated with the Proposed Development.

10.4.2 During the assumed 18-month construction period, the following traffic would require access to the site:

- Staff transport, either cars or staff minibuses;
- Construction equipment and materials, deliveries of machinery and supplies such as raw materials for the production of concrete;
- AILs consisting of the wind turbine components and heavy lift crane(s); and
- Escort vehicles for AIL deliveries.

10.4.3 Except for the turbine components, most traffic would be normal construction plant and would include grading tractors, excavators, high capacity cranes, forklifts and dumper trucks. Most would arrive at the site on low loaders.

10.4.4 The turbines are delivered in component sections for transport and would be assembled at the site. The nacelle, hub, drive train, blade and tower sections are classified as AIL due to their weight and/or length, width and height when loaded.

10.4.5 The components can be delivered on a variety of transport platforms with typical examples illustrated in the TA (Technical Appendix 10.1 (EIAR Volume 4)).

10.4.6 In addition to the turbine deliveries, one high capacity erection crane would be needed to offload some components and erect the turbines. The crane is likely to be a mobile crane with a capacity up to 1,000 tonnes that would be escorted by boom and ballast trucks to allow full mobilisation on Site. A smaller erector / assist crane will also be present to allow the assembly of the main cranes and to ease overall erection of the turbines.

10.4.7 The distribution of development traffic on the network would vary depending on the types of loads being transported. The assumptions for the distribution of construction traffic during the peak months would be as follows:

- Deliveries associated with the batching of concrete on site will arrive via the A75, C22w and C3w. No bulk material deliveries will pass through Glenluce;
- Sand and aggregate for use in the on-site batching plant will be sourced from local quarries. For the purposes of the assessment, it is assumed that all material will be taken from the quarry to the south of Glenluce. The Balance of Plant (BoP) contractor will confirm final quarry and material sourcing with DGC in the CTMP;
- HGV deliveries associated with the HV electrical installation, control buildings, batteries, etc will arrive via the A75 from the east;
- Staff working at the Site are likely to be based locally. It is assumed that 50% will come from Stranraer and its surrounding area and 50% from Newton Stewart. Staff based to the west of the Site could access the site via Glenluce and the C3w (10 journeys per day – 5 inbound and 5 outbound); and
- General Site deliveries will be via the A75, C22w and C3w to Site.

10.4.8 Loads relating to the turbine components would be delivered on either of the routes illustrated in Figure 10.2. The final choice on access route from the A75 will be agreed with DGC post consent and secured by planning condition.

10.4.9 The peak of construction occurs in Month 8 with 142 journeys (20 Car / Lights and 122 HGV journeys).

10.4.10 Please note that in all of the traffic generation and impact assessment reviews, rounding errors may occur. Numbers displayed are rounded up or down to the nearest whole number, however the calculations are undertaken to at least two decimal points

Potential Construction Effects

10.4.11 To estimate the total trips through the study area during the peak of the construction phase, traffic was distributed through the network and combined with the 2023 Baseline traffic data and the committed development traffic flows. The resulting figures were compared with the weekday 2023 Baseline traffic (with committed development flows) to provide a percentage change in movements.

Table 10.7: Future Traffic Conditions (Weekday Average Two Way Flows) (excluding committed development flows)

Survey Location	Cars & LGV	HGV	Total	% Increase Car & LGV	% Increase HGV	% Increase Total Traffic
A75 East of Kirkcowan	3907	638	4545	0.0%	4.6%	0.6%
A75 West of Kirkcowan	3574	756	4330	0.3%	14.2%	2.5%
C22w	135	130	265	8.0%	1602.5%	99.5%
C23w	87	123	210	12.9%	11217.4%	168.6%

10.4.12 The total traffic movements are not predicted to increase by more than 30% on the A75.

10.4.13 The total traffic movements will increase significantly on both the C22w and C3w. Whilst this increase is statistically significant, it is generally caused by the relatively low current traffic flows. At the peak of construction, each road will have an additional 66 inbound movements per day. This represents an average of an additional eight inbound trips every hour during construction activities, which is not considered significant in operational terms. The areas where an additional assessment will be required are therefore:

- C22w Users (High sensitivity);
- C3w Users (High sensitivity);
- Residents along the C22w (negligible sensitivity);
- Residents along the C3w (negligible sensitivity); and
- Residents at the Three Lochs Holiday Park (Low sensitivity).

10.4.14 It should also be noted the construction phase is transitory in nature and the peak of construction activities is short lived.

10.4.15 A review of existing road capacity has been undertaken using the Design Manual for Roads and Bridges, Volume 15, Part 5 "The NESA Manual". The theoretical road capacity has been estimated for each of the road links for a 12-hour period. The assessment presented in Technical Appendix 10.1: Transport Assessment and indicates that none of the study area road links are over or at capacity.

10.4.16 Table 10.8 summarises the likely significant effects on the receptors for the construction phase, in the absence of mitigation.

Table 10.8: Overall Construction Phase Effects

Receptors	Severance	Driver Delay	Pedestrian Delay	Amenity	Fear	Accidents & Safety
C22w Users	Large	Moderate / Slight	Slight	Slight	Large	Slight
C3w Users	Large	Moderate / Slight	Slight	Slight	Large	Slight
C22w Residents	Slight	Slight	Negligible	Slight	Slight	Slight
C3w Residents	Slight	Slight	Negligible	Slight	Slight	Slight
Three Lochs Residents	Moderate	Slight	Moderate	Slight	Moderate	Slight

10.4.17 Professional judgement has been used to review the "Moderate / Slight" effects noted in table 10.8. Both categories have been classified as "Slight" as the overall number of additional vehicle numbers is low and the likely effects will be similar to existing forestry and agricultural movements.

10.4.18 The assessment of significance suggests traffic flows on the C22w and C3w are considered significant effects for users of the road and for residents at Three Lochs, prior to the application of mitigation measures.

10.4.19 Pedestrian delay on the C22w and C3w are considered slight as there are no pedestrian facilities provided and no potential pedestrian trip factors in the area. This changes at the Three Lochs Holiday Park, where there is some potential for pedestrian crossing of the C3w.

Potential Operational Effects

10.4.20 It is predicted that during the operation of the site there would be up to two vehicle movements per week for maintenance purposes. Also, there may be very occasional abnormal load movements to deliver replacement components in the unlikely event of a significant component failure.

10.4.21 As agreed with the statutory consultees, no further consideration of the operational effects has been made.

Potential Decommissioning Effects

10.4.22 Prior to decommissioning of the site, anticipated to be approximately 30 years from commissioning, a traffic assessment would be undertaken and appropriate traffic management procedures followed.

10.4.23 The decommissioning phase would result in fewer trips on the road network than the construction phase as it is considered likely that elements of infrastructure such as access tracks and electrical connections would be left in place and components may be broken up on-site to allow transport by reduced numbers of standard HGVs.

10.4.24 As agreed with the statutory consultees, no further consideration of the decommissioning effects have been made.

Potential Cumulative Construction Effects

10.4.25 The assessment has considered the effects of those committed development schemes noted earlier.

10.4.26 Should any of the Proposed Development schemes be consented and their construction activities coincide with work at the Proposed Development, any adverse cumulative impacts would be addressed by means of a traffic management plan.

Potential Cumulative Operational Effects

10.4.27 There are no cumulative operational effects.

10.5 Mitigation

Mitigation during Construction

10.5.1 The following measures would be implemented through a CTMP during the construction phase. The CTMP would be agreed with DGC prior to construction works commencing:

- Where possible the detailed design process would minimise the volume of material to be imported to site to help reduce HGV numbers. This will include more intensive use of the borrow pits than has been assumed in the assessment;
- A site worker transport and travel arrangement plan, including transport modes to and from the worksite (including pick up and drop off times);
- A Transport Management Plan for AIL traffic;
- All materials delivery vehicles (dry materials) should be sheeted to reduce dust and stop spillage on public roads;
- Specific training and disciplinary measures should be established to ensure the highest standards are maintained to prevent construction vehicles from carrying mud and debris onto the carriageway;
- Wheel cleaning facilities may be established at the site entrance, depending the views of DGC;
- Normal site working hours would be limited to between 0700 and 1900 (Monday to Friday and 0700 and 1600 (Saturday) though component delivery and turbine erection may take place outside these hours;
- A temporary speed limit on the C22w and C3w of 20 mph along the frontage of the Three Lochs Holiday Park and the provision of a signed temporary pedestrian crossing facility;
- The development of a passing place strategy with DGC (and other wind farm developers in the area) to agree a series of passing places to ease severance and vehicle flow movements on the C22w and C3w. This should be developed in consultation with DGC (as per their scoping note) and can be secured and delivered by planning condition once the exact scope and needs of other developers (including timber traffic and other development interests) have been confirmed. The passing place areas would only be delivered within the limits of the adopted road boundary;
- Appropriate traffic management measures would be put in place near to the new Site access junction to avoid conflict with general traffic, subject to the agreement of DGC. Typical measures would include HGV turning and crossing signs and/ or banksmen at the site access and warning signs;
- Provide construction updates on the project website and or a newsletter to be distributed to residents within an agreed distance of the Site;
- All drivers would be required to attend an induction to include:
  - A tool box talk safety briefing;
  - The need for appropriate care and speed control;
  - A briefing on driver speed reduction agreements (to slow site traffic at sensitive locations through the villages); and
  - Identification of the required access routes and the controls to ensure no departure from these routes.

10.5.2 DGC will require an agreement to cover the cost of abnormal wear and tear on the local road network from the A75 junction to the new site access junctions.

10.5.3 Video footage of the pre-construction phase condition of the abnormal loads access route and the construction vehicles route would be recorded to provide a baseline of the state of the road prior to any construction work commencing. This baseline would inform any change in the road condition during the construction stage of the Proposed Development. Any necessary repairs would be coordinated with the Roads Authority. Any damage caused by traffic

associated with the Proposed Development, during the construction period that would be hazardous to public traffic, would be repaired immediately.

10.5.4 Any damage to road infrastructure caused directly by construction traffic would be made good, and street furniture that is removed on a temporary basis would be fully reinstated.

10.5.5 A similar agreement will be made with DGC for areas where mitigation works to accommodate the AIL traffic has been made.

10.5.6 There would be a regular road edge review and any debris and mud would be removed from the public carriageway to keep the road clean and safe during the initial months of construction activity, until the construction junction and immediate access track works are complete.

10.5.7 Before the AIL traverse the route, the following tasks would be undertaken to ensure load and road user safety:

- Ensure any vegetation which may foul the loads is trimmed back to allow passage;
- Confirm there are no roadworks or closures that could affect the passage of the loads;
- Check no new or diverted underground services on the proposed route are at risk from the abnormal loads; and
- Confirm the police are satisfied with the proposed movement strategy.

10.5.8 An AIL Management plan will be developed. All abnormal load deliveries would be undertaken at appropriate times (to be discussed and agreed with the relevant roads authorities and police) with the aim to minimise the effect on the local road network. It is likely that the abnormal load convoys would travel in the early morning periods, before peak times while general construction traffic would generally avoid the morning and evening peak periods.

10.5.9 The majority of potential conflicts between construction traffic and other road users will occur with abnormal load traffic. Other construction traffic is not likely to come into conflict with other road users as the vehicles are smaller and road users are generally more accustomed to them.

10.5.10 Potential conflicts between the abnormal loads and other road users can occur at a variety of locations and circumstances. The main potential conflicts are likely to occur:

- On the A75 where the loads may straddle the centre line, where fast moving oncoming traffic may be encountered;
- On the local road network where loads require the full road width between the A75 junction and the site access junction;
- Where traffic turns at a road junction, requiring other traffic to be restrained on other approach arms; and
- In locations where high speeds of general traffic are predicted.

10.5.11 Advance warning signs would be installed on the approaches to the affected road network. This signage will assist in helping improve driver information and allow other road users to consider alternative routes or times for their journey (where such options exist).

10.5.12 The Abnormal Load Transport Management Plan would also include:

- Procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads;
- A diary of proposed delivery movements to liaise with the communities to avoid key dates such as local events;

- A protocol for working with local businesses to ensure the construction traffic does not interfere with deliveries or normal business traffic; and
- Proposals to establish a construction liaison committee to ensure the smooth management of the project / public interface with the applicant, the construction contractors, the local community, and if appropriate, the police forming the committee.

10.5.13 Information on the turbine convoys would be provided to local media outlets such as local papers and local radio to help assist the public.

10.5.14 A police escort would be required to facilitate the delivery of the predicted loads. The police escort would be further supplemented by a civilian pilot car to assist with the escort duty. It is proposed that an advance escort would warn oncoming vehicles ahead of the convoy, with one escort staying with the convoy at all times. The escorts and convoy would remain in radio contact at all times where possible.

10.5.15 The abnormal loads convoys would be no more than three AIL long, or as advised by the police, to permit safe transit along the delivery route and to allow limited overtaking opportunities for following traffic where it is safe to do so.

10.5.16 The times in which the convoys would travel will need to be agreed with Police Scotland who have sole discretion on when loads can be moved.

Mitigation during Operation

10.5.17 In terms of the IEMA Guidelines, such a small number of traffic movements and the associated percentage uplift over Baseline traffic movements are not considered significant and therefore no mitigation is proposed or required.

Mitigation during Decommissioning

10.5.18 As decommissioning would result in fewer vehicle trips on the road network than the construction phase, the significance of any effects would not be greater. It can therefore be assumed that the assessment of the construction phase covers the worst-case scenario.

10.6 Assessment of Residual Effects

10.6.1 An evaluation of the potential effects of the increase in traffic on the study area roads used for construction traffic was undertaken. The summary of this assessment is provided in Table 10.9.

10.6.2 The assessment confirms the majority of effects would be not significant. The traffic effects are transitory in nature and no long-lasting detrimental transport or access issues are associated with the construction phase of the Proposed Development.

Residual Construction Effects

10.6.3 This section considers the assessment of traffic effects following the incorporation of the mitigation measures identified previously.

10.6.4 Table 10.9 summarises the assessment of residual effects identified in the evaluation with mitigation in place. The assessment confirms that following the implementation of mitigation measures there would be no likely significant traffic effects.

10.6.5 It should be acknowledged that the assessment has focussed on the peak in construction traffic activities and that the percentage increases noted are high, given the relatively low level of HGV traffic on the existing network.

10.6.6 The construction period is transitory in nature and all impacts will be short lived and temporary.

Residual Operational Effects

10.6.7 No residual operational effects are predicted as part of the Proposed Development.

Residual Decommissioning Effects

10.6.8 No residual decommissioning effects are predicted as part of the Proposed Development.

Residual Cumulative Construction Effects

10.6.9 No residual cumulative effects are predicted as part of the Proposed Development.

Residual Cumulative Operational Effects

10.6.10 No residual cumulative effects are predicted as part of the Proposed Development.

10.7 Monitoring

Construction Phase Monitoring

10.7.1 The condition of the local road network will be undertaken on a regular basis with DGC to ensure the road remains in a safe and efficient condition.

10.7.2 Monitoring will also include reviewing if neighbouring sites are due to commence construction works within the same timescale of the Proposed Development. Traffic management measures would then be agreed with DGC and the neighbouring development to lessen traffic impacts and associated effects.

Operation Phase Monitoring

10.7.3 No operational monitoring is required.

Decommissioning Phase Monitoring

10.7.4 No decommissioning monitoring is required.

10.8 Summary

10.8.1 The Proposed Development would lead to a temporary increase in traffic volumes on the study road network during the construction phase. Traffic volumes would fall off considerably outside the peak period of construction.

10.8.2 The maximum traffic impact associated with construction is predicted to occur in Month 8 of the programme. The greatest impact would occur at the Site access where an additional 142 additional trips are included to the network.

10.8.3 The development traffic at the peak of construction would result in 122 HGV movements per day (61 inbound and 61 outbound) and 20 Car / LGV movements (10 inbound trips and 10 outbound trips).

10.8.4 No significant capacity issues are expected on any of the roads within the study area due to the additional construction traffic movements associated with the Proposed Development as background traffic movements are low, the links are of reasonable standard and appropriate mitigation is proposed.

10.8.5 Traffic levels during the operational phase of Proposed Development would be one or two vehicles per week for maintenance purposes. Traffic levels during the decommissioning of the Proposed Development are expected to be lower than during the construction phase as some elements may be left in situ and others broken up on-site.

10.8.6 The movement of AIL traffic would require small scale and temporary remedial works at a number of locations along identified delivery route.

Table 10. 9: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
C22w and C3w Severance	CTMP proposals, passing place upgrades and greater use of on-site materials.	Site working travel plan, AIL traffic management plan, traffic management measures to control and provide advance warning on the local road network, driver training, improved direction signage and public information. Greater use of on-site borrow pits to reduce traffic flows and provision of passing place enhancements	Not Significant
C22w and C3 Fear	CTMP proposals, passing place upgrades and greater use of on-site materials.	Site working travel plan, AIL traffic management plan, traffic management measures to control and provide advance warning on the local road network, driver training, improved direction signage and public information. Greater use of on-site borrow pits to reduce traffic flows and provision of passing place enhancements.	Not Significant
Three Lochs Holiday Park Severance	CTMP proposals, passing place upgrades and greater use of on-site materials.	Site working travel plan, AIL traffic management plan, traffic management measures on the local road network, driver training, improved direction signage and public information. Provision of temporary 20 mph zone and pedestrian crossing facility. Greater use of on-site borrow pits to reduce traffic flows	Not Significant
Three Lochs Holiday Park Pedestrian Delay	CTMP proposals, passing place upgrades and greater use of on-site materials.	Provision of temporary 20 mph zone and pedestrian crossing facility.	Not Significant

Table 10. 9: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
		Greater use of on-site borrow pits to reduce traffic flows.	
Three Lochs Holiday Park Fear	CTMP proposals, passing place upgrades and greater use of on-site materials.	Provision of temporary 20 mph zone and pedestrian crossing facility. Greater use of on-site borrow pits to reduce traffic flows.	Not Significant
Operation			
None	None	None	None
Decommissioning			
None	None	None	None
Cumulative Construction			
None	None	None	None
Cumulative Operation			
None	None	None	None

11 Noise and Vibration

11.1 Introduction

11.1.1 This chapter considers the likely significant effects with respect to the noise associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the noise baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

11.1.2 The assessment has been carried out by Jason Baldwin (operational noise) and Jim Singleton (construction noise) of TNEI Services Ltd. The assessments have been reviewed by James Mackay, of TNEI Services Ltd. James is a Full Member of the Institute of Acoustics and holds the Diploma in Acoustics and Noise Control. James has over 13 years' of experience undertaking noise assessments for wind farm developments (refer to Volume 4: Technical Appendix 1.2).

11.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures;
  - Figure 11.1: Construction Noise Assessment Study Area;
  - Figure 11.2: Noise Monitoring and Assessment Locations; and
  - Figure 11.3: Cumulative Wind Farm Locations.
- Volume 4: Technical Appendices;
  - Technical Appendix 11.1: Construction and Decommissioning Report; and
  - Technical Appendix 11.2: Operational Noise Report.

11.1.4 Figures and technical appendices are referenced in the text where relevant.

11.2 Assessment Methodology and Significance Criteria

Scope of Assessment

11.2.1 Wind farms have the potential to create noise during their construction, operational and decommissioning phases. This chapter assesses the potential noise impacts at the nearest Noise Sensitive Receptors (NSRs) during the construction (which includes consideration of decommissioning) and operational phases.

11.2.2 The scope of the assessment has been informed by the following guidelines/ policies:

- Planning Advice Note PAN 1/2011: 'Planning and Noise'[1];
- BS5228-1: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open developments - Noise' [2];
- Web Based Renewables Advice: 'Onshore Wind Turbines' (updated May 2014)[3];

[1] The Scottish Government, 2011. Planning Advice Note PAN 1/2011: Planning and Noise

[2] British Standard BS5228-1:2009+A1:2014 *'Code of practice for noise and vibration control on construction and open sites' – Part 1: Noise*

- ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'[4];
- ISO9613: 1996 'Acoustics - Attenuation of sound during propagation outdoors Part 2: General method of calculation'[5]; and
- Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (2013) (IOA GPG)[6].

11.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2).

Construction and Decommissioning Noise Methodology

11.2.4 The construction noise assessment has been undertaken using guidance contained in BS5228: Part 1 2009+A1:2014 (BS5228). The prediction of construction noise levels was undertaken using the calculation methodology presented in ISO 9613:1996, together with published noise data for appropriate construction plant. To undertake an assessment of the construction noise impact using relevant data from BS5228, the following steps have been taken:

- identify the NSRs and select representative Noise Assessment Locations;
- identify the applicable threshold of significant effects from BS5228;
- predict the noise levels for various construction noise activities;
- compare predicted noise levels against the applicable threshold;
- where necessary, develop suitable mitigation measures to minimise any significant adverse effects during the construction phase; and, if required
- assess any residual adverse effects taking into account any identified mitigation measures.

11.2.5 The construction process would be undertaken in several successive phases. During each phase the plant and equipment, and the associated traffic, would influence the noise generated. The selection of plant and equipment to be used would be determined by the main contractor and detailed arrangements for on-site management would be decided at that time. This assessment has therefore been based upon a typical selection of plant for a wind farm project of this size and assesses a number of construction scenarios that have been chosen to represent the likely noisiest activities that will occur across the construction phases. For each scenario the plant has been modelled operating in the closest activity areas to each receptor for any given activity, whereas in reality plant will move around the site and for much of the time will be operating at more distant locations.

11.2.6 The core hours for construction activity are anticipated to be 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Any construction work outside these hours would be an exception and subject to approval by the Dumfries and Galloway Council. It should be noted that out of necessity some activity, for example abnormal load deliveries, could occur outside the specified hours stated above.

11.2.7 For the purposes of this assessment construction scenarios have been modelled to reflect the activities detailed within the indicative construction timetable, as detailed in Chapter 2

3 The Scottish Government, Web Based Renewables Advice: 'Onshore Wind Turbines' – updated May 28th 2014

4 The Working Group on Noise from Wind Turbines (1996) ETSU-R-97 The Assessment and Rating of Noise from Wind Farms', ETSU for the DTI (Department of Trade and Industry)

5 International Standards Organisation, ISO9613: 1996 'Acoustics - Attenuation of sound during propagation outdoors' -Part 2: General method of calculation

6 Institute of Acoustics (2013) 'Good Practice Guidance on the application of ETSU-R-97 for wind turbine noise assessment'

Development Description (EIAR Volume 2). The plant and construction activities considered within the noise model are based on the noisiest activities that are likely to occur during the construction programme. Noise immission levels have been modelled for each month of the construction programme (months 1 to 18) as well as a single model that considers the use of diesel generators to provide power and lighting at night.

11.2.8 The modelled scenarios represent the assumed 'noisiest' activities. Other construction activities not included in the noise models will occur, however, the noise output from these will be less than those considered above. Modelled activities include;

- Forestry (felling and forwarding);
- Delivery of materials;
- Construction of site tracks;
- Borrow pit activities including rock crushing;
- Foundation construction;
- Turbine erection;
- Substation construction; and,
- On-site power generation.

11.2.9 Decommissioning activities have not been modelled as the plant and activities for this phase are assumed to be similar to those used in the primary construction phases. Accordingly, if noise levels during the construction phases are acceptable, they should also be acceptable during the decommissioning phase.

11.2.10 The noise-generating equipment assessed for each construction phase is detailed in Technical Appendix 11.1 (EIAR Volume 4), which shows actual noise data measured at 10 m from the noise source. It is noted that for much of the working day the noise associated with construction activities would be less than predicted, as the assessment has assumed all equipment is operating at full power, continually and concurrently and is located within activity areas closest to each receptor, whereas in practice equipment load and precise location will vary.

Operational Noise

11.2.11 The assessment has been undertaken in accordance with ETSU-R-97 *'The Assessment and Rating of Noise from Wind Farms*' and current good practice. ETSU-R-97 provides a robust basis for determining acceptable noise limits for wind farm developments. Consequently, the test applied to operational noise is whether or not the calculated wind farm noise levels at nearby noise sensitive properties would be below the noise limits derived in accordance with ETSUR97.

11.2.12 Limits differ between quiet daytime and night time periods. The daytime criteria is based upon background noise level measured during the 'quiet periods of the day' comprising:

- All evenings from 18:00 to 23:00; plus
- Saturday afternoons from 13:00 to 18:00; and
- All day Sunday 07:00 to 23:00.

11.2.13 Night time periods are defined as 23:00 to 07:00 with no differentiation made between weekdays and weekends.

11.2.14 ETSU-R-97 recommends that wind farm noise for the daytime periods should be limited to 5 dB(A) above the prevailing background or a fixed minimum level (FML) within the range

35 - 40 dB $L_{A90,10min}$, whichever is the higher. The precise choice of criterion level within the range 35 - 40 dB(A) depends on a number of factors, including the number of dwellings in the neighbourhood of the wind farm (relatively few dwellings suggest a figure towards the upper end), the effect of noise limits on the number of kWh generated (larger sites tend to suggest a higher figure) and the duration and level of exposure to any noise. In addition, consideration should also be given to the FML already awarded to consented and operational wind farms in the immediate area.

11.2.15 The exception to the setting of both the quiet daytime and night time fixed minimum on the noise limits occurs where a property occupier has a financial involvement in the wind farm development where the fixed minimum limit can be increased to 45 dB(A) or a higher permissible limit above background during the quiet daytime and night time periods.

11.2.16 The Total ETSU-R-97 Noise Limits for the daytime has been set at 40 dB(A) or background plus 5 dB whichever is the greater; this is necessary as a 40 dB FML has already been allocated to the operational Kilgallioch Wind Farm. This 'Total' limit relates to noise from all wind farm developments in the area. The 'Total ETSU-R-97 Noise Limits' have been used to derive 'Site Specific Noise Limits' for the Proposed Development. Compliance with the 'Site Specific Noise Limits' ensures that the Proposed Development could operate in conjunction with other wind farms to meet the 'Total ETSU-R-97 Limits. ' The Site Specific Noise Limits have been derived based on a FML of 35 dB or background plus 5 dB daytime or 43 dB or background plus 5 dB night time whichever is the greater whilst taking account of the proportion of the noise limit that has been allocated to, or could theoretically be used by, other schemes.

11.2.17 In addition to ETSU-R-97, the recommendations included in the Institute of Acoustics '*A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*' (2013) (IOA GPG) have been considered in the noise assessment.

Cumulative Noise

11.2.18 The need for a cumulative noise assessment was considered in accordance with the guidance contained within the IOA GPG (2013). There are a number of operational, consented and proposed wind turbine developments within the vicinity of the Proposed Development; as such, and where required, a cumulative noise assessment was undertaken. The noise assessment has been undertaken in three separate stages:

- Stage 1 – establish the 'Total ETSU-R-97 Noise Limits' for each Noise Assessment Location (NAL) using the measured background noise levels to derive new limits;
- Stage 2 – undertake noise predictions to determine whether noise predictions from the Proposed Development on its own are within 10 dB of the total noise predictions from the other wind turbines within the area. Where turbine predictions are within 10 dB then a likely cumulative noise assessment will be undertaken; and
- Stage 3 – establish the 'Site Specific Noise Limits' for the Proposed Development (through apportioning the 'Total ETSU-R-97 Noise Limits') and compare the noise predictions from the Proposed Development on its own against the 'Site Specific Noise Limits'.

11.2.19 The aim of the operational noise assessment therefore is to establish the Total ETSU-R-97 Noise Limits, determine the likely impacts of the Proposed Development and other schemes at the nearest NSRs, derive Site Specific Noise Limits and to demonstrate that the Proposed Development could meet those limits.

11.2.20 The exact model of turbine to be installed on the site would be the result of a future tendering process should consent be granted. Achievement of the Site Specific Noise Limits determined by this assessment will be a key determining factor in the final choice of turbine for the Proposed Development. Predictions of wind turbine noise for the Proposed Development were made, based upon the sound power level data for a candidate wind turbine, the Vestas V150 5.6 MW, as it is considered representative of the type of turbine that would be installed at the site.

11.2.21 All the turbines modelled, inclusive of those considered in the cumulative noise assessment (Stage 2), are summarised in Annex 4 of Technical Appendix 11.2 (EIAR Volume 4). Uncertainty in sound power data for the Proposed Development has been accounted for using the guidance contained within Section 4.2 of the IOA GPG (2013).

11.2.22 Noise predictions have been undertaken using the propagation model contained within Part 2 of International Standard ISO 9613-2, 'Acoustics – Attenuation of sound during propagation outdoors' (ISO,1996). The model calculates, on an octave band basis, attenuation due to geometric spreading, atmospheric absorption and ground effects. The noise model was set up to provide realistic noise predictions, including mixed ground attenuation (G=0.5) and atmospheric attenuation relating to 70% Relative Humidity and 10ºC.

11.2.23 Typically, wind farm noise assessments assume all properties are downwind of all turbines at all times (as this would result in the highest wind turbine noise levels). However, where properties are located in between groups of turbines they cannot be downwind of all turbines simultaneously so it is appropriate to consider the effect of wind direction on predicted noise levels. Directivity has therefore been considered in accordance with the guidance in the IOA GPG (2013).

11.2.24 In line with the IOA GPG (2013), an assessment has been undertaken to determine whether a concave ground profile correction (+3 dB) or barrier correction (-2 dB), is required due to the topography between the turbines and the NSRs. Propagation across a valley (concave ground) increases the number of reflection paths, and in turn, has the potential to increase sound levels at a given receptor. Terrain screening effects (barrier corrections) act as blocking points, subsequently reductions in sound levels at a given receptor can potentially be observed. A concave ground and barrier correction was found to be required for a number of turbines at a number of receptors as detailed in Annex 4, EIAR Volume 4: Technical Appendix 11.2.

11.2.25 Information relating to operational noise such as Amplitude Modulation (AM), a potential characteristic of wind turbine noise and Low Frequency Noise are also addressed within Technical Appendix 11.2 (EIAR Volume 4).

Consultation

11.2.26 Table 11.1 summarises the consultation responses received regarding Noise and provides information on where and/ or how they have been addressed in this assessment.

11.2.27 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 11.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response/ Action Taken**
Dumfries and Galloway Council 07/08/2020	Scoping	'Environmental Health has advised that until a site-specific impact assessment has been carried out with regard to noise …they are unable to comment fully as to the expected impacts at this stage.'	None
Dumfries and Galloway Council 07/08/2020	Scoping	'Environmental Health suggest that a method statement for the construction project should be provided within the EIA report for approval by Dumfries & Galloway Council. This should include an assessment of potentially noisy operations and outline the noise mitigation measures proposed. This will also include a programme and phases for each stage of work. Guidance as to construction noise prediction methodology may be found within BS5228:2009.'	Chapter 2 provides a description of construction/ indicative timelines. An Outline CEMP is also included in Technical Appendix 2.1 (EIAR Volume 4). The construction noise assessment has been undertaken with reference to the most up to date version of BS5228 (Part 1 2009+A1:2014).
Dumfries and Galloway Council 25/06/2020	Other Consultation (letter to agree proposed methodology including the approach to determining baseline data and to setting noise limits)	No response received	None

Method of Baseline Characterisation

Extent of the Study Area

11.2.28 Prior to the commencement of the operational noise assessment, initial desktop noise modelling was undertaken using ReSoft WindFarm Release 4.2.1.7 (WindFarm) software in order to identify suitable locations at which to consider NSRs as part of the assessment. A draft 20 wind turbine layout was input into the 'WindFarm' software and using noise data for the Vestas V150 5.6 MW turbine, which is representative of the type that could be installed at the Proposed Development, a noise contour plot was produced. The noise contour plot defined the extent of the assessment area for the operational noise assessment based upon a 35 dB(A) contour. A total of twenty four noise sensitive receptors were then chosen as NALs; the NALs were chosen to represent the noise sensitive receptors located closest to the Proposed Development, and additional receptors were included to consider cumulative noise impacts. The NALs are shown on Figure 11.2 (EIAR Volume 3a).

11.2.29 The assessment locations for the construction noise assessment are shown on Figure 11.1 and are detailed in full in Table 3.2 of Technical Appendix 11.1 (EIAR Volume 4). The assessment locations are the closest receptors to the construction activities that would occur as part of the Proposed Development (for example new access tracks).

11.2.30 There are a number of operational, consented and proposed wind farms located in the vicinity of the Proposed Development, referred to as the cumulative developments, these include:

- Artfield Fell Wind Farm - Operational;
- Balmurrie Fell Wind Farm - Operational;
- Carscreugh Wind Farm - Operational;
- Glenchamber Wind Farm - Operational;
- Kilgallioch Wind Farm - Operational;
- Kilgallioch Wind Farm Extension – Planning;
- Airies Wind Farm - Operational; and
- Airies Wind Farm II – Scoping.

11.2.31 Whilst consideration is not usually given to projects at the pre-application stage (due to the uncertainty regarding scheme layout) Airies II Wind Farm has been included in the assessment. The layout for that scheme is based on a pre-application stage layout provided in September 2020[7].

11.2.32 The wind farms detailed above and shown on Figure 11.3 (EIAR Volume 3a) have been considered as part of the cumulative operational noise assessment. Further information on the cumulative noise assessment can be found in Section 1 of Technical Appendix 11.2 (EIAR Volume 4).

Field Survey

11.2.33 ETSU-R-97 and the IOA GPG make it clear that background noise levels should be established in the absence of noise from wind turbines. Due to the presence of a number of operational wind farms around the Proposed Development, noise monitoring undertaken to derive background noise levels could have been influenced by noise from existing operational turbines. In such circumstances the IOA GPG suggests a number of methods that can be used as an alternative; Section 5 of Technical Appendix 11.2 (EIAR Volume 4) specifies these options in further detail.

11.2.34 On consideration of these options, and following a review of the existing data available and potential monitoring locations around the Proposed Development, it was proposed that the original background noise measurements, used to inform the other consented and operational schemes, are used to derive the Total ETSU-R-97 Noise Limits. This approach was set out in initial consultation undertaken with the Council (as detailed in Annex 3 of Technical Appendix 11.2 (EIAR Volume 4)).

11.2.35 Generally speaking there is nothing to suggest that the noise levels in area would have reduced over time for any particular reason. It is considered much more likely that noise levels will have increased rather than decreased over time, due to continually increasing levels of road traffic for example.

11.2.36 Background noise monitoring was undertaken at a number of Noise Monitoring Locations (NMLs) as part of the (now operational) Airies and Kilgallioch wind farms applications. Table

[7] It is noted that the Airies II developer confirmed that they had not yet reached design freeze at the time this data was provided and therefore the layout may change when an application is made. The Airies II developer has been provided with the final Proposed Development layout.

5.1 of Technical Appendix 11.2 (EIAR Volume 4)) details the NMLs used for each scheme, and these have been used within the operational assessment to derive the Total ETSU-R-97 Noise Limits.

Criteria for the Assessment of Effects

Construction and Decommissioning Noise

11.2.37 BS5228-1:2009+A1:2014, Appendix E Part E.3.2 provides example thresholds of potential significant effects at dwellings for assessing the significance of construction noise effects and gives examples of acceptable threshold values for construction noise. For the purposes of this assessment, having due regard to the existing ambient noise levels measured during background noise monitoring for the operational noise survey around the site, the Category A noise threshold values are applicable for all properties. This category has been utilised to assess the significance of the construction effects throughout the construction period. The significance criteria adopted for this assessment are based on Appendix E part E.3.2 of BS5228-1:2009+A1:2014 as detailed in Section 4.3 of the Construction Noise Report (EIAR Volume 4: Technical Appendix 11.1).

11.2.38 The criteria for indicating a potential significant effect are provided in Table 11.2. It should be noted that exceedance of the threshold value does not in itself indicate a significant effect, rather, the standard states *"If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect".*

Table 11.2: Construction Noise Significance Criteria

	Threshold Values, dB $L_{Aeq\ t}$
Category A Daytime (07:00 to 19:00) and Saturdays (07:00 to 13:00)	>65 dB $L_{Aeq,\ 12\ hr}$
Evenings and weekends	>55 dB $L_{Aeq,\ t}$
Night time (23:00 to 07:00)	>45 dB $L_{Aeq,\ 8\ hr}$

Operational Noise

11.2.39 Planning Advice Note PAN 1/2011 'Planning and Noise' provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. PAN 1/2011 refers to the web-based planning advice on renewable technologies for Onshore Wind Turbines, which states that ETSU-R-97 should be used to assess and rate noise from wind energy developments. ETSU-R-97 does not define significance criteria, but describes a framework for the measurement of wind farm noise and gives indicative noise levels considered to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development. Achievement of ETSU-R-97 derived noise limits ensures that wind turbine noise will comply with current Government guidance.

11.2.40 In terms of the EIA Regulations, the use of the term "significance" in this chapter refers to compliance/ non-compliance with the ETSU-R-97 derived noise limits. For situations where predicted wind turbine noise meets or is less than the noise limits defined in ETSU-R-97, then the noise effects are deemed to be not significant. Any breach of the ETSU-R-97 derived noise limits due to the Proposed Development is deemed to result in a significant effect.

11.2.41 For the purposes of this assessment, residential properties that lawfully exist and/ or have extant planning permission are considered to be NSRs.

11.3 Baseline Conditions

Current Assumed Baseline

11.3.1 The Proposed Development is located within a rural location where existing background noise levels at the NSRs are generally considered to be low. The predominant noise sources in the area are wind induced noise (wind passing through vegetation and around buildings), local watercourses, agricultural noise and birdsong. At some receptors the soundscape is affected by local road traffic noise.

11.3.2 Table 11.4: Summary of Prevailing Background Noise Levels during Quiet Daytime Periods (dB(A)) and Table 11.5: Summary of Prevailing Background Noise Levels during Night Time Periods (dB(A)) provide a summary of the background noise levels detailed in the Environmental Statement (ES) chapters submitted as part of the Airies and Kilgallioch Wind Farm applications. Further information can be found in Section 5 of the Operational Noise Report (EIAR Volume 4: Technical Appendix 11.2).

Table 11.4: Summary of Prevailing Background Noise Levels during Quiet Daytime Periods (dB(A))

Noise Monitoring Location	1	2	3	4	5	6	7	8	9	10	11	12
NML1 - Kilquockadale	25.1	24.3	24.4	25.5	27.6	30.6	34.6	39.5	45.3	45.3	45.3	45.3
NML2 - Three Lochs Holiday Park	18.8	21.4	23.9	26.3	28.7	31.0	33.2	35.4	37.5	37.5	37.5	37.5
NML3 - Low Airies	26.3	24.7	24.3	25.2	27.2	30.5	34.9	40.6	47.5	55.5	55.5	55.5
NML4 - Gass Farm	30.1	30.0	30.6	31.8	33.7	36.2	39.4	43.2	47.7	47.7	47.7	47.7
NML5 - Kilmacfadzean	17.6	18.9	20.6	22.4	24.4	26.9	29.9	33.6	37.7	41.5	41.5	41.5
NML6 - Quarter Farm	21.8	24.6	26.2	27.4	28.9	31.0	34.0	37.5	41.0	43.7	43.7	43.7
NML7 - Pultadie	25.3	26.0	26.5	27.1	28.2	30.2	33.3	37.1	41.0	43.5	43.5	43.5

Table 11.5: Summary of Prevailing Background Noise Levels during Night Time Periods (dB(A))

Noise Monitoring Location	1	2	3	4	5	6	7	8	9	10	11	12
NML1 - Kilquockadale	22.7	21.0	20.7	21.6	23.8	27.4	32.2	38.4	45.8	45.8	45.8	45.8
NML2 - Three Lochs Holiday Park	22.9	20.9	20.1	20.6	22.3	25.2	29.4	34.8	34.8	34.8	34.8	34.8
NML3 - Low Airies	22.6	20.9	20.5	21.7	24.2	28.2	33.6	40.4	48.7	58.4	58.4	58.4
NML4 - Gass Farm	25.2	22.8	22.2	23.4	26.3	30.9	37.3	45.5	55.4	55.4	55.4	55.4
NML5 - Kilmacfadzean	17.6	18.0	18.6	19.5	20.7	22.1	23.8	25.6	25.6	25.6	25.6	25.6
NML6 - Quarter Farm	22.7	23.6	24.7	26.0	27.5	29.2	31.0	32.9	32.9	32.9	32.9	32.9

Table 11.5: Summary of Prevailing Background Noise Levels during Night Time Periods (dB(A))												
Noise Monitoring Location	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NML7 - Pultadie	25.5	26.2	26.7	27.3	28.0	29.1	30.8	33.1	33.1	33.1	33.1	33.1

Future Baseline

11.3.3 As per section 11.2.34 above; ETSU-R-97 and the IOA GPG make it clear that background noise levels should be established in the absence of noise from wind turbines. The baseline levels presented in this chapter are therefore based on background noise levels measured before all currently existing wind farms, with the exception of Artfield Fell Wind Farm, became operational.

11.3.4 Whilst the now consented and operational Airies and Kilgallioch wind farms undertook baseline monitoring with Artfield Fell in operation, there was no suggestion within their respective ESs that measurements were contaminated by noise from Artfield. The baseline noise monitoring locations undertaken for both the operational Airies and Kilgallioch Wind Farms were agreed with the Council prior to the survey and additional consultation was also undertaken following completion of the survey to agree the survey results.

11.3.5 It should be noted that, in reality the actual baseline levels at properties in the areas are likely to be higher now as several wind farms have since become operational.

11.3.6 Should the Proposed Development not be constructed/ become operational, then the future baseline noise environment would likely be characterised by further gradual increases in noise over time due to traffic on the local road network, in addition to wind farms currently at the scoping/ planning stages becoming operational in the area. At present, these will include the proposed Kilgallioch Extension Wind Farm (in planning), and Airies II Wind Farm which is currently at the scoping stage. The predictions presented in this assessment assume that all proposed wind farms are consented and built to ensure that the assessment considers a worst case scenario.

11.3.7 Given that the noise limits are set relative to background noise level, use of the older (lower) background noise levels affords the maximum protection to local residents.

11.4 Assessment of Likely Effects

Construction Noise

11.4.1 A total of seven Construction Noise Assessment Locations (CNALs) were chosen as representative of the nearest NSRs. The CNALs chosen were the closest receptors to the Proposed Development and access tracks and these are presented in EIAR Volume 3a: Figure 11.1: Construction Noise Assessment Locations.

11.4.2 The CNALs refer to the position on the curtilage of a property where the predictions of construction noise levels have been made, as detailed in Table 11.6: Summary of Construction Noise Assessment Locations.

Table 11.6: Summary of Construction Noise Assessment Locations			
Receptor	**Easting**	**Northing**	**Elevation (m AOD)**
CNAL01 - Artfield	223713	566158	163
CNAL02 - Low Airies	226107	566542	147
CNAL03 - Torwood Two Dogs Lodge	224551	564121	126
CNAL04 - Scotts Corner	225033	564053	108
CNAL05 - Mark of Lochronald Bungalow	226031	564598	113
CNAL06 - Balminnoch	226837	565411	124
CNAL07 - Kilmacfadzean	220363	567523	148

Operational Noise

11.4.3 A total of 24 NSRs were chosen as representative NALs. The NALs chosen were generally the closest receptors to the Proposed Development and other wind turbine developments. The NALs were selected as they provided the worst case predictions within each area when considering predictions from the Proposed Development alone and also cumulative predictions.

11.4.4 The NALs refer to the position in the curtilage of a property. This approach ensures that the assessment considers the worst case (loudest) noise immission level expected at the NSR. Predictions of wind turbine noise have been made at each of the NALs as detailed in Table 11.7: Summary of Operational Noise Assessment Locations, are shown on EIAR Volume 3a: Figure 11.2: Operational Noise Assessment Locations. Table 11.7: Summary of Operational Noise Assessment Locations also details which NML has been used to set noise limits for each NAL.

Table 11.7: Summary of Operational Noise Assessment Locations					
Receptor	**Easting**	**Northing**	**Elevation (m AOD)**	**Approximate Distance to Nearest Artfield Forrest Turbine* (m)**	**Background Noise Data Used**
NAL1 – Artfield**	223713	566158	163	1,476 (T11)	NML3
NAL2 - Low Airies***	226107	566542	147	1,609 (T12)	NML3
NAL3 – Glenchamber****	223793	563918	135	3604 (T11)	NML4
NAL4 - Torwood Bungalow 2	224358	563762	117	3712 (T11)	NML4
NAL5 - Torwood Bungalow*****	224426	563859	122	3615 (T11)	NML4
NAL6 - Torwood House Hotel	224466	564064	128	3411 (T11)	NML4
NAL7 - Torwood Two Dogs Lodge	224551	564121	126	3357 (T11)	NML4
NAL8 - Gass Farm*****	224928	564021	109	3459 (T12)	NML4
NAL9 - Scotts Corner	225033	564053	108	3,433 (T12)	NML4
NAL10 - Mark of Lochronald Bungalow	226031	564598	113	3132 (T12)	NML2

Table 11.7: Summary of Operational Noise Assessment Locations

Receptor	Easting	Northing	Elevation (m AOD)	Approximate Distance to Nearest Artfield Forrest Turbine* (m)	Background Noise Data Used
NAL11 - Mark of Lochronald	226093	564491	111	3,255 (T12)	NML2
NAL12 - Fell of Loch Ronald	227063	564387	115	3,831 (T12)	NML2
NAL13 - Balminnoch	226837	565411	124	2902 (T12)	NML2
NAL14 - The Old Schoolhouse	228677	566389	104	4029 (T12)	NML1
NAL15 - Kilquhockadale	229258	567804	115	4472 (T12)	NML1
NAL16 - Urrall	229275	569553	141	4935 (T12)	NML1
NAL17 - Tannielaggie	228748	572073	117	5972 (T2)	NML7
NAL18 - Kilmacfadzean	220363	567523	148	2362 (T5)	NML7
NAL19 - Quarter Farm	218645	568273	139	3,915 (T5)	NML8
NAL20 - Pultadie	218253	570027	145	4605 (T5)	NML9
NAL21 - Balmurrie	220495	566427	145	2850 (T5)	NML7
NAL22 - Dranigower	220128	565132	100	4068 (T5)	NML7
NAL23 - Garvilland	221583	561787	125	6337 (T11)	NML4
NAL24 - Carscreugh Croft	223200	562300	116	5307 (T11)	NML4

* Please note the distances to nearest turbines quoted above may differ from those reported elsewhere. Distances for the noise assessment are taken from the nearest turbine to the closest edge of the amenity area (usually the garden).

** the occupiers are financially involved with Artfield Fell/ Balmurrie

*** the occupiers are financially involved with Airies

**** the occupiers are financially involved with Glenchamber

***** the occupiers are financially involved with the Proposed Development.

Potential Construction Effects

11.4.5 The construction noise impact results show that the predicted construction noise levels are below the Category A Threshold Levels as detailed in Table 11.2: Construction Noise Significance Criteria. For all of the CNALs and for all assessment scenarios, therefore, there would be **no significant effects**. Full details of the modelling and assessment can be found in EIAR Volume 4: Technical Appendix 11.1: Construction and Decommissioning Noise Assessment).

Potential Operational Effects

Setting the Total ETSU-R-97 Noise Limits (Stage 1)

11.4.6 Based on the previously collected background noise levels, the Total ETSU-R-97 Noise Limits have been established for each of the NALs detailed in Table 11.7: Summary of Operational Noise Assessment Locations above. The Total ETSU-R-97 Noise Limits are as detailed in Table 6.3 and Table 6.4 of EIAR Volume 4: Technical Appendix 11.2: Operational Noise Assessment and have been based on an upper fixed minimum of 40 dB (daytime) or background plus 5 dB and 43 dB (night time) or background plus 5 dB.

11.4.7 The prevailing background noise levels are detailed in Tables 11.4: Summary of Prevailing Background Noise Levels during Quiet Daytime Periods (dB(A)) and 11.5: Summary of Prevailing Background Noise Levels during Night Time Periods (dB(A)).

Predicting the Likely Effects and the Requirement for a Cumulative Noise Assessment (Stage 2)

11.4.8 A likely cumulative noise assessment was undertaken at the 24 NALs detailed in Table 11.7: Summary of Operational Noise Assessment Locations. The results of the cumulative assessment are shown in EIAR Volume 4: Technical Appendix 11.2: Operational Noise Assessment, Tables A6.5 and A6.6. The Tables detail the Total ETSU-R-97 Noise Limits and predicted likely cumulative wind turbine noise levels for ETSU-R-97 daytime hours and ETSU-R-97 night time hours.

11.4.9 The result of the likely cumulative noise assessment show that there are predicted to be exceedances of the Total ETSU-R-97 Noise Limits at three NALs, but this is as a result of the predicted noise from other schemes in the area. At the locations where exceedances are identified the Proposed Development can operate concurrently with the proposed, consented and operational wind farms in the area, as its contribution is negligible. For the other 21 NALs likely cumulative noise levels meet the Total ETSU-R-97 Noise Limits. Accordingly the Proposed Development would result in **no significant effects**.

Operational Phase – Derivation of Site Specific Noise Limits for the Development (Stage 3)

11.4.10 As summarised in Table 6.7 of EIAR Volume 4: Technical Appendix 11.2: Operational Noise Assessment, at 18 NALs existing/ proposed wind farms in the area are predicted to use most or all of the Total ETSU-R-97 Noise Limit (the headroom between predicted cumulative noise levels excluding the Proposed Development and the Total ETSU-R-97 Noise Limits is less than 5 dB). Having due regard to the guidance in ETSU-R-97 and the IOA GPG, Site Specific Noise Limits at these locations have been set 10 dB below the Total ETSU-R-97 Noise Limits.

11.4.11 For the other six NALs, there was 'significant headroom' (more than 5 dB) between the predicted cumulative noise level excluding the Proposed Development and the Total ETSU-R-97 Noise Limit. Limit apportionment was therefore undertaken in accordance with the IOA GPG, whereby the Total ETSU-R-97 Limit is split with a portion allocated to the existing schemes and the remainder allocated to the Proposed Development. Where apportionment was required, cautious predicted noise levels were subtracted from the Total ETSU-R-97 Noise Limit to determine the 'residual limit' available for the Proposed Development.

11.4.12 The daytime Site Specific Noise Limits have been derived based on the lesser of:

- The residual limit; and
- The lower daytime fixed minimum noise limits (35 dB) or the background noise level plus 5 dB (whichever is greater).

11.4.13 The Proposed Developments Site Specific Noise Limits were compared to the predictions of the Proposed Development operating on its own and the results are summarised in EIAR Volume 4: Technical Appendix 11.2: Operational Noise Report (EIAR Volume 4), Table A6.8 for the daytime and Table A6.9 for the night time. The tables also show the exceedance level which is the difference between the predicted wind turbine noise level and the Site Specific Noise Limit at a given wind speed. A negative exceedance level indicates satisfaction of the noise limit. The Site Specific Noise Limits and predictions are also shown on Figures A1.3a – x in Technical Appendix 11.2: Operational Noise Assessment (EIAR Volume 4).

11.4.14 The assessment shows that the predicted Wind turbine noise immission levels meet the Site Specific Noise Limits under all conditions and at all locations for both daytime and night time periods at all receptors. There would be **no significant effects**.

Potential Decommissioning Effects

11.4.15 Noise levels occurring during decommissioning activities are assumed to be similar to those occurring during the construction phases. As such, decommissioning activities have not been considered on the assumption that if noise levels are within acceptable levels during the construction period they should also be within acceptable levels during decommissioning.

Potential Cumulative Construction Effects

11.4.16 The predicted construction noise levels at all NSRs are significantly below the threshold levels (by at least 10 dB) such that any contribution from the Proposed Development would not increase the received noise levels attributable to other nearby construction activities above the threshold levels at any NSR. Accordingly, there would be **no significant cumulative construction noise effects**.

Potential Cumulative Operational Effects

11.4.17 The result of the likely cumulative noise assessment show that there are predicted to be exceedances of the Total ETSU-R-97 Noise Limits at three NALs, but this is as a result of the predicted noise from other schemes in the area. At the locations where exceedances are identified the Proposed Development can operate concurrently with the proposed, consented and operational wind farms in the area, as its contribution is negligible. For the other 21 NALs, likely cumulative noise levels meet the Total ETSU-R-97 Noise Limits. Accordingly the Proposed Development would result in **no significant cumulative effects.**

11.5 Mitigation

Mitigation during Construction

11.5.1 No significant effects resulting from construction noise are predicted. Nevertheless, a range of good practice measures would be presented in the detailed Construction Environmental Management Plan (CEMP) and employed to minimise noise impacts. At this stage of the development process, the assessment is based on a worst-case scenario, as a detailed construction programme is not available. An Outline CEMP is presented in Technical Appendix 2.1 (EIAR Volume 4).

11.5.2 Good site practices would be implemented to minimise the likely effects. Section 8 of BS5228-1:2009+A1:2014 recommends a number of simple control measures as summarised below that would be employed on-site:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that could cause concern;
- Ensure that any extraordinary site work continuing throughout 24 hours of a day (for example, crane operations lifting components onto the tower) would be programmed, when appropriate, so that haulage vehicles would arrive at or leave the site between 7:00 and 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays, with the exception of abnormal loads that would be scheduled to avoid anticipated periods of high traffic flows;
- Ensure all vehicles and mechanical plant would be fitted with effective exhaust silencers and be subject to programmed maintenance;

- Select inherently quiet plant where appropriate – all major compressors would be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;
- Ensure all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Instruct that machines would be shut down between work periods or throttled down to a minimum;
- Regularly maintain all equipment used on site, including maintenance related to noise immissions;
- Vehicles would be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- Ensure all ancillary plant such as generators and pumps would be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures should be provided.

11.5.3 The extent of any blasting requirement cannot be determined until intrusive site investigation tests are completed. Nevertheless should blasting be required, a series of tests would be undertaken by the appointed contractor in accordance with guidance outlined in BS5228-2:2009+A1:2014[8]. In addition blasts would be designed through appropriate specification of Maximum Instantaneous Charge (MIC) to ensure that vibration levels at the nearest NSRs would not exceed the guideline limits presented in BS 7385-2: 1993 'The Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration'[9] and BS 6472-2: 2008 'Guide to evaluation of human exposure to vibration in buildings. Blast-induced vibration'[10]. A condition could be attached to the consent to require compliance with these limits. Given the relative distances between the potential locations of blasting and the closest noise sensitive receptors, there is no reason to suggest that the guidance within BS7385-2: 1993 and BS 6472-2: 2008 would not be met.

Mitigation during Operation

11.5.4 The exact model of wind turbine to be used for the Proposed Development would be the result of a future tendering process. Achievement of the noise limits determined by this assessment would be a key determining factor in the final choice of wind turbines for the site. Based on the Vestas V150 wind turbine, no mitigation would be required for the Proposed Development to meet the daytime or night time derived Site Specific Noise Limits.

11.6 Assessment of Residual Effects

Residual Construction Effects

11.6.1 Predicted wind farm construction noise levels are below the assessment criteria at all receptors, for all phases of construction. Due to the low background noise levels at some locations, elements of construction noise may be audible at the closest residential receptors for certain periods during construction, however, with or without the good practice construction mitigation measures outlined above there would be **no significant residual effects.**

[8] British Standard BS5228-2: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' – Part 2: Vibration

[9] British Standard BS7385-2: 1993 'The Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration'

[10] British Standard BS6472: 2008 'Guide to evaluation of human exposure to vibration in buildings. Blast-induced vibration'

Residual Operational Effects

11.6.2 Predicted wind farm operational noise levels at all the NALs lie below the Site Specific daytime and night time Noise Limits. Accordingly the Proposed Development would result in **no significant residual effects.**

11.6.3 At some locations, under some wind conditions and for a certain proportion of the time operational wind farm noise would be audible; however, it would be at an acceptable level in relation to the ETSU-R-97 guidelines. There would be **no significant residual effects.**

Residual Decommissioning Effects

11.6.4 Noise levels during decommissioning activities are anticipated to remain below the threshold levels at all receptors. There would be **no significant residual effects.**

Residual Cumulative Construction Effects

11.6.5 The predicted construction noise levels, even without any mitigation measures, are predicted to be more than 10 dB below the threshold levels. As such, construction noise attributable to the wind farm would not increase the received noise levels attributable to other nearby construction activities above the threshold levels at any NSR. There would be **no significant residual effects.**

Residual Cumulative Operational Effects

11.6.6 Whilst there are predicted to be cumulative exceedances at a three NALs (as a result of the predicted noise from other schemes in the area), the Proposed Development is having a negligible contribution. At the locations where exceedances are identified the Proposed Development can operate concurrently with the proposed, consented and operational wind farms in the area, as its contribution is negligible. For the other 21 NALs, likely cumulative noise levels meet the Total ETSU-R-97 Noise Limits. There would be **no significant residual effects.**

11.7 Monitoring

Construction Phase Monitoring

11.7.1 No monitoring would be required during the construction phase.

Operation Phase Monitoring

11.7.2 No monitoring would be required during the operational phase.

Decommissioning Phase Monitoring

11.7.3 No monitoring would be required during the decommissioning phase.

11.8 Summary

11.8.1 Predicted construction noise levels compared with the Category A criteria outlined in Section E.3 of BS5228: Part 1 2009+A1:2014 indicate that construction noise levels are below the guidelines considered acceptable at all receptors for all construction phases and therefore no significant effects are anticipated.

11.8.2 The predicted construction noise levels, even without any mitigation measures, are predicted to be more than 10 dB below the threshold levels. As such, construction noise attributable to the Proposed Development would not increase the received noise levels

attributable to other cumulative sites (e.g. nearby construction activities) above the threshold levels at any NSR. There would be no significant residual effects either from the Proposed Development alone or in combination with other cumulative developments.

11.8.3 The guidance contained within ETSU-R-97 was used to assess the likely operational noise impact of the Proposed Development. Predicted levels and previously measured background noise levels indicate that for dwellings neighbouring the Site, wind turbine noise would meet the Site Specific Noise Limits established in accordance with ETSU-R-97 and the IOA GPG for both the Proposed Development alone and taken in combination with other cumulative developments.

11.8.4 There are a range of wind turbine models that may be appropriate for the Proposed Development. If the proposal receives planning consent, further data would be obtained from the supplier for the final choice of wind turbine model to demonstrate compliance with the operational noise limits derived in this report.

11.8.5 Table 11.8 provides a summary of the likely significant effects of the Proposed Development

Table 11.8: Summary of Likely Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/ Residual Effect
Construction			
Potential construction noise effects on noise sensitive receptors	No specific measures required other than standard good site practices.	These would be included in the detailed CEMP and delivered as a condition of consent.	Not Significant
Operation			
Potential operational noise effects on noise sensitive receptors	No specific measures required.	N/A	Not Significant
Decommissioning			
Potential decommissioning noise effects on noise sensitive receptors	No specific measures required other than standard good site practices which would be applicable at the time.	N/A	Not Significant
Cumulative Construction			
Potential cumulative construction noise effects on noise sensitive receptors	No specific measures required.	N/A	Not Significant
Cumulative Operation			
Potential cumulative operational noise effects on noise sensitive receptors	No specific measures required.	N/A	Not Significant

12 Aviation and Telecommunications

12.1 Introduction

12.1.1 This chapter considers the likely significant effects on aviation and telecommunications associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the aviation and telecommunications baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

12.1.2 The assessment has been carried out by Malcolm Spaven, Director of Aviatica, a specialist consultancy with 24 years' experience of providing aviation and telecommunications advice to the wind energy industry (refer to Volume 4: Technical Appendix 1.2 for further details).

12.2 Assessment Methodology and Significance Criteria

Scope of Assessment

12.2.1 This chapter considers effects on:

- aviation;
- defence; and
- telecommunications.

12.2.2 The chapter assesses cumulative effects as arising from the addition of the Proposed Development to other cumulative developments, which are the subject of a valid planning application[1]. Operational, under construction and consented developments are considered as part of the baseline. Developments close to the end of their operational life will be included as part of the baseline to present 'worst case scenario'.

12.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2).

12.2.4 The scope of the assessment has been informed by consultation responses summarised in Table 12.1 and the following guidelines/policies:

- Civil Aviation Authority, Safety Regulation Group, CAP 764: CAA Policy and Guidelines on Wind Turbines, February 2016;
- Civil Aviation Authority, Safety Regulation Group, CAP 670: Air Traffic Services Safety Requirements, Third Issue, Amendment 1/2019, 1 June 2019, Part B, Section 4; and
- Scottish Government, Planning Circular 2/2003: Safeguarding of Aerodromes, Technical Sites and Military Explosive Storage Areas: The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosive Storage Areas) (Scotland) Direction 2003 (revised edition March 2016).

[1] Airies II windfarm is at the scoping stage however given its proximity to the Proposed Development this assessment includes consideration of potential for cumulative effects from the combination of Airies II and the Proposed Development.

Consultation

12.2.5 Table 12.1 summarises the consultation responses received regarding aviation and telecommunications and provides information on where and/or how they have been addressed in this assessment.

12.2.6 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 12.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
Defence Infrastructure Organisation (Ministry of Defence), 16 June 2020	Scoping	"the MoD have no concerns about the proposal."	No action required.
NATS En Route, 22 May 2020	Scoping	"The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal."	No action required.
Glasgow Prestwick Airport (GPA), 11 June 2020	Scoping	"As the proposed windfarm is within the instrumented range of both of our primary radars, we would expect the EIA to consider this, and undertake line of sight (LOS) analysis to confirm or otherwise that the windfarm is terrain shielded from the primary radars at Glasgow Prestwick Airport."	Illustrative radar line of sight profiles, showing no line of sight, provided to GPA 16 June 2020. GPA confirmed no requirement for further assessment.
BT, 26 May 2020	Scoping	"the Project indicated should not cause interference to BT's current and presently planned radio network".	No action required.
JRC, 26 May 2020	Scoping	"In the case of this proposed wind energy development, JRC does not foresee any potential problems based on known interference scenarios and the data you have provided."	No action required.
Vodafone	Pre-application	Microwave radio link supporting the SSE Artfield Fell wind farm crosses the development area of the site. It will be in operation until 2022/23.	Potential effects assessed in this chapter.

Potential Effects Scoped Out

12.2.7 Effects on civil and military air traffic control radar, air defence radar, Meteorological Office radar, aeronautical radio navigation aids, military low flying, airports, airfields and flying sites have been scoped out on the basis of the scoping responses.

12.2.8 Effects on telecommunications, other than the Vodafone microwave link referred to in Table 12.1, have been scoped out of further assessment on the basis of scoping responses and a search of the Ofcom Spectrum Information Portal and Wireless Telegraphy Register.

Method of Baseline Characterisation

Extent of the Study Area

12.2.9 The study areas for the aviation assessment were radii from the centre of the Site, as follows:

- 150 km for air traffic control and air defence primary surveillance radars;
- 30 km for Meteorological Office rainfall radars;
- 20 km for secondary surveillance radars and aeronautical radio navigation aids;
- 50 km for the Eskdalemuir seismic monitoring station;
- 30 km for licensed, certificated and Government aerodromes; and
- 10 km for unlicensed aerodromes, airstrips and gliding sites.

12.2.10 The study area for the telecommunications assessment was a 5 km radius around the Site. This was selected in order to capture all fixed telecommunications links with the potential to be affected by turbines on the Site.

Desk Study

12.2.11 The aviation baseline assessment was carried out by consulting the UK Aeronautical Information Publication, the UK Military Aeronautical Information Publication, civil and military aeronautical charts and Aviatica in-house databases of aviation infrastructure and assets.

12.2.12 The telecommunications baseline assessment was carried out by accessing the Ofcom Spectrum Information Portal and carrying out a map search for licensed telecommunications links in the vicinity of the site. In addition a search by OS grid reference was conducted in the Ofcom Wireless Telegraphy Register.

Criteria for the Assessment of Effects

12.2.13 Significance criteria for assessment of impacts on aviation and telecommunications, unlike those for environmental effects, are not based on the sensitivity of the receptor. Further, while magnitude of change can be determined in some circumstances, it typically does not provide a standardised metric on which to measure the significance of any effects. In this context, the significance of effects on aviation and telecommunications has been determined in this chapter by application of professional judgement, underpinned by consideration of the magnitude of change (where measurable), the regulation and procedures in place for ensuring that avation and telecommunications infrastructure meets required performance standards, and the safeguarding policies and practices in use by specific aviation and telecommunications stakeholders.

12.2.14 Residual adverse effects of the Proposed Development on aviation and telecommunications are described as either nil, negligible, minor, moderate or major. Nil, negligible or minor effects are categorised as not significant. Moderate or major effects are categorised as significant.

Limitations and Assumptions

12.2.15 The aviation and telecommunications baseline described in this chapter is extant as at October 2020. The assessment assumes that there will be no significant changes to this baseline over the lifetime of the Proposed Development. This is a standard assumption for such assessments and is not considered to undermine its validity.

12.3 Baseline Conditions

Current Baseline

12.3.1 The Proposed Development is located in uncontrolled airspace between ground level and Flight Level 195 (approximately 19,500 feet above sea level). Above that level the airspace is Class C controlled airspace under the control of the NATS En Route Ltd (NERL) Scottish Area Control Centre at Prestwick. The airspace between ground level and Flight Level (FL) 195 over the Site may be used by any civil or military aircraft without clearance from or radio contact with any air traffic control agency. The users of this airspace include military aircraft, predominantly between ground level and 2,000 feet, and occasional light civil aircraft.

12.3.2 Between FL195 and FL245 the airspace over the Site retains the Class C classification but is designated as Temporary Reserved Airspace 004, for use when notified for autonomous military operations. The main users of this airspace are Hawk training aircraft from RAF Valley and trials aircraft operating from Bae Systems Warton.

12.3.3 Above FL245 the airspace over the Site is part of the Scottish Upper Information Region designated as Scottish Direct Route Airspace. The main air traffic in this airspace is transatlantic traffic between the UK/Europe and North America, under the control of the NATS En Route Ltd (NERL) Scottish Area Control Centre at Prestwick.

12.3.4 Air traffic control and air defence radars within 150 km of the site are as follows:

- Glasgow Prestwick Airport;
- Glasgow Airport;
- Cumbernauld (Orchardton);
- Kincardine;
- Edinburgh Airport;
- NATS Lowther Hill;
- RAF Spadeadam Deadwater Fell;
- RAF Spadeadam Berry Hill;
- NATS Great Dun Fell;
- Isle of Man (Ronaldsway) Airport;
- Belfast City Airport;
- Belfast International Airport; and
- QinetiQ West Freugh.

12.3.5 There are no Meteorological Office rainfall radars within 30 km; no secondary surveillance radars or aeronautical radio navigation aids within 20 km; no licensed, certificated or Government aerodromes within 30 km; no unlicensed aerodromes, airstrips or gliding sites within 10 km ; and the Site is beyond the 50 km consultation radius for the Eskdalemuir seismic monitoring station.

12.3.6 The Site is located within a part of the UK Military Low Flying System known as Low Flying Area 16. In addition it is within Low Flying Area 20 (Tactical), also known as the Borders Tactical Training Area (TTA), where military aircraft are permitted to fly as low as 100 feet above ground level. However the Proposed Development is wholly located within a sector of the TTA categorised by the MoD as a "low priority military low flying area less likely to raise concerns".

12.3.7 The telecommunications fixed link baseline consists of a single microwave link, operated by Vodafone on behalf of SSE, running from the Artfield Fell wind farm to Cambret Hill near Creetown.

12.3.8 The Proposed Development is surrounded on three sides by other existing wind farm developments with different lighting configurations.

Future Baseline

12.3.9 Future baseline conditions are expected to remain unchanged in the event that the Proposed Development does not go ahead, with the exception of aviation lighting.

12.3.10 The Proposed Development is located in close proximity to two other proposed wind farm developments with potentially different lighting configurations (Kilgallioch Extension (in planning) and Airies II (scoping)).

Summary of Receptors

Scoped Out Receptors

12.3.11 The radars at Glasgow Airport, Cumbernauld, Kincardine, Edinburgh Airport, Deadwater Fell, Berry Hill, Isle of Man Airport, Belfast City and Belfast International Airports were scoped out because they either had insufficient range to reach the Site, were terrain screened from radar visibility or do not provide air traffic services in the vicinity of the Site.

12.3.12 The NATS Lowther Hill and Great Dun Fell radars have been scoped out because the scoping response from NATS confirms that there will be no line of sight from those radars to the Proposed Development.

12.3.13 The QinetiQ West Freugh radar and military low flying have been scoped out because the MoD scoping response confirms that they have no concerns about the Proposed Development.

Scoped In Receptors

12.3.14 The Vodafone microwave link from Artfield Fell to Cambret Hill has been scoped in to the assessment.

12.4 Assessment of Likely Effects

Potential Construction Effects

12.4.1 The Ofcom-recommended Bacon formula was used to determine the minimum acceptable separation between the centre of the link path and any part of a wind turbine in the Proposed Development. This found that the maximum size of buffer zone around the centre of the link would be 24.7 metres. In addition an allowance of up to 50 m is normally made for inaccuracies in the stated grid references for each end of the link. The required separation between the link and any part of a turbine is therefore 74.7 m. In addition Bacon recommends that wind turbines are not placed any closer than 500 m from the transmitter at either end of the link.

12.4.2 The closest turbine in the Proposed Development to the Vodafone link would be Turbine 11. This is located 800 metres from the link path, and 1350 metres from the transmitter/receiver on Artfield Fell.

12.4.3 Since the separations between the Vodafone link and all turbines in the Proposed Development are well in excess of those recommended by the Bacon formula, it is concluded that the Proposed Development will have nil effects on the Vodafone link during the construction phase, when there may also be cranes and other equipment located at or close to the turbine locations.

Potential Operational Effects

12.4.4 The effects on the Vodafone link during the operational phase will be the same as during the construction phase.

12.4.5 Article 222 of the Air Navigation Order (ANO) 2016 requires all structures with a height of 150m or more above ground level to be fitted with visible spectrum aviation obstruction lighting. The proposed turbines will be 180m above ground level to blade tip. The CAA issued a Policy Statement in 2017 on the lighting of onshore wind turbines 150m or more above ground level, providing for some alleviations of the full requirements of the ANO. In addition, a draft new edition of CAP 764, the CAA's policy and guidelines on wind turbines, was circulated for consultation in 2020. This contains a new section on lighting which incorporates the provisions of the 2017 Policy Statement and applies the ICAO Annex 14 Recommended Practices on the lighting of perimeter turbines in a wind farm.

12.4.6 The emerging CAP 764 policy on lighting of wind turbines has been applied to the Proposed Development, incorporating the following design principles:

- the lighting will identify the corners and perimeter of the wind farm;
- there will be a maximum spacing of 900 metres between lit turbines;
- each turbine to be lit will be fitted with a 2000 candela steady red light on the nacelle, with a second such light fitted on the nacelle to be used as a back-up in the event of failure of the main light; additionally, a minimum of three 32 candela steady red lights will be fitted on the turbine tower at half the nacelle height; and
- the lights will be capable of being dimmed to 10% of their peak intensity when a sensor at the wind farm detects that the visibility exceeds 5km.

12.4.7 The resulting lighting design, as specified in Chapter 2: Development Description will have all turbines except Turbines 3 and 9 lit.

12.4.8 In addition to the visible spectrum lighting specified above, all turbines in the Proposed Development will be fitted with infra-red lighting to MoD specification.

Potential Decommissioning Effects

12.4.9 The effects on the Vodafone link during the decommissioning phase will be the same as during the construction phase.

Potential Cumulative Construction Effects

12.4.10 Since the stand-alone effects of the Proposed Development on the Vodafone link will be nil, the cumulative construction effects will also be nil.

Potential Cumulative Operational Effects

12.4.11 Since the stand-alone effects of the Proposed Development on the Vodafone link will be nil, the cumulative operational effects will also be nil.

12.4.12 It is concluded that there will be no significant effects of the Proposed Development on the Vodafone microwave link from Artfield Fell to Cambret Hill.

12.4.13 The status and specification of lighting on existing operational developments (e.g. Artfield Fell, Balmurrie Fell, Airies, Glenchamber and Kilgallioch) and proposed development (e.g. Kilgallioch Extension and Airies II) may alter the ability of the lighting scheme on the Proposed Development to define the perimeter of the cumulative area of wind turbines.

12.5 Mitigation

12.5.1 No mitigation is required as there are no significant effects on aviation or telecommunications as a result of the construction, operation or decommissioning of the Proposed Development.

12.5.2 Given the potential for cumulative operational effects with respect to aviation lighting, it is proposed to draft a lighting condition that allows for re-design of the lighting scheme, prior to construction, which may take into account the lighting status of adjacent developments and continue to provide warning to airspace users of the perimeter of the cumulative area of wind turbines.

12.6 Assessment of Residual Effects

12.6.1 There will be no residual effects of the Proposed Development on aviation or telecommunications.

12.7 Summary

12.7.1 There will be no significant effects on aviation or telecommunications as a result of the construction, operation or decommissioning of the Proposed Development.

Lighting in accordance with CAA requirements will be fitted to all turbines except Turbines 3 and 9. Infra-red lighting to MoD specifications will be fitted to all turbines. A lighting condition will provide flexibility for alterations to the lighting scheme prior to construction, to take account of cumulative lighting requirements.

13 Socioeconomics

13.1 Introduction

13.1.1 This chapter considers the likely significant socioeconomic effects associated with the construction and operation of the Proposed Development. The specific objectives of the chapter are to:

- describe the socioeconomic baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

13.1.2 The assessment has been carried out by Ramboll UK Limited (Ramboll). The assessment has been reviewed and approved by Peter Bruce, BSc (Hons) MSc MIEMA CEnv, who has over 14 years' of experience in providing impact assessments, specialising in onshore wind farm development. There are no formally recognised standards, guidelines or methodologies for assessing wind farm effects on socioeconomics for the purposes of an EIA. Therefore, the assessment has been based on professional judgement, and industry publications such as reports from RenewableUK [4] [5].

13.2 Assessment Methodology and Significance Criteria

Scope of Assessment

13.2.1 This chapter considers the following effects:

- direct and indirect effects on employment and economic activity during construction and operation;
- the contribution of Non-Domestic Rates (a tax which is paid on non-domestic property);
- direct and indirect effects on recreation assets during operation; and
- direct and indirect effects on key tourist routes during construction and operation.

13.2.2 The chapter assesses the potential for cumulative effects of the Proposed Development along with other Proposed Developments, which are the subject of a valid planning application. Operational, under construction and consented developments are considered as part of the baseline.

13.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Development Description.

Consultation

13.2.4 The request for scoping opinion and Scoping Report (May 2020)[1] set out a proposed scope for the consideration of socioeconomic effects, which included consultation (through scoping) with Dumfries and Galloway Council, Scotways (in relation to public rights of way) and local community councils. Table 13.1 summarises the consultation responses received and provides information on where and/ or how they have been addressed in this assessment. No

1 Artfield Forest Wind Farm Scoping Report, May 2020, Ramboll UK Limited.

comments on the scope of the assessment of socioeconomic effects were received as part of the scoping opinion.

13.2.5 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 13.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response/ Action Taken
Scotways, 2 June 2020	Scoping	Scotways confirmed that there are no Public Rights of Way identified within the site. The consultation response notes that DW88 would be crossed by the proposed route for construction traffic accessing the site. The response also notes the presence of the promoted 'Military Road to Glenluce' in the wider surrounding area.	The potential for construction traffic to result in significant effects on other road users is addressed in Chapter 10: Traffic and Transport.

Potential Effects Scoped Out

13.2.6 Effects arising during decommissioning have been scoped out of this assessment since they would be of a similar nature to construction effects, but of a smaller scale and shorter duration.

13.2.7 Research undertaken by Visit Scotland[2] and BiGGAR Economics[3] suggests that there is no evidence that the presence of wind farm developments have an adverse effect on the tourism sector in Scotland. Potential impacts of the Proposed Development on local tourist attractions and accommodation within the study areas is, therefore, not assessed within the socioeconomics assessment.

Method of Baseline Characterisation

Extent of the Study Area

13.2.8 For the purposes of the assessment, the following socioeconomic study areas were considered:

- Local Area - Mid Galloway and Wigtown West Ward;
- Region – Dumfries and Galloway; and
- National – Scotland.

Desk Study

13.2.9 To understand the baseline conditions relevant to the assessment of effects on socioeconomics, tourism and recreation, the following has been undertaken:

- a review of national, regional and local economic data;
- an analysis of socioeconomic statistics for the relevant study areas;
- an analysis of tourism statistics in the relevant study areas; and
- identification of local tourism and recreation assets, and accommodation providers.

2 Visit Scotland (2014), VisitScotland Position Statement - Wind Farms. Available online: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/policies/visitscotland-position-statement---wind-farms---oct-2014.pdf [Last accessed: 18/11/2020].

3 BiGGAR Economics (2017), Wind Farms and Tourism Trends in Scotland. Available online: https://biggareconomics.co.uk/wp-content/uploads/2020/01/Wind-farms-and-tourism-trends-in-Scotland.pdf [Last accessed: 18/11/2020].

Field Survey

13.2.10 A field survey was not considered necessary as part of the socioeconomic assessment.

Criteria for the Assessment of Effects

Socioeconomics

13.2.11 There are no recognised standards, guidelines or methodologies for assessing the effects of wind farms on socioeconomics, tourist routes or recreation. Therefore, to identify the potential effects, the assessment is based on professional judgement of the degree of change resulting from the Proposed Development.

13.2.12 The assessment of effects utilises data from the RenewablesUK report on the economic effects of the onshore wind sector in the UK[4], which was subsequently updated in 2015[5], with a further report produced in 2019 on quantifying the benefits of onshore wind in the UK[6].

13.2.13 Although there are no recognised methodologies for assessing the impact of wind farms, this approach is now recognised practice, having been used in reports for the Scottish government, UK government and RenewableUK.

13.2.14 The following stages have been undertaken for the economic assessment:

- estimate total expenditure;
- estimate the breakdown of expenditure into component contracts and subcontracts;
- estimate the impact on employment during construction and operation; and
- using the figures above to estimate the economic impact.

Tourism and Recreation

13.2.15 Renewable energy and tourism are both important sectors in the Scottish economy, which are sometimes thought to be in conflict. The link between wind energy developments and tourism in Scotland has been reviewed to assess the potential effect, informed by the following reports:

- Wind Farms and Tourism Trends, 2016[7];
- The Economic Impacts of Wind Farms on Scottish Tourism, 2008[8];
- A Report on the achievability of the Scottish Government's renewable energy targets, 2012[9];
- Wind Farms and Changing Mountaineering Behaviour in Scotland, 2014[10]; and

[4] RenewableUK (2012), *Onshore Wind: Direct and Wider Economic Impacts*. Available online: https://www.gov.uk/government/publications/onshore-wind-direct-and-wider-economic-impacts [Last accessed 19/11/2020].

[5] RenewableUK (2015), Onshore Wind: Economic Impacts 2014.

[6] Vivid Economics (2019), *Quantifying benefits of onshore wind to the UK*. Available online: https://cdn.ymaws.com/www.renewableuk.com/resource/resmgr/media/Quantifying_the_Benefits_ofO.pdf [Last accessed 19/11/2020].

[7] BiGGAR Economics (2016), *Wind Farms and Tourism Trends in Scotland.* Available at: https://biggareconomics.co.uk/wp-content/uploads/2020/01/Research-Report-on-Wind-Farms-and-Tourism-in-Scotland-July-16.pdf [Last accessed 26/11/2020].

[8] Glasgow Caledonian University/Moffat Centre (2008), The Economic Impacts of Wind Farms on Scottish Tourism. Available at : https://www.gov.scot/publications/economic-impacts-wind-farms-scottish-tourism/pages/4/ [Last accessed 26/11/2020].

9 Scottish Parliament Economy, Energy and Tourism Committee (2012), Report on the achievability of Scottish Government's renewable energy targets. Available at : https://www.parliament.scot/S4_EconomyEnergyandTourismCommittee/eeR12-07.pdf [Last accessed 26/11/2020].

10 Mountaineering Scotland (2014), Wind Farms and Changing Mountaineering Behaviour in Scotland. Available at : https://www.mountaineering.scot/assets/contentfiles/pdf/mcofs-wind-farm-survey-report_2014-reduced.pdf [Last accessed 26/11/2020].

- Wind Farms and Mountaineering Behaviour in Scotland, 2016[11].

13.2.16 An overview of tourism and recreation assets in the area are presented in the baseline and the potential effects of the Proposed Development on tourism routes and recreation assets has been undertaken.

Cumulative Effects

13.2.17 Operational, under construction and consented developments are considered as part of the baseline. Developments that are consented but not yet under construction and those that are the subject of valid planning applications have been considered as part of the qualitative cumulative impact assessment.

Criteria for Assessing Significance

13.2.18 The criteria outlined in Table 13.2: Significance Criteria have been used to assess the significance of effects. Major and moderate effects are categorised as **significant**. Minor and negligible are **not significant**.

Table 13.2: Significance Criteria

Effect	Description
Major	Major loss/ improvement to key elements/ features of the baseline conditions such that post development character/ composition of baseline condition will be fundamentally changed. For example, a major long-term alteration of socioeconomic conditions, a major reduction/ improvement of recreational assets or a substantial change to tourism spend.
Moderate	Loss/ improvement to one or more key elements/ features of the baseline conditions such that post development character/ composition of the baseline condition will be materially changed. For example, a moderate long-term alteration of socioeconomic conditions, a moderate reduction/ improvement in the recreational asset, or a moderate change to tourism spend.
Minor	Changes arising from the alteration will be detectable but not material; the underlying composition of the baseline condition will be similar to the pre-development situation. For example, a small alteration of the socioeconomic conditions, a small reduction/improvement in the recreational asset, or a small change in tourism spend.
Negligible	Very little change from baseline conditions. Change is barely distinguishable, approximating to a "no change" situation.

Limitations and Assumptions

13.2.19 The assessment is based on the experience of comparable developments elsewhere and a review of the local socioeconomic context. In order to maximise the beneficial economic effects associated with the Proposed Development it will be necessary for national, regional and local contractors to engage with the opportunities; as assumed in the assessment.

11 Mountaineering Scotland (2016), Wind Farms and Mountaineering Behaviour in Scotland. Available at: https://www.mountaineering.scot/assets/contentfiles/pdf/Wind-farms-and-mountaineering-behaviour-2016.pdf [Last accessed 26/11/2020].

13.3 Baseline Conditions

Strategic Context

Scotland's Economic Strategy[12]

13.3.1 In March 2015, the Scottish Government published its economic strategy with the two main purposes of increasing competitiveness and tackling inequality. The strategy outlined four main priorities to achieve these aims:

- investing in Scotland's people, infrastructure and assets;
- promoting inclusive growth, which creates opportunity through a fair and inclusive jobs market, and regional cohesion to provide economic opportunities across all of Scotland;
- fostering a culture of innovation, open to change and new ways of doing things; and
- enabling Scotland to take advantage of international opportunities.

13.3.2 The economic strategy also states that sustainable economic growth in Scotland requires a 'transition to a more resource efficient, lower carbon economy'. Strategic investment in the renewable energy sector by utilising Scotland's natural resources in an efficient and sustainable way for sustainable economic growth to be achieved.

13.3.3 In addition, the economic strategy emphasises the importance of rural areas to the Scottish economy, noting that rural sectors including tourism, farming, fishing, food, drink and renewables, contribute significantly to the Scottish economy, as well as providing vital natural resources, such as energy, to our cities and other non-rural communities.

Scottish Energy Strategy[13]

13.3.4 In December 2017, the Scottish Government released the Scottish Energy Strategy, which set out the Government's vision for Scotland's energy future.

13.3.5 The Strategy highlights that in 2016, 54% of all electricity in Scotland was generated from renewable sources, with a target of producing 100% from renewable sources by 2020. Scottish Government analysis underpinning this target shows that renewable electricity, which has already outperformed the interim 2015 target of 50%, could rise to over 140% of Scottish electricity consumption, ensuring its contribution to the wider renewable energy target for 2030.

13.3.6 In the Strategy, the Scottish Government has also highlighted that renewables present an economic opportunity as an expanding market where Scotland will support growth by capitalising on its reputation, and the Government will continue to support businesses in Scotland.

Dumfries and Galloway Economic Strategy 2016-2020[14]

13.3.7 The Dumfries and Galloway Economic Strategy 2016-2020 highlights a number of key challenges facing the region including:

- Gross Value Added (GVA) per hour worked in Dumfries and Galloway is 82% of the Scottish average;

[12] Scottish Government (2015), Scotland's Economic Strategy.

[13] Scottish Government (2017), Scottish Energy Strategy: The Future of Energy in Scotland.

14 Dumfries and Galloway Council (2016), Dumfries and Galloway Regional Economic Strategy 2016-2020. Available at: Regional_Economic_Strategy_2016_-_2020.pdf (dumgal.gov.uk) [Last accessed 26/11/2020].

- A high, and growing, proportion of jobs are part-time;
- Many of the jobs in the region's key sectors provide low levels of productivity and often seasonal employment; and
- Relatively few of those of working age have a high level of qualification.

13.3.8 The strategy also highlights a number of strategic actions including:

- Increase productivity and provide the conditions for business-led growth;
- Empower the region's communities to address their distinct economic challenges and opportunities;
- Create a vibrant culture of opportunity in the region to retain and attract people of working age and improve the competitiveness of individual businesses;
- Enhance regional connectivity, removing barriers to business competitiveness;
- Focus on the development of large investment projects; and
- Achieve a shared vision and partnership working across the public, private and third sectors along with providers of further and higher education.

Current Socioeconomic Baseline

Population

13.3.9 The nearest 'District Centre', as defined by the Dumfries and Galloway Local Development Plan (LDP)[15], is Newton Stewart. Newton Stewart is identified as a 'key town' for the area, located in the Mid Galloway and Wigtown West Ward (Local Area) in Dumfries and Galloway district. As reported in the Mid-2016 Population Estimates for Settlements and Localities in Scotland, Newton Stewart had a total population of 4,080. The local area (Mid Galloway and Wigtown West Ward) has a total population of 13,429, as set out in Table 13.3: Population, Mid-2019 Estimate. Over a quarter of the local area's population are above 65 years old (27.4%), compared to 25.9% in Dumfries and Galloway and 18.0% in Scotland. The proportion of the population that are of working age in the local area (58.0%) is lower than both Dumfries and Galloway (58.5%) and Scotland (65.2%). This highlights that this particular area has a proportionally older population, with less people of working age compared to both the district and Scotland as a whole.

13.3.10 Whilst the town of Newton Stewart is highly populated for a town in Dumfries and Galloway, the local area is very rural and sparsely populated with a density of 9 people per square kilometre (km²). This is significantly lower than the population density of Dumfries and Galloway of 23 people / km² and much lower than the density of Scotland as a whole at 70 people / km².

Table 13.3: Population, Mid-2019 Estimate[16]

	Local Area	**Dumfries and Galloway**	**Scotland**
Total	13,429	148,860	5,463,300
0-15	14.6%	15.6%	16.9%
16-64	58.0%	58.5%	65.2%
65+	27.4%	25.9%	18.0%
Population Density (person / km^2)	9	23	70

15 Dumfries and Galloway Council (2019) Local Development Plan 2. URL: https://www.dumgal.gov.uk/ldp2 (accessed 05/01/2021)

16 Source Table 13.3 – National Records of Scotland (2020), Mid-2019 Estimates.

13.3.11 Between 2019 and 2041 the population of Dumfries and Galloway is expected to decrease (4.7%), while the population of Scotland is expected to increase by 2.0%. The population is also expected to become older, with 33.8% of the population of Dumfries and Galloway being aged 65+ in 2041, compared to 25.1% in Scotland as a whole. As a result, the working age proportion of the population is expected to fall to 51.5% in Dumfries and Galloway and 60.2% in Scotland as a whole, see Table 13.4: Population Projections, 2019-2041.

13.3.12 Although data is not available for the local area, it would be reasonable to assume that the population surrounding the wind farm is unlikely to experience growth and given its age profile is already older than Dumfries and Galloway, the proportion of the population aged 65+ is expected to increase further by 2041.

Table 13.4: Population Projections, 2020-2041[17]

	Dumfries and Galloway		**Scotland**	
	2020	**2041**	**2020**	**2041**
Total	148,768	141,818	5,464,679	5,575,012
0-15	15.6%	14.7%	16.8%	14.8%
16-64	58.2%	51.5%	63.8%	60.2%
65+	26.2%	33.8%	19.4%	25.1%

Economic Activity

13.3.13 The economic activity rate is lower in Dumfries and Galloway (74.8%) than across Scotland (77.1%) and the unemployment rate of the region (1.8%) is lower than that of the country (3.3%). The Gross Weekly Pay of full time employment in Dumfries and Galloway is lower than it is across Scotland, see Table 13.5: Economic Indicators, 2019/20.

Table 13.5: Economic Indicators, 2019/2020[18]

	Dumfries and Galloway	**Scotland**
Economic Activity Rate	74.8%	77.1%
Unemployment Rate	1.8%	3.3%
Gross Weekly Pay (Full Time)	517.50 (£)	595.00 (£)

Industrial Structure

13.3.14 The local, regional and national employment structure is provided in Table 13.6: Business Survey and Employment Register, 2019 (Employee Jobs). There are 3,500 employees in the local area with agriculture, forestry and fishing (which does not include farm agriculture) accounting for 2.1% of employment, lower than the Dumfries and Galloway level of 6.7% but broadly in line with the Scottish level of 1.7%.

13.3.15 Construction represents a larger proportion of employment in the local area (12.9%) compared to regionally (4.2%) and nationally (5.4%) suggesting the importance of the construction sector.

13.3.16 Retail corresponds to a broadly similar proportion of employment in the local area (14.3%) compared to regionally (15%) and nationally (13.3%). Accommodation and food service

17 Source Table 13.4: National Records of Scotland (2020), Population Projections for Scottish Areas.

18 Source: Table 13.5: ONS (2019/2020), Annual Population Survey. Available at: https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=136 [Last accessed 24/11/2020].

activities also correspond to a broadly similar proportion of employment in the local area (10.0%) compared to regionally (10.0%) and nationally (8.2%).

13.3.17 Sectors associated with the public sector, such as healthcare and education, are responsible for relatively greater employment in the local area compared to regionally and nationally. Human health and social work activities contribute the largest proportion of workers in the local area (17.1%), broadly in line with the Scottish level (15.8%) and slightly below the regional level (20.0%). Education accounts for more employment in the local area (11.4%) compared to regionally (8.3%) and nationally (8.2%). However, administrative and support service activities account for less employment in the local area (2.9%) compared to regionally (4.2%) or nationally (8.1%).

Table 13.6: Business Survey and Employment Register, 2019 (Employee Jobs) [19]

Sector	Local Area (%)	Dumfries and Galloway(%)	Scotland (%)
Agriculture, forestry and fishing*	2.1	6.7	1.7
Mining and Quarrying	0.4	0.1	1.1
Manufacturing	5.0	8.3	6.7
Electricity, Gas, Steam and Air Conditioning Supply	0.1	0.4	0.7
Water Supply, Sewerage, Waste Management and Remediation Activities	0.4	1.0	0.8
Construction	12.9	4.2	5.4
Wholesale and Retail Trade	14.3	15.0	13.3
Transportation and Storage	3.6	4.2	4.2
Accommodation and Food Service Activities	10.0	10.0	8.2
Information and Communication	1.0	1.0	3.4
Financial Aid and Insurance Activities	0.4	0.8	3.3
Real Estate Activities	1.1	1.7	1.5
Professional, Scientific and Technical Activities	3.6	5.0	7.1
Administrative and Support Service Activities	2.9	4.2	8.1
Public Administration and Defence, Compulsory Social Security	3.6	4.2	6.2
Education	11.4	8.3	8.2
Human Health and Social Work Activities	17.1	20.0	15.8
Arts, Entertainment and Recreation	3.6	2.5	2.8
Other Service Activities	1.4	1.3	1.6
Total Employee Jobs	3,500	60,000	2,503,000

*Does not include farm agriculture

Tourism Economy

13.3.18 Tourism is a significant contributor to the economy of rural Scotland, including taxis and public transport, accommodation, restaurants, village shops and visitor attractions. This provides wider cash flow into the local economy and supply chains that support the tourism industry.

[19] Source Table 13.6: ONS (2019), *Business Register and Employment Survey.* Available at: https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?theme=27. [Last accessed 24/11/2020].

13.3.19 Tourism is important to the Dumfries and Galloways economy and nationally. It contributed £113 million GVA to Dumfries and Galloway in 2017 and employed 6,000 people. In Scotland, tourism contributed £4,121 million and employed 206,000 people in 2017.

Table 13.7: Sustainable Tourism Economy in 2017[20]		
	Dumfries and Galloway	**Scotland**
GVA (£m)	113	4,121
Employment*	6,000	206,000
*Including additional PAYE only units		

Visitors

13.3.20 In 2016, tourists from within Great Britain (GB) accounted for about 762,000 overnight stays in Dumfries and Galloway, representing 6.5% of all GB visits to Scotland, as shown in Table 13.8: Visitor Numbers (000s) in 2018.

13.3.21 International visitor trips to Dumfries and Galloway represented 39,000 trips in 2018, as shown in Table 13.8: Visitor Numbers (000s) in 2018. The largest proportion of international visitors came from the United States of America (USA), who accounted for 16% of international visitor overnight stays to Dumfries and Galloway in 2018 .

Table 13.8: Number of Overnight Trips (000s) in 2018[21]		
	Dumfries and Galloway	**Scotland**
GB Visitors	762	11,803
International Visitors	39	3,538

13.3.22 Accommodation occupancy figures can be used to highlight the seasonality of the tourism sector, particularly in Dumfries and Galloway. The type of accommodation most-affected by seasonality in Dumfries and Galloway is Guesthouses and B&Bs, with a difference of 55% occupancy between the high and low periods, as shown in Table 13.9: Accommodation Occupancy (Dumfries and Galloway).

Table 13.9: Accommodation Occupancy (Dumfries and Galloway)[22]			
	Hotel	**Guesthouse and B&Bs**	**Self-catering**
High Season Average	71.5	75	65.5
Low Season Average	34.4	20	36.4

Local Attractions, Tourist Routes, Recreation and Accommodation

13.3.23 The Site does not currently provide any material recreational or tourism value.

13.3.24 Local attractions and recreational facilities near to the Site include outdoor activities including, cycling, walking, fishing and scenic driving. There are also various cultural and historic attractions located near to Site.

[20] Source Table 13.7: Scottish Government (2019), *Growth Sector Statistics 2018.*

[21] Source Table 13.8: VisitScotland (2018), *Dumfries and Galloway Factsheet (2018).* Available at: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/regional-factsheets/dumfries-and-galloway-factsheet-2018.pdf [Last accessed 24/11/2020].

22 Source Table 13.9: VisitScotland (2018), Dumfries and Galloway Factsheet (2018). Available at: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/regional-factsheets/dumfries-and-galloway-factsheet-2018.pdf [Last accessed 24/11/2020].

13.3.25 The Museum Newton Stewart is located in the town of Newton Stewart approximately 15 km east of the Site. Housed in the former St Johns Church the museum displays exhibits such as local photography, costumes and fabrics relating to the natural and social history of Galloway. The museum is split into different sections, such as The Nursery, Tradesman's Tools, The Dairy, The Kitchen and The Smithy and is open from the end of March to the end of June[23].

13.3.26 Glenluce Abbey located 1 km north of the village of Glenluce and approximately 8 km south west of the Site was founded in 1192 by Roland, Earl of Galloway. The ruins of this Cistercian Abbey are some of the best preserved in Scotland. The abbey will be closed until the spring of 2021[24].

13.3.27 The 'Stranraer Line' between Stranraer to Glasgow is advertised as a 'Great Scenic Railway Journey' by Scotrail. The section of the line between Stranraer Train Station and Barrhill Train Station runs in a south-north direction approximately 7 km west of the Site at its closest point[25].

13.3.28 The Southern Upland Way (long distance path) runs approximately 344 km from Port patrick on the south west coast to Cockburnspath on the east coast. Section 2 Castle Kennedy to Bargrennan approaches the Site from the west coming within approximately 1 km of the Site for approximately 2 km distance. This section of the Southern Upland Way is suitable for both hiking and mountain biking[26].

13.3.29 Galloway Forest Park established in 1947 is Britain's largest forest park. The park is known for ancient woodland, magnificent scenery and a wide range of wildlife. The park offers opportunities for walking, cycling, fishing and scenic driving. The park also has a visitor centre and café at Clatteringshaws, Glen Trool and Kirroughtree. Glen Trool being the closest to the Site approximately 11 km to the east[27].

13.3.30 Core Path 432 Three Lochs Kirkcowan is approximately 4 km in length and is located approximately 2 km to the south east of the Site. The path provides easy walking, cycling and horse riding routes on the Three Lochs estate. A gastropub and shop are available at the Three Lochs caravan park. Core Path 334 Glen Kitten Fell adjoins the Southern Upland Way and is located approximately 1 km to the north west of the Site. The path runs for approximately 6 km north west away from the Site[28].

13.3.31 Accommodation opportunities are centred around the villages near to the Site, including hotels, B&Bs, guesthouses, caravans and camp sites. Accommodation is available in the town of Newton Stewart and the villages of Kirkowan, Glenluce and New Luce, as well as more isolated rural accommodation in the surrounding area.

23 Visit Scotland (2020), The Museum Newton Stewart. Available online: https://www.visitscotland.com/info/see-do/the-museum-newton-stewart-p251421 [Last accessed 27/11/2020].

24 Visit Scotland (2020), Glenluce Abbey. Available online: https://www.visitscotland.com/info/see-do/glenluce-abbey-p247661 [Last accessed 27/11/2020].

25 Scotrail (2020), Great Scenic Railway Journeys. Available online: https://www.scotrail.co.uk/scotland-by-rail/great-scenic-rail-journeys [Last accessed: 27/11/2020].

26 Dumfries and Galloway Council (2020), The Southern Upland Way. Available online: https://dgtrails.org/route-section/2-castle-kennedy-to-bargrennan/ [Last accessed 27/11/2020].

27 Visit Scotland (2020), Galloway Forest Park. Available online: https://www.visitscotland.com/info/towns-villages/galloway-forest-park-p249171 [Last accessed 27/11/2020].

28 Dumfries and Galloway Council (2020), Core paths: walking and cycling in Dumfries and Galloway. Available online: https://info.dumgal.gov.uk/mapviewers/pathsmap.aspx [Last accessed 27/11/2020].

13.3.32 A survey commissioned by Visit Scotland in 2011[29] looked at the attitudes of tourists towards wind farms. It surveyed 2,000 people in the UK and 1,000 people in Scotland, who had visited Scotland recently. The majority (80% of the UK and 83% of Scottish respondents) were in agreement that scenery and landscape were important factors when taking holidays or short breaks and that their decision to stay in the UK for a short holiday would not be affected by the presence of a wind farm. In general, the respondents did not feel that wind farms affected the tourism experience.

13.3.33 In 2017 BiGGAR economics[30] undertook a study to understand if a relationship exists between tourism and the wind energy sector in Scotland. The study focussed on changes in employment in the sustainable tourism sector between 2009 and 2015 along with the growth in the onshore wind sector during this time period. The analysis found that there was no relationship between the increase in the number of wind farms and the level of tourism employment at the local authority level and in many local areas surrounding wind farms, the tourism sectors grew faster (although the research does not identify a direct relationship between tourism sector growth and development in this case). The research does note that any impacts identified due to the development of a wind farm are likely to effect receptors within the immediate vicinity of the development.

13.3.34 As stated in Section 13.2.5 above, research undertaken by Visit Scotland and BiGGAR Economics suggests that there is no evidence that the presence of wind farm developments have an adverse effect on the tourism sector in Scotland. Potential impacts of the Proposed Development on local attractions and accommodation within the study areas is therefore not assessed within the socioeconomics assessment. Tourist and recreational routes have been included in the socioeconomics assessment due to the potential for adverse visual amenity effects for users of these routes.

Future Baseline

13.3.35 Under the "do nothing" scenario i.e. the conditions in the event that the Proposed Development does not go ahead, it is expected that there will be no substantial change in the socioeconomic baseline.

13.4 Assessment of Likely Effects

13.4.1 This section considers the economic impact associated with the construction of the Proposed Development, as well as its operation and maintenance. It also considers the potential effects of the Proposed Development on recreation assets and key tourism routes.

Potential Construction Effects

Construction and Development

13.4.2 The Proposed Development would comprise 12 turbines, each with an anticipated capacity of between 4.2 MW and 6 MW (based on current (2020) wind turbine generator technology), resulting in an indicative total generating capacity of between 50.4 MW and 72 MW. The Proposed Development has a grid connection offer for 67.2 MW. Based on an estimated capital

29 Visit Scotland (2014), VisitScotland Position Statement - Wind Farms. Available online: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/policies/visitscotland-position-statement---wind-farms---oct-2014.pdf [Last accessed: 18/11/2020].

30 BiGGAR Economics (2017), Wind Farms and Tourism Trends in Scotland. Available online: https://biggareconomics.co.uk/wp-content/uploads/2020/01/Wind-farms-and-tourism-trends-in-Scotland.pdf [Last accessed: 18/11/2020].

expenditure of £1 million per installed MW the estimated capital costs of the Proposed Development would be approximately £50.4 million to £72 million.

13.4.3 This expenditure is split into four main categories of contracts:

- pre-construction;
- balance of plant;
- turbines; and
- grid connection[31].

13.4.4 Based on the estimates of capital expenditure, the largest proportion of capital expenditure (capex) would be on turbine related contracts, followed by balance of plant, grid connection**Error! Bookmark not defined.** and pre-construction.

13.4.5 The economic impact of the construction and development phase was estimated for Dumfries and Galloway and Scotland. In order to do this, it was necessary to estimate the proportion of each type of contract that might be secured in each of the study areas. The assumptions were based on the average from the RenewableUK research.

13.4.6 It is anticipated that up to 13% of planning and development costs for the Proposed Development could be spent in Dumfries and Galloway, and 59% in Scotland. It is also anticipated that up to 12% of the overall value of construction contracts for the Proposed Development could be realised in Dumfries and Galloway, and 36% of the value in Scotland[5].

13.4.7 It is anticipated that this value would be divided approximately as follows: planning and development (pre-construction) costs (10%), balance of plant (26%), turbines (58%) and grid connection costs (6%). The estimated division of the total capital spend (high estimate) is given in Table 13.10: Potential Construction and Development Expenditure by Study Area and Contract Type (£m).

Table 13.10: Potential Planning, Development and Construction Expenditure by Study Area and Contract Type (£m) – high estimate **calculated based on information from Renewable UK5**

	Dumfries and Galloway	**Scotland**
Pre-Construction	£0.9	£4.2
Balance of plant	£2.2	£6.7
Turbine	£5.0	£15.0
Grid connection[32]**Error! Bookmark not defined.**	£0.6	£1.7
Total	£8.7	£27.6
Total (%) of Project Value	12%	38%

13.4.8 The contract values potentially awarded in each area would represent an increase in turnover for businesses. The value of the Proposed Development to the local economy could be increased by promoting awareness of the Proposed Development and associated opportunities among local businesses. It is important to note however that economic contribution of the onshore wind sector varies over the lifecycle of an individual project.

[31] Note that a grid connection for the proposed development does not form part of this application. If the proposed development is consented, a separate application will be undertaken for a grid connection.

[32] Note that a grid connection for the proposed development does not form part of this application. If the proposed development is consented, a separate application will be undertaken for a grid connection.

13.4.9 Research from RenewableUK[5] provides information on how the employment supported through the lifecycle of an onshore windfarm peaks during the construction stage, however, benefits are still realised throughout the operations and maintenance stage. In addition to the capital expenditure, construction employment and spending in the local economy would provide some beneficial effects to the regional and Scottish economy.

13.4.10 Based on the same research, it is anticipated the construction phase would support between 124 and 179 jobs (based on 2.49 jobs per MW) and add between £8 and £11.5 million GVA to the UK economy (based on £159,251 GVA per MW).

13.4.11 Employment impacts during the construction and development phase are reported in job years, rather than full-time equivalents (FTEs) because the contracts would be short-term. Job years measures the number of years of full-time employment generated by a project. For example, an individual working on the Proposed Development for 18 months would be reported as 1.5 job years. The Proposed Development would support approximately 227 to 327 job years.

13.4.12 The development and construction stage employment would generate indirect economic benefits through spending both locally and nationally. Based on an estimated salary cost of £34,613[33] (the average salary for employees in the onshore wind sector), it is estimated that up to £11 million would be paid in salaries to people employed during the development and construction of the Proposed Development.

13.4.13 The Proposed Development would therefore generate an uplift in employment for the local area and region, as a whole. This is assessed to be a short term, beneficial effect, significant at the local level but not significant at a national level. This effect is therefore assessed as **Minor Beneficial** and **not significant**.

13.4.14 In combination with other similar renewable energy developments, the economic benefits are considered to contribute to **significant cumulative beneficial effects** for the Scottish economy.

Tourist Routes

13.4.15 The following tourist routes are in relatively close proximity to the Site:

- The Southern Upland Way comes to approximately 1 km to the west of the Site at its closest point.
- Core Path 432 is located approximately 2 km to the south east of the Site at its closest point.
- Core Path 334 is located approximately 1 km to the west of the Site at its closest point.
- The Great Scenic Stranraer Line runs north to south from Stranraer train station to Glasgow Central train station. At its closest point between Stranraer train station and Barhill train station it is approximately 7 km to the west of the Site.

13.4.16 Chapter 5: Landscape and Visual Amenity, describes the potential for adverse visual amenity effects for users of this tourist route during construction. It is noted that there is no evidence that wind farms result in a reduction of tourism, and therefore while there may be some likely significant effects on visual amenity, there would be no likely significant effects predicted on the local tourism economy as a result of the Proposed Development.

[33] Department of Energy and Climate Change, RenewableUK (2012), Onshore Wind: Direct and Wider Economic Impacts.

Potential Operational Effects

EXPENDITURE

13.4.17 It is estimated that the annual operation and maintenance expenditure of the Proposed Development would equate to approximately £60,000 per MW. With a capacity of between 50 MW and 72 MW, this would equate to an operational expenditure of approximately £3 million to £4 million per annum. It is estimated that approximately 42% of the contract value could be secured in the Dumfries and Galloway region[5].

13.4.18 It is estimated that the operation and maintenance of the Proposed Development would require 20 person days per year, per turbine. In addition, the Site would employ one full time operations manager. The full time equivalent jobs for 30 years would equate to approximately 50 job years.

13.4.19 The development would therefore generate an uplift in employment, with the potential for direct and indirect benefits. This is assessed to be a **Minor Beneficial** effect and **not significant** at the local and national level.

COMMUNITY BENEFIT

13.4.20 The Proposed Development would also generate a beneficial effect on the local economy as a result of community funding provided by the developer. Standard industry practice is to provide annual community funding of £5,000 per MW during the operational life of a Proposed Development[34].

13.4.21 The proposed community benefit package would be £336,000 per year (based on 67.2 MW capacity), which would equate to £10.08 million over a 30 year lifetime.

13.4.22 In addition to delivering a community benefit fund, Statkraft look for other ways to bring meaningful benefits to the community such as the potential for improved access to broadband, shared ownership and using local suppliers.

13.4.23 This effect is assessed as **Moderate Beneficial** and **significant** at the local level.

TOURISM AND RECREATION

13.4.24 No direct effects on recreation receptors are anticipated as the Site does not currently provide any material recreational value.

13.4.25 Chapter 5: Landscape and Visual Amenity, describes the potential for adverse visual amenity effects on people participating tourism or recreation based leisure pursuits in the area surrounding the Proposed Development.

NON-DOMESTIC RATES

13.4.26 The Proposed Development would be liable for non-domestic rates, the payment of which would contribute directly to public sector finances. These non-domestic rates, as shown in Table 13.11: Non-Domestic Rates, would support the delivery of government services by providing an additional revenue stream.

[34] Department of Energy and Climate Change (2014), *Community Benefits from Onshore Wind Developments: Best Practice Guidance for England*. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/363405/FINAL_-_Community_Benefits_Guidance.pdf [Last accessed 26/11/2020].

13.4.27 An analysis of the rateable values paid by several wind farms in Dumfries and Galloway indicates that the average rateable value per MW is £23,100[35]. Given that the Proposed Development is expected to be 67.2 MW, it is estimated that the total rateable value would be up to £1.55 million. Given a poundage rate of £0.524 per £1 of rateable value for business[36], it is estimated that the Proposed Development could contribute in the region of £0.8 million annually to public finances. However, the actual contribution will depend on variables such as the actual load factor and the potential for any relief from non-domestic rates.

Table 13.11: Non-Domestic Rates	
Rateable value per MW (£)	23,100
Poundage rate (£)	0.524
Annual Contribution (£m)	0.8

13.4.28 This effect is assessed as **Minor Beneficial** and **not significant**.

Potential Cumulative Effects

13.4.29 The operational wind farms of Airies, Glenchamber, Kilgallioch Artfield Fell and Balmurrie Fell are located within approximately 1 km of the Site. In addition, the proposed Airies II wind farm and Kilgallioch Extension wind farm are located within 1 km of the Site. Further operational wind farms are located within 10 km of the Proposed Development including Carscreugh, Barlockhart Moor and Arecleough. Finally the proposed Barlockhart Moor Extension and Chirmorie wind farms are located within 10 km of the Proposed Development. In combination with the aforementioned wind farms the economic benefits are considered to contribute to major significant cumulative beneficial effects for the local economy and significant at a national level.

13.4.30 This affect is assessed as **Major Beneficial** and **significant** at the local level and **Medium Beneficial** and **significant** at a national level.

13.4.31 Potential cumulative effects on tourist routes and recreation could occur if there are significant cumulative effects on the landscape. Chapter 5: Landscape and Visual Amenity provides a detailed assessment of potential cumulative effects on the landscape.

13.5 Mitigation

Mitigation during Construction

13.5.1 No significant adverse effects as a result of the construction of the Proposed Development have been identified and therefore no mitigation is required.

Mitigation during Operation

13.5.2 No significant adverse effects as a result of the construction of the Proposed Development have been identified and therefore no mitigation is required.

35 Scottish Power Renewables (2019), Kilgallioch Extension Environmental Statement: Chapter 13 Socioeconomics Tourism and Recreation. Available online: https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00001996 [Last accessed 26/11/2020].

36 Dumfries and Galloway Council (2020), How Business Rates are Calculated. Available online: https://www.dumgal.gov.uk/article/15181/How-business-rates-are-calculated [Last accessed 19/11/2020].

13.6 Assessment of Residual Effects

13.6.1 No change from pre-mitigation effects have been identified. Summary of residual effects provided in Table 13.12: Summary of Potential Significant Effects of the Proposed Development.

Residual Construction Effects

Construction and Development

13.6.2 The Proposed Development would generate an uplift in employment for the local area and region, as a whole. This is assessed to be a short term, beneficial effect. This effect is therefore assessed as **Minor Beneficial** and **not significant**.

13.6.3 In combination with other similar renewable energy developments, the economic benefits are considered to contribute to **significant cumulative beneficial effects** for the Scottish economy.

Residual Operational Effects

Expenditure

13.6.4 The Proposed Development would generate an uplift in employment, with the potential for direct and indirect benefits. This is assessed to be a long-term beneficial effect, however not significant at the local or national level.

13.6.5 As no mitigation is required, the residual effect at a local level is assessed as **Minor Beneficial** and **not significant**.

Community benefit

13.6.6 The Proposed Development would generate a beneficial effect on the local economy as a result of community funding provided by the developer.

13.6.7 As no mitigation is required, the residual effect at a local level is assessed as **Moderate Beneficial** and **significant**.

Residual Cumulative Effects

13.6.8 No residual significant cumulative effects have been identified.

13.7 Summary

13.7.1 This chapter considered the potential for effects on socioeconomic indicators, tourism routes and recreation.

13.7.2 The assessment has identified that the Proposed Development would support between 124 and 179 jobs during construction across the UK economy. Overall the socioeconomic effects of the capital investment, employment and GVA to the economy are considered to be beneficial (short term during construction, long term during operation). In combination with other similar renewable energy developments, the economic benefits are considered to contribute to significant cumulative beneficial effect for the Scottish economy.

13.7.3 The effects of the Proposed Development on visual amenity of tourism routes and recreation receptors are considered in Chapter 5: Landscape and Visual Amenity and have been identified in this chapter.

13.7.4 It is noted that the Proposed Development would also generate a beneficial effect on the local economy as a result of community funding provided by the developer with an estimated contribution of over £10.08 million during the operational life of the Proposed Development.

Table 13.12: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome
Construction			
Beneficial Economic Impact (Dumfries and Galloway)	None required	Not applicable	Not significant
Beneficial Economic Impact (Scotland)	None required	Not applicable	Not significant
Cumulative Beneficial Economic Impact (Scotland)	None required	Not applicable	Significant beneficial effects
Tourist Routes	None required	Not applicable	Not significant
Operation			
Expenditure (Local)	No significant adverse effects as a result of the operation of the proposed development have been identified and therefore no mitigation is required.	Not applicable	Not significant
Expenditure (national)			Not significant
Community Benefit (Local)			Significant beneficial effects
Community Benefit (national)			Not significant
Non-domestic Rates			Not significant
Cumulative Beneficial Impact (Local)			Significant beneficial effects
Cumulative Beneficial Impact (national)			Significant beneficial effects
Tourism and Recreation	None required	Not applicable	Not significant
Decommissioning			
Scoped Out	N/A	N/A	Not significant

14 Forestry

14.1 Introduction

14.1.1 This chapter considers the likely significant effects on the forests and woodland associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the forest baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

14.1.2 The assessment has been carried out by Neil McKay MICFor, Director of Neil McKay Forestry Consultant Limited, a professional member of the Institute of Chartered Foresters (ICF) since 1994 with more than 35 years' forestry practice in the public and private sectors throughout Scotland (further details of professional competency are provided in Volume 4: Technical Appendix 1.2). Neil McKay has ten years' experience producing forestry sections for EIARs for renewable energy and energy transmission infrastructure developments across Scotland. The assessment has been carried out in line with ICF code of conduct and relevant standards and guidance.

14.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures
  - Figure 14.1: Forestry study area;
  - Figure 14.2: Baseline age class;
  - Figure 14.3: Baseline felling phases;
  - Figure 14.4: Wind farm felling plan;
  - Figure 14.5: Wind farm permanent woodland loss; and
  - Figure 14.6: Woodland restocking.
- Volume 4: Technical Appendices
  - Technical Appendix 14.1: Planting year and species in hectares by forest;
  - Technical Appendix 14.2: Photographic records;
  - Technical appendix 14.3: Total felling area in hectares by forest; and
  - Technical Appendix 14.4: Total permanent felling area in hectares by forest.

14.2 Assessment Methodology and Significance Criteria

Scope of Assessment

14.2.1 This chapter considers effects of the Proposed Development on forestry within the Site.

14.2.2 The chapter assesses cumulative effects as arising from the addition of the Proposed Development to other cumulative developments, which are the subject of a valid planning application. Operational, under construction and consented developments are considered as part of the baseline.

14.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2) and Long Term Forest Plans where available.

14.2.4 The scope of the assessment has been informed by consultation responses summarised in Table 14.1 and the following guidelines/ policies:

- Forestry Commission Scotland (2019) Scottish Government's policy on control of woodland removal: implementation guidance February 2019.
- Forestry Commission Scotland (2009) The Scottish Government's Policy on Control of Woodland Removal, Edinburgh.
- Forestry Commission (2017) The UK Forestry Standard: The Government's Approach to Sustainable Forestry, 4th Edition, Forestry Commission, Edinburgh.
- The Scottish Government (2020) Scotland's Forestry Strategy Implementation Plan ››2020-2022
- The Scottish Government (2019) Scotland's Forestry Strategy 2019-2029. Edinburgh.
- The Scottish Government (2011) Scottish Land Use Strategy. Edinburgh.
- The Scottish Government (2014a) Scotland's Third National Planning Framework (NPF3). Edinburgh.
- The Scottish Government (2014b) Scottish Planning Policy. Edinburgh.
- Forestry Commission (2019) Managing forest operations to protect the water environment. Forestry Research Practice Guide. Forestry Commission, Edinburgh.
- SEPA (2013) SEPA Guidance Notes WST-G-027 "Management of Forestry Waste".
- SEPA (2014) LUPS-GU27 "Use of Trees Cleared to Facilitate Development of Afforested Land".
- UKWAS (2012) The UK Woodland Assurance Standard, Third Edition, UKWAS, Edinburgh.

Consultation

14.2.5 Table 14.1 summarises the consultation responses received regarding forestry and provides information on where and/ or how they have been addressed in this assessment.

14.2.6 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 14.1: Consultation Responses

Consultee and Date	Scoping/ Other Consultation	Issue Raised	Response / Action Taken
Scottish Forestry 20 June 2020	Scoping Opinion	Scottish Government's Control of Woodland Removal Policy and other relevant guidance: there is a strong presumption in favour of protecting Scotland's woodland resources.	The Proposed Development has been designed to minimise the amount of permanent woodland loss.
		The Proposed Development falls within the category of woodland removal with a need for compensatory planting.	Compensatory planting shall form part of this assessment.
		The Proposed Development area includes an area of Wet Woodland, as identified in the Native Woodland Survey of Scotland (NWSS). As a UK Biodiversity Action Plan Priority Habitat, Scottish Government's policy on control of woodland removal places a particularly strong presumption against its removal.	The areas of Wet Woodland have been identified and are taken into consideration within this assessment.

Table 14.1: Consultation Responses			
Consultee and Date	**Scoping/ Other Consultation**	**Issue Raised**	**Response / Action Taken**
		Detailed information on all types and areas of forestry to be felled. Detailed information on compensatory planting proposals should be provided. All felling, restocking and compensatory planting proposals must be compliant with the UK Forestry Standard.	All felling proposals, replanting on-site and off-site compensatory planting proposals will be tabulated within this assessment.
Scottish Environmental Protection Agency 4 June 2020	Scoping Opinion	Key hole felling must be used wherever possible as large scale felling can result in large amounts of waste material and in a peak release of nutrients which can affect local water quality. The supporting information should refer to the current Forest Plan if one exists and measures should comply with the Plan where possible.	Key hole felling is considered within this assessment. Felling design will be in accordance with the UK Forestry Standard and Forestry waste material will be managed in accordance with SEPA Guidance Notes WST-G-027 "Management of Forestry Waste".
		Clear felling may be acceptable only in cases where planting took place on deep peat and it is proposed through a Habitat Management Plan to reinstate peat-forming habitats. To include: a) A map demarcating the areas to be subject to different felling techniques b) Photography of general timber condition in each of these areas c) A table of approximate volumes of timber which will be removed from Site and volumes, sizes of chips or brash and depths that will be re-used on Site. d) A plan showing how and where any timber residues will be re-used for ecological benefit within that area.	The assessment considers the current planting on deep peat guidance and includes recommendations for reinstatement of peat-forming habitats where appropriate. Plans, photographs and tables are included within this forestry assessment.
Galloway Fisheries Trust 7 June 2020	Scoping Opinion	It is important to recognise that large scale felling of conifers often causes water quality and fisheries impacts especially where planting has occurred on peat.	Felling to meet the UK Forestry Standard Guidelines: Forests and Water within the UKFS guidelines with particular attention to section 6 recognising the factors affecting water and will follow the practices within Forest Research Practice Guide "Managing forest operations to protect the water environment".
		Compensatory planting – there would be an opportunity to improve the River Bladnoch SAC through riparian deciduous tree planting both within the development area and in other parts of the catchment.	Compensatory planting and replanting on-site are considered within this assessment.

Potential Effects Scoped-Out

14.2.7 Secondary effects resulting from forestry activities, including effects on habitats and species, ornithology, hydrology and landscape and visual effects, are considered within their respective chapters of this EIA Report and are not included within this Chapter.

Method of Baseline Characterisation

Extent of the Study Area

14.2.8 The Forestry Study Area extends to some 686 hectares (ha) within the Site. The forest area is comprised of three privately owned and managed forest units; Artfield Forest, Gass Forest and Meikle Cairn Forest. The woodlands are primarily productive conifer plantations, the boundary of which are shown on Figure 14.1: Forestry Study area. Gass Forest extends outside the Site boundary making the total area of the three forest units 785.24 ha. This additional area is distinct to the Site and unaffected by the Proposed Development. See Technical Appendix 14.1: Planting year and species in hectares by forest.

Desk Study

14.2.9 The compartment schedule or sub compartment database for each forest management unit has been provided by the forest managers. This schedule contains, as a minimum, the tree species and planting year with the area in hectares relating to a compartment map. Digital information is available for two of the units, while the information for Gass Forest was available only in paper form. This information has been digitised to be compatible with the Geographic Information System used to provide the figures used in this EIAR.

14.2.10 Scottish Forestry Map Viewer[1] illustrates that Gass Forest has a Long Term Forest Plan approved in 2012 with a contract end date in 2022. Meikle Cairn Forest has a Forest Plan current from 2014 through to 2024. Artfield Forest has no approved Forest Plan in place.

14.2.11 Scottish Forestry Land Information Search (LIS)[2] contains the Native Woodland Survey of Scotland (NWSS)[3] dataset which shows small areas of wet woodland within Artfield Forest and Gass Farm. NWSS also includes an area of lowland mixed deciduous woodland adjacent to the Tarf Water on Gass Farm. Both wet woodland and lowland mixed deciduous woodland are UK Biodiversity Action Plan Priority Habitats. No further records appear for Gass or Meikle Cairn Forests. No entries appear within the Site under the Ancient Woodland Inventory of Scotland (AWI)[4].

Field Survey

14.2.12 The field survey undertaken acts as ground truthing against the compartment maps supplied. Tree heights were estimated using a clinometer and tape. Visual assessment of tree health and vigour were observed.

14.2.13 Forest ground conditions and cultivation at establishment were noted along with current management activities such as drains maintenance, thinning or felling and replanting.

14.2.14 The tree height assessment, together with observations on cultivation, soil strength and waterlogging assist in predicting adjacent wind throw should felling take place.

14.2.15 Photographic records were also taken, and are included in Technical Appendix 14.2.

[1] Scottish Forestry Map Viewer: https://forestry.gov.scot/support-regulations/scottish-forestry-map-viewer [Visited 05/11/2020]

[2] Scottish Forestry Land Information Search: https://forestry.gov.scot/support-regulations/land-information-search [Visited 05/11/2020]

[3] Scottish Forestry Native Woodland Survey of Scotland: https://forestry.gov.scot/forests-environment/biodiversity/native-woodlands/native-woodland-survey-of-scotland-nwss [Viewed 05/11/2020]

[4] Ancient Woodland Inventory: https://data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland [Visited 05/11/2020]

Criteria for the Assessment of Effects

14.2.16 The Criteria for the assessment of effects on forestry are based against the standards set in UK Forestry Standards (UKFS)[5] and the Scottish Government's Control of Woodland Removal Policy (CoWRP)[6] and the implementation guidance.

14.2.17 UKFS is the reference standard for sustainable forest management in the UK. The standards for the planning, design and sustainable management of forests and woodlands in the UK use an approach based on internationally recognised science and best practice.

14.2.18 The seven elements of sustainable forest management within UKFS are:

- Forests and Biodiversity;
- Forests and Climate Change;
- Forests and Historic Environment;
- Forests and Landscape;
- Forests and People;
- Forests and Soil; and
- Forests and Water.

14.2.19 The UKFS includes guideline points associated with each of these seven elements, which in turn enable an assessment to be made as to whether the relevant requirements of the UKFS have been achieved.

Criteria for Assessing the Sensitivity of Receptors

14.2.20 Productive conifer plantations are dynamic over time through planned and unplanned interventions, however within any woodland there may be designated conservation areas and areas which are planned for enhancing biodiversity. The criteria for assessing sensitivity is as follows:

- High: Ancient Woodland/ Native Woodland Survey of Scotland;
- Medium: Plantation on ancient woodland sites (PAWS), Long Term Retention (LTR) and Natural Reserve (NR);
- Low: Productive conifer plantation; and
- Negligible: Unplanted areas.

Criteria for Assessing the Magnitude of Change

14.2.21 The criteria for assessing the Magnitude of Change for the forestry activities associated with the Proposed Development is the measurement or scale of felling required, both temporary which will be replanted and that which will be permanent woodland loss to these forests. Permanent woodland loss will be compensated for elsewhere following CoWRP and should also be considered temporary in a Scottish forestry context.

14.2.22 Guidance within UKFS on the scale of felling is provided dealing with landscape and the protection of water quality. It is considered that the most appropriate guidance, in this instance, is that given in UKFS guideline on water. Section 42 advises avoiding the potential for nutrient enrichment by limiting any clear felling to less than 20% of the catchment in any

[5]Forestry Commission. (2017) *The UK Forestry Standard*: Edinburgh.

[6] Forestry Commission Scotland. (2009) *The Scottish Government's Policy on Control of Woodland Removal*. Edinburgh

three year period[5]. Within the Tarf water catchment this equates to a total of 2,166 ha in any three year period or 722 ha consecutive annual felling.

14.2.23 Guidance on assessing the scale of felling, in terms of relationship to the landscape, is provided in the UKFS. Using the 'one third rule', any felling in excess of 261 ha within the Site in a five year felling phase would be considered high, where as felling of less than 261 ha would be low.

14.2.24 Similarly, the UKFS guideline on water provides guidance on assessing the scale of felling in relation to potential impacts on the water environment. Section 42 advises avoiding the potential for nutrient enrichment by limiting any clear felling to less than 20% of the catchment in any three year period[5]. Within the Tarf water catchment this equates to a total of 2,166 ha in any three year period or 722 ha consecutive annual felling. As such, the follow criteria can be used for assessing felling impacts on the water environment.

- High: Felling >20% water catchment area in a three year period;
- Medium: >261 ha in a single felling phase;
- Low: <261 ha to 0.01 ha; and
- Negligible: <0.1 ha.

Criteria for Assessing Cumulative Effects

14.2.25 As woodland felling, and replanting is constant within productive conifer forests cumulative effects are not assessed. As the restructuring of first rotation forests takes place, the age classifications and species diversity increases by design to meet UKFS requirements. This will include designed open space. Where woodland loss occurs on any site then appropriate compensatory planting must take place in accordance with the CoWRP. Therefore the balance of forest resource is maintained relating to this Proposed Development. On this basis, the Proposed Development would not contribute to any additional cumulative effect on forest resource in combination with other reasonably foreseeable projects and cumulative effects are not considered any further in this Chapter.

Criteria for Assessing Significance

14.2.26 Table 14.2 illustrates how residual effects are determined by comparison of the sensitivity of receptors with the magnitude of predicted change. For the purposes of this assessment, taking account of landscape and water environment criteria, would be moderate and major effects would be considered significant.

Table 14.2: Residual Effects

	Magnitude of Change				
Sensitivity	**High**	**Medium**	**Low**	**Negligible**	**None**
High	Major	Major/ moderate	Moderate	Moderate/ minor	None
Medium	Major/ moderate	Moderate	Moderate/ minor	Minor	None
Low	Moderate	Moderate/ minor	Minor	Minor/ none	None
Negligible	Negligible	Negligible	Negligible	Negligible	None

14.2.27 In addition, the Scottish Government's Control of Woodland Removal Policy (CoWRP)[7] provides the key terms of reference for this assessment. In this regard, any loss of forest resource as a result of the Proposed Development would be considered significant. Where

[7] Forestry Commission Scotland. (2009) The Scottish Government's Policy on Control of Woodland Removal. Edinburgh

forest resource would be maintained in the long term through provision of compensatory planting and compliance with the UKFS (in so far as is possible within the Site), effects of felling to accommodate the Proposed Development would be considered not significant.

Limitations and Assumptions

14.2.28 The forest sub compartment data is provided by the relevant forest managers, these schedules describe the current position regarding species and planting year. The detail in the schedules may include Yield Class assessments and wind hazard class assessments. There may be some minor inconsistencies within the schedules but nothing which undermines the overall assessment.

14.2.29 Where Forest Plans exist, in the case of Gass and Meikle Cairn Forests felling phases are described and the replanting design and species choices are included. Designed open space and non-intervention or LTR may be developed. While Artfield Forest does not currently have an approved Forest Plan, the sub compartment maps show open space associated with watercourses which can predictably be used as future felling coupe boundaries. Taking note of the small area of NWSS wet woodland which would also feature in any future Artfield Forest Plan without a wind farm.

14.2.30 By assessing the changes to the forest structure and any permanent woodland loss resulting from the Proposed Development a reasonable worst case is assumed and therefore affording maximum protection of the woodland resource.

14.3 Baseline Conditions

Current Baseline

14.3.1 The forestry study area within the Proposed Development consists of three privately owned productive conifer forests. Artfield Forest, Gass Forest and Meikle Cairn Forest. The total area of these three woodland units is 785.24 ha.

14.3.2 From the data provided within the compartment schedules, Artfield Forest was planted over two years, 1982 and 1983, to produce marketable timber from 2021. The forest is therefore considered to be approaching economic maturity. The total area of the forest is 435.15 ha with a planted area of 404.93 ha. The species present is almost wholly Sitka spruce with a few other exotic conifers present.

14.3.3 From on-site assessments the Yield Class range is between YC 6 in waterlogged locations to YC 22 on drier ground conditions.

14.3.4 Within the conifer plantation there is one area of wet woodland recorded within the NWSS. This area is located adjacent to the existing forest road and amounts to 1.32 ha (see Figure 14.2 (EIAR Volume 3a)).

14.3.5 The unplanted areas tend to be represented by the forest roads, rides and watercourses, in particular the open ground associated with the Tarf Water.

14.3.6 Pre-planting cultivation was typical of the 1980s forest expansion by way of ploughed furrows and ploughed drains. Active forest management to date includes drain maintenance and some areas of pre-commercial thinning to improve crop quality and average tree size.

14.3.7 Gass Forest was initially planted in 1976 and has undergone felling and replanting since 1984 with the final first rotation felling planned for 2024. The total area of the forest is recorded

as some 96.80 ha. The area of Gass Forest which lies within the Site has been felled in accordance with an approved Felling Plan, with the last felling taking place in 2020.

14.3.8 Replanting has taken place apart from the most recent felling which is planned for replanting in due course. This area is second rotation forest and contains Sitka spruce, Norway spruce and mixed broadleaves planted at strategic locations notably along watercourses and forest edges.

14.3.9 Meikle Cairn Forest is a productive coniferous plantation which was initially planted in three phases: 1975, 1979 and 1982, predominantly with Sitka spruce. The forest extends to 186.72 ha.

14.3.10 The woodland has been thinned in parts and remedial drainage work has been undertaken in selected locations. The first felling took place in 2011 with restocking following in 2013. Incipient wind throw has affected the more exposed edges of the woodland.

14.3.11 Gass Farm, over which the wind farm access is to be taken, includes a small area of woodland recorded by NWSS as wet woodland. Additionally, the riparian woodland along a section of Tarf Water is identified by NWSS as lowland mixed deciduous woodland.

14.3.12 The baseline forest age class is shown in Figure 14.2.

14.3.13 As described, the baseline sensitivity of Site (and each of the three ownerships) is low on the basis that the Site contains productive conifer woodland with planned felling and restocking to UKFS. The only exception would be the small areas of wet woodland, which have high sensitivity.

Future Baseline

14.3.14 Productive conifer plantations are active with their structure undergoing change through planned felling and replanting, or reaction to natural events such as wind throw or pests and diseases. First rotation forests are required to improve the biodiversity with age and species diversity as determined by the (UKFS). This process is referred to as "restructuring". The three forest units are at differing stages of restructuring.

14.3.15 In the absence of the Proposed Development the future baseline is measured against the same standards set within UKFS. All felling is assumed to be temporary which will then be replanted, albeit potentially to a different design and species mix. It is noted that while Artfield Forest would be required to develop an UKFS compliant plan, both the other forest units existing plans are due for revision in the next few years. These revisions will be further opportunities to ensure the structural and biological diversity of these forests. The future baseline assessment is based on the further felling and replanting in accordance with the same UKFS guidelines. Felling coupe sizes would need to be within the guidance for good practice to avoid nutrient enhancement, not more than 20% felling within the catchment within any three year period.

14.3.16 According to UKFS General Forestry Practice the standard for forest structure is to maintain or establish a diverse composition within the forest management unit, a minimum of:

- 10% open ground or ground managed for conservation enhancement of biodiversity as the primary objective;
- 10% of other species; and
- 5% native broadleaved trees or shrubs.

14.3.17 Where only one species is suited to a site and management objectives, a maximum of 75% may be allocated to a single species.

14.3.18 The future forest baseline felling proposals are illustrated in Figure 14.3: Baseline Felling Plan (EIAR Volume 3a). All phases have been shown with Phase 1 being the 2020 starting point.

14.3.19 Artfield Forest is a first rotation plantation where no felling or replanting has taken place, accordingly, the forest currently has very limited structural and species diversity. However, to embark upon felling, a Forest Plan would be required with approval by Scottish Forestry. Although the forest does not have an approved Forest Plan, the forest managers have an outline felling plan which suggests felling would commence in 2021 in four phases through to 2040.

14.3.20 Within the Site, Gass Forest has completed all the felling of first rotation. Replanting has taken place in accordance with a Long Term Forest Plan (LTFP) reference number 4129350 approved in 2012 and which expires in 2022. Outside the Site but within the forest unit, the final first rotation felling is planned for 2024, although currently without felling approval. The forest will continue to be maintained and allowed to develop with felling of the second rotation commencing in approximately 2050.

14.3.21 Meikle Cairn Forest has a current Forest Plan, LTFP reference number 4453620, approved in 2014 with the contract end date of 2024. An amendment to this Plan was approved in 2018 revising the felling phases. Replanting and maintenance is ongoing with felling of the second rotation expected to commence after 2047 to 2050.

Summary of Sensitive Receptors

Scoped- Out Receptors

14.3.22 General forest management is not being regarded as a receptor for this Environmental Impact Assessment as these forestry management considerations are developed within Forest Plans and UKFS compliance. This EIA Report chapter therefore concentrates on the Proposed Development plans for felling, restocking and any permanent woodland loss.

14.4 Assessment of Likely Effects

14.4.1 As plantation forests are changing entities the most appropriate assessment of likely effects is to compare Forests Plans with and without the Proposed Development.

14.4.2 A LTFP will typically contain felling and restocking proposals covering a 10 year period in detail, with outline proposals for the areas which lie outwith this time frame. There are plans in place for both Gass Forest and Meikle Cairn Forest. As stated previously there is no approved LTFP in place for Artfield Forest and the outline felling plan is used in bringing these plans together for the purpose of this assessment.

14.4.3 The development of a LTFP involves a scoping exercise whereby views of Statutory Consultees, neighbours and stakeholders are sought, resulting in an agreed Scoping Report. The results of the scoping exercise are incorporated into the LTFP. The LTFP contains aspects of conservation, archaeology, landscape and local community in addition to forestry and silvicultural considerations. A felling plan takes account of the forest owners' objectives while following the UK Forestry Standards in restructuring the age and species classes. In some cases, restructuring may take more than two forest rotations.

14.4.4 A LTFP, sometimes referred to as a Forest Design Plan, Forest Plan or Land Management Plan, requires approval by Scottish Forestry. This approval leads to the permission to fell trees, formerly a felling licence. The approval will also be for other detail within the LTFP including the restocking plans and other operations such as forest road construction.

14.4.5 The Proposed Development introduces additional land management objectives (i.e. to accommodate wind farm infrastructure within the forest), which would result in the following potential impacts:

- Temporary felling; and
- Permanent felling.

14.4.6 A wind farm Forest Plan takes account of the requirements of the Proposed Development including felling for the construction of infrastructure such as wind turbines and hardstanding, access roads and turning areas, and buildings such as substations and energy storage. Felling within the wind farm plan may be considered as temporary felling where the area felled will be replanted on Site. Permanent felling is where replanting in situ cannot take place due to the presence of permanent infrastructure. Within this classification of permanent infrastructure falls the necessity for a stand-off distance from wind turbines to trees, this will include the prescribed "bat buffer". The stand-off distance for this Proposed Development is calculated as 97 m radius in accordance with NatureScot guidance Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation[8].

Potential Construction Effects

14.4.7 To enable construction to take place the areas of woodland detailed within the temporary and permanent felling must be cleared. Figure 14.4: Wind farm felling plan, illustrates the temporary and permanent felling within the Site.

14.4.8 Within Artfield Forest, the areas to be cleared contain mature and semi mature timber which will be conventionally harvested and exported from the Site using industry standard road going timber lorries. With the construction of wind farm access roads, it may initially be necessary to temporarily store timber on-site. The scale of felling for the Proposed Development is not unusual for a first phase felling of a forest of this size.

14.4.9 Improvements to the access on Gass Farm from the public road are essential to accommodate abnormal loads. This realignment requires the removal of 0.08 ha of deciduous scrub of which 0.02 ha is NWSS wet woodland.

14.4.10 The mass of timber to be harvested for construction is calculated as 39,775 tonnes. Brash is to be left on-site and where replanting would take place tree stumps are to be left in situ in accordance with good forest practice. The implications of stump removal are discussed in the Forestry Commission Research Note "Environmental effects of stump and root harvesting".[9]

14.4.11 Table 14.3 provides an estimate of volumes and tonnes of marketable timber to be removed from Site. The average Yield Class 16 (YC16) is used for this calculation, Yield Class is the UK forestry index of productivity[10] of even aged stands of trees. It is measured in units of cubic metres per hectare per year (m^3 ha^{-1} yr^{-1}).

Table 14.3: Summary of timber production

Forest	Area Felled (ha)	YC16/m^3/ha	Tonnes/ha[11]	Total Tonnes
Artfield Forest	98.45	535	433	42,629

[8] URL: https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation [accessed 06/11/2020]

[9] Forestry Commission Research Note "Environmental effects of stump and root harvesting" (Forestry Commission, 2011) https://www.forestry.gov.uk/pdf/FCRN009.pdf/$FILE/FCRN009.pdf [accessed 5/11/2020]

[10] Forestry Commission, "Forest Yield, A handbook on forest growth and yield tables for British forestry" (Forestry Commission, 2016)

[11] A conversion factor of 0.81 from volume over bark to tonnes is applied

Table 14.3: Summary of timber production				
Forest	**Area Felled (ha)**	**YC16/m³/ha**	**Tonnes/ha**[11]	**Total Tonnes**
Gass Forest	1.25	0	0	0
Meikle Cairn Forest	9.48	0	0	0
Gass Farm	0.08	0	0	0
Total	109.26	535	433	42,629

14.4.12 The areas required for infrastructure within both Gass Forest and Meikle Cairn Forest are young restocked areas and will produce no marketable timber. The best method of woodland clearance will be determined at the time of construction, and professional judgement will determine if harvesting of these trees for the biomass market is possible. This would be in keeping with avoiding creating forestry waste as the Scottish Environment Protection Agency (SEPA) guidance document WST-G-027, "Management of Forestry Waste" (SEPA, 2013)[12].

14.4.13 Should timber and brash be required, for example, for the construction of access tracks on wet ground, relevant good practice would be followed (SEPA, 2014)[13]. It is not proposed that forestry waste is used for other environmental purposes.

14.4.14 Table 14.4 contains the total areas of temporary felling and the area of permanent woodland loss for the Proposed Development including access tracks and infrastructure including the stand-off buffers for each turbine. The balance between the total felling and permanent felling is temporary felling for good forest management reducing the risk of wind throw and avoiding creating isolated areas which will be difficult to harvest in future.

Table 14.4: Summary of felling and replanting on Site (ha)			
Forest	**Total Fell (ha)**	**Permanent Fell (ha)**	**Restock on Site (ha)**
Artfield Forest	98.45	43.78	54.66
Gass Forest	1.25	1.25	0.00
Meikle Cairn Forest	9.48	9.25	0.23
Gass Farm	0.08	0.08	0.00
Total	109.26	54.37	54.89

14.4.15 Based on the areas of felling (109.26 ha), the magnitude of impact would be low when assessed against the current baseline for both landscape related effects and water environment related effects. In the absence of mitigation, low magnitude impact on the low sensitivity productive conifer woodland would result in a low and not significant effect.

14.4.16 With reference to the CoWRP, the permanent felling of 54.37 ha would, in the absence of outlined in 14.5 Mitigation, be significant.

14.4.17 It is noted that the Proposed Development would not have any impact on the area of high sensitivity wet woodland, and therefore the magnitude of impact on that specific area would be none. As a result no likely significant effect is predicted for the wet woodland.

[12] SEPA (2013) *SEPA Guidance Notes WST-G-027 "Management of Forestry Waste"*

[13] SEPA (2014): *LUPS-GU27 Use of Trees Cleared to Facilitate Development of Afforested Land.* https://www.sepa.org.uk/media/143799/use_of_trees_cleared_to_facilitate_development_on_afforested_land_sepa_snh_fcs_guidance-_april_2014.pdf [accessed 05/11/2020]

Potential Operational Effects

14.4.18 The remainder of the forest areas will continue to be maintained, felled and replanted in accordance with approved forest plans. On this basis, there would be no operational effects on forestry or woodland.

Potential Decommissioning Effects

14.4.19 At the time of decommissioning any previously forested areas designated as restoration may be replanted with trees in keeping with the Proposed Development's decommissioning plan.

Potential Cumulative Construction Effects

14.4.20 On the basis that the overall forest resource will be maintained across the board in line with CoWRP and UKFS, then no cumulative effects are anticipated.

Potential Cumulative Operational Effects

14.4.21 Replanting and maintenance operations are normal ongoing activities and do not have any cumulative effect during the Operational phase.

14.5 Mitigation

14.5.1 The Proposed Development requires felling of trees for the infrastructure access and stand-off from wind turbines.

14.5.2 The design of the layout and access took account of the Wet Woodland within Artfield Forest and avoided this sensitive area.

14.5.3 The felling design minimised all felling restricting the permanent felling to that required by the permanent infrastructure.

14.5.4 The scoping opinion from Scottish Forestry refers to The Scottish Government's Control of Woodland Removal Policy and other relevant guidance. This recognises that where woodland removal is required to enable the Proposed Development this is expected to be with minimal woodland removal. The scoping report advises that the Proposed Development falls into the category of woodland removal with a need for compensatory planting.

14.5.5 Compensatory planting is calculated in accordance with Annex 5 of the Scottish Government's policy on control of woodland removal: implementation guidance February 2019[14]. Accordingly, compensatory planting arrangements shall be provided for up to 54.37 ha without taking into account any potential low yield class forest on deep peat, where restoration potential could be realised through the Artfield Forest restructuring. The worst case compensatory planting is summarised in Table 14.5.

Table 14.5: Summary of Compensatory Planting (ha)

Forest	Compensatory Planting
Artfield Forest	43.78
Gass Forest	1.25
Meikle Cairn Forest	9.25
Gass Farm	0.08
Total	**54.37**

[14] Forestry Commission Scotland (2019) Scottish Government's policy on control of woodland removal: implementation guidance, revised February 2019

14.5.6 Compensatory planting will be subject to a planting plan to the UKFS approval by Scottish Forestry. As the area required for compensatory planting exceeds the 20 ha afforestation threshold, assuming no part of the land is in a sensitive area, it will be subject to an EIA determination through Scottish Forestry.

14.5.7 Compensatory planting arrangements are being sought on-site with the prospect, subject to the required Scottish Forestry authorisations, a compensatory planting plan will be developed prior to the operation of this Proposed Development.

Mitigation during Construction

14.5.8 All forestry felling operations must maintain good practice identified in Forestry Commission Technical Note: Protecting the Environment during Mechanical Harvesting Operations. Particular attention must be given to the protection of all watercourses but with specific reference to the River Bladnoch Special Area of Conservation. Nutrient enrichment is a potential risk in the UKFS Forest and Water guidelines resulting from large scale felling and requires management of harvesting operations ensuring suitable buffer zones, brash management and restricting whole-tree harvesting and the removal of forest residues in acid-sensitive areas. Typical construction environmental management controls (CEMP) will match or exceed forest practice to avoid diffuse pollution risk and avoid oil and fuel pollution.

14.5.9 The 2nd edition Forestry and Water Scotland guidelines[15] sets out the rules for working around watercourses, including connected ditches and drains:

- Prepare and follow the Site plan, paying particular attention to the main extraction route locations;
- Minimise the risk of diffuse pollution by assessing the drainage system and identifying watercourses and drains;
- Ensure that roadside drains are disconnected before work commences;
- Plan for bad weather and work sensitive areas in drier conditions;
- Only use band tracks where necessary;
- Always try to fell away from watercourses and lift any brash and tops out of the buffer zone;
- Minimise water crossings;
- Use pipes and log bridges when crossing is unavoidable (and remove these when site work is completed);
- Stack from in-wood where site conditions allow;
- Use brash or cut-offs to deflect water from extraction routes onto the forest floor;
- Maintain brash mats, patching holes before they become waterlogged; and
- Utilise alternative working options for sites that lack brash.

Mitigation during Operation

14.5.10 Forestry activities will be ongoing during operation of the wind farm, however, no mitigation required for forestry or woodland.

Mitigation during Decommissioning

14.5.11 The above controls will be required should any of the decommissioned Site be replanted.

[15] Forestry and Water Scotland guidelines: forestrywaterscotland.com [accessed 18/11/2020]

14.6 Assessment of Residual Effects

14.6.1 The assessment of residual effects is based on the change of forest structure with the Proposed Development taking account of the proposed mitigation.

Residual Construction Effects

14.6.2 The residual construction effects on forestry are a reduction of planted ground within each forest unit, in total by 54.37 ha. However, when considering the proposed mitigation measures, including compensatory planting, the overall magnitude of impact would be negligible and there would be no likely significant effect.

Residual Operational Effects

14.6.3 There are no residual adverse operational effects on forestry.

Residual Decommissioning Effects

14.6.4 There are no decommissioning effects on forestry.

Residual Cumulative Construction Effects

14.6.5 Cumulative effects are not relevant to forestry.

Residual Cumulative Operational Effects

14.6.6 Cumulative effects are not relevant to forestry.

14.7 Monitoring

Construction Phase Monitoring

14.7.1 Monitoring of forest operations during construction shall be required to ensure compliance with good forestry practice during the felling and replanting operations.

Operation Phase Monitoring

14.7.2 Incidences of wind throw will require monitoring with consideration to the requirement to amend any felling plans following forestry good practice.

Decommissioning Phase Monitoring

14.7.3 No monitoring of forestry shall be required during the decommissioning phase

14.8 Summary

14.8.1 The total forestry study area extends to 785.24 ha and comprises of three separate forest units under different private ownership. Within the farmland there is 3.31 ha of deciduous woodland and scrub.

14.8.2 Tree felling would be required for 109.26 ha to construct the Proposed Development.

14.8.3 The species composition would remain materially unaltered as a result of the Proposed Development as all felling is within spruce compartments. Species diversity will increase due to bringing Artfield Forest compliant with UKFS within an approved Forest Plan.

14.8.4 As a result of the woodland permanently felled for the infrastructure including tracks and stand-off distances between trees and turbines would result in a net woodland loss of

54.37 ha. In the absence of mitigation highlighted in 14.5 Mitigation, this would be a significant effect when considering the CoWRP.

14.8.5 In order to comply with the CoWRP compensation planting would be required to mitigate the loss of woodland area. The Applicant is committed to providing appropriate compensatory planting. The extent, location and composition of such planting would be agreed with Scottish Forestry, taking into account any revision to the felling and restocking plans prior to the commencement of operation. Compensatory planting shall be evaluated under Scottish Forestry EIA determination.

14.8.6 Following completion of the compensatory planting, the residual effect of the Proposed Development would be **not significant**.

Table 14.5: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome
Construction			
Permanent woodland loss	Compensatory planting will be provided, calculated in accordance with Annex 5 of the Scottish Government's policy on control of woodland removal: implementation guidance February 2019[16], taking into account any potential low yield class forest on deep peat, where restoration potential could be realised through the Artfield Forest restructuring.	Planning Condition requiring scope of compensatory planting to be agreed	Not significant
Increased harvesting with risk to water quality	None required All forestry felling operations must maintain good practice identified in Forestry Commission Technical Note: Protecting the Environment during Mechanical Harvesting Operations Good practice timber harvesting. The CEMP will incorporate good practice from The 2nd edition Forestry and Water Scotland guidelines[17] in relation to working around watercourses, including connected ditches and drains.	Planning Condition requiring scope of CEMP to be agreed	Not significant
Operation			
No significant effect	None	N/A	Not significant
Decommissioning			
No significant effect	None	N/A	Not significant
Cumulative Construction			
Not relevant to forestry	None	N/A	Not Relevant/ Applicable
Cumulative Operation			
Not relevant to forestry	None	N/A	Not Relevant/ Applicable

[16] Forestry Commission Scotland (2019) Scottish Government's policy on control of woodland removal: implementation guidance, revised February 2019

[17] Forestry and Water Scotland guidelines: forestrywaterscotland.com [accessed 18/11/2020]

15 Shadow Flicker

15.1 Introduction

15.1.1 This chapter considers the likely significant effects on shadow flicker associated with the construction, operation and decommissioning of the Proposed Development. Shadow flicker is a phenomenon caused by the moving shadow of the turbine rotor being cast over a narrow opening, such as a window or open door. The specific objectives of the chapter are to:

- describe the shadow flicker baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

15.1.2 The assessment has been carried out by Ramboll UK Limited (Ramboll). Lead authors are Peter Bruce, MSc BSc (Hons) MIEMA CEnv, Managing Consultant. Mr Bruce has over 15 years of experience in environmental consultancy, specialising in Impact Assessment for renewable energy developments (refer to Volume 4: Technical Appendix 1.2 for further details).

15.1.3 This chapter is supported by the following figures and technical appendices:

- Volume 3a: Figures; and
  - Figure 15.1: Shadow Flicker Study Area and Receptors.

15.1.4 Figures and technical appendices are referenced in the text where relevant.

15.2 Assessment Methodology and Significance Criteria

Scope of Assessment

15.2.1 This chapter considers potential shadow flicker effects on properties within 10 rotor diameters (RD) of the proposed turbine locations. The Scottish Government web-based renewable advice for onshore wind turbines recommends that a separation between turbines and dwellings beyond 10 RD should avoid nuisance issues and annoyance to nearby residents[1]. The advice quotes:

"In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 RD), 'shadow flicker' should not be a problem."

15.2.2 The assessment is based on the Proposed Development as described in Chapter 2: Development Description.

15.2.3 Using proprietary specialist modelling software 'Windfarm' (RESoft Windfarm V4.2.5.3), an annual analysis of shadow flicker for the Proposed Development was carried out, taking into account the behaviour of the sun, the local topography and the turbine layout and dimensions.

15.2.4 It should be noted that the modelling analysis was performed using the following assumptions:

- The sun will always be visible during daylight hours (conservative assumption);

[1] Scottish Government, Onshore Wind Turbines: Planning Advice, (2014). Available online from: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/

- The turbine blades are always turning at these times (conservative assumption);
- The alignment of the turbine rotor blades with respect to the sun's position will always produce maximum shadow casting (conservative assumption; it is unlikely that the wind, and therefore the rotor blades, will track the sun in practice);
- The analysis looks at shadow casting over the building from all directions rather than over vertical orientated windows only (conservative assumption);
- The intensity of the sun will be insufficient to cast strong shadows at elevations less than 2.0°;
- Shielding due to features such as trees or other obstacles has not been taken into account; and
- Terrain shielding, however, is modelled.

15.2.5 The significance of the shadow flicker effect to the surrounding properties has been assessed according to the Department of Energy and Climate Change (DECC) guidelines, stating:

"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."[2]

Consultation

15.2.6 The EIA scoping report provided an opportunity for comments from consultees on shadow flicker, however, no consultation responses were received during this period on the scope and assessment of shadow flicker.

15.2.7 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Potential Effects Scoped Out

15.2.8 As shadow flicker is a phenomenon caused by the moving shadow of the turbine rotor being cast over a narrow opening, such as a window or open door, no shadow flicker effects from the construction or decommissioning of the Proposed Development are anticipated. Assessments of potential shadow flicker effects resulting from the construction and decommissioning of the Proposed Development has therefore been scoped out of the shadow flicker assessment.

15.2.9 Based on turbine locations and shadow lengths, no cumulative assessment was deemed necessary for the shadow flicker assessment.

15.2.10 A related visual effect to shadow flicker is that of reflected sunlight. Theoretically, should the light be reflected off a rotating turbine blade onto an observer then a stroboscopic effect could be experienced. In practice, a number of factors limit the severity of the phenomenon. Firstly, wind turbines have a semi-matt surface finish which means that they do not reflect light as strongly as materials such as glass or polished vehicle bodies. Secondly, due to the convex surfaces found on a turbine, the light would generally be reflected in a divergent manner. Thirdly, the variability in flow within a wind farm results in slightly differing orientation of rotor directions. Therefore, it is unlikely that an observer would experience simultaneous reflections from a number of turbines. Fourthly, as with shadow flicker, certain weather conditions and solar positions are required before an observer would experience the phenomenon. Therefore,

[2] Department of Energy and Climate Change (2010) Update of UK Shadow Flicker Evidence Base. Available online from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf

it is concluded that the Proposed Development would not cause a material reduction to amenity owing to the reflected light, and the reflected light has not been considered in the assessment.

15.2.11 People with photosensitive epilepsy are usually sensitive to flickering light that is between 3 –60 Herts (Hz); according to the NSP EN-3: Renewable Energy Infrastructure (2011)[3] 'the maximum frequency of the shadowing effect arising from commercial-scale wind turbines is less than 1 Hz'. Therefore, any potential shadow flicker effects arising from the Proposed Development are purely an effect on amenity, rather than having the potential to affect the health or wellbeing of occupants.

Method of Baseline Characterisation

Extent of the Study Area

15.2.12 The Shadow Flicker study area is comprised of a 10 RD (1,500 m) assessment area surrounding each proposed turbine, in accordance with the Scottish Government advice[1]. The study area is shown in EIAR Volume 3a: Figure 15.1: Shadow Flicker Study Area and Receptors.

Desk Study

15.2.13 A desktop assessment was undertaken in November 2020 using Royal Mail address data and publicly available aerial and satellite images, in order to identify all residential properties located within the study area. Computer modelling was used to present the extent of shadow flicker to those properties for the Proposed Development, assuming a worst-case scenario and providing a very conservative (i.e. high) estimate.

Modelling Methodology

15.2.14 A model was carried out for the Proposed Development using a 150 m rotor diameter[4]. The computer software 'WindFarm" was used to identify potential areas susceptible to shadow flicker, and the extent of shadow flicker impact caused. This software identifies the study area for the assessment based on candidate turbines dimensions and orientations, as well as model periods of predicted shadow flicker. The following model parameters were used:

- The candidate wind turbine with hub height of 105 m, a rotor diameter of 150 m and a tip height of 180 m[5];
- The maximum distance of shadow flicker influence considered is 10 times the rotor diameter (150 m x 10 = 1,500 m);
- The centre of the window (viewing height) is 2 m above ground level;
- Each property has 1 window facing the Proposed Development;
- Each window is 1 m by 1 m;
- The calculation year of 2020;
- The maximum sun height of 2° above the horizon; and
- Topography has been considered using 5 m grid spaced digital terrain model (DTM) data and the Earth's curvature has been accounted for.

[3] Scottish Government, (2011). Onshore Wind Turbines: Planning Advice. Available at: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/ [Last Accessed: 16/11/2020]]

[4] 150 m rotor diameter was used for EIAR purposes only.

[5] Parameters specified for the purposes of modelling potential shadow flicker only.

Model Output

15.2.15 For each property within the study area in the model predicted the number of days per year, maximum hours per day, mean hours per day and total hours per year that the property would experience shadow flicker. The model output is presented in Table 15.1: Summary of Model Output (see section 15.4).

15.2.16 In addition, the model could produce a graph illustrating the time of day and time of year shadow flicker effects could potentially for each property within the shadow flicker study area. However as shown in Table 15.1, there is no shadow flicker effect predicted and hence no graph has been produced.

Criteria for the Assessment of Effects

15.2.17 No formal guidance is available regarding what levels of shadow flicker may be considered acceptable in Scotland. In the absence of this, the significance of the shadow flicker effect to the surrounding properties has been assessed according to the Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', (Department of Environment (DoE) Northern Ireland, 2009, pp 29)[6], which recommends that shadow flicker at neighbouring offices and dwellings should not exceed 30 hours per year or 30 minutes per day.

15.2.18 For the purposes of this chapter, values greater than 30 hours per year or 30 minutes per day are considered significant.

Limitations and Assumptions

15.2.19 A number of worst-case assumptions were made to generate the modelling output for the assessment. It should also be noted that even if shadow flicker impact does occur at a specific location, this does not imply that it would be witnessed. Potential receptors may be occupying a room on the other side of the house, which is not impacted, or indeed absent from the location altogether (e.g. at work, on holiday etc.) during the times of the shadow flicker events.

15.2.20 The use of these assumptions is considered to provide a precautionary basis for the purpose of this assessment.

15.2.21 The instances of shadow flicker would always be less than that predicted by the model. The occurrence of shadow flicker is only possible during the operation of the wind turbine (i.e. when the rotor blades are turning) and when the sky is clear enough for the sun to cast shadows. It is important to consider the following facts when making an assessment:

- Climatic conditions dictate that the sun is not always shining. Met Office data gives average annual sunshine hours for the west of Scotland to be 28% of total daylight hours[7], based on climate data from 1981 -2010. Cloud cover during other times may obscure the sun and prevent shadow flicker occurrence. While some shadow may still be cast under slightly overcast conditions, no shadow at all would be cast when heavy cloud cover prevails;
- Objects such as trees or walls may surround windows and obscure the view of the turbine and hence prevent or limit shadow flicker; and

[6]Department of the Environment, (2009). Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf, p29, 1.3.77

[7] Calculated based on figures available at https://www.metoffice.gov.uk/public/weather/climate/ 1251.1 hours of sunshine a year, with an approximate total daylight hours of 4380 per year (1079.9/4380*100 = 28%) (last accessed 16/11/2020)

- During operation, the turbine rotors would automatically orientate themselves to face the prevailing wind direction. This means the turbine rotors would not always be facing the affected window and in fact would sometimes be 'side-on' to the window. Very little of the blade movement would be visible during such occurrences and therefore the potential for shadow flicker is reduced.

15.3 Baseline Conditions

Current Baseline

15.3.1 The desk study identified one property across the shadow flicker study area from the Royal Mail address data, i.e. Artfield Farm(P1). The property included in the assessment is shown in EIAR Volume 3a: Figure 15.1: Shadow Flicker Study Area and Receptors.

Future Baseline

15.3.2 If a new property were to be constructed within the shadow flicker study area during the operational phase of the Proposed Development, this would create a potential new shadow flicker receptor. However, due to the remote location and topography of the Site, it is not anticipated that many, if any, new residential properties would be constructed in the shadow flicker study area if the Proposed Development is not constructed. No consented or proposed residential developments have been identified within the shadow flicker study area on the Dumfries and Galloway Council (DGC) Planning Portal at present.

15.3.3 In addition, if any of the existing properties within the study area were modified, for example, a new window or door was installed, or the property is extended, this could alter the individual property's sensitivity to shadow flicker. Again, no consented or proposed planning applications to modify existing properties within the shadow flicker study area have been identified on the DGC Planning Portal.

15.3.4 There would be no further changes to the shadow flicker baseline if the Proposed Development does not take place.

15.4 Assessment of Likely Effects

15.4.1 The results of the shadow flicker model for the Proposed Development are detailed in Table 15.1: Summary of Model Output.

Table 15.1: Summary of Model Output

Property	Description	Easting	Northing	Days per Year	Max Hours	Mean Hours per Day	Total Hours per Year
P1	Artfield Farm	223702	566147	0.00	0.00	0.00	0.00

15.4.2 The assessment indicates that no properties would be subject to shadow flicker from the proposed turbines. Table 15.1 provides a summary of the results. EIAR Volume 3a: Figure 15.1: Shadow Flicker Study Area and Receptors, details the property location relative to the Proposed Development.

15.4.3 The one receptor identified Artfield Farm(P1), which is located approximately 1.4 km to the south of the nearest Turbine (T11) would not experience any shadow flicker.

15.5 Mitigation

15.5.1 No mitigation is required as there are no significant effects as a result of the operation of the Proposed Development.

15.6 Assessment of Residual Effects

15.6.1 No residual effects from shadow flicker are anticipated during the operation of the Proposed Development. Potential impacts relating to shadow flicker are therefore anticipated to be non-significant.

15.7 Monitoring

15.7.1 No monitoring is required as there are no significant effects as a result of the operation of the Proposed Development.

15.8 Summary

15.8.1 This chapter provides an assessment of the potential impacts on residential amenity resulting from shadow flicker from the Proposed Development. The shadow flicker assessment has been undertaken to consider the maximum tip height of 180 m and a typical rotor diameter of 150 m for the Proposed Development. A study area of 10 RD (1,500 m) around each turbine was considered, with one receptor found within the area potentially susceptible to shadow flicker within the study area.

15.8.2 There is no standard assessment of shadow flicker in Scotland, and there are no guidelines from which to quantify what exposure levels would represent a significant versus non-significant effect. In the absence of specific guidelines, the assessment has considered the 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy', (DoE Northern Ireland, 2009, pp 29) [8], which states that shadow flicker should not be allowed to exceed 30 hours per year or 30 minutes per day. As such, properties where shadow flicker would potentially exceed these thresholds would be subject to significant effects, in the absence of mitigation.

15.8.3 The assessment indicates that there would be zero shadow flicker hours experienced at the one property identified within the study area.

15.8.4 Table 15.2: Summary of Potential Significant Effects of the Proposed Development provides a summary of the effects. As highlighted, the Proposed Development would not require any mitigation measures, and the shadow flicker is predicted to be non-significant for the Proposed Development.

[8]Department of the Environment, (2009). Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf, p29, 1.3.77

Table 15.2: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
Construction			
None	N/A	N/A	Not Significant
Operation			
Disturbance to properties within the shadow flicker study area.	None	N/A	Not Significant
Decommissioning			
None	N/A	N/A	Not Significant

16 Climate

16.1 Introduction

16.1.1 This chapter considers the likely significant effects on climate associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the climate baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

16.1.2 The assessment has been carried out by Ramboll UK Limited. The assessment has been reviewed and approved by Peter Bruce BSc (Hons) MSc MIEMA CEnv, who has over 14 years' of experience in providing impact assessments, specialising in onshore wind farm development (further details on profession competency is provided in Volume 4: Technical Appendix 1.2).

16.1.3 This chapter is supported by the following technical appendices:

- Volume 4: Technical Appendices
  - Technical Appendix 16.1: Carbon Balance Assessment.

16.2 Assessment Methodology and Significance Criteria

Scope of Assessment

16.2.1 The EIA Regulations[1] include the requirement to consider likely significant effects on climate both in terms of greenhouse gas emissions and the impacts relevant to adaptation.

16.2.2 This chapter considers the following:

- The influence of the Proposed Development on climate change – This assessment quantifies the effect of the Proposed Development on climate change via the results of the carbon calculator[2]. The temporal scope of this assessment is the operational lifetime of the Proposed Development (assumed to be 30 years).

16.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Development Description (EIAR Volume 2).

Legislation, Guideline and Policy

16.2.4 The scope of the assessment has been informed by the following legislation, guidelines and policies.

International

16.2.5 The Kyoto Protocol[3] to the United Nations Framework Convention on Climate Change (UNFCCC) commits state parties to reduce greenhouse gas (GHG) emissions.

[1] The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017

[2] URL: https://informatics.sepa.org.uk/CarbonCalculator/index.jsp (accessed 15/12/2020)

[3] UNFCCC (2020) What is the Kyoto Protocol? Available at: https://unfccc.int/kyoto_protocol [Last accessed 02/12/20]

16.2.6 The Paris Agreement[4] builds upon the UNFCCC and sets out efforts for all nations to combat climate change and adapt to its effects.

16.2.7 The EIA Regulations[1] introduced the need to consider climate as part of EIA.

National

16.2.8 The Climate Change (Scotland) Act 2009 (the 2009 Act) amended by the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[5] (the 2019 Act) established the context for Scottish Government action. 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') by 2045. The interim target for 2020 is 56% and 75% by 2030. The 2019 Act requires local authorities to act in a way that contributes and helps deliver these emission targets.

16.2.9 The Scottish Government Climate Change Plan (CCP)[6] (2018 to 2032) sets out how Scotland will continue to improve resilience to climate change and reduce missions over the period to 2032. The CCP specifies the framework for Scotland's transition to a low-carbon economy and aligns with the Scottish Energy Strategy[7].

16.2.10 The Scottish Government addresses climate change in the context of planning through the National Policy Framework (NPF3)[8]. While NPF3 does not set out the role of EIA in climate change mitigation and adaptation, it does acknowledge that the energy sector accounts for a significant share of the country's GHG emissions and states 'A Low Carbon Place' as a key planning strategy to help reduce Scotland's GHG emissions and adapt to and mitigate against climate change. National Planning Policy Framework 4 (NPF4) is under preparation, please refer to Chapter 4: Energy and Planning Legislation and Policy (EIAR Volume 2) for more details.

16.2.11 The Dumfries and Galloway Council (DGC) declared a Climate Emergency in 2019 and adopted Climate Change as a fifth Council Priority in 2020[9]. DGC's document 'Carbon Management Plan 2 and Climate Change Action Plan'[10] highlights the Council's targets and actions for the region.

Consultation

16.2.12 No responses specifically on the scope of climate assessment were received as part of the pre-application scoping consultation.

[4] UNFCCC (2015) Paris Agreement. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement [Last accessed 02/12/20]

[5] An Act of the Scottish Parliament to amend the Climate Change (Scotland) Act 2009 to make provision setting targets for the reduction of greenhouse gases emissions and to make provision about advice, plans and reports in relation to those targets. Available at: http://www.legislation.gov.uk/asp/2019/15/enacted [Last accessed 02/12/20]

[6] Scottish Government (2018) Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3) – summary. Available at: https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018-9781788516488/ [Last accessed 02/12/20]

[7] Scottish Government (2017) The future of energy in Scotland: Scottish energy strategy. Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ [Last accessed 02/12/20]

[8] Scottish Government (2014). National Planning Framework 3. Available at: https://www.gov.scot/publications/national-planning-framework-3/ [Last accessed 02/12/20]

[9] DGC (2020) Agenda and draft minutes. 24th September 2020. Available at: https://dumfriesgalloway.moderngov.co.uk/ieListDocuments.aspx?CId=137&MId=4962 [Last accessed 02/12/20]

[10] DGC (2019) Carbon Management Plan 2 and Climate Change Action Plan. Available at: https://www.dumgal.gov.uk/media/20058/Carbon-Management-Plan/pdf/Carbon_Management_Plan.pdf?m=636595812056870000&m=636595812056870000 [Last accessed 02/12/20]

Potential Effects Scoped-Out

16.2.13 The vulnerability of the Proposed Development to climate change hazards is considered to be low on the basis that the design has specifically included embedded mitigation to ensure that the significant effects are avoided or reduced to a tolerable level. Embedded mitigation includes but is not limited to Sustainable Drainage System (SuDS), ultrasonic anemometers and remote operational control system (controller and SCADA systems) which is linked to an ice detection application and fire detection and warning systems. Therefore, the assessment of the vulnerability of the Proposed Development to climate change, climate change resilience has been scoped-out.

16.2.14 Carbon dioxide emissions contribute cumulatively with all sources of carbon dioxide emissions globally to cause climate change. No further consideration of the Proposed Development's carbon dioxide emissions with other sources of carbon dioxide is considered necessary.

Method of Baseline Characterisation

Desk Study

16.2.15 A desk study was undertaken to ascertain the national carbon dioxide emissions (equivalent) statistics and Scottish Government carbon budgets.

16.2.16 National carbon dioxide emissions statistics are published by the UK Government and contain historic emissions data covering 2007 to 2017 for all local authorities and councils.

16.2.17 Under the Climate Change Act 2008, the UK Government must set five-yearly carbon budgets, twelve years in advance, from 2008 to 2050. The 2009 Act required an 80% reduction in GHG emissions in Scotland by 2050, compared to the 1990 to 1995 baseline. The Scottish Government has since passed the 2019 Act[5] which has set net zero emissions target by 2045.

16.2.18 Applications under Section 36 of the Electricity Act 1989 are required to calculate potential carbon losses and savings on Scottish peatlands. The Scottish Government's carbon calculator tool allows a consistent and comprehensive assessment of the carbon impact of wind farm developments. The associated technical guidance[11] on how to use the carbon calculator was reviewed as part of the desk-study.

16.2.19 Further data sources used in the carbon balance assessment are set out in EIAR Volume 4: Technical Appendix 16.1: Carbon Balance Assessment. The assessment was informed by completed peat depth surveys. Please refer to Technical Appendix 2.3: Peat Depth Survey Results; Technical Appendix 2.4: Peat Management Plan (PMP) and Technical Appendix 2.5: Peat Landslide Hazard and Risk Assessment (PLHRA) (all in EIAR Volume 4) for further information.

Modelling Methodology

16.2.20 The modelling methodology followed for the carbon calculator is set out in EIAR Volume 4: Technical Appendix 16.1: Carbon Balance Assessment. The online version of the carbon calculator used was v1.6.1 and the reference number is OGV1-BJ8C-O6X8 v3.

[11] Scottish Government (no date on document). Calculating potential carbon losses and savings from wind farms on Scottish peatlands (Technical note – Version 2.10.0). Available at: https://www.gov.scot/publications/carbon-calculator-technical-guidance/ [Last accessed: 02/12/20]

Field Survey

16.2.21 As set out in EIAR Volume 4: Technical Appendix 2.3: Peat Survey Results, peat surveys were undertaken by McKay Forestry Limited in July 2020 and by Ramboll in September 2020. For more information, please refer to Technical Appendix 2.3 (EIAR Volume 4).

16.2.22 The data obtained as part of the desk study and collected as part of the field work has been processed and interpreted to complete the impact assessment.

Criteria for the Assessment of Effects

16.2.23 As stated in paragraph 16.2.18, Applications under Section 36 of the Electricity Act 1989 are required to calculate potential carbon losses and savings on Scottish peatlands. The Scottish Government's carbon calculator tool compares the carbon costs of wind farm developments with the carbon savings attributable to the wind farm.

16.2.24 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 peatlands – a new approach'[12] and revised equations for GHG emissions[13].

Criteria for Assessing the Sensitivity of Receptors

16.2.25 Construction carbon emissions associated with the Proposed Development would be released to the atmosphere in Scotland. Therefore, the atmosphere is considered to be the receptor. In line with standard practice, the sensitivity of human and natural receptors is not considered within this assessment.

Criteria for Assessing the Magnitude of Change

16.2.26 The carbon calculator methodology calculates total carbon dioxide savings and payback time for the Proposed Development. The carbon payback time is the measurement indicator to assess the influence of the Proposed Development on climate change. The shorter the payback period, the greater the benefit the Proposed Development would have in displacing emissions associated with electricity generated by burning fossil fuels. The payback period has been calculated by using the total carbon cost (carbon loses) of the Proposed Development and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements.

Criteria for Assessing Significance

16.2.27 To determine whether effects are significant under the EIA Regulations, it is appropriate to consider the sensitivity (value and resilience) of the receptor and magnitude of the impact, taking into account uncertainty. This is based on the professional judgement of the assessor.

16.2.28 The categories of significance which effects are assessed as are:

- negligible – no detectable or material change to a location, environment, species or sensitive receptor;
- minor – a detectable but non-material change to a location, environment, species or sensitive receptor;

[12] Nayak *et al* (2008, 2010) and Smith (2011). Calculating Carbon Savings from Wind Farms on Scottish Peatlands - A New Approach. Available at: https://www.gov.scot/publications/calculating-carbon-savings-wind-farms-scottish-peat-lands-new-approach/pages/11/ [Last accessed 02/12/20]

[13] Nayak, D.R., Miller, D., Nolan, A., Smith, P. and Smith, J.U (2008 & 2010) Wind Farm and Carbon Savings – Technical Note v.2 2.10.0. Input Parameters.

- moderate – a material, but non-fundamental change to a location, environment, species or sensitive receptor; or
- major – a fundamental change to a location, environment, species or sensitive receptor.

16.2.29 Effects assessed can be both beneficial or adverse as a result of the Proposed Development and the impacts of climate change. Sensitivity of climate change receptors is inherently linked to the magnitude of change. Whilst receptors may be considered "high-value", a non-material magnitude of change would result in any effect being considered not significant.

Limitations and Assumptions

16.2.30 Climate projections can be used to determine likely future trends in climate conditions in the locality of the Proposed Varied Development through its lifetime. The climate trends included in this assessment are based on a range of GHG emissions scenarios which are subject to a degree of uncertainty. How the climate will react to different levels of emissions is also uncertain.

16.2.31 Data sources and assumptions used in the carbon balance assessment are detailed in EIAR Volume 4: Technical Appendix 16.1: Carbon Balance Assessment.

16.3 Baseline Conditions

Current Baseline

16.3.1 Technical Appendix 2.3: Peat Survey Results (EIAR Volume 4) sets out the baseline for the peat conditions on Site. As the Site is currently undeveloped, baseline carbon emissions to the atmosphere are considered to be minimal, however it is widely acknowledged that peatlands sequester, and store carbon and the amount sequestered by peat bog varies depending on its condition. The Site is dominated by commercially managed plantation forestry. Draining of the site for the purposes of plantation forestry has caused drying, oxidation, erosion and release of particulate and dissolve organic carbon into watercourses, these effects increase carbon release rather than the site being a source of carbon capture, and carbon release to watercourses increases the potential for acidification, a lack of pH buffering and a decrease in habitat suitability for aquatic species.

Future Baseline

16.3.2 The Digest of United Kingdom Energy Statistics (DUKES) 2020[14] provides details of the sources used in generation of electricity throughout 2019 by major power producers. Of a total of 59.9 million tonnes of oil equivalent (mtoe) generated in 2019 within the UK, 43.1% were generated by fossil fuels (natural gas, oil and coal), and 37.1% were generated from renewable resources. These numbers demonstrate that fuels which emit high levels of carbon emissions are currently generating the majority of electricity within the UK.

16.3.3 The Scottish Government has set ambitious targets for reductions in GHG emissions. Most of Scotland's electricity requirements are currently met by renewable energy, with most of this growth over the past two decades attributed to a substantial increase in onshore wind developments. With the continued development of onshore wind farms, in the planning and pre-construction phases, it is anticipated that onshore wind farms will continue to make a

[14] Department for Business, Energy & Industrial Strategy (2020) Digest of United Kingdom Energy Statistics 2020: Chapter 5 Electricity. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904805/DUKES_2020_Chapter_5.pdf [Last accessed 03/12/20]

sizeable contribution to the energy generated from renewable energy technologies within Scotland.

16.3.4 In the future, it is expected the GHG/ carbon intensity will continue to decline in Scotland due to a combination of factors including:

- UK and Scottish Government carbon budget;
- Local carbon reduction targets; and
- Decarbonisation of industry, energy supply and transportation.

Summary of Sensitive Receptors

16.3.5 Construction carbon emissions associated within the Proposed Development would be released to the atmosphere in Scotland. Therefore, it is considered to be the receptor. In line with standard practice, the sensitivity of human and natural receptors is not considered within this assessment.

16.4 Assessment of Likely Effects

Potential Construction Effects

16.4.1 In terms of 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.

16.4.2 The carbon calculator presented in EIAR Volume 4: Technical Appendix 16.1: Carbon Balance Assessment sets out the potential annual carbon dioxide emission savings for the Proposed Development. Table 16.1 summarises the potential annual carbon dioxide emission savings for the expected scenario for the Proposed Development.

Table 16.1: Expected Carbon Savings for the Proposed Development (Expected Scenarios)

Fuel Source	Proposed Development Estimated Expected CO_2 saving (tCO_2yr^{-1})
Coal fired electricity generation	180,123
Grid mix electricity generation	49,647
Fossil fuel mix electricity generation	88,104

16.4.3 In terms of carbon losses, there is a carbon cost associated with the manufacturing, construction and installation of wind turbines for any wind farm development. Carbon losses also result from the need for extra capacity to back up wind power generation. The reduced carbon fixing potential and loss of organic soil matter via peat excavations during the construction phase result in carbon losses. The forest felling requirements for the Proposed Development also would result in carbon losses. Removal of the conifer plantation for the construction of the Proposed Development allows the opportunity to restore the peatland habitats present within the Site. Currently the conifer plantation is causing degradation to the peatland habitats through lowering of the water table. This in turn is enabling oxidation of the peat to occur and the release of carbon dioxide (a key GHG) into the atmosphere, contributing to climate change. Restoration of the peatlands following removal of the conifer plantation through raising of the water table and re-establishment of key peatland species would change the degraded peatlands from a source of carbon dioxide release to one of capture, in turn aiding in reducing carbon dioxide emissions and tackling climate change.

16.4.4 Table 16.2 summarises the carbon losses of the expected scenario for the Proposed Development.

Table 16.2: Expected Carbon Losses for the Proposed Development (Expected Scenarios)	
Fuel Source	**Proposed Development Estimated Total CO_2 losses (tCO_2 eq.)**
Losses due to turbine life (e.g. manufacture, construction, decommissioning)	55,530
Losses due to back-up	35,478
Losses due to reduced carbon fixing potential	1,160
Losses from soil organic matter	11,382
Losses due to DOC and POC leaching	359
Losses due to felling forestry	65,788
Total losses of Carbon Dioxide	**169,699**

16.4.5 The carbon payback time is the measurement indicator to assess the influence of the Proposed Development on climate change. The shorter the payback period, the greater the benefit the Proposed Development would have in displacing emissions associated with electricity generated by burning fossil fuels and with the carbon losses associated with the Proposed Development. The payback period is calculated by using the total carbon cost (carbon loses) of the Proposed Development and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements.

16.4.6 Table 16.3 summarises the carbon payback period for all scenarios for the Proposed Development.

Table 16.3: Carbon Payback Period for the Proposed Development (All Scenarios)		
Generation Type	**Scenario**	**Proposed Development Estimated Carbon Payback Period (years)**
Coal-fired electricity generation	Expected	0.9
	Minimum	0.3
	Maximum	2.2
Grid-mix of electricity generation	Expected	3.4
	Minimum	1.2
	Maximum	7.9
Fossil fuel - mix of electricity generation	Expected	1.9
	Minimum	0.7
	Maximum	4.4

16.4.7 The carbon payback period is considered to be negligible, beneficial environmental effect that is not significant under the EIA Regulations.

Potential Operational Effects

16.4.8 The carbon calculator factors the operational stage effects into the calculations. Please refer to the Potential Construction Effects section above where the results of the carbon calculator are discussed.

Potential Decommissioning Effects

16.4.9 The carbon calculator factors the decommissioning stage effects into the calculations. Please refer to the Potential Construction Effects section above where the results of the carbon calculator are discussed.

Potential Cumulative Construction Effects

16.4.10 Carbon dioxide emissions contribute cumulatively with all sources of carbon dioxide emissions globally to cause climate change. This assessment has considered carbon dioxide emissions in the context of carbon dioxide emissions in Scotland and no further consideration of the Proposed Development's carbon dioxide emissions with other sources of carbon dioxide is considered necessary.

Potential Cumulative Operational Effects

16.4.11 Carbon dioxide emissions contribute cumulatively with all sources of carbon dioxide emissions globally to cause climate change. This assessment has considered carbon dioxide emissions in the context of carbon dioxide emissions in Scotland and no further consideration of the Proposed Development's carbon dioxide emissions with other sources of carbon dioxide is considered necessary.

16.5 Mitigation

Mitigation during Construction

16.5.1 All potential climate change effects during construction are mitigated by topic-specific mitigation measures and there would be no resulting significant effects as a result of the construction of the Proposed Development. Therefore, no additional mitigation measures to address the impact of climate change during construction are proposed beyond those described in the remainder of the EIAR. The Applicant is committed to delivering the mitigation set out in the EIAR including the CEMP (EIAR Volume 4: Technical Appendix 2.1) and PMP (EIAR Volume 4: Technical Appendix 2.5).

Mitigation during Operation

16.5.2 All potential climate change effects during construction are mitigated by topic-specific mitigation measures and there would be no resulting significant effects as a result of the construction of the Proposed Development. Therefore, no additional mitigation measures to address the impact of climate change during construction are proposed beyond those described in the remainder of the EIAR. The Applicant is committed to delivering the mitigation set out in the EIAR including delivery of the Operations Environmental Management Plan (EMP).

Mitigation during Decommissioning

16.5.3 Decommissioning would be undertaken in line with best practice measures and guidance which would be relevant at the time of decommissioning (in >30 years' time). It is assumed for the purposes of this assessment decommissioning mitigation measures would be along similar lines to those used for the construction phase of the Proposed Development.

16.6 Assessment of Residual Effects

Residual Construction Effects

16.6.1 No significant residual environmental effects have been identified for the construction phase.

Residual Operational Effects

16.6.2 No significant residual environmental effects have been identified for the operational phase.

Residual Decommissioning Effects

16.6.3 No significant residual environmental effects have been identified for the decommissioning phase.

Residual Cumulative Construction Effects

16.6.4 No significant residual cumulative environmental effects have been identified.

Residual Cumulative Operational Effects

16.6.5 No significant residual cumulative environmental effects have been identified.

16.7 Monitoring

16.7.1 No monitoring is required beyond that identified in the remaining technical assessment chapters of this EIAR.

16.8 Summary

16.8.1 As required by the EIA Regulations, a high level climate assessment has been prepared to support the Proposed Development application. The scope of this assessment includes the following:

- The influence of the Proposed Development on climate change – A quantification of the effect of the Proposed Development on climate change via the results of the carbon calculator.

16.8.2 The results of the carbon calculator calculated the estimated carbon payback period of the Proposed Development fossil fuel – mix of electricity generation to be 1.9 years. The carbon payback period is considered to be negligible, beneficial environmental effect that is not significant under the EIA Regulations.

16.8.3 All potential climate change effects are mitigated by topic-specific mitigation measures and there are no resulting significant effects as a result of the Proposed Development. Therefore, no additional mitigation measures to address the impact of climate change are proposed beyond those described in the remainder of the EIAR. The Applicant is committed to delivering the mitigation set out in the EIAR including the CEMP and PMP (EIAR Volume 4).

16.8.4 A summary of the potential predicted significant effects of the Proposed Development are presented in Table 16.4.

Table 16.4: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Construction			
Negligible	N/A	N/A	N/A
Operation			
Negligible	N/A	N/A	N/A
Decommissioning			
Negligible	N/A	N/A	N/A
Cumulative Construction			
Negligible	N/A	N/A	N/A
Cumulative Operation			
Negligible	N/A	N/A	N/A

17 Summary and Schedule of Mitigation

17.1 Introduction

17.1.1 The purpose of this chapter is to summarise the mitigation measures proposed in each of the technical chapters. Mitigation measures have been proposed to avoid, reduce or offset impacts which could otherwise give rise to significant residual environmental effects. In addition, some additional good practice environmental management measures have been proposed to further reduce environmental effects, which are not considered to give rise to likely significant effects with or without mitigation. It is anticipated that the mitigation measures outlined in Table 17.1: Summary of Mitigation would be secured through appropriately worded conditions of consent.

17.1.2 The main aim of the design process was to 'design out' potential for significant environmental effects as far as possible. This chapter does not summarise 'mitigation by design'. EIAR Volume 2: **Chapter 3: Design Evolution and Alternatives,** and in particular Table 3.1: Preliminary Site and Design Guidance for Artfield Forest Wind Farm provides detailed review of mitigation achieved through design.

17.1.3 Most of the pre-construction and construction phase mitigation would be delivered through a Construction Environmental Management Plan (CEMP). The outline content of the proposed CEMP is provided in EIAR Volume 4: Technical Appendix 2.1: Outline CEMP. Further details on specific measures to be included in the final CEMP are contained in each of the technical chapters of the EIAR, where relevant.

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Construction (and Decommissioning)				
Landscape and Visual	Construction			
	No significant effects identified for landscape fabric	None required	N/A	Not significant
	Localised temporary effects (not significant) on Seascape and Landscape Character Types	None required	N/A	Not significant
	Localised temporary effects (not significant) on Landscape Designations	None required	N/A	Not significant
	Localised temporary effects (not significant) on Visual Amenity	None required	N/A	Not significant
	Cumulative Construction			
	N/A	N/A	N/A	N/A
Cultural Heritage	Construction			
	Non-significant effects upon known heritage assets. (Sites 279, 293, 294, 295, 296 and 298).	Walkover survey following felling but prior to commencement of construction to identify the extent of survival of known remains and demarcating of remains if required. Watching brief on ground breaking works which will cross or be located in the vicinity of these assets. This will ensure avoidance of inadvertent damage to heritage assets and recording of remains where assets are to be removed will ensure preservation by record leading to minimal loss of information content.	Planning Condition with scope agreed by Written Scheme of Investigation.	Not significant
	Possible significant effects upon hitherto unknown archaeological remains.	Walkover survey following felling but prior to commencement of construction to identify the extent of survival of known remains and demarcating of remains if required. Watching brief on ground breaking works which will	Planning Condition with scope agreed by Written Scheme of Investigation.	Not significant.

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
		cross or be located in the vicinity of these assets. This will ensure avoidance of inadvertent damage to heritage assets and recording of remains where assets are to be removed will ensure preservation by record leading to minimal loss of information content.		
	Cumulative Construction			
	N/A	N/A	N/A	N/A
Ecology	Construction			
	Medium (significant) indirect effects on the River Bladnoch SAC through changes in hydrology.	With the exception of the Tarf Water crossing, no infrastructure shall be microsited, nor associated construction activity take place, within 50 m of the River Bladnoch SAC boundary without prior approval of the DGC in consultation with NatureScot. Best practice environmental management during construction and in particular watercourse crossing construction would be implemented through the proposed CEMP. Monitoring of works by the Ecological Clerk of Works (ECoW), inspection of watercourses during the construction phase. Baseline and subsequent water quality monitoring.	Planning Condition requiring scope of CEMP, associated Watercourse Crossing Method Statement (WCMS) and Pollution Prevention Plan (PPP) and appointment of ECoW to be agreed.	Not significant
	Low (non-significant) direct loss of habitats Annex 1 and Priority Peatland Habitats to accommodate the Proposed Development.	None required. However, the measures outlined below are standard best practice mitigation that the Applicant is committed to delivering. The CEMP would also include Habitat Specific Protection Plans (HSPPs) detailing good practice measures for construction works within North Atlantic wet heath and blanket bog habitats. HSPPs would detail measures	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
		required to manage construction works within these sensitive habitats and include habitat restoration measures. Monitoring of works by the ECoW, inspection of watercourses during the construction phase. Enhancement provided through HMP.		
	Negligible to low (non-significant) temporary short term disturbance of habitats.	None required. However, the measures outlined below are standard best practice mitigation that the Applicant is committed to delivering. Re-instatement of habitats post construction.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
	Low to medium (non-significant) indirect changes in hydrology of wetlands through pollution, sedimentation or erosion.	None required. However, the measures outlined below are standard best practice mitigation that the Applicant is committed to delivering. Drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed. Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
	Low (non-significant) displacement/ disturbance of foraging and commuting bats (common pipistrelle, soprano pipistrelle, *Nyctalus spp*).	None required. Enhancement provided through HMP.	Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
	Potential (non-significant) for direct killing/ injuring, disturbance and/ or displacement of other protected mammals.	None required. To ensure legislative compliance pre-construction surveys for protected mammals will be undertaken to identify the presence or likely presence of species within working areas to inform SPPs.	Planning Condition requiring scope of CEMP and appointment of ECoW to be agreed.	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Medium (Significant) impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on fish populations.	With the exception of the proposed watercourse crossings, no infrastructure shall be micro-sited, nor associated construction activity take place, within 50 m of watercourses without prior approval of the ECoW. Implementation of best practice with regards to construction methods in close proximity to watercourses. To include diversion ditches around excavation works. Baseline and subsequent water quality and fish population monitoring.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not significant
	Medium (Significant) impact on surface water through pollution, increased sedimentation and nutrient enrichment of watercourses on Fresh water pearl mussel populations.	With the exception of the proposed watercourse crossings, no infrastructure shall be micro-sited, nor associated construction activity take place, within 50 m of watercourses without prior approval of the ECoW. Implementation of best practice with regards to construction methods in close proximity to watercourses. To include diversion ditches around excavation works. Baseline and subsequent water quality monitoring.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and appointment of ECoW to be agreed.	Not significant
	Potential (non-significant) for direct killing/ injuring, disturbance and/ or displacement of reptile species.	None required. To ensure legislative compliance an SPP will be prepared and adopted for the construction phase, including precautionary avoidance measures.	Planning Condition requiring scope of CEMP and appointment of ECoW to be agreed.	Not significant
	Cumulative Construction			
	No likely significant cumulative effects on ecological receptors identified, beyond those already identified for the Proposed Development alone.	As above for mitigation required to protect the water environment.	Planning Condition requiring scope of CEMP, associated WCMS and PPP and	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
			appointment of ECoW to be agreed.	
Ornithology	Construction			
	Negligible (non-significant) effect on hen harrier (non-breeding) through Displacement/ Disturbance.	None required. Precautionary checks for winter roosts and the implementation of protection zones around any identified roost locations.	Planning Condition requiring scope of CEMP and appointment of ECoW to be agreed.	Not significant
	Minor (non-significant) effect on goshawk through Displacement/ Disturbance.	None required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Planning Condition requiring scope of CEMP, including Construction Breeding Bird Protection Plan (CBBPP), and appointment of ECoW to be agreed.	Not significant
	Cumulative Construction			
	Negligible (non-significant) effect on hen harrier and goshawk through Displacement/ Disturbance.	None required. Mitigation included as part of the CEMP to ensure legislative compliance for breeding birds as part of the CBBPP.	Planning Condition requiring scope of CEMP, including CBBPP, and appointment of ECoW to be agreed.	Not significant
Hydrology, Hydrogeology and Geology	Construction			
	Major (Significant) potential impact on surface waters on the Site and downstream from the Site, due to: • release of chemical pollutants; • sedimentation and erosion: effects on water quality due to increased sediment loads; • potential for hardstanding and compacted surfaces to increase rates of surface runoff on the area of the Proposed Development and for infrastructure to create preferential drainage pathways;	Storage, containment and operational best practice as defined by the CEMP shall be implemented. Suitable emergency spill or leak response kits and procedures shall be in place. With the exception of the proposed watercourse crossings, no infrastructure shall be micro-sited, nor associated construction activity taking place, within 50 m of watercourses without prior approval of the ECoW. Implementation of best practice with regards to construction methods in close proximity to	Planning Condition requiring scope of CEMP, including PPP and appointment of ECoW to be agreed to be agreed. Detailed specification shall be submitted to SEPA with regards to the application for a Construction Site License by the contractor.	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	• restriction of surface water flows and near-surface flows downslope across the Site. This leads to the potential for a reduction in the water supply to down slope mire habitats; and • felling and clearing of areas of forestry for diffuse pollution to affect surface waters.	watercourses. To include diversion ditches around excavation works. Implementation of best practice with regards to construction of watercourse crossings. Baseline and subsequent water quality monitoring. Drainage management proposals to ensure pre-construction rates/ volumes of run-off maintained. The drainage management works would be supervised by the ECoW. Track design in accordance to best practice measures for the construction of tracks on peat. Maintenance of 'clean' water flows around construction locations. Suitable distribution of surface waters from SuDS measures. Best practice measures shall be implemented by the contractor responsible for felling operations in line with applicable General Binding Rules and Forestry Commission best practice measures to protect the water environment. Best practice measures shall be implemented by the contractor responsible for felling operations in line with applicable General Binding Rules and Forestry Commission best practice measures to protect the water environment.		
	Minor (non-significant) effects on groundwater, associated with chemical pollution, alteration of sub-surface flows and lowering groundwater table.	None required. Good practice drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP to be agreed.	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Moderate/ minor to none (non-significant) effects of peat resource.	A detailed Peat Management Plan (PMP) will be developed in accordance with the Stage 1 PMP presented in Technical Appendix 2.4 or this EIA Report. Recommended good practice measures set out in Technical Appendix 2.5: Peat Landslide Hazard Risk Assessment (PLHRA) will be implemented.	Planning Condition requiring scope of CEMP, incorporating PMP and good practice measures from PLHRA to be agreed.	Not significant
	Moderate/ minor (non-significant) effects on GWDTE.	None required. Good practice drainage management proposals to ensure groundwater flow and hydraulic continuity is maintained.	Planning Condition requiring scope of CEMP to be agreed.	Not significant
	Cumulative Construction			
	Potential (non-significant) cumulative impacts to water quality of the River Tarf.	None required. In addition to measures set out above, the implementation of a water quality monitoring programme is proposed as a good practice measure. Water quality monitoring shall be supervised by the ECoW and the location and frequency of water quality monitoring shall be agreed with SEPA.	Planning Condition requiring scope of CEMP, associated Water Quality Monitoring Programme and appointment of ECoW to be agreed.	Not significant
Traffic, Transport and Access	Construction			
	Potential large (Significant) effects on the C22w and C3w related to severance and fear as a result of construction traffic. Effects on the C22w and C3w users related to driver delay, pedestrian delay, amenity and accidents/ safety would be slight (non-significant). Effects on C22w and C3w residents would be negligible or slight (non-significant).	Mitigation measures proposed include the development of a Construction Traffic Management Plan (CTMP) to incorporate: Site working travel plan, abnormal loads traffic management plan, traffic management measures to control and provide advance warning on the local road network, driver training, improved direction signage and public information; use of onsite borrow pits to reduce traffic flows and provision of passing place enhancements.	Planning Condition requiring scope of CTMP to be agreed with the Roads Authority.	Not significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Potential moderate (Significant) effects on the Three Lochs Holiday Park related to severance, pedestrian delay and fear/ intimidation.	Mitigation measures proposed include the development of a Construction Traffic Management Plan (CTMP) to incorporate: Site working travel plan, abnormal loads traffic management plan, traffic management measures to control and provide advance warning on the local road network, driver training, improved direction signage and public information; use of onsite borrow pits to reduce traffic flows and provision of passing place enhancements. Provision of temporary 20 mph zone and pedestrian crossing facility.	Planning Condition requiring scope of CTMP to be agreed with the Roads Authority.	Not significant
	Cumulative Construction			
	None	None	N/A	N/A
Noise and Vibration	Construction			
	Predicted construction noise levels are below the Category A Threshold Levels for all receptors and scenarios, therefore there would be no significant effects.	None required. Standard good site practices would be included in the CEMP in accordance with BS5228-1:2009+A1:2014.	Planning Condition requiring scope of CEMP to be agreed.	Not significant
	Cumulative Construction			
	No significant cumulative construction noise effects predicted on noise sensitive receptors.	None	N/A	Not significant
Aviation and Telecommunications	Construction			
	None	None	N/A	Not significant
	Cumulative Construction			
	None	None	N/A	Not significant
Socioeconomics	Construction			

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Beneficial Economic Impact (Local)	None	N/A	Not significant
	Beneficial Economic Impact (National)	None	N/A	Not significant
	Tourist Routes	None	N/A	Not significant
	Cumulative Construction			
	Cumulative Beneficial Economic Impact (National)	None	N/A	Significant Beneficial Effects
Forestry	Construction			
	With reference to the Control of Woodland Removal Policy, the permanent felling would be significant in the absence of mitigation.	Compensatory planting will be provided, calculated in accordance with Annex 5 of the Scottish Government's policy on control of woodland removal: implementation guidance February 2019[1], taking into account any potential low yield class forest on deep peat, where restoration potential could be realised through the Artfield Forest restructuring.	Planning Condition requiring scope of compensatory planting to be agreed.	Not significant
	Increased harvesting with risk to water quality (non-significant).	None required. All forestry felling operations must maintain good practice identified in Forestry Commission Technical Note: Protecting the Environment during Mechanical Harvesting Operations Good practice timber harvesting. The CEMP will incorporate good practice from The 2nd edition Forestry and Water Scotland guidelines[2] in relation to working around watercourses, including connected ditches and drains.	Planning Condition requiring scope of CEMP to be agreed.	Not significant
	Cumulative Construction			
	Not relevant to forestry	None	N/A	N/A

1 Forestry Commission Scotland (2019) Scottish Government's policy on control of woodland removal: implementation guidance, revised February 2019

2 Forestry and Water Scotland guidelines: forestrywaterscotland.com [accessed 18/11/2020]

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Shadow Flicker.	Construction			
	None	None	N/A	N/A
	Cumulative Construction			
	N/A	N/A	N/A	N/A
Climate	Construction			
	None	None	N/A	Not Significant
	Cumulative Construction			
	None	None	N/A	Not Significant
Operation				
Landscape and Visual	Operational			
	Effects on DGC Regional Scenic Areas – ranging from Moderate to None and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
	Effects on South Ayrshire Scenic Area – Minor and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
	Effects on Gardens and Designed Landscapes (GDL) – None.	None required.	N/A	Not significant
	Effects on Merrick WLA – Minor to None and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A	Not significant
	Effects on local landscape character – LCT174: Plateau Moorland with Forest – Dumfries and Galloway – Major/ Moderate to Moderate/ Minor Landscape Effect on (localised Significant effect on part of the host) LCT.	Mitigation inherent in the design. No further mitigation proposed.	N/A	Significant (localised)

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Effects on all other LCTs and SCTs – ranging from moderate to none and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	Effects on transport routes (including national cycle routes): ranging from Moderate/ Minor to none and not significant (Visual Effects).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	Southern Upland Way – Moderate generally (not significant) to Major (Significant) within approx. 6 km of the route from the nearest turbine of the Proposed Development –Visual Effects.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	**Significant** (localised)
	The Moors of Wigtownshire Walk – Major (significant) visual effect locally within the Tarf Bridge section. Moderate (not significant) for remainder of route.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	**Significant** (localised)
	Three Lochs Kirkcowan – Major (Significant) Visual Effects.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant
	All other recreational routes: ranging Moderate/ Minor to none and not significant Visual Effects.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	Effects on settlements: ranging from Moderate to None and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	Cumulative Operation			
	In-addition cumulative effects on all RSA and South Ayrshire Scenic Area – ranging from Moderate/ Minor to None and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-combination cumulative effects on Galloway Hills and Mochrum Lochs RSA and South Ayrshire Scenic Area –	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	ranging from Major to Major/ Moderate and Significant.			
	In-combination cumulative effects on Machars Coast (none) and Rhins Coast (moderate) RSA– not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-addition and In-combination cumulative effects on GDL (none).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	Merrick WLA – In-addition cumulative effects (none).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-addition cumulative effects on landscape character – ranging from Moderate/ Minor to None and not significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-combination cumulative effects on landscape character – ranging from Major to Major/ Moderate (significant) for LCT72; LCT73; LCT78; LCT83; LCT159; LCT167; LCT168; LCT172; LCT173; LCT174; LCT175; LCT179 and LCT181.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant
	In-combination cumulative effects on landscape character (all other LCT and SCT) – Moderate (not significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-addition cumulative effects on transport routes (A75, A7814, A747, B7005 and NCR 73) – Moderate/ Minor to Minor (not significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-combination cumulative effects on transport routes (A75, A7814, A747, B7005 and NCR 73) – Major/ Moderate (Significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	In-addition cumulative effects on recreational routes (SUW, Mull of Galloway Trail, New Luce to Kilhern – Circular Walk; Stranoch to Beneraird), Moderate to Moderate/ Minor (not significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-addition cumulative effects on recreational routes, The Moors of Wigtownshire Walk (Moderate/ Major – locally around Tarf Bridge); Three Lochs Kirkcowan – (Major); Glenkitten Fell (Major/ Moderate) – Significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant (localised)
	In-combination cumulative effects on recreational routes - SUW, Mull of Galloway Trail, New Luce to Kilhern – Circular Walk, The Moors of Wigtownshire Walk, Three Lochs Kirkcowan, Glenkitten Fell; Stranoch to Beneraird (Major to Major/ Moderate) Significant.	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant
	In-addition cumulative effects on settlements (all) – ranging Moderate to Moderate/ Minor (not significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Not significant
	In-combination cumulative effects on settlements (all except Whithorn) – Major/ Moderate (significant) (Whithorn is Moderate and not significant).	Mitigation inherent in the design. No further mitigation proposed.	N/A.	Significant
Cultural Heritage	Operation			
	Significant effects upon the settings of the Scheduled Wood Cairn (Site 242) and non-designated High Eldrig Cairn (Site 328).	Mitigation inherent in the design. No further mitigation proposed.	N/A	Significant
	Cumulative Operation			

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Significant cumulative effects upon the settings of the Scheduled Wood Cairn (Site 242) and the non-designated High Eldrig cairn (Site 328).	Mitigation inherent in the design. No further mitigation proposed.	N/A	Significant
Ecology	Operation			
	Negligible to low (non-significant) direct collision/ mortality, loss or damage of habitats or disturbance/ displacement of commuting and/ or foraging habitats for bats.	None required. Appropriate buffer included in the design of the Proposed Development between turbines and woodland edge habitats. 97 m buffer to be maintained tree-free during operation of the Proposed Development (see Technical Appendix 7.3: HMP).	Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
	Cumulative Operation			
	Negligible to low (non-significant) direct collision/ mortality, loss or damage of habitats or disturbance/ displacement of commuting and/ or foraging habitats for bats.	None required. Appropriate buffer included in the design of the Proposed Development between turbines and woodland edge habitats. 97 m buffer to be maintained tree-free during operation of the Proposed Development (see Technical Appendix 7.3: HMP).	Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
Ornithology	Operation			
	Negligible (non-significant) effect on hen harrier through Collision Mortality and displacement.	None required.	N/A	Not significant
	Minor (non-significant) effect on goshawk from displacement.	None required.	N/A	Not significant
	Negligible (non-significant) effect on goshawk through Collision Mortality.	None required.	N/A	Not significant
	Cumulative Operation			

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Negligible (non-significant) effect on hen harrier and goshawk from Collision Mortality and Displacement.	None required.	N/A	Not significant
Hydrology, Hydrogeology and Geology	Operation			
	None – Minor (non-significant) effects associated with alterations to runoff volumes and rates and fluvial morphology through the alteration of drainage patterns. Groundwater recharge through impermeable surfaces. Sediment related pollution and chemical contamination of surface or groundwater.	On-going maintenance for all proposed drainage measures on the Site, particularly including water crossings and sustainable drainage features designed to manage water quality and runoff rate.	Relevant legislation and good practice measures for Site operation to be followed.	Not significant
	Potential indirect Minor (non-significant) effects on peatland habitats through alteration of drainage pathways. Potential beneficial (non-significant) effect on peatland habitats through enhancement.	None required. Beneficial effects realised through the HMP.	Planning Condition requiring HMP to be agreed as per Technical Appendix 7.3: HMP.	Not significant
	No impact (non-significant) for GWDTE during operation further to those identified for the construction phase.	None required.	N/A	Not significant
	Cumulative Operation			
	No additional cumulative effects over and above those detailed above.	None required.	N/A	Not significant
	No additional cumulative effects over and above those detailed above.	None required.	N/A	Not significant
Traffic, Transport and Access	Operation			
	None	None	N/A	N/A
	Cumulative Operation			
	None	None	N/A	N/A

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Noise and Vibration	Operation			
	Potential operational noise effects on noise sensitive receptors.	None required. Further data would be obtained from the supplier for the final choice of wind turbine model to demonstrate compliance with the operational noise limits derived in this report.	Planning Condition	Not significant
	Cumulative Operation			
	Potential cumulative operational noise effects on noise sensitive receptors.	None	N/A	Not significant
Aviation and Telecommunications	Operation			
	None	None	N/A	Not significant
	Cumulative Operation			
	Cumulative Operational Effects related to aviation lighting (significant).	It is proposed to re-design the lighting scheme, prior to construction, taking into account the lighting status of adjacent developments and the need to continue to provide warning to airspace users of the perimeter of the cumulative area of wind turbines.	Planning Condition.	Not significant
Socioeconomics	Operation			
	Expenditure (Local)	None	N/A	Not significant
	Expenditure (National)	None	N/A	Not significant
	Community Benefit (Local)	None	N/A	Significant Beneficial Effects
	Community Benefit (National)	None	N/A	Not significant
	Non-domestic Rates	None	N/A	Not significant
	Tourism and Recreation	None required.	Not applicable	Not significant
	Cumulative Operation			

Table 17.1: Summary of Mitigation				
Topic	**Potential Effect (without Mitigation)**	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
	Cumulative Beneficial Impact (Local)	None	N/A	Significant Beneficial Effects
	Cumulative Beneficial Impacts (National)	None	N/A	Significant Beneficial Effects
Forestry	Operation			
	None	None	N/A	Not significant
	Cumulative Operation			
	Not relevant to forestry	None	N/A	N/A
Shadow Flicker (potential to be scoped-out, depending on final wind farm design).	Operation			
	Disturbance to properties within the shadow flicker study area.	None	N/A	Not significant
	Cumulative Operation			
	N/A	N/A	N/A	N/A
Climate	Operation			
	None	None	N/A	Not significant
	Cumulative Operation			
	None	None	N/A	Not significant

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